SPECIFICATION

INTERIOR AND EXTERIOR RENOVATIONS

Qikiqtarjuaq, Nunavut

Tender
18 05 02

Can-Tec Services Ltd.
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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the upgrade of mechanical systems in Facility Building V088 and in Residences V103 and V104 in Qikiqtarjuaq, Nunavut. This work includes; labour, materials and shipping of materials, in accordance with the contract documents and as further described herein.

1.2 SCOPE OF WORK- FACIITY BUILDING V088

.1 Remove and replace air handling unit

.2 Remove and replace existing HRV units

.3 Repair 4-way valve

.4 Repair in-floor heating system

1.3 FACILITY BUILDING V088 – EXTRA MATERIALS

.1 Supply a 55 gallon drum of DOWFROST 50/50 Premix.

1.4 SCOPE OF WORK – RESIDENCE V103

.1 Remove and replace window

.2 Install new furnace

.3 Install new hot water tank

.4 Install new sewage tank

.5 Remove and replace sanitary plumbing

.6 Remove and replace ductwork

.7 Re-support domestic water piping

1.5 SCOPE OF WORK – RESIDENCE V104

.1 Remove and replace boiler system and associated piping

.2 Remove and replace HRV

.3 Install new fuel piping to boilers

1.6 SITE VERIFICATION

Upon award of the contract contractor is to schedule a site trip to site verify all sizes and dimensions. No additional fees will be considered for materials brought onto site of the wrong size.

1.7 MOCKUP

.1 The entire steel ramp system and a section of steel grating (see structural drawings for details) is to be mocked up at a location of the General Contractors choosing for review by the Architect and Structural Engineer.

.2 Wood footing system does not have to be mocked up

.3 Once the steel ramp system has been reviewed and approved in writing by the structural engineer and architect can the ramp be broken down and shipped to site.

1.8 WORK SEQUENCE

.1 Buildings will remain occupied during the renovation.

.2 Co-ordinate Progress Schedule with Departmental Representative, Consultant and Local Commander

.3 Maintain fire access/control at all times.

.4 The work on the facility building will be done in phases one phase being completed and certified prior to the second phase being started.

1.9 PROTECTION OF BUILDING

.1 The contractor is to document photo the condition of the existing exterior of the building and all surrounding areas at takeover of the area of work and supply a digital copy to the consultant within five days of coming to site.

.2 The contractor is responsible for the protection of all damage caused during the construction process and it will be the responsibility of the contractor to make good to the acceptance of the Project Manager and Consultant.

1.10 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for storage, and for access to allow:

.1 Owner Occupancy

.2 Work by other Contractors

.3 Public Usage

.2 Keep clear products or equipment which may **interfere** with operation of Building or other contractors.

.3 Assume responsibility for the protection and safekeeping of products under this contract.

.4 Co-ordinate use of premises under direction of Consultant and Departmental Representative.

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

.6 Ensure safe practices and work area to prevent injury or damage to portions of existing work which remain.

.7 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.

1.11 OWNER OCCUPANCY

.1 Facility building will be occupied during construction.

.2 Co-Operate with Owner in scheduling operations to minimize conflict and to facilitate owner usage.

1.12 EXISTING SERVICES

.1 Notify Consultant and utility companies of intended interruption of services and obtain required permission. Pay fees and obtain certificates and permits required.

.2 Where Work involves breaking into or connecting to existing services, give 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic and tenant operations.

.3 Provide alternative routes for personnel and vehicular traffic (if required).

.4 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.

.5 Submit schedule to and obtain approval from Consultant and building operations for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services when directed by Consultant or as required to maintain critical building and tenant systems.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.9 Protect, relocate or maintain existing active services. When inactive services are encountered, inform consultant and owner prior to capping off in manner approved by authorities having jurisdiction.

.10 Record locations on as-built drawings of maintained, re-routed and abandoned service lines.

.11 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures

1.13 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.

1.14 CODES AND STANDARDS

.1 Materials shall be new and work shall conform to the minimum applicable standards of the Canadian General Standards board, the Canadian Standards Association, The National Building Code of Canada 2010, and all applicable Territorial and Municipal codes, and all standards listed below. In the case of conflict or discrepancy the most stringent requirement shall apply.

.2 Meet or exceed requirements of contract documents, specified standards, codes and referenced documents.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the upgrade of mechanical systems in Facility Building V088 and in Residences V103 and V104 in Qikiqtarjuaq, Nunavut. This work includes; labour, materials and shipping of materials, in accordance with the contract documents and as further described herein.

1.2 SCOPE OF WORK- FACIITY BUILDING V088

.1 Remove and replace air handling unit

.2 Remove and replace existing HRV units

.3 Repair 4-way valve

.4 Repair in-floor heating system

1.3 SCOPE OF WORK – RESIDENCE V103

.1 Remove and replace window

.2 Install new furnace

.3 Install new hot water tank

.4 Install new sewage tank

.5 Remove and replace sanitary plumbing

.6 Remove and replace ductwork

.7 Re-support domestic water piping

1.4 SCOPE OF WORK – RESIDENCE V104

.1 Remove and replace boiler system and associated piping

.2 Remove and replace HRV

.3 Install new fuel piping to boilers

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.2 Co-ordinate Progress Schedule with Departmental Representative, Consultant and Local Commander

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.3 Provide alternative routes for personnel and vehicular traffic (if required).

.4 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.

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.8 Field Test Reports.
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.10 Health and Safety Plan and Other Safety Related Documents.
.11 Other documents as specified.

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.1 Materials shall be new and work shall conform to the minimum applicable standards of the Canadian General Standards board, the Canadian Standards Association, The National Building Code of Canada 2010, and all applicable

Territorial and Municipal codes, and all standards listed below. In the case of conflict or discrepancy the most stringent requirement shall apply.

.2 Meet or exceed requirements of contract documents, specified standards, codes and referenced documents.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

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

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

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

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

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

.1 Notify, utility companies, Consultant, of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

1.5 SPECIAL REQUIREMENTS

.1 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

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

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

1.6 SECURITY CLEARANCES

.1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will be required to enter premises.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not allowed on the property.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ON-SITE DOCUMENTS

.1 Contract Documents

.2 Specifications

.3 Addenda

.4 Reviewed shop drawings

.5 Change orders

.6 Other modifications in contract

.7 Field test reports

.8 Copy of approved Work Schedule

.9 Manufacturers installation and application instructions

.10 Labour conditions and wage schedules

.11 Project Record Documents (for as-built purposes)

.12 Codes and Standards listed in 01 11 00

1.2 ADMINISTRATIVE

.1 Attend project meetings throughout the progress of the work at the call of Consultant.

.2 Provide physical space and make arrangements for meetings.

.3 Consultant will record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.4 Consultant will reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants, affected parties not in attendance, Project Manager, and Contractor.

.5 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.3 PRECONSTRUCTION MEETING

.1 After award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities. Meeting will be held at the location and time designated by the departmental representative

.2 Departmental Representative, Engineer and Consultant, Contractor, major Subcontractors, will be in attendance. Others may be in attendance at the discretion of the departmental representative or the Contractor. Representatives of the local Building Manager may also be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 2 days before meeting.

.4 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

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

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Delivery schedule of specified equipment.

.6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

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

.8 Owner provided products.

.9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures

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

.11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.12 Monthly progress claims, administrative procedures, photographs, hold backs.

.13 Appointment of inspection and testing agencies or firms.

.14 Insurances, transcript of policies.

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

.6 During construction coordinate use of site and facilities through Departmental Representatives procedures for intra-project communications: submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

.7 Comply with instruction of consultant for use of Temporary utilities and construction facilities.

.8 Coordinate field engineering and layout work with consultant.

1.4 PROGRESS MEETINGS

.1 During course of Work at the discretion of the Consultant and Departmental Representative.

.2 Representatives of the Contractor, major Subcontractors involved in the work and other as required and decided upon by the Departmental Representative or Contractor are to be in attendance. Contractor to notify all sub-contractors.

.3 Consultant will notify contractor min 5 days prior to meetings

.4 Consultant to record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revision to construction schedule.
.8 Progress schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.
.11 Review proposed changes for affect on construction schedule and on completion date.
.12 Other business.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by RCMP to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Construction Progress Schedule to be Completed in Microsoft Project or Similar Software.

.3 Plan to complete Work in accordance with prescribed milestones and time frame.

.4 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

.5 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

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

.2 Submit to Consultant within 5 working days of Award of Contract as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Consultant within 5 working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

1.5 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Consultant will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Submit to Consultant submittals listed 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 extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in imperial units.

.4 Where items or information is not produced in imperial units converted values are acceptable.

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

.6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's, Consultant's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.

.10 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in the Territory of Nunavut, Canada.

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

.4 Allow 14 days for Consultant's review of each submission.

.5 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.6 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.

.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.

.8 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Property Manager's, Engineer's, Consultant's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant and Engineer may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant and Engineer.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Consultant and Engineer

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic or 6 copies of manufacturers instructions for requirements requested in specification Sections and as requested by Consultant and Engineer.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit 6 copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant and Engineer.

.1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.16 Submit 6 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant and Engineer

.17 Delete information not applicable to project.

.18 Supplement standard information to provide details applicable to project.

.19 If upon review by Consultant and Engineer, 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.

.20 The review of shop drawings by and Consultant is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or

omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Consultants business address.

.3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

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

.5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.6 Make changes in samples which Consultant may require, consistent with Contract Documents.

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

1.4 NOT USED

.1 Not Used.

Part 2 Execution

2.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

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

.1 Material Safety Data Sheets (MSDS).

.3 Northwest Territories & Nunavut

.1 The Workers Compensation Act latest edition.

1.2 SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Consultant or authority having jurisdiction, as required.

.4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

1.3 SAFETY ASSESSMENT

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

1.4 MEETINGS

.1 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.

1.5 REGULATORY REQUIREMENTS

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

1.6 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.7 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.8 COMPLIANCE REQUIREMENTS

.1 Comply with The Workers Compensation Act, Workplace Safety Regulation, Northwest Territories and Nunavut WSCC - Workers Safety & Compensation Commission.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 UNFORSEEN HAZARDS

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

1.10 POSTING OF DOCUMENTS

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

1.11 CORRECTION OF NON-COMPLIANCE

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

.2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

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

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify consultant and Project Manager.

.2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant and Project Manager.

.3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant and Project Manager.

1.3 BUILDING SMOKING ENVIRONMENT

.1 No smoking permitted.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

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

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant, instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies may be engaged by consultant for purpose of inspecting and/or testing portions of Work.

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

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Project Manager or Consultant at no cost to Property Manager or Consultant. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

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

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

1.4 PROCEDURES

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

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

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

1.5 REJECTED WORK

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

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

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

1.6 REPORTS

.1 Submit electronic copies of inspection and test reports to Consultant.

.2 Provide copies to subcontractor of work being inspected or tested.

1.7 MOCK-UPS

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

.2 Construct in locations acceptable to Consultant.

.3 Prepare mock-ups for Consultant's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

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

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

1.8 MILL TESTS

.1 Submit mill test certificates as requested.

1.9 EQUIPMENT AND SYSTEMS

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.3 WATER SUPPLY

.1 Water is available for use by the contractor provided by the Building Owner

1.4 TEMPORARY POWER AND LIGHT

.1 Power is available for use by the contractor provided by the Building Owner.

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

1.5 TEMPORARY COMMUNICATION FACILITIES

.1 Contractor to furnish own Temporary phone, Fax and e-mail.

1.6 FIRE PROTECTION

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

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-0121-M1978(R2003), Douglas Fir Plywood.

.3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.

.4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by contractor, number of trailers used, avenues of ingress/egress to fenced are and details of fence installation

.2 Indicate use of supplemental or other staging area.

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

.4 Remove from site all such work after use.

1.4 SITE STORAGE/LOADING

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

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

1.5 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work or impede the operation of the detachment.

.2 Adequate parking must be maintained for public and building occupant access. This area is already defined and is not to be used for contractor parking.

.3 Provide and maintain adequate access to project site.

1.6 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

.2 Locate materials Required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.7 CLEAN-UP

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

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

.3 Remove materials resulting from demolition as soon as possible from site.

.4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.3 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.4 FIRE ROUTES

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

1.5 PROTECTION OF BUILDING FINISHES

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

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with property manager and detachment commander locations and installation schedule 3 days prior to installation.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

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

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

.3 Clear snow and ice from access to building, bank/pile snow in designated areas only.

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

.5 Dispose of waste materials and debris off site.

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

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

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

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

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

1.2 FINAL CLEANING

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

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

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris including that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

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

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

.8 Remove dirt and other disfiguration from exterior surfaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Dispose of waste and separate waste materials for recycling as per requirements of local authorities.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION AND DECLARATION

.1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Inspection.

.2 Consultant and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

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

.1 All Tank Installation Summary Sheets and required photos have been submitted to the engineer prior to inspection being requested. See Section 01 78 00 for standard information sheet and photo requirements.

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

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

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

.5 Certificates required by Fire Commissioner, Utility companies, Engineering Services and Local Authorities have been submitted.

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

.7 Work is complete and ready for final inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Consultant and Contractor. If Work is deemed incomplete by Consultant, complete outstanding items and request reinspection.

1.2 CLEANING

.1 In accordance with Section 01 74 11 – Cleaning.

.2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with local authorities.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 Not Used

.1 Not Used.

END OF SECTION

TANK INSTALLATION SUMMARY

Tank Location:

Community: _____

Building Address: _____

Date of Installation: _____

Temperature and Weather of Installation: _____

Name of Installer: _____

Tank Information:

Type of Tank: _____
Tank Clearances:
Front:_____ Right Side:_____ Left Side:_____ Rear :_____
Tank Serial Number: _____
Stand Type: _____
Tank Warrantee Start Date: _____

Piping and Accessories Installed:

		Photo Provided
Shut Off Valve at Tank:	_____	_____
Drip Leg and Valve	_____	_____
Flex Connection	_____	_____
Vent Cover	_____	_____
Interstitial Vent Cover	_____	_____
Vent whistle	_____	_____
Fill Cover	_____	_____
Gauge and Protector	_____	_____
Exterior Caulking Installed	_____	_____
Two layers pipe tape at wall entry	_____	_____
Touch Up Paint for all Fittings	_____	_____
Minimum 24” Clearance to tank	_____	_____
Vent Clearance to Window/openings	_____	_____
Fill Clearance to Windows/openings	_____	_____

Interior Piping Installed

		Photo Provided
Interior Shut-off Valves	_____	_____
Warming Pipe	_____	_____
De-aerator (tiger loop)	_____	_____
Filter	_____	_____
Fusible Head Valve:	_____	_____

Interior Piping: _____

Type: _____ Length:_____ Photo Provided: _____

Photos

	Photo Provided
Complete elevation with tank	_____
Close up of tank:	
Front:	_____
Right side	_____
Left Side	_____
Rear:	_____
Interior Piping Changes:	_____
New fittings	_____
New Spill Kit	_____
Supplied Spill Report Document	_____

Submitted By:_____ Date:_____

Part 1 General

1.1 SUBMITTALS

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

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

.3 Copy will be returned after final inspection, with Consultant comments.

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

.5 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, four final copies of operating and maintenance manuals in English.

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

.7 Furnish evidence, if requested, for type, source and quality of products provided.

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

.9 Pay costs of transportation.

.10 Supply one electronic and 5 copies of equipment manuals for all new items installed under this project

1.2 FORMAT

.1 Organize data as instructional manual.

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

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

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

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

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

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

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

.9 Provide scaled CAD files in dwg format on CD.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

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

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

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

.5 Digital Photos of the sites before and after the tanks have been installed. Provided on a CD or Flash Drive indexed to each community and structure. Photos to be cross referenced to the photos requested in the attached Tank Installation Summary.

.6 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.

.7 Training: refer to Section 01 79 00 - Demonstration and Training.

1.4 INSTALLATION REPORT

.1 Submit installation report for each oil tank installation. See Schedule 1 for Report format.

1.5 AS-BUILTS AND SAMPLES

.1 Maintain, at site for Consultant one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

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

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

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

.5 All copies of the documents must be turned over to consultant, **NO** copies may be maintained by the General Contractor or Trades.

1.6 EQUIPMENT AND SYSTEMS

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

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

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

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

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

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.

.15 Additional requirements: as specified in individual specification sections.

1.7 MATERIALS AND FINISHES

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

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

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

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

1.8 SPARE PARTS

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

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

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

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

1.9 SPECIAL TOOLS

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

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

.3 Deliver to site; place and store

.4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listing in Maintenance Manual

1.10 MAINTENANCE MATERIALS

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

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

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

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

1.11 SPECIAL TOOLS

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

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

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

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

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

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

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

.5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

1.13 WARRANTIES AND BONDS

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

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Property Manager and Consultant for approval.

.3 Warranty management plan to include required actions and documents to assure that Property Manager receives warranties to which it is entitled.

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

.5 Submit, warranty information made available during construction phase, to Property Manager for approval prior to each monthly pay estimate.

.6 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 applicable item of work.

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

.5 Co-execute submittals when required.

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

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

.8 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.

.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 Contractor's plans for attendance at 10 month post-construction warranty inspections.

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

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

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

.10 Written verification will follow oral instructions. Failure to respond will be cause for the property manager to proceed with action against Contractor.

1.14 PRE-WARRANTY CONFERENCE

.1 Meet with Consultant, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Consultant.

.2 Consultant will establish communication procedures for:

- .1 Notification of construction warranty defects.
- .2 Determine priorities for type of defect.
- .3 Determine reasonable time for response.

.3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.15 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Property Manager or Consultant.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

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

.4 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.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

Part 4 SCHEDULES

See following Pages

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 This section is limited to portions of the Building Management Manual (BMM) provided to Departmental Representative by Contractor.

.2 Acronyms:

.1 BMM - Building Management Manual.
.2 HVAC - Heating, Ventilation and Air Conditioning.
.3 PI - Product Information.
.4 PV - Performance Verification.
.5 TAB - Testing, Adjusting and Balancing.
.6 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 216 mm x 279mm.

.2 Binders: vinyl hard covered, “D” ring,(not “O” ring) loose leaf sized, with spine pocket. Identify contents of each binder on spine

.3 Methodology used to facilitate updating.

.4 Drawings, diagrams and schematics to be professionally developed.

.5 Electronic copy of data to be in a format accepted and approved by Property Manger (PDF).

1.3 APPROVALS

.1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Property Manager.

1.4 GENERAL INFORMATION

.1 Provide Consultant the following for insertion into appropriate Part and Section of BMM:

.1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
.2 Summary of architectural and structural systems installed and commissioned - as indicated in Section 1.4 of BMM.
.1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
.3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.

.4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM..

.5 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Consultant to review and approve format and organization within 2 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Approved project shop-drawings, product and maintenance data.

.6 Inspection certificates with expiration dates, which require on-going re-certification inspections.

1.6 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide RCMP supporting documentation relating to installed equipment and system, including:

.1 General:

.1 Approved "as-built" drawings and specifications.

.2 Cross-Reference to specification sections.

.2 Architectural and structural:

.1 Inspection certificates, construction permits.

1.7 LANGUAGE

.1 English only.

1.8 IDENTIFICATION OF FACILITY

.1 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation:

.1 To be supplied to successful contractor.

1.9 USE OF CURRENT TECHNOLOGY

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures.

1.2 SUBMITTALS

.1 Submit shop drawings in accordance with Sections 01 33 00 - Submittal Procedures 01 00 10 - General Instructions.

1.3 SITE CONDITIONS

.1 Should material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Consultant immediately.

.1 Do not proceed until written instructions have been received from Consultant.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 PREPARATION

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

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

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

3.2 PROTECTION

.1 Prevent movement, settlement, or damage to adjacent structures,utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

3.3 SALVAGE

.1 Refer to demolition drawings and specifications for items to be salvaged for reuse.

.2 Items to be stored in weather tight enclosure to ensure that no damaged is caused prior to re-installation

3.4 SITE REMOVALS

.1 Remove items as indicated.

3.5 DEMOLITION

.1 Remove parts of existing building to permit new construction.

.2 Trim edges of partially demolished building elements to tolerances as defined by Consultant to suit future use.

3.6 DISPOSAL

.1 Dispose of removed materials, except where specified otherwise, in accordance with authority having jurisdiction.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00, 061500, 061753.

1.2 REFERENCES

.1 American National Standards Institute/National Particleboard Association (ANSI/NPA)

.1 ANSI/NPA A208.1-2009, Particleboard.

.2 ASTM International

.1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.

.3 ASTM C578-11a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.4 ASTM C1289-11, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.5 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.

.6 ASTM D1761-06, Standard Test Methods for Mechanical Fasteners in Wood.

.7 ASTM D5055-11, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.8 ASTM D5456-11, Standard Specification for Evaluation of Structural Composite Lumber Products.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction and amendment.

.4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 CSA International

.1 CAN/CSA-A123.2-03(R2008), Asphalt Coated Roofing Sheets.

.2 CAN/CSA-A247-M86 (R1996), Insulating Fiberboard.

.3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.5 CSA O121-08, Douglas Fir Plywood.

.6 CAN/CSA O122-06(R2011), Structural Glued-Laminated Timber.

.7 CSA O141-05(R2009), Softwood Lumber.

.8 CSA O151-09, Canadian Softwood Plywood.

.9 CSA O153-M1980 (R2008), Poplar Plywood.

.10 CSA O325-07, Construction Sheathing.

.11 CSA O437 Series-93(R2011), Standards on OSB and Waferboard.

.12 CAN/CSA-Z809-08, Sustainable Forest Management.

.5 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.6 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2010.

.7 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

.8 The Truss Plate Institute of Canada

.1 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses 2007.

.9 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.

1.4 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

.3 Sustainable Standards Certification:

.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wood from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 FRAMING STRUCTURAL AND PANEL MATERIALS

.1 Description:

.1 Sustainability Characteristics:

.1 Lumber, Finger Jointed Lumber, Glulam, I-Joists, Trusses, SCL, CAN/CSA-Z809 or FSC or SFI certified.

.2 Plywood. Particleboard OSB urea-formaldehyde free, CAN/CSA-Z809 or FSC or SFI certified.

.2 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 Glulam in accordance with Structural Glued-Laminated Timber CAN/CSA-O122.

.4 Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D5055.

.5 Light-frame trusses in accordance with "Truss Design and Procedures for Light Metal Connected Wood Trusses", The Truss Plate Institute of Canada.

.6 Structural Composite Lumber (SCL) in accordance with ASTM D5456.

.7 Framing and board lumber: in accordance with NBC.

.8 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:

.1 Board sizes: "Standard" or better grade.

.2 Dimension sizes: "Standard" light framing or better grade.

.3 Post and timbers sizes: "Standard" or better grade.

.9 Plywood, OSB and wood based composite panels: to CSA O325.

.10 Douglas fir plywood (DFP): to CSA O121, standard construction.

.11 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.12 Poplar plywood (PP): to CSA O153, standard construction.

.13 Interior mat-formed wood particleboard: to ANSI/NPA 208.1.

.14 Mat-formed structural panelboards (OSB wafer): to CAN O437.

.15 Insulating fiberboard sheathing: to CAN/CSA-A247 CAN/ULC-S706.

.16 Glass fibre board sheathing: non-structural, rigid, faced, fiberglass, insulating exterior sheathing board.

.17 Gypsum sheathing: to ASTM C1396/C1396M.

2.2 ACCESSORIES

.1 Exterior wall sheathing paper: to CAN/CGSB-51.32

.2 Polyethylene film: to CAN/CGSB-51.34, Type 1, 0.15 mm thick.

.3 Roll roofing: to CAN/CSA A123.2, Type S.

.4 Air seal: closed cell polyurethane or polyethylene.

.5 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.6 Subflooring adhesive: to CAN/CGSB-71.26, cartridge loaded.

.7 General purpose adhesive: to CSA O112.9.

.8 Nails, spikes and staples: to CSA B111.

.9 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.10 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.11 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation. Hangers to be sized by truss manufacturer.

.12 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Consultant.

.13 Fastener Finishes:

.1 Galvanizing: to ASTM A123/A123M, ASTM A653, use galvanized fasteners for exterior work and treated lumber.

.14 Wood Preservative:

.1 Preservative Coating: in accordance with manufacturer's recommendations for surface conditions:

.1 Preservative: VOC limit 350 g/L maximum to SCAQMD Rule 1113.

.2 Coatings: VOC limit 350 g/L maximum to SCAQMD Rule 1113.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.

.1 Inform Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 PREPARATION

.1 Treat surfaces of material with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

3.3 MATERIAL USAGE

.1 Roof sheathing:

.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, square edge, 12.5 mm thick.

.2 Exterior wall sheathing:

.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, square edge, 12.5 mm thick.

.3 Subflooring:

.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T and G edge, 19 mm thick.

3.4 INSTALLATION

.1 Install members true to line, levels and elevations, square and plumb.

.2 Construct continuous members from pieces of longest practical length.

.3 Install spanning members with "crown-edge" up.

.4 Select exposed framing for appearance. Install lumber panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.5 Install subflooring combined subfloor and underlay with panel end-joints located on solid bearing, staggered at least 800 mm.

.1 In addition to mechanical fasteners, floor panels secure floor subflooring to floor joists using glue and screws. Place continuous adhesive bead in accordance with manufacturer's instructions, single-bead on each joist and double-bead on joists where panel ends butt.

.6 Install all wall sheathing in accordance with manufacturer's printed instructions.

.7 Install all roof sheathing in accordance with requirements of NBC.

.8 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.

.9 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.

.1 Align and plumb faces of furring and blocking to tolerance of 1:600.

.10 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.11 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

.12 Install sleepers as indicated.

.13 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

.14 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.15 Countersink bolts where necessary to provide clearance for other work.

.16 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)

- .1 ANSI A208.1-99, Particleboard.
- .2 ANSI A208.2-02, Medium Density Fibreboard (MDF).
- .3 ANSI/HPVA HP-1-2004, Standard for Hardwood and Decorative Plywood.

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

- .1 ASTM E1333-96(2002), Standard Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)

- .1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 2003.

.4 Canada Green Building Council (CaGBC)

- .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

.5 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-11.3-M87, Hardboard.

.6 Canadian Plywood Association (CanPly)

- .1 The Plywood Handbook 2005.

.7 Canadian Standards Association (CSA International)

- .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA O121-M89(R2003), Douglas Fir Plywood.
- .4 CAN/CSA O141-91(R1999), Softwood Lumber.
- .5 CSA O151-04, Canadian Softwood Plywood.
- .6 CSA O153-M1980(R2003), Poplar Plywood.
- .7 CSA Z760-94, Life Cycle Assessment.

.8 Forest Stewardship Council (FSC)

- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.9 National Hardwood Lumber Association (NHLA)

- .1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.

.10 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2005.

.11 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)

.1 SCAQMD Rule 1113-04, Architectural Coatings.

.2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.12 Underwriters Laboratories of Canada (ULC)

.1 CAN4-S104-80(R1985), Standard Method for Fire Tests of Door Assemblies.

.2 CAN4-S105-85(R1992), Standard Specification for Fire Door Frames, meeting the Performance Required by CAN4-S104.

1.2 SUBMITTALS

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

.2 Shop Drawings Submittals: in accordance with Section 01 33 00 - Submittal Procedures .

.1 Indicate details of construction, profiles, jointing, fastening and other related details.

.2 Indicate materials, thicknesses, finishes and hardware.

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

.1 Submit duplicate samples: sample size 150 x 150 mm or 150 mm long unless specified otherwise of panel materials.

1.3 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.1 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements .

.1 Protect materials against dampness during and after delivery.

.2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

Part 2 Products

2.1 LUMBER MATERIAL

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 AWMAC custom grade, moisture content as specified.

.4 Forest Stewardship Council (FSC) certified.

.2 Machine stress-rated lumber is acceptable.

.3 Hardwood lumber: moisture content 8% or less in accordance with following standards:

.1 National Hardwood Lumber Association (NHLA).

.2 AWMAC custom grade, moisture content as specified.

.4 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.5 Wood screws: plain, type and size to suit application.

.6 Splines: wood.

Part 3 Execution

3.1 INSTALLATION

.1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

3.2 CONSTRUCTION

.1 Fastening:

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Standing and running trim:

.1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.

.2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.

.3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.

.4 Install door and window trim in single lengths without splicing.

3.3 SCHEDULES

.1 All Window Casings to be replaced and be:

.1 Metrie – Model 136P Casing – Primed Finger Joint Pine

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).

.2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.

.3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).

.4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.

.5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.

.3 General Services Administration (GSA) - Federal Specifications (FS)

.1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

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

.1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's product to describe:

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Samples:

.1 Submit samples of each type of material and colour.

.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions:

.1 Submit instructions to include installation instructions for each product used.

1.3 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect joint sealants from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

.1 Ambient Conditions:

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.

.2 Joint substrates are dry.

.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:

.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.

.2 Conform to manufacturers recommended installation conditions for applications of sealants

.3 Ventilate area of work by use of portable supply and exhaust fans.

Part 2 Products

2.1 SEALANT MATERIALS

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

.2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.3 Where sealants are qualified with primers use only these primers.

.4 All sealants to be used in accordance with manufacturers recommended applications

.5 It remains the contractors responsibility to verify compatibility of the sealant with the substrate, primers, backer rods and weather conditions prior to installation.

.1 Bring any discrepancies with the above to the attention of the project manager.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Exterior joints in horizontal wearing (concrete) surfaces: Polyurethane, semi-self-levelling, moisture curing, non-staining, non-bleeding, colour as selected.

.1 ASTM C920
.2 Single Component
.3 Pourable
.4 Class – Cyclic Movement - 100/50
.5 CAN/CGSB – 19.13-M87
.6 Acceptable Product: Vulkem 45 SSL – Tremco Sealants, or approved equivalent.

.2 General exterior use: Silicone, neutral cure ultra-low modulus, moisture curing, nonstaining, nonbleeding, colour as selected.

.1 ASTM C920
.2 Single Component
.3 Non-Sag
.4 Class – Cyclic Movement - 100/50
.5 Class ‘A’
.6 ASTM C1248, C1382, E84
.7 CAN/CGSB – 19.13-M87
.8 Acceptable Product: Spectrem 1 – Tremco Sealants, or approved equivalent.

.3 Glazing: Silicone, neutral cure, medium modulus, colour as selected.

.1 ASTM C920
.2 Single Component
.3 Non-Sag
.4 Class – Cyclic Movement - 50
.5 Class 'A'
.6 ASTM C1248
.7 CAN/CGSB – 19.13-M87
.8 Acceptable Product: Spectrem 2 – Tremco Sealants, or approved equivalent.

.4 Air-Barrier to Window air-seal sealant: Silyl-terminated polyether polymer (STPe), moisture cure, medium modulus.

.1 Compatible with Air-Barrier system.
.2 ASTM C920
.3 Single Component
.4 Non-Sag
.5 Class – Cyclic Movement - 25
.6 Class 'A'
.7 Acceptable Product: Bakor HE925 BES, or approved equivalent.

.5 General interior use: painted gypsum, painted concrete, painted concrete block: Acrylic latex, colour as selected.

.1 Low VOC.
.2 Single Component
.3 Non-Sag
.2 Class – Cyclic Movement - 12.5
.3 Class 'A'
.4 CAN/CGSB 19-GP-14M
.5 Acceptable Product: Tremflex 834 – Tremco Sealants, or approved equivalent.

.6 Plumbing fixtures and general washroom / kitchen (wet-area) usage: sinks, tubs, urinals, water-closets, vanities: Silicone, acetoxy, moisture curing, with fungicide.

.1 ASTM C920
.2 Single Component
.3 Non-Sag
.4 Class – Cyclic Movement – 25
.5 Class 'A'
.6 CAN/CGSB – 19.13-M87
.7 Acceptable Product: Tremsil 200 – Tremco Sealants, or approved equivalent.

.7 Acoustical Sealant: to ASTM C919: Synthetic rubber, single-component, non-skinning, non-hardening.

.1 Single Component

.2 Non-Sag

.3 Class – Cyclic Movement – N/A

.4 CAN/CGSB 19.21 M87

.5 Acceptable Product: Acoustical Sealant – Tremco Sealants, or approved

.8 Preformed compressible and non-compressible back-up materials:

.1 Polyethylene, urethane, neoprene or vinyl foam:

.1 Extruded open closed cell foam backer rod.

.2 Size: oversize 30 to 50 %.

.2 Neoprene or butyl rubber:

.1 Round solid rod, Shore A hardness 70.

.3 High density foam:

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond breaker tape:

.1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 JOINT CLEANER

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

.2 Primer: in accordance with sealant manufacturer's written recommendations.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

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

3.2 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Clean adjacent surfaces immediately.

.3 Remove excess and droppings, using recommended cleaners as work progresses.

.4 Remove masking tape after initial set of sealant.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

PART 1 – GENERAL

1.1 SCOPE OF WORK

.1 This specification applies to buildings included in Part 9 of the National Building Code. This includes buildings of 3 stories or less used for residential occupancy.

.2 Remove and dispose of existing windows.

.3 Provide labour, material, equipment and services necessary and incidental to the general replacement of the windows. Replace window components as described herein.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.

.2 CAN/CGSB-12.8-97, Insulating Glass Units.

.3 SMA 1201R-2002 Specification for Insect Screens for Windows, Sliding Doors and Swinging Doors..

.4 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass

.5 CAN/CGSB-12.11-M, Wired Safety Glass

.6 CAN/CGSB-12.20-M, Structural Design of Glass for Buildings

.2 Canadian Standards Association (CSA) International

.1 AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.

.2 CSA A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/1.S.2/A440, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.

.3 CAN/CSA-A440.4-07(R2012), Window, Door, and Skylight Installation

.4 CAN/CSA-A440.2/A440.3-09, Fenestration energy performance/User guide to CSA A440.2, Fenestration energy performance.

.5 CAN/CSA-Z91-02(R2013), Health and Safety Code for Suspended Equipment Operations.

.6 CAN/CSA-Z809-08(R2013), Sustainable Forest Management.

1.3 PERFORMANCE REQUIREMENTS

.1 Design frames in exterior walls to accommodate expansion and contraction within services temperature range of -40°C to 40°C.

.2 Window air tightness to meet the rating of A3 when tested in accordance with CAN/CSA-440 windows.

.3 Window water tightness shall meet the B5 rating when tested in accordance with CAN/CSA-440 windows.

.4 Structural performance shall incorporate minimum design pressure (DP) of 1440Pa with a maximum deflection of 1/175 of the span when tested in accordance with CAN/CSA-440 Windows.

.5 Wind load resistance for window shall meet the C3 rating or better when tested in accordance with CAN/CSA-A440 Windows.

.6 Performance requirement for ease of operation shall be 60 N to initiate movement and 30 N to maintain motion.

.7 The window condensation temperature index of the frame (I_f) shall be 77 or better and temperature index of the glass (I_g) shall be 77 or better when tested in accordance with CAN/CSA-A440 Windows.

.8 The fixed and operable window thermal transmittance U-Value shall be less than 1.7 W/(m^2x°C) when tested in accordance with AAMA 1503.1 and CAN/CSA-A440.2.

.9 Windows shall meet or exceed minimum requirements as listed in CAN/CSA-A440 Windows, Table 27.

.10 Windows shall satisfy egress requirements as detailed in the National Building Code and shall conform to the local Code Authorities having jurisdiction.

.11 Insect screens to be provided for all vent windows; Rating S1 as per Table 4, CSA A440.

.12 Resistance to Forced Entry: F20.

.13 Windows shall conform to the requirements of CSA A440, latest applicable edition and meet eligibility requirements of the Manitoba Hydro Power Smart Program. Prior to contract award, the low bidder shall provide the Owner with test reports for the proposed new windows completed by an independent technical source, tested to CSA A440.2 or AAMA 1503 or NFRC Certified Products Listing. A CPD or model number shall be provided.

.14 The Contractor shall process and submit all requirements for the application of Manitoba Hydro Power Smart Program. The Owner to receive all Power Smart and other applicable rebates.

1.4 SHOP DRAWINGS

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

.2 Indicate materials and details in full scale for head, jamb, mullion, sill and sash details, profiles of components, interior and exterior trim, junction between combination units, elevation of units, installation methods, anchorage details, fasteners, caulking, internal drainage details, description of accessories and related components. Indicate location of manufacturer's nameplates.

.3 The Contractor shall supply window shop drawings showing window and glass sizes in addition to screen placement and anchorage. Locking mechanisms for windows shall also be shown. Prior to review by the Owner/Consultant, shop drawings shall be firstly reviewed by the General Contractor.

.4 Provide manufacturer’s fabrication dimensions for all window components (cut sheets) for all window types and configurations.

.5 Provide a list of all window parts, including manufacturers names, extruder name and window series, and current sources of components.

.6 Indicate on shop drawings, dimensions, relation to construction of adjacent work, air and

vapour seal with adjacent construction materials, component anchorage and locations, anchor methods, shim methods and materials, and hardware installation details. Include also opening dimensions, frames opening tolerances and affected related work and installation requirements. Provide shop drawings for anchor and shim methods and materials, sealed by an engineer registered in the Province of Manitoba.

1.5 NOT USED

1.6 QUALIFICATIONS

.1 Manufacturer and installers are to be specialized in the manufacturing and installation respectively of fiberglass window system with a minimum of three years each of documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Protect pre-finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.8 SAMPLES

.1 Prior to use in this project, upon request by the Owner, a minimum 300 mm x 300 mm (12”x12”) corner sample of windows shall be submitted to the Owner and Consultant for approval.

.2 Include frame, sash, sill, interlock, glazing and weather-proofing method, insect screens, surface finish and all hardware.

1.9 MAINTENANCE DATA

.1 Provide three (3) copies of operation and maintenance data, including cleaning instructions, for all windows and frames for incorporation into Manitoba Housing operation and maintenance manual.

1.10 MAINTENANCE MATERIALS

.1 Prior to the completion of the Contract, the Contractor must supply the following maintenance materials to a representative of Manitoba Housing:

.1 5% of each size of operable sash complete with hardware and glazing (minimum 1)

.2 5% of each size of screen (minimum 1)

.3 5% of all locks, crank hardware, rollers, guides, drain caps and other miscellaneous hardware.

1.12 WARRANTY

.1 Provide written warranty for a period of one year from the date of substantial completion for any defects relating to complete installation and workmanship.

.2 Provide written warranty against defects and malfunction, against material or manufacturing defects under normal usage for a period of twenty (20) years from the date of substantial performance.

.3 Provide written warranty for glazing seal against failure of the hermetic seal for a period of ten (10) years from the date of substantial performance. Date of manufacture to be unobtrusively marked on the interior right hand corner of each unit and shall be not more than one month prior to the date of installation.

.4 Provide written lifetime warranty for all operating hardware.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 All windows by the same manufacturer, with sash and main frames of a type and size to suit the job conditions. General Contractor to verify site conditions prior to manufacturing of windows. Each window location to be site measured as rough opening dimensions may vary.

.2 Isolate aluminum from the following components, by means of isolation pad or coating:

.2 Dissimilar metals except stainless steel, zinc, or white bronze of small area.

.3 Concrete, mortar and masonry.

.3 Exterior caulking shall be Dow Corning 795 high grade neutral cure silicone, or approved alternate as authorized by the Consultant and approved by window manufacturer. Colour shall match that of the material to which it is applied.

.4 All frames to be factory fabricated and shall be fully assembled before shipping to site.

.5 Mounting screws shall be 300 series stainless steel or 400 series stainless steel cadmium plated and of sufficient size and quantity to perform their intended function.

.6 Anchorage materials: non-corrosive.

.7 Weathering and glazing gaskets shall be extruded, black, closed cell or dense elastomer of durometer appropriate to the function.

.8 Glazing tapes shall be macro-polyisobutylene, highly adhesive and elastic with built in shim.

.9 Provide FIBERGLASS mullion caps, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and contraction, including building deflections. Where mullion joint requires special condition provide alternate proposals, engineering, and other documentation to ensure integrity of the mullion joint. Provide reinforcing mullion plates at every joint secured to frames by screws.

.10 Hardware for locking mechanism shall not impact air leakage performance.

.11 All windows to be supplied with insect screens and all required/specified hardware, friction fit within operable windows.

.12 Screen frame: baked on enamel finish, extruded aluminum complete with corner keys and retainer spline. Casement and awning screen to include integral perimeter flange. Screens removable to the inside only.

.13 Screens: aluminum or galvanized or Fiberglass mesh.

.14 Jamb extensions: 18 mm (¾") FIBERGLASS jamb extensions to suit wall thickness. Jamb extensions to have factory edge adjacent to casings. End caps not permitted.

.15 Casings or finish trim: solid wood (or approved equal), minimum width to suit site conditions.

.16 Weather-stripping: compression type seal against sash, single weather seal at exterior.

2.2 SEALANT MATERIALS

.1 Caulking subcontractor must seal joints between windows and adjacent surfaces with

sealant, in accordance with Specification Section 079200.

.2 Window manufacturer will provide written confirmation to the Consultant that the sealant materials are acceptable for use and will have no adverse affect on the window aesthetics, operation or long-term performance.

2.3 WINDOW TYPES

.1 All windows to be full frame replacements complete with brick mould and jamb extensions.

.2 PICTURE WINDOW

.1 Dry glazed interior stops, sealed unit to be removable to interior.

.3 SINGLE OPERATOR HORIZONTAL SLIDING WINDOW (GLIDER)

.1 Locking Hardware: Die cast housing cam lock complete with adjustable strike.

.2 Rolling Hardware: one pair dual brass, nylon or Lubex rollers.

.3 Sash track to include tapered block insert to increase contact pressure at meeting rail.

.4 SINGLE OPERATOR VERTICAL SLIDING WINDOW (SINGLE HUNG)

.1 Locking Hardware: Die cast housing cam lock complete with adjustable strike.

.2 Sash Balance: Adjustable Spiral Balance or Dual opposing stainless steel coil constant force sash balance.

.3 Sash pulls to be integral to sash extrusion or designated handle secured through a minimum of two FIBERGLASS walls. Sash pulls integrated with glazing stops not acceptable.

.4 Pivot bars to be fastened through two FIBERGLASS walls or one wall and screw boss, using FIBERGLASS screws.

.5 CASEMENT WINDOW

.1 Locking Hardware: Die cast multi point lever lock complete with die cast adjustable mushroom head rollers and keepers. Minimum 2 point lock on all sashes.

.2 Operating Hardware: Roto gear dual arm operator using sill mounting *or* flange mounting with reinforcing back plate. High-pressure zinc die cast housing and steel base plate, hardened steel drive worm and gear arm.

.6 AWNING WINDOW

.1 Locking Hardware: Die cast lock. Minimum two locks on all sashes.

.2 Operating Hardware: Roto gear scissor arm operator *or* roto gear pivot shoe operator. High-pressure zinc die cast housing and steel base plate, hardened steel drive worm and gear arm.

2.4 GLASS AND GLAZING MATERIALS

.1 Glaze windows in accordance with CAN/CSA-A440. Insulating glass units must carry Insulating Glass Manufacturers Association of Canada (IGMAC) Certification and be

identified with IGMAC, the name of the manufacturer, the location where the units were made and the year of manufacture. Units must comply with the latest edition of CAN/CGSB 12.8, Insulating Glass.

.2 Glazing must have a written ten (10) year warranty against failure of the seal.

.3 Windows to be triple glazed, insulated glass (minimum ½" air space incorporating Argon fill) and at the discretion of the Owner, incorporate Solarban 70XL low emissivity coating on surface 3. Other acceptable coatings : Cardinal LoE 366.

.4 Glazing thickness to be in accordance with Table A-9.6.1.3.(1) A for Hourly Wind Pressure (HWP) less than 0.55 kPa, in Appendix A, National Building Code, 2010.

.5 All glazing to incorporate Super Spacer Architectural S-Class foam tape glazing spacer or approved equal.

.6 Common area glazing units for both interior and exterior shall utilize glass conforming to CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass or CAN/CGSB-12.11-M, Wired Safety Glass.

2.5 ACCESSORIES

.1 Brick mould and brick mould extensions to be manufactured from extruded FIBERGLASS profiles; matching frame nominal wall thickness. Type as detailed on drawings. Colour to be selected by Owner.

.2 Jamb, sill and head extensions to be made from cellular FIBERGLASS. Size, color and configuration of extensions as shown on drawings and as required on site.

2.6 FABRICATION

.1 Fabricate in accordance with CSA-A440 supplemented as follows:

.2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm (0.06") for units with a diagonal measurement of 1800 mm (71") or less and plus or minus 3 mm (0.12")for units with a diagonal measurement over 1800 mm. (71").

.3 Frame face dimensions detailed are maximum permissible sizes.

.4 Manufacturer's nameplates on windows are not acceptable.

.5 Brace frames to maintain squareness and rigidity during shipment and installation.

.6 Finish steel clips and reinforcement to be galvanized with 380 g/m^2 zinc coating to CSA G164.

.7 Fabricate framing from extrusions of size and shape shown on shop drawings.

.8 All framing joints shall be accurately machined, assembled, and sealed to provide neat weather tight connections.

.9 Coupling mullions shall be designed to provide a functional split to permit modular construction and allow for thermal expansion.

.10 Glass stops shall be lock-in screwless type.

.11 Elastomeric seal gasket shall be installed around the full perimeter of glass and sealed at the corners with silicone sealant.

.12 Air seal gasket must have adhesion with silicone sealant.

.13 All FIBERGLASS joints to be "welded corner" construction, frames and sashes.

.14 Drain hole covers for FIBERGLASS windows to be rigid or manufacturer to provide one extra hinged cover per window.

.15 Brick moulds and jamb extension to be installed using arrowhead slots, sealed and mechanically fastened to main frame.

.16 Provide horizontal and vertical galvanized steel or aluminum reinforcement as required to achieve structural requirements as specified.

.17 Vertical and Horizontal sliding windows: sash and frame meeting rails to be reinforced with aluminum or galvanized steel channel, as required to meet structural requirements as specified.

.18 All windows within a tolerance of ±6 mm (± ¼") shall be fabricated to one dimension.

PART 3 - EXECUTION

3.1 WORKMANSHIP

.1 Install in accordance with CSA-A440.4 supplemented with installation instructions in this specification and manufacturers recommendations. Conflict between installation instructions in this specification and manufacturers instructions must be brought to the attention of the Owner and Consultant prior to installation.

3.2 PREPARATION

.1 All window sizes and measurements shall be taken from the jobsite. The Contractor shall check and verify all site dimensions, on an individual basis, prior to fabrication of windows. The Contractor shall not make any claim to the Owner for mis - measured or improperly measured work.

.2 Remove existing sash, tracks, frames, interior and exterior trims and discard off site. Relocate when possible on a daily basis.

.3 Examine openings into which windows are to be installed to ensure that it is satisfactory before commencement of work. Notify Owner of any rot, damage or deterioration that is evident prior to proceeding with the Work.

.4 Furr out existing openings to achieve ½" maximum shim space. All furring set into the original opening shall be bedded in acoustic sealant.

.5 Move furniture and appliances 4ft from the window and remove window coverings as required, to gain access to window area. The Owner will make arrangements to move fragile items.

3.3 INSTALLATION

.1 All Work shall be completed according to applicable CGSB standards and best industry practice.

.2 Windows shall be installed, glazed and adjusted by experienced personnel in accordance with the manufacturer's instructions and approved shop drawings.

.3 In addition to the manufacturer's installation instructions, the following installation procedures shall be followed:

.1 Fill the space between the window and the rough opening with specified low expansion urethane foam. Note that foam must not be used as a structural load bearing connection meant to resist lateral wind loads.

.2 Maintain continuous air and vapour barriers throughout the assembly, primarily in line with the inside pane of glass and heel bead of glazing compound.

.3 Ensure that the sheet air barrier membrane is adequately adhered to the indicated surfaces prior to the window installation.

.4 Drain water entering joints, condensation occurring in glazing channels or migrating moisture occurring within the system, to the exterior by a weep drainage network.

.5 The system is to accommodate without damage to the components or deterioration of the seals, movement between the window and the perimeter framing.

.4 All items in this section shall be set in their correct location and shall be set level, square, plumb and at proper elevations and in alignment with other work.

.5 Set window into opening plumb and square. Provide temporary shims at window sides and head to ensure proper alignment of window during fastening. Shim along sill at corners, at all vertical mullions and other locations as required to achieve shims at maximum 600 mm (24 inches) o/c.

.6 All windows to be mechanically fastened through side jambs and head, adjacent to shims. Do not fasten through sill. Fastening to be 150-300mm (6-12 inches) from each corner and at maximum 600mm (24 inches) o/c. All screw holes through FIBERGLASS to be predrilled; holes to be 2mm larger than screw diameter. Fasten with minimum #8 stainless steel pan head screws, length sufficient to penetrate framing material a minimum of 35mm (1½ “). Screws to be concealed at all possible locations. Exposed screws to be capped.

.7 Remove shims from side jambs and head of window.

.8 All existing flashing and drip mouldings to be replaced. Refer to detail drawings.

.9 Replace, at no extra cost to the Owner, all glass cracked or broken during the Work of this contract, or otherwise damaged prior to substantial performance. Any breakage due to improper setting and installation shall be replaced by the Contractor, at no extra cost to the Owner, for a period of one year following substantial performance.

.10 Adjust operating sashes and ventilators, screens, hardware and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts if necessary. Refer to manufacturer’s instruction sheets.

.11 The Contractor shall ensure that damage done to the interior and exterior finishes, caused by the removal of existing windows, is kept to a minimum. The Contractor will be responsible to repair any damage caused, and to provide and finish any fillers required to fill between surface of new window and the existing surface of the exterior skin of the structure. The cost incurred to do this work will be considered as incidental to the Contract and will not be paid for separately.

3.4 CAULKING

.1 Seal joints between windows and exterior finish. Use foam backer rod to achieve 2:1 width:depth joint ratio.

.2 Apply sealant in accordance with Section 07 92 00 Joint Sealants.

3.5 RESTORATION OF INTERIOR AND EXTERIOR FINISHES

.1 Any and all finishes removed or damaged by the removal of the existing windows or installation of the new windows shall be repaired or replaced to original condition.

.2 All window casings to be replaced with new solid wood casings, minimum width to satisfy site conditions. Casings to be primed/painted or stained/varnished with as many coats as necessary to provide quality finish. Finish color to be selected by the Owner.

.3 The Contractor will be responsible for the removal and re-installation of existing window coverings. The cost for doing this will be considered as incidental to the contract. Reinstall all rails, rods, drapery, drapery tracks, blinds or any other window treatments removed to necessitate the installation of the new windows.

.4 The existing tenant-owned air-conditioners shall be removed, and back to tenant, and re-installed, custom-fitted, to the new window unit.

3.6 FINAL CLEANING

.1 Every piece of glass shall bear the manufacturer's names, type and thickness of the glass. Leave all labels on the glass until they have been inspected and approved by the owner. Labels shall not be removed until final cleaning; leaving no glue residue that may remain after the removal of the label.

.2 Protect installed windows from damage during construction. Protect new window units from incidental damages resulting from plaster, cement, stucco or other harmful contaminants. Do not apply masking tape, adhesives or other chemicals directly to window components. Consult with window manufacturer for product compatibility.

.3 All window components including glazing, shall be thoroughly cleaned, all imperfections corrected and all damaged glass replaced in accordance with manufacturer's instructions at the completion of the project.

.4 Clean the work area, remove and dispose of construction debris from site in accordance with all local regulations and bylaws on a daily basis.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Aluminum Association, Inc. (AAI)

.1 AAI DAF45-03, Designation System for Aluminum Finishes.

.2 ASTM International Inc.

.1 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM B32-04, Standard Specification for Solder Metal.

.3 ASTM B456-03, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.

.2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.

.3 CGSB 31-GP-107Ma-90, Non-Inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.4 CGSB 41-GP-6M-1983, Sheets, Thermosetting Polyester Plastics, Glass Fibre Reinforced. Reaffirmation of September 1976.

.4 Canadian Standards Association (CSA International)

.1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 CSA W47.2-M1987(R2008), Certification of Companies for Fusion Welding of Aluminum.

.3 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.4 CSA W59.2-M1991(R2003), Welded Aluminum Construction.

.5 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI SSF 6-1995, Sheet Steel Facts #6, Metallic Coated Sheet Steel for Structural Building Products-July 1995.

.6 Green Seal Environmental Standards

.1 Standard GS-11-2008, 2nd Edition, Paints and Coatings.

.2 Standard GS-36-00, Commercial Adhesives.

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

.1 Material Safety Data Sheets (MSDS).

.8 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - February 2004.

.1 MPI #76, Quick Dry Alkyd Metal Primer.

.2 MPI #96, Quick Dry Enamel Gloss.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer’s installation instructions and warranty requirements.

1.3 ACTION SUBMITTALS

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

.2 Shop Drawings:

.1 Submit shop drawings and catalogue sheets.

.2 Indicate materials, thicknesses, sizes, finishes, colours, construction details, removable and interchangeable components, electrical components specifications and power loads, wiring terminal box locations, lamp centres and overlaps, access panels, mounting methods, schedule of signs.

.3 Submit drawn-to-scale details for individually fabricated or incised lettering indicating word and letter spacing.

.3 Samples:

.1 Submit duplicate representative sample of each type sign, sign image and mounting method including, but not limited to: graphics, cast letters, sign box installation method, channel letters, and wall plates fixed mounting installation method.

1.4 INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature panel signage or components, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

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

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

.1 Welding Certification in accordance with CSA W47.2.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

Part 2 Products

2.1 MATERIALS

.1 Aluminum extrusions: to designation AA 6063-T5 AA 6006-T5.

.2 Sheet aluminum: anodizing quality.

.3 Prefinished sheet aluminum: plain utility sheet with manufacturer applied baked enamel finish.

.4 Electrical components: CSA approved.

.5 Welding materials: to CSA W59.

.6 Solder: to ASTM B32, Type Sn50.

.7 Self-stick foam tape: 1.6 mm thick, 352.4 kg/m^3 density polyurethane open-cell foam tape for sign purposes, with synthetic self-stick adhesive on both sides.

.1 Width: to suit sign sizes.

.8 Bituminous paint: to MPI EXT 5.4D.

2.2 TANK SIGNAGE

.1 Screen print on steel or aluminum with reflective sheeting finish.

.1 WHIMIS Label 1202 10 ¾" x 10 ¾"

.2 Spill Report sign 10" x 14"

.3 No Smoking Sign 10" x 14"

.2 Supply Shop drawing for each sign for approval

.3 Wording as per drawings

.4 U-Channel post: Hot dipped galvanized rolled high tensile steel, length to suit, prepuce with 10 mm holes at 25 mm orc.

.5 Tamper-proof bolts and nuts: steel zinc plated bolts with cone shaped fluted aluminum nuts.

2.3 FABRICATION

.1 Fabricate signs in accordance with details, specifications and shop drawings.

.2 Build units square, true, accurate to size, free from visual or performance defects.

.3 Fit and securely join sections to obtain tight, closed joints.

.4 Allow for thermal movement without distortion of components.

.5 Exposed fasteners permitted where indicated where approved by Consultant and to be inconspicuous and same color and finish as base material or as noted.

.6 Polish exposed edges of metal to smooth, slightly convex profile.

.7 Do steel welding to CSA W59 and aluminum welding to CSA W59.2.

.1 Finish exposed welds flush and smooth.

.8 Apply bituminous paint to aluminum in contact with dissimilar metals, concrete or masonry.

.9 Manufacturer's nameplates on sign surface permitted in non-visible locations in completed work.

Part 3 Execution

3.1 INSTALLATION

.1 Manufacturer's Instructions: compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

.2 Erect and secure signs plumb and level at elevations indicated.

.3 Comply with sign manufacturer's installation instructions and approved shop drawings.

.4 Mechanical attachment:

.1 To concrete or solid masonry: use lag screws and expansion bolts or screws and fibre plugs, as appropriate for stresses involved.

.2 To hollow masonry: use toggle bolts or equivalent.

.3 To steel: use bolts with nut and lock washers, self-tapping screws.

.1 Do steel welding to CSA W59 and aluminum welding to CSA W59.2.

.2 Finish exposed welds flush and smooth.

.4 To wood: use screws.

.5 Secure into framing members behind stud walls or above ceilings.

.6 Mechanical fasteners on exterior: non-staining, non-ferrous type.

.7 Fabricate special fasteners as required for installation conditions.

.8 Mechanical fasteners and methods of attachment subject to Consultant's approval.

.1 Obtain Consultant’s approval before fixing to structural steel.

.5 Adhesive attachment:

.1 Use self-stick adhesive foam tape to manufacturer's instructions to fix sign and prevent "rocking".

.2 Keep tape maximum 1.6 mm from edges.

3.2 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

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

3.3 CLEANING

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

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Leave signs clean.

.3 Remove debris from interior of sign boxes.

.4 Touch up damaged finishes.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.5 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, Consultant 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 Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

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

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

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.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 Consultant 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.

1.2 QUALITY ASSURANCE

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

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 MAINTENANCE

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

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One 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.

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

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

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

Part 2 Execution

2.1 PAINTING REPAIRS AND RESTORATION

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

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

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

2.2 CLEANING

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

2.3 FIELD QUALITY CONTROL

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

.2 Manufacturer's Field Services:

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

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

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

2.4 DEMONSTRATION

.1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

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

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

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

.5 Consultant will record these demonstrations on video tape for future reference.

2.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Disinfection of potable water distribution system.

.2 Testing and reporting results.

1.2 RELATED SECTIONS

.1 Section 01 20 13 - Price and Payment Procedures.

.2 Section 01 33 00 - Administrative Requirements.

.3 Section 01 44 00 - Quality Assurance.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements.

.6 Section 33 11 16 - Site Water Utility Distribution Piping.

.7 Section 33 21 13 - Public Water Supply Well.

.8 Section 22 10 00 - Plumbing Piping: Disinfection of building domestic water piping system.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

.1 Section 01 20 13: Unit prices.

.2 Disinfection: By the linear metre. Includes preparing, disinfecting, testing, and reporting.

1.4 REFERENCES

.1 AWWA B300 - Standard for Hypochlorites.

.2 AWWA B301 - Standard for Liquid Chlorine.

.3 AWWA B302 - Standard for Ammonium Sulfate.

.4 AWWA B303 - Standard for Sodium Chlorite.

.5 AWWA C651 - Standards for Disinfecting Water Mains.

1.5 SUBMITTALS FOR INFORMATION

.1 Test Reports: Indicate results comparative to specified requirements.

.2 Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.6 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submission procedures.

.2 Disinfection report:

.1 Type and form of disinfectant used.
.2 Date and time of disinfectant injection start and time of completion.
.3 Test locations.
.4 Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
.5 Date and time of flushing start and completion.
.6 Disinfectant residual after flushing in ppm for each outlet tested.

.3 Bacteriological report:

.1 Date issued, project name, and testing laboratory name, address, and telephone number.
.2 Time and date of water sample collection.
.3 Name of person collecting samples.
.4 Test locations.
.5 Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
.6 Coliform bacteria test results for each outlet tested.
.7 Certification that water conforms, or fails to conform, to bacterial standards of Province of Manitoba.

1.7 QUALITY ASSURANCE

.1 Perform Work in accordance with AWWA C651.

.2 Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

.3 Testing Firm: Company specializing in testing potable water systems, certified/approved by the Province of Manitoba.

.4 Submit bacteriologist's signature and authority associated with testing.

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable code or regulation for performing the work of this Section.

.2 Provide certificate of compliance from authority having jurisdiction indicating approval of water system.

Part 2 Products

2.1 DISINFECTION CHEMICALS

.1 Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that piping system and water well has been cleaned, inspected, and pressure tested.

.2 Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 EXECUTION

.1 Provide and attach required equipment to perform the work of this Section.

.2 Inject treatment disinfectant into piping system.

.3 Maintain disinfectant in system for 24 hours.

.4 Flush, circulate, and clean until required cleanliness is achieved; use domestic water.

.5 Replace permanent system devices removed for disinfection.

.6 Pressure test system to 400 kPa. Repair leaks and re-test.

3.3 FIELD QUALITY CONTROL

.1 Section 01 44 00: Field inspection and testing.

.2 Test samples in accordance with AWWA C651.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Pipe, pipe fittings, valves, and connections for piping systems.

.1 Sanitary sewer.

.2 Domestic water.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance: Requirements for references and standards.

.3 Section 01 44 00 - Quality Assurance.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements.

.6 Section 08 31 13 - Access Doors And Frames.

.7 Section 09 91 10 - Painting.

.8 Section 23 05 48 - Vibration Isolation.

.9 Section 23 05 53 - Mechanical Identification.

.10 Section 23 07 19 - Piping Insulation.

.11 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

.2 ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

.3 ASME B16.3 - Malleable Iron Threaded Fittings.

.4 ASME B16.4 - Grey Iron Threaded Fittings.

.5 ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

.6 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.7 ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

.8 ASME B16.26 - Copper Alloy Bronze Fittings for Flared Copper Tubes.

.9 ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

.10 ASME B16.32 - Cast Copper Alloy Solder Joint Fittings for Sovent Drainage Systems.

.11 ASME B31.1 - Power Piping.

.12 ASME B31.2 - Fuel Gas Piping.

.13 ASME B31.9 - Building Services Piping.

.14 ASME SEC IV - Construction of Heating Boilers.

.15 ASME SEC IX - Welding and Brazing Qualifications.

.16 ASTM A47/A47M - Ferritic Malleable Iron Castings.

.17 ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.18 ASTM A74 - Cast Iron Soil Pipe and Fittings.

.19 ASTM A234/A234M - Piping Fittings of Wrought-Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.20 ASTM B32 - Solder Metal.

.21 ASTM B42 - Seamless Copper Pipe, Standard Sizes.

.22 ASTM B43 - Seamless Red Brass Pipe, Standard Sizes.

.23 ASTM B68 - Seamless Copper Tube, Bright Annealed.

.24 ASTM B75 - Seamless Copper Tube.

.25 ASTM B88 - Seamless Copper Water Tube.

.26 ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.

.27 ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.28 ASTM B302 - Threadless Copper Pipe, Standard Sizes.

.29 ASTM B306 - Copper Drainage Tube (DWV).

.30 ASTM C4 - Clay Drain Tile and Perforated Clay Drain Tile.

.31 ASTM C14/C14M - Concrete Sewer, Storm Drain, and Culvert Pipe.

.32 ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

.33 ASTM C443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

.34 ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.35 ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

.36 ASTM C1053 - Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.

.37 ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

.38 ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.

.39 ASTM D2239 - Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

.40 ASTM D2241 - Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

.41 ASTM D2447 - Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.

.42 ASTM D2466 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

.43 ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

.44 ASTM D2564 - Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

.45 ASTM D2609 - Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.

.46 ASTM D2661 - Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

.47 ASTM D2662 - Polybutylene (PB) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

.48 ASTM D2665 - Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

.49 ASTM D2666 - Polybutylene (PB) Plastic Tubing.

.50 ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

.51 ASTM D2729 - Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.52 ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer, Pipe, and Fittings.

.53 ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.

.54 ASTM D2855 - Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

.55 ASTM D2996 - Filament-Wound 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pipe.

.56 ASTM D2997 - Centrifugally-Cast 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pipe.

.57 ASTM D3000 - Polybutylene (PB) Plastic Pipe (SDR-PR) Based on Outside Diameter.

.58 ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.59 ASTM D3262 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Sewer Pipe.

.60 ASTM D3309 - Polybutylene (PB) Plastic Hot- and Cold-Water Distribution System.

.61 ASTM D3517 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pressure Pipe.

.62 ASTM D3754 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.

.63 ASTM D3840 - 'Fibreglass' (Glass-Fibre-Reinforced Thermosetting-Resin) Pipe Fittings for Non-Pressure Applications.

.64 ASTM E814 - Fire Tests of Through-Penetration Fire Stops.

.65 ASTM F437 - Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

.66 ASTM F438 - Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

.67 ASTM F439 - Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

.68 ASTM F441 - Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

.69 ASTM F442 - Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe(SDR-PR).

.70 ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

.71 ASTM F493 - Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

.72 ASTM F628 - Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core.

.73 ASTM F679 - Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

.74 ASTM F708 - Design and Installation of Rigid Pipe Hangers.

.75 ASTM F1281 - Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.

.76 ASTM F1282 - Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.

.77 AWS A5.8 - Filler Metals for Brazing and Braze Welding.

.78 AWWA C105 - Polyethylene Encasement for Ductile-Iron Piping Systems.

.79 AWWA C110 - Ductile - Iron and Gray - Iron Fittings, 3 In. - 48 In. (76 mm - 1219 mm), for Water.

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

.81 AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water.

.82 AWWA C651 - Disinfecting Water Mains.

.83 AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe (and Fabricated Fittings), 4 inch - 12 inch (100 mm - 300 mm), for Water Distribution.

.84 AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch - 3 inch (13 mm - 76 mm) for Water Service.

.85 AWWA C902 - Polybutylene (PB) Pressure Pipe and Tubing, 1/2 inch - 3 inch (13 mm - 76 mm) for Water.

.86 AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch - 48 inch (350 mm - 1200mm).

.87 AWWA C950 - Fibreglass Pressure Pipe.

.88 CAN-3 B281 - Aluminum Drain, Waste, and Vent Pipe and Components.

.89 CISPI 301 - Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.

.90 CISPI 310 - Joints with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applictions.

.91 MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

.92 MSS SP-67 - Butterfly Valves.

.93 MSS SP69 - Pipe Hangers and Supports - Selection and Application.

.94 MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

.95 MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

.96 MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

.97 MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

.98 MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.

.99 MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

.100 MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

.101 NCPWB - Procedure Specifications for Pipe Welding.

.102 UL 1479 - Fire Tests of Through-Penetration Firestops.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Procedures for submittals.

.2 Project Record Documents: Record actual locations of valves.

1.6 QUALITY ASSURANCE

.1 Perform Work to Province of Manitoba standards. Maintain one copy on site.

.2 Valves: Manufacturer's name and pressure rating marked on valve body.

.3 Welding Materials and Procedures: Conform to ASME SEC IX and applicable provincial labour regulations.

.4 Welders Certification: To ASME SEC IX and NCPWB Standard Procedure Specifications.

.5 Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.7 REGULATORY REQUIREMENTS

.1 Perform Work to Province of Manitoba plumbing code.

.2 Conform to applicable code for installation of backflow prevention devices.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept valves on site in shipping containers with labelling in place. Inspect for damage.

.3 Provide temporary protective coating on cast iron and steel valves.

.4 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Section 01 61 00: Environmental conditions affecting products on site.

.2 Do not install underground piping when bedding is wet or frozen.

1.10 EXTRA MATERIALS

.1 Section 01 78 10: Operation and maintenance data.

.2 Provide two repacking kits for each size valve.

Part 2 Products

2.1 SANITARY SEWER PIPING, ABOVE GRADE

.1 PVC Pipe: ASTM D2729.

.1 Fittings: PVC.

.2 Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

.2 PVC Pipe: ASTM D2665.

.1 Fittings: PVC.

.2 Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.2 WATER PIPING, ABOVE GRADE

.1 Copper Tubing: ASTM B88M, Type L, hard drawn.

.1 Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

.2 Joints: ASTM B32, solder, Grade 95TA.

2.3 FLANGES, UNIONS, AND COUPLINGS

.1 Pipe Size 80 mm and Under:

.1 Ferrous pipe: Class 150 malleable iron threaded unions.

.2 Copper tube and pipe: Class 150 bronze unions with soldered joints.

.2 Pipe Size Over 25 mm:

.1 Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

.2 Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

.3 Grooved and Shouldered Pipe End Couplings:

.1 Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.

.2 Sealing gasket: "C" shape composition sealing gasket.

.4 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.4 PIPE HANGERS AND SUPPORTS

.1 Plumbing Piping - Drain, Waste, and Vent:

.1 Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.

.2 Hangers for Pipe Sizes 15 to 40 mm: Carbon steel, adjustable swivel, split ring.

.3 Hangers for Pipe Sizes 50 mm and Over: Carbon steel, adjustable, clevis.

.4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.5 Wall Support for Pipe Sizes to 80 mm: Cast iron hook.

.6 Wall Support for Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp.

.7 Vertical Support: Steel riser clamp.

.8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.2 Plumbing Piping - Water:

.1 Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.

.2 Hangers for Pipe Sizes 15 to 40 mm: Malleable iron Carbon steel, adjustable swivel, split ring.

.3 Hangers for Cold Pipe Sizes 50 mm and Over: Carbon steel, adjustable, clevis.

.4 Hangers for Hot Pipe Sizes 50 to 100 mm: Carbon steel, adjustable, clevis.

.5 Hangers for Hot Pipe Sizes 150 mm and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.

.6 Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.

.7 Multiple or Trapeze Hangers for Hot Pipe Sizes 150 mm and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.

.8 Wall Support for Pipe Sizes to 80 mm: Cast iron hook.

.9 Wall Support for Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp.

.10 Wall Support for Hot Pipe Sizes 150 mm and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.

.11 Vertical Support: Steel riser clamp.

.12 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.13 Floor Support for Hot Pipe Sizes to 100 mm: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

.14 Floor Support for Hot Pipe Sizes 150 mm and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.

.15 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.5 GATE VALVES

.1 Up To and Including 80 mm:

.1 MSS SP-80, Class 125 , bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

.2 50 mm and Larger:

.1 MSS SP-70, Class 125 , iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 150 mm and larger mounted over 2400 mm above floor.

2.6 GLOBE VALVES

.1 Up To and Including 80 mm:

.1 MSS SP-80, Class 125 , bronze body, bronze trim, handwheel, teflon disc, solder or threaded ends.

.2 50 mm and Larger:

.1 MSS SP-85, Class 125 , iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 150 mm and larger mounted over 2400 mm above floor.

2.7 BALL VALVES

.1 Construction, 100 mm and Smaller: MSS SP-110, Class 150, 2760 kPa CWP , bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

2.8 PLUG VALVES

.1 Construction 65 mm and Larger: MSS SP-78, 1200 kPa CWP , cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.9 FLOW CONTROLS

.1 Construction: Class 150 , Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet , blowdown/backflush drain.

.2 Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 24 kPa.

2.10 SWING CHECK VALVES

.1 Up To and Including 80 mm:

.1 MSS SP-80, Class 125 , bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

.2 50 mm and Larger:

.1 MSS SP-71, Class 125 , iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.11 SPRING LOADED CHECK VALVES

.1 Class 125 , iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.12 WATER PRESSURE REDUCING VALVES

.1 MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded double union ends.

.2 Over 50 mm:

.1 MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.13 RELIEF VALVES

.1 Pressure Relief:

.1 AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

.2 Temperature and Pressure Relief:

.1 AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 98.9 degrees C, capacity ASME SEC IV certified and labelled.

2.14 STRAINERS

.1 Size 50 mm and Under:

.1 Class 150, threaded bronze body 2070 kPa CWP, Y pattern with 0.8 mm1/32 inch stainless steel perforated screen.

.2 Size 40 mm to 100 mm:

.1 Class 125, flanged iron body, Y pattern with 1.6 mm stainless steel perforated screen.

.3 Size 125 mm and Larger:

.1 Class 125, flanged iron body, basket pattern with 3.2 mm stainless steel perforated screen.

2.15 FIRE STOP SYSTEMS

.1 General Purpose Fire Stopping Sealant:

.1 Water based, nonslumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

.2 General Purpose Vibration Resistant Fire Stopping Sealant:

.1 Silicone based, nonslumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479.

.3 DWV Plastic Pipe Systems Fire Stopping Sealant:

.1 Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479 with metal collars.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01100- Coordination and Meetings: Verification of existing conditions before starting work.

.2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

.1 Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

.2 Remove scale and dirt, on inside and outside, before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.

.3 Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

.4 Install piping to maintain headroom, conserve space, and not interfere with use of space.

.5 Group piping whenever practical at common elevations.

.6 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

.7 Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.

.8 Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 13.

.9 Establish elevations of buried piping outside the building to ensure not less than 1.0 m of cover.

.10 Install vent piping penetrating roofed areas to maintain integrity of roof assembly

.11 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

.12 Provide support for utility meters to requirements of utility companies.

.13 Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 91 10.

.14 Excavate to Sections 31 23 18 and 31 23 23 for work of this Section.

.15 Backfill to Sections 31 23 16 and 31 23 23 for work of this Section.

.16 Install bell and spigot pipe with bell end upstream.

.17 Install valves with stems upright or horizontal, not inverted.

.18 Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

.19 Install water piping to ASME B31.9.

.20 Sleeve pipes passing through partitions, walls and floors.

.21 Inserts:

- .1 Provide inserts for placement in concrete formwork.
- .2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- .3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100 mm.
- .4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- .5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

.22 Pipe Hangers and Supports:

.1 Install to ASTM B31.9 ASTM F708 and MSS SP89.

.2 Support horizontal piping as scheduled.

.3 Install hangers to provide minimum 15 mm space between finished covering and adjacent work.

.4 Place hangers within 300 mm of each horizontal elbow.

.5 Use hangers with 40 mm minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

.6 Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.

.9 Prime coat exposed steel hangers and supports. Refer to Section 09 91 10. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

.10 Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 23 05 48.

.11 Support cast iron drainage piping at every joint.

3.4 APPLICATION

.1 Use grooved mechanical couplings and fasteners only in accessible locations.

.2 Install unions downstream of valves and at equipment or apparatus connections.

.3 Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

.4 Install gate ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

.5 Install globe ball or butterfly valves for throttling, bypass, or manual flow control services.

.6 Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

.7 Provide spring loaded check valves on discharge of water pumps.

.8 Provide flow controls in water recirculating systems where indicated.

3.5 ERECTION TOLERANCES

.1 Section 01 44 00: Tolerances.

.2 Establish invert elevations, slopes for drainage to 2 one percent minimum. Maintain gradients.

.3 Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

.1 Disinfect water distribution system to Section 22 05 81.

3.7 SERVICE CONNECTIONS

.1 Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

.2 Provide new water service complete with approved double check backflow preventer and water meter with by-pass valves pressure reducing valve,.

.1 Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.8 SCHEDULES

.1 Pipe Hanger Schedule:

.1 Metal Piping:

.1 Pipe size: 15 to 32 mm:

.1 Maximum hanger spacing: 2 m.

.2 Hanger rod diameter: 9 mm.

.2 Pipe size: 40 to 50 mm:

.1 Maximum hanger spacing: 3 m.

.2 Hanger rod diameter: 9 mm.

.3 Pipe size: 65 to 75 mm:

.1 Maximum hanger spacing: 3 m.

.2 Hanger rod diameter: 13 mm.

.4 Pipe size: 100 to 150 mm:

.1 Maximum hanger spacing: 3 m.

.2 Hanger rod diameter: 15 mm.

.5 Pipe size: 200 to 300 mm:

.1 Maximum hanger spacing: 4.25 m.

.2 Hanger rod diameter: 22 mm.

.6 Pipe size: 350 mm and Over:

.1 Maximum hanger spacing: 6 m.

.2 Hanger rod diameter: 25 mm.

.2 Plastic Piping:

.1 All Sizes:

.1 Maximum hanger spacing: 1.8 m.

.2 Hanger rod diameter: 9 mm.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Roof and floor drains.

.2 Cleanouts.

.3 Hose bibs.

.4 Hydrants.

.5 Backflow preventers.

.6 Water hammer arrestors.

.7 Interceptors.

.8 Thermostatic mixing valves.

.9 Catch basins and manholes.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 22 10 00 - Plumbing Piping.

.5 Section 22 42 02 - Plumbing Fixtures.

.6 Section 22 47 00 - Plumbing Equipment.

.7 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

.8 Section 33 05 13 - Manholes And Catch Basins.

1.3 REFERENCES

.1 ASME A112.21.1 - Floor Drains.

.2 ASME A112.21.2 - Roof Drains.

.3 ASME A112.26.1 - Water Hammer Arrestors.

.4 ASSE 1011 - Hose Connection Vacuum Breakers.

.5 ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.

.6 ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.

.7 ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

.8 ASTM C478 - Precast Reinforced Concrete Manhole Sections.

.9 AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

.10 PDI G-101 - Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.

.11 PDI WH-201 - Water Hammer Arrestors.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

.3 Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Procedures for submittals.

.2 Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

.3 Operation Data: Indicate frequency of treatment required for interceptors.

.4 Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept specialties on site in original factory packaging. Inspect for damage.

1.9 EXTRA MATERIALS

.1 Section 01 78 10.

.2 Supply two loose keys for outside hose bibs, hose end vacuum breakers for hose bibs, service kits for .

Part 2 Products

2.1 FLOOR DRAINS

.1 Floor Drain (FD-1):

.1 Watts #FD-100-C-A5-1-7 Floor Drain - epoxy coated cast iron body, reversible flashing clamp with primary and secondary weepholes, trap primer connection with plug, no hub outlet Watts -A5-1 5" (127 mm) diameter, nickel bronze, adjustable round strainer. With Trap Guard primer.

.2 Funnel Floor Drain (FD-1):

.1 Watts #FD-100-C-EG Floor Drain with oval funnel - epoxy coated cast iron body, reversible flashing clamp with primary and secondary weepholes, trap primer connection with plug, no hub outlet Watts -A5-1 5" (127 mm) diameter, oval cast iron (standard) funnel, nickel bronze, adjustable round strainer. With Trap guard primer.

2.2 CLEANOUTS

.1 Interior Finished Floor Areas (CO):

.1 Manufacturers:

.1 Zurn Model ZN-1400-HD-BP-NH

.2 Substitutions: Refer to Section 01 62 00.

.2 Galvanized cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

.2 Interior Finished Wall Areas (CO):

.1 Manufacturers:

.1 Zurn Model ZANB-1460

.2 Substitutions: Refer to Section 01 62 00.

.2 Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

.3 Interior Unfinished Accessible Areas (CO-5): Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

.3 Encase exterior cleanouts in concrete flush with grade.

.4 Install floor cleanouts at elevation to accommodate finished floor.

.5 Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

.6 Pipe relief from backflow preventer to nearest drain.

.7 Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks washing machine outlets.

.8 Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or20 mm minimum, and minimum450 mm long.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Water Heaters.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 48 - Vibration Isolation.

.5 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ASHRAE 90A - Energy Conservation in New Building Design.

.2 ASME Section 8D - Boilers and Pressure Vessel Codes - Rules for Construction of Pressure Vessels.

.3 UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.

.4 UL 174 - Household Electric Storage Tank Water Heaters.

.5 CAN/CSA C22.2 No.110, Construction and Test of Electric Storage Tank Water Heaters.

.6 CAN/CSA-C191, Performance of Electric Storage Tank Water Heaters for Household Service.

.1 CAN/CSA-C309, Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data:

.1 Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.

.2 Indicate pump type, capacity, power requirements.

.3 Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

.4 Provide electrical characteristics and connection requirements.

.3 Shop Drawings:

.1 Indicate heat exchanger dimensions, size of tappings, and performance data.

.2 Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Procedures for submittals.

.2 Project Record Documents: Record actual locations of components.

.3 Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

.4 Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Provide pumps with manufacturer's name, model number, and rating/capacity identified.

.3 Ensure products and installation of specified products are to recommendations and requirements of the following organizations:

.1 Canadian Standards Association (CSA).

.2 National Sanitation Foundation (NSF).

.3 American Society of Mechanical Engineers (ASME).

.4 National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).

.5 National Electrical Manufacturers' Association (NEMA).

.6 Underwriters Laboratories of Canada (ULC).

.4 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.8 WARRANTY

.1 Provide five year manufacturer warranty for domestic water heaters, in-line circulator, submersible sump pumps, sewage ejectors.

Part 2 Products

2.1 OIL FIRED WATER HEATERS

.1 Manufacturer: Dettson Model CMO32/CMO50. (On site)

.2 Type: Automatic, oil-fired, vertical storage.

.3 Tank: Glass lined welded steel with single flue passage, flue baffle and draft hood; thermally insulated with glass fibre and encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

.4 Controls: Automatic water thermostat, temperature range adjustable from 49 to 77 degrees C, flame retention oil burner, safety high limit control.

.5 Accessories: Water connections and dip tube, drain valve, magnesium anodes, and temperature and pressure relief valve.

Part 3 Execution

3.1 INSTALLATION

.1 Install water heaters to manufacturer's instructions and CSA B149.1.

.2 Coordinate with plumbing piping and related electrical work to achieve operating system.

.3 Domestic Hot Water Storage Tanks:

.1 Provide steel pipe support, independent of building structural framing members.

.2 Clean and flush after installation. Seal until pipe connections are made.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Nunavut, Canada.

.3 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.4 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.6 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, Consultant 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 Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

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

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

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.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 Consultant 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.

1.2 QUALITY ASSURANCE

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

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 MAINTENANCE

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

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One 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.

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

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

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

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

Part 2 Execution

2.1 SECURITY FASTENERS

.1 Security screws are required to be used in all secure areas.

2.2 PAINTING REPAIRS AND RESTORATION

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

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

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

2.3 CLEANING

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

2.4 DEMONSTRATION

.1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Fan coils and air conditioning units.

.2 In-floor hydronic system.

.3 Exhaust fans.

.4 Hot water tank and recirculation pump.

.5 LAN room AC unit.

.6 Forced flow heaters.

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

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

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

.6 Consultant will record these demonstrations on video tape for future reference.

2.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Expansion tanks.

.2 Air vents.

.3 Air separators.

.4 Strainers.

.5 Glycol specialties.

.6 Flow control valve.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 22 42 01 - Plumbing Specialties: Backflow Preventers.

.5 Section 23 21 00 - Hydronic Piping.

.6 Section 23 25 00 - Chemical Treatment For Piping: Pipe Cleaning.

1.3 REFERENCES

.1 ASME - SEC 8D - Boilers and Pressure Vessels Code - Rules for Construction of Pressure Vessels.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.

.3 Submit inspection certificates for pressure vessels from authority having jurisdiction.

.4 Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.5 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

1.6 OPERATION AND MAINTENANCE DATA

.1 Section 01 78 10: Submittals for project closeout.

.2 Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept valves on site in shipping containers with labeling in place. Inspect for damage.

.3 Provide temporary protective coating on cast iron and steel valves.

.4 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.9 MAINTENANCE SERVICE

.1 Provide service and maintenance of glycol system for one year from date of substantial completion.

.2 Visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

1.10 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide one extra 4 L drum of glycol.

Part 2 Products

2.1 DIAPHRAGM-TYPE EXPANSION TANKS

.1 Manufacturers:

.1 Watts Model ETA-15.

.2 Construction: Welded steel, tested and stamped to ASME SEC 8-D; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible butyl diaphragm sealed into tank, and steel support stand.

.3 Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 80 kPa.

.4 Automatic Cold Water Fill Assembly: Pressure reducing valve, double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

.5 Size:

.1 Capacity: 7.5 Gal.

.2 Acceptance capacity: 2.5 Gal

.3 Diaphragm suitable for 240 F operating temperature.

2.2 AUTOMATIC AIR VENTS

.1 Standard float vent: brass body and NPS connection

2.3 AIR SEPARATORS – EXPANSION TANK FITTING

.1 Complete with adjustable vent tube and built in manual vent valve

2.4 STRAINERS

.1 Size 50 mm and Under:

.1 Screwed brass or iron body for 1200 kPa working pressure, Y pattern with 0.8 mm stainless steel perforated screen.

2.5 FLOW CONTROLS

.1 Manufacturers:

.1 Tekmar 4-way mixing valve Model 721 and actuating motor model 742.

.2 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Valve Construction: Brass body used to mix supply water from a heat source with water returning from a system. It is designed for use in either closed loop or open loop hydronic systems. It connects to pipe using standard female NPT threads. The valve provides a maximum leak through rate of 1% to allow for water expansion during temperature changes. The valve position can be manually set using the handle. An Actuating Motor 741 can be used to automatically operate the valve.

.1 Main Seal — EPDM Peroxide “O” ring

.2 Maximum Operating Pressure — 146 psi (10 bar)

.3 Operating Temperature Range — -20 to 248°F (-28 to 120°C)

.4 Valve Body and Vane — CW 617N - EN 12165 Brass

.5 Shaft Seal — EPDM Peroxide “O” ring

.3 Actuating Motor: The Actuating Motor 742 uses a 0-10 or 2-10 V (dc) signal to adjust the position of a mixing valve. It is compatible with Tekmar brass mixing valves 710 to 724. It provides 88 in•lbs (10 N•m) of torque over a 90° rotation. The rotation directions selected by a toggle switch.

2.6 FLOW BALANCING VALVES

.1 Manufacturers:

.1 Uponor Model TruFLOW Jr Assembly with Balancing and Assembly Valves.

.2 Uponor Single Stage Set Point controller.

.3 Other acceptable manufacturers offering equivalent products.

.4 Substitutions: Refer to Section 01 62 00.

.2 Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet.

.3 Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum pressure 145 psig

.4 Accessories: In-line strainer on inlet and ball valve on outlet.

2.7 GLYCOL SYSTEM

.1 Glycol System Tanks and Pump

.1 Manufacturers:

.1 Axiom MF300.

.2 Substitutions: Refer to Section 01 62 00.

.2 System shall include 65 litre (17 U.S. gallon) storage/mixing tank with molded-in level gauge, 125 mm (5”) fill/access opening and cover; pump suction hose with inlet strainer and check valve; pressure pump with fuse protection; low fluid level pump cut-out float switch; manual diverter valve for purging air and agitating contents of storage tank; pressure switch with snubber and two sets of SPST dry contacts, each individually adjustable from 115kPa (10 psig) to 170 kPa (25 psig) cut-out pressure; factory cut-out pressure set to 115 kPa (17psig); and liquid filled pressure gauge. Unit to be c/w UL listed and fused power supply adapter with LED power indicator light, 115/60/1 to 24 VDC 50 watts AC, supplied loose for field installation.

.3 Feeder shall be compatible with glycol solutions of up to 50% concentration. Pump shall be capable of running dry without damage. The second set of contacts in the pressure switch shall be wired to a terminal strip for use as low pressure alarm contacts for remote alarm circuit supplied by others. Unit shall be completely assembled.

.2 Glycol Solution

.1 Manufacturers:

.1 Dowfrost HD Propylene Glycol.

.2 Substitutions: Not permitted

.2 Inhibited propylene glycol and water solution mixed 50 percent glycol – 50 percent water, suitable for operating temperatures from -40 degrees C to 121 degrees C.

Part 3 Execution

3.1 INSTALLATION

.1 Install specialties to manufacturer's instructions.

.2 Where large air quantities can accumulate, provide enlarged air collection standpipes.

.3 Provide manual air vents at system high points and as indicated.

.4 For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

.5 Provide air separator on suction side of system circulation pump and connect to expansion tank.

.6 Provide valved drain and hose connection on strainer blow down connection.

.7 Provide pump suction fitting on suction side of base mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.

.8 Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.

.9 Support pump fittings with floor mounted pipe and flange supports.

.10 Provide radiator valves on water inlet to terminal heating units such as radiation, unit heaters, and fan coil units.

.11 Provide radiator balancing valves on water outlet from terminal heating units such as radiation, unit heaters, and fan coil units.

.12 Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.

.13 Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

.14 Pipe relief valve outlet to nearest floor drain.

.15 Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

.16 Clean and flush glycol system before adding glycol solution. Refer to Section 23 25 00.

.17 Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at 80 kPa. Pressure system cold at 35 kPa.

.18 Perform tests determining strength of glycol and water solution and submit written test results.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Nameplates.

.2 Tags.

.3 Pipe Markers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 09 91 10 - Painting: Identification painting.

1.3 REFERENCES

.1 ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Submit list of wording, symbols, letter size, and colour coding for mechanical identification.

.3 Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

.4 Product Data: Provide manufacturers catalogue literature for each product required.

.5 Samples: Submit two labels, tags.

.6 Manufacturer's Installation Instructions: Indicate special procedures, and installation.

1.5 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of tagged valves.

Part 2 Products

2.1 NAMEPLATES

.1 Manufacturers:

.1 Seaton.

.2 Substitutions: Refer to Section 01 62 00.

.2 Description: Laminated three-layer plastic with engraved black letters on light contrasting background colour. 2” x 4”

2.2 TAGS

.1 Manufacturers:

.1 Seaton .

.2 Substitutions: Refer to Section 01 62 00.

.2 Plastic Tags: Laminated three-layer plastic with engraved letters on light contrasting background colour. Tag size minimum 1-1/2 inch square.

.3 Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

.1 Manufacturers:

.1 Seaton Model Set Mark Pipe Marker.

.2 Substitutions: Refer to Section 01 62 00.

.2 Colour: Conform to ASME A13.1.

.3 Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

.4 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

Part 3 Execution

3.1 PREPARATION

.1 Degrease and clean surfaces to receive adhesive for identification materials.

.2 Prepare surfaces to Section 09 91 10 for stencil painting.

3.2 INSTALLATION

.1 Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

.2 Install tags with corrosion resistant chain.

.3 Install plastic pipe markers to manufacturer's instructions.

.4 Install plastic tape pipe markers complete around pipe to manufacturer's instructions.

.5 Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

.6 Identify control panels and major control components outside panels with plastic nameplates.

.7 Identify thermostats relating to terminal boxes or valves with nameplates.

.8 Identify valves in main and branch piping with tags.

.9 Identify air terminal units and radiator valves with numbered tags.

.10 Tag automatic controls, instruments, and relays. Key to control schematic.

.11 Identify piping, concealed or exposed, with plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 15 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Testing, adjustment, and balancing of air systems.

.2 Testing, adjustment, and balancing of hydronic systems.

.3 Measurement of final operating condition of HVAC systems.

.4 Sound measurement of equipment operating conditions.

.5 Vibration measurement of equipment operating conditions.

1.2 RELATED SECTIONS

.1 Section 01 20 13 - Price and Payment Procedures.

.2 Section 01 33 00 - Administrative Requirements.

.3 Section 01 44 00 - Quality Assurance:

- .1 Testing laboratory services.
- .2 Employment of testing agency and payment for services.
- .3 Inspection and testing allowances.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements:

- .1 Starting of Systems.
- .2 Testing, Adjusting, and Balancing of Systems.

1.3 ALLOWANCES

.1 Cash Allowance: Section 01 20 13 for the Cash Allowance Sum applicable to this section.

.2 Allowance includes testing, adjusting, and balancing of mechanical systems.

.3 Work is included in this section and is part of the Contract Sum/Price.

1.4 REFERENCES

.1 AABC - National Standards for Total System Balance.

.2 ADC - Test Code for Grilles, Registers, and Diffusers.

.3 ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.

.4 NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

.5 SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.5 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

.3 Section 01 44 00: Procedures for submitting Field Reports.

.4 Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

.5 Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

.6 Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Consultant and for inclusion in operating and maintenance manuals.

.7 Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

.8 Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

.9 Test Reports: Indicate data on AABC National Standards for Total System Balance forms. Submit data in S.I. Metric units.

1.6 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of flow measuring stations and balancing valves and rough setting.

1.7 QUALITY ASSURANCE

.1 Perform total system balance to AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

.2 Maintain one copy of each document on site.

1.8 QUALIFICATIONS

.1 Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC/CAABC.

.2 Perform Work under supervision of CAABC Certified Test and Balance Engineer.

1.9 PRE-BALANCING CONFERENCE

.1 Convene one week prior to commencing work of this section, to Section 01 33 00.

1.10 SEQUENCING

.1 Sequence work to Section 01 10 13.

.2 Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

1.11 SCHEDULING

.1 Schedule work to Section 01 33 00.

.2 Schedule and provide assistance in final adjustment and test of life safety and smoke control system with Fire Authority.

Part 2 Products

.1 Not used

Part 3 Execution

3.1 AGENCIES

.1 Air Movement Services, Winnipeg.

.2 Airdronics, Winnipeg.

.3 Other AABC/CAABC certified balancing companies.

3.2 EXAMINATION

.1 Verify that systems are complete and operable before commencing work. Ensure the following conditions:

.1 Systems are started and operating in a safe and normal condition.

.2 Temperature control systems are installed complete and operable.

.3 Proper thermal overload protection is in place for electrical equipment.

.4 Final filters are clean and in place. If required, install temporary media in addition to final filters.

.5 Duct systems are clean of debris.

.6 Fans are rotating correctly.

.7 Fire and volume dampers are in place and open.

.8 Air coil fins are cleaned and combed.

.9 Access doors are closed and duct end caps are in place.

.10 Air outlets are installed and connected.

.11 Duct system leakage is minimized.

.12 Hydronic systems are flushed, filled, and vented.

.13 Pumps are rotating correctly.

.14 Proper strainer baskets are clean and in place.

.15 Service and balance valves are open.

.2 Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

.3 Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

.1 Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Consultant to facilitate spot checks during testing.

.2 Provide additional balancing devices as required.

3.4 INSTALLATION TOLERANCES

.1 Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

.2 Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

.3 Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 ADJUSTING

.1 Ensure recorded data represents actual measured or observed conditions.

.2 Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

.3 After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

.4 Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

.5 At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

.6 Check and adjust systems approximately six months after final acceptance and submit report.

3.6 AIR SYSTEM PROCEDURE

.1 Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

.2 Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

.3 Measure air quantities at air inlets and outlets.

.4 Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

.5 Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

.6 Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

.7 Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

.8 Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

.9 Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

.10 Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

.11 Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

.12 Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 12.5 Pa positive static pressure near the building entries.

.13 Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

.14 For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

.15 On fan powered VAV boxes, adjust air flow switches for proper operation.

3.7 WATER SYSTEM PROCEDURE

.1 Adjust water systems to provide required or design quantities.

.2 Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

.3 Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

.4 Effect system balance with automatic control valves fully open to heat transfer elements.

.5 Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

.6 Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.8 SCHEDULES

.1 Equipment requiring testing, adjusting and balancing:

- .1 Plumbing Pumps
- .2 HVAC Pumps
- .3 Forced Air Furnaces
- .4 Heat recovery ventilators
- .5 Air Cooled Refrigerant Condensers
- .6 Computer Room Air Conditioning Units
- .7 Electric duct heater Coils
- .8 Fans
- .9 Air Filters
- .10 Air Inlets and Outlets

.2 Report Forms

- .1 Title Page:
  - .1 Name of Testing, Adjusting, and Balancing Agency
  - .2 Address of Testing, Adjusting, and Balancing Agency
  - .3 Telephone number of Testing, Adjusting, and Balancing Agency
  - .4 Project name
  - .5 Project location
  - .6 Project Architect
  - .7 Project Engineer
  - .8 Project Contractor

.9 Project altitude

.10 Report date

.2 Summary Comments:

.1 Design versus final performance

.2 Notable characteristics of system

.3 Description of systems operation sequence

.4 Summary of outdoor and exhaust flows to indicate amount of building pressurization

.5 Nomenclature used throughout report

.6 Test conditions

.3 Instrument List:

.1 Instrument

.2 Manufacturer

.3 Model number

.4 Serial number

.5 Range

.6 Calibration date

.4 Electric Motors:

.1 Manufacturer

.2 Model/Frame

.3 HP/BHP

.4 Phase, voltage, amperage; nameplate, actual, no load

.5 RPM

.6 Service factor

.7 Starter size, rating, heater elements

.8 Sheave Make/Size/Bore

.5 V-Belt Drive:

.1 Identification/location

.2 Required driven RPM

.3 Driven sheave, diameter and RPM

.4 Belt, size and quantity

.5 Motor sheave diameter and RPM

.6 Centre to centre distance, maximum, minimum, and actual

.6 Pump Data:

.1 Identification/number

.2 Manufacturer

.3 Size/model

.4 Impeller

.5 Service

.6 Design flow rate, pressure drop, BHP

.7 Actual flow rate, pressure drop, BHP

.8 Discharge pressure
.9 Suction pressure
.10 Total operating head pressure
.11 Shut off, discharge and suction pressures
.12 Shut off, total head pressure

.7 Air Cooled Condenser:
.1 Identification/number
.2 Location
.3 Manufacturer
.4 Model number
.5 Serial number
.6 Entering DB air temperature, design and actual
.7 Leaving DB air temperature, design and actual
.8 Number of compressors

.8 Cooling Coil Data:
.1 Identification/number
.2 Location
.3 Service
.4 Manufacturer
.5 Air flow, design and actual
.6 Entering air DB temperature, design and actual
.7 Entering air WB temperature, design and actual
.8 Leaving air DB temperature, design and actual
.9 Leaving air WB temperature, design and actual
.10 Water flow, design and actual
.11 Water pressure drop, design and actual
.12 Entering water temperature, design and actual
.13 Leaving water temperature, design and actual
.14 Saturated suction temperature, design and actual
.15 Air pressure drop, design and actual

.9 Heating Coil Data:
.1 Identification/number
.2 Location
.3 Service
.4 Manufacturer
.5 Air flow, design and actual
.6 Water flow, design and actual
.7 Water pressure drop, design and actual
.8 Entering water temperature, design and actual
.9 Leaving water temperature, design and actual
.10 Entering air temperature, design and actual

.11 Leaving air temperature, design and actual
.12 Air pressure drop, design and actual

.10 Electric Duct Heater:
.1 Manufacturer
.2 Identification/number
.3 Location
.4 Model number
.5 Design kW
.6 Number of stages
.7 Phase, voltage, amperage
.8 Test voltage (each phase)
.9 Test amperage (each phase)
.10 Air flow, specified and actual
.11 Temperature rise, specified and actual

.11 Air Moving Equipment
.1 Location
.2 Manufacturer
.3 Model number
.4 Serial number
.5 Arrangement/Class/Discharge
.6 Air flow, specified and actual
.7 Return air flow, specified and actual
.8 Outside air flow, specified and actual
.9 Total static pressure (total external), specified and actual
.10 Inlet pressure
.11 Discharge pressure
.12 Sheave Make/Size/Bore
.13 Number of Belts/Make/Size
.14 Fan RPM

.12 Return Air/Outside Air Data:
.1 Identification/location
.2 Design air flow
.3 Actual air flow
.4 Design return air flow
.5 Actual return air flow
.6 Design outside air flow
.7 Actual outside air flow
.8 Return air temperature
.9 Outside air temperature
.10 Required mixed air temperature
.11 Actual mixed air temperature

.12 Design outside/return air ratio
.13 Actual outside/return air ratio

.13 Exhaust Fan Data:
.1 Location
.2 Manufacturer
.3 Model number
.4 Serial number
.5 Air flow, specified and actual
.6 Total static pressure (total external), specified and actual
.7 Inlet pressure
.8 Discharge pressure
.9 Sheave Make/Size/Bore
.10 Number of Belts/Make/Size
.11 Fan RPM

.14 Duct Traverse:
.1 System zone/branch
.2 Duct size
.3 Area
.4 Design velocity
.5 Design air flow
.6 Test velocity
.7 Test air flow
.8 Duct static pressure
.9 Air temperature
.10 Air correction factor

.15 Duct Leak Test:
.1 Description of ductwork under test
.2 Duct design operating pressure
.3 Duct design test static pressure
.4 Duct capacity, air flow
.5 Maximum allowable leakage duct capacity times leak factor
.6 Test apparatus
.1 Blower
.2 Orifice, tube size
.3 Orifice size
.4 Calibrated
.7 Test static pressure
.8 Test orifice differential pressure
.9 Leakage

.16 Air Monitoring Station Data:
.1 Identification/location

.2 System
.3 Size
.4 Area
.5 Design velocity
.6 Design air flow
.7 Test velocity
.8 Test air flow

.17 Flow Measuring Station:
.1 Identification/number
.2 Location
.3 Size
.4 Manufacturer
.5 Model number
.6 Serial number
.7 Design Flow rate
.8 Design pressure drop
.9 Actual/final pressure drop
.10 Actual/final flow rate
.11 Station calibrated setting

.18 Air Distribution Test Sheet:
.1 Air terminal number
.2 Room number/location
.3 Terminal type
.4 Terminal size
.5 Area factor
.6 Design velocity
.7 Design air flow
.8 Test (final) velocity
.9 Test (final) air flow
.10 Percent of design air flow

.19 Sound Level Report:
.1 Location
.2 Octave bands - equipment off
.3 Octave bands - equipment on

.20 Vibration Test:
.1 Location of points:
.1 Fan bearing, drive end
.2 Fan bearing, opposite end
.3 Motor bearing, centre (if applicable)
.4 Motor bearing, drive end
.5 Motor bearing, opposite end

.6 Casing (bottom or top)
.7 Casing (side)
.8 Duct after flexible connection (discharge)
.9 Duct after flexible connection (suction)

.2 Test readings:
.1 Horizontal, velocity and displacement
.2 Vertical, velocity and displacement
.3 Axial, velocity and displacement

.3 Normally acceptable readings, velocity and acceleration

.4 Unusual conditions at time of test

.5 Vibration source (if non-complying)

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Duct work insulation.

.2 Duct Liner.

.3 Insulation jackets.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 09 91 10 - Painting: Painting insulation jackets.

.5 Section 23 05 53 - Mechanical Identification.

.6 Section 23 31 00 - Duct Work: Glass fibre duct work.

.7 Section 23 31 00 - Duct Work: Duct liner.

1.3 REFERENCES

.1 Section 01 44 00: Requirements for references and standards.

.2 ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

.3 ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Metre Apparatus.

.4 ASTM C553 - Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.5 ASTM C612 - Standard Specification for Mineral Fibre Block and Board Thermal Insulation.

.6 ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

.7 ASTM C1071 - Fibrous Glass Duct Lining Insulation(Thermal Sound Absorbing Material).

.8 ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

.9 ASTM E96 - Water Vapour Transmission of Materials.

.10 ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

.11 ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.12 NAIMA National Insulation Standards.

.13 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

.14 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.15 UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

.1 Materials: Flame spread/smoke developed rating of 25/50 to ASTM E84 NFPA 255 UL 723.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

.3 Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Section 01 61 00: Environmental conditions affecting products on site.

.2 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

.3 Maintain temperature during and after installation for minimum period of 24 hours.

Part 2 Products

2.1 INSULATION

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

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 deg C mean temperature when tested in accordance with ASTM C 335

.3 TIAC Code C-1; Rigid mineral fibre board to ASTM C 612, with or without factory applied vapour retarder jacket to CBSB 51-GP-52Ma

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C 553 faced with or without factory applied vapour retarder jacket to CGSB 51-GP-52Ma

.1 Mineral Fibre to ASTM c 553

.2 Jacket: to CGSB 51-gp-52MA

.3 Maximum "k" Factor to ASTM C 553

2.2 JACKETS

.1 Canvas:

.1 220 gm/m2 cotton. Plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921

2.3 ACCESSORIES

.1 Vapour retarder lap adhesive

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

.2 Indoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449

.4 ULC Listed Canvas Jacket

.5 Tape self-adhesive, aluminum reifinroced 75mm wide

.6 Contact adhesive: quick setting

.7 Canvas adhesive: washable

.8 Tie wire: 1.5mm stainless stel

.9 Banding: 12mm wide, 0.5mm thick stainless steel

.10 Facing: 25mm galvanized steel hexagonal wire mesh stitched on one face of insulation

.11 Fasteners: 4mm dia pins with 35mm dia clips, length to suit insulation thickness.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00 - Examination and Preparation: Verification of existing conditions before starting work.

.2 Verify that duct work has been tested before applying insulation materials.

.3 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

.1 Section 01 44 00 - Quality Assurance: Manufacturer's instructions.

.2 Install to NAIMA National Insulation Standards.

.3 Insulated duct work conveying air below ambient temperature:

.1 Provide insulation with vapour barrier jackets.
.2 Finish with tape and vapour barrier jacket.
.3 Continue insulation through walls, sleeves, hangers, and other duct penetrations.
.4 Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

.4 Insulated duct work conveying air above ambient temperature:

.1 Provide with or without standard vapour barrier jacket.
.2 Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

.5 Duct Work Exposed in Mechanical Equipment Rooms or Finished Spaces below 3 metres above finished floor: Finish with canvas jacket sized for finish painting or aluminum jacket.

.6 Exterior Applications: Provide insulation with vapour barrier jacket. Cover with caulked aluminum jacket with seams located on bottom side of horizontal duct section.

.7 External Duct Insulation Application:

.1 Secure insulation with vapour barrier with wires and seal jacket joints with vapour barrier adhesive or tape to match jacket.

.2 Secure insulation without vapour barrier with staples, tape, or wires.

.3 Install without sag on underside of duct work. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct work off trapeze hangers and insert spacers.

.4 Seal vapour barrier penetrations by mechanical fasteners with vapour barrier adhesive.

.5 Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

.8 Duct and Plenum Liner Application:

.1 Adhere insulation with adhesive for 90 percent coverage.

.2 Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.

.3 Seal and smooth joints. Seal and coat transverse joints.

.4 Seal liner surface penetrations with adhesive.

.5 Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

Ducts	**Insulation**
Exhaust Ducts Within 3 m of Exterior Openings	3” foil-faced insulation
Outside Air Intake Ducts and Plenum	3” foil-faced insulation
Supply and Return Ducts and Plenums in Basement	1” foil-faced insulation or to match existing
Supply and Return Ducts and Plenums in Crawlspace	2” foil-faced insulation or to match existing
Supply and Return Ducts and Plenums in Attic space	2” foil-faced insulation
Supply and Return Ducts in Ceiling Space above General offices	Acoustic insulation
Vertical supply and return shafts supplying General offices	Acoustic insulation

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Piping insulation.

.2 Jackets and accessories.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 09 91 10 - Painting: Painting insulation jacket.

.4 Section 22 10 00 - Plumbing Piping: Placement of hangers and hanger inserts.

.5 Section 23 05 53 - Mechanical Identification.Section 23 21 00 - Hydronic Piping: Placement of hangers and hanger inserts.

1.3 REFERENCES

.1 ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

.2 ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

.3 ASTM C195 - Mineral Fibre Thermal Insulating Cement.

.4 ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

.5 ASTM C449/C449M - Mineral Fibre Hydraulic-setting Thermal Insulating and Finishing Cement.

.6 ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Metre Apparatus.

.7 ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

.8 ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

.9 ASTM C547 - Mineral Fibre Pipe Insulation.

.10 ASTM C552 - Cellular Glass Thermal Insulation.

.11 ASTM C578 - Rigid, Cellular Polystyrene Thermal Insulation.

.12 ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

.13 ASTM C591 - Unfaced Preformed Cellular Polyisocyanurate Thermal Insulation.

.14 ASTM C610 - Moulded Expanded Perlite Block and Pipe Thermal Insulation.

.15 ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

.16 ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

.17 ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).

.18 ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

.19 ASTM E84 - Surface Burning Characteristics of Building Materials.

.20 ASTM E96 - Water Vapour Transmission of Materials.

.21 NFPA 255 - Surface Burning Characteristics of Building Materials.

.22 UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide product description, list of materials and thickness for each service, and locations.

.3 Samples: Submit two samples of any representative size illustrating each insulation type.

.4 Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

.1 Materials: Flame spread/smoke developed rating of 25/50 25/100 / or less to ASTM E84. NFPA 255. UL 723.

1.6 QUALIFICATIONS

.1 Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

.3 Store insulation in original wrapping and protect from weather and construction traffic.

.4 Protect insulation against dirt, water, chemical, and mechanical damage.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

.2 Maintain temperature during and after installation for minimum period of 24 hours.

Part 2 Products

2.1 INSULATION

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

.2 Thermal Conductivity ('k' factor) not to exceed 0.035-0.04 W/m.C at 38 degrees C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code A-1: Rigid moulded mineral fibre without factory applied vapour retarder jacket

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

.5 TIAC Code C-2: mineral fiber blanket faced with or without factory applied vapour retarder jacket

.6 Acceptable materials: Fiberglass Canada, Manson, Knauf, Plasti-fab, Manville

2.2 INSULATION SECUREMENT

.1 Vapour retarder lap adhesive

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

.2 Indoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449

.4 ULC Listed Canvas Jacket

.5 Tape self-adhesive, aluminum reinforced 75mm wide

.6 Contact adhesive: quick setting

.7 Canvas adhesive: washable

.8 Tie wire: 1.5mm stainless stel

.9 Banding: 12mm wide, 0.5mm thick stainless steel

2.3 JACKETS

.1 Canvas

.1 220 gm/m2 cotton. Plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921

.2 Use Armaflex insulation for liquid and gas lines to condenser.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that piping has been tested before applying insulation materials.

.2 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

.1 Install materials to manufacturer's instructions.

.2 On exposed piping, locate insulation and cover seams in least visible locations.

.3 Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:

.1 Provide vapour barrier jackets, factory applied or field applied.

.2 Insulate fittings, joints, and valves with moulded insulation of like material and thickness as adjacent pipe.

.3 Finish with glass cloth and vapour barrier adhesive.

.4 PVC fitting covers may be used.

.5 Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

.6 Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

.4 For insulated pipes conveying fluids above ambient temperature:

.1 Provide standard jackets, with or without vapour barrier, factory applied or field applied.

.2 Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.

.3 Finish with glass cloth and adhesive.

.4 PVC fitting covers may be used.

.5 For hot piping conveying fluids 60 degrees C or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

.6 For hot piping conveying fluids over 60 degrees C, insulate flanges and unions at equipment.

.5 Inserts and Shields:

.1 Application: Piping 40 mm diameter or larger.

.2 Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

.3 Insert Location: Between support shield and piping and under the finish jacket.

.4 Insert Configuration: Minimum 150 mm long, of same thickness and contour as adjoining insulation; may be factory fabricated.

.5 Insert Material: hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

.6 Finish insulation at supports, protrusions, and interruptions.

.7 For pipe exposed in mechanical equipment rooms or in finished spaces below 3 metres above finished floor, finish with canvas jacket sized for finish painting.

.8 For exterior applications, provide vapour barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapour barrier cement. Cover with aluminum stainless steel jacket with seams located on bottom side of horizontal piping.

.9 For buried piping, provide factory fabricated assembly with inner all-purpose service jacket with self sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

.10 For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 TOLERANCE

.1 Substituted insulation materials: Thermal resistance within 10 percent at normal conditions, as materials indicated.

	PIPING SYSTEMS	**PIPE SIZE mm**	**INSULATION THICKNESS** mm
Plumbing Systems: conditioned space			
	Domestic Hot Water Supply	= 50mm	25mm
	Domestic Hot Water Recirc	= 50mm	25mm
	Domestic Cold Water Supply	= 50mm	25mm
	Vent Lines	All	25mm

Note: Insulation k-factor to be 0.035-0.038 W/m.C at mean rating temperature 38C.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Pipe and pipe fittings.

.2 Valves.

.3 Fuel oil storage tanks.

.4 Accessories.

1.2 RELATED SECTIONS

.1 Section 01 10 13 - Summary of Work

.2 Section 01 20 13 - Price and Payment Procedures

.3 Section 01 33 00 - Administrative Requirements.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements.

.6 Section 08 31 13 - Access Doors And Frames.

.7 Section 09 91 10 - Painting.

.8 Section 23 05 16 - Piping Expansion Compensation.

.9 Section 23 05 29 - Supports And Anchors.

.10 Section 23 05 53 - Mechanical Identification.

.11 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

.12 Section 31 23 18 - Trenching.

.13 Section 31 23 23 - Backfilling.

1.3 REFERENCES

.1 ANSI B31.1 - Power Piping.

.2 ANSI B31.4 - Liquid Petroleum Transportation Piping Systems.

.3 ANSI B31.9 - Building Service Piping.

.4 API Spec 12P - Fibreglass Reinforced Plastic Tanks.

.5 API 650 - Welded Steel Tanks for Oil Storage.

.6 API 2000 - Venting Atmospheric and Low Pressure Storage Tanks.

.7 ASME - Boiler and Pressure Vessel Code.

.8 ASME SEC IX - Welding and Brazing Qualifications.

.9 ASME B16.3 - Malleable Iron Threaded Fittings.

.10 ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.

.11 ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings

.12 ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

.13 ASME B36.10 - Welded and Seamless Wrought Steel Pipe.

.14 ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.15 ASTM A234/A234M - Piping Fittings of Wrought-Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.16 ASTM B88 - Seamless Copper Water Tube.

.17 AWS A5.8 - Filler Metals for Brazing and Braze Welding.

.18 AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems.

.19 CSA B139.2-15 Installation code for oil-burning equipment for residential and small commercial buildings

.20 CAN/ULC –S670 Standard for Aboveground non-metallic tanks for fuel oil and other combustible liquids

.21 CAN/ULC –S670, 677, 652, 601, 602, 653, or 655

.22 Factory Mutual Class 7440 – fusible links

.23 NFPA 30 - Flammable and Combustible Liquids Code.

.24 NFPA 31 - Installation of Oil-Burning Equipment.

.25 ULC/ORD –C842 Guide for the Investigation of Valves for Flammable and Combustible Liquids.

.26 ULC/ORD –C536 Flexible Metallic Hose

.27 UL 80 - Steel Tanks for Oil-Burner Fuel.

.28 UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids.

.29 UL 1316 - Glass Fibre Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol Gasline Mixtures.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

.3 Shop Drawings: Indicate tanks, system layout, pipe sizes, location, and elevations. For fuel oil tanks, indicate dimensions and accessories including manholes and hold down straps.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Certificates: Certify that tanks/pumps/valves meet or exceed specified requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Closeout submittals.

.2 Project Record Documents: Record actual locations of piping system, storage tanks, and system components.

.3 Maintenance Data: Include installation instructions, spare parts lists.

.4 Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 Welding Materials and Procedures: Conform to ASME Code.

.2 Welders Certification: To ASME SEC IX and CSA.

.3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.4 Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

.5 Valves: Manufacturer's name and pressure rating marked on valve body.

.6 Piping, flanges, unions, couplings: Manufacturer's name and pressure rating marked on body.

1.8 REGULATORY REQUIREMENTS

.1 Conform to CSA B139.1-15 and CSA B139.2-15 for installation of fuel oil system.

.2 Provide certificate of compliance from authority having jurisdiction indicating approval of installation of fuel oil system.

.3 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

1.10 WARRANTY

.1 Section 01 78 10.

.2 Provide thirty-year manufacturer warranty for oil tank against defects and corrosion.

1.11 EXTRA MATERIALS

.1 Section 01 78 10.

.2 Provide two repacking kits for each size valve.

.3 Provide two oil filters for each boiler or furnace.

.4 Provide dipstick and water finding paste.

.5 Provide spill kit for each tank.

Part 2 Products

2.1 ABOVE GROUND PIPING

.1 Copper Tubing: ASTM B88M, Type K,L,M, hard drawn.

.1 Fittings: ASME B16.18, cast copper alloy or ASTM B16.22 wrought copper and bronze.

.2 Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

.2 Copper Tubing: ASTM B88M, Type K,L, annealed.

.1 Fittings: ASME B16.26, cast bronze.

.2 Joints: Flared.

.3 Steel Pipe: ASTM A53 or ASME B36.10, Schedule 40 black.

.1 Fittings: ASTM B16.3, malleable iron, or ASTM A234/A234M, wrought carbon steel and alloy steel welding type.

.2 Joints: NFPA 30, threaded or welded to ASME 16.3 or ASME 16.39.

.4 No compression fittings. No union requiring packing or gaskets. No right and left couplings. No solder or braze materials with a MP538C.

.5 Pipe jointing compound – CAN/ULC-S642. Suitable for fuel oil.

2.2 PIPE HANGERS AND SUPPORTS

.1 Hangers for Pipe Sizes 15 to 40 mm, Carbon steel, adjustable swivel, split ring.

.2 Hangers for Pipe Sizes 50 mm and Over: Carbon steel, adjustable, clevis.

.3 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.4 Wall Support for Pipe Sizes to 80 mm: Cast iron hook.

.5 Vertical Support: Steel riser clamp.

.6 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.7 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.3 FLANGES, UNIONS, AND COUPLINGS

.1 Pipe Size 50 mm and Under:

.1 Ferrous pipe: 1034 kPa (150 psi) malleable iron threaded unions.

.2 Copper tube: 1034 kPa (150 psi) bronze unions with brazed joints. No solder or braze materials with a MP538C.

.2 Pipe jointing compound – CAN/ULC-S642. Suitable for fuel oil.

2.4 BALL VALVES (BV-1)

.1 Manufacturer: Kitz 68A

.2 Other acceptable manufacturers offering equivalent products:

.1 Morrison Bros.

.2 Toyo

.3 Substitutions: Refer to Section 01 62 00.

.3 Class 600 WOG, bronze, full bore, forged brass ball, brass gland and PTFE Teflon seats, steel lever handle, solder or threaded ends.

.4 Exterior valves suitable for cold temperatures to -40C (-40F).

.5 Conforms to ULC/ORD-C482.

2.5 CHECK VALVES (CV-1)

.1 Manufacturer: Beckett Model 12430, 12440

.2 Other acceptable manufacturers offering equivalent products:

.1 Morrison Bros.

.2 Kitz Fig 22

.3 Substitutions: Refer to Section 01 62 00.

.3 MSS SP-80, Class 125, bronze body and cap, bronze swing disc, threaded ends.

2.6 FLEXIBLE CONNECTORS (FC-1)

.1 Manufacturer: OPW Model Stainless Steel Flex Connectors.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Refer to Section 01 62 00.

.3 Bronze inner hose and braided exterior sleeve, suitable for temp rating -40F to 105F. Max operating pressure 1375kPa (200 psi) CWP.

.4 ULC/ORD C536 Flexible Metallic Hose.

2.7 DEAERATOR (DA-1)

.1 Manufacturer: Westwood Products: Tigerloop Ultra with screw-on oil filter

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Temp rating -7C to 40C (20F-105F). Max operating pressure 55 kPa (8psi). Max nozzle capacity 75.8 L/min (20GPH).

2.8 FUSIBLE LINKS (FL-1)

.1 Manufacturer: Firomatic.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Max temp rating 74C (165F).

.4 ULC 842 listed.

2.9 TANK WHISTLE (TW-1)

.1 Manufacturer: Beckett.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Refer to Section 01 62 00.

.3 Lockable, with screen on vent cover.

2.10 SPILL KITS (SK-1)

.1 Manufacturer:. SPC Oil Only Spill Kits (Economy and 55Gal drum)

.2 Other acceptable manufacturers offering equivalent products:

.1 Enpac

.2 Substitutions: Refer to Section 01 62 00.

.3 Residences: 5Gal capacity

.4 Detachments: 20Gal capacity.

2.11 VENT CAPS (VC-1)

.1 Manufacturer: Beckett. Model: Zinc-plated mushroom vent cap.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Refer to Section 01 62 00.

.3 Zinc plated cast iron, with screen.

2.12 FILL CAP WITH SPILL CONTAINER (C-1)

.1 Manufacturer: Morrison Bros Model 517 Series 3.5 Gallon AST Spill container

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Refer to Section 01 62 00.

.3 3.5 Gal capacity, hinged lockable cover.

.4 Meets CAN-ULC-S663-11.

2.13 LEVELOMETER (LI-1)

.1 Manufacturer: K TECH LEVELOMETER Model Midget Model 277 Pneumatic Indicator

.2 Other acceptable manufacturers offering equivalent products:

.1 King Tank Gauges.

.2 Rocket Wireless Gauge.

.3 Substitutions: Refer to Section 01 62 00.

.3 ULC/ORD-C180-97 listed.

2.14 OIL FILTER

.1 Manufacturer: Canadian General Filters

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Refer to Section 01 62 00.

.3 Suitable for oil burner.

2.15 WARM-UP PIPE (WP-1,2)

.1 Shop manufactured. See sketch SK-1 and SK-2 in Appendix A.

.2 WP-1: Schedule 40 pipe, 250mm (10") dia., 600mm (24") long, 31L.

.3 WP-2: Schedule 40 pipe, 100mm (4") dia., 600mm (24") long, 5L.

.4 With 25mm (1") drain valve and air bleed valve. (BV-1)

2.16 ABOVEGROUND FUEL STORAGE TANKS (T-1)

.1 Manufacturer: Vilco D252.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Tank: CAN/ ULC-S670, double wall, fibreglass, oval with integral molded support feet, tappings for accessories, threaded connections.

.4 Capacity: 1136 L. (250 gallons).

2.17 INDOOR DOUBLE-WALL STORAGE TANKS (T-2)

.1 Manufacturer: Steelcraft.

.2 Other acceptable manufacturers offering equivalent products:

.1 DTE Industries
.2 Clemmersteel
.3 Roth
.4 Regal Tanks
.5 Substitutions: Refer to Section 01 62 00..

.3 Tank: CAN/ ULC-S602, double wall steel construction, tappings for accessories, threaded connections. Vacuum monitored, or contained type designed to contain at least 100% of tank volume with monitoring (as per CSA B139.1.1-15 Section 6.2). Sizes as per schedule.

2.18 FUEL OIL PUMPS

.1 Manufacturer: Viking Model FH-432X.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Casing: Bronze, rated for 860 kPa (125 psi) working pressure with integral pressure relief valve.

.4 Impeller: Bronze gears, positive displacement.

.5 Drive: Direct connected with flexible coupling.

.6 Accessories: Adjustable pressure control valve, bleed valve, mechanical seal.

.7 ULC listed for fuel oil.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 10 13: Verification of existing conditions before starting work.

.2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

.1 Ream pipe and tube ends. Remove burrs.

.2 Remove scale and dirt, on inside and outside, before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

.1 Install to manufacturer's instructions, stamped drawings, and CSA B139.2-15.

.2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.

.3 Install piping using fittings manufactured to ANSI standards. Provide threaded fittings, except use welded fittings where piping is concelad.

.4 Route piping in orderly manner and maintain gradient.

.5 Install piping to conserve building space and not interfere with use of space.

.6 Group piping whenever practical at common elevations.

.7 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

.8 Provide clearance for installation of insulation and access to valves and fittings.

.9 Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 13.

.10 Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.

.11 Where pipe travels through buildings walls, use pipe sleeves or wrap pipe with two layers or pipe wrap.

.12 Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 09 91 10.

.13 Identify piping systems including underground piping. refer to Section 23 05 53.

.14 Install valves with stems upright or horizontal, not inverted.

.15 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

.16 Test system in accordance with CSA B139.2-15 Section 11.3 and authority having jurisdiction. Isolate tank from piping during tests. Clean strainers and filters after testing and provide new filter upon handover.

3.4 FUEL TANK INSTALLATION

.1 Install tanks and associated piping to manufacturer's instructions, stamped drawings, and CSA B139.2-15.

.2 Test tank as per manufacturer’s instructions. Upon delivery, perform pneumatic testing as per manufacturer’s instructions.

.3 Mount aboveground tanks on foundation or stands as indicated on drawings.

.4 Clean and flush day tank/warming tank prior to delivery to site. Seal until pipe connections are made.

.5 Fill tanks at project turn-over with appropriate fuel. Do not transfer oil from old tank to new tank. At first fill, perform hydrostatic test of tank as per CSA B139.2-15 section 6.9.

.6 Ensure level gauges have leak-proof and vapour-proof connections. Calibrate level gauges.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Pipe and pipe fittings.

.2 Valves.

.3 Fuel oil storage tanks.

.4 Accessories.

1.2 RELATED SECTIONS

.1 Section 01 10 13 - Summary of Work

.2 Section 01 20 13 - Price and Payment Procedures

.3 Section 01 33 00 - Administrative Requirements.

.4 Section 01 61 00 - Common Product Requirements.

.5 Section 01 78 10 - Execution Requirements.

.6 Section 08 31 13 - Access Doors And Frames.

.7 Section 09 91 10 - Painting.

.8 Section 23 05 16 - Piping Expansion Compensation.

.9 Section 23 05 29 - Supports And Anchors.

.10 Section 23 05 53 - Mechanical Identification.

.11 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

.12 Section 31 23 18 - Trenching.

.13 Section 31 23 23 - Backfilling.

1.3 REFERENCES

.1 ANSI B31.1 - Power Piping.

.2 ANSI B31.4 - Liquid Petroleum Transportation Piping Systems.

.3 ANSI B31.9 - Building Service Piping.

.4 API Spec 12P - Fibreglass Reinforced Plastic Tanks.

.5 API 650 - Welded Steel Tanks for Oil Storage.

.6 API 2000 - Venting Atmospheric and Low Pressure Storage Tanks.

.7 ASME - Boiler and Pressure Vessel Code.

.8 ASME SEC IX - Welding and Brazing Qualifications.

.9 ASME B16.3 - Malleable Iron Threaded Fittings.

.10 ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.

.11 ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings

.12 ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

.13 ASME B36.10 - Welded and Seamless Wrought Steel Pipe.

.14 ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.15 ASTM A234/A234M - Piping Fittings of Wrought-Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.16 ASTM B88 - Seamless Copper Water Tube.

.17 AWS A5.8 - Filler Metals for Brazing and Braze Welding.

.18 AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems.

.19 CSA B139.2-15 Installation code for oil-burning equipment for residential and small commercial buildings

.20 CAN/ULC –S670 Standard for Aboveground non-metallic tanks for fuel oil and other combustible liquids

.21 CAN/ULC –S670, 677, 652, 601, 602, 653, or 655

.22 Factory Mutual Class 7440 – fusible links

.23 NFPA 30 - Flammable and Combustible Liquids Code.

.24 NFPA 31 - Installation of Oil-Burning Equipment.

.25 ULC/ORD –C842 Guide for the Investigation of Valves for Flammable and Combustible Liquids.

.26 ULC/ORD –C536 Flexible Metallic Hose

.27 UL 80 - Steel Tanks for Oil-Burner Fuel.

.28 UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids.

.29 UL 1316 - Glass Fibre Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol Gasline Mixtures.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

.3 Shop Drawings: Indicate tanks, system layout, pipe sizes, location, and elevations. For fuel oil tanks, indicate dimensions and accessories including manholes and hold down straps.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Certificates: Certify that tanks/pumps/valves meet or exceed specified requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Closeout submittals.

.2 Project Record Documents: Record actual locations of piping system, storage tanks, and system components.

.3 Maintenance Data: Include installation instructions, spare parts lists.

.4 Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 Welding Materials and Procedures: Conform to ASME Code.

.2 Welders Certification: To ASME SEC IX and CSA.

.3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.4 Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

.5 Valves: Manufacturer's name and pressure rating marked on valve body.

.6 Piping, flanges, unions, couplings: Manufacturer's name and pressure rating marked on body.

1.8 REGULATORY REQUIREMENTS

.1 Conform to CSA B139.1-15 and CSA B139.2-15 for installation of fuel oil system.

.2 Provide certificate of compliance from authority having jurisdiction indicating approval of installation of fuel oil system.

.3 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

1.10 WARRANTY

.1 Section 01 78 10.

.2 Provide thirty-year manufacturer warranty for oil tank against defects and corrosion.

1.11 EXTRA MATERIALS

.1 Section 01 78 10.

.2 Provide two repacking kits for each size valve.

.3 Provide two oil filters for each boiler or furnace.

.4 Provide dipstick and water finding paste.

.5 Provide spill kit for each tank.

Part 2 Products

2.1 ABOVE GROUND PIPING

.1 Copper Tubing: ASTM B88M, Type K,L,M, hard drawn.

.1 Fittings: ASME B16.18, cast copper alloy or ASTM B16.22 wrought copper and bronze.

.2 Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

.2 Copper Tubing: ASTM B88M, Type K,L, annealed.

.1 Fittings: ASME B16.26, cast bronze.

.2 Joints: Flared.

.3 Steel Pipe: ASTM A53 or ASME B36.10, Schedule 40 black.

.1 Fittings: ASTM B16.3, malleable iron, or ASTM A234/A234M, wrought carbon steel and alloy steel welding type.

.2 Joints: NFPA 30, threaded or welded to ASME 16.3 or ASME 16.39.

.4 No compression fittings. No union requiring packing or gaskets. No right and left couplings. No solder or braze materials with a MP<538C.

.5 Pipe jointing compound – CAN/ULC-S642. Suitable for fuel oil.

2.2 PIPE HANGERS AND SUPPORTS

.1 Hangers for Pipe Sizes 15 to 40 mm, Carbon steel, adjustable swivel, split ring.

.2 Hangers for Pipe Sizes 50 mm and Over: Carbon steel, adjustable, clevis.

.3 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.4 Wall Support for Pipe Sizes to 80 mm: Cast iron hook.

.5 Vertical Support: Steel riser clamp.

.6 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.7 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.3 FLANGES, UNIONS, AND COUPLINGS

.1 Pipe Size 50 mm and Under:

.1 Ferrous pipe: 1034 kPa (150 psi) malleable iron threaded unions.

.2 Copper tube: 1034 kPa (150 psi) bronze unions with brazed joints. No solder or braze materials with a MP<538C.

.2 Pipe jointing compound – CAN/ULC-S642. Suitable for fuel oil.

2.4 BALL VALVES (BV-1)

.1 Manufacturer: Kitz 68A

.2 Other acceptable manufacturers offering equivalent products:

.1 Morrison Bros.

.2 Toyo

.3 Substitutions: [Refer to Section 01 62 00.]

.3 Class 600 WOG, bronze, full bore, forged brass ball, brass gland and PTFE Teflon seats, steel lever handle, solder or threaded ends.

.4 Exterior valves suitable for cold temperatures to -40C (-40F).

.5 Conforms to ULC/ORD-C482.

2.5 CHECK VALVES (CV-1)

.1 Manufacturer: Beckett Model 12430, 12440

.2 Other acceptable manufacturers offering equivalent products:

.1 Morrison Bros.

.2 Kitz Fig 22

.3 Substitutions: [Refer to Section 01 62 00.]

.3 MSS SP-80, Class 125, bronze body and cap, bronze swing disc, threaded ends.

2.6 FLEXIBLE CONNECTORS (FC-1)

.1 Manufacturer: OPW Model Stainless Steel Flex Connectors.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: [Refer to Section 01 62 00.]

.3 Bronze inner hose and braided exterior sleeve, suitable for temp rating -40F to 105F. Max operating pressure 1375kPa (200 psi) CWP.

.4 ULC/ORD C536 Flexible Metallic Hose.

2.7 DEAERATOR (DA-1)

.1 Manufacturer: Westwood Products: Tigerloop Ultra with screw-on oil filter

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Temp rating -7C to 40C (20F-105F). Max operating pressure 55 kPa (8psi). Max nozzle capacity 75.8 L/min (20GPH).

2.8 FUSIBLE LINKS (FL-1)

.1 Manufacturer: Firomatic.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Max temp rating 74C (165F).

.4 ULC 842 listed.

2.9 TANK WHISTLE (TW-1)

.1 Manufacturer: Beckett.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: [Refer to Section 01 62 00.]

.3 Lockable, with screen on vent cover.

2.10 SPILL KITS (SK-1)

.1 Manufacturer:. SPC Oil Only Spill Kits (Economy and 55Gal drum)

.2 Other acceptable manufacturers offering equivalent products:

.1 Enpac

.2 Substitutions: [Refer to Section 01 62 00.]

.3 Residences: 5Gal capacity

.4 Detachments: 20Gal capacity.

2.11 VENT CAPS (VC-1)

.1 Manufacturer: Beckett. Model: Zinc-plated mushroom vent cap.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: [Refer to Section 01 62 00.]

.3 Zinc plated cast iron, with screen.

2.12 FILL CAP WITH SPILL CONTAINER (C-1)

.1 Manufacturer: Morrison Bros Model 517 Series 3.5 Gallon AST Spill container

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: [Refer to Section 01 62 00.]

.3 3.5 Gal capacity, hinged lockable cover.

.4 Meets CAN-ULC-S663-11.

2.13 LEVELOMETER (LI-1)

.1 Manufacturer: K TECH LEVELOMETER Model Midget Model 277 Pneumatic Indicator

.2 Other acceptable manufacturers offering equivalent products:

.1 King Tank Gauges.

.2 Rocket Wireless Gauge.

.3 Substitutions: [Refer to Section 01 62 00.]

.3 ULC/ORD-C180-97 listed.

2.14 OIL FILTER

.1 Manufacturer: Canadian General Filters

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: [Refer to Section 01 62 00.]

.3 Suitable for oil burner.

2.15 WARM-UP PIPE (WP-1,2)

.1 Shop manufactured. See sketch SK-1 and SK-2 in Appendix A.

.2 WP-1: Schedule 40 pipe, 250mm (10") dia., 600mm (24") long, 31L.

.3 WP-2: Schedule 40 pipe, 100mm (4") dia., 600mm (24") long, 5L.

.4 With 25mm (1") drain valve and air bleed valve. (BV-1)

2.16 ABOVEGROUND FUEL STORAGE TANKS (T-1)

.1 Manufacturer: Vilco D252.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Tank: CAN/ ULC-S670, double wall, fibreglass, oval with integral molded support feet, tappings for accessories, threaded connections.

.4 Capacity: 1136 L. (250 gallons).

2.17 INDOOR DOUBLE-WALL STORAGE TANKS (T-2)

.1 Manufacturer: Steelcraft.

.2 Other acceptable manufacturers offering equivalent products:

.1 DTE Industries
.2 Clemmersteel
.3 Roth
.4 Regal Tanks
.5 Substitutions: [Refer to Section 01 62 00.].

.3 Tank: CAN/ ULC-S602, double wall steel construction, tappings for accessories, threaded connections. Vacuum monitored, or contained type designed to contain at least 100% of tank volume with monitoring (as per CSA B139.1.1-15 Section 6.2). Sizes as per schedule.

2.18 FUEL OIL PUMPS

.1 Manufacturer: Viking Model FH-432X.

.2 Other acceptable manufacturers offering equivalent products:

.1 Substitutions: Not permitted.

.3 Casing: Bronze, rated for 860 kPa (125 psi) working pressure with integral pressure relief valve.

.4 Impeller: Bronze gears, positive displacement.

.5 Drive: Direct connected with flexible coupling.

.6 Accessories: Adjustable pressure control valve, bleed valve, mechanical seal.

.7 ULC listed for fuel oil.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 10 13: Verification of existing conditions before starting work.

.2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

.1 Ream pipe and tube ends. Remove burrs.

.2 Remove scale and dirt, on inside and outside, before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

.1 Install to manufacturer's instructions, stamped drawings, and CSA B139.2-15.

.2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.

.3 Install piping using fittings manufactured to ANSI standards. Provide threaded fittings, except use welded fittings where piping is concelad.

.4 Route piping in orderly manner and maintain gradient.

.5 Install piping to conserve building space and not interfere with use of space.

.6 Group piping whenever practical at common elevations.

.7 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

.8 Provide clearance for installation of insulation and access to valves and fittings.

.9 Provide access where valves and fittings are not exposed. [Coordinate size and location of access doors with Section 08 31 13.]

.10 Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.

.11 Where pipe travels through buildings walls, use pipe sleeves or wrap pipe with two layers or pipe wrap.

.12 Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 09 91 10.

.13 Identify piping systems including underground piping. refer to Section 23 05 53.

.14 Install valves with stems upright or horizontal, not inverted.

.15 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

.16 Test system in accordance with CSA B139.2-15 Section 11.3 and authority having jurisdiction. Isolate tank from piping during tests. Clean strainers and filters after testing and provide new filter upon handover.

3.4 FUEL TANK INSTALLATION

.1 Install tanks and associated piping to manufacturer's instructions, stamped drawings, and CSA B139.2-15.

.2 Test tank as per manufacturer’s instructions. Upon delivery, perform pneumatic testing as per manufacturer’s instructions.

.3 Mount aboveground tanks on foundation or stands as indicated on drawings.

.4 Clean and flush day tank/warming tank prior to delivery to site. Seal until pipe connections are made.

.5 Fill tanks at project turn-over with appropriate fuel. Do not transfer oil from old tank to new tank. At first fill, perform hydrostatic test of tank as per CSA B139.2-15 section 6.9.

.6 Ensure level gauges have leak-proof and vapour-proof connections. Calibrate level gauges.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Pipe and pipe fittings for:

- .1 Heating water piping system.
- .2 Glycol water piping system.

.2 Valves:

- .1 Gate valves.
- .2 Globe or angle valves.
- .3 Ball valves.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 08 31 13 - Access Doors And Frames.

.5 Section 09 91 10 - Painting.

.6 Section 23 05 16 - Piping Expansion Compensation.

.7 Section 23 05 53 - Mechanical Identification.

.8 Section 23 05 48 - Vibration Isolation.

.9 Section 23 07 19 - Piping Insulation.

.10 Section 23 05 20 - Hydronic Specialties.

.11 Section 23 25 00 - Chemical Treatment For Piping: for Piping.

.12 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ASME -Welding and Brazing Qualifications.

.2 ASME B16.3 - Malleable Iron Threaded Fittings Class 50 and 300.

.3 ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

.4 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.5 ASME B31.5 - Refrigeration Piping and Heat Transfer Components.

.6 ASME B31.9 - Building Services Piping.

.7 ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.8 ASTM A234/A234M - Piping Fittings of Wrought-Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.9 ASTM B32 - Solder Metal.

.10 ASTM B88 - Seamless Copper Water Tube.

.11 ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

.12 ASTM D2235 - Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.13 ASTM D2241 - Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).

.14 ASTM D2310 - Machine-Made Fibreglass' (Glass Fibre-Reinforced Thermosetting Resin) Pipe.

.15 ASTM D2466 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

.16 ASTM D2467 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

.17 ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping.

.18 ASTM D2683 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

.19 ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

.20 ASTM D2855 - Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

.21 ASTM D3309 - Polybutylene (PB) Plastic Hot-and Cold-Water Distribution Systems.

.22 ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

.23 ASTM F708 - Design and Installation of Rigid Pipe Hangers.

.24 ASTM F876 - Crosslinked Polyethylene (PEX) Tubing.

.25 ASTM F877 - Crosslinked Polyethylene (PEX) Plastic Hot - and Cold - Water Distribution Systems.

.26 AWS A5.8 - Filler Metals for Brazing and Braze Welding.

.27 AWS D1.1 - Structural Welding Code - Steel.

.28 AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

.29 AWWA C110 - Ductile - Iron and Grey -Iron Fittings 3 inch - 48 inch (76 mm - 1219 mm), for Water and Other Liquids.

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

.31 AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water.

.32 MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

.33 MSS SP69 - Pipe Hangers and Supports - Selection and Application.

.34 MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.4 SYSTEM DESCRIPTION

.1 Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

.2 Use grooved mechanical couplings and fasteners in accessible locations.

.3 Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

.4 Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

.5 Provide pipe hangers and supports to ASTM B31.9 MSS SP69 unless indicated otherwise.

.6 Use gate ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

.7 Use globe ball or butterfly valves for throttling, bypass, or manual flow control services.

.8 Use spring loaded check valves on discharge of condenser water _____ pumps.

.9 Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

.10 Use butterfly valves in heating water systems in chilled and condenser water systems in heating, chilled and condenser water systems interchangeably with gate and globe valves.

.11 Use only butterfly valves in chilled and condenser water systems for throttling and isolation service.

.12 Use lug end butterfly valves to isolate equipment.

.13 Use 3/4 inch (20 mm) gate ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.5 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

.3 Welders Certificate: Include welders certification of compliance with ASME SEC 9. AWS D1.1.

.4 Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.6 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of valves. _____.

1.7 OPERATION AND MAINTENANCE DATA

.1 Submit to Section 01 78 10.

.2 Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three _____ years documented experience.

.2 Installer: Company specializing in performing the work of this section with minimum _____ years documented experience.

.3 Welders: Certify to ASME SEC 9. AWS D1.1. _____.

1.9 REGULATORY REQUIREMENTS

.1 Conform to ASME B31.9 code for installation of piping system.

.2 Welding Materials and Procedures: Conform to ASME SEC 9 and applicable provincial labour regulations.

.3 Provide certificate of compliance from authority having jurisdiction _____ indicating approval of welders.

1.10 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept valves on site in shipping containers with labeling in place. Inspect for damage.

.3 Provide temporary protective coating on cast iron and steel valves.

.4 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.11 ENVIRONMENTAL REQUIREMENTS

.1 Do not install underground piping when bedding is wet or frozen.

1.12 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide two ____ repacking kits for each size and valve type.

Part 2 Products

2.1 HEATING WATER AND GLYCOL PIPING, ABOVE GROUND

.1 Steel Pipe: ASTM A53, Schedule 40, 10 mm wall for sizes 300 mm and over, black.

- .1 Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
- .2 Joints: Threaded, or AWS D1.1,welded.

.2 Copper Tubing: ASTM B88, Type M and DWV, M, L, hard drawn.

- .1 Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
- .2 Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
- .3 Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 220 to 280 degrees C. Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 640 - 805 degrees C.

2.2 RADIANT HEATING PIPING

.1 Copper Tubing: ASTM B88, Type K, L, annealed.

- .1 Fittings: ASME B16.22, wrought copper.
- .2 Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 220 to 280 degrees C. Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 640 - 805 degrees C.

.2 Polybutylene Pipe: ASTM 3309, 690 kPa at 82 degrees C and 1380 kPa at 23 degrees C, grey black colour.

.1 Fittings: ASTM F845 PB, or brass or copper.

.2 Joints: Mechanical compression fittings or insert fittings with copper compression rings.

.3 Polyethylene Pipe: ASTM F876 and ASTM F877, cross-linked polyethylene, 690 kPa operating pressure at 82 degrees C.

.1 Fittings: Brass and copper.

.2 Joints: Mechanical compression fittings.

.4 Composite Polyethylene Pipe: Aluminum tube laminated between two layers of high density cross-linked polyethylene, 1034 861 ____ kPa operating pressure at maximum 60 82 _____ degrees C.

.1 Fittings: Brass flared compression.

.2 Joints: Fittings adapt to copper tubing or copper tube fittings, threaded pipe and fittings, and copper compression fittings.

.5 Hose: Composite hose with nitrile liner, braided fibre reinforcing, neoprene cover, 1034 kPa operating pressure at 96 degrees C.

.1 Fittings: Copper.

.2 Joints: Nipple with stainless steel clamp.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

.1 Steel Pipe: ASTM A53, Schedule 40 galvanized.

.1 Fittings: Galvanized cast iron, or ASTM B16.3 malleable iron.

.2 Joints: Threaded, or grooved mechanical couplings.

.2 Copper Tubing: ASTM B88, Type M and DWV, M, L, hard drawn.

.1 Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.

.2 Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 220 to 280 degrees C.

.3 PVC Pipe: ASTM D1785, Schedule 40, and Schedule 80 for sizes 200 mm and larger, or ASTM D2241, SDR 21 or 26.

.1 Fittings: ASTM D2466 or D2467, PVC.

.2 Joints: ASTM D2855, solvent weld.

.4 ABS Pipe: ASTM D2680 or D2751.

.1 Fittings: ASTM D2751.

.2 Joints: ASTM D2235, solvent weld.

2.4 PIPE HANGERS AND SUPPORTS

.1 Conform to ASME B31.9 ASTM F708 MSS SP58 MSS SP69 MSS SP89.

.2 Hangers for Pipe Sizes 13 to 38 mm: Malleable iron Carbon steel, adjustable swivel, split ring.

.3 Hangers for Cold Pipe Sizes 50 mm and Over: Carbon steel, adjustable, clevis.

.4 Hangers for Hot Pipe Sizes 50 to 100 mm: Carbon steel, adjustable, clevis.

.5 Hangers for Hot Pipe Sizes 150 mm and Over: Adjustable steel yoke, cast iron roll, double hanger.

.6 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.7 Multiple or Trapeze Hangers for Hot Pipe Sizes 150 mm and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

.8 Wall Support for Pipe Sizes to 76 mm: Cast iron hook.

.9 Wall Support for Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp.

.10 Wall Support for Hot Pipe Sizes 150 mm and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

.11 Vertical Support: Steel riser clamp.

.12 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.13 Floor Support for Hot Pipe Sizes to 100 mm: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.14 Floor Support for Hot Pipe Sizes 150 mm and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

.15 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.16 Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

.17 Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 UNIONS, FLANGES, AND COUPLINGS

.1 Unions for Pipe 50 mm and Under:

.1 Ferrous Piping: 1034 kPa malleable iron, threaded.

.2 Copper Pipe: Bronze, soldered joints.

.2 Flanges for Pipe Over 50 mm:

.1 Ferrous Piping: 1034 kPa forged steel, slip-on.

.2 Copper Piping: Bronze.

.3 Gaskets: 1.6 mm thick preformed neoprene.

.3 Grooved and Shouldered Pipe End Couplings:

.1 Housing Clamps: Malleable iron galvanized to engage and lock, designed to permit some angular deflection, contraction, and expansion.

.2 Sealing Gasket: C-shape elastomer composition for operating temperature range from -34 ____ degrees C to 110 _____ degrees C.

.3 Accessories: Steel bolts, nuts, and washers.

.4 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.6 GATE VALVES

.1 Up To and Including 50 mm:

.1 Manufacturers:

.1 _____ Model _____.

.2 _____ Model _____.

.3 _____ Model _____.

.4 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Bronze body, bronze trim, screwed union bonnet, non-rising rising stem, lockshield stem handwheel, inside screw with backseating stem, solid split wedge disc, alloy seat rings, solder or threaded ends.

.2 Over 50 mm:

.1 Manufacturers:

.1 _____ Model _____.

.2 _____ Model _____.

.3 _____ Model _____.

.4 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Iron body, bronze trim, bolted bonnet, rising non-rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends.

2.7 GLOBE OR ANGLE VALVES

.1 Up To and Including 50 mm:

.1 Manufacturers:

.1 _____ Model _____.

.2 _____ Model _____.

.3 _____ Model _____.

.4 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Bronze body, bronze trim, screwed union bonnet, rising stem and handwheel lockshield, inside screw with backseating stem, renewable composition disc and

bronze seat renewable plug disc and stainless steel seat ring, solder or threaded ends.

.2 Over 50 mm:

.1 Manufacturers:

.1 _____ Model _____.

.2 _____ Model _____.

.3 _____ Model _____.

.4 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.8 BALL VALVES

.1 Up To and Including 50 mm:

.1 Manufacturers:

.1 _____ Model _____.

.2 _____ Model _____.

.3 _____ Model _____.

.4 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Bronze Stainless steel one two piece body, chrome plated brass stainless steel ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends with union.

.2 Over 50 mm:

.1 Manufacturers:

.1 _____ Model _____.

.2 _____ Model _____.

.3 _____ Model _____.

.4 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 250 mm and over, flanged.

Part 3 Execution

3.1 PREPARATION

.1 Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

.2 Remove scale and dirt on inside and outside before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

.4 Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

.5 After completion, fill, clean, and treat systems. Refer to Section 23 25 00.

3.2 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Install heating water, glycol, chilled water, condenser water, and engine exhaust piping to ASME B31.9. Install chilled water piping to ASME B31.5.

.3 Route piping in orderly manner, parallel to building structure, and maintain gradient.

.4 Install piping to conserve building space, and not interfere with use of space.

.5 Group piping whenever practical at common elevations.

.6 Sleeve pipe passing through partitions, walls and floors.

.7 Slope piping and arrange to drain at low points.

.8 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

.9 Inserts:

- .1 Provide inserts for placement in concrete formwork.
- .2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- .3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100 mm.
- .4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- .5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

.10 Pipe Hangers and Supports:

- .1 Install to ASTM B31.9 ASTM F708 and MSS SP89.
- .2 Support horizontal piping as scheduled.
- .3 Install hangers to provide minimum 13 mm space between finished covering and adjacent work.
- .4 Place hangers within 300 mm of each horizontal elbow.
- .5 Use hangers with 38 mm minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- .6 Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
- .7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- .8 Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.
- .9 Prime coat exposed steel hangers and supports. Refer to Section 09 91 10. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

.11 Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.

.12 Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 13.

.13 Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

.14 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

.15 Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 09 91 10.

.16 Install valves with stems upright or horizontal, not inverted.

3.3 SCHEDULES

.1 Hanger Rod:

	PIPE SIZE mm	**MAX. HANGER SPACING m**	**DIAMETER mm**
	12 to 32	2	9
	38 to 50	3	9
	62 to 75	3	13
	100 to 150	3	15
	200 to 300	4.25	22
	350 and Over	6	25
	PVC (All Sizes)	1.8	9

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Metal duct work.

.2 Casing and plenums.

.3 Duct cleaning.

1.2 RELATED SECTIONS

.1 Section 01 10 00 - Summary of Work: Owner provided kitchen range hoods.

.2 Section 01 33 00 - Administrative Requirements.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 Section 03 30 00 - Cast-in-place Concrete.

.6 Section 09 91 10 - Painting: Weld priming, weather resistant, paint or coating.

.7 Section 11 40 00 - Food Service Equipment: Supply of kitchen range hoods for placement by this Section.

.8 Section 23 05 29 - Supports And Anchors: Sleeves.

.9 Section 23 07 13 - Duct Insulation: External insulation and duct liner.

.10 Section 23 33 00 - Duct Work Accessories.

.11 Section 23 36 00 - Air Terminal Units.

.12 Section 23 37 00 - Air Outlets And Inlets.

.13 Section 23 05 93 - Testing, Adjusting, And Balancing.

1.3 REFERENCES

.1 ASTM A36/A36M - Carbon Structural Steel.

.2 ASTM A90/A90M - Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.3 ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.4 ASTM A480/A480M - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.5 ASTM A568/A568M - General Requirements for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

.6 ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.7 ASTM A1008/A1008M - Steel, Sheet, Cold-Rolled Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.

.8 ASTM A1011/A1011M - Standard Specification for Steel, Sheet, and Strip Hot-Rolled, Carbon, Structural, High-Strength, Low-Alloy with Improved Formability.

.9 ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

.10 ASTM C14/C14M - Concrete Sewer, Storm Drain, and Culvert Pipe.

.11 ASTM C443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

.12 AWS D9.1 - Sheet Metal Welding Code.

.13 NBS PS 15 - Voluntary Product Standard for Custom Contact-Moulded Reinforced-Polyestor Chemical Resistant Process Equipment.

.14 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

.15 NFPA 90B - Installation of Warm Air Heating and Air-Conditioning Systems.

.16 NFPA 91 - Exhaust Systems for Air Conveying of Vapours, Gases, Mists, and Noncombustible Particulate Solids.

.17 NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations.

.18 SMACNA - HVAC Air Duct Leakage Test Manual.

.19 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.20 SMACNA - Fibrous Glass Duct Construction Standards.

.21 UL 181 - Factory-Made Air Ducts and Connectors.

1.4 PERFORMANCE REQUIREMENTS

.1 No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts to ASHRAE table of equivalent rectangular and round ducts.

1.5 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for 1000 kPa pressure class and higher glass fibre duct systems.

.3 Product Data: Provide data for duct materials duct liner duct connectors .

1.6 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.7 QUALITY ASSURANCE

.1 Perform Work to SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.2 Maintain one copy of document on site.

1.8 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Installer: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.9 REGULATORY REQUIREMENTS

.1 Construct duct work to NFPA 90B standards.

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

.2 Maintain temperatures during and after installation of duct sealants.

Part 2 Products

2.1 MATERIALS

.1 Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G90 zinc coating of to ASTM A90.

.2 Fasteners: Rivets, bolts, or sheet metal screws.

.3 Sealant:

.1 Manufacturers:

.1 Duro Dyne S-2.

.2 Foster

.3 Substitutions: Refer to Section 01 62 00. Not permitted.

.2 Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

.4 Hanger Rod: ASTM A36; steel , galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCT WORK FABRICATION

.1 Fabricate and support to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

.2 Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centreline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fibre insulation.

.3 Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

.4 Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.3 MANUFACTURED DUCT WORK AND FITTINGS

.1 Manufacture to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

2.4 CASINGS

.1 Fabricate casings to SMACNA HVAC Duct Construction Standards - Metal and Flexible and construct for operating pressures indicated.

.2 Mount floor mounted casings on 100 mm high concrete curbs. At floor, rivet panels on 200 mm centres to angles. Where floors are acoustically insulated, provide liner of 1.20 mm galvanized expanded metal mesh supported at 300 mm centres, turned up 300 mm at sides with sheet metal shields.

.3 Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 150 X 150 mm size.

.4 Fabricate acoustic casings with reinforcing turned inward. Provide 1.50 mm back facing and 0.80 mm perforated front facing with 2.4 mm diameter holes on 4 mm centres. Construct panels 75 mm thick packed with 72 kg/cu m minimum glass fibre media, on inverted channels of 1.50 mm.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Install and seal ducts to SMACNA HVAC Duct Construction Standards - Metal and Flexible.

.3 Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

.4 Provide openings in duct work where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated duct work, install insulation material inside a metal ring.

.5 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

.6 Use crimp joints with or without bead for joining round duct sizes 200 mm and smaller with crimp in direction of air flow.

.7 Use double nuts and lock washers on threaded rod supports.

.8 Connect diffusers or light troffer boots to low pressure ducts directly or with 1.5 m maximum length of flexible duct held in place with strap or clamp.

.9 Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

.10 Set plenum doors 150 to 300 mm above floor. Arrange door swings so that fan static pressure holds door in closed position.

.11 During construction provide temporary closures of metal or taped polyethylene on open duct work to prevent construction dust from entering duct work system.

3.2 CLEANING

.1 Clean work to 01 78 10.

.2 Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

.3 Clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into duct work for cleaning purposes.

3.3 SCHEDULES

3.4 DUCT WORK MATERIAL SCHEDULE

	AIR SYSTEM	MATERIAL

	AIR SYSTEM	**MATERIAL**
	Low Pressure Supply (Heating Systems)	Steel
	Low Pressure Supply (System with Cooling Coils)	Steel
	Return and Relief	Steel,
	General Exhaust	Steel
	Outside Air Intake	Steel
	Evaporative Condenser Intake and Exhaust	Steel

3.5 DUCT WORK PRESSURE CLASS SCHEDULE

	AIR SYSTEM	**PRESSURE CLASS**
	Supply (Heating Systems)	125 Pa 250 Pa
	Supply (System with Cooling Coils)	125 Pa 250 Pa 500 Pa
	Return and Relief	125 Pa 250 Pa
	General Exhaust	125 Pa 250 Pa
	Outside Air Intake	125 Pa 250 Pa 500 Pa
	Evaporative Condenser	125 Pa
	Intake and Exhaust	250 Pa 500 Pa

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Duct access doors.

.2 Duct test holes.

.3 Flexible duct connections.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 48 - Vibration Isolation.

.5 Section 23 31 00 - Duct Work.

.6 Section 23 36 00 - Air Terminal Units: Pressure regulating damper assemblies.

.7 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

.2 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers duct access doors and duct test holes.

.3 Product Data: Provide for shop fabricated assemblies including volume control dampers duct access doors duct test holes and hardware used. Include electrical characteristics and connection requirements.

.4 Manufacturer's Installation Instructions: Indicate for fire dampers and combination fire and smoke dampers.

1.5 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of access doors and test holes.

1.6 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect dampers from damage to operating linkages and blades.

1.9 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide two of each size and type of fusible link.

Part 2 Products

2.1 DUCT ACCESS DOORS

.1 Manufacturers:

.1 Naylor

.2 Substitutions: Refer to Section 01 62 00.

.2 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

.3 Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated duct work, install minimum 25 mm thick insulation with sheet metal cover.

.1 Less Than 300 mm Square: Secure with sash locks.

.2 Up to 450 mm Square: Provide two hinges and two sash locks.

.3 Up to 600 x 1200 mm: Three hinges and two compression latches.

.4 Larger Sizes: Provide an additional hinge.

.4 Access doors with sheet metal screw fasteners are not acceptable.

2.2 DUCT TEST HOLES

.1 Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.3 FLEXIBLE DUCT CONNECTIONS

.1 Manufacturers:

.1 Flexmaster

.2 Substitutions: Refer to Section 01 62 00.

.2 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

.3 Connector: Fabric crimped into metal edging strip.

.1 Fabric: UL listed fire-retardant neoprene coated woven glass fibre fabric to NFPA 90A, minimum density 1.0 kg/sq m.

.2 Net Fabric Width: Approximately 50mm wide.

.3 Metal: 75 mm wide, 0.6 mm thick galvanized steel.

Part 3 Execution

3.1 PREPARATION

.1 Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

3.3 INSTALLATION

.1 Install accessories to manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

.2 Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 200 x 200 mm size for hand access, 450 x 450 mm size for shoulder access, and as indicated. Provide 100 x 100 mm for balancing dampers only. Review locations prior to fabrication.

.3 Provide duct test holes where indicated and required for testing and balancing purposes.

.4 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment , and supported by vibration isolators. Refer to Section 23 05 48. For fans developing static pressures of 1250 Pa and over, cover connections with leaded vinyl sheet, held in place with metal straps.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Registers/grilles.

.2 Goosenecks.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 .

1.3 REFERENCES

.1 ADC 1062 - Air Distribution and Control Device Test Code.

.2 AMCA 500 - Method of Testing Louvres for Ratings.

.3 AMCA 5000 - Method of Testing Dampers for Ratings.

.4 ARI 650 - Air Outlets and Inlets.

.5 ASHRAE 70 - Method of Testing for Rating the Performance of Outlets and Inlets.

.6 SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

.7 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

.3 Samples: Submit one _____ of each required air outlet and inlet type.

1.5 PROJECT RECORD DOCUMENTS

.1 Section 01 78 10: Submittals for project closeout.

.2 Record actual locations of air outlets and inlets.

1.6 QUALITY ASSURANCE

.1 Test and rate air outlet and inlet performance to ADC Equipment Test Code 1062 and ASHRAE 70.

.2 Test and rate louvre performance to AMCA 500.

1.7 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

Part 2 Products

2.1 GOOSENECKS

.1 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, of minimum 1.20 mm galvanized steel.

.2 Mount on minimum 300 mm high curb base where size exceeds 230 x 230 mm.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

.3 Install diffusers to duct work with air tight connection.

.4 Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

.5 Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 91 10.

3.2 SCHEDULES

.1 See mechanical drawing table

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

.2 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for chimneys and stacks and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Territory of Nunavut, Canada.

.2 Indicate following:

.1 Methods of sealing sections.

.2 Methods of expansion.

.3 Details of thimbles.

.4 Bases/Foundations.

.5 Supports.

.6 Guy details.

.7 Rain caps.

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

1.3 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with CEPA, CEAA, TDGA, applicable Provincial/Territorial regulations.

.2 Certifications:

.1 Catalogued or published ratings: obtained from tests carried out by independent testing agency or manufacturer signifying adherence to codes and standards.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect chimneys and stacks from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CHIMNEY AND BREECHING AND VENT

.1 Provide Type L venting for the boiler. Provide engineered stamped drawings and calculations for the chimney, breeching and venting, for review by the Consultant.

2.2 ACCESSORIES

.1 Hangers and supports: in accordance with recommendations by SMACNA and L-vent manufacturer.

.2 Stainless steel flashing, storm collar, and rain cap. All piping above the roofline to be stainless steel jacketed.

.3 Expansion sleeves with heat resistant caulking, held in place as indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for chimney and stack installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION - GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5 m centres and at each joint.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.

.5 Install flashings on chimneys penetrating roofs, as indicated.

.6 Install rain caps and cleanouts, as indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Fabricated breechings.

.2 Vent dampers.

.3 Manufactured double wall chimneys for fuel fired equipment.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 23 05 13 - Motors: Inducer draft fan motor.

.4 Section 23 07 16 - Equipment Insulation: Breeching insulation.

.5 Section 25 50 01 - Analog Control Equipment. 25 50 02 - Digital Control Equipment.

.6 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

.2 Underwriters' Laboratories of Canada (ULC)

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for chimneys and stacks and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Territory of Nunavut, Canada.

.2 Indicate following:

.1 Methods of sealing sections.

.2 Methods of expansion.

.3 Details of thimbles.

.4 Bases/Foundations.

.5 Supports.

.6 Guy details.

.7 Rain caps.

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

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with CEPA, CEAA, TDGA, applicable Provincial/Territorial regulations.

.2 Certifications:

.1 Catalogued or published ratings: obtained from tests carried out by independent testing agency or manufacturer signifying adherence to codes and standards.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect chimneys and stacks from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CHIMNEY AND BREECHING AND VENT

.1 Provide Type L venting for the boilers, the HWT, and the furnace. Provide shop drawings for the chimney, breeching and venting, for review by the Consultant.

2.2 ACCESSORIES

.1 Hangers and supports: in accordance with recommendations by SMACNA and L-vent manufacturer.

.2 Stainless steel flashing, storm collar, and rain cap. All piping above the roofline to be stainless steel jacketed.

.3 Expansion sleeves with heat resistant caulking, held in place as indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for chimney and stack installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION - GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5 m centres and at each joint.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.

.5 Install flashings on chimneys penetrating roofs, as indicated.

.6 Install rain caps and cleanouts, as indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Boilers.

.2 Controls and boiler trim.

.3 Hot water connections.

.4 Fuel connection.

.5 Collector, draft hood, and chimney connection.

.6 Circulator.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 Section 23 05 20 - Hydronic Specialties.

.6 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ASME SEC 4 - Boiler and Pressure Vessel Codes - Rules for Construction of Heating Boilers.

.2 ASME SEC 8D - Boilers and Pressure Vessel Codes - Rules for Construction of Pressure Vessels.

.3 HI (Hydronics Institute) - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

.4 NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

.5 NFPA 31 - Installation of Oil-Burning Equipment.

.6 NFPA 54 (AGA Z223.1) - National Fuel Gas Code.

.7 NFPA 58 - Liquified Petroleum Gas Code.

.8 UL 726 - Oil-Fired Boiler Assemblies.

.9 UL - Gas and Oil Equipment Directory.

.10 CAN/CSA-B139, Installation Code for Oil Burning Equipment

.11 CAN/CSA-B140.0, General Requirements for Oil-burning Equipment

.12 CSA C22.1 Canadian Electrical Code

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide data indicating general layout, dimensions, and size and location of water, gas, and vent connections, and electrical characteristics and connection requirements.

.3 Section 01 33 00: Submittals for information.

.4 Submit manufacturer's installation instructions.

.5 Manufacturer's Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

.6 Section 01 78 10: Submittals for project closeout.

.7 Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.5 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

.1 Conform to applicable code for internal wiring of factory wired equipment.

.2 Conform to ASME SEC 4 and SEC 8D for boiler construction.

.3 Units: CSA labeled.

.4 Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Canada Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

1.8 WARRANTY

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide a ten year warranty for cast iron boiler sections.

Part 2 Products

2.1 MANUFACTURERS

.1 Weil MacLean Model Ultra Oil High Efficiency boiler UO-4E.

.2 Substitutions: Refer to Section 01 62 00.

2.2 MANUFACTURED UNITS

.1 Hot Water Boilers: Suitable for natural draft with insulated jacket, sectional cast iron heat exchanger, fuel oil burning system, refractory, controls, and boiler trim including circulator and fill system consisting of diaphragm type expansion tank, fill and check valve, and automatic air vent.

.2 Electrical Characteristics:

.1 115 volts, single phase, 60 Hz.

.2 Refer to Section 26 05 80.

2.3 HOT WATER BOILER TRIM

.1 ASME rated pressure relief valve, 200 kPa 30 psig.

.2 Combination water pressure and temperature gauge.

.3 Low water cut-off to prevent burner operation when boiler water falls below safe level.

.4 Electronic operating temperature controller:

.1 NEMA 250 Type 1 enclosure with full cover for wall mounting.

.2 Ambient temperature range - -34 to 66 degrees C.

.3 Adjustable reset ratio of outside air temperature change to discharge control point change 1:2 to 100:1.

.4 Integral set point adjustment 27 to 110 degrees C.

.5 Electronic primary and outdoor sensors.

.6 Suitable for on-off switching of pilot duty single throw double pole relays.

.5 High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature.

.6 Boiler air vent.

2.4 FUEL BURNING SYSTEM

.1 Burner Operation: Modulating with low fire position for ignition.

.2 Oil Burner: High pressure atomizing type for No. 2 fuel oil with combustion air blower, fuel pump, hinged flame inspection port, cadmium sulphide flame sensor, electrodes, ignition transformer, and oil nozzle.

.3 Oil Burner Safety Controls: Energize burner motor and electric ignition, limit time for establishment of main flame, monitor flame continuously during burner operation and stop burner on flame failure with manual reset necessary, solenoid oil delay valve opens after burner motor energized and closes when de-energized.

.4 Controls: Pre-wired, factory assembled electronic controls in control cabinet with flame scanner or detector, programming control, relays, and switches. Provide pre-purge and post-purge ignition and shut-down of burner in event of ignition pilot and main flame failure with manual reset.

2.5 PERFORMANCE

.1 Performance rating to be to HI - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

.2 Rating: See Schedule

2.6 AUXILIARY EQUIPMENT

2.7 CIRCULATOR, P1a, P1b, P1c, P1d

.1 Manufacturers:

.1 Bell & Gossett Model ecocirc XL 20-35.
.2 Other acceptable manufacturers offering equivalent products.
.3 Substitutions: Refer to Section 01 62 00.

.2 Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in line mounting, oil lubricated, for 860 kPa maximum working pressure.

.3 Performance:

.1 Flow capacity: L/sec 17 gal/min.
.2 Head: 15 feet.

.4 Electrical Characteristics:

.1 1/12 hp.
.2 115 volts, single phase, 60 Hz.
.3 1.3 amperes.
.4 Refer to Section 26 05 80.

2.8 CIRCULATOR, P4

.1 Manufacturers:

.1 Bell & Gossett Model ecocirc vario.

.2 Other acceptable manufacturers offering equivalent products.

.3 Substitutions: Refer to Section 01 62 00.

.2 Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in line mounting, oil lubricated, for 860 kPa maximum working pressure.

.3 Performance:

.1 Flow capacity: L/sec 1 gal/min.

.2 Head: 10 feet.

.4 Electrical Characteristics:

.1 60W.

.2 115 volts, single phase, 60 Hz.

.3 1.3 amperes.

.4 Refer to Section 26 05 80.

.5

.5 Zone Controllers

.1 Weil MacLean Zone Valve Controllers.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Install to CSA B139.

.3 Install boiler on concrete housekeeping base, sized minimum 100 mm larger than boiler base. Refer to Section 03 30 00.

.4 Provide connection of fuel oil service to CSA B139.

.5 Provide piping connections and accessories as indicated; refer to Section 23 05 20.

.6 Provide piping connections and accessories as indicated; refer to Section 23 22 26.

.7 Pipe relief valves to nearest floor drain.

.8 Install circulator and diaphragm expansion tank on boiler.

.9 Provide for connection to electrical service. Refer to Section 26 05 80.

3.2 MANUFACTURER'S FIELD SERVICES

.1 Prepare and start systems to Section 01 44 00.

.2 Instruct operating personnel in operation and maintenance of units.

3.3 SCHEDULES

		B-1
	Location	Mechanical Room
	Manufacturer	Weil-MacLain
	Model	UO-4E
	Fuel	Oil
	Input at Sea Level	168 Mbh
	DOE Heating Capacity	148 Mbh
	DOE Seasonal Efficiency (AFUE) Working Pressure	87%
	Auxiliary equipment	Circulators, expansion tanks, zone controllers

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Forced air furnaces.

.2 Controls.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 13 - Motors: Evaporator and condenser fan motors.

.5 Section 23 05 48 - Vibration Isolation.

.6 Section 23 07 13 - Duct Insulation: Duct Liner.

.7 Section 23 40 00 - Air Cleaning Devices.

.8 Section 25 50 01 - Analog Control Equipment: 25 50 02 - Digital Control Equipment: Thermostats, humidistats, time clocks.

.9 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.3 REFERENCES

.1 ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

.2 ARI 270 - Sound Rating of Outdoor Unitary Equipment.

.3 ARI 520 - Positive Displacement Condensing Units.

.4 ARI 610 - Central System Humidifiers for Residential Applications.

.5 ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.

.6 ASHRAE 15 - Safety Standard for Refrigeration Systems.

.7 ASHRAE 52 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

.8 ASHRAE 90A - Energy Conservation in New Building Design.

.9 ASHRAE 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers.

.10 NFPA 31 - Installation of Oil-Burning Equipment.

.11 NFPA 54 (AGA Z223.1) - National Fuel Gas Code.

.12 NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

.13 NFPA 90B - Installation of Warm Air Heating and Air-Conditioning Systems.

.14 NFPA 211 - Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances.

.15 UL 207 - Refrigerant-Containing Components and Accessories, Non-electrical.

.16 UL 303 - Refrigeration and Air-Conditioning Condensing and Compressor Units.

.17 UL 727 - Oil-Fired Central Furnaces.

.18 UL 729 - Oil-Fired Floor Furnaces.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

.3 Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Design Data: Indicate refrigerant pipe sizing.

.3 Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Project Record Documents: Record actual locations of components and connections.

.3 Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

.4 Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.8 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.9 WARRANTY

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide five year manufacturers warranty for heat exchangers.

.3 Provide three year manufacturers warranty for solid state ignition modules.

1.10 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Substitutions: Refer to Section 01 62 00. Not permitted.

.3 Provide two of pilot thermocouples, filters for each furnace.

Part 2 Products

2.1 OIL FIRED FURNACES

.1 Manufacturer: Olsen Model WMLV.

.1 Other acceptable manufacturers offering equivalent products.

.2 Substitutions: Refer to Section 01 62 00.

.2 Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.

.1 Air Flow Configuration: Upflow.

.2 Heating: Oil fired, No. 2 oil.

.3 Cabinet: Steel with baked enamel finish, easily removed and secured access doors, glass fibre insulation and reflective liner and welded steel base.

.4 Supply Fan: Centrifugal type rubber mounted with direct or belt drive , adjustable variable pitch motor pulley.

.5 Motor: Refer to Section 23 05 13; 1750 rpm multiple speed.

.6 Combustion Chamber: welded stainless steel with precast refractory and aluminum fin stainless steel tube coil.

.7 Oil Burner: High pressure atomizing type, rubber mounted, adjustable combustion air blower, integrated fuel pump, hinged flame inspection port, cadmium sulphide flame sensor, electrodes, ignition transformer, oil nozzle.

.1 Barometric draft regulator in flue.

.2 Non-corrosive combustion air blower with permanently lubricated motor.

.8 Oil Burner Safety Controls:

.1 Time delay relay limits time for establishment of main flame.

.2 Flame sensor monitors flame continuously during burner operation and stops burner on flame failure with manual reset.

.3 Solenoid operated oil delay valve opens after burner motor is energized and closes instantly when burner motor is de-energized.

.4 Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

.9 Burner Operating Controls

.1 Room Thermostat: Cycles burner to maintain room temperature setting.

.2 Supply Fan Control: Energize from bonnet temperature independent of burner controls, with fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation.

.10 Air Filters: 25 mm thick glass fibre, disposable type arranged for easy replacement.

.11 Performance:

.1 Ratings: Energy Efficiency Rating (EER) not less than requirements of ASHRAE 90A; seasonal efficiency to ASHRAE 103.

.2 Refer to Furnace Schedule.

.3 Air Handling:

.1 Air flow: 1600 cfm.

.2 External static pressure: 0.5 inch wg.

.3 Motor:

.1 ECM variable speed high efficiency.

.4 Heating Capacity:

.1 Heating output: 76,000 Btuh.

.2 Heating input: 1.0 gph No. 2 oil.

.3 Annual fuel utilization efficiency (AFUE): 83 percent.

2.2 THERMOSTATS

.1 Manufacturer: Honeywell Model .

.1 Other acceptable manufacturers offering equivalent products.

.1 Vaisala.

.2 Substitutions: Refer to Section 01 62 00.

.2 Adjustable Room Thermostat: Low voltage, to control burner operation, heater stages in sequence with delay between stages, compressor and condenser fan and supply fan to

maintain temperature setting. Include system selector switch (heat-off-cool) and fan control switch (auto-on).

.3 Electric solid state microcomputer based room thermostat with remote sensor:

.1 Automatic switching from heating to cooling.

.2 Preferential rate control to minimize overshoot and deviation from setpoint.

.3 Set-up for four separate temperatures per day.

.4 Instant override of setpoint for continuous or timed period from one hour to 31 days.

.5 Short cycle protection.

.6 Programming based on weekdays, Saturday and Sunday every day of the week.

.7 Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.

.8 Battery replacement without program loss.

.9 Thermostat display:

.1 Time of day.

.2 Actual room temperature.

.3 Programmed temperature.

.4 Programmed time.

.5 Duration of timed override.

.6 Day of week.

.7 System mode indication: heating, cooling, auto, off, fan auto, fan on.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 10 13: Verification of existing conditions before starting work.

.2 Verify that floors are ready for installation of units and openings are as indicated on shop drawings.

.3 Verify that proper power supply is available for furnace.

.4 Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

.1 Install oil fired furnaces to CSA B139.1.

.2 Mount counterflow furnaces installed on combustible floors on additive base.

3.3 SCHEDULES

	Drawing Code	**FU-1**	**FU-2**	**FU-3**	**FU-4**
	Manufacturer				
	Furnace Model				

	Drawing Code	**FU-1**	**FU-2**	**FU-3**	**FU-4**
	Heating Output				
	Heating Input				
	AFUE				
	Airflow Capacity				
	External Static Pressure				
	Fan Rpm				
	Motor Size				
	Cooling Coil Model				
	Cooling Output				
	Condenser Model				
	Cooling Input				
	Sound Rating Number				

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Heat Recovery Ventilators.

.2 Condensate pump.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

.3 Section 01 78 00 – Closeout Submittals.

.4 Section 23 33 00 – Air Duct Accessories.

.5 Section 23 33 15 – Dampers - Operating.

1.3 REFERENCES

.1 American Bearing Manufacturer's Association (ABMA)

.1 ANSI/ABMA 9 Load Ratings and Fatigue Life for Ball Bearings.

.2 ANSI/ABMA 11 Load Ratings and Fatigue Life for Roller Bearings.

.2 Air Movement and Control Association (AMCA)

.1 AMCA 210, Laboratory Method of Testing Fans for Aerodynamic Performance Rating (ASHRAE).

.2 AMCA 300 Reverberant Room Method for Sound Testing of Fans.

.3 American National Standards Institute/Air-Conditioning and Refrigeration Institute (ANSI/ARI)

.1 ANSI/ARI 430, Central Station Air Handling Units.

.4 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 68, Laboratory Method of Testing to Determine the Sound Power in a Duct.

.2 ASHRAE 84, Method of Testing Air-to-Air Exchangers.

.5 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.181, Ready-Mixed Organic Zinc-Rich Coating.

.6 Canadian Standards Association (CSA)

.1 CSA B52 Mechanical Refrigeration Code.

.7 National Electrical Manufacturer's Association (NEMA)

.1 NEMA MG1 Motors and Generators

.2 NEMA ICS 7-1 Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.

.8 Provincial Boiler, Pressure Vessel and Compressed Gas Regulations.

.9 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate following: fan, fan curves showing point of operation, motor drive, bearings, filters, mixing box, dampers, VAV, coil, include performance data.

1.5 CLOSEOUT SUBMITTALS

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

.2 Include following: fan, bearings, motor, damper, VAV control, air volume, total cooling, sensible cooling, EDB, EWB, OAT.

1.6 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide one spare set of filters.

.3 Provide list of individual manufacturer's recommended spare parts for equipment such as bearings and seals, and addresses of suppliers, together with list of specialized tools necessary for adjusting, repairing or replacing, for placement into operating manual.

.4 Spare filters: in addition to filters installed for startup and commissioning. Immediately prior to acceptance by Owner's Representative, supply 1 complete set of filters for each filter unit or filter bank.

PART 2 PRODUCTS

2.1 HEAT RECOVERY VENTILATORS

.1 Venmar Product Constructo 1.5.

.2 Substitutions: Refer to Section 01 62 00.

2.2 GENERAL

.1 Heat exchanger, cross-flow.

.2 Unit to be self contained with all necessary controls and wiring to facilitate a single point connect. Provide disconnect and vibration isolators.

.3 Non-negative pressure defrost system.

.4 Controls: Provide controllers to mount in mechanical room.

.5 Performance: See Schedule.

2.3 CABINET, FANS AND FILTERS

.1 Casing: galvanized, pre-painted steel with foil faced insulation. Double wall construction.

.2 Provide full size access doors to allow for periodic maintenance and inspection. Door construction, same as unit with compression type handles and resilient gaskets.

.3 Drain pans to be formed sections, recessed, fabricated from 1.2 mm stainless steel 304. Piped to nearest floor drain.

.4 Fans: centrifugal type with double blowers and motors rated for single phase 208 V. Separate Motor for the supply and exhaust fan.

.5 Filers: medium efficiency in the supply and exhaust air streams.

.6 Minimum 55% effectiveness in heating.

2.4 CONDENSATE PUMP

.1 Little Giant condensate pump.

.2 Pump to nearest drain or septic tank.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install units in accordance with manufacturer's instructions and as indicated.

.2 Ensure adequate clearance for servicing and maintenance.

.3 Continuous operation, to be interlocked with air handling unit operation.

3.2 SCHEDULES

.1 HEAT RECOVERY VENTILATORS

	Drawing Code	**HRV-1**	**HRV-1,2**
	Location	V103, V104	Detachment
	Manufacturer	Venmar	Venmar
	Model	Constructo 1.5	Constructo 1.5
		115/1 phase/60Hz	115/1 phase/60Hz
	Airflow Capacity (L/s)	71	71
	External Static Pressure	0.4	0.4
	Accessories	Filter kit, speed control	Filter kit, speed control

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Packaged air handling units.

.2 Heating coils.

.3 Filter sections.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 Section 22 10 00 - Plumbing Piping: Equipment drains.

.6 Section 23 05 13 - Motors.

.7 Section 23 05 16 - Piping Expansion Compensation.

.8 Section 23 05 48 - Vibration Isolation.

.9 Section 23 07 13 - Duct Insulation.

.10 Section 23 31 00 - Duct Work.

.11 Section 23 33 00 - Duct Work Accessories: Flexible duct connections.

.12 Section 23 34 13 - Axial Fans.

.13 Section 23 34 16 - Centrifugal Fans.

.14 Section 23 40 00 - Air Cleaning Devices.

.15 Section 23 82 16 - Air Coils.

.16 Section 23 84 15 - Humidifiers - Steam.

.17 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

.2 AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

.3 AMCA 99 - Standards Handbook.

.4 AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.5 AMCA 300 - Reverberant Room Method for Sound Testing of Fans.

.6 AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

.7 AMCA 500 - Method of Testing Louvres for Ratings.

.8 AMCA 5000 - Method of Testing Dampers for Ratings.

.9 ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

.10 ARI 430 - Fabrication of Central Station Air Handling Units.

.11 ARI 435 - Application of Central-Station Air-Handling Units.

.12 ARI 610 - Central System Humidifiers for Residential Applications.

.13 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.14 UL 900 - Air Filter Units.

1.4 SUBMITTALS

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

.3 Product Data:

.1 Provide literature which indicates dimensions, weights, capacities, ratings, fan performance, gauges and finishes of materials, and electrical characteristics and connection requirements.

.2 Provide data of filter media, filter performance data, filter assembly, and filter frames.

.3 Provide fan curves with specified operating point clearly plotted.

.4 Submit sound power level data for both fan outlet and casing radiation at rated capacity.

.5 Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

.4 Samples: Submit two of each type of replacement filter media with frame.

.5 Manufacturer's Installation Instructions.

1.5 OPERATION AND MAINTENANCE DATA

.1 Section 01 78 10: Submittals for project closeout.

.2 Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.6 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience, who issues complete catalogue data on total product.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

.3 Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.9 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide one set for each unit of fan belts, filters.

Part 2 Products

2.1 MANUFACTURERS

.1 Energy Saving Products Model LV-70 Fan Coil.

.2 Substitutions: Refer to Section 01 62 00.

2.2 GENERAL DESCRIPTION

.1 Configuration: Fabricate with fan and heating coil section.

.2 Fabrication: Conform to AMCA 99.

.3 Performance

.1 Air Flow: 1000 cfm at 0.5 in wg external static pressure.

.2 Motor: 1/4 hp, 115 volt, single phase, 60 Hz.

2.3 ELECTRICAL CHARACTERISTICS AND COMPONENTS

.1 Electrical Characteristics:

.1 115 volts, single phase, 60 Hz.
.2 Refer to Section 26 05 80.

.2 Motor: TEFC Refer to Section 23 05 13.

.3 Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated.

2.4 COILS

.1 Hot Water Heating Coil:

.1 Rows: 6.
.2 Capacity: 90,500Btu/hr.
.3 Entering Air Temperature: 65 degrees F.
.4 Water Flow Rate: 6 gal/min.
.5 Entering Water Temperature: 180 degrees F.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's instructions.

.2 Install to ARI 435.

.3 Isolate air handling unit with flexible duct connections.

.4 Provide filters.

.5 Install assembled unit on vibration isolators. Refer to Section 23 05 48.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Glycol coils.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 20 - Hydronic Specialties.

.5 Section 23 07 19 - Piping Insulation.

.6 Section 23 31 00 - Duct Work: Installation of duct coils.

.7 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 ARI 410 - Forced-Circulation Air-Cooling and Air- Heating Coils.

.2 SMACNA - HVAC Duct Construction Standards, Metal and Flexible.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

.3 Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submittals for information.

.2 Certificates: Certify that coil capacities, pressure drops, and selection procedures meet or exceed specified requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Warranty: Submit manufacturer warranty and ensure forms have been completed in Owners name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.8 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Canada Inc or CSA as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

.3 Protect coils from entry of dirt and debris with pipe caps or plugs.

1.10 WARRANTY

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide five (5) year manufacturer warranty.

Part 2 Products

2.1 GLYCOL HEATING COILS, HC-1,2

.1 Manufacturer: Greenheck

.2 Other acceptable manufacturers offering equivalent products.

.1 Daikin

.2 Substitutions: Refer to Section 01 62 00.

.3 Tubes: 5/8 inch (16 mm) OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, brazed joints.

.4 Fins: Aluminum or copper continuous plate type with full fin collars or individual helical finned tube type wound under tension.

.5 HC-1 To provide 3000W (10kBtuh) heat transfer to 150cfm in HRV fresh air intake duct.

.6 50%/50% glycol/water, maximum 1.5-2.0 GPM, temperature drop across coil 180F to 160F.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturers written instructions.

.2 Install in ducts and casings to SMACNA HVAC Duct Construction Standards, Metal and Flexible.

- .1 Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
- .2 Provide frames for maximum three coil sections.
- .3 Arrange supports to avoid piercing drain pans.
- .4 Provide airtight seal between coil and duct or casing.
- .5 Refer to Section 23 31 00.

.3 Protect coils to prevent damage to fins and flanges. Comb out bent fins.

.4 Install coils level. Install cleanable tube coils with 1:50 pitch.

.5 Make connections to coils with unions and flanges.

.6 Hydronic Coils:

- .1 Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
- .2 Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
- .3 Locate water supply at bottom of supply header and return water connection at top.
- .4 Provide manual air vents at high points complete with stop valve.
- .5 Ensure water coils are drainable and provide drain connection at low points.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Thermostats.

.2 Pressure gauges.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 61 00 - Common Product Requirements.

.3 Section 01 78 10 - Execution Requirements.

.4 Section 23 05 19 - Gages And Meters: Thermometer sockets, gauge taps.

.5 Section 23 05 48 - Vibration Isolation.

.6 Section 23 21 00 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gauge taps.

.7 Section 23 22 00 - Steam And Steam Condensate Piping: Installation of control valves, flow switches, temperature sensor sockets, gauge taps.

.8 Section 23 33 00 - Duct Work Accessories: Installation of automatic dampers.

.9 Section 25 50 01 - Analog Control Equipment.

.10 Section 25 50 02 - Digital Control Equipment.

.11 Section 25 90 00 - Sequence Of Operation.

.12 Section 26 27 26 - Wiring Devices: Elevation of exposed components.

.13 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 AMCA 500 - Test Methods for Louvres, Dampers and Shutters.

.2 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.3 ASTM B32 - Solder Metal.

.4 ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.5 ASTM D1693 - Environmental Stress - Cracking of Ethylene Plastics.

.6 NEMA DC 3 - Residential Controls - Electric Wall-Mounted Room Thermostats.

.7 NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

.3 Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.

.3 Revise shop drawings to reflect actual installation and operating sequences.

.4 Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

.5 Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

.1 Products Requiring Electrical Connection: Listed and classified by CSA as suitable for the purpose specified and indicated.

1.8 WARRANTY

.1 Section 01 78 10: Submittals for project closeout.

.2 Correct defective Work within a five year period after Substantial Completion.

.3 Provide five year manufacturer's warranty.

1.9 MAINTENANCE SERVICE

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide service and maintenance of control system for one year from Date of Substantial Completion.

.3 Provide complete service of controls systems, including call backs. Make minimum of two complete normal inspections of approximately two hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

1.10 EXTRA MATERIALS

.1 Section 01 78 10: Submittals for project closeout.

.2 Provide one of each type of thermostat and exposed sensor.

Part 2 Products

2.1 THERMOSTATS

.1 Electric Room Thermostats:

.1 Manufacturer: Uponor Setpoint 501/501S.

.2 Other acceptable manufacturers offering equivalent products.

.1 Johnson Controls

.2 Vaisala

.3 Wirsbo

.4 Substitutions: Refer to Section 01 62 00.

.3 Type: NEMA DC 3, 24 volts, with setback/setup temperature control.

.4 Service: heating only.

.5 Covers: set point adjustment with thermometer.

2.2 PRESSURE GAUGES

.1 Pressure Gauge for Hydronic system:

.1 Manufacturer: Watts.

.2 Other acceptable manufacturers offering equivalent products.

.1 Vaisala

.2 Schneider

.3 Substitutions: Refer to Section 01 62 00.

.3 Type: Series LFDPG-1 Bottom-Entry Pressure Gauges are used in commercial, residential, and institutional HVAC applications. These gauges feature ABS polymer cases, Kostil Polymer windows, 1/4" NPT connections, and copper alloy Bourdon tube sensing elements. The LFDPG-1 features Lead Free* construction

to comply with Lead Free* installation requirements. Accuracy is ASME, Type B.

.4 Service: heating only.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 78 10: Verification of existing conditions before starting work.

.2 Verify that systems are ready to receive work.

.3 Beginning of installation means installer accepts existing conditions.

.4 Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

.5 Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

.6 Ensure installation components is complementary to installation of similar components.

.7 Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

.1 Install to manufacturer’s instructions.

.2 Check and verify location of thermostats and humidistats and other exposed control sensors with plans and room details before installation. Locate 1 500 mm above floor. Align with lighting switches and humidistats.

.3 Mount freeze protection thermostats using flanges and element holders.

.4 Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

.5 Provide conduit and electrical wiring to Section 26 05 80. Electrical material and installation to appropriate requirements of Division 16.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Sequence of operation:

- .1 Hydronic Control Valve
- .2 Glycol feed tank
- .3 Hot Water Tank
- .4 Heat recovery ventilator
- .5 HRV preheat coil/reheat coil
- .6 Oil-fired forced air Furnace

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Administrative Requirements.

.2 Section 01 44 00 - Quality Assurance.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 78 10 - Execution Requirements.

.5 Section 25 30 00 - Instruments And Control Elements.

.6 Section 25 50 01 - Analog Control Equipment.

.7 Section 25 50 02 - Digital Control Equipment.

.8 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 SYSTEM DESCRIPTION

.1 This section defines the manner and method by which controls function.

.2 Requirements for each type of control system operation are specified.

.3 Equipment, devices, and system components required for control systems are specified in other Sections.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

.2 Shop Drawings: Indicate mechanical system controlled and control system components.

- .1 Label with settings, adjustable range of control and limits. Include written description of control sequence.
- .2 Include flow diagrams for each control system, graphically depicting control logic.

.3 Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 78 10: Submittals for project closeout.

.2 Project Record Documents: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

Part 2 Products

2.1 Not Used

.1 Not Used

Part 3 Execution

3.1 BOILER

.1 Two oil-fired hot water boiler operating at 180F, providing hot water to all loops. Primary loop to maintain constant circulation. On a call for heat from any of the secondary components, a loop valve shall open. Each zone to be controlled by thermostats: heating zones by radiator thermostats, hot water heater by water heater thermostat, heat exchanger by septic tank thermostat.

.2 Boiler Loop Control

.1 When outdoor temperature is 10C (adjustable) or lower, enable boilers. Control heating water supply temperature at 82 degrees C.

.2 Alternate use of boilers – every Wed at 12 noon and every Sunday at midnight. If one boiler fails, then switch to the other boiler and generate an alarm.

.3 Boiler loop to run continuously when boiler in operation.

.3 Primary Loop control

.1 Primary loop pump operates continuously.

.2 Flow control valve will open and close to maintain primary loop temperature at 82 degrees C.

.3 Flow switch in heating pump discharge provides on/off indication.

.4 Zone Loop control

.1 On call for heat from zone thermostat, control valve will open and allow water from primary loop to circulate through zone loop. When call for heat is satisfied, control valve will close.

.2 Flow switch in heating water circuit on no flow conditions indicates alarm.

.3 On outside temperatures above 10 degrees C, de-energize loop pumps for septic tank and suppress alarm.

3.2 HOT WATER TANK

.1 Boiler provides heat to indirect-fired water heater at 180F. Water heater thermostat connected to boiler's zone controls for hot water heater. On a call for heat at the hot water heater, the boiler zone controls shall circulate boiler hot glycol through the hot water tank until the desired temperature is achieved.

3.3 HEAT RECOVERY VENTILATORS

.1 A heat recovery ventilator is used to provide fresh air to the both units. The HRV supplies and exhausts 150cfm to and from the ventilation ductwork, as shown in the drawings.

.2 The heat recovery ventilator will run continuously at high speed to provide fresh air and exhaust. Low speed, High speed and Off options will also be controllable via a controller located in the mechanical room.

3.4 HRV HYDRONIC PREHEAT COIL

.1 The HRV unit will have a hydronic glycol in-duct coil located in the outdoor air intake for defrost, to ensure 100% ventilation at all times. This hydronic coil will be cycled on off as enabled from a duct air temperature sensor to maintain outdoor air temperature of -5 degrees C air temperature, and will have a failsafe air switch (sail switch) to keep the coil from heating should the air system fail.

3.5 RADIANT BASEBOARD HEATERS

.1 Each zone contains a thermostat to maintain constant space temperature by controlling zone hydronic flow. Further comfort adjustments can be made by moving radiator dampers and adjusting individual radiator valves.

3.6 SEPTIC TANK HEATING LOOP

.1 A hydronic glycol line will run from the heat exchanger to the septic tank and associated piping. Sensors in the septic tank and in the wrapped piping will cause a call for heat in the loop when their temperatures drop below 5C. When the outdoor temperature is greater than 5C, the loop circulator for the septic system will be disabled.

3.7 OIL-FIRED FORCED AIR FURNACE – V103

.1 The furnace provides heated air during heating season. Fresh air from the HRV is introduced to the fan coils via the return air duct. The furnace shall be controlled at the room thermostat, both manually and automatically.

.2 During heating season, a programmable room thermostat maintains a constant room temperature.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Holding tank.

1.2 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials.

.2 Section 31 23 16 - Excavating.

.3 Section 31 23 18 - Trenching.

.4 Section 31 23 23 - Backfilling.

.5 Section 33 31 13 - Site Sanitary Sewerage Piping: Effluent discharge.

.6 Section 33 05 13 - Manholes And Catch Basins: Effluent discharge.

.7 Section 22 10 00 - Plumbing Piping: Building sanitary drainage piping; effluent discharge.

1.3 REFERENCES

.1 AASHTO T180 - Moisture-Density Relations of Soils Using a 4.54 kg Rammer and an 457 mm Drop.

.2 ANSI A21.11 - Rubber Gasket Joints For Cast Iron and Ductile Iron Pressure Pipe and Fittings.

.3 ASTM A74 - Cast Iron Soil Pipe and Fittings.

.4 ASTM C4 - Clay Drain Tile and Perforated Clay Drain Tile.

.5 ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines.

.6 ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

.7 ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.8 ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

.9 ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN/m; (12,400 ft - lb/ft;)).

.10 ASTM D1556 - Test Methods for Density and Unit Weight of Soil In-Place by the Sand-Cone Method.

.11 ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN - m/m; (56,000 ft - lb/ft;)).

.12 ASTM D2311 - Perforated Homogeneous Bituminized Fiber Pipe For General Drainage.

.13 ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.14 ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

.15 ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

.16 ASTM D3017 - Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

.17 ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Shop Drawings: Indicate tank size and configuration; plan, location and inverts of filtre field; inverts of connecting piping.

.3 Product Data: Provide data on tank accessories.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 01 73 03: Submission procedures.

.2 Accurately record actual locations and inverts of buried pipe, components, and connections.

1.6 REGULATORY REQUIREMENTS

.1 Conform to Manitoba Plumbing code and regulations for Work of this section.

.2 Provide certificate of compliance from authority having jurisdiction indicating approval of systems.

Part 2 Products

2.1 HOLDING TANK

.1 Manufacturers:

.1 EQUINOX Guardian Low profile sewage tank. G1000 HHT.

.2 Substitutions: Refer to Section 01 61 00.

.2 Holding Tank: Fibreglass construction, vent, inlet inspection hole, hydronic heating coils.

.1 Tank Capacity: 3 785L 1,000gallon.

Part 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions to Section 01 73 03.

.2 Verify that building sanitary sewer connection, size, location and invert are as indicated.

3.2 PREPARATION

.1 Ream pipe ends and remove burrs.

.2 Remove scale and dirt from components before assembly.

.3 Establish invert elevations for all components in the system.

.4 Hand trim excavation to suit septic tank, distribution box and field tile arrangement. Remove stones, roots or other obstructions.

.5 Examine and test hydronic heating coil before installation.

3.3 TANK AND TANK BEDDING

.1 Hand trim excavation for accurate placement of tank to elevations indicated.

.2 Place bedding material level in one continuous layer not exceeding 8inches compacted depth, compact to 95 percent.

.3 Backfill around sides of tank, tamp in place and compact to 95 percent.

.4 Maintain optimum moisture content of bedding material to attain required compaction density.

.5 Install septic tank and distribution box and related components on bedding in accordance with manufacturer's instructions. Position components to permit access to inspection ports.

3.4 CONNECTING PIPING

.1 Place pipe and fittings on clean excavated subsoil.

.2 Coordinate the work with connections to building sanitary sewer piping outlet.

END OF SECTION

Appendix A

Water Tank Cleaning Checklist

RCMP – V DIVISION. ANNUAL WATER TANK AND PRESSURE SYSTEM INSPECTION / CLEANING.

- ☐ 1 - Contact clients in building for scheduling, insure interruption on building operation is minimized.
- ☐ 2 - Contact water truck company to stop water delivery prior to tank cleaning to avoid too much water to be drained. Contractor needs to use their own potable tank/ pressure pump for the cleaning.
- ☐ 3 - Turn DHW tank off prior to tank cleaning.
- ☐ 4 - Turn Pressure pump off.
- ☐ 5 - Drain/pump tank out, use portable sump pump to speed up the process.
- ☐ 6 - Scrub, wash internal tank wall and bottom, drain/remove all contaminated water and sediment.
- ☐ 7 - Use fresh potable water and bleach to wash interior tank, leave bleached water in tank for ½ hour for sterilization, then drain tank. Add 5ml of liquid bleach for every litre of water tank capacity. A 1000 L tank will require 5 litres of bleach, less if a concentrated bleach.
- ☐ 8 - Rinse tank with fresh potable water to remove the high chlorine concentration. Drain water and dry tank with clean mop.
- ☐ 9 - Call water truck to fill tank.
- ☐ 10 - Check all float/ level controllers for proper positions.
- ☐ 11 - Prime and Start pressure pump; check/adjust Cut in/ Cut out pressures to 30-50 PSI approximately.
- ☐ 12 - Check expansion tank, if pump cut in/ cut out sporadically- replace tank.
- ☐ 13 -Turn DHW tank back on, insure that breaker/burner is on and in operation.
- ☐ 14 - Check all water taps/ sinks/ toilets, etc. throughout the building, ensure that they are not left running.
- ☐ 15 - Enter building log book what has been done.
- ☐ 16 - Inform client in building that water is back on service.

FACILITY NAME: _____ COMMUNITY: _____

INSPECTED BY: _____ DATE: _____