SPECIFICATION DOCUMENTS **No. of Pages**

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Division 40 – Process Piping

Division 43 – Process Pumping

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies additional requirements for equipment which has been pre-selected by the City of Winnipeg:

- .1 Centrifugal Pumps
  - .1 Two (2) one hundred fifty-four (154) L/s pumps complete with motors, drive shafts, drive shaft guards, pump suction elbows, supports and spare parts. [P-L01, P-L02].
- .2 Gate Valves
  - .1 Two (2) three hundred (300) millimetre rising stem gate valves – manually actuated, resilient seated, for the suction side of the pumps. [SLG-L01B, SLG-L02B];
  - .2 Two (2) two hundred fifty (250) millimetre rising stem gate valves – manually actuated, resilient seated, for the discharge side of the pumps. [SLG-L01C, SLG-L02C].
  - .3 One (1) three hundred fifty (350) millimetre rising stem gate valve – manually actuated, resilient seated. [SLG-L03C];
  - .4 One (1) two hundred fifty (250) millimetre non-rising stem gate valve – manually actuated [SLG-L04C].
- .3 Check Valves
  - .1 Two (2) two hundred fifty (250) millimetre check valves with “hold-open” device, for the discharge side of the pumps. [CV-L01A, CV-L02A].

.2 Refer to Section 43 21 13 – Centrifugal Pumps, for the Specifications of the centrifugal pumps and Section 40 05 52 – Process Valves, for the Specifications of the process valves.

.3 Obtain details of the pre-selected equipment from Dillon Consulting Limited. Contact the Contract Administrator.

1.2 DESCRIPTION

.1 Pre-selection and pre-purchase of this equipment was made on the basis of competitive quotations.

.2 The Contractor shall be responsible for coordination with the supplier to ensure that the Site is prepared ready to receive the equipment based on the agreed upon date.

.3 The Contractor may contact the Contract Administrator for further clarification and/or details on the pre-selected equipment, supplier scope, conditions and Specifications only after a thorough review of the Contract Documents and direct communications with the named supplier.

Part 2 Products

2.1 GENERAL

.1 The pre-selected and pre-purchased equipment is as shown on the Drawings.

.2 The Contractor shall notify the Contract Administrator of equipment delivery dates.

Part 3 Execution

3.1 EQUIPMENT INSTALLATION – GENERAL

.1 All equipment installed under this Contract shall be installed by skilled trade people and in accordance with the manufacturer's recommendations.

.2 All installations shall be carried out in a workmanlike manner, taking all possible precautions to ensure proper alignment of equipment shafts and pipe connections to avoid transmission of piping weight reactions to the equipment at pipe connections.

.3 Before acceptance of the equipment by the Contract Administrator, it shall be inspected and final adjustments made by a qualified, competent representative of the manufacturer.

.4 The manufacturer shall provide a certificate of installation to the Contract Administrator when the equipment has been satisfactorily installed.

3.2 INSTALLATION AND COMMISSIONING

.1 The Contractor shall be responsible for the installation of the pumps and associated appurtenances.

.2 The supplier will conduct testing and commissioning performance tests in accordance with the Contract Documents.

3.3 TRAINING

.1 The supplier shall provide operating training, which shall include familiarization with the equipment, its maintenance and operation requirement, calibration and tuning, and review of the Operations and Maintenance Manuals.

3.4 PROGRAMMING, TESTING, START-UP AND COMMISSIONING

.1 Pre-purchase equipment supplier shall complete all programming.

.2 Pre-purchase equipment supplier shall provide start-up and commission. Contractor shall carry the cost of supporting services.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Submit to Contract Administrator 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.

.1 Allow ten (10) Working Days for review of submittals by the Contract Administrator.

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

.3 Present Shop Drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are accepted.

.5 Review submittals prior to submission to Contract Administrator. 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 Contract Administrator, 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 Contract Administrator’s review of submittals.

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

.10 The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.

.11 After Contract Administrator’s review and return of copies, distribute copies to sub-trades as appropriate.

.12 Keep one (1) 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 one (1) electronic copy of Shop Drawings for each requirement requested in Specification Sections and as Contract Administrator may reasonably request.

.3 The Contractor shall arrange for the preparation of clearly identified Shop Drawings as specified or as the Contract Administrator may reasonably request. Shop Drawings are to clearly indicate materials, weights, dimensions, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, clearly indicate that all such attachments and connections have been properly coordinated, regardless of the trade under which the adjacent articles or equipment will be supplied and installed. Shop Drawings are to indicate their relationship to design Drawings and Specifications. Notify the Contract Administrator in writing of any deviations in Shop Drawings from the requirements of the Contract Documents.

.4 Submit Drawings stamped and signed by professional Engineer registered or licensed in the province of Manitoba as required in the Specifications.

.5 The Contractor shall examine all Shop Drawings prior to submission to the Contract Administrator to ensure that all necessary requirements have been determined and verified and that each Shop Drawing has been checked and coordinated with the requirements of the Work and the Contract Documents. Examination of each Shop Drawing shall be indicated by stamp, date and signature of a responsible person of the Subcontractor for supplied items and of the General Contractor for fabricated items. Shop Drawings not stamped, signed and dated will be returned without being reviewed and stamped "Re-submit". Ensure that the following are verified:

.1 Field Measurements;

.2 Field construction criteria; and

.3 Catalogue numbers and similar data.

.6 Submit one (1) electronic copy of product data sheets or brochures for requirements requested in Specification Sections and as requested by Contract Administrator where Shop Drawings will not be prepared due to standardized manufacture of product.

.7 Submit one (1) electronic copy of test reports for requirements requested in Specification Sections and as requested by Contract Administrator.

.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 three (3) years of date of Contract Award for Project.

.8 Submit one (1) electronic copy of certificates for requirements requested in Specification Sections and as requested by Contract Administrator.

.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.

.9 Submit one (1) electronic copy of manufacturers' instructions for requirements requested in Specification Sections and as requested by Contract Administrator.

.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.

.10 Submit one (1) electronic copy of Manufacturer's Field Reports for requirements requested in Specification Sections and as requested by Contract Administrator.

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

.11 Submit one (1) electronic copy of Operation and Maintenance Data for requirements requested in Specification Sections and as requested by Contract Administrator.

.12 Delete information not applicable to Project.

.13 Supplement standard information to provide details applicable to Project.

.14 If upon review by Contract Administrator, 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, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.15 Contractor will be charged for Contract Administrator subsequent reviews of submittal packages exceeding two (2) submissions.

.16 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 Specification Section, Title, Number and Clause;

.6 Other pertinent data;

.7 Date and revision dates;

.8 Project title and Bid Opportunity number;

.9 Name of:

.1 Contractor;

.2 Subcontractor;

.3 Supplier;

.4 Manufacturer; and

.5 Separate detailer when pertinent.

.10 Identification of product of material;

.11 Relation to adjacent structure or materials;

.12 Field dimensions, clearly identified as such;

.13 Specification Section name, number and clause number or Drawing number and detail/section number;

.14 Applicable standards, such as CSA or CGSB numbers; and

.15 Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.

1.3 PRODECURES

.1 The Contractor shall, if required by the Contract Administrator, submit for the review of the Contract Administrator method statements which describe in detail, supplement with Drawings where necessary, the methods to be adopted for executing any portion of Work.

.2 These statements shall also include details of constructional plant and labour to be employed. Acceptance by the Contract Administrator shall not relieve the Contractor of any of his responsibilities, nor shall reasonable refusal to approve entitle the Contractor to extra payment or an extension of time.

.3 Other Considerations:

.1 Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.

.2 Material and equipment delivered to the Site of the Works will not be paid for at least until pertinent Shop Drawings have been submitted and reviewed.

.3 Incomplete Shop Drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

.4 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of Shop Drawings.

.5 Contractor to monitor the shoring for movement on a daily basis and provide a written weekly report showing the daily records to the Contract Administrator.

1.4 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 Contract Administrator's business address.

.3 Notify Contract Administrator 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 Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

.6 Make changes in samples which Contract Administrator 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.

1.5 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 – Quality Control.

1.6 PROGRESS PHOTOGRAPHS

.1 Submit progress photographs.

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow Contract Administrator 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 Contract Administrator 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 The Contract Administrator 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. If such Work is found in accordance with Contract Documents, the City shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Contract Administrator 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 Contract Administrator at no cost to Contract Administrator. 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 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 the Contract Administrator 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 the Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the City of Winnipeg 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 Contract Administrator.

1.5 PROCEDURES

.1 Notify appropriate agency and Contract Administrator 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.

1.6 REPORTS

.1 Submit four (4) copies of inspection and test reports to Contract Administrator, prior to inclusion with the Operations and Maintenance manuals, in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide copies to Subcontractor of Work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Contract Administrator and may be authorized as recoverable.

Part 2 Products – NOT USED

Part 3 Execution – 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 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavation and Site free from standing water.

1.4 WATER SUPPLY

.1 Provide potable water as required for construction Work.

1.5 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

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

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

.1 Facilitate progress of Work;

.2 Protect Work and products against dampness and cold;

.3 Prevent moisture condensation on surfaces;

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

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

.4 Maintain temperatures of minimum ten (10) degrees Celsius in areas where construction is in progress.

.5 Ventilating:

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

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

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

.4 Ventilate storage spaces containing hazardous or volatile materials;

.5 Ventilate temporary sanitary facilities; and

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

.6 Permanent heating system of building, may be used when available. Be responsible for damage to heating system if use is permitted.

.7 On completion of Work for which permanent heating system is used, replace filters.

.8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by the Contract Administrator.

.9 Pay costs for maintaining temporary heat, when using permanent heating system. The City of Winnipeg will pay utility charges when temporary heat source is existing building equipment.

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

.1 Conform with applicable codes and standards;

.2 Enforce safe practices;

.3 Prevent abuse of services;

.4 Prevent damage to finishes; and

.5 Vent direct-fired combustion units to outside.

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

1.6 TEMPORARY POWER AND LIGHT

.1 Provide construction power and light panel board. Provide circuit breaker and cabling and connect to empty circuit in panel board with spare capacity.

.2 Provide and maintain temporary lighting throughout Project. Ensure level of illumination on all floors and stairs is not less than one hundred sixty-two (162) lx.

1.7 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone fax data hook up, lines, equipment necessary for own use.

1.8 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.

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).

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

1.2 ACTION AND INFORMATIONAL 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 to be used, avenues of ingress/egress to fenced area 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 SCAFFOLDING

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

.2 Provide and maintain scaffolding and ladders.

1.5 HOISTING

.1 Provide, operate and maintain hoists, cranes required for moving of workers, materials and equipment.

.2 Hoists, cranes to be operated by qualified operator.

1.6 SITE STORAGE/LOADING

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

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

1.7 CONSTRUCTION PARKING

.1 Parking will be permitted on Site in public parking areas provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to Project Site including fire route access.

1.8 SECURITY

.1 Provide and pay for responsible security personnel to guard Site and contents of Site after working hours and during holidays.

1.9 OFFICES

.1 Provide office heated to twenty-two (22) degrees Celsius, lighted seven hundred fifty (750) lx and ventilated, of sufficient size to accommodate Site meetings and furnished with Drawing laydown table.

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

.3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

.4 Supply temporary office facilities for the Contract Administrator on Site, meeting the following requirements:

.1 Minimum floor area of twenty (20) square metres, with windows and a door entrance complete with suitable lock satisfactory to the Contract Administrator;

.2 Suitable for all-weather use and capable of maintaining a temperature range between twenty (20) and twenty-five (25) degrees Celsius;

.3 Equipped with fluorescent lights and one hundred twenty (120) volt ac electrical wall outlets;

.4 Furnished with one (1) desk, one (1) filing cabinet and two (2) chairs, all satisfactory to the Contract Administrator;

.5 All of the temporary structures provided by the Contractor for this Project shall be stabilized in a sufficient manner to prevent the temporary structure from being overturned by wind forces as defined in the National Building Code. The stabilization provided shall be designed by a Professional Engineer registered in the Province of Manitoba. Detailed Drawings and design notes for the stabilization Works bearing the Engineer's seal shall be provided to the Contract Administrator for review; and

.6 The Contractor shall be responsible for installation, maintenance, removal, operating costs and service installation costs for the field office as described herein.

1.10 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 not required to be stored in weatherproof sheds on Site in manner to cause least interference with Work activities.

1.11 SANITARY FACILITIES

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

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

1.12 LAYDOWN AND STORAGE

.1 All construction materials shall be stored at designated storage areas. Stored combustible materials shall be separated by clear space to prevent fire spread and allow access for manual firefighting equipment, including fire hoses, extinguishers, hydrants, etc.

.2 Pressurized dry chemical fire extinguishers of suitable capacity or equally effective extinguishers as per NFPA 10 shall be provided where:

.1 Flammable liquids are stored or handled; and

.2 Welding or flame cutting is performed.

1.13 DISPOSAL OF WASTE MATERIALS

.1 Spoiled and waste materials shall not be dumped, under any circumstances, in any locations other than those approved by the local authorities. Any cost for permits and fees for disposing of waste materials shall be at the Contractor’s expense.

.2 Disposal of all excavated and waste materials shall be in accordance with the requirements of the appropriate provincial regulatory agencies.

.3 When working anywhere within the Works the Contractor shall at the end of each Working Day remove the rubbish and leave the Site in a clean and tidy state, to the satisfaction of the Contract Administrator. If this is not done, the City of Winnipeg will clean the Site and charge the Contractor.

1.14 FACILITY ELECTRICAL SUPPLY AND DISTRIBUTION

.1 If service interruptions are necessary, such interruptions shall be made only at times approved by the Contract Administrator.

1.15 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Contract Administrator.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and Work and erection and maintenance of adequate warning, danger and direction signs.

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from Site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.7 Construct access and haul roads necessary.

.8 Provide necessary lighting, signs, barricades and distinctive markings for safe movement of traffic.

.9 Dust control: adequate to ensure safe operation at all times.

.10 Provide snow removal during period of Work.

1.16 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from Work Site daily.

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

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

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

1.17 FIRE ACCESS

.1 Maintain safe access for fire and rescue vehicles along south side of building.

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from Site all such Work after use.

1.2 HOARDING

.1 Erect temporary Site enclosure.

.2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.3 GUARD RAILS AND BARRICADES

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

.2 Provide as required by governing authorities.

1.4 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings enclose building interior Work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.5 DUST TIGHT SCREENS

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

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

1.6 ACCESS TO SITE

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

1.7 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights or lanterns as required to perform Work and protect public.

1.8 FIRE ROUTES

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

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.10 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 Contract Administrator locations and installation schedule three (3) days prior to installation.

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

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Conform to reference standards, in whole or in part as specifically requested in Specifications.

.2 If there is question as to whether products or systems are in conformance with applicable standards, the Contract Administrator reserves the right to have such products or systems tested to prove or disprove conformance.

.3 Cost for such testing will be borne by the City of Winnipeg in event of conformance with Contract Documents or by the Contractor in event of non-conformance.

1.2 QUALITY

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

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection. Should disputes arise as to quality or fitness of products, decision rests strictly with the Contract Administrator based upon requirements of Contract Documents.

.3 Unless otherwise indicated in Specifications, maintain uniformity of manufacture for any particular or like item throughout building.

1.3 AVAILABILITY

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

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

1.4 METRIC PROJECT

.1 Unless otherwise noted, this project has been designed and is to be constructed in the International System (SI) of Units metric system of measurements.

.2 During construction, when specified metric elements are unattainable at the time they are required to meet the construction schedule, the Contractor shall notify the Contract.

1.5 STORAGE, HANDLING AND PROTECTION

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

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

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

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

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

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

.8 Remove and replace damaged products at own expense and to satisfaction of the Contract Administrator.

.9 Touch-up damaged factory finished surfaces to Contract Administrator’s satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

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

1.7 MANUFACTURORS INSTRUCTIONS

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

.2 Notify the Contract Administrator in writing, of conflicts between Specifications and manufacturer's instructions, so that the Contract Administrator will establish the course of action.

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

1.8 REMEDIAL WORK

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

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

1.9 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, unless stainless steel or other material is specifically requested in affected Specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.10 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of the Contract Administrator.

Part 2 Products – NOT USED

Part 3 Execution

3.1 WORKMANSHIP

.1 Ensure quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify the Contract Administrator if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. The Contract Administrator reserves the right to require dismissal from Site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with the Contract Administrator, whose decision is final.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

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

- .1 Structural integrity of elements of Project;
- .2 Integrity of weather-exposed or moisture-resistant elements;
- .3 Efficiency, maintenance or safety of operational elements;
- .4 Visual qualities of sight-exposed elements; and
- .5 Work of the City of Winnipeg or separate Contractor.

.3 Include in request:

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

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 – Submittal Procedures.

1.3 PREPARATION

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

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

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

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

.5 Provide protection from elements for areas which are to be exposed by uncovering Work; maintain excavations free of water.

1.4 EXECUTION

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

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

.3 Uncover Work to install ill-timed Work.

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

.5 Remove samples of installed Work for testing.

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

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

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

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

.10 Restore Work with new products in accordance with requirements of Contract Documents.

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

.12 At penetration of fire rated wall, ceiling or floor construction, completely seal voids with firestopping material with approved fire stopping assembly.

.13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

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

Part 2 Products – NOT USED

Part 3 Execution – 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.

.2 Remove waste materials from Site at daily regularly scheduled times or dispose of as directed by Contract Administrator. Do not burn waste materials on Site.

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

.4 Make arrangements with and obtain permits from Authorities Having Jurisdiction for disposal of waste and debris.

.5 Provide on Site containers for collection of waste materials and debris.

.6 Dispose of waste materials and debris off Site.

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

.8 Store volatile waste in covered metal containers, and remove from premises at end of each Working Day.

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

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

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

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

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

.1 Diversion of Materials;

.2 Materials Source Separation Program (MSSP); and

.3 Canadian Governmental Responsibility for the Environment Resources.

1.2 DEFINITIONS

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

.2 Recyclable: Ability of product or material to be recovered at end of its life cycle and remanufactured into new product for reuse by others.

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

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

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

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

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

1.3 SUBMITTALS

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

1.4 MATERIALS SOURCE SEPARATION PROGRAM

.1 Prepare Material Source Separation Program and have ready for use prior to Project start up.

.2 Implement Material Source Separation Program for waste generated on Project in compliance with approved methods and as reviewed by Contract Administrator. Provide on Site facilities for collection, handling and storage of anticipated quantities of reusable and recyclable materials.

.3 Provide containers to deposit reusable and recyclable materials.

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

.5 Locate separated material(s) in area(s) which minimize material damage.

.6 Collect, handle, store on Site and transport off site, salvaged materials in separate condition.

.7 Transport to approved and authorized recycling facility.

.8 Collect, handle, store on Site and transport off site, salvaged materials in combined condition.

.9 Ship material(s) to Site operating under Certificate of Approval or as directed by the City of Winnipeg.

.10 Materials must be immediately separated into required categories for reuse or recycling.

1.5 WASTE PROCESSING SITES

.1 Identify appropriate waste processing sites, based on municipal requirements, as required.

1.6 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Contract Administrator.

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

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

.4 Separate non salvageable materials from salvaged items. Transport and deliver non salvageable items to licensed disposal facility.

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

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Contract Administrator.

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

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

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

.10 On Site source separation is recommended.

.11 Remove co-mingled materials to offsite processing facility for separation.

.12 Provide waybills for separated materials.

1.7 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

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

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

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

.5 Dispose of waste in accordance with Municipal and Provincial regulations.

1.8 USE OF SITE AND FACILITIES

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

.2 Maintain security measures established by existing facility and provide temporary security measures approved by Contract Administrator as required.

1.9 SCHEDULING

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

Part 2 Execution – NOT USED

Part 3 Execution

3.1 APPLICATION

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

3.2 CLEANING

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

.2 Clean-up Work area as Work progresses.

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

END OF SECTION

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 Contract Administrator's comments.

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

.5 Two (2) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, four (4) 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.

1.2 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, three (3) 'D' ring, loose leaf two hundred nineteen (219) by two hundred seventy-nine (279) millimetres 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.

1.3 CONTENTS – EACH VOLUME

.1 Table of Contents: provide title of project; Date of submission; names.

.1 Addresses and telephone numbers of Contract Administrator and Contractor with name of responsible parties.

.2 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 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.6 Training: refer to Section 01 79 00 – Demonstration and Training.

1.4 AS-BUILTS AND SAMPLES

.1 Maintain, in addition to requirements in General Condition, at Site for Contract Administrator one (1) 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; and

.8 Manufacturer's certificates.

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

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

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

.5 Keep record documents and samples available for inspection by Contract Administrator.

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of Drawings.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

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

.4 Contract Drawings and Shop Drawings mark each item to record actual construction, including:

- .1 Measured depths of elements of foundation in relation to finish first floor datum;
- .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements;
- .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction;
- .4 Field changes of dimension and detail;
- .5 Changes made by Change Orders;
- .6 Details not on original Contract Drawings; and
- .7 References to related Shop Drawings and modifications.

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

- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and Change Orders.

.6 Other Documents; maintain manufacturer's certifications, inspection certifications, field test records, required by individual Specifications Sections.

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

.12 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.

.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 Contract Administrator. Include approved listings in Maintenance Manual.

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

1.9 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 Contract Administrator. Include approved listings in Maintenance Manual.

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

1.10 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. Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

1.11 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 Contract Administrator.

1.12 WARRANTIES

.1 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, executed in duplicate by Subcontractors, suppliers and manufacturers, within ten (10) 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; and

.6 Retain warranties until time specified for submittal.

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

.3 Conduct joint eleven (11) month warranty inspection, measured from Date of Substantial Performance, by Contract Administrator.

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

.5 Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Demonstrate operation and maintenance of equipment and systems to City of Winnipeg's personnel one (1) week prior to date of Substantial Performance.

.2 The City of Winnipeg will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.2 QUALITY CONTROL

.1 When specified in individual sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct City of Winnipeg's personnel, and provide written report that demonstration and instructions have been completed.

1.3 SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two (2) weeks prior to designated dates, for Contract Administrator approval. Submit reports within one (1) week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.3 Give time and date of each demonstration, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing and maintenance of each item of equipment.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.7 TIME ALLOCATED FOR INSTRUCTIONS

.1 Ensure amount of time required for instruction of each item of equipment or system is adequate as determined by the Contract Administrator.

.2 At a minimum allow for training of each system to two (2) separate groups of City of Winnipeg personnel.

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This Section specifies requirements for testing, start-up, commissioning and trial operations of the Works.

1.2 DEFINITIONS

.1 Start-up: start-up for each individual piece of equipment shall consist of the manufacturer's representative inspecting the installation, starting and running the equipment and making any adjustments. Start-up for each piece of equipment shall be considered complete when the Contract Administrator is notified, in writing, by the manufacturer's representative that the equipment is installed, checked and is in working order and ready to be put in continuous operation.

.2 Commissioning: commissioning shall consist of placing individual pieces of equipment and/or process subsystems into continuous operation. During commissioning, equipment shall be verified for mechanical, electrical and control conformance with the Specifications. Commissioning shall be deemed complete when the Contract Administrator receives notification that the station is ready for trial operation.

.3 Trial operation: trial operation shall consist of placing all of the various systems of the Works into continuous operation. Once all systems are on-line and working as a complete unit, the station will be operated continuously for fourteen (14) days. Trial operation shall be deemed complete after the station has been operating continuously for fourteen (14) days, and all process, mechanical and electrical equipment is free of vibration, overloading and overheating, and is functioning in accordance with specified rates, methods and performance.

.4 Special equipment performance test requirements may exceed commissioning and trial operations as outlined above.

.5 All equipment must be commissioned in accordance with the City of Winnipeg Standards.

1.3 SUBMITTALS

.1 The Contractor shall provide a detailed written description of the procedures they plan to follow for the start-up on each system, including methods of calibration, flow routes, tests and personnel involved. This procedure shall be submitted to the Contract Administrator at least four (4) weeks prior to start-up of the systems.

.2 The Contractor shall prepare a written procedure for commissioning and trial operations of the Works. The Contractor shall accept the direction and co-ordination assistance of the Contract Administrator for both commissioning and trial operation.

.3 Start-up, commissioning and trial operations shall not commence until the procedure has been approved by the Contract Administrator.

.4 A forty-eight (48) hour advance notice shall be given to the Contract Administrator before the testing and start-up of each system.

1.4 RESPONSIBILITY

.1 The Contractor shall be responsible for testing, start-up, commissioning and trial operation. The Contract Administrator will witness testing and start-up. The Contractor shall co-ordinate equipment supplier's representatives for start-up.

.2 Under no circumstance shall anyone other than a licensed operator from the City of Winnipeg operate this system.

.3 The operating authority shall be responsible for Water Quality Monitoring during trial operation.

1.5 TESTING AND START-UP

.1 When equipment installation has been completed by the Contractor to standards indicated by these Specifications, the Contractor shall arrange for the services of the equipment manufacturer's technical representative.

.2 The equipment manufacturer's technical representative shall inspect the installation to ensure that the equipment has been installed in accordance with the manufacturer's requirements. If the installation is not in order, the Contractor shall make adjustments in accordance with instructions of the Equipment Manufacturer's Technical Representative. The equipment shall be started and run, and adjustments made at this time.

.3 Following satisfactory start-up, the manufacturer's technical representative shall advise the Contract Administrator, in writing, that the installation has been installed, checked and is in working order.

1.6 COMMISSIONING AND TRIAL OPERATIONS

.1 Commissioning will not commence until all Work is complete and SCADA documentation per City of Winnipeg SCADA standards are issued for all systems.

.2 The Contract Administrator will request that the equipment be operated to demonstrate that it performs as specified. If the Contract Administrator notes deficiencies, the deficiency shall be corrected immediately by the Contractor. The Contractor shall advise the Contract Administrator, in writing, when the deficiencies have been corrected.

.3 Deficiencies of a serious nature, as determined by the Contract Administrator, shall be corrected by the manufacturer's representative.

.4 In the presence of the Contractor and Contract Administrator, a licensed operator from the City of Winnipeg will commission the Works in accordance with the written procedure for commissioning. The Contractor shall provide sufficient manpower for the duration of the commissioning period. The Contractor shall make necessary adjustments during commissioning to put the Works into continuous operation.

.5 During the trial operation period, the Contractor shall provide the manpower necessary to monitor and maintain the Works in operation outside normal working hours to ensure continuous operation of the Works.

.6 The station will be considered substantially performed and ready for use at the end of the 'Trial Operation Period' provided the fourteen (14) day running test has been satisfactorily completed and all other requirements of General Conditions and Construction Lien Act have been met.

1.7 CONSTRUCTION COMPLETE CERTIFICATES

.1 The Contractor shall be required to prepare and use Construction Complete Certificate for each system of the Works.

.2 The Construction Complete Certificate shall include the following:

.1 Description of system;

.2 Test results including areas for the Contract Administrator's and Contractor's Signature;

.3 Test deficiencies;

.4 Start-up results including areas for the Contract Administrator's and Contractor's signature;

.5 Start-up deficiencies;

.6 Instrument Calibration Sheets (as commissioned);

.7 SCADA documentation per City of Winnipeg SCADA Standards; and

.8 Comments.

.3 The Construction Complete Certificate shall include, as attachments, records such as suppliers' representatives' reports, alignment reports, instrumentation loop checks, as well as any other relevant information.

.4 The Construction Complete Certificate shall conform to the requirements of the City of Winnipeg SCADA standards. All the relevant calibration and instrumentation testing and verification forms provided in the standards will be completed by the equipment supplier and Contractor and verified by the Contract Administrator.

.5 The Contract Administrator will provide to the Contractor the latest version of the City of Winnipeg standards.

1.8 OPERATOR TRAINING

.1 Provide operator training on equipment operation and maintenance.

.2 The training can be combined with start-up and commissioning.

1.9 BASIS OF PAYMENT

.1 Payment for testing, start-up and commissioning to be included in the Lump Sum Price for Commissioning in the Form B of Tender.

.2 The Lump Sum Price shall cover supply of all labour, materials, tools and equipment, including manufacturers' representatives, as specified, and/or required.

.3 Cost of remedying faults and correcting deficiencies, attributable to the Contractor and consequent additional tests and start-ups, shall be at Contractor's expense.

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA S350, Code of Practice for Safety in Demolition of Structures.

1.2 EXISTING CONDITIONS

.1 Structures to be demolished to be based on their condition on date that Tender is accepted.

.2 Items to be salvaged, as identified by City of Winnipeg and/or City of Winnipeg's Representative, to be carefully removed protected and handed to City of Winnipeg and/or City of Winnipeg's Representative.

1.3 DEMOLITION DRAWINGS

.1 Where required by authorities having jurisdiction, submit for approval Drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.

.2 Temporary supporting structures and shoring systems are to be designed and submittals sealed by a structural Engineer licensed to practice in the province of Manitoba.

1.4 PROTECTION

.1 Prevent movement, settlement or damage of adjacent structures, services, parts of existing building to remain. Provide bracing, shoring and underpinning as required. Make good damage caused by demolition.

.2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify the Contract Administrator.

.3 Prevent physical intrusion and damage caused by environmental factors such as wind and rain and the spread of dust and contaminants by means of temporary plywood enclosures, screens, fencing, tarps and other means sealed against other areas of the building as required.

Part 2 Products – NOT USED

Part 3 Execution

3.1 PREPARATION

.1 Disconnect and re-route electrical and telephone service lines entering areas to be demolished in accordance with authorities having jurisdiction. Post warning

signs on electrical lines and equipment which must remain energized to serve other areas of the building during period of demolition.

.2 Disconnect and cap designated mechanical services in accordance with authorities having jurisdiction where indicated.

.3 Do not disrupt active or energized utilities designated to remain undisturbed.

3.2 DEMOLITION

.1 Demolish and remove in general portions of exterior and interior walls, roofing, ceilings, structures, finishes, fixed furnishings and mechanical and electrical components in the area of Work that are not to be incorporated in the completed Project.

.2 At end of each day's Work, leave Work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts to be demolished from exterior elements at all times.

.3 Demolish to minimize dusting.

.4 Do not sell or burn materials on Site.

.5 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

3.3 SALVAGE

.1 Items to be salvaged: As directed by Contract Administrator.

.2 Carefully dismantle items containing materials for salvage and stockpile salvaged materials on Site.

.3 All pumps and motors to be handed over to the City of Winnipeg.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 The Contract Documents applied to the Work of this section.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA A165 Series-04 (R2014), CSA Standards on Concrete Masonry Units (Consists of: A165.1, A165.2, and A165.3);

.2 CSA A82.14 (R2018) Fired Masonry Brick made from Clay or Shale;

.3 CSA A179-14 Mortar and Grout for Unit Masonry;

.4 CSA A370-14 (R2008) Connectors for Masonry;

.5 CSA A371-14 Masonry Construction for Buildings;

.6 CSA G30.18-09 (R2014) Carbon Steel Bars for Concrete Reinforcement;

.7 CSA S304-14 Design of Masonry Structures;

.8 CSA A23.1/A23.2-14 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete;

.9 ASTM C216-17a Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); and

.10 ASTM C568/C568M-15 Standard Specification for Limestone Dimension Stone.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, Specifications and data sheets.

.2 Samples:

.1 As requested by the Contract Administrator.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with the manufacturer's recommendations.

.2 Deliver materials to job Site in dry condition.

□

.3 Cement and other packaged materials shall be delivered in original undamaged packages.

.4 Storage and Protection:

.1 Keep materials dry until use.

.2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material and pallets in appropriate on-site for recycling.

.3 Unused metal materials are to be diverted from landfill to a metal recycling facility as approved by Contract Administrator.

.4 Unused or damaged masonry materials must be diverted from landfill to a local quarry facility as approved by Contract Administrator.

1.7 SITE CONDITIONS

.1 Site Environmental Requirements:

.1 Cold weather requirements – Supplement Clause 5.15.2 of CSA A371 with the following requirements:

.1 Maintain temperature of mortar between five (5) and forty (40) degrees Celsius until batch is used or becomes stable; and

.2 Maintain ambient temperature between five (5) and forty (40) degrees Celsius and protect Site from wind.

.2 Hot weather requirements:

.1 Protect freshly laid masonry from drying too quickly by means of waterproof, non-staining coverings; and

.2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until Masonry Work is completed and protected by flashings or other permanent construction.

Part 2 Products

2.1 MATERIALS

.1 Standard concrete masonry units Type S: to CAN3-A165 Series (CAN3-A165.1):

.1 Classification: H/15/A/M.

.2 Solid units: S/15/A/M.

.3 Sizes:

.1 Metric modular, one hundred ninety (190) by three hundred ninety (390) millimetres face to thicknesses indicated on the Drawings, and complete with return corners and required shapes; and

.2 Metric modular, concrete brick fifty-seven (57) by one hundred ninety (190) millimetres face to thicknesses indicated on the Drawings, and complete with return corners and required shapes.

.4 Special shapes: provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.

.5 Color: standard grey.

.2 Face Brick: to CSA A82.14, ASTM C216:

.1 Type FBS, Grade SW.

.2 Size: 57 modular.

.3 Special shapes: provide solid units where core exposed to final assembly.

.4 Running bond.

.5 Acceptable materials: I-XL Interstate Brick's Mountain Red Brick.

.3 Lime Stone: to ASTM C568:

.1 Category II, medium density.

.2 Acceptable materials: Tydall Stone Gillis Quarries Ltd, Winnipeg, Manitoba.

.3 Grey color, sawn-face, sawn top and bottom beds, ninety (90) millimetres thickness, one hundred ninety (190) millimetres course height.

.4 Mortar and Grout: to CSA A179:

.1 Type N based on Proportion Specifications.

.2 Use non-staining mortar for Limestone Work.

.5 Masonry Connector: to CSA A370 and CSA S304:

.1 Galvanized.

.2 Block shear connector assembly as manufactured by Fero Corp.

.3 Consists of connector plate, V-tie and polyethylene insulation support.

.6 Masonry Reinforcement:

.1 All masonry walls shall be reinforced by means of the following unless otherwise specified:

.1 Blok-Trus: standard truss type masonry wall reinforcing fabricated of 3.8 millimetres parallel side rods welded to a continuous diagonal formed cross rod of 3.8 millimetres cold drawn steel wire, hot-dipped galvanized after fabrication. Overall width of reinforcing shall be approximately fifty (50) millimetres less than the nominal wall thickness.

.2 For single wythe walls: use Blok-Trus Type BL-30.

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.3 For exterior cavity walls: use Blok-Trus Type BL-31 where masonry joints across cavity are horizontally aligned. If joints not aligned, use Blok-Trus BL-36 with galvanized hooked box ties.

.4 Corner-Lok: of same gauge and finish material as specified for Blok-Trus.

.5 Partition-Lok: of same gauge and finish material as specified for Blok-Trus.

.6 Adjustable veneer anchors: Blok-Lok BL-407 with Type "S" ties, galvanized steel.

.2 Masonry reinforcement shall be as manufactured by Blok-Lok, Duro-O-Wal Limited or Consultant approved equal.

.7 Masonry Flashing:

.1 Self-adhesive bitumen sheet membrane, minimum one (1.0) millimetres thick.

.2 Acceptable materials: Henry® Blueskin SA, WE Grace Perm-a-Barrier, Soprema Colphene 1500.

.8 Mortar Net and Wall Vents:

.1 Mortar Break II as manufactured by Advanced Building Products Inc.

.2 Mortar Maze weep system, colour matched to mortar, as manufactured by Advanced Building Products Inc.

.9 Cavity Wall Insulation and Adhesive:

.1 Cavity wall insulation air barrier and adhesive material are specified under Section 07 21 19 – Sprayed Foam Insulation.

.10 Control Joint Fillers:

.1 Joint backing material for caulking of joints shall be white, non-absorbent, closed cell foam polyethylene.

.11 Metal Drip Edge:

.1 Brake formed of twenty-four (24) ga prefinished steel sheet of same color as sheet metal roofing.

.2 Form drip edge to extend one hundred (100) millimetres under base course, with six (6) to nine (9) millimetres formed drip at front edge.

Part 3 Execution

3.1 PREPARATION

.1 Provide temporary bracing of masonry Work during and after erection until permanent later support is in place.

.2 The Contractor is responsible for ensuring the adequacy of the bracing.

3.2 CONSTRUCTION

.1 Concrete block units:

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.1 Bond: running.

.2 Coursing height: two hundred (200) millimetres for one (1) block and one (1) joint.

.3 Jointing: concave where exposed or where paint or other finish coating is specified.

.2 Face Brick:

.1 Bond: stretcher running.

.2 Course height two hundred (200) millimetres for three (3) bricks and three (3) joints.

.3 Exposed cores not permitted.

.3 Limestone:

.1 Pattern: Random coursed ashlar.

.2 Joint lines to run horizontally and vertically.

.3 Stagger vertical joints.

.4 Concrete block lintels:

.1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.

.2 End bearing: not less than two hundred (200) millimetres.

.5 Do all masonry Work in accordance with CSA A371.

.6 Supply and install masonry connectors and reinforcement in accordance with CSA A370, CSA A371, CSA A23.1 and CSA S304, and as indicated on the Drawings and masonry notes. Coordinate the installation of the roof truss uplift anchors with roof truss supplier and Subcontractor.

.1 Minimum horizontal joint reinforcement shall consist of 3.8 millimetres diameter truss type wire reinforcing with deformation placed every two hundred (200) millimetres. All splices shall be lapped minimum eight hundred (800) millimetres from course to course. Joint reinforcement shall be made continuous at all wall corners by mean of specifically manufactured L shaped pieces.

.2 Minimum horizontal bar reinforcement shall consist of twenty (20) MPa concrete filled four hundred (400) millimetres deep U block bond beams reinforced with 2-15M continuous with matching corner bars.

.3 Provide reinforced lintels over all openings as follows:

.1 Up to one thousand two hundred (1,200) millimetres span – twenty (20) MPa concrete filled U block reinforced with 2-15M bearing two hundred (200) millimetres each end, with three (3) cores filled in wall each end.

.2 From one thousand two hundred (1,200) to two thousand four hundred (2,400) millimetres span – twenty (20) MPa concrete filled four hundred (400) millimetres U block reinforced with 2-15M bearing two hundred (200) millimetres each end, with three (3) cores filled in wall each end.

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.4 Minimum vertical reinforcement shall consist of 15M full height bar with twenty (20) MPa filled core at one thousand (1,000) millimetres o/c, at each wall corner, at each side of doors and at each side of openings.

.7 Build masonry plumb, level, and true to line, with vertical joints in alignment. Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

.8 Remove chipped, cracked and otherwise damage units in exposed masonry and replace with undamaged units.

.9 Cut out for electrical switches, outlet boxes and other recessed or built-in objects. Make cuts straight, clean and free from uneven edges

.10 Build in items required to be built into masonry. Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as Work progresses.

.11 Construct continuous control joints in exterior masonry veneer. Fill joints with joint filler, backer rods and sealant.

.12 Tool joints with round jointer to provide concave joints where exposed or to receive paint or other thin finish coating. Strike flush all joints located in concealed spaces.

.13 Keep masonry cavity free of mortar droppings.

.14 Provide weep holes over masonry flashings, spaced at maximum eight hundred (800) millimetres o/c.

.15 Build in flashing in masonry in accordance with CSA A371. Carry under base course and up backup wall minimum one hundred fifty (150) millimetres and seal stop edge.

.16 Install metal drip edge over masonry flashings at base courses and angles lintels. Align drip edge straight and even. Overlap joints minimum twenty (20) millimetres.

3.3 SITE TOLERANCES

.1 Tolerances in notes to CSA A371 apply.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing will be carried out by testing laboratory designated by the Contract Administrator.

3.5 CLEANING

.1 Standard block: Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.

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.2 Faced brick and stone block: Clean masonry as Work progresses using soft, clean cloths, within few minutes after laying. Upon completion, when mortar has set so that it will not be damaged by cleaning, clean with soft sponge or clean cloths, brush and clean water.

.3 Post-construction: clean area of wall designated by Contract Administrator as directed below and leave for one (1) week. If no harmful effects appear and after mortar has set and cured, clean masonry as follows:

.1 Remove large particles with wood paddles without damaging surface. Saturate masonry with clean water and flush off loose mortar and dirt.

.2 Scrub with solution of twenty-five (25) mL Trisodium phosphate and twenty-five (25) mL household detergent dissolved in one (1) litre of clean water using stiff fibre brushes, then clean off immediately with clean water using hose. Alternatively, use proprietary compound recommended by brick masonry manufacturer in accordance with manufacturer's directions.

.3 Repeat cleaning process as often as necessary to remove mortar and other stains.

.4 Use alternative cleaning solutions and methods for difficult to clean stone only after consultation with masonry unit manufacturer.

.4 Protect sills, doors, trims and other Work.

.5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

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Part 1 General

1.1 RELATED SECTIONS

.1 The Contract Documents applied to the Work of this Section.

1.2 REFERENCES

.1 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.

.2 ASTM A193/A193M-16, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and Other Special Purpose Applications.

.3 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60,000 psi Tensile Strength.

.4 ASTM A325-14, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.5 ASTM A325M-14, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric).

.6 ASTM F3125/F3125M-15a, Standard Specification for High-Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.7 CAN/CGSB-85.10-99, Protective Coatings for Metals.

.8 Handbook of Steel Construction, 11th Edition (2016).

.9 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.

.10 CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel.

.11 CAN/CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

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

.13 CAN/CSA-S16-14, Design of Steel Structures.

.14 CAN/CSA-S136-12, North American Specification for the Design of Cold-Formed Steel Structural Members.

.15 CAN/CSA-S136.1-12, Commentary on North American Specification for the Design of Cold-Formed Steel Structural Members.

.16 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.

.17 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.

.18 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.

.19 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.20 MPI-R2012, Architectural Painting Manual.

.21 MPI-R2012, Maintenance Repainting Manual: Interior Repainting.

.22 MPI-R2012, Maintenance Repainting Manual: Exterior Repainting.

.23 The Society for Protective Coatings (SSPC).

1.3 DESIGN REQUIREMENTS

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

.2 Design shear connections to develop shear capacity of member being connected and show details on Shop Drawings.

.3 Design moment connections to develop moment capacity of member being connected and show details on Shop Drawings.

.4 Design all temporary bracings as required for structural stability during construction stages.

.5 Design all bolt connections with a minimum two (2) bolts in a connection.

.6 Submit sketches and design calculations signed and sealed by a Professional Engineer registered in the Province of Manitoba for non-standard connections.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 – Submittals Procedures.

.2 For LEED projects, submit Shop Drawings with accompanying LEED Requirements and Environmental Procedures.

.3 Erection Drawings shall include details and information necessary for assembly and erection purposes, framing plans and grid lines, bearing details, framed openings, accessories, schedule of materials, camber and loading, fasteners and welds and required temporary bracing.

.4 Additional Erection Drawings including sequence of erection and type of equipment used in the erection may be required.

.5 Ensure Fabricator Drawings showing designed assemblies, components and connections are signed and sealed by a Professional Engineer registered in the Province of Manitoba.

.6 All Shop Drawings to be reviewed and checked by the Contractor prior to submission to the Contract Administrator.

.7 Review of Shop Drawing by the Contract Administrator in no way relieves the Contractor responsibility for the accuracy of the Shop Drawings.

.8 Specify primer to be used for each member and components.

.9 Fabricator is to certify that all connection design and details including erection procedure have been supervised and carried out by a Professional Engineer registered in the Province of Manitoba.

1.5 QUALITY ASSURANCE

.1 If requested, submit two (2) copies of mill test reports two (2) weeks prior to fabrication of structural steel.

.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in Project.

.2 Provide mill test reports certified by metallurgists qualified to practice in Canada.

.2 If requested, provide structural steel Fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

.3 Submit welder’s Certificates.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

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

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials to metal recycling facility.

.5 Divert unused paint material to hazardous material collections facility.

.6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.7 Clean up and remove all rubbish and surplus materials from Site.

Part 2 Products

2.1 MATERIALS

.1 Structural steel: to CAN/CSA-G40.20/G40.21 (or ASTM A36/A36M) Grade 350W for rolled section and Grade 300W for plates and angles.

.2 Cold-formed structural members: to CAN/CSA-S136.

.3 Anchor bolts: to CAN/CSA-G40.20/G40.21 Grade 300W.

.4 High strength anchor bolts: to ASTM A193/A 93M.

.5 Bolts, nuts and washers: to ASTM A325/A325M.

.6 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.

.7 Primer: to CISC/CPMA1 for interior steel and to CISC/CPMA2 for exterior steel.

.8 Hot dip galvanizing: galvanize steel, for exterior steel and for where indicated, to CAN/CSA-G164, minimum zinc coating of seven hundred (700) g/m^2.

.9 Shear studs: to CSA W59, Appendix H.

2.2 FABRICATION

.1 For rehabilitation and remediation projects, verify dimensions prior to commencing fabrication.

.2 Fabricate structural steel in accordance with CAN/CSA-S16 and/or CAN/CSA-S136.

.3 Weld to CSA W59.

.4 Joint surfaces to be free from fins and tears.

.5 Install shear studs in accordance with CSA W59.

.6 Continuously seal members by continuous welds where indicated. Grind smooth.

.7 Seal all hollow structural sections with suitable cap plates or by welding all around to adjoining members.

.8 Splice members are not allowed unless noted otherwise or with a written consent of the Contract Administrator. Where spliced, reliable non-destructive inspection such as X-ray is mandatory to ensure the splice workmanship and at the Contractor’s expense.

.9 Weld threaded studs to top flanges for attachment of wood nailers.

.10 Clean, prepare surfaces in accordance with SSPC and prime structural steel in accordance with MPI except where members to be encased in concrete.

Part 3 Execution

3.1 GENERAL

.1 Structural steel Work: to CAN/CSA-S16 and/or CAN/CSA-S136.

.2 Welding: in accordance with CSA W59.

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

3.2 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of Existing Work, report discrepancies and potential problem areas to Contract Administrator for direction before commencing fabrication.

3.3 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.4 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and/or CAN/CSA-S136 and in accordance with approved reviewed Erection Drawings.

.2 Field cutting or altering structural members: to approval of Contract Administrator.

.3 Provide all temporary bracings.

.4 Fix and attach all members and bracing by means of field welding.

.5 Continuously seal members by continuous welds where indicated. Grind smooth.

.6 Level, plumb and align all members to CAN/CSA S16.

.7 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.8 Galvanize all exterior structural steel components and all noted or specified components to ASTM A123/A123M.

.9 Weld all anchors required to restrain concrete masonry walls.

.10 Correct to acceptance all errors in member fit and erection.

.11 Do not place holes or openings in structural members without the approval of Contract Administrator. Provide reinforcing plates around all openings to maintain design strength where approval is granted.

.12 Frame all openings in steel deck exceeding four hundred (400) millimetres across the flutes.

.13 Provide steel plates, shelf angles, including anchors, required to support steel deck on masonry walls.

3.5 FIELD QUALITY CONTROL

.1 The Contract Administrator, and/or the City of Winnipeg's representative will periodically visit the Site.

.2 Field services by the Contract Administrator, and/or the City of Winnipeg's representative do not in any way relieve the Contractor's responsibility to carry out work as shown in the Contract Documents.

.3 Inspection of materials and workmanship to be carried out by an independent inspection and testing firm certified in accordance with CAN/CSA W178.1 retained and paid for by the Contractor and approved by the Contract Administrator, and/or the City of Winnipeg's representative.

.4 An independent inspection shall include:

- .1 Visual inspection of all welds and workmanship that are readily accessible;
- .2 Random check of structural steel member sizes and steel deck gauge;
- .3 Other non-destructive tests, if required;
- .4 Review welder's certificates and welding procedure;
- .5 Inspect all puddle welds and side lap crimping of accessible steel decking;
- .6 Confirm acceptable coatings;
- .7 Tracking all noted deficiencies and providing report to all relevant parties; and
- .8 A final report sealed and signed by a Professional Engineer registered in the province where the Work is located certifying that all welds and connections, including confirmation that required repairs have been completed.

.5 Provide safe access and working areas for testing and inspection on Site, as required by testing agency and/or the Contract Administrator.

.6 Submit mill test reports to Contract Administrator, and/or the City of Winnipeg's representative upon request.

.7 The Contractor will pay costs of inspection and testing, re-inspection as a result of defective workmanship, and repairs to correct defective Work.

.8 Additional inspection or test may be requested by the Contract Administrator, with the approval of the City of Winnipeg. The cost associating with approved additional inspections or tests to be paid for by the City of Winnipeg.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 The Contract Documents applied to the Work of this Section.

1.2 REFERENCES

.1 ASTM A653/A653M-17, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A792M-10 (2015), Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.3 CSA C22.2 No.79-16, Cellular Metal and Cellular Concrete Floor Raceways and Fittings.

.4 CAN/CSA S16-14, Design of Steel Structures.

.5 CAN/CSA S136-16, North American specification for the design of cold-formed steel structural members.

.6 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.

.7 CSA W55.3-08 (R2013), Certification of companies for resistance welding of steel and aluminum.

.8 CSA W59-13, Welded steel construction (metal arc welding).

.9 CSSBI 12M-15, Standard for Composite Steel Deck.

1.3 DESIGN REQUIREMENTS

.1 Design steel deck using limit states design in accordance with CSA S136 and CSSBI 12M.

.2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action and uplift as indicated.

.3 Deflection under specified live load not to exceed 1/240 of span.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings, Erection and Shoring Drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit Drawings stamped and signed by qualified Professional Engineer registered or licensed in the Province of Manitoba, Canada.

.3 Submit design calculations if requested by Contract Administrator.

.4 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacing, projections, openings, reinforcement details and accessories.

.5 Indicate details of temporary shoring of steel deck, such as location, time and duration of placement and removal of shoring for concrete fill decks.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Divert unused metal from landfill to metal recycling facility approved by the Contract Administrator.

.3 Dispose of unused paint material at official hazardous material collections site approved by the Contract Administrator.

.4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.5 Dispose of unused caulking material at official hazardous material collections site approved by the Contract Administrator.

Part 2 Products

2.1 MATERIALS

.1 Coated steel sheet: to ASTM A653/A653M structural quality with ZF75 coating.

.2 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 1.2 millimetres. Metallic coating same as deck material.

.3 Primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.2 TYPES OF DECKING

.1 Composite steel deck: Nominal depth and minimum thicknesses as noted on Drawings.

Part 3 Execution

3.1 GENERAL

.1 Structural steel Work: in accordance with CAN/CSA-S136 and CSSBI 12M.

.2 Welding: in accordance with CSA W59, except where specified otherwise.

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

3.2 ERECTION

.1 Erect steel deck as indicated and in accordance with CSA S136 and CSSBI 12M and in accordance with reviewed erection Drawings.

.2 Button punch side laps mechanically, six hundred (600) millimetres on center (o/c) maximum unless otherwise shown on the Drawings.

.3 Lap ends: to fifty (50) millimetres minimum.

.4 Weld and test stud shear connectors through steel deck to steel joists/beams below in accordance with CSA W59.

.5 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

.6 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.

.7 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains seventy-five percent (75%) of its specified twenty-eight (28) day compression strength.

.8 Place and support reinforcing steel as indicated.

.9 Minimum bearing on steel: seventy-five (75) millimetres.

.10 Weld deck to supporting steel with twenty (20) millimetres diameter spots three hundred (300) millimetres on center (o/c) at interior supports and one hundred fifty (150) millimetres on center (o/c) maximum at exterior supports unless noted otherwise on Drawings. Use weld washers where necessary. Fill weld centers so that the center height is not below the original metal surface. Fuse the sheet at the periphery of each plug weld for a minimum of seventy-five percent (75%) of the circumference of the plug weld. No burn-through is allowed.

.11 Excessive burning and damage to support structures resulting from careless or improper deck welding to be repaired and made good at the expense of the Contractor.

.12 In the event of the repairs to support structure are deemed necessary, a letter, signed and sealed by a Professional Engineering registering in the Province of Manitoba, certifying to the adequacy of the repair for the stipulated loading conditions shall be provided by the Contractor.

3.3 CLOSURES

.1 Install closures in accordance with approved details.

3.4 OPENINGS AND AREAS OF CONCENTRATED LOADS

.1 No reinforcement required for openings cut in deck which are smaller than one hundred fifty (150) millimetres square.

.2 Frame deck openings between one hundred fifty (150) to three hundred (300) millimetres across the flutes with seventy-five (75) by seventy-five (75) by six (6) angle, extended two (2) flutes and welded to each side of openings.

.3 For deck openings with any one (1) dimension greater than three hundred (300) millimetres and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.5 CONNECTIONS

.1 Install connections in accordance with CSSBI recommendations as indicated.

3.6 FIELD QUALITY CONTROL

.1 Contract Administrator will conduct Site visits to determine in general if the quality of the Work is in accordance with the Contract Documents.

.2 Field services by the Contract Administrator do not any way relieve the Contractor of his responsibility to carry out the Work as shown in the Contract Documents.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 The Contract Documents applied to the Work of this Section.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM):

.1 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless;

.2 ASTM A269/A269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service;

.3 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; and

.4 ASTM A108-18, Standard Specification for Steel Bar, Carbon and Alloy, Cold-finished.

.2 Canadian Standards Association (CSA International):

.1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel;

.2 CAN/CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles;

.3 CAN/CSA-S16-14, Design of Steel Structures;

.4 CAN/CSA S167-17, Strength Design in Aluminum;

.5 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding; and

.6 CSA W59-18, Welded Steel Construction (Metal Arc Welding).

1.3 SUBMITTALS

.1 Qualification:

.1 Submit qualifications of the manufacturer, welder, mill certificates.

.2 Shop Drawings:

.1 Submit Shop Drawings signed and sealed by a Professional Engineer practicing in the Province of Manitoba.

.2 Indicate erection detail, materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories.

1.4 QUALITY ASSURANCE

.1 Fabricator and welders must be certified in accordance with CSA and the Canadian Welding Bureau.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Storage and Protection:

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.1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job Site.

.2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

.3 Store materials off ground in a dry, well-ventilated area.

.4 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

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

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 350W/300W.

.2 Steel pipe: to ASTM A53/A53M galvanized finished.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A307.

.6 Studs Anchors: to ASTM A108 Gr 1020.

.7 Aluminum: to CSA S157 and the Aluminum Association Specifications for Aluminum Structures.

.8 Aluminum plates: type 6061-T651. Aluminium plate shall have an approved raised multi-grip pattern.

.9 Aluminum welding: CAN W59.2.

.10 Hot Dipped Galvanized Steel Repair: Galvalloy, Gal-Viz.

.11 Grout: non-shrink, non-metallic, flowable, fifteen (15) MPa at twenty-four (24) hours.

2.2 FABRICATION

.1 Fabricate Work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Confirm measurements for all fabrications before fabricating.

.3 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as noted.

.4 Where possible, fit and shop assemble Work, ready for erection.

.5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.6 Remove and grind smooth burrs, filings, sharp protrusions and projections from metal fabrications to prevent possible injury.

2.3 ACCESS COVERS

.1 All aluminum surfaces in contact with concrete shall be isolated using alkali-resistant bituminous paint meeting the requirement of CGSB 31-GP-3M.

.2 Aluminum plates shall have an approved raised multi-grip pattern with edges straight and true, and shall be cut as far as practical to maintain continuity of the pattern at abutting edges.

.3 Angle frames shall be of the same material as cover plates, and cover plates shall be hinged and be supplied with lifting handles, as required.

2.4 PIPE BOLLARDS

.1 Steel pipe: double strong, diameter as indicated, hot-dip galvanized.

.2 Concrete: Type HS or HSb sulphate resistant, minimum twenty (20) MPa.

2.5 RAILS

.1 Steel pipe: diameter as indicated, hot-dip galvanized after fabrication.

.2 Fabricate and install pipe rails to be removable as indicated on Drawings. Sleeve to be secured in concrete slab.

2.6 Self-Closing Safety Gate

.1 Fully assembled gate shall be capable of swinging in either direction by inverting installation position. Gate size shall be laterally adjusted from minus 32 mm (1-1/4 inch) to plus 64 mm (2-1/2 inch).

.2 Approved Product: GuardDog Self-Closing Safety Gate

- .1 Standards: System shall have top and mid rail in accordance with OSHA Standards - 29 CFR 1910.29 (b)(1)(2)
- .2 Width: As indicated on Drawings.
- .3 Height:
  - .1 Top Rail: 1067 mm (42 inches), minimum.
  - .2 Bottom Rail: 533 mm (21 inches).
- .4 Hardware: Provide the following:

□

.1 Gate Hardware: U-Bolts.

.2 Universal Hinge Assembly: Fits railing types up to 51 mm (2 inches) O.D. or flat surface mounting.

.3 Railing adapter kit.

.4 Self-Closing Springs: Two stainless steel torsion springs.

.5 Material: Mild steel, hot-dip galvanized with powder-coated finish.

.3 Acceptable Manufacturer:

.1 Bluewater Manufacturing (https://www.safetygate.com)

.2 Consultant approved equivalent

2.7 STAIRS

.1 Stairs sizes and framings as indicated.

.2 Galvanized after fabrication.

2.8 HOIST BEAMS

.1 Steel beams to be pocketed on Masonry wall as per Drawings.

.2 Finish: galvanize.

2.9 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating six hundred (600) g/m^2 to CAN/CSA-G164.

.2 Paint for shop primed ferrous metal surfaces: MPI EXT 5.1D Alkyd G5 (semi-gloss) finish, premium grade. Color schedule will be provided by the Contract Administrator.

.3 Zinc primer: zinc rich, ready mix.

Part 3 Execution

3.1 ERECTION

.1 Do welding Work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight and true, accurately fitted, with tight joints and intersections.

.3 Provide components for building by other sections in accordance with Shop Drawings and schedule.

.4 Make field connections with bolts to CAN/CSA-S16, or weld.

.5 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

□

3.2 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

□

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 61 00 – Common Product Requirements.

.4 Section 01 74 19 – Waste Management and Disposal.

.5 Section 05 50 00 – Metal Fabrication.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA B111-1974(R1998), Wire Nails, Spikes and Staples;

.2 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles;

.3 CAN/CSA-O141-91(R1999), Softwood Lumber; and

.4 CSA O151-M1978 (R1998), Canadian Softwood Plywood.

.2 National Lumber Grades Authority (NLGA):

.1 Standard Grading Rules for Canadian Lumber 2000.

1.3 QUALITY ASSURANCE

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

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

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

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

.4 Divert unused wood materials from landfill to approved facility.

.5 Do not dispose of preservative treated wood through incineration.

.6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.

.7 Dispose of treated wood, end pieces, wood scraps and sawdust at approved sanitary.

.8 Dispose of unused wood preservative material at official, approved hazardous material collections site.

.9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

Part 2 Products

2.1 LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content nineteen percent (19%) or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Furring, blocking, nailing strips and fascia backing:

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

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

2.2 PANEL MATERIALS

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

.2 Fire retardant treated plywood to be G1S – Good One Side: BC fir plywood with smooth sanded surface on one (1) side suitable for painting and be pressure impregnated with fire-retardant chemicals in conformance with CAN/CSA-O80 Series-M, “Wood Preservation”, and have a flame-spread rating not more than twenty-five (25).

2.3 ACCESSORIES

.1 Nails, spikes and staples: to CSA B111, hot dipped galvanized.

.2 Bolts: 12.5 millimetres diameter unless indicated otherwise, complete with nuts and washers.

.3 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.

.4 All interior fasteners to be type 304 stainless steel.

2.4 WOOD PRESERVATIVE

.1 Surface-applied wood preservative: copper napthenate or five percent (5%) pentachlorophenol solution, water repellent preservative.

.2 Pentachlorophenol use is restricted to building components that are in ground contact and subject to decay or insect attack only. Where used, pentachlorophenol-treated wood must be covered with two (2) coats of an appropriate sealer.

.3 Structures built with wood treated with pentachlorophenol and inorganic arsenicals must not be used for storing food nor should the wood come in contact with drinking water.

Part 3 Execution

3.1 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 three (3) minute soak on lumber and one (1) minute soak on plywood.

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

.4 Treat material as indicated and as follows:

.1 Curbs, nailers, sleepers on roof deck and parapets.

.2 Wood furring within outside surface of exterior masonry and concrete walls.

.3 All wood in contact with unfinished concrete or masonry.

3.2 INSTALLATION

.1 Install furring and blocking as required to space-out and support fascia, soffit, siding and other work as required.

.2 Align and plumb faces of furring and blocking to tolerance of one (1): six hundred (600).

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

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

.5 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

.6 Sheathing:

.1 Install plywood sheathing with surface grain at right angles to roof framing, and in accordance with requirement of the National Building Code, and to the plywood manufacturer's recommendations.

3.3 ERECTION

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

.2 Countersink bolts where necessary to provide clearance for other Work.

3.4 SCHEDULES

.1 Provide electrical equipment backboards for mounting electrical and telecommunications/data equipment as indicated.

.2 Use nineteen (19) millimetres thick fire retardant treated plywood on nineteen (19) by thirty-eight (38) millimetres furring spaced at maximum three hundred (300) millimetres centres and at vertical edges of mounting board.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 The Contract Documents applied to the Work of this Section.

1.2 REFERENCES

.1 National Building Code of Canada (NBC).

.2 Manitoba Building Code (MBC).

.3 Canadian Standards Association (CSA):

.1 CAN/CSA-O80 Series, Wood Preservation;

.2 CAN/CSA-O86.1, Engineering Design in Wood;

.3 CAN/CSA-O141, Softwood Lumber;

.4 CSA S307-, Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings;

.5 CSA S347, Method of Test for Evaluation of Truss Plates Used in Lumber Joints; and

.6 CSA W47.1, Certification of Companies for Fusion Welding of Steel.

.4 National Lumber Grades Authority (NLGA):

.1 NLGA, Standard Grading Rules for Canadian Lumber.

.5 Truss Plate Institute of Canada (TPIC):

.1 TPIC, Truss Design Procedures and Specifications for Light Metal Plate Connected Trusses (Limit States Design).

1.3 DESIGN REQUIREMENTS

.1 Design trusses, bracing, blocking and bridging in accordance with CAN/CSA-O86.1 for loads indicated and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.

.2 Limit live load deflection to 1/360 of span where plaster gypsum board ceilings are hung directly from trusses.

.3 Limit live load deflections to 1/240 of span unless otherwise specified or indicated.

.4 Provide camber for trusses as required.

1.4 SOURCE QUALITY CONTROL

.1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

.2 Certify preservative and fire retardant treated wood in accordance with CAN/CSA-O80 Series.

1.5 QUALIFICATION OF MANUFACTURERS

.1 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

1.6 QUALITY ASSURANCE

.1 Provide Certificate of Quality Compliance from truss manufacturer upon completion of fabrication.

.2 Provide Certificate of Quality Compliance upon satisfactory completion of installation.

1.7 SUBMITTALS

.1 Each Shop Drawing submission shall bear signature and stamp of Professional Engineer registered or licensed in Province of Manitoba, Canada.

.2 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates.

.3 Indicate species, sizes and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.

.4 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.

.5 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

.6 Show lifting points for storage, handling and erection.

.7 Show location of lateral bracing for compression members.

1.8 DELIVERY AND STORAGE

.1 Deliver to and store on job Site in accordance with manufacturer's instructions. Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

Part 2 Products

2.1 MATERIALS

.1 Lumber: Spruce (S-P-F) species, No. 1 grade, softwood, S4S, with maximum moisture content of nineteen percent (19%) at time of fabrication and to following standards:

.1 CAN/CSA-O141; and

.2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.

.2 Fastenings: to CAN/CSA-O86.1.

2.2 FABRICATION

.1 Fabricate wood trusses in accordance with reviewed Shop Drawings.

.2 Provide for design camber and roof slopes when positioning truss members.

.3 Connect members using metal connector plates.

Part 3 Execution

3.1 ERECTION

.1 Erect wood trusses in accordance with reviewed Erection Drawings.

.2 Indicated lifting points to be used to hoist trusses into position.

.3 Make adequate provisions for handling and erection stresses.

.4 Exercise care to prevent out-of-plane bending of trusses.

.5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.

.6 Install permanent bracing in accordance with reviewed Shop Drawings, prior to application of loads to trusses.

.7 Do not cut or remove any truss material without approval of Contract Administrator.

.8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

3.2 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment on completion of installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM E96/E96M 05, Standard Test Methods for Water Vapour Transmission of Materials.

.2 Canadian General Standards Board (CGSB):

.1 CGSB 71 GP 24M 77 (R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

.3 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S701 05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings; and

.2 CAN/ULC S702 97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.

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

.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, Specifications and data sheet in accordance with Special Provisions of the Contract.

.2 Submit two (2) copies of WHMIS MSDS Material Safety Data Sheets in accordance with Special Provisions of the contract. Indicate VOC's insulation products and adhesives.

.2 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.3 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal

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

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on Site for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 INSULATION

.1 Horizontal Rigid Insulation: Styrofoam™ Highload Ultra by Dow Chemical Canada Inc., or approved equal, extruded polystyrene foam to CAN/ULC S701 Type 4.

.2 Vertical Exterior Perimeter foundation insulation:

.1 CFI (concrete faced insulated panels) by Tech-Crete Processors Ltd., or approved equal, extruded polystyrene foam to CAN/ULC S701 Type 4.

.2 Styrofoam SM by Dow Chemical Canada Inc., or approved equal, expanded closed cell polystyrene to CAN/CGSB-51.20 Type 4.

.3 Provide in total thickness and depth as shown on the Drawings.

2.2 ADHESIVE

.1 Adhesive (for polystyrene): to CGSB 71 GP 24, compatible with specified insulation.

Part 3 Execution

3.1 MANUFACTURING INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets.

3.2 WORKMANSHIP

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum three (3) inches (seventy-five (75) millimetres) from heat emitting devices.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected and approved by Engineer.

3.3 EXAMINATION

.1 Examine substrates and immediately inform the Contract Administrator in writing of defects.

.2 Prior to commencement of work ensure:

.1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 RIGID INSULATION INSTALLATION

.1 Apply adhesive to substrate in accordance with manufacturer's recommendations.

.2 At below grade locations on concrete walls against soil, imbed insulation boards in spots of adhesive sufficient to hold them in place until backfilled.

3.5 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 SCOPE

.1 This Section describes the requirements for blanket insulation applied to inside walls and attic space.

1.2 REFERENCES

.1 National Building Code of Canada (NBC).

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

.1 ASTM C553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications; and

.2 ASTM C665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.3 Canadian Standards Association (CSA International):

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

.4 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, Specifications and data sheet in accordance with Section 01 33 00 – Submittal Procedures.

.2 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal

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

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on Site for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 INSULATION

.1 Batt and blanket mineral fibre: to ASTM C665 and CAN/ULC S702.

.1 Type: Owens Corning Pink Fibre glass or approved equal in accordance with B7.

.2 Thickness: one hundred forty (140) millimetres providing total insulation value RSI 3.52 (R20), or to fill cavities as indicated on Drawings.

.3 Thickness: providing total insulation value RSI 7.04 (R40) to attic space.

2.2 ACCESSORIES

.1 Type: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets.

3.2 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C1320.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

.4 Keep insulation minimum seventy-five (75) millimetres from heat emitting devices such as recessed light fixtures, and minimum fifty (50) millimetres from sidewalls of chimneys and Type B vents.

.5 Do not enclose insulation until it has been inspected and approved by Contract Administrator.

3.3 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 19 – Waste Management and Disposal.

1.2 REFERENCES

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

.2 Underwriters' Laboratories of Canada (ULC):

.1 CAN/ULC-S101-1989, Fire Endurance Tests of Building Construction and Materials;

.2 CAN/ULC-S102-1988 (R2000), Surface Burning Characteristics of Building Materials and Assemblies;

.3 CAN/ULC-S705.1-01, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Material Specification; and

.4 CAN/ULC-S705.2-02, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Installer's Responsibilities-Specification.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, Specifications and datasheet and include:

.1 Product characteristics;

.2 Performance criteria; and

.3 Limitations.

.3 Submit two (2) copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

1.4 TEST REPORTS

.1 Submit test reports, verifying qualities of insulation meet or exceed requirements of this Specification.

.2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

1.5 QUALITY ASSURANCE

.1 Applicators to conform to CUFCA Quality Assurance Program.

1.6 SAFETY REQUIREMENTS

.1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:

.1 Workers must wear gloves respirators dust masks long sleeved clothing eye protection protective clothing when applying foam insulation.

.2 Workers must not eat, drink or smoke while applying foam insulation.

1.7 PROTECTION

.1 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.

.2 Protect adjacent surfaces and equipment from damage by overspray, fall-out and dusting of insulation materials.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

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

.3 Dispose of waste foam daily in location approved by Contract Administrator and decontaminate empty drums in accordance with foam manufacturer's instructions CAN/ULC-S705.2.

.4 Divert metal drums from landfill to metal recycling facility as approved by Contract Administrator and to CAN/ULC-S705.2.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

1.10 SURFACE PREPARATION

.1 Surfaces must be clean and dry, as required by CAN/ULC-S705.2-98. The substrate must be free of all frost, dust, oil, grease, oxidization or any other element that may affect adhesion of the system i.e. high moisture content.

.2 Metallic surfaces should be checked to ensure no oxidization has occurred.

.3 All transition membranes must be installed prior to application of the polyurethane foam. These membranes must be installed in accordance with the manufacturer’s recommendations. Adhesion of the membranes to the substrate must be sufficient to resist the stress applied by the polyurethane foam during the curing time.

.4 All of the following stages must be completed prior to application of the insulating/air barrier system:

.1 Installation of masonry anchoring system;

.2 Installation of wood blocking required at all openings;

.3 Installation of any electrical or mechanical penetrations; and

.4 Adjacent areas have been protected via drop sheets or polyethylene masking.

Part 2 Products

2.1 MATERIALS

.1 Acceptable products:

.1 Insulation: 'Walltite', spray polyurethane to CAN/ULC-S705.1.

.2 Contract Administrator approved equal in accordance with B7.

.3 Primers: in accordance with manufacturer's recommendations for surface conditions.

.4 Transition membranes: Bakor Blueskin four (4) mil (one (1) millimetre) thick self-adhering EPDM membrane.

2.2 ACCEPTABLE SOURCES

.1 Manufacturers of Foam-in-Place Insulations having comparable products conforming to the requirements of this Section, considered acceptable for use:

.1 BASF – The Chemical Company; and

.2 Contract Administrator approved equal in accordance with B7.

Part 3 Execution

3.1 APPLICATION

.1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions. Use primer where recommended by manufacturer.

.2 Apply sprayed foam insulation in uniform minimum thickness of fifty (50) millimetres with minimum aged thermal resistance value of 1.05RSI per twenty-five (25) millimetres. (R6 per inch).

.3 All excessively wide joints should be covered or filled before applying the polyurethane foam.

.4 Polyurethane foam to be sprayed as per the Standard CAN/ULC-S705.2 with a tolerance of +6/-0 millimetres in relation to the specified thickness, functioning as an effective and continuous air and vapour barrier.

.5 Avoid the formation of sub-layer air pockets when applying.

.6 Avoid spraying the foam on any surfaces other than those indicated. Use drop sheets or masking tape to protect other surfaces.

.7 Once the foam has hardened, remove all overspray from non-prescribed surfaces.

.8 Do not allow polyurethane foam once applied, to be damaged during Work by other trades.

.9 Ensure the subsequent coverage of the applied insulating foam will be completed within the manufacturer's prescribed time frame.

.10 Spray the polyurethane foam in overlapping layers, so as to obtain a smooth, uniform surface.

.11 Do not spray polyurethane foam any closer than seventy-five (75) millimetres from chimneys, heating vents, steam pipes, recessed lighting fixtures and other heat sources. Do not spray the interior of any exit openings or electrical junction boxes.

.12 All mechanical fixtures should be covered with polyurethane foam in order to reduce thermal bridging.

3.2 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 07 21 16 – Blanket Insulation.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM D412-98a (2002) e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 37.58-M86, Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing;

.2 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction; and

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

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, Specifications and datasheet and include:

.1 Product characteristics;

.2 Performance criteria; and

.3 Limitations.

.3 Submit two (2) copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

.4 Quality assurance submittals:

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

.2 Instructions: submit manufacturer's installation instructions and comply with written recommendations or Specifications, including product technical bulletins, handling, storage and installation instructions and datasheet.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

Part 2 Products

2.1 SHEET VAPOUR BARRIER

.1 Polyethylene film: to CAN/CGSB-51.34, six (6) mil (0.15 millimetres) thick.

2.2 LIQUID AIR BARRIER MEMBRANES (WALL SURFACE)

.1 Liquid air/vapour barrier (thick system type): Air-Bloc 32 as manufactured by Bakor, a one (1) component elastomeric bitumen, trowel or spray applied to a wet film thickness of 0.118" (three (3) millimetres) or consultant approved equal.

2.3 TRANSITION MEMBRANE AND BASE FLASHING

.1 Transition membrane to span gaps between dissimilar surfaces in key areas such as wall-to-window frames, wall-to-slab, wall-to-roof junction, base flashings at masonry walls, flashings at stone sills and joints between dissimilar materials etc.): Bakor Blueskin SA, one (1.0) millimetres thick, self-adhered EPDM membrane flashing.

2.4 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, cloth fabric duct tape type recommended by vapour barrier manufacturer, two (2) inches (fifty (50) millimetres) wide for lap joints and perimeter seals, one (1) inch (twenty-five (25) millimetres) wide elsewhere.

.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.

.3 Staples: minimum ¼ inch (six (6) millimetres) leg.

.4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Sheet Vapour Barrier:

.1 Ensure services are installed and inspected prior to installation of retarder;

.2 Install sheet vapour retarder on warm side of exterior wall assemblies to form continuous retarder;

.3 Use sheets of largest practical size to minimize joints; and

.4 Inspect for continuity. Repair punctures and tears with sealing tape before Work is concealed.

.2 Transition Membranes:

.1 Verify that surfaces and conditions are ready to accept the Work of this section. Notify Contract Administrator in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrate;

.2 Apply in accordance with manufacturer's written instructions and stipulated environmental conditions;

.3 Overlap and seal to adjacent surfaces for continuous gap free installation; and

.4 Do not conceal with new construction until inspected.

3.2 PERIMETER SEALS

.1 Seal perimeter of sheet vapour barrier as follows:

.1 Apply continuous bead of sealant to substrate at perimeter of sheets;

.2 Lap sheet over sealant and press into sealant bead;

.3 Install staples through lapped sheets at sealant bead into wood substrate; and

.4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.3 LAP JOINT SEALS

.1 Seal lap joints of sheet vapour barrier as follows:

.1 Attach first sheet to substrate;

.2 Apply continuous bead of sealant over solid backing at joint;

.3 Lap adjoining sheet minimum six (6) inches (one hundred fifty (150) millimetres) and press into sealant bead;

.4 Install staples through lapped sheets at sealant bead into wood substrate; and

.5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 ELECTRICAL BOXES

.1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:

.1 Install moulded box vapour barrier Wrap boxes with film sheet providing minimum twelve (12) inches (three hundred (300) millimetres) perimeter lap flange; and

.2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.5 CLEANING

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

END OF SECTION

Part 1 General

1.1 SCOPE

.1 The scope of this section generally includes but not limited to:

- .1 Underlayment;
- .2 Roof panel clip system; and
- .3 Roof panel.

1.2 REFERENCES

.1 Design of cladding system in accordance to the latest edition of:

- .1 CSA-S136 for the design of Cold Formed Steel Structural Members;
- .2 Canadian Sheet Steel Building Institute Standards 10M and 20M; and
- .3 National Building Code of Canada.

.2 The Aluminum Association Inc. (AA):

- .1 Aluminum Sheet Metal Work in Building Construction-2000; and
- .2 AA DAF45-97, Designation System for Aluminum Finishes.

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

- .1 ASTM A606-01, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance;
- .2 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process;
- .3 ASTM A792/A792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process;
- .4 ASTM D523-89 (1999), Standard Test Method for Specular Gloss; and
- .5 ASTM D822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.4 Canadian Roofing Contractors Association (CRCA):

- .1 Roofing Specifications Manual 1997.

.5 Canadian General Standards Board (CGSB):

- .1 CAN/CGSB-19.13-M87, sealing compound, one component, silicone base, chemical curing;
- .2 CAN/CGSB-19.24-M90, sealing compound, multi-component, chemical curing;
- .3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement;
- .4 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type; and
- .5 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.6 Canadian Standards Association (CSA International):

.1 CSA A123.3-98, Asphalt Saturated Organic Roofing Felt; and

.2 CSA B111-1974 (R1998), Wire Nails, Spikes and Staples.

1.3 DESIGN REQUIREMENTS

.1 Design roof system to resist:

.1 Snow loads and snow build-up and rain load, expected in this geographical region OBC climatic data, fifty (50) year probability;

.2 Wind loads, positive and negative, expected in this geographical region climatic data, fifty (50) year probability; and

.3 Dead load of roof system.

.2 Deflection of the roof system is not to exceed 1/180 of the span for the specified live loading.

.3 Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, overstressing of components, failure of connections and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and night-time sky heat loss.

.1 Temperature Change (Range): twenty (20) degrees Celsius, ambient; forty (40) degrees Celsius, material surfaces.

1.4 SAMPLES

.1 Submit samples of standard coloured metal roof for review by the Contract Administrator, prior to fabrication.

1.5 SHOP DRAWINGS

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

.1 Indicate arrangement of pre-finished Roof Sheet, including joints, types and locations of supports, fasteners, flashing, gutters, mitres and all metal components related to the roof installation. Include for underlayment as part of the roof system.

.2 Drawings shall be signed and sealed by a Contract Administrator, attesting to the ability of the metal panel’s assembly to withstand the specified loads.

1.6 PRODUCT DELIVERY, HANDLING AND STORAGE

.1 Store components and materials in accordance with panel manufacturer’s recommendations and protect from elements.

.2 Protect prefinished steel during fabrication, transportation, Site storage and erection, in accordance with CSSBI Standards.

1.7 GUARANTEE

.1 For the Work in this Section, warranty by installer against defects or deficiencies in materials or workmanship shall be for a period of one (1) year from date of substantial completion.

Part 2 Products

2.1 ROOF SYSTEM COMPONENTS

.1 Roof System: Tradition 100-4 on Solid Substrate by Vicwest.

.1 Underlayment: Membrane shall be Ice and Water Shield by W.R. Grace or an approved equal.

.2 Clip System:

.1 Thermally responsive clips to be fabricated from a minimum of 0.91 millimetres (.036 inches) steel, with minimum Z275 galvanized coating designed to accommodate expansion and contraction of the roof sheet.

.2 Roof Fasteners: As specified by manufacturer, to resist wind uplift and sliding snow forces.

.3 Prefinished Roof Sheet, exposed to exterior.

.1 Profile: Tradition 100-4, with I-style ribs at four (400) millimetres spacing.

.2 Panel: Z275 galvanized (zinc coated) sheet steel conforming to ASTM A653M structural quality Grade 230 having a nominal core thickness 0.76 millimetres (0.030 inches).

.4 Snap Cap:

.1 Provide twenty-five (25) millimetres high snap caps for full length of the roof panel and retained by panel clips, fabricated from Z275 galvanized (zinc coated) sheet steel conforming to ASTM A653M structural quality Grade 230 having a minimum nominal core thickness 0.61 millimetres (0.024 inches). Finish and colour to match roof sheet.

2.2 PANEL FINISHES

.1 Coating: Prepainted with WeatherX™ on interior face.

2.3 COLOUR

.1 Colour to be selected from the manufacturer’s standard colour range.

2.4 ACCESSORIES

.1 Flashing: Formed from same materials as the roof sheet. Custom fabricated to suit architectural details, as required.

.2 Closures: Foam and metal closures to suit profiles selected, to manufacturer's recommendations.

.3 Sealants: In accordance with manufacturer's recommendation and Section 07 92 10 – Joint Sealing.

.4 Ventilated ridge cap: prefinished, brake formed, purpose made flashing to provide continuous air vent, incorporating drip edge, snow baffle and mesh material to allow unrestricted venting of attic space while preventing insect, rain and snow from entering. Colour and finish to match roofing.

.5 Snow fence: Continuous double bar snow fence supported on zinc die cast metal brackets. Rails formed of swaged galvalume tubes connected with concealed joiners and pinned. Brackets secured with stainless steel screws through neoprene washers through the roofing material into solid wood blocking.

2.5 FABRICATION

.1 Fabricate roof components to comply with dimensions, profiles, gauges and details as shown on the Shop Drawings, including fascia and soffit panels and all companion flashing.

.2 Fabricate all components of the system in the factory, ready for field installation.

.3 Provide roof sheet and all accessories in longest practicable length to minimize field lapping of joints.

Part 3 Execution

3.1 EXAMINATION

.1 Examine Work of other sections upon which Work of this Section depends.

.2 Report all discrepancies to Contract Administrator before beginning Work on the roof system.

3.2 INSTALLATION

.1 Roof Materials:

.1 Underlayment: Install underlayment fully adhered to solid substrate according to manufacturer's recommendations. Ensure all joints are properly lapped and sealed. Tie in with barriers on adjacent surfaces to ensure airtight construction. Provide a continuous seal around all openings in the insulated metal roof system.

.2 Clip: Attach Tradition clips using fasteners as recommended by the manufacturer, to suit the substrate.

.2 Roof Panel Installation:

.1 Install exterior prefinished roof panels on panel support clips, using manufacturer's proper construction procedure. Ensure metal roofing sheet side-lap is positively retained by clips, and proper sheet coverage is maintained.

.2 Install the snap-cap at all side laps as shown on the approved Shop Drawings. Mitre snap-cap as required to resist water entry.

.3 Where indicated on approved Shop Drawings, secure the end-lap of metal roofing sheets in accordance with the manufacturer's Specifications and details to provide a weather-tight seal. Exposed fasteners to match colour of the roof sheet.

.4 Provide notched and formed closures, sealed against weather penetration, at changes in pitch, and at ridges and eaves, where required.

.5 Install all companion flashing, gutters, ventilators as shown on the Shop Drawings. Use concealed fasteners when possible. Exposed fasteners to match colour of roof sheet.

3.3 CLEAN-UP

.1 Clean exposed panel surfaces in accordance with manufacturer's instructions.

.2 Repair and touch up with colour matching high grade enamel minor surface damage, only where permitted by the Contract Administrator and only where appearance after touch-up is acceptable to Contract Administrator.

.3 Replace damaged panels and components that, in opinion of the Contract Administrator, cannot be satisfactorily repaired.

END OF SECTION

Part 1 General

1.1 SCOPE

.1 The scope of this Section generally includes but is not limited to:

.1 Pre finished metal siding and trim; and

.2 Metal flashing at roofing perimeter and wall penetrations, openings.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

1.3 REFERENCES

.1 National Building Code of Canada (NBC).

.2 The Aluminum Association Inc. (AA):

.1 Aluminum Sheet Metal Work in Building Construction-2000; and

.2 AA DAF45-97, Designation System for Aluminum Finishes.

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

.1 ASTM A606-01, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance;

.2 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process;

.3 ASTM A792/A792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process;

.4 ASTM D523-89(1999), Standard Test Method for Specular Gloss; and

.5 ASTM D822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.4 Canadian Roofing Contractors Association (CRCA):

.1 Roofing Specifications Manual 1997.

.5 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-19.13-M87, sealing compound, one component, silicone base, chemical curing;

.2 CAN/CGSB-19.24-M90, sealing compound, multi-component, chemical curing;

.3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement;

.4 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type; and

.5 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.6 Canadian Standards Association (CSA International):

.1 CSA A123.3-98, Asphalt Saturated Organic Roofing Felt; and

.2 CSA B111-1974 (R1998), Wire Nails, Spikes and Staples.

1.4 SAMPLES

.1 Submit duplicate fifty (50) millimetres by fifty (50) millimetres samples of each type of sheet metal material, colour and finish.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

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

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on Site bins for recycling in accordance with Waste Management Plan.

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

.5 Ensure emptied containers are sealed and stored safely for disposal away from children.

.6 Divert unused metal materials from landfill to metal recycling facility as approved by Contract Administrator.

.7 Unused paint and sealant material must be disposed of at an official hazardous material collections site as approved by Contract Administrator.

.8 Unused paint and sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

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

Part 2 Products

2.1 PRE FINISHED METAL SIDING

.1 Zinc coated steel sheet: commercial quality to ASTM A653/A653M, grade 50, with Z275 designation zinc coating.

.2 Exterior side prefinished with WeatherX™ Silicone modified polyester paint system by Valspar with direct from manufacturer forty (40) year warranty against paint defects and thirty (30) years for fade resistance.

.3 Interior side protected by wash coat of primer.

.4 Product: VicWest or approved equal in accordance with B7.

.5 Profile: twenty-four (24) gauge CL 6025-SR, thirty-six (36) millimetres deep, nine hundred (900) millimetres wide.

.6 Factory applied sealant in interlocking side lap joints to provide weathertight installation.

2.2 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.

2.3 PREFINISHED STEEL SHEET

.1 Prefinished steel with factory applied silicone modified polyester paint system.

.1 Class F1S.

.2 Colour selected by Contract Administrator from manufacturer's standard range.

.3 Specular gloss: thirty (30) units +/- in accordance with ASTM D523.

.4 Coating thickness: not less than twenty-two (22) micrometres.

2.4 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.

.3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

.4 Sealants: Multi-component conforming to CGSB Specification CAN/CGSB-19.24, or single component conforming to CGSB Specification CAN/CGSB-19.13.

.1 Acceptable products:

.1 Dymeric by Tremco (Canada) Limited;

.2 Proglaze by Tremco (Canada) Ltd;

.3 One thousand two hundred (1,200) Sealant by CGE Canada Ltd;

.4 Seven hundred ninety-five (795) Sealant by Dow Corning Canada; and

.5 Contract Administrator approved equal in accordance with B7.

.5 Cleats: of same material, and temper as sheet metal, minimum fifty (50) millimetres wide. Thickness, same as sheet metal being secured.

.6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, one (1) millimetres thick with rubber packings.

.8 Touch-up paint: as recommended by prefinished material manufacturer.

2.5 FABRICATION

.1 Fabricate metal flashings and other sheet metal Work in accordance with applicable CRCA 'FL' series details.

.2 Form pieces in two thousand four hundred (2,400) millimetres maximum lengths. Make allowance for expansion at joints.

.3 Hem exposed edges on underside twelve (12) millimetres. Mitre and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.6 METAL FLASHINGS

.1 Form flashings, copings and fascias to profiles indicated of twenty-six (26) ga thick prefinished aluminum or prefinished galvanized steel.

2.7 CAP FLASHINGS

.1 Form metal cap flashing of 0.45 millimetres (twenty-six (26) gauge) thick sheet metal as detailed and in accordance with CRCA FL series details. Provide slotted fixing holes and plastic washer fasteners.

2.8 EAVES TROUGHS and DOWNSPOUTS

.1 Formed from prefinished twenty-two (22) gauge metal.

.2 Secure to building with metal strap.

Part 3 Execution

3.1 INSTALLATION

.1 Provide and install pre-finished metal siding materials, flashings at openings and trim shapes as indicated in approved Shop Drawings.

.2 Avoid end laps in vertical sections.

.3 Install sheet metal Work in accordance with CRCA FL series details.

.4 Use concealed fastenings except where approved before installation.

.5 Provide underlay under sheet metal. Secure in place and lap joints one hundred (100) millimetres.

.6 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.

.7 Lock end joints and caulk with sealant.

.8 Install surface mounted reglets true and level, and caulk top of reglet with sealant.

.9 Insert metal flashing under cap flashing to form weather tight junction.

.10 Turn top edge of flashing into recessed reglet or mortar joint minimum of twenty-five (25) millimetres. Lead wedge flashing securely into joint.

.11 Caulk flashing at cap flashing with sealant.

3.2 EAVES TROUGHS AND DOWNPIPES

.1 Install eaves troughs and secure to building at one thousand two hundred twenty (1,220) millimetres on centre with galvanized metal straps.

.2 Slope eaves troughs to down pipes.

.3 Seal joints watertight.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials, preparation and application for caulking and sealants.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 61 00 – Common Product Requirements.

.4 Section 01 74 19 – Waste Management and Disposal.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM):

.1 ASTM C919-02, 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; and

.5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound, Type 2, Class B.

.3 Department of Justice Canada (Jus):

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

.4 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.

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

.1 Material Safety Data Sheets (MSDS).

1.4 SUBMITTALS

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

.2 Manufacturer's product to describe.

.1 Caulking compound.

.2 Primers.

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

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

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each color where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5 QUALITY ASSURANCE

.1 Carry out the supply and installation of sealants and caulking Work by recognized Specialist Applicators having at least five (5) years of proven satisfactory experience and having skilled workmen thoroughly trained and competent in all phases of caulking work.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

.3 Store materials in dry location in such manner that no damage will be done to materials or building.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

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

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

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

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

.6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.7 Divert unused joint sealing material from landfill to an approved, official hazardous material collections site.

.8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.

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

1.8 PROJECT CONDITIONS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees Celsius.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.9 ENVIRONMENTAL REQUIREMENTS

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

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

1.10 WARRANTY

.1 Provide written warranty covering the Work of this Section for a period of two (2) years from the date of Substantial Completion as per the Project Agreement.

.2 Defective Work shall include but not be restricted to leakage, cracking, crumbling, melting, running, loss of adhesion, loss of cohesion, staining of adjoining or adjacent surfaces or Work.

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 offgas 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.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Sealants – Type A:

.1 Multi-component sealants to meet CGSB Specification CAN/CGSB-19.24, (2-part urethane) or single component sealant to meet CGSB Specification CAN/CGSB-19.13, (silicone) to be used for:

.1 Exterior joints around perimeters of metal door frames including thresholds and sills;

.2 Exterior joints around perimeters of louvre frames and duct penetrations;

.3 Exterior perimeter of conduit, wire and pipe penetrations;

.4 Exterior control joints; and

.5 Roof flashings.

.2 Use one (1) of the following sealants:

.1 Dymeric by Tremco (Canada) Limited;

.2 One thousand two hundred (1,200) Sealant by CGE Canada Ltd; or

.3 Seven hundred ninety-five (795) Sealant by Dow Corning Canada.

.2 Sealants – Type B:

.1 Acrylic solvent release, one part sealant, to meet CGSB Specification 19-GP-5M, to be used for all other locations where caulking beads remain exposed:

.1 Interior perimeters of door and window frames, louvre openings, service penetrations and ducts; and

.2 Interior movement joints in exterior masonry walls.

.2 Use one (1) of the following sealants:

.1 Mono by Tremco (Canada) Limited;

.2 Acryflex by Sternson Ltd;

.3 Parr-Crylic by Parr Sealants of Canada Ltd; or

.4 PR12-100 Vinyl Acrylic by PRC Canada Ltd.

.3 Silicone Sealant – Type C:

.1 Apply clear, mildew resistant silicone sealant at perimeter of backsplashes, at millwork mounted against walls, at washroom vanities, and around plumbing fixtures at floor and wall surfaces.

.2 Use one (1) of the following sealants:

.1 Tremsil 200 by Tremco (Canada) Ltd; or

.2 DAP 3.0.

.4 Primers

.1 To be of a type recommended by sealant manufacturer for the appropriate sealant and corresponding substrate.

.5 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 thirty (30) to fifty percent (50%).

.2 Neoprene or Butyl Rubber.

.1 Round solid rod, Shore A hardness seventy (70).

.3 High Density Foam.

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness twenty (20), tensile strength one hundred forty (140) to two hundred (200) kPa, extruded polyolefin foam, thirty-two (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 COLOURS

.1 Colours of sealant, shall match the predominant material to which sealant is applied.

2.4 JOINT CLEANER

.1 Non-corrosive and non-taining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

Part 3 Execution

3.1 PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

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 thirty percent (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 Cleanup:

.1 Clean adjacent surfaces immediately and leave Work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as Work progresses.

.3 Remove masking tape after initial set of sealant.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 61 00 – Common Product Requirements.

.3 Section 01 74 19 – Waste Management and Disposal.

.4 Section 07 92 10 – Joint Sealing: Caulking of joints between frames and other building components.

.5 Section 08 71 10 – Door Hardware: Supply of finish hardware, including weatherstripping and mounting heights.

.6 Section 09 91 00 – Painting and Protective Coatings.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International):

.1 ASTM A653/A653M-03, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.ASTM B29-92 (1997), Specification for Refined LeadASTM B749-97, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International):

.1 G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel; and

.2 CSA W59-M1989 (R2001), Welded Steel Construction (Metal Arc Welding) (Metric Version).

.4 Canadian Steel Door Manufacturers' Association, (CSDMA):

.1 CSDMA, Specifications for Commercial Steel Doors and Frames, 1990; and

.2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.

.5 National Fire Protection Association (NFPA):

.1 NFPA 80-99, Standard for Fire Doors and Fire Windows.NFPA 252-99, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC):

.1 CAN4-S104-M80, Fire Tests of Door Assemblies;

.2 CAN4-S105-M85, Fire Door Frames Meeting the Performance Required by CAN4-S104;

.3 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering;

.4 CAN/ULC-S702-97, Mineral Fibre Thermal Insulation for Buildings; and

.5 CAN/ULC-S704-03, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 DESIGN REQUIREMENTS

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of negative thirty-five (-35) degrees Celsius to thirty-five (35) degrees Celsius.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175 of span.

1.4 SHOP DRAWINGS

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

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed louvred, arrangement of hardware and fire rating and finishes.

.3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing firerating finishes.

.4 Indicate details of construction and installation of all components of the Work.

.5 Include schedule identifying each unit, with door marks and numbers relating to numbering on Drawings and door schedule.

.6 Submit test and engineering data, and installation instructions.

1.5 REQUIREMENTS

.1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M, CAN4-S105M and NFPA 252 for ratings specified or indicated.

.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104, ASTM E152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.6 WARRANTY

.1 Materials and workmanship shall be warranted by manufacturer in accordance with Canadian Steel Door Manufacturers' Association, (CSDMA) Standard Warranty for Steel Doors and Frames.

1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Provide and maintain dry, off-ground weatherproof storage.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

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

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

.4 Divert unused paint and sealant materials from landfill to an approved, official hazardous material collections site.

.5 Do not dispose of unused paint and sealant materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

.6 Divert unused metal materials from landfill to an approved metal recycling facility.

.7 Divert unused wood materials from landfill to an approved recycling facility.

.8 Damaged or broken glazing materials are not recyclable. These materials must not de disposed of with materials destined for recycling.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 Only steel frame products manufactured by Canadian Steel Door Manufacturers' Association, (CSDMA) members are eligible for use on this Project.

2.2 MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 – Thickness for Component Parts.

.2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, hot dipped galvanized.

.3 Fire-rated doors and frames: Material and construction in accordance with listing requirements. Doors to be flush type with no face seams.

2.3 DOOR CORE MATERIALS

.1 Honeycomb construction:

.1 Structural small cell, 24.5 millimetres maximum kraft paper 'honeycomb', weight: 36.3 kilograms per ream minimum, density: 16.5 kg/m^3 minimum sanded to required thickness.

.2 Insulated:

.1 Expanded polystyrene: CAN/ULC-S701, density sixteen (16) to thirty-two (32) kg/m^3.

.3 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to two hundred fifty (250) degrees Celsius at thirty (30) minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, ASTM E152 or NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.4 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.5 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.

2.6 PAINT

.1 Field paint steel doors and frames in accordance with 09 91 00 – Painting and Protective Coatings. Protect weatherstrips from paint. Provide final finish shall be free of scratches or other blemishes.

2.7 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma steel.

.3 Door bottom seal: to Section 08 71 10 – Door Hardware.

.4 Metallic paste filler: to manufacturer's standard.

.5 Accessories (doors and frames) and minimum base steel thickness:

.1	Lock/strike reinforcements:	1.6 millimetres
.2	Hinge reinforcements:	2.7 millimetres
.3	Flush bolt reinforcements:	1.6 millimetres
.4	Reinforcements for surface applied hardware:	1.2 millimetres
.5	Top or bottom channels:	1.2 millimetres
.6	Glass trim, screw fixed or snap-in types:	0.9 millimetres
.7	Mortar guard boxes:	0.8 millimetres
.8	Floor anchors:	1.6 millimetres
.9	Jamb spreaders:	0.9 millimetres

.6 Sealant: to Section 07 92 10 – Joint Sealing.

2.8 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA Specifications, reviewed Shop Drawings and listing requirements.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Finish: hot dipped galvanized after fabrication.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Protect mortised cutouts with steel guard boxes welded to frame.

.6 Prepare frame for door silencers, three (3) for single door, and two (2) at head for double door.

.7 Manufacturer's nameplates on frames and screens are not permitted.

.8 Conceal fastenings except where exposed fastenings are indicated.

.9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.10 Insulate exterior frame components with mineral wool insulation.

2.9 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb, minimum three (3) anchors per jamb.

.3 Provide two (2) anchors for rebate opening heights up to one thousand five hundred twenty (1,520) millimetres and one (1) additional anchor for each additional seven hundred sixty (760) millimetres of height or fraction thereof.

2.10 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane; fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in two (2) temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.11 DOOR FABRICATION GENERAL

.1 Fabricate doors in accordance with CSDMA Specifications, reviewed Shop Drawings and listing requirements.

.2 Doors: swing type, flush, with provision for single, sealed insulated glass units, and louvre openings as indicated.

.3 Interior doors: honeycomb hollow steel construction.

.4 Exterior doors: insulated polystyrene core construction.

.5 Fabricate doors with longitudinal edges mechanically interlocked with visible seams.

.6 Bevel hinge and lock edges of doors, three (3) millimetres in fifty (50) millimetres.

.7 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.

.8 Factory prepare holes 12.7 millimetres diameter and larger except mounting and through-bolt holes, on Site, at time of hardware installation.

.9 Reinforce doors where required, for surface mounted hardware.

.10 Provide flush PVC steel top caps to exterior doors.

.11 Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.12 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.13 Provide one hundred twenty-seven (127) millimetres backset for all locksets and latchsets where indicated in the Door Schedule.

2.12 HOLLOW STEEL CONSTRUCTION

.1 Form each face sheet for exterior doors from 1.6 millimetres (sixteen (16) gauge) galvanized sheet steel with polystyrene core laminated under pressure to face sheets.

.2 Form each face sheet for interior doors from 1.3 millimetres (eighteen (18) gauge) galvanized sheet steel with honeycomb or temperature rise rated core laminated under pressure to face sheets.

.3 Reinforce doors with vertical stiffeners, securely welded to each face sheet at one hundred fifty (150) millimetres on centre maximum.

2.13 THERMALLY BROKEN DOORS AND FRAMES

.1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.

.2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 Fabricate thermally broken frames separating exterior parts form interior parts with continuous interlocking thermal break.

.4 Welding of thermally broken frames must not cause thermal transfers between exterior and interior surfaces of frame sections.

.5 Fill voids in frame with mineral wool insulation prior to insulation.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.2 FRAME INSTALLATION

.1 Coordinate electrical requirements, for doors and frames with electrical devices, prior to the start of frame installation. Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over one thousand two hundred (1,200) millimetres wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier and vapour retarder.

.7 Install door silencers after finish painting of frame has been completed.

3.3 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 – Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: one (1.0) millimetres.

.2 Latchside and head: 1.5 millimetres.

.3 Finished floor and thresholds: thirteen (13) millimetres.

.3 Adjust operable parts for correct function.

.4 Install louvres.

.5 Install vinyl top caps in out swinging exterior doors for weather protection.

3.4 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 07 92 10 – Joint Sealing: Caulking of joints between frames and other building components.

1.2 COORDINATION

.1 Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies.

.2 Coordinate delivery with other Work to avoid delay.

1.3 SHOP DRAWINGS

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

.2 Shop Drawings:

.1 Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.

.2 Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.

.3 General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.

.3 Product Data:

.1 Manufacturer’s technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.

.2 Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

.4 Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

1.4 WARRANTY

.1 Provide manufacturer's written warranty.

.2 Warrant materials and fabrication against defects after completion and final acceptance of Work.

.1 Repair defects, or replace with new materials, faulty materials or fabrication developed during the warranty period at no expense to City of Winnipeg.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Provide and maintain dry, off-ground weatherproof storage.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

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

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material appropriately on Site for recycling in accordance with Waste Management Plan.

.4 Divert unused paint and sealant materials from landfill to an approved, official hazardous material collections site.

.5 Do not dispose of unused paint and sealant materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

.6 Divert unused metal materials from landfill to an approved metal recycling facility.

.7 Divert unused wood materials from landfill to an approved recycling facility.

.8 Damaged or broken glazing materials are not recyclable. These materials must not be disposed of with materials destined for recycling.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Acudor Products Inc.

.2 Similar products by Bauco Access Panel Solutions, Nystrom Building Products or Cendrex Inc. of same materials, metal gauge and finishes are considered equal.

2.2 MATERIALS

.1 Flush Non-Rated Access Doors and Frame with exposed flanges (non-rated insulated access door with gasket).

.1 Basis-of-Design Product: Subject to compliance with requirements, provide Acudor LT-4000, aluminum specialty access door.

.2 Location: Ceiling.

.3 Door Size: six hundred ten (610) millimetres by nine hundred fourteen (914) millimetres.

.4 Material: Aluminum

.1 Door: 1.6 millimetres, flush to edge of frame, thirty-three (33) millimetres mitered aluminum extrusion flange.

.2 Mounting Frame: two (2) millimetres, thirty-eight (38) millimetres deep.

.3 Hinge: Doors with width six hundred ten (610) millimetres or less to have concealed pin hinge. Doors with width over six hundred ten (610) millimetres to have continuous aluminum piano hinge with exposed knuckle, set to open to one hundred eighty (180) degrees.

.5 Insulation: nineteen (19) millimetres Type 3 Expanded Polystyrene (EPS) Foil Lined Insulation, with a 3.18 R Value.

.6 Gasket: three (3) millimetres by 9.5 millimetres closed cell neoprene gasketing.

.7 Standard Latch: Screwdriver operated cam latch.

.8 Finish: Mill finish.

Part 3 Execution

3.1 EXAMINATION

.1 Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

.1 Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 61 00 – Common Product Requirements.

.3 Section 01 74 19 – Waste Management and Disposal.

.4 Section 01 78 00 – Closeout Submittals.

.5 Section 08 11 14 – Metal Doors and Frames.

1.2 REFERENCES

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

.1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-69.17-M86 (R1993), Bored and Preassembled Locks and Latches;

.2 CAN/CGSB-69.18-M90/ANSI/BHMA A156.1-1981, Butts and Hinges;

.3 CAN/CGSB-69.19-93/ANSI/BHMA A156.3-1984, Exit Devices;

.4 CAN/CGSB-69.20-M90/ANSI/BHMA A156.4-1986, Door Controls (Closers);

.5 CAN/CGSB-69.21-M90/ANSI/BHMA A156.5 1984, Auxiliary Locks and Associated Products;

.6 CAN/CGSB-69.22-M90/ANSI/BHMA A156.6-1986, Architectural Door Trim;

.7 CAN/CGSB 69.24-M90/ANSI/BHMA A156.8-1982, Door Controls - Overhead Holders;

.8 CAN/CGSB-69.29-93/ANSI/BHMA A156.13-1987, Mortise Locks and Latches;

.9 CAN/CGSB-69.31-M89/ANSI/BHMA A156.15-1981, Closer/Holder Release Device;

.10 CAN/CGSB-69.32-M90/ANSI/BHMA A156.16-1981, Auxiliary Hardware; and

.11 CAN/CGSB-69.34-93/ANSI/BHMA A156.18-1987, Materials and Finishes.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, Specifications and data sheet in accordance with Section 01 33 00 – Submittal Procedures.

.2 Samples:

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

.2 Identify each sample by label indicating applicable Specification paragraph number, brand name and number, finish and hardware package number.

.3 After approval samples will be returned for incorporation in the Work.

.3 Hardware List:

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

.2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.5 Closeout Submittals

.1 Provide operation and maintenance data for door closers, locksets, door holders.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements:

.1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

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

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.2 Storage and Protection:

.1 Store finishing hardware in locked, clean and dry area.

1.6 WASTE DISPOSAL AND MANAGEMENT

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

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

.3 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on Site bin for recycling in accordance with site waste management program.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.

.2 Supply two (2) sets of wrenches for door closers, locksets and exit hardware.

Part 2 Products

2.1 HARDWARE ITEMS

.1 Use one (1) manufacturer's products only for similar items.

2.2 DOOR HARDWARE

.1 Butts and hinges: to CAN/CGSB-69.18, (Three (3) per door for doors up to two thousand one hundred thirty-five (2,135) millimetres and four (4) per door for doors up to two thousand four hundred forty (2,440) millimetres in height or over nine hundred fourteen (914) millimetres in width), NRP, ball bearing type, stainless steel.

.1 Acceptable products:

.1 Hagar AB850 x 114 x 114;

.2 Stanley CB199 x 114 x 114; and

.3 Contract Administrator approved equal in accordance with B7.

.2 Exit devices: to CAN/CGSB-69.19, rim exit device, ULC rated, with cylinder core, exterior lever handle trim and vinyl touch bar.

.1 Acceptable products:

.1 Von Duprin 98 series;

.2 Sargent 8800 series; and

.3 Contract Administrator approved equal in accordance with B7.

.2 Locksets:

.1 Locksets to CAN/CGSB-69.17 –M86, Grade 1 lever handle;

.2 Provide construction cylinder cores and final cores with keying to City’s BEST master key system;

.3 Acceptable products for exterior locksets:

.1 Schlage “D” series;

.2 Stanley 9K series; and

.3 Contract Administrator approved equal in accordance with B7.

.3 Door Closers and Accessories:

.1 Door controls (closers): to CAN/CGSB-69.20, one (1) per door. All door closers shall be through bolted. Finish aluminum lacquer.
.1 Acceptable products:
.1 LCN 4040 Super Smoothee by LCN closers; and
.2 Contract Administrator approved equal in accordance with B7.

.2 Door controls – overhead holders: to CAN/CGSB-69.24, extruded bronze, one hundred ten (110) degree hold-open and stop, one (1) per door.
.1 Acceptable products:
.1 Sargent 598H; and
.2 Contract Administrator approved equal in accordance with B7.

.4 Architectural door trim: to CAN/CGSB-69.22, as listed below.

.1 Door protection plates: kick plate type, 1.27 millimetres thick stainless steel.
.1 Acceptable products:
.1 Canadian Builders Hardware; and
.2 Contract Administrator approved equal in accordance with B7.

.5 Auxiliary hardware: to CAN/CGSB-69.32, as listed below.

.1 Surface bolt: (two hundred (200) millimetres), heavy duty top and bottom.
.1 Acceptable products:
.1 Canadian Builders Hardware F67;
.2 Ives SB1630TBL 1289; and
.3 Contract Administrator approved equal in accordance with B7.

.6 Thresholds: one hundred fifty (150) millimetres, extruded aluminum with thermal break.

.1 Acceptable products:
.1 K. N. Crowder CT-46; and
.2 Contract Administrator approved equal in accordance with B7.

.7 Weather-stripping:

.1 Head and jamb seal: Adjustable spring loaded, vinyl in extruded aluminum trim
.1 Acceptable products:
.1 K. N. Crowder W44; and
.2 Contract Administrator approved equal in accordance with B7.

.2 Door bottom seal: Neoprene rubber in extruded aluminum trim.
.1 Acceptable products:
.1 K. N. Crowder Type CT-54 Automatic door bottom.

.2 Contract Administrator approved equal in accordance with B7.

.8 Astragal: full height mounted, interior magnetic in extruded aluminum trim and pile strip in extruded aluminum trim on exterior.

.1 Acceptable products:

.1 Zero International, No.40 Interior and No.41 Exterior; and

.2 Contract Administrator approved equal in accordance with B7.

2.3 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one (1) side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

.6 All fasteners to be non-corroding.

2.4 KEYING

.1 Lay out keying system in consultation with the City of Winnipeg. Keying system shall include keying alike, keying differently, keying in groups, submaster keying and grand master keying locks as necessary to meet the requirements of the City of Winnipeg.

.2 Keying chart and related explanatory data shall be prepared and submitted to the City of Winnipeg for approval, and lock work shall not be commenced until written confirmation of keying arrangements is received from the City of Winnipeg.

.3 Provide keys in duplicate for every lock.

.4 Stamp keying code numbers on keys and cylinders.

.5 Provide cabinet for key control with two (2) tag security system complete with key loan register, three-way cross reference index, and cabinet door locking device.

.6 All locks shall be operated by a construction master key in construction cylinder cores while the building is under construction, but shall not operate when the temporary construction cores are replaced with permanent master keyed cylinders at completion of the building.

.7 Provide all permanent cores and keys to City of Winnipeg.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets.

.2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their Work to receive hardware.

.3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 INSTALLATION

.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

.2 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.3 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.4 Remove construction cores when directed by Contract Administrator; install permanent cores and check operation of locks.

3.3 PROTECTION

.1 Protect all items of hardware until the City of Winnipeg accepts the project as complete.

3.4 INSPECTION

.1 After installation has been completed, hardware supplier shall have a qualified hardware consultant (member of DHI) inspect the job to determine that the correct hardware has been furnished, installed and is operating properly and is in accordance with the approved hardware schedule and keying schedule. Also, check the operation and adjustment of all hardware items and instruct the City of Winnipeg personnel in the care, adjustment and maintenance of the hardware.

3.5 ADJUSTING

.1 At final completion, all hardware shall be left clean and free from disfigurement. Make a final adjustment to all door closers and other items of hardware. Where hardware is found to be defective, repair or replace or otherwise correct as directed.

.2 Provide the services of a representative to inspect material furnished and its installation and adjustment, to make final hardware adjustment, and to instruct the City of Winnipeg personnel in adjustment, care, and maintenance of the hardware.

.3 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.4 Lubricate hardware, operating equipment and other moving parts.

.5 Adjust door hardware to provide tight fit at contact points with frames.

3.6 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.

.3 Remove protective material from hardware items where present.

.4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.7 HARDWARE SCHEDULE

.1 Refer to Drawings for door hardware sets.

END OF SECTION

Part 1 General

1.1 ENVIRONMENTAL CONDITIONS

.1 Ensure that minimum ambient and surface temperatures are sixteen (16) degrees Celsius (sixty (60) degrees Fahrenheit) at time of application and maintained for curing period.

.2 Ensure that work areas are properly ventilated.

.3 Observe health and safety regulations including use of approved respirators, safety goggles and impervious gloves as required.

1.2 STORAGE

.1 Store materials in original containers at minimum sixteen (16) degrees Celsius (sixty (60) Fahrenheit) in clean, dry area. Avoid excessive heat and do not freeze.

1.3 QUALITY ASSURANCE

.1 Use only skilled personnel with proven quality experience to expediently complete the Work under this Section in an efficient and workmanlike manner.

.2 Report to the Contract Administrator in writing, defective surfaces prepared by other trades which affect the Work of this Section. Commencement of Work shall imply acceptance of surfaces.

.3 Ensure that sufficient material, labour and finishers are available to maintain continuous placement of epoxy finishes over entire area once application commences.

.4 Apply epoxy finishes only on clean, sound, properly prepared substrates.

1.4 SAMPLES

.1 Submit material samples of manufacturer's complete range of standard colours for floor finishes and sealants, as requested by Contract Administrator.

1.5 PROTECTION

.1 Post legible signs at all points of entry to areas in which Work of this Section is being applied, to warn against smoking and the use of open flame, such as torches, matches and lighters.

.2 Erect suitable barriers to prevent traffic and other trades from working in areas during application of coatings.

Part 2 Products

2.1 ACCEPTABLE SYSTEMS

.1 Epoxy systems specified are based on products of Sika Canada Inc.

.2 Comparable epoxy systems of following manufacturers conforming to the requirements of this Section are acceptable:

.1 Niagara Protective Coatings, Epoxal Hibuild "Double" (one hundred twenty (120) mils) Series 3005, fine texture.

.2 Stonhard Floor Systems, Stonekote, GS4, double broadcast, fine texture.

.3 Contract Administrator-approved equal.

2.2 SYSTEMS

.1 SikaFloor Coloured Quartzite Broadcast System:

.1 Primer: neat application of wall mixed two-component clear Sikafloor Duochem-9205 at rate of four (4) m²/L (one hundred sixty (160) ft²/US gal.) at ten (10) mils wet film thickness (w.f.t.) or for uniform coverage without ponding.

.2 First Broadcast: apply binder coat of Sikafloor Duochem-9205 two (2) component, high solids, low odour, low VOC, high strength, high gloss, clear epoxy resin at rate of 2.6 m²/L (one hundred six (106) ft²/US gal.) at fifteen (15) mils (w.f.t.) by squeegee and backroll immediately with a roller to provide a uniform surface. Broadcast pre-blended coloured Sikafloor Quartz Aggregate at rate of three (3) kg/m² (sixty (60) lb/one hundred (100) ft²) into wet binder coat.

.3 Second Broadcast: apply binder coat of Sikafloor Duochem-9205 two (2) component, high solids, low odour, low VOC, high strength, high gloss, clear epoxy resin at rate of two (2.0) m²/L (eighty (80) ft²/US gal.) at twenty (20) mils (w.f.t.) by squeegee and backroll immediately with a roller to provide a uniform surface. Broadcast pre-blended coloured Sikafloor Quartz Aggregate at rate of four (4) kg/m² (eighty (80) lb/one hundred (100) ft²) into wet binder coat.

.4 Top coat: Apply Sikafloor®-2002 top coat at a rate of two (2) to four (4) m²/L (eighty (80) to one hundred sixty (160) ft²/US gal.) at ten (10) to twenty (20) mils w.f.t. using a non-marking squeegee or flexible steel trowel, followed by backrolling to provide a uniform texture and gloss finish.

2.3 SEALANTS

.1 Control Joint Sealant, to suit application, as recommended by epoxy system manufacturer, at control joints and junction with other surfaces and finishes.

.2 Colour: to match samples approved by Contract Administrator.

Part 3 Execution

3.1 SURFACE PREPARATION

.1 Allow concrete substrates to cure at least twenty-eight (28) days prior to commencing Work.

.2 Prepare concrete surfaces in strict accordance with recommendations of the epoxy coating manufacturer.

.3 Prepare concrete floors by utilizing a self-contained dust controlled machine, such as Blast-Trac, to produce a dry, clean, rough surface profile prior to epoxy application, to CSP 4-6 or other method approved by manufacturer.

.4 For concrete stair treads, landings, and other concrete surfaces inaccessible to shot-blasting preparation, use abrasive grinding methods recommended by epoxy system manufacturer to provide required surface profile prior to epoxy application.

3.2 APPLICATION

.1 Use application methods and procedures in strict accordance with the product manufacturer's directions.

.2 Apply coatings to produce smooth surface, uniform in sheen, colour and finish, free from marks, dirt, particles, runs, holes, air pockets and other defects.

3.3 SEALANTS

.1 Apply sealants only on clean, sound, properly prepared substrates.

.2 Prime substrates, mix and apply sealants in accordance with manufacturer's directions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Moisture testing of substrates.

.2 Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking and making good surfaces and areas to limits defined under Master Painters Institute Repainting Maintenance Manual requirements.

.3 Specific pre-treatments noted herein or specified in the Master Painters Institute Repainting Maintenance Manual.

.4 Sealing/touch-up, spot priming, and/or full priming surfaces for repainting in accordance with Master Painters Institute Repainting Maintenance Manual requirements.

.5 Provision of safe and adequate ventilation as required where toxic and/or volatile/flammable materials are being used over and above temporary ventilation supplied by others.

1.2 REFERENCES

.1 Maintenance Repainting Manual by the Master Painters Institute, including Identifiers, Evaluation, Systems, Preparation and Approved Product List.

.2 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.3 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

.1 Contractor shall have a minimum of five (5) years proven satisfactory experience. Provide a list of last three (3) comparable jobs including, job name and location, specifying authority and Project Manager.

.2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting Work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with applicable trade regulations.

.3 Conform to latest Master Painters Institute requirements for interior painting Work including cleaning, preparation and priming.

.4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the latest edition of the Master Painters Institute Approved Product List and shall be from a single manufacturer for each system used.

.5 Paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in Master Painters Institute Maintenance Repainting Manual and shall be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted Master Painters Institute requirements when requested by Contract Administrator.

.7 Standard of Acceptance: When viewed using final lighting source surfaces shall indicate the following:

.1 Walls: No defects visible from a distance of one thousand (1,000) millimetres at ninety (90) degrees to surface.

.2 Ceilings: No defects visible from floor at forty-five (45) degrees to surface.

.3 Final coat to exhibit uniformity of colour and sheen across full surface area.

1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide indoor paint products meeting Master Painters Institute "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.

1.5 INSPECTION REQUIREMENTS

.1 Interior surfaces requiring repainting shall be inspected by both painting Contractor who will notify Contract Administrator and Contractor in writing of defects or problems, prior to commencing repainting Work, or after surface preparation if unseen substrate damage is discovered.

.2 Where an assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered shall be rectified by others, as mutually agreed, before repainting is started.

1.6 SUBMITTALS

.1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be used in accordance with the requirements of Section 01 33 00 – Submittal Procedures.

.2 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.

.3 Submit WHMIS Material Safety Data Sheets for paint and coating materials in accordance with section.

.4 Upon completion, submit records of products used. List products in relation to finish system and include the following:

.1 Product name, type and use (i.e., materials and location);

.2 Manufacturer's product number;

.3 Colour code numbers;

.4 Master Painters Institute Environmentally Friendly classification system rating; and

.5 Manufacturer's Material Safety Data Sheets.

1.7 QUALITY CONTROL

.1 Provide a mock-up in accordance with requirements of Section 01 33 00 – Submittal Procedures.

.2 Prepare and repaint mock-up designated interior room, surface or item to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to Master Painters Institute Maintenance Repainting Manual standards for review and approval.

.3 When approved, repainted room, surface and/or item shall become acceptable standard of finish quality and workmanship for similar on Site interior repainting Work.

1.8 DELIVERY, HANDLING AND STORAGE

.1 Deliver and store materials in original containers, sealed, with labels intact.

.2 Labels shall clearly indicate:

.1 Manufacturer's name and address;

.2 Type of paint or coating;

.3 Compliance with applicable standard; and

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from Site.

.4 Observe manufacturer's recommendations for storage and handling.

.5 Store materials and equipment in a secure, dry, well-ventilated area with temperature range between seven (7) degrees Celsius to thirty (30) degrees Celsius. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Contract Administrator. After completion of operations, return areas to clean condition to approval of Contract Administrator.

.7 Remove paint materials from storage in quantities required for same day use.

.8 Comply with requirements of Workplace Hazardous Materials Information System regarding use, handling storage and disposal of hazardous materials.

.9 Fire Safety Requirements:

.1 Provide one (1) nine (9) kilogram Type ABC dry chemical fire extinguisher adjacent to storage area;

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from Site on a daily basis; and

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.9 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:

.1 Perform no repainting Work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above ten (10) degrees Celsius for twenty-four (24) hours before, during and after paint application and until paint has cured sufficiently.

.2 Ventilate enclosed spaces. Where required, provide continuous ventilation for seven (7) days after completion of application of paint.

.3 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements. The use of gas-fired appliances is not permitted.

.4 Perform no painting Work unless a minimum lighting level of three hundred twenty-three (323) Lux is provided on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no repainting Work when:

.1 Ambient air and substrate temperatures are below ten (10) degrees Celsius.

.2 Substrate temperature is over thirty-two (32) degrees Celsius unless paint is specifically formulated for application at high temperatures.

.3 Relative humidity within area to be repainted is above eighty-five percent (85%).

.2 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except use a simple "cover patch test" on concrete floors to be repainted.

.3 Perform no repainting Work when maximum moisture content of substrate exceeds:

.1 Twelve percent (12%) for concrete and masonry (clay and concrete brick/block).

.2 Fifteen percent (15%) for wood.

.3 Twelve percent (12%) for plaster and gypsum board.

.4 Test painted concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by the specific coating manufacturer.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.2 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal or appropriate cleaning and laundering.

.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

.5 Where paint recycling is available, collect waste materials by type and provide for delivery to recycling or collection facility.

.6 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals or organizations for verifiable re-use or re-manufacturing.

1.11 EXTRA MATERIALS

.1 Submit maintenance materials in accordance with Special Provisions of the Contract.

.2 Submit one (1), four (4) litre can of each type and colour of finish coating. Identify type and colour in relation to established colour schedule and finish system.

.3 Deliver to City of Winnipeg and store where directed.

Part 2 Products

2.1 MATERIALS

.1 Paint materials listed in the latest edition of the Master Painters Institute Approved Product List (APL) as supplied by one (1) of following manufacturers are acceptable for use on this Project:

.1 ICI Devoe;
.2 PPG Industries, Inc.;
.3 Colour Your World;
.4 Pratt and Lambert;
.5 Benjamin Moore; or
.6 Para Paints.

.2 Where required by authorities having jurisdiction, paints and coatings shall provide a fire resistant rating.

.3 Paint materials for repaint systems shall be products of a single manufacturer.

.4 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.5 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

2.2 COLOURS

.1 Contract Administrator will provide Colour Schedule after Contract award.

.2 Colour schedule will be based upon selection of five (5) base colours and three (3) accent colours. No more than eight (8) colours will be selected for the entire Project and no more than three (3) colours will be selected in each area.

.3 Selection of colours will be from manufacturer’s full range of colours.

.4 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.5 First coat in a two (2) coat (Premium) repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to Site.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following Master Painters Institute gloss/sheen standard values:

GLOSS LEVEL CATEGORY	UNITS at 60^{O}	UNITS at 85^{O}
G1 – matte finish	0 to 5	maximum 10
G2 – velvet finish	0 to 10	10 to 35
G3 – eggshell finish	10 to 25	10 to 35
G4 – satin finish	20 to 35	minimum 35
G5 – semi-gloss finish	35 to 70	
G6 – gloss finish	70 to 85	
G7 – high gloss finish	> 85	

.2 Gloss level ratings of repainted surfaces shall be as specified herein and as noted on Finish Schedule.

2.5 INTERIOR PAINTING SYSTEMS

.1 Applies to new finishes over previously unpainted surfaces or new shop primed surfaces to be field painted.

.2 Refer to Finish Schedule on Architectural Drawings for locations.

.3 Galvanized and non-galvanized metal: doors, frames, railings, structural and miscellaneous metals (within floor to underside of ceilings):

.1 Alkyd primer/sealer – One (1) coat; and

.2 Alkyd – G5 finish – Two (2) coats.

.4 Gypsum board and exposed plywood: gypsum wallboard, drywall, "sheet rock type material", plywood and wood:

.1 Latex primer/sealer – One (1) coat; and

.2 Latex G3 finish – Two (2) coats.

.5 Canvas and cotton coverings:

.1 Latex G1 finish – Two (2) coats.

2.6 INTERIOR RE-PAINTING SYSTEMS

.1 Applies to previously painted surfaces, not new or shop primed.

.2 Galvanized and non-galvanized metal: doors, frames, railings, misc. steel, pipes and ducts.

.1 Prepare by mechanical means or shot blasting.
.2 Primer – Amerlock 2.
.3 Finish coat – Amerlock 400 Two-component, high solids epoxy coating.

.3 Concrete and masonry surfaces:

.1 Latex block filler – One (1) thick coat to fill pores; and
.2 Latex G3 finish – Two (2) coats.

.4 Canvas and cotton coverings:

.1 Latex G1 finish – Two (2) coats.

2.7 EXTERIOR PAINTING AND RE-PAINTING SYSTEMS

.1 Galvanized Metal:

.1 Galv, metal primer – One (1) coat; and
.2 Alkyd G5 level finish – Two (2) coats.

2.8 ANTI-GRAFFITI COATING

.1 Applied to exterior masonry and exposed concrete surfaces:

.1 Sherwin Williams Anti-Graffiti Coating (or Contract Administrator approved alternate) siloxane, non-stick transparent coating with non-glossy finish applied following suppliers instructions on sand blasted and clean surfaces.

Part 3 Execution

3.1 GENERAL

.1 Perform preparation and operations for interior painting in accordance with Master Painters Institute Maintenance Repainting Manual requirements except where otherwise specified.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

.1 Prior to commencing Work, thoroughly examine Site conditions and existing interior substrates to be repainted. Report in writing to Contract Administrator

damages, defects or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this Work.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Contract Administrator. Maximum moisture content shall not exceed limits specified herein.

.3 No repainting Work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor and Inspection Agency. Commencement of Work shall not be held to imply acceptance of surfaces except as qualified herein.

.4 Degree of surface deterioration shall be assessed using Master Painters Institute Identifiers and Assessment criteria indicated in the Master Painters Institute Maintenance Repainting Manual. Master Painters Institute degree of surface deterioration ratings and descriptions are as follows:

CONDITION	**DESCRIPTION**
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

3.3 PROTECTION

.1 Protect existing surfaces and adjacent fixtures and furnishings from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Contract Administrator.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect general public and building occupants in and about the building.

.5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and surface mounted equipment, fittings and fastenings shall be done prior to undertaking re-painting operations by Contractor. Items shall be securely stored and re-installed by Contractor after painting is completed.

.6 Move and cover furniture and portable equipment as necessary to carry out repainting operations. Replace as painting operations progress.

.7 As repainting operations progress, place "WET PAINT" signs in occupied areas to approval of Contract Administrator.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare interior surfaces to be repainted in accordance with Master Painters Institute Maintenance Repainting Manual requirements. Refer to Master Painters Institute Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Remove chipped, loose, scaling, sealants and caulking materials, fasteners, adhesive residues etc. or other surface blemishes which would impair the final results.

.3 Patch small holes and depressions in drywall finishes with appropriate patching compound and sand flush with adjacent finish.

.4 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.

.5 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.6 Allow surfaces to drain completely and to dry thoroughly. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing Work.

.7 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.

.8 Many water-based paints cannot be removed with water once dried. Minimize the use of kerosene or such organic solvents to clean up water-based paints.

.2 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with Master Painters Institute requirements. Remove such contaminates from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.

.3 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime and apply primer, paint or pre-treatment as soon as possible after cleaning and before deterioration occurs.

.4 Do not apply paint until prepared surfaces have been accepted by Contract Administrator.

.5 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to one thousand (1,000) millimetres.

3.5 APPLICATION

.1 Apply paint by method that is best suited for substrate being repainted using brush roller air sprayer and/or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise. Methods of application shall be as pre-approved by Contract Administrator before commencing the Work.

.2 Brush and Roller Application:

- .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple.
- .5 Remove runs, sags and brush marks from finished Work and repaint.

.3 Spray Application:

- .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application by continuous mechanical agitation intermittent agitation frequently as necessary.
- .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
- .4 Back roll spray applications and brush out runs and sags immediately.
- .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Contract Administrator.

.5 Apply paint coats in a continuous manner and allow surfaces to dry and properly cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats shall not be less than that recommended by the manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Sand and dust between coats to remove visible defects.

.7 Repaint surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.8 Repaint top, bottom and vertical edges of doors to be repainted.

.9 Repaint closets and alcoves to match existing, unless otherwise scheduled or noted.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise noted, repainting shall also include exposed to view/previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, ventilation fan enclosures, etc.).

.2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.

.3 Do not paint over name plates or instruction labels.

.4 Leave unfinished exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.

.5 Keep sprinkler heads free of paint.

.6 Do not paint interior transformers and substation equipment.

3.7 CLEAN-UP

.1 Remove paint where spilled, splashed, splattered or sprayed as Work progresses using means and materials that are not detrimental to affected surfaces.

.2 Keep Work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

.4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as noted herein.

.5 Painting equipment shall be cleaned in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations shall be recycled or disposed of in a manner acceptable to authorities having jurisdiction.

.6 Paint and coatings in excess of repainting requirements shall be recycled as noted herein.

3.8 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Contract Administrator. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Contract Administrator.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI):

.1 ANSI/NFPA 10-2010, Portable Fire Extinguishers.

.2 Underwriters' Laboratories of Canada (ULC):

.1 CAN/ULC-S508-2002 (R2007), Rating and Fire Testing of Fire Extinguishers and Class "D" Extinguishing Media.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit Shop Drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

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

Part 2 Products

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHER

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection.

.2 Size: 4.5 kilograms.

2.2 EXTINGUISHER BRACKET

.1 Type recommended by extinguisher manufacturer.

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of CAN/ULC-S508.

.2 Supply and install an identification lamacoid adjacent to each fire extinguisher.

.3 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

Part 3 Execution

3.1 INSTALLATION

.1 Install or mount extinguishers in cabinets or on brackets as indicated.

.2 Attach lamacoid with screws.

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; and
- .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; and
- .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, Contract Administrator 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.
- .4 Maintenance data to include: servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .1 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.

1.2 MAINTENANCE

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

.1 One (1) filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.2 Provide one (1) set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 – Closeout Submittals.

Part 2 Products – NOT USED

Part 3 Execution

3.1 PAINTING, REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 00 – Painting and Protective Coatings.

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

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

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests 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.

3.4 DEMONSTRATION

.1 Contract Administrator 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.

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

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

1.2 REFERENCES

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

.1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

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

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

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

.3 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement;

.4 ASTM C533, Calcium Silicate Block and Pipe Thermal Insulation;

.5 ASTM C547, Mineral Fiber Pipe Insulation;

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

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

.3 Canadian General Standards Board (CGSB):

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

.4 Manufacturer's Trade Associations:

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

.5 Underwriters' Laboratories of Canada (ULC):

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

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering;

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings; and

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

.1 For purposes of this Section:

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

.2 "Exposed" – will mean "not concealed" as specified.

.2 TIAC:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, Specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

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

.2 Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: twenty-five (25).

.2 Maximum smoke developed rating: fifty (50).

2.2 INSULATION

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

.2 Thermal conductivity ("k" factor) not to exceed specified values at twenty-four (24) degrees Celsius mean temperature when tested in accordance with ASTM C335.

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

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

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

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

.4 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit Project requirements.

.1 Insulation: to ASTM C533.

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

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, plain, fifty (50) millimetres wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 millimetres diameter stainless steel.

.5 Bands: stainless steel, nineteen (19) millimetres wide, 0.5 millimetres thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

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

2.5 VAPOUR RETARDER LAP ADHESIVE

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

2.6 VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 JACKETS

.1 Canvas:

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

.2 Lagging adhesive: compatible with insulation.

.2 Stainless steel:

.1 Type: three hundred four (304).

.2 Thickness: 0.25 millimetres.

.3 Finish: smooth.

.4 Joining: longitudinal and circumferential slip joints with fifty (50) millimetres laps.

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

.6 Metal jacket banding and mechanical seals: stainless steel, nineteen (19) millimetres wide, 0.5 millimetres thick at three hundred (300) millimetres spacing.

2.8 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Caulking to: Section 07 92 10 – Joint Sealing.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLATION REQUIREMENT

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

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

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and this Specification.

.3 Use two (2) layers with staggered joints when required nominal wall thickness exceeds seventy-five (75) millimetres.

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

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

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

3.4 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturer’s instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

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

.1 Seals: lap seal adhesive, lagging adhesive.

.2 Installation: TIAC Code: 1501-C.

.3 TIAC Code: A-2.

.1 Seals: lap seal adhesive, lagging adhesive.

.2 Installation: TIAC Code: 1501-H.

.4 Thickness of insulation as listed in following table.

.1 Run-outs to individual units and equipment not exceeding four thousand (4,000) millimetres long.

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

Application	Temp°C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
• Domestic CWS with vapour retarder		C-2	25	25	25	25	25	25

.5 Finishes:

.1 Exposed indoors: canvas.

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

.3 Outdoors: water-proof SS jacket.

.4 Finish attachments: SS bands, at one hundred fifty (150) millimetres on centre. Seals: closed.

.5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.6 CLEANING

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

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Shop Drawings:

.1 Indicate on Drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 Shop Drawings and product data accompanied by:

.1 Detailed Drawings of bases, supports and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Division 1.

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

.1 Operation and maintenance manual approved by, and final copies deposited with the Contract Administrator before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls;

.2 Description of systems and their controls;

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances;

.4 Operation instruction for systems and component;

.5 Description of actions to be taken in event of equipment failure;

.6 Valves schedule and flow diagram; and

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment; and

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete;

.2 Equipment performance verification test results;

.3 Special performance data as specified; and

.4 Testing, adjusting and balancing reports as specified in Section 22 05 93 – Testing, Adjusting and Balancing for Plumbing.

.5 Approvals:

.1 Submit one (1) copy of draft operation and maintenance Manual to the Contract Administrator for approval. Submission of individual data will not be accepted.

.2 Make changes as required and re-submit as directed by the Contract Administrator.

.6 Additional data:

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

.7 Site records:

.1 Provide sets of white prints as required for each phase of Work. Mark changes as Work progresses and as changes occur. Include changes to all mechanical systems, control systems and low voltage control wiring.

.2 Use different colour waterproof ink for each service.

.3 Make available for reference purposes and inspection.

.8 As-built Drawings:

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

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

.3 Submit to the Contract Administrator for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for Plumbing using as-built Drawings.

.5 Submit completed reproducible as-built Drawings with operating and maintenance manuals.

.9 Submit copies of as-built Drawings for inclusion in the final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Division 1.

.2 Furnish spare parts per equipment manufacturer’s recommendations and instructions.

.3 Provide one (1) set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one (1) commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

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

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

.3 Replace defective or damaged materials with new.

Part 2 Products – NOT USED

Part 3 Execution

3.1 EXAMINATION

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

.1 Inform the Contract Administrator of unacceptable conditions immediately upon discovery.

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

3.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with applicable Specification Section as required.

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

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

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of

product and submit Manufacturer's Field Reports as described in PART 1 – ACTION AND INFORMATIONAL SUBMITTALS.

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

3.4 DEMONSTRATION

.1 Contractor 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.

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

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

.1 NSF/ANSI 14, Plastic Piping System Components and Related Materials;

.2 ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250; and

.3 ASME B31.9 – Building Services Piping.

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

.1 ASTM F1970, Standard Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems;

.2 ASTM D2241, Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series);

.3 ASTM D1785, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120;

.4 ASTM D2467, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; and

.5 ASTM D2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride).

.3 Canadian Standards Associations (CSA):

.1 CSA B137.3, Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications; and

.2 ASME A112.14/CSA B125.14, Manually Operated Valves for Use in Plumbing Systems.

.4 National Plumbing Code of Canada (NPC).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Deliver materials to Site in original factory packaging, labelled with manufacturer's name, address.

.2 Ensure materials are new, and free of defects.

.3 Avoid contact between dissimilar metals at all times.

Part 2 Products

2.1 GENERAL

.1 Installations shall include all devices, attachments, equipment, components and piping necessary to form a complete working system to code requirements.

2.2 VALVES

.1 Refer to the Equipment Schedule for valve types and Specifications.

.2 All valves of one (1) type (e.g. gate valves) must be of one (1) manufacturer. Ensure that working pressure, size and manufacturer's name are cast or stamped into the body of each valve.

2.3 DIELECTRIC PIPE FITTINGS /UNIONS

.1 Dielectric fittings factory certified to withstand a minimum of six hundred (600) volts on a dry line with no flashover. Unions rated at 1.7 MPa conforming to ANSI B16.39. Flanged fittings rated at 1.2 MPa conforming to ANSI B16.24 (bronze) and B16.42 (iron).

2.4 PIPE SLEEVES AND SEALS

.1 Where piping penetrates below grade walls or floors:

.1 Seal: modular, mechanical type, consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening complete with 316 stainless steel fasteners. Seal elements shall be sized and selected per manufacturer’s recommendations and be suitable for the required fire-resistance rating and anticipated environmental conditions. Standard of acceptance: ‘Link-Seal”.

.2 Sleeve: custom-sized molded HDPE sleeves matched to the mechanical seal dimensions complete with reinforcing ribs, end caps, and integrally formed hollow water stop having a minimum outside diameter one hundred (100) millimeters larger than the diameter of the sleeve itself and allowing thirteen (13) millimeters movement between wall forms to resist pour forces. Standard of acceptance: ‘Century-Line’.

.2 Elsewhere: Schedule 40 black steel pipe sleeve.

.3 All sleeves and floor penetrations to be water-tight.

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Provide valves and unions to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.3 Route the piping in such a way to have a clear space required for access and service of equipment.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for safe operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment and components.

.3 Ensure that none of the pipework and supports obstruct walkways and access ways. Provide not less than 2.1 metres clear headroom under piping, piping insulation and supports.

.4 Keep piping clear of manholes and access openings.

3.3 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

3.4 PIPEWORK INSTALLATION

.1 Install pipework in complete accordance with applicable Codes and by-laws.

.2 Run piping as indicated on the Drawings. Check for interferences and make minor adjustments to routing as required to accommodate possible field interferences. If any field interferences require major changes to piping design or routing, contact the Contract Administrator and after obtaining written authorization make the required changes.

.3 Install exposed piping, and similar items approximately as shown on the Drawings, parallel or perpendicular to building lines and as close to the structure as possible.

.4 Install all pipe mounted control devices, such as control valves and switches in such manner they can be reached without using a lifting device.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 American National Taper pipe thread must be used for all thread connections. Remove burrs and chips and ream or file the pipe ends out to size of bore.

.7 Leave not more than two (2) threads exposed on threaded joints when made up.

.8 Ream pipes, remove scale and other foreign material before assembly.

.9 Arrange piping to permit flushing.

.10 Support piping as required.

3.5 PLUMBING ISOLATION

.1 Install isolation valves as shown on Drawings.

3.6 PIPE GUIDES

.1 Provide alignment guides where required for proper operation of the system.

3.7 PIPE ANCHORS

.1 Provide substantial pipe anchors. Anchors shall be suitably attached to the structure and the pipe to prevent movement.

3.8 PIPE SLEEVES AND SEALS

.1 General: Install where pipes pass through masonry structures, concrete structures and elsewhere as indicated. Be responsible for maintaining the integrity of the building envelope when making penetrations. Enlist the services of qualified trade(s) to make openings in, and/or repairs to, building envelope.

.2 Sleeve Sizes:

.1 Walls: six (6) millimetres minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.2 Floors: twenty (20) millimetres minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.3 Sleeve Installation:

.1 Concrete walls, masonry walls, and concrete floors on grade: Terminate flush with finished surface.

.2 Other floors:

.1 Terminate fifty (50) millimetres above finished floor.

.2 Adjust as necessary to accommodate the requirements of through-penetration fire-stopping systems.

.4 Sealing:

.1 Foundation walls and below grade floors: Waterproof, modular mechanical seal.

3.9 FLUSHING OUT OF PIPING SYSTEMS

.1 In accordance as specified in relevant sections of Division 22.

.2 Before start-up, clean interior of piping systems in accordance with requirements as specified in relevant sections of Division 22.

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

3.10 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise the Contract Administrator and the City of Winnipeg forty-eight (48) hours minimum prior to performance of pressure tests. All pressure testing to be in accordance with applicable standards and documented on Contractor's standard testing forms.

.2 Pipework: Test as specified in relevant sections of Division 22, otherwise test to requirements of ASME B31.9.

.3 Test all piping hydraulically to 1.5 times the operating pressure but not less than eight hundred sixty (860) kPa (one hundred twenty-five (125) pounds per square inch).

.4 Prove piping with less than fourteen (14) kPa pressure drop and no visible leakages for a period of twenty-four (24) hours with a hydraulic test.

.5 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or test media.

.6 Conduct tests in presence of the Contract Administrator or designate approved by the Contract Administrator.

.7 Pay costs for testing, repairs or replacement, retesting, and making good. The Contract Administrator to determine whether repair or replacement is appropriate.

.8 Insulate or conceal Work only after approval and certification of tests by the Contract Administrator.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 National Building Code of Canada (NBC).

.2 National Plumbing Code of Canada (NPC).

1.2 GENERAL

.1 TAB means to test, adjust and balance in accordance with requirements of Contract Documents and to do other Work as specified.

.2 The TAB Company must be a firm specializing in such Work, equipped with a full range of calibrated instruments, and experienced in adjustment and operation of mechanical systems.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Names of personnel proposed to perform TAB to be submitted and approved by the Contract Administrator within ninety (90) days of Award of Contract.

.2 Provide documentation confirming qualifications, successful experience.

1.4 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.5 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.6 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, final adjustments and re-testing) into Project construction and completion schedule so as to ensure completion before acceptance of Project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with affected systems.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 INSTRUMENTS

.1 Prior to TAB, submit to the Contract Administrator list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for applicable system.

.3 Calibrate within three (3) months of TAB. Provide certificate of calibration to the Contract Administrator, prior to start of TAB work on Site.

1.8 SUBMITTALS

.1 Submit to the Contract Administrator, prior to commencement of TAB:

.1 A written description of approach to TAB for each system, written specifically for the Project, outlining sequence and procedures for the Work. Include relevant information including, but not limited to, location of sensors, balancing valves and test ports, approach to optimizing system set points, concerns affecting other trades such as penetration sealing, and possible limitations of specified equipment that may affect TAB. Identify deviations from referenced standards and commonly accepted industry practice.

1.9 PRELIMINARY TAB REPORT

.1 Submit for review and approval by the Contract Administrator, prior to submission of formal TAB report:

.1 Details of instruments used;

.2 Details of TAB procedures employed, if different from procedures submitted earlier;

.3 Calculations procedures; and

.4 Preliminary measurements.

1.10 TAB REPORT

.1 Format to be in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record Drawings; and

.2 System schematics.

.3 Submit six (6) copies of TAB Report to the Contract Administrator for verification and approval, in English, spiral or cerlox bound with covers, complete with index tabs.

1.11 VERIFICATION

.1 Reported results subject to verification by the Contract Administrator.

.2 Provide manpower and instrumentation to verify up to thirty percent (30%) of reported results.

.3 Number and location of verified results to be at discretion of the Contract Administrator.

.4 Bear costs to repeat TAB as required to satisfaction of the Contract Administrator.

1.12 SETTINGS

.1 After TAB is completed to satisfaction of the Contract Administrator, return systems and equipment to final operation condition. Lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Markings covered in anyway and shall be permanent and not easily eradicated.

.1 Set memory stop function on calibrated balancing valves.

1.13 COMPLETION OF TAB

.1 TAB to be considered complete when final TAB Report received and reported approved by the Contract Administrator in writing.

1.14 INSTRUMENT TEST PORTS

.1 Coordinate and utilize permanent test ports as required.

1.15 PLUMBING SYSTEMS – DESIGN INTENT

.1 Arrange a meeting with the Contract Administrator to review design intent for all systems prior to the start of TAB. Obtain all information relevant to TAB work prior, including, but not limited to domestic cold water system supply location and flow rate, pressure reducing valve location and set point.

Part 2 Products – NOT USED

Part 3 Execution

3.1 GENERAL

.1 Investigate all problems and resolve with the Contractor's help, to ensure all values are within range. Obtain direction from the Contract Administrator when necessary.

3.2 PRE-TAB REVIEW

.1 Review Contract Documents and submit documentation specified below in writing to the Contract Administrator prior to the installation of any systems that will require TAB.

.2 Arrange and attend a meeting with the Contract Administrator and appropriate trades to review and discuss adequacy of provision for TAB and other aspects of design and installation pertinent to success of TAB.

.3 Review proposed location of sensors, balancing valves and test ports with other trades to confirm that locations are suitable for TAB equipment and will permit repeatable measurements to permit recalibration on the control’s sensors.

.4 Confirm in writing to the Contract Administrator adequacy of provisions for TAB.

.5 Review specified standards and report to the Contract Administrator in writing all proposed procedures that vary from standard.

3.3 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere.

3.4 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by the Contract Administrator for verification of TAB reports.

3.5 START OF TAB

.1 Notify the Contract Administrator seven (7) days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.1 Construction affecting TAB;

.2 All pressure, leakage, other tests specified; and

.3 All provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal and safe operation of plumbing and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment; and

.2 Liquid systems:

.1 Flushed, filled, vented;

.2 Correct pump rotation;

.3 Strainers in place, baskets clean;

.4 Isolating and balancing valves installed, open;

.5 Calibrated balancing valves installed, at factory settings; and

.6 Water treatment systems complete, operational.

3.6 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 Balance water systems to within ten percent (10%) of the quantities shown on the Drawings for each component, and to within five percent (5%) of design requirements for the overall system.

.2 Check all change orders and clarifications to ensure current information is utilized.

3.7 ACCURACY TOLERANCES

.1 Measured values to be accurate to within two percent (2%) of actual values.

3.8 VERIFICATION OF CONTROLS SYSTEMS

.1 TAB contractor shall assist in verification, demonstration and calibration of the plumbing controls systems, specified under Division 22.

.2 Perform measurements at test ports to confirm calibration of controls sensors, including temperature and pressure, and report on measured versus sensed values.

3.9 PLUMBING SYSTEMS

.1 Do TAB of systems, equipment, components, controls as required to satisfy systems performance.

.2 Quality assurance: Perform TAB under direction of the Project supervisor.

.3 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rates, pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power, voltage, current draw, noise, vibration.

.4 Locations of equipment measurement: To include, but not be limited to, following as appropriate:

- .1 Inlet and outlet of pressure reducing valves, control valves, other equipment causing changes in conditions.
- .2 At controllers, controlled device.

.5 For All Pumps:

- .1 Horsepower as determined by voltage and current measurements in all phases.
- .2 Pressure difference and flow rate.
- .3 Nameplate data.
- .4 Verify pump rotation and shut-off head.
- .5 Pump curve with operating design and shut-off conditions shown.

.6 For Control Stations and Pressure Reducing Valves:

- .1 Set to ensure desired pressure or flow rating.

.7 Flow Meters and Balancing Valves:

- .1 Nameplate data.
- .2 Primary and converted readings for each condition.
- .3 Description, including service and location.

3.10 SCHEDULE

.1 Schedule the balancing to suit the progress of the Work. Make every attempt to complete the Work, or at least the affected local Work, prior to occupancy or partial occupancy.

.2 In phased Projects, complete the Work in each phase, as it is completed. Make final checks and corrections as required to all phases at the completion of the entire Project.

3.11 FINAL ADJUSTMENT

.1 Allow for a final adjustment, as directed by the Contract Administrator. Revise the reports accordingly.

3.12 POST-OCCUPANCY TAB

.1 Participate in systems checks twice during Warranty Period – first visit approximately three (3) months after acceptance and second visit within one (1) month of termination of Warranty Period.

.2 Start-up and Commissioning: upon completion and after final cleaning, start-up and commission fans in accordance with manufacturer's printed instructions and Division 1.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

.1 NSF/ANSI 14, Plastic Piping System Components and Related Materials;

.2 ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250;

.3 ASME B31.9 – Building Services Piping;

.4 ASME A112.19.2/CSA B45.1 – Stainless Steel Plumbing Fixtures; and

.5 ASME B36.19M – Stainless Steel Pipe.

.2 American Society for Testing and materials (ASTM):

.1 ASTM F1970, Standard Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems;

.2 ASTM D2241, Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series);

.3 ASTM D1785, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120;

.4 ASTM D2467, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80;

.5 ASTM D2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride);

.6 ASTM A 312/A 312M – Seamless, Welded, and Heavily Cold Worked Stainless Steel Pipes; and

.7 ASTM A182/A 182M – Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

.3 Canadian Standards Associations (CSA):

.1 CSA B137.3, Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications; and

.2 ASME A112.14/CSA B125.14, Manually Operated Valves for Use in Plumbing Systems.

.4 National Plumbing Code of Canada.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual as specified in Division 1.

Part 2 Products

2.1 PIPING

.1 Domestic cold system, within building.

.1 PVC water pipe Schedule 80 per ASTM D1785, CSA B137.3.

.2 Stainless steel pipe Schedule 80 per ASTM 312 Gr. 304, threaded ends. (Per location as shown on Drawing).

2.2 FITTINGS

.1 Fittings shall conform to ASTM D 2467, CSA B137.3 for PVC pipe.

.2 Fittings Class 3000 forged stainless steel Gr. 304 threaded fittings, ASTM A182 for Stainless Steel pipe.

2.3 JOINTS, UNIONS AND COUPLINGS

.1 For valve threaded joints: ULC certified sealant.

.2 Weld-On joints: solvent cement.

.3 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

.4 Connection between dissimilar material: adapters compatible with materials of both piping systems.

.5 PVC joint unions for solvent weld PVC piping to one thousand thirty-five (1,035) kPa (one hundred fifty (150) psi).

.6 For stainless steel pipe: Class 3000 forged stainless steel Gr. 304 union ASTM A182, steel to steel ground seats, threaded ends.

2.4 BALL VALVES

.1 As specified in Equipment Schedule.

2.5 GATE VALVES

.1 As specified in Equipment Schedule.

2.6 SOLENOID VALVES

.1 As specified in Equipment Schedule.

2.7 HOSE BIBBS

.1 As specified in Equipment Schedule.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code.

.2 Install pipe Work in accordance with Section 22 05 02 – Installation of Pipework – Plumbing.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.5 Install wall anchored stainless steel brackets/clamps for PVC piping with spacing as required.

3.3 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

3.4 PRESSURE TESTS

.1 Conform to requirements of Section 22 05 00 – Common Work Results for Plumbing.

.2 Test pressure: greater of 1.5 times maximum system operating pressure or eight hundred sixty (860) kPa (one hundred twenty-five (125) psi).

3.5 FLUSHING AND CLEANING

.1 Flush entire system. Let stand for twenty-four (24) hours, then draw one (1) sample off longest run. Submit to testing laboratory to verify that system is clean to Provincial potable water guidelines.

3.6 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

3.7 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.

.2 Upon completion, provide laboratory test reports on water quality for the Contract Administrator’s approval.

3.8 START-UP

.1 Timing: start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish water flow and ensure that air is eliminated from the system.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.4 Rectify start-up deficiencies.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for plumbing specialties and accessories.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings; and

.2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA):

.1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case;

.2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service; and

.3 AWWA C702-1, Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA International):

.1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers;

.2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction; and

.3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Plumbing and Drainage Institute (PDI):

.1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data; and

.2 PDI-WH201, Water Hammer Arresters Standard.

1.3 SUBMITTALS

.1 Submittals in accordance with Division 1.

.2 Shop Drawings:

.1 Submit Shop Drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details.

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

.4 Instructions: submit manufacturer's installation instructions.

.5 Manufacturers' Field Reports: manufacturers' field reports specified.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual in accordance with Division 1, include:

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity;

.2 Details of operation, servicing and maintenance; and

.3 Recommended spare parts list.

Part 2 Products

2.1 BACK FLOW PREVENTERS

.1 Preventers: to CSA-B64 Series, reduced pressure principle type.

.2 As indicated on Drawing – Equipment Schedule.

.3 Acceptable Manufacturers: Watts

2.2 WATER METERS

.1 Turbine type to AWWA C701 and as per City of Winnipeg requirements.

.2 As indicated on Drawing – Equipment Schedule.

.3 Acceptable Manufacturers: Neptune

2.3 SUMP PUMPS

.1 Electric submersible heavy duty automatic sewage sump pump.

.2 Heavy cast iron with epoxy powder coat finish and stainless steel fasteners construction.

.3 Fifty (50) millimetres solids-handling.

.4 As indicated on Drawing – Equipment Schedule.

.5 Acceptable Manufacturers: Zoeller.

2.4 STRAINER

.1 Cast bronze “Y” type strainer.

.2 Certified to NSF/ANSI 372.

.3 Screen 20 Mesh stainless Steel.

.4 As indicated on Drawing – Equipment Schedule.

.5 Acceptable Manufacturers: Zurn.

2.5 PRESSURE REDUCING VALVE

.1 Adjustable from one hundred seventy-two (172) to five hundred seventeen (517) kPa (twenty-five (25) to seventy-five (75) pounds per square inch).

.2 As indicated on Drawing – Equipment Schedule.

.3 Acceptable Manufacturers: Watts.

2.6 SIGHT GLASS

.1 Clear Schedule 40 PVC pipe, no scale.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or Specifications, including product technical bulletins, handling, storage and installation instructions and data sheet.

3.2 INSTALLATION

.1 Install equipment in accordance with provincial codes, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 WATER METERS

.1 Install water meter provided by local water authority.

.2 Install water meter as indicated.

3.4 START-UP

.1 Timing: start-up only after:

.1 Pressure tests have been completed;
.2 Disinfection procedures have been completed;
.3 Certificate of static completion has been issued; and
.4 Water treatment systems operational.

3.5 TESTING AND ADJUSTING

.1 Timing:

.1 After start-up deficiencies rectified; and
.2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:

.1 Pressure at fixtures: ± seventy (70) kPa.

.2 Flow rate at fixtures: ± twenty percent (20%).

.3 Vacuum breakers, backflow preventers:

.1 Test tightness, accessibility for operations and maintenance of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.4 Access doors:

.1 Verify size and location relative to items to be accessed.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Shop Drawings:

.1 Indicate on Drawings:

.1 Mounting arrangements; and

.2 Operating and maintenance clearances.

.3 For equipment requiring power, include Voltage, Amperage and Horsepower.

.2 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; and

.5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Division 1.

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

.1 Operation and maintenance manual approved by, and final copies deposited with, the Contract Administrator before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls;

.2 Description of systems and their controls;

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances;

.4 Operation instruction for systems and components;

.5 Description of actions to be taken in event of equipment failure; and

.6 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment; and

.2 Data to include schedules of tasks, frequency, tools required and time required to complete a task.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete;

.2 Equipment performance verification test results;

.3 Special performance data as specified; and

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit one (1) copy of draft Operation and Maintenance Manual to the Contract Administrator for approval. Submission of individual data will not be accepted.

.2 Make changes as required and re-submit as directed by the Contract Administrator upon review.

.6 Additional data:

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

.7 Site records:

.1 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 Use different colour waterproof ink for each service.

.3 Make available for reference purposes and inspection.

.8 As-built Drawings:

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

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

.3 Submit to the Contract Administrator for approval and make corrections as directed.

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

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

.9 Submit copies of as-built Drawings for inclusion in final testing, adjusting and balancing report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Division 1.

.2 Furnish spare parts per equipment manufacturer’s recommendations and instructions.

.3 Provide one (1) set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one (1) commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:

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

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

.3 Replace defective or damaged materials with new.

Part 2 Products – NOT USED

Part 3 Execution

3.1 EXAMINATION

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

.1 Inform the Contract Administrator of unacceptable conditions immediately upon discovery.

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

3.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting to match existing station coatings.

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

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

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers.

3.4 FIELD QUALITY CONTROL

.1 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 Division 1.

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

3.5 DEMONSTRATION

.1 The Contract Administrator 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.

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel; and

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.2 The City of Winnipeg, Water and Waste Department, Identification Standard.

1.3 SUBMITTALS

.1 Product data to include paint colour chips, other products specified in this Section.

.2 Samples:

.1 Samples to include nameplates, labels, tags, lists of proposed legends.

.3 Submit fabrication Shop Drawings as soon as possible, allowing ample time for review, fabrication and installation.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Follow the requirements outlined in Division 1.

Part 2 Products

2.1 PAINT MATERIALS

.1 To match existing across the station as required.

2.2 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

.3 Provide on each piece of equipment. Include registration plates as required by respective agency and as specified.

.4 Do not apply insulation or paint over plates.

2.3 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 Three (3) millimetres thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of twenty-five (25) letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size # five (5).

.2 Equipment across the Plant: use size # nine (9).

2.4 EQUIPMENT IDENTIFICATION FOR PREVENTATIVE MAINTENANCE

.1 All equipment that requires preventative or scheduled maintenance shall have an identification plate screwed or riveted to it.

.2 For hot equipment, identification plate shall be engraved brass or bronze plate with engraved characters filled with black paint.

.3 For other equipment, identification plate shall be laminated phenolic plastic with black face and white letters engraved.

.4 Minimum letter or character size: 3/8 inch (ten (10) millimetres).

.5 The following information shall appear on each identification plate:

.1 Equipment Number and Name; and

.2 Equipment Code Number.

.6 Prior to fabrication of identification plates, submit list for approval of wording and fabrication details (letter, size, colour, etc.). This list shall include the following for each proposed identification plate:

.1 Proposed Equipment Number and Description; and

.2 Permanent Location of the Equipment.

.7 Vibration isolation devices do not require lamacoid identification.

.8 All pumps, tanks, safety and relief valves, and pressure reducing valves, require lamacoid identification.

.9 Confirm permanent building and location codes with the Contract Administrator prior to submittal of lists.

.10 After identification plate installation, insert typewritten directory listing equipment name, description, area(s) served and equipment code number into each Operating and Maintenance manual.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than seventy-five (75) millimetres: one hundred (100) millimetres long by fifty (50) millimetres high.

.2 Outside diameter of pipe or insulation seventy-five (75) millimetres and greater: one hundred fifty (150) millimetres long by fifty (50) millimetres high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing twenty (20) millimetres and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective over coating, waterproof contact adhesive undercoating, suitable for ambient of one hundred percent (100%) RH and continuous operating temperature of one hundred fifty (150) degrees Celsius and intermittent temperature of two hundred (200) degrees Celsius.

.7 Colours and Legends:

.1 Where not listed, obtain direction from the Contract Administrator.

.2 Colours for legends, arrows: to following table:

Background colour:	**Legend, arrows:**
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	**Background colour marking**	**Legend**
Domestic cold water supply	Green	DOM. CWS

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 Fifty (50) millimetres high stencilled letters and directional arrows one hundred fifty (150) millimetres long by fifty (50) millimetres high.

.2 Colours: black, or coordinated with base colour to ensure strong contrast.

2.7 VALVES, CONTROLLERS

.1 All valves shall be tagged and identified, excluding fixture stop valves located adjacent to fixtures and drain valves that are not piped to drain (either directly or indirectly). All balancing valves are to be tagged.

.2 Provide brass tags with twelve (12) millimetres stamped identification data filled with black paint identifying each valve. Identification to meet ANSI 13.1 and ANSI 535 standards for labelling equipment and valve tagging.

.3 Add the following information to balancing valve tags, if applicable:

.1 Valve final setting position;

.2 Date of adjustment; and

.3 Company and name of individual who made adjustment.

.4 Prepare complete valve directory listing all valve codes and identifying all areas that are served or controlled downstream of each valve (i.e., what each valve shuts off).

.5 Prepare corresponding Drawings illustrating each valve location and corresponding valve code. Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position and location.

.6 Provide a copy of the final valve directory and corresponding Drawings in each Operations and Maintenance Manual.

2.8 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system data where applicable including point name and ID number, equipment type, set point and range, function and (where appropriate) fail-safe position.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

.3 Provide printed cards, laminated with heavy plastic both side, and secure using nylon tags.

2.9 LANGUAGE

.1 Identification in English.

Part 3 Execution

3.1 GENERAL

.1 Before starting Work, obtain written approval of identification system from the Contract Administrator.

.2 Provide identification only after all painting specified in Division 09 has been completed.

.3 Perform Work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.4 Provide ULC and/or CSA registration plates as required by respective agency.

.5 All identification work shall be one hundred percent (100%) complete prior to commissioning.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Perform Work in accordance with CAN/CGSB-24.3 except as specified otherwise.

3.4 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.5 PVC PIPE

.1 Locations:

.1 To facilitate easy reading and identification from operating floor.

.2 Protection:

.1 Do not paint, insulate or cover.

3.6 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in the pump areas: at not more than seventeen (17) metres intervals and more frequently if required to ensure that at least one (1) is visible from any one (1) viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction, or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.7 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one (1) copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by the Contract Administrator. Provide one (1) copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.8 PAINTING AND IDENTIFICATION

.1 Do not paint pre-finished surfaces or brass.

.2 Do not paint non-ferrous and chrome-plated surfaces, stainless steel, aluminum, plastic, glass and pre-finished surfaces, unless directed otherwise by the Contract Administrator.

.3 Prepare all canvas or canvas-like surfaces with one (1) coat (two (2) mil dry thickness) of a premium quality latex primer-sealer prior to application of two (2) finish coats of paint. In all finished areas, prepare, prime and paint all exposed conduit to match the colour and finish coating of adjacent surfaces (environment) or as directed by the Contract Administrator.

.4 In architecturally unfinished areas, where mechanical lines are normally not painted, colour code lines with minimum three hundred (300) millimetres long solid colour band at maximum six (6) metres intervals, at inlet and outlet points, before and after barriers and equipment, beside all valves and on each line at every access door. Identification markings (fluid service code identification stencil and directional arrow) shall be painted onto every band such that markings are visible and obvious to a viewer.

3.9 NAMEPLATES AND IDENTIFICATION PLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide on hot and/or insulated surfaces.

.3 Protection

.1 Do not paint, insulate or cover in any way.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Testing, Adjusting and Balancing (TAB) means to test, adjust and balance systems to perform in accordance with requirements of Contract Documents and to do all other Work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Prior to testing, adjusting and balancing, names of all personnel it is proposed to perform testing, adjusting and balancing to be submitted to and approved by the Contract Administrator.

.2 Provide documentation confirming qualifications, successful experience.

1.3 PURPOSE OF TESTING, ADJUSTING AND BALANCING

.1 Test to verify proper and safe operation of equipment and to determine quantitative performance of equipment.

.2 Adjust and regulate the specified flow rates and air patterns at the terminal equipment.

.3 Balance to proportion flows within the distribution systems in accordance with specified design quantities and objectives.

1.4 EXCEPTIONS

.1 Testing, adjusting and balancing of systems and equipment regulated by codes and standards to be to satisfaction of authorities having jurisdiction (AHJ).

1.5 CO-ORDINATION

.1 Schedule time required for testing, adjusting and balancing (including allowance for repairs and re-testing) into Project construction and completion schedule so as to ensure completion before acceptance of Project.

.2 Do testing, adjusting and balancing of each system independently, and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TESTING, ADJUSTING AND BALANCING REVIEW

.1 Review Contract Documents before Project construction is started and confirm in writing to the Contract Administrator adequacy of provisions for testing, adjusting and balancing and other aspects of design and installation pertinent to success of testing, adjusting and balancing.

.2 Review specified standards and report to the Contract Administrator in writing all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of testing, adjusting and balancing devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturers unless specified otherwise.

1.8 OPERATION OF SYSTEMS DURING TESTING, ADJUSTING AND BALANCING

.1 Operate systems for length of time required for testing, adjusting and balancing and as required by the Contract Administrator for verification of testing, adjusting and balancing reports.

1.9 START OF TESTING, ADJUSTING AND BALANCING

.1 Notify the Contract Administrator ten (10) days prior to start of testing, adjusting and balancing.

.2 Start testing, adjusting and balancing when building is essentially complete, including:

.1 Installation of doors, windows and other construction affecting testing, adjusting and balancing;

.2 Application of door gaskets, weather stripping, sealing and caulking;

.3 All pressure and other tests specified elsewhere in Contract Documents; and

.4 All provisions for testing, adjusting and balancing installed and operational.

.3 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting testing, adjusting and balancing, including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment; and

.2 Air systems:

.1 Filters in place, clean;

.2 Duct systems clean;

.3 Correct fan rotation;

.4 Volume control dampers installed and open;

.5 Access doors installed and closed; and

.6 All outlets installed, volume control dampers open.

1.10 APPLICATION TOLERANCES

.1 Do testing, adjusting and balancing to following tolerances of design values:

.1 Air handling systems: plus or minus five percent (5%).

1.11 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus two percent (2%) of actual values.

1.12 INSTRUMENTS

.1 Prior to testing, adjusting and balancing, submit to the Contract Administrator list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of referenced standards.

.3 Calibrate within three (3) months of testing, adjusting and balancing. Provide certificate of calibration to the Contract Administrator.

1.13 SUBMITTALS

.1 Submit, prior to commencement of testing, adjusting and balancing, proposed methodology and procedures for performing testing, adjusting and balancing, if different from referenced standards.

1.14 PRELIMINARY TESTING, ADJUSTING AND BALANCING REPORT

.1 Submit for checking and approval by the Contract Administrator, prior to submission of formal testing, adjusting and balancing report, sample of rough testing, adjusting and balancing sheets. Include:

.1 Details of instruments used;

.2 Details of testing, adjusting and balancing procedures employed;

.3 Calculation procedures; and

.4 Summaries.

1.15 TESTING, ADJUSTING AND BALANCING REPORT

.1 Format to be in accordance with referenced standards.

.2 Testing, adjusting and balancing report to show results in SI units and to include:

.1 Project record Drawings; and

.2 System schematics.

.3 Submit six (6) copies of testing, adjusting and balancing Report to the Contract Administrator for verification and approval, in D-ring binders, complete with index tabs.

1.16 VERIFICATION

.1 All reported results subject to verification by the Contract Administrator.

.2 Provide manpower and instrumentation to verify up to thirty percent (30%) of reported results.

.3 Number and location of verified results to be at discretion of the Contract Administrator.

.4 Bear costs to repeat testing, adjusting and balancing as required to satisfaction of the Contract Administrator.

1.17 SETTINGS

.1 After testing, adjusting and balancing is completed to satisfaction of the Contract Administrator, replace drive guards, close access doors, lock devices in set positions, and ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TESTING, ADJUSTING AND BALANCING

.1 Testing, adjusting and balancing to be considered complete only when final testing, adjusting and balancing Report received and approved by the Contract Administrator.

1.19 AIR SYSTEMS

.1 Standard: testing, adjusting and balancing to be to standards of AABC or NEBB.

.2 Do testing, adjusting and balancing of all systems, equipment, components and controls shown on the Drawings.

.3 Qualifications: personnel performing testing, adjusting and balancing to be current member in good standing of AABC or NEBB.

.4 Quality assurance: perform testing, adjusting and balancing under direction of supervisor qualified by AABC or NEBB.

.5 Measurements to include, but not be limited to, following as appropriate for systems, equipment, components and controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dew point), duct cross-sectional area, RPM, electrical power, voltage.

.6 Locations of equipment measurements to include, but not be limited to, following as appropriate:

.1 Inlet and outlet of each damper, filter, fan or other equipment causing changes in conditions.

.2 At each controller and controlled device.

.7 Locations of system measurements to include, but not be limited to, following as appropriate: each main duct, main branch, sub-branch, run-out (or grille, register or diffuser).

Part 2 Products – NOT USED

Part 3 Execution – NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications;

.2 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation; and

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

.2 Canadian General Standards Board (CGSB):

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

.2 CGSB 51.53, Poly Vinyl Chloride Jacketing Sheet for Insulated Pipes, Vessels and Round Ducts.

.3 Manufacturer's Trade Associations:

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

.4 Underwriters' Laboratories of Canada (ULC):

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

1.2 DEFINITIONS

.1 For purposes of this Section:

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

.2 "Exposed" – will mean "not concealed" as defined herein.

.3 "Insulation Systems" – insulation materials, fasteners, jackets and other accessories.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork.

.2 CRF: Code Rectangular Finish.

1.3 SUBMITTALS

.1 Submit in accordance with Division 1.

.2 Product Data:

.1 Submit manufacturer's Shop Drawings, instructions, printed product literature and data sheets. Indicate the following:

.1 Manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

.1 Installation instructions to include procedures to be used, installation standards to be achieved.

.2 Material “K” value, temperature rating, density, finish, thickness for each individual service.

1.4 PERFORMANCE CERTIFICATION

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to test codes and standards.

.2 Provide confirmation of testing.

1.5 QUALIFICATIONS

.1 Installer to be specialist in performing Work of this Section, have at least three (3) years of successful experience in this size and type of Project, and be a member, in good standing, of TIAC.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 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.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: twenty-five (25).

.2 Maximum smoke developed rating: fifty (50).

2.2 INSULATION

.1 TIAC Code C-1: rigid glass fibre board (ninety-six (96) kg/m^3 density) to ASTM C612 with foil-scrim-kraft (FSK) factory applied vapour retarder jacket (as scheduled in PART 3 of this Section) to CGSB 51-GP-52Ma having a minimum puncture resistance of twenty-five (25) Beach Units. On curved surfaces score to suit radius of curve.

.1 Acceptable material: Knauf Insulation Board.

.2 TIAC Code C-2: glass fibre blanket (sixteen (16) kg/m^3 density) to ASTM C553 with foil-scrim-kraft (FSK) factory applied vapour retarder jacket (as scheduled in PART 3 of this Section) to CGSB 51-GP-52Ma having a minimum puncture resistance of forty (40) Beach Units.

.1 Acceptable material: Knauf Commercial Duct Wrap.

2.3 JACKETS

.1 Canvas (on concealed and exposed duct located in building interior): ULC listed, 220-gm/m2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.1 Lagging adhesive: compatible with insulation.

.2 Aluminum (on duct located in building exterior):

.1 To ASTM B209.

.2 Thickness: 0.41 millimetres sheet.

.3 Finish: smooth.

.4 Jacket mechanical seals: nineteen (19) millimetres wide, 0.5 millimetres thick, type 304 stainless steel.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive: water based, fire retardant type, compatible with insulation.

.2 Indoor vapor retarder finish: vinyl emulsion type acrylic, compatible with insulation.

.3 Tape: self-adhesive, aluminum, reinforced, seventy-five (75) millimetres wide minimum.

.4 Contact adhesive: quick-setting.

.5 Canvas adhesive: washable.

.6 Fasteners: four (4) millimetres diameter pins with thirty-five (35) millimetres square clips, two (2) rows each side, length to suit thickness of insulation.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENTS

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

3.2 INSTALLATION REQUIREMENTS

.1 Install in accordance with TIAC National Standards.

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

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

.1 Hangers, supports to be outside vapour retarder jacket.

.4 Hangers, supports: apply high-compressive strength insulation where insulation may be compressed by weight of ductwork.

.5 Fasteners: at three hundred (300) millimetres o.c. in horizontal and vertical directions, minimum two (2) rows each side.

3.3 DUCTWORK INSULLATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular outdoor air intake ducts	C-1	Yes	50
Rectangular relief air hoods	C-1	No	50
Rectangular relief air ducts	C-1	Yes	50
Round and rectangular exhaust air ducts	C-2	Yes	50
Round and rectangular heating air supply ducts	C-2	Yes	50
Return air ducts exposed to room air temperature (space being served)	None, unless noted otherwise		

.2 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed	CRF/1	CRD/1
Outdoor	CRF/3	n/a

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation procedures for electric heating and cooling controls.

1.2 SUBMITTALS

.1 Product Data:

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

.2 Quality assurance submittals: submit following in accordance with Division 1 Submittal Procedures.

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

.2 Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 THERMOSTAT (LOW VOLTAGE)

.1 Low voltage wall thermostat:

.1 For use on twenty-four (24) V circuit at 1.5 A capacity.

.2 Temperature setting range: ten (10) to forty (40) degrees Celsius.

.3 With sub-base.

2.2 DAMPER ACTUATORS

.1 Low voltage modulating actuators:

.1 For use on twenty-four (24) V circuit at 1.5 A capacity.

.2 Proportional modulation of control dampers, spring return.

.3 With overload protection.

.4 NEMA 4X housing.

.5 ULC listed, CSA approved.

.6 Acceptable manufacturer: Belimo.

2.3 CONTROLLER – MAIN FLOOR

.1 The main floor ventilation system consists of the following components:

.1 Supply fan SF-F66;

.2 Outside air supply motorized damper FV-L601, modulating;

.3 Recirculation air motorized damper FV-L602, modulating; and

.4 Exhaust air motorized damper FV-L603, modulating.

.2 The ventilation system shall operate as following:

.1 Interlock all motorized dampers with the Main Floor Room light switch. The supply fan SF-F66 operates continuously during occupied and unoccupied modes.

.2 When the Main Floor Room light switch is turned ON (occupied mode), damper FV-L601 is fully open and damper FV-L602 is fully closed. Damper FV-L603 is fully open.

.3 When the Main Floor Room light switch is turned OFF (unoccupied mode), dampers FV-L602 and FV-L601 will be positioned to provide seventy-five percent (75%) recirculated air and twenty-five percent (25%) outside air intake, with twenty-five percent (25%) of the outside air to be exhausted through modulated exhaust damper FV-L603. Recirculation damper FV-L602 is fully open providing seventy-five percent (75%) of recirculated air. The position angle of the dampers to be determined during air balancing to provide the required outside air and recirculated air flows.

.4 Controls Contractor shall be responsible for specifying all control wiring and controls to meet the sequence of operation.

.3 Main Floor Room cooling and heating systems consist of the following components:

.1 In-duct electric heater HCE-L60.

.2 Unit heater UH-L61;

.3 Air conditioning unit AC-L69 (indoor unit) and CU-L68 (outdoor unit); and

.4 Wall mounted thermostats.

.4 Main Floor Room cooling and heating system shall operate as following:

.1 The heat to the main floor shall be provided by the in-line duct electrical heater HCE-L60 to heat outdoor supply air, equipped with integral high temperature and low air flow cut-outs.

.2 When space temperature drops below ten (10) degrees Celsius (adjustable), supplemental unit heater UH-L61 turns ON to provide heating to satisfy space temperature set-point of ten (10) degrees Celsius (adjustable) when unoccupied, and twenty (20) degrees Celsius (adjustable) when occupied.

.3 The mechanical cooling is provided by an air conditioning ductless split system, where an evaporator unit to be installed indoors (AC-L69) as a wall mounted, and condenser unit (CU-L68) to be installed outdoors, exterior wall mounted. The cooling is controlled by a unit temperature controller. The thermostatic control shall utilize a dual set point temperature switch. The cooling unit should start running when the main floor room air temperature reaches thirty (30) degrees Celsius and it will continue running until the room air temperature drops to twenty-four (24) degrees Celsius (adjustable).

.4 Controls contractor shall be responsible for specifying all control wiring and controls to meet the sequence of operation.

2.4 CONTROLLER – DRY WELL SPACES BELOW MAIN FLOOR

.1 The dry well spaces ventilation system consists of the following components:

.1 Supply fan SF-F67;

.2 Outside air supply motorized damper FV-L604, modulating;

.3 Recirculation air motorized damper FV-L605, modulating; and

.4 Exhaust air motorized damper FV-L603, modulating (common exhaust for the entire station).

.2 The ventilation system shall operate as following:

.1 Interlock all motorized dampers with the Main Floor Room light switch. The supply fan SF-F67 operates continuously during occupied and unoccupied modes.

.2 When the Main Floor Room light switch is turned ON (occupied mode), damper FV-L604 is fully open and damper FV-L605 is fully closed. Damper FV-L603 is fully open.

.3 When the Main Floor Room light switch is turned OFF (unoccupied mode), dampers FV-L605 and FV-L604 will be positioned to provide seventy-five percent (75%) recirculated air and twenty-five percent (25%) outside air intake, with twenty-five percent (25%) of the outside air to be exhausted through modulated exhaust damper FV-L603. Recirculation damper FV-L605 is fully open providing seventy-five percent (75%) of recirculated air. The position angle of the dampers to be determined during air balancing to provide the required outside air and recirculated air flows.

.4 Controls Contractor shall be responsible for specifying all control wiring and controls to meet the sequence of operation.

.3 Dry well spaces heating system consists of the following components:

.1 In-duct electric heater HCE-L68.

.2 Unit heaters UH-L62 through UH-L65; and

.3 Wall mounted thermostats.

.4 Dry well spaces heating system shall operate as follows:

.1 The heat to dry well spaces shall be provided by the in-line duct electrical heater HCE-L68 to heat outdoor supply air, equipped with integral high temperature and low air flow cut-outs.

.2 When spaces temperature drops below ten (10) degrees Celsius (adjustable), supplemental unit heaters UH-L62 – UH-L65 turn ON to provide heating to satisfy space temperature set-points of ten (10) degrees Celsius (adjustable) when unoccupied and occupied.

.3 Controls contractor shall be responsible for specifying all control wiring and controls to meet the sequence of operation.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install control devices.

.2 On outside wall, mount thermostats on bracket or insulated pad twenty-five (25) millimetres from exterior wall.

.3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

3.3 CLEANING

.1 Proceed in accordance with Division 1 Cleaning.

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible;

.2 SMACNA Round Industrial Duct Construction Standards; and

.3 SMACNA Rectangular Industrial Duct Construction Standards.

.2 American National Standards Institute (ANSI)/National Fire Protection Association (NFPA):

.1 ANSI/NFPA 90A, Installation of Air-Conditioning and Ventilating Systems; and

.2 ANSI/NFPA 90B, Installation of Warm Air Heating and Air-Conditioning Systems.

.3 Underwriters Laboratories of Canada (ULC):

.1 CAN4-S112, Fire Test of Fire Damper Assemblies; and

.2 ULC-S505, Fusible Links for Fire Protection Service.

.4 American Society for Testing and Materials (ASTM):

.1 ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

1.2 SUBMITTALS

.1 Submit in accordance with Division 1.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets. Indicate the following:

.1 Sealants;

.2 Tape; and

.3 Proprietary joints.

.3 Maintenance Materials, Special Tools and Spare Parts:

.1 Provide the following: six (6) fusible links of each type for fire dampers.

1.3 PERFORMANCE CERTIFICATION

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to test codes and standards.

.2 Provide confirmation of testing.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Division 1 General Requirements.

.2 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.

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

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 ALUMINUM DUCT

.1 Fabricate all ductwork utilizing type 3003-H14 smooth aluminum sheet and type 6061-T6 aluminum angle for flanges and reinforcing.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint shall be considered a Class A seal.

.1 Acceptable material: Ductmate Canada Ltd., Exanno Nexus.

.4 All transverse joints in ducts three hundred five (305) millimeters or more in width, height or diameter to be flanged type.

2.2 SEAL CLASSIFICATION

.1 Classification as follows: SMACNA Seal Class A.

.2 Seal classification definitions:

.1 Class A: Longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with gaskets or sealant and tape.

.2 Class B: Longitudinal seams, transverse joints and connections made airtight with gaskets or sealant and tape.

.3 Class C: Transverse joints and connections made airtight with gaskets or sealant and tape. Longitudinal seams unsealed.

.4 Class D: Unsealed seams and joints.

2.3 SEALANT

.1 Sealant: oil resistant, polymer type, flame resistant duct sealant. Temperature range of minus thirty (30) degrees Celsius to plus ninety-three (93) degrees Celsius.

.2 Acceptable material: Duro Dyne S-2, Foster 30-02.

2.4 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, fifty (50) millimetres wide.

.2 Acceptable material: Duro Dyne FT-2.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: centerline radius: 1.5 times width of duct unless indicated otherwise.

.2 Round: five-piece, centerline radius: 1.5 times diameter of duct unless indicated otherwise.

.3 Mitered elbows, rectangular: with single thickness turning vanes.

.4 Branches:

.1 Rectangular branch: forty-five (45) degrees entry on branch.

.2 Round main and branch: conical entry on branch.

.3 Provide volume control damper in branch duct near connection to main duct.

.5 Transitions:

.1 Diverging: twenty (20) degrees maximum included angle.

.2 Converging: sixty (60) degrees maximum included angle.

.6 Offsets: short radiused elbows.

.7 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.

2.6 FIRESTOPPING

.1 Retaining angles all around sleeve, on both sides of fire separation.

.2 Fire stopping material and installation must not distort duct.

2.7 HANGERS AND SUPPORTS

.1 Hanger configurations:

.1 Rectangular duct: trapeze hanger to SMACNA.

.2 Round duct: band hanger to SMACNA, with top and bottom halves and a hanger rod on each side of duct.

.2 Lower hanger attachments:

.1 Rectangular duct: 6061-T6 aluminum angle with 304 stainless steel rods to SMACNA.

.2 Round duct: 6061-T6 aluminum band with 304 stainless steel rods to SMACNA.

.3 Upper hanger attachments: proprietary manufactured galvanized steel strut channel secured to roof truss bottom chords or supplementary wood framing with galvanized steel lag screws.

.1 Acceptable material: Unistrut, Canstrut.

2.8 HOODS (AS REQUIRED)

.1 Anchor securely into opening. Make building/hood interface weather tight all around.

2.9 BALANCING DAMPERS

.1 Multi-bladed opposed blade type of aluminum construction, with maximum one hundred (100) millimeters high blades, self-lubricating nylon bearings, shaft extension with locking quadrant, and channel frame complete with angle stop.

2.10 AIR SUPPLY DAMPERS

.1 Thermally insulated extruded aluminum damper with thermally broken frames and blades.

.2 Opposed action blades for volume control, parallel action blades for open/close position.

.3 Stainless steel linkage hardware.

.4 To be installed according to manufacturer's instructions and recommendations.

.5 AMCA certified rating.

.6 Factory installed Belimo electric actuator with NEMA 4X housing.

2.11 RELIEF AND BACKDRAFT DAMPERS

.1 Automatic gravity operated, multi-leaf type, with extruded aluminum drop-in frame with polyurethane sponge sill seal, twenty-six (26) gauge single-thickness aluminum blades with felt seals, 4.8 millimeters diameter galvanized steel axles, self-lubricating heavy duty nylon bearings, and mill finish.

Part 3 Execution

3.1 GENERAL

.1 Do Work in accordance with SMACNA, ANSI/NFPA 90A and 90B, and as indicated.

.2 Support risers in accordance with SMACNA.

.3 Do not break continuity of insulation vapor barrier with hangers or rods.

.4 Install breakaway joints in ductwork on each side of fire damper.

.5 Fabricate ductwork in lengths to accommodate installation of duct lining where required.

.6 Install proprietary manufactured flanged duct joints in accordance with manufacturer's printed instructions.

3.2 HANGERS

.1 Coordinate with building framing trade for required supplementary wood framing between roof trusses.

.2 Lag screws: holes pre-drilled to seventy percent (70%) of screw diameter and counter-bored to screw diameter for non-threaded shank portion of screw.

.3 Rods: complete with 304 stainless steel locking nuts and washers.

.4 Hanger spacing: in accordance with SMACNA.

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for outdoor air intakes.

.2 Form bottom of horizontal duct without longitudinal seams. Solder joints of bottom and side sheets. Seal all other joints with duct sealer.

.3 Slope horizontal duct down towards intake hood.

3.4 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's printed instructions.

.2 Bed tape in sealant and recoat with minimum of one (1) coat of sealant to manufacturer's printed instructions.

3.5 PROTECTION

.1 Protect installed ductwork from damage during construction.

.2 Repair damage to adjacent materials caused by ductwork installation.

3.6 CLEAN-UP, START-UP AND COMMISSIONING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 1.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for duct accessories including flexible connections, balancing dampers.

1.2 REFERENCES

.1 Air Movement & Control Association International Inc.:

.1 AMCA Standard 500-D, Laboratory Methods of Testing Dampers for Rating; and

.2 AMCA Standard 511, Certified Ratings Program for Air Control Devices.

.2 Canadian Standards Association (CSA International):

.1 CAN/ULC-S109M, Standard for Flame Tests of Flame-Resistant Fabrics and Films.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

.1 HVAC Duct Construction Standards - Metal and Flexible.

1.3 SUBMITTALS

.1 Submit in accordance with Division 1 General Requirements.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets. Indicate the following:

.1 Flexible connections;

.2 Duct access doors;

.3 Turning vanes; and

.4 Instrument test ports.

1.4 PERFORMANCE CERTIFICATION

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to test codes and standards.

.2 Provide confirmation of testing.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 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.

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

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

.1 Manufacture in accordance with SMACNA HVAC Duct Construction Standards.

.2 General: construction and air tightness suitable for duct air velocities and pressure class. The following are minimum requirements. Provide additional features where required to suit the Work.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: seventy-five (75) millimetres wide galvanized sheet metal frame, 1.6 millimetres thick, with fabric clenched by means of double locked seams.

.2 Material:

.1 Indoor application: fire-resistant, self-extinguishing, neoprene-coated glass fabric, temperature rated at minus forty (-40) degrees Celsius to ninety (90) degrees Celsius, 0.63 millimetres thick, and density of 1.02 kg/m^2. Meets the flame-resistance requirements of CAN/ULC-109M.

.2 Outdoor application: fire-resistant, self-extinguishing, DuPont 'Durolon'-coated glass fabric, temperature rated at minus forty (-40) degrees Celsius to one hundred twenty (120) degrees Celsius, 0.61 millimetres thick, and density of 0.81 kg/m^2.

2.3 SINGLE BLADE DAMPERS

.1 Of same material as duct, but at least one sheet metal thickness heavier.

.2 Size and configuration to recommendations of SMACNA,

.3 Round: frame with stiffening beads, continuous shaft for blades over two hundred (200) millimetres diameter.

.4 Locking quadrant with shaft extension to accommodate insulation thickness.

.5 Inside square end bearing and outside spring-loaded round end bearing.

.6 Vibration-free operation.

2.4 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Parallel-blade configuration for ON-OFF operation, metal thickness and construction to recommendations of SMACNA. Insulated blades with dura-blade seals.

.3 Maximum blade height: one hundred fifty (150) millimetres.

.4 Maximum blade length: one thousand two hundred (1,200) millimetres. Use multi-sectional dampers for applications exceeding one thousand two hundred (1,200) millimetres.

.5 Bearings: pin in bronze bushings or self-lubricating nylon.

.6 Linkage: shaft extension to accommodate insulation thickness with locking quadrant.

.7 Channel frame of same material as adjacent duct, complete with angle stop.

.8 Vibration-free operation.

2.5 ACCESS DOORS IN DUCTS

.1 Uninsulated ducts: sandwich construction of same material as duct, one (1) sheet metal thickness heavier, minimum 0.6 millimetres thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one (1) sheet metal thickness heavier, minimum 0.6 millimetres thick complete with sheet metal angle frame and twenty-five (25) millimetres thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to three hundred (300) by three hundred (300) millimetres: two (2) sash locks.

.2 Three hundred one (301) to four hundred fifty (450) millimetres: four (4) sash locks.

.3 Four hundred fifty-one (451) to one thousand (1,000) millimetres: piano hinge and minimum two (2) sash locks.

2.6 TURNING VANES

.1 Factory or shop fabricated single thickness with trailing edge, to recommendations of SMACNA.

2.7 INSTRUMENT TEST PORTS

.1 1.6 millimetres thick steel, zinc plated and painted after manufacture.

.2 Camlock handles with neoprene expansion plug and handle chain.

.3 Twenty-eight (28) millimetres minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

.5 Acceptable manufacturer: Duro Dyne IP1 or IP2.

Part 3 Execution

3.1 INSTALLATION

.1 Install air duct accessories in accordance with recommendations of SMACNA HVAC Duct Construction Standards and manufacturer's instructions.

.2 Provide adequate access for service, adjustment, replacement of all accessories.

.3 Flexible Connections:

- .1 Install in following locations:
  - .1 As indicated on Drawings and directed by the Contract Administrator.
- .2 Length of connection: one hundred fifty (150) millimetres maximum.
- .3 Minimum distance between metal parts when system in operation: seventy-five (75) millimetres.
- .4 When fan is running:
  - .1 Ducting on sides of flexible connection to be in alignment.
  - .2 Ensure slack material in flexible connection.
  - .3 Material does not protrude into the duct.

.4 Balancing Dampers:

- .1 Install quadrant handles parallel to damper blade(s).
- .2 Splitter dampers shall be used only where approved by the Contract Administrator.
- .3 Where damper throttling produces excessive noise provide two (2) dampers, duct baffle, volume extractor, or similar device to reduce noise to an acceptable level.
- .4 Locations:
  - .1 Supply, return and ductwork air systems: in each duct.
  - .2 As directed by the Contract Administrator and testing, adjusting and balancing Contractor.
- .5 All dampers to be vibration-free.
- .6 Ensure damper operators are observable and accessible.

.5 Access doors:

- .1 Size:
  - .1 Three hundred (300) by three hundred (300) millimetres minimum for viewing.
  - .2 Up to one thousand (1,000) by one thousand (1,000) millimetres (as duct size permits) for servicing entry.

.6 Location:

- .1 At backdraft dampers.
- .2 At locations required by code.

.7 Instrument test ports:

.1 General: install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate to permit testing, adjusting and balancing and easy manipulation of instruments.

.3 Install insulation port extensions as required.

.8 Turning vanes: install in accordance with recommendations of SMACNA.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)/Air Movement and Control Association (AMCA):

.1 ANSI/AMCA 99, Standards Handbook;

.2 ANSI/AMCA 300, Reverberant Room Method for Sound Testing of Fans;

.3 ANSI/AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data; and

.4 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.

1.2 SUBMITTALS

.1 Submit in accordance with Division 1 General Requirements.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for fans and fan accessories. Include the following:

.1 Fan performance curves showing point of operation, BHP, kW and efficiency;

.2 Sound rating data at point of operation;

.3 Motor, sheave, bearing, shaft, filter, damper and construction details;

.4 Details of vibration isolation; and

.5 Power requirements including Voltage, Amperage and Horsepower.

.3 Operating and Maintenance Data:

.1 Submit manufacturer's printed operating and maintenance data for fans and fan accessories for incorporation into manual specified in Division 1 General Requirements.

.4 Maintenance Materials, Special Tools and Spare Parts:

.1 Provide ten (10) spare sets of filters and three (3) spare set of belts for each in-duct fan.

.2 Furnish list of recommended spare parts for equipment such as bearings and seals, together with list of specialized tools necessary for adjusting, repairing or replacing.

1.3 PERFORMANCE CERTIFICATION

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to test codes and standards.

.2 Provide confirmation of testing.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 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.

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

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 INLINE DUCT FANS

.1 For product Specifications refer to Drawing – Equipment Schedule.

2.2 SUPPLEMENTARY SUSPENSION STEEL

.1 Upper hanger attachments: proprietary manufactured galvanized steel strut channel secured to roof truss bottom chords or supplementary wood framing with galvanized steel lag screws.

.1 Acceptable material: Unistrut, Canstrut.

2.3 FAN DRIVES WITH SPEED CONTROLS

.1 Fan drives as indicated in the Drawing – Equipment Schedule.

.2 Dual speed direct driven fans to have Vari-Green motors unless otherwise indicated on the Drawings.

2.4 ACCEPTABLE MANUFACTURERS – SUPPLY AND EXHAUST FANS

.1 Greenheck.

.2 Twin City.

Part 3 Execution

3.1 INSTALLATION

.1 General:

.1 Install with sufficient clearances to permit performance of fan service, maintenance and repair.

.2 Install in accordance with manufacturer's printed installation instructions.

.3 Provide supplementary suspension steel as required. Coordinate with building framing trade for required supplementary wood framing between roof trusses. Pre-drill lag screw holes to seventy

percent (70%) of screw diameter and counter-bore to screw diameter for non-threaded shank portion of screw.

.2 In-duct Fans:

.1 Install complete with resilient mountings and flexible electrical lead.

.2 Provide sheave and belt required for final air balance.

.3 Access panel to be readily accessible and removable.

3.2 PROTECTION

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

.2 Repair damage to adjacent materials caused by fan installation.

3.3 CLEAN-UP, START-UP AND COMMISSIONING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 1 General Requirements.

.3 Start-up and Commissioning: upon completion and after final cleaning, start-up and commission fans in accordance with manufacturer's printed instructions and Division 1 General Requirements.

END OF SECTION

Part 1 General Pumping

1.1 SUBMITTALS

.1 Submit in accordance with Division 1 General Requirements.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for grilles, registers and diffusers. Indicate the following:

.1 Capacity;

.2 Throw and terminal velocity;

.3 Noise generation characteristics;

.4 Pressure drop;

.5 Size; and

.6 Neck Velocity.

.3 Operating and Maintenance Materials:

.1 Provide keys for volume and air flow pattern adjustment.

1.2 PERFORMANCE CERTIFICATION

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to test codes and standards.

.2 Provide confirmation of testing.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 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.

.2 Store and protect grilles, registers and diffusers from nicks, scratches and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GRILLES, REGISTERS AND DIFFUSERS

.1 For product specifications refer to Drawing – Equipment Schedule.

.2 Grilles, registers and diffusers of the same generic type, shall be products of one (1) manufacturer.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's printed installation instructions.

.2 Install with oval head stainless steel screws in counter-sunk holes where fastenings are visible.

3.2 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International:

.1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Indicate following:

.1 Pressure drop;

.2 Face area; and

.3 Free area.

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

.3 Test Reports: submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

1.3 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 intakes and vents from nicks, scratches and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 HOODS 45/90 DEGREES (AS REQUIRED)

.1 Thickness: to SMACNA.

.2 Fabrication: to SMACNA.

.3 Joints: to SMACNA.

.4 Supports: as indicated.

.5 Complete with integral bird screen of 2.7 millimetres diameter aluminum wire.

.6 Insect screens as indicated on the Drawings.

2.3 FIXED LOUVERS

.1 As per Drawing – Equipment Schedule.

.2 Louvers to be finished with fluoropolymer based resin coating, color to match the building exterior.

.3 Insect and bird screens as indicated on the Drawings.

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 louvres, intakes and vents installation in accordance with manufacturer's written instructions.

.1 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standard Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

.1 ANSI/ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size (ANSI approved).

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-115.10, Disposable Air Filters for the Removal of Particulate Matter from Ventilating Systems;

.2 CAN/CGSB-115.15, High Efficiency Rigid Type Air Filters for Removal of Particulate Matter from Ventilating Systems; and

.3 CAN/CGSB-115.18, Filter, Air, Extended Area Panel Type, Medium Efficiency.

.3 Underwriters' Laboratories of Canada (ULC):

.1 ULC -S111, Standard Method of Fire Tests for Air Filter Units.

1.2 SUBMITTALS

.1 Submit in accordance with Division 1 General Requirements.

.2 Product Data:

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

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

.4 Extra Materials:

.1 Provide maintenance materials in accordance with Division 1 General Requirements.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment such as frames and filters, addresses of suppliers, list of specialized tools necessary for adjusting, repairing or replacing for inclusion in operating manual.

.3 Spare filters: in addition to filters installed immediately prior to acceptance by the Contract Administrator, supply one (1) complete set of filters for each.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Division 1 General Requirements.

.2 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 well-ventilated location, and in accordance with manufacturer's recommendations.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

.1 Media: suitable for air at one hundred percent (100%) RH and air temperatures between minus forty (-40) degrees Celsius and fifty (50) degrees Celsius.

.2 Filters shall be provided and installed to allow easy removal. Filter removal shall be from one (1) side of ductwork.

2.2 COTTON PANEL FILTERS

.1 Disposable pleated reinforced cotton dry media: to CAN/CGSB 115.18.

.2 Holding frame: slide in channel for side access.

.3 Performance:

.1 The filter media shall have a minimum efficiency of eighty percent (80%) to ANSI/ASHRAE 52.1, and a minimum of MERV 13 per ANSI/ASHRAE 52.2.

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 filter installation in accordance with manufacturer's written instructions.

.1 Inform the Contract Administrator of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION GENERAL

.1 Install in accordance with manufacturer's recommendations and with adequate space for access, maintenance and replacement.

3.3 REPLACEMENT MEDIA

.1 Replace media with new upon acceptance.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE):

.1 ANSI/ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size.

.2 ASTM International (ASTM):

.1 ASTM C547, Specification for Mineral Fiber Pipe Insulation.

.3 CSA Group (CSA):

.1 CSA B52, Mechanical Refrigeration Code; and

.2 CAN/CSA-C656, Performance Standard for Single Package Central Air-Conditioners and Heat Pumps.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Division 1 Submittal Procedures.

.2 Product Data:

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

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit Shop Drawings and product data in accordance with Division 1 Submittal Procedures.

.2 Indicate major components and accessories including sound power levels of units.

.3 Type of refrigerant to be used: R-410A.

1.4 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in Division 1 Closeout Submittals.

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

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 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 indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect air conditioning components from nicks, scratches and blemishes.

.3 Replace defective or damaged materials with new.

1.6 WARRANTY

.1 Provide five (5) year warranty including material and labour on compressors.

Part 2 Products

2.1 INDOOR UNIT (AC-L69)

.1 Refer to Drawing – Equipment schedule.

2.2 OUTDOOR UNIT (CU-L68)

.1 Refer to Drawing – Equipment schedule.

2.3 ACCEPTABLE MANUFACTURERS

.1 LG;

.2 Daikin; and

.3 Mitsubishi.

Part 3 Execution

3.1 GENERAL

.1 Install as indicated, to manufacturer's recommendations, and in accordance with EPS 1/RA/2.

.2 Manufacturer to certify installation.

.3 Run drain line from cooling coil condensate drain pan to terminate over nearest floor drain.

3.2 EQUIPMENT PREPARATION

.1 Provide services of manufacturer's field engineer to set and adjust equipment for operation as specified.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Division 1 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 Division 1 Cleaning.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.1 No. 46, Electric Air Heaters.

.2 Canadian Electrical Code (Section 62).

1.2 SUBMITTALS

.1 Submit in accordance with Division 1 General Requirements.

.2 Shop Drawings. Indicate the following:

- .1 Physical size and mounting methods;
- .2 Layout and wiring diagrams of electric heaters including low voltage controls;
- .3 Power rating (Kw), voltage, phase;
- .4 Required clearances from combustible materials; and
- .5 Heater construction and finish.

Part 2 Products

2.1 GENERAL

.1 All product to be supplied suitable to area classifications as indicated on Drawings.

2.2 ELECTRIC UNIT HEATERS

.1 Horizontal discharge complete with adjustable louvers finished to match cabinet.

.2 Fan type unit heaters with built-in high heat limit protection. Liquid tight flex connecting the control enclosure to the motor.

.3 Fan motor: Totally enclosed, permanently lubricated ball bearing type with resilient mount. Built in fan motor thermal overload protection.

.4 Wall or ceiling mounting bracket as required.

.5 Controls: Provide NEMA 4X remote thermostat controls for all unit heaters as indicated, from the same manufacturer as the heater. Provide all necessary control relays, transformers, contactors, wiring, etc. that are required for a functional system.

.6 All spaces:

- .1 Epoxy coated cabinet.
- .2 Finned tubular sheath elements.
- .3 Balanced aluminum fan blade.
- .4 Acceptable manufacturers: Ouellet, or approved equal.

2.3 IN-DUCT ELECTRIC HEATER

.1 In-line electric heater shall be flanged connected and installed per manufacturer's instructions and recommendations.

.2 Provide ductwork transitions round to square if required to allow in-duct heater installation.

.3 The heater remote controller shall be interconnected with HVAC Control Panel.

.4 Acceptable manufacturers: Thermolec.

2.4 THERMOSTATS

.1 Provide heater control remote thermostats as required.

.2 Remote control thermostats shall wall mounted and rated as low voltage twenty-four (24) VAC.

Part 3 Execution

3.1 INSTALLATION

.1 Suspended unit heaters shall be installed at the elevation as shown in Equipment Schedule Specification.

.2 Install in accordance with manufacturer's instructions and recommendations.

.3 Provide and install power and controls as required.

3.2 FIELD QUALITY CONTROL

.1 Tests:

.1 Perform tests in accordance with Division 26 Electrical.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements that are common to NMS Sections found in Division 26 Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations; and

.2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC):

.1 EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear.

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

.1 Material Safety Data Sheets (MSDS).

.4 City of Winnipeg Water and Waste Department – Electrical Design Guide, Rev 01.

.5 City of Winnipeg Water and Waste Department – Automation Design Guide, Rev 00.

.6 City of Winnipeg Water and Waste Department – Identification Standard, Rev 00.

1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at sixty (60) Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates for control items in English.

1.4 SUBMITTALS

.1 Quality Control:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to Site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of Contract.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.

.2 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within three (3) days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in Part 3 – Field Quality Control.

1.5 QUALITY ASSURANCE

.1 Quality Assurance:

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

1.6 SYSTEM STARTUP

.1 Instruct City of Winnipeg’s personnel in operation, care and maintenance of systems, system equipment and components.

.2 Assist City of Winnipeg’s personnel and the Contract Administrator in the start-up of equipment.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.7 Site

.1 Classification of Pumping Station Areas:

.1 Building Superstructure: Ordinary.

.2 Building Substructure: Category 1.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to Site and submit such approval as described in Part 1 – Submittals.

.2 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: in accordance with Division 29.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of inspection authorities.

.2 Lamacoid signs, minimum size one hundred seventy-five (175) by two hundred fifty (250) millimetres.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid three (3) millimetres thick plastic engraving sheet, white with black core, lettering accurately aligned and engraved into core mechanically attached with self-tapping stainless steel screws.

.2 Lamacoids as follows:

Application	**Text Size**	**Text**
Electrical Equipment – General	5 mm	Line 1: Identifier
Circuit Breaker – Separate	5 mm	Line 1: Identifier Line 2: Load Identifier Line 3: Load Description
Disconnect Switch – Separate	5 mm	Line 1: Identifier Line 2: Load Identifier Line 3: Load Description
Fire Alarm Devices	8 mm	Line 1: Identifier
Light Switches	3 mm	Source Panel and Circuit Number
Motor Control Centre	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By
Motor Starter or MCC Bucket	5 mm	Line 1: Load Identifier Line 2: Load Description
Panelboards	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By

Application	Text Size	Text
Receptacles	3 mm	Source Panel and Circuit Number
Switchgear	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By
Switchgear Breaker	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By
Transformer – Indoor	8 mm	Line 1: Identifier Line 2: Rating, System Voltage Line 3: Fed By
Transformer – Outdoor	10 mm	Line 1: Identifier Line 2: Rating, System Voltage Line 3: Fed By

.2 Wording on nameplates to be approved Contract Administrator prior to manufacture.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling or floor, and at fifteen (15) metres intervals.

.3 Colours: twenty-five (25) millimetres wide prime colour and twenty (20) millimetres wide auxiliary colour.

.4 Colour Codes:

	Prime	Auxiliary
Power, 120/208/240 VAC	Black	
UPS Power, 120/208/240 VAC	Black	Green
Control Wiring, 120VAC	Black	Orange
Fire Alarm	Red	
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring, <50 V	Blue	Orange
Intrinsically Safe	Blue	White

	Prime	Auxiliary
Up to 250 V	Yellow	
Up to 600 V	Yellow	Green
Other Communication Systems	Green	Blue

.5 Cable Colour Codes

	Prime	Auxiliary
Power, 120/208/240 VAC	Black	
UPS Power, 120/208/240 VAC	Black	Green
Control Wiring, 120VAC	Black	Orange
Fire Alarm	Red	
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring, <50 V	Blue	Orange
Intrinsically Safe	Blue	White
up to 600 V	Yellow	Green
Other Communication Systems	Green	Blue

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

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

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

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

3.3 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: one thousand four hundred (1,400) millimetres.

.2 Wall receptacles:

.1 General: three hundred (300) millimetres.

.2 In mechanical rooms: one thousand four hundred (1,400) millimetres.

.3 Panelboards: as required by Code or as indicated.

.4 Control panels: as indicated.

3.4 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.5 FIELD QUALITY CONTROL

.1 Conduct following tests:

.1 Circuits originating from branch distribution panels.

.2 Lighting and its control.

.3 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to three hundred fifty (350) V with a five hundred (500) V instrument.

.2 Megger three hundred fifty (350) to six hundred (600) V circuits, feeders and equipment with a one thousand (1,000) V instrument.

.3 Check resistance to ground before energizing.

.2 Carry out tests in presence of Contract Administrator.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of Project.

3.6 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware; and

.2 CSA C22.2No.65, Wire Connectors.

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

.1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA).

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded copper conductors;

.2 Clamp for stranded copper conductors;

.3 Stud clamp bolts;

.4 Bolts for copper conductors; and

.5 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 20 – Wire and Box Connectors.

1.2 REFERENCES

.1 CSA C22.2 No.0.3, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No.131, Type TECK 90 Cable.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for ten (10) AWG and larger. Minimum size: twelve (12) AWG.

.2 Copper conductors: size as indicated, with one thousand (1,000) V insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE or RW90 XLPE.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No.131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Chemically cross-linked thermosetting polyethylene rated type XLPE, one thousand (1,000) V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:

.1 One-hole stainless steel straps to secure surface cables fifty (50) millimetres and smaller. Two-hole stainless steel straps for cables larger than fifty (50) millimetres.

.2 Channel type supports for two (2) or more cables at nine hundred (900) millimetres centers.

.3 Stainless steel threaded rods: six (6) millimetres dia. to support suspended channels.

.8 Connectors.

2.3 VFD DRIVE CABLE

.1 Cable: to CAN/CSA- C22.2 No. 123, 174.

.2 Conductors:

.1 Sectored Grounding conductors: three (3) bare copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Type: ethylene propylene rubber.

.2 Chemically cross-linked thermosetting polyethylene rated one thousand (1,000) V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: heavy wall, continuously corrugated aluminum.

.6 Nexan DriveRx or approved equal.

2.4 CONTROL CABLES

.1 Type LVT: soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.

.2 Six hundred (600) V type: stranded annealed copper conductors, sizes as indicated with PVC insulation type TW, or cross-linked polyethylene type RW90 x-link with shielding of metallized tapes over each pair of conductors and overall covering of thermoplastic jacket interlocked armour and jacket over sheath of PVC.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install building wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduits Fastening and Conduits Fitting.

3.2 INSTALLATION OF TECK CABLE 0 – 1,000 V

.1 Teck cable to be only used for pump power or as approved by Contract Administrator.

.2 Install cables.

.1 Group cables wherever possible on channels.

.3 Lay cable in cabletroughs/cable tray in accordance with Section 26 05 36 – Cable Trays for Electrical Systems.

.4 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors.

3.3 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield at one (1) end only.

3.4 INSTALLATION OF VFD DRIVE CABLE

.1 Install drive cable between VFD output and motor load.

.2 Install cables.

.1 Group cables wherever possible on channels.

.3 Lay cable in cabletroughs in accordance with Section 26 05 34 – Conduits, Conduits Fastening and Conduits Fitting.

.4 Use approved connectors.

.5 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE):

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International).

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Rod electrodes: copper clad steel nineteen (19) millimetres dia. by three (3) metres long.

.3 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.4 Insulated grounding conductors: green, type RW90.

.5 Ground bus: copper, size as required, complete with insulated supports, fastenings, connectors.

.6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings;
.2 Protective type clamps;
.3 Bolted type conductor connectors;
.4 Thermit welded type conductor connectors;
.5 Bonding jumpers, straps; and
.6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.

□

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.10 Ground secondary service pedestals.

3.2 ELECTRODES

.1 Install rod electrodes and make grounding connections.

.2 Bond separate, multiple electrodes together.

.3 Use size 2/0AWG copper conductors for connections to electrodes.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of primary six hundred (600) V system, secondary two hundred eight (208) V system.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, pump shafts, frames of motors, motors, motor control centres, starters, VFDs, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.5 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall.

.2 Ground items of electrical equipment in electrical room to ground bus with individual green insulated stranded copper connections sized in accordance with the Canadian Electrical Code.

□

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to Site conditions and to approval of Contract Administrator.

.3 Perform tests before energizing electrical system.

END OF SECTION

□

Part 1 General – NOT USED

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape aluminum, size forty-one (41) by forty-one (41) millimetres, 2.5 millimetres thick, surface mounted or suspended.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.5 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole stainless steel straps to secure surface conduits and cables fifty (50) millimetres and smaller.
- .2 Two-hole stainless steel straps for conduits and cables larger than fifty (50) millimetres.
- .3 Beam clamps to secure conduit to exposed steel Work.

.6 Suspended support systems.

- .1 Support individual cable or conduit runs with six (6) millimetres dia. threaded rods and spring clips.
- .2 Support two (2) or more cables or conduits on channels supported by six (6) millimetres dia. threaded rod hangers where direct fastening to building construction is impractical.

.7 For surface mounting of two (2) or more conduits use channels at one (1) metre on center spacing.

.8 Provide metal brackets, frames, hangers, clamps, and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit Shop Drawings and product data for cabinets in accordance with Section 01 33 00 – Submittal Procedures.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three (3) spare terminals on each set of lugs in splitters less than four hundred (400) A.

2.2 JUNCTION AND PULL BOXES

.1 Cast aluminium construction with screw-on flat covers for surface mounting.

.2 Covers with twenty-five (25) millimetres minimum extension all around, for flush-mounted pull and junction boxes.

2.3 CABINETS

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, two (2) keys, containing sheet steel backboard for surface mounting.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than two (2) metres above finished floor.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed thirty (30) metres of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Install size two (2) identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.1, Canadian Electrical Code, Part 1.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 One hundred two (102) millimetres square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Three hundred forty-seven (347) V outlet boxes for three hundred forty-seven (347) V switching devices.

.6 Combination boxes with barriers where outlets for more than one (1) system are grouped.

2.2 CAST ALUMINIUM OUTLET BOXES

.1 Cast aluminium single and multi-gang flush device boxes for flush installation, minimum size seventy-six (76) by fifty (50) by thirty-eight (38) millimetres or as indicated. One hundred two (102) millimetres square outlet boxes when more than one (1) conduit enters one (1) side with extension and plaster rings as required.

.2 Cast aluminium utility boxes for outlets connected to surface-mounted rigid aluminum conduit, minimum size one hundred two (102) by fifty-four (54) by forty-eight (48) millimetres.

.3 One hundred two (102) millimetres square or octagonal outlet boxes for lighting fixture outlets.

2.3 CONDUIT BOXES

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

2.4 FITTINGS – GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to thirty-two (32) millimetres and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of Work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within six (6) millimetres of opening.

.4 Provide correct size of openings in boxes for conduit. Reducing washers are not allowed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA):

- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware;
- .2 CSA C22.2 No. 45, Rigid Metal Conduit;
- .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit;
- .4 CSA C22.2 No. 83, Electrical Metallic Tubing;
- .5 CSA C22.2 No. 211.2 Rigid PVC (Unplasticized) Conduit; and
- .6 CAN/CSA C22.2 No. 227.3, Flexible Nonmetallic Tubing.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One-hole aluminum or stainless steel straps to secure surface conduits fifty (50) millimetres and smaller. Two-hole aluminum or stainless steel straps for conduits larger than fifty (50) millimetres.

.2 Beam clamps to secure conduits to exposed steel Work.

.3 Channel type supports for two (2) or more conduits at one (1) metre on center (oc).

.4 Stainless steel threaded rods, six (6) millimetres dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where ninety (90) degree bends are required for twenty-five (25) millimetres and larger conduits.

.3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for one hundred (100) millimetres linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and nineteen (19) millimetres deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 X-ray cast walls and floors before coring to confirm location of embedded items.

.3 Existing structure may contain asbestos. Confirm materials are free of asbestos before drilling or coring.

.4 Use rigid aluminum threaded conduit in all areas.

.5 Use epoxy coated conduit underground and in cast concrete.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.

.7 Minimum conduit size for lighting and power circuits: nineteen (19) millimetres.

.8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10 of its original diameter.

.9 Mechanically bend steel conduit over nineteen (19) millimetres dia.

.10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.11 Install fish cord in empty conduits.

.12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.13 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

.1 Paint walls before installation of electrical equipment including conduits.

.2 Run parallel or perpendicular to building lines.

.3 Locate conduits behind infrared or gas fired heaters with 1.5 metres clearance.

.4 Run conduits in flanged portion of structural steel.

.5 Group conduits wherever possible on suspended or surface channels.

.6 Do not pass conduits through structural members except as indicated.

.7 Do not locate conduits less than seventy-five (75) millimetres parallel to steam or hot water lines with minimum of twenty-five (25) millimetres at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

.5 Do not place conduits is slabs in which slab thickness is less than four (4) times conduit diameter.

.6 Encase conduits completely in concrete with minimum twenty-five (25) millimetres concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.5 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits twenty-five (25) millimetres and larger below slab and encased in seventy-five (75) millimetres concrete envelope. Provide fifty (50) millimetres of sand over concrete envelope below floor slab.

3.6 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CAN/CSA C22.2No.126, Cable Tray Systems.

.2 National Electrical Manufacturers Association (NEMA) standards:

.1 NEMA VE 1, Metal Cable Tray Systems.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit Shop Drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Identify types of cable troughs used.

.3 Show actual cable trough installation details and suspension system.

Part 2 Products

2.1 CABLETROUGH

.1 Cable troughs and fittings: to NEMA VE 1.

.2 Ladder type, Class D1 to CAN/CSA C22.2 No.126.

.3 Trays: extruded aluminum, wide as required with depth of one hundred (100) millimetres.

.4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cable trough supplied.

.1 Radii on fittings: six hundred (600) millimetres minimum.

.5 Barriers where different voltage systems are in same cable trough.

.6 De-rate power cables according to the Manitoba Electrical Code.

2.2 SUPPORTS

.1 Provide supports as required.

Part 3 Execution

3.1 INSTALLATION

.1 Install complete cable trough system.

.2 Cable trough systems are not fully indicated on the plans. Provide cable trough, indicated or not, to fully support cables.

.3 Support cable trough on both sides.

.4 Install green insulated 1/0 copper bonding conductor to run full length of cable troughs.

.5 Bonding conductors to be fastened with electrically conducting metal clamps at six (6) metres centres and at each end of terminated cable trough.

.6 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

3.2 CABLES IN CABLETROUGH

.1 Install cables individually.

.2 Lay cables into cable trough. Use rollers when necessary to pull cables.

.3 Secure cables in cable trough at three (3) metres centres, with nylon ties in horizontal applications

.4 Secure cables in cable trough at three (3) metres centres, with cable clips in vertical applications

.5 Identify cables every thirty (30) metres with size two (2) nameplates.

END OF SECTION

Part 1 General

1.1. REFERENCES

.1 CAN3-C17, Alternating - Current Electricity Metering.

.2 ANSI/IEEE C37.90A surge withstand and fast transient tests.

1.2. PRODUCT DATA

.1 Submit product data in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Indicate meter, instrument, outline dimensions, panel drilling dimensions and include cut out template.

Part 2 Products

2.1. DIGITAL METERING INSTRUMENT

.1 Microprocessor-based data collection and storage meter to monitor power conditions on main service as shown on the plans.

.2 Meter to display true RMS value of:

.1	Amps	3-phase current.
.2	Volts	Line-to-line or line-to-neutral 3-phase voltage.
.3	kW	kilowatts.
.4	kVA	kilovoltamperes.
.5	Pf	power factor.
.6	F	frequency.
.7	kWd	kilowatt demand.
.8	Ad	amperes demand.
.9	kWh	kilowatt hours.

.10 Total kWH as an accumulating total, providing bi-directional (import/export) indication.

.11 Total kVARH as an accumulating total, providing bi-directional (import/export) indication.

.12 kW Demand, user-programmable length of each demand period and the number of periods averaged to match local utility billing method.

.13 Amps Demand.

.14 kVA Demand, user-programmable length of each demand period and the number of periods averaged to match local utility billing method.

.15 Total harmonic current and voltage.

.16 Individual harmonic true rms current and voltage to the 63rd harmonic.

.3 Each power meter to have:

.1 True RMS measurement.

.2 Direct connection to six hundred (600) V, 3-phase, 4-wire system.

.3 Fourth current input for measurement of ground or neutral current.

.4 Eight (8) digital inputs for status/counter inputs, self-excited dry contact sensing, to remotely monitor breaker status, ground fault relay status, or any other dry contact input.

.5 Storage in non-volatile memory for the following:

.1 A time-stamped alarm and event log of up to eight hundred (800) events which records event date, time (to 0.001 sec), event type, and value for all over/under limit conditions, all status input activity, and all relay operations.

.2 A time-stamped minimum/maximum log, which records the value of any parameter exceeding the previous highest or lowest value recorded. Log to be read from the front panel display or via the communications port.

.3 All setup data.

.6 Waveform capture capability allowing any of the eight voltage and current input channels to be digitally sampled at two hundred fifty-six (256) samples/sixty (60) Hz cycle. Waveform capture to be initiated using commands made via the communications port or event triggered. Waveform capture data is to be made accessible via the communications port.

.7 Liquid crystal display, three hundred twenty (320) by two hundred forty (240) pixels resolution, backlight.

.8 Serial communications ports:

.1 One (1) RS-232C/RS-485, and one (1) RS-485.

.2 Protocols:Modbus RTU.

.3 Baud rate: RS-232, three hundred (300) bps to one hundred fifteen thousand two hundred (115,200) bps.

.4 Baud rate: RS-485, three hundred (300) bps to fifty-seven thousand six hundred (57,600) bps.

.9 Ethernet port:

.1 Protocols:Modbus TCP.

.2 10BaseT.

.10 Field programmability as follows:

.1 Volts scale, volts mode (wye, delta, single phase), amps scale, Vaux scale, baud rate, TCP/IP address and the relay operation are programmable from the front panel.

.2 All parameters in 10.1 above, plus additional alarm/event parameters may be programmed via the communications port using a portable terminal or a computer.

.3 Ensure programming is password protected.

.11 Compliance with the following standards:

.1 ULC certified.

.2 CSA approved.

.3 Voltage, current, status, relay and power inputs pass the ANSI/IEEE C37.90A surge withstand and fast transient tests.

.4 Certified to comply with FCC Part 15 Subpart J for Class A computing devices.

.12 Three hundred (300) amps for one (1) second surge protection on all four (4) current inputs.

.13 The following accuracy, resolution, range, and power supply ratings specifications:

Parameter	Accuracy	Resolution	Range
Volts (V1, V2, V3)	0.1%	0.1%	0 - 1,000,000[1]
Amps (I1, I2, I3)	0.1%	0.1%	0 - 30,000
Neutral Current (I4)	0.4%	0.1%	0 - 9,999
kW	class 0.2	0.1%	0 - 1,000,000[2]
kVAR	class 0.2	0.1%	0 - 1,000,000[2]
kVA	class 0.2	0.1%	0 - 1,000,000[2]
Power Factor	0.2%	1.0%	1.0 to ±0.6
Frequency	0.005 Hz	0.1 Hz[3]	40 to 450 Hz
kW Demand	class 0.2	0.1%	0 - 1,000,000
Amps Demand	class 0.2	0.1%	0 - 30,000
kWH (-F, -R)	class 0.2	1 kWH	0 - 1,000,000,000
kVARH (-F, -R)	class 0.2	1 kVARH	0 - 1,000,000,000

.1 Reads in kV for voltages over nine thousand nine hundred ninety-nine (9,999).

.2 Reads in MVA, MW, MVAR for readings over nine thousand nine hundred ninety-nine (9,999) K.

.3 One (1) Hz resolution at four hundred (400) Hz range.

.4 Power Supply:

.1 Eighty-five (85) to two hundred fifty (250) VAC.

.2 Burden: fifteen (15) VA typical, thirty-five (35) VA maximum.

.3 Record and store the following information in meter memory. Recall and reset stored data via meter controls and meter indicator.

.1 Volts max/min at one (1) second interval.

.2 Amps max/min at one (1) second interval.

.3 F max/min at one (1) second interval.

.4 kW max/min at one (1) second interval.

.5 Pf max/min (or kVA max/min) at one (1) second interval.

.6 kWd at field programmable intervals of one (1) minute to thirty (30) minutes; set at one (1) minute.

.7 Ad per kWd.

.5 10-Base-T communications port for connection to Ethernet network.

.6 Field programmable for set-up and system variables.

.7 Test terminal blocks as required.

.8 Relay output signalling loss of phase. Relay to open on phase loss.

.9 CSA approved.

.10 Approved Product: Schneider Electric PM8000 Series.

2.2. CURRENT TRANSFORMERS

.1 Provide shorting switches or test blocks for all meter CT inputs.

2.3. EQUIPMENT IDENTIFICATION

.1 Provide equipment identification.

Part 3 Execution

3.1. METERING INSTALLATION

.1 Install meters in panels as indicated.

.2 Make connections in accordance with diagrams.

.3 Connect phase loss relay to RTU control panel.

3.2. FIELD QUALITY CONTROL

.1 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.

.2 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and components for dry type transformers up to six hundred (600) V primary, equipment identification and transformer installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type); and
.2 CSA C9, Dry-Type Transformers.

.2 National Electrical Manufacturers Association (NEMA).

1.4 PRODUCT DATA

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

Part 2 Products

2.1 TRANSFORMERS

.1 Use transformers of one manufacturer throughout project and in accordance with CAN/CSA-C22.2 No.47.

.2 Design:

.1 Type: ANN.
.2 Windings: Copper
.3 Rating as specified.
.4 Voltage taps: standard.
.5 Insulation: one hundred fifty (150) degrees Celsius temperature rise.
.6 Basic Impulse Level (BIL): standard.
.7 Hipot: standard.
.8 Average sound level: standard.
.9 Impedance at seventeen (17) degrees Celsius: standard.
.10 Enclosure: CSA 1, removable metal front panel c/w sprinkler shield.
.11 Finish: in accordance with Section 26 05 00 – Common Work – Electrical.

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.12 Acceptable manufactures: Schneider Electric, Eaton, Rex Manufacturing, Hammond, or Delta.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work – Electrical.

.2 Nameplate wording example:

XFMR-L73
15kVA
600V – 120/208V

Part 3 Execution

3.1 INSTALLATION

.1 Wall mount dry type transformers above associated panel boards.

.2 Ensure adequate clearance around transformer for ventilation.

.3 Install transformers in level upright position.

.4 Remove shipping supports only after transformer is installed and just before putting into service.

.5 Loosen isolation pad bolts until no compression is visible.

.6 Make primary and secondary connections in accordance with wiring diagram.

.7 Energize transformers after installation is complete.

END OF SECTION

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Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

.3 Section 26 28 21 – Molded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

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

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one (1) manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 Two hundred fifty (250) V panelboards: bus and breakers rated for ten (10) kA (symmetrical) interrupting capacity or as indicated.

.3 Panelboard width to be less than two hundred thirty (230) millimetres.

.4 Integral Surge Protection Device.

.5 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.6 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on plans.

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.7 Two (2) keys for each panelboard and key panelboards alike.

.8 Copper bus with neutral of same ampere rating as mains.

.9 Mains: suitable for bolt-on breakers.

.10 Trim with concealed front bolts and hinges.

.11 Trim and door finish: baked grey enamel.

.12 Approved manufacture: Schneider Electric

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 – Molded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Lock-on devices for fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work – Electrical.

.2 Nameplate for each panelboard size four (4) engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size two (2) engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

.1 Wall mount panelboards as indicated in the Drawings.

.2 Connect loads to circuits.

.3 Connect neutral conductors to common neutral bus with respective neutral identified.

.4 Measure load current on each phase and adjust phase loading for a balanced system.

END OF SECTION

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Part 1 General

1.1 RELATED WORK

.1 Section 26 05 00 – Common Work – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA):

.1 CAN/CSA-Q9000, Quality Management and Quality Assurance Standards - Guidelines for Selection and Use.

1.3 PRODUCT DATA

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

.2 Submit product data sheets for sills, busbars and compartments. Include product characteristics, physical size and finish.

.3 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

1.4 SHOP DRAWINGS

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

.2 Indicate:

.1 Outline dimensions;

.2 Configuration of identified compartments;

.3 Floor anchoring method and dimensioned foundation template;

.4 Cable entry and exit locations;

.5 Dimensioned position and size of busbars and details of provision for future extension; and

.6 Schematic and wiring diagrams.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for motor control centre for incorporation into manual.

.2 Include data for each type and style of starter.

1.6 EXTRA MATERIALS

.1 Provide maintenance materials.

.2 Include: five (5) control fuses, control transformer, H-O-A selector switch and contact blocks, five (5) lamps.

Part 2 Products

2.1 SUPPLY CHARACTERISTICS

.1 Six hundred (600) V, sixty (60) Hz, amperage as indicated on plans, wye connected, 3-phase, 4-wire, grounded neutral.

.2 Fault current: 18kAIC

2.2 GENERAL DESCRIPTION

.1 Compartmentalized vertical sections with common power busbars.

.2 Floor mounting, free standing, enclosed dead front.

.3 Indoor CSA 12 gasketted enclosure.

.4 Class I Type B.

.5 The only accepted product shall be the Schneider Electric Model 6 MCC as standardized by the City of Winnipeg. All requests for purchase shall reference RFP 756-2013 to reflect the City of Winnipeg's discount pricing. No alternates of substitutes will be accepted.

2.3 VERTICAL SECTION CONSTRUCTION

.1 Independent vertical sections fabricated from rolled flat steel sheets bolted together to form rigid, completely enclosed assembly.

.2 Each vertical section divided into compartment units, minimum three hundred five (305) millimetres high, as indicated.

.3 Each unit to have complete top and bottom steel plate for isolation between units.

.4 Horizontal wireways, equipped with cable supports, across top and bottom, extending full width of motor control centre, isolated from busbars by steel barriers.

.5 Vertical wireways c/w doors for load and control conductors extending full height of vertical sections, and equipped with cable tie supports. Installation wiring to units accessible with doors open and units in place.

.6 Openings, with removable coverplates, in side of vertical sections for horizontal wiring between sections.

.7 Incoming cables to enter at side with terminals.

.8 Provision for outgoing cables to exit via top or bottom with terminals.

.9 Removable lifting means.

.10 Provision for future extension of both ends of motor control centre including busbars without need for further drilling, cutting or preparation in field.

.11 Divide assembly for shipment to Site, complete with hardware and instructions for re-assembly.

.12 Provide isolation barriers between units and wireways. Provide bolted on finger-safe barriers and/or guards for all incoming power cabling to each MCC compartment along with bucket breaker line side fuses. Control transformer primary fuses shall also be covered to prevent accidental contact.

2.4 SILLS

.1 Continuous channel iron floor sills for mounting bases with nineteen (19) millimetres diameter holes for bolts.

2.5 BUSBARS

.1 Main horizontal and branch vertical, three phase high conductivity tin plated copper busbars in separate compartment self-cooled, extending entire width and height of motor control centre, supported on insulators and rated:

.1 Main horizontal busbars: six hundred (600) A.

.2 Branch vertical busbars: three hundred (300) A.

.2 Branch vertical busbars for distribution of power to units in vertical sections.

.3 No other cables, wires, equipment in main and branch busbar compartments.

.4 Brace buswork to withstand effects of short-circuit current of 42kA rms symmetrical.

.5 Bus supports: with high dielectric strength, low moisture absorption, high impact material and long creepage surface designed to discourage collection of dust.

2.6 GROUND BUS

.1 Copper ground bus extending entire width of motor control centre.

2.7 MOTOR STARTERS AND DEVICES

.1 Rated 18kAIC.

.2 See Section 26 29 10 – Motor Starters to 600 V.

2.8 STARTER UNIT COMPARTMENTS

.1 Units EEMAC size five (5) and smaller, circuit breaker units two hundred twenty-five (225) A and smaller, plug-in type

.2 External operating handle of circuit switch interlocked with door to prevent door opening with switch in "on" position. Provision for three (3) padlocks to lock operating handle in "off" position and lock door closed.

.3 Hinge unit doors on same side.

.4 Overload relays manually reset from front with door closed.

.5 Pushbuttons and indicating lights mounted on door front.

.6 Devices and components by one (1) manufacturer to facilitate maintenance.

.7 Pull-apart terminal blocks for power and control to allow removal of starter units without removal of field wiring.

2.9 MISCELLANEOUS DEVICES

.1 Provide a six hundred (600) V surge protection device.

.2 Provide a six hundred (600) V power fail monitoring relay.

2.10 WIRING IDENTIFICATION

.1 Provide wiring identification in accordance with Section 26 05 00 – Common Work – Electrical.

2.11 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work – Electrical.

.1 Motor control centre main nameplate: size No. seven (7), engraved as indicated.

.2 Individual compartment nameplates: size No. five (5), engraved as indicated.

2.12 FINISHES

.1 Apply finishes in accordance with Section 26 05 00 – Common Work – Electrical.

.2 Paint motor control centre exterior light gray and interiors white.

2.13 SOURCE QUALITY CONTROL

.1 Provide Manufacturer's type test certificates including short circuit fault damage certification up to short circuit values specified under bus bracing.

.2 Contract Administrator to witness standard factory testing of complete motor control centre including operation of switches, circuit breakers, starters and controls.

.3 Manufacturer to provide proof of quality control program in accordance with CAN/CSA-Q9000.

Part 3 Execution

3.1 INSTALLATION

.1 Make field power and control connections as indicated.

.2 Ensure correct overload heater elements are installed.

.3 All MCC lineups shall be installed on housekeeping pads.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work – Electrical.

.2 Ensure moving and working parts are lubricated where required.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices;

.2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D);

.3 CSA-C22.2 No.55, Special Use Switches; and

.4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit Shop Drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

Part 2 Products

2.1 SWITCHES

.1 Twenty (20) A, one hundred twenty (120) V, single pole, double pole, three-way, four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

.2 Manually-operated general purpose ac switches with following features:

.1 Terminal holes approved for No. 10 AWG wire;

.2 Silver alloy contacts;

.3 Urea or melamine moulding for parts subject to carbon tracking;

.4 Suitable for back and side wiring; and

.5 Ivory toggle.

.3 Toggle operated locking fully rated for tungsten filament and fluorescent lamps, and up to eighty percent (80%) of rated capacity of motor loads.

.4 Switches of one (1) manufacturer throughout Project.

.5 Acceptable materials: Leviton specification grade, Hubbell specification grade.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, one hundred twenty-five (125) V, fifteen (15) A, U ground, to: CSA-C22.2 No.42 with following features:

.1 Ivory urea moulded housing;

.2 Suitable for No. 10 AWG for back and side wiring;

.3 Break-off links for use as split receptacles;

.4 Eight (8) back wired entrances, four (4) side wiring screws; and

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, one hundred twenty-five (125) V, fifteen (15) A, U ground with following features:

.1 Ivory urea moulded housing;

.2 Suitable for No. 10 AWG for back and side wiring; and

.3 Four (4) back wired entrances, 2-side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one (1) manufacturer throughout Project.

.5 Acceptable materials: Leviton specification grade, Hubbell specification grade.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Cover plates from one (1) manufacturer throughout Project.

.3 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.4 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one (1) switch is required in one (1) location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one (1) receptacle is required in one (1) location.

.2 Mount receptacles at height in accordance with Section 26 05 00 – Common Work Results – Electrical.

.3 Where split receptacle has one (1) portion switched, mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other Work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

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

.2 Include time-current characteristic curves for breakers with ampacity of ninety (90) A and over or with interrupting capacity of twenty-two thousand (22,000) A symmetrical (rms) and over at system voltage.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for forty (40) degrees Celsius ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from three (3) to eight (8) times current rating.

.5 Circuit breakers to have minimum symmetrical rms interrupting capacity rating matching panel board or switchboard containing breaker.

2.2 THERMAL MAGNETIC BREAKERS [DESIGN A]

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS [DESIGN B]

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 SOLID STATE TRIP BREAKERS [DESIGN D]

.1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for phase and ground fault short circuit protection.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated in the Drawings.

.2 Set adjustable trip settings according to coordination study.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches; and

.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 SUBMITTALS

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

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Heavy duty non-fusible, horsepower rated disconnect switch to CAN/CSA C22.2 No.4.

.2 Provision for padlocking in OFF position.

.3 Quick-make, quick-break action.

.4 ON-OFF switch position indication on switch enclosure cover.

.5 Category 1 locations: NEMA 4.

.6 Category 2 locations: NEMA 4x.

.7 Ordinary locations: NEMA 12.

.8 Outdoor: NEMA 3.

.9 Acceptable Manufacturer: Square D, Eaton, Hubbell, Pass & Seymour, Leviton.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches as indicated and as required by CSA C22.1.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for industrial control devices including pushbutton stations, control and relay panels.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA C22.2 No.14, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA):

.1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

1.4 SHOP DRAWINGS

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

.2 Include schematic, wiring, interconnection diagrams.

1.5 QUALITY ASSURANCE

.1 Submit to Contract Administrator copy of test results.

Part 2 Products

2.1 AC CONTROL RELAYS

.1 Control Relays: to CSA C22.2 No.14.

.2 Fixed contact plug-in type: general purpose heavy duty with two (2) poles. Coil rating: one hundred twenty (120) V. Contact rating: two hundred forty (240) V, two (2) A.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open – convertible to normally-closed in field.

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2.3 OILTIGHT LIMIT SWITCHES

.1 Snap action type: roller, rod, fork, lever, top, side, push, wobble stick actuator, CSA type 4 enclosure. Contact rating two hundred forty (240) VAC, 2A

2.4 SOLID STATE TIMING RELAYS

.1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact.

.2 Operation: on-delay or off-delay.

.3 Potentiometer: self contained to provide time interval adjustment.

.4 Supply voltage: one hundred twenty (120) V, AC, sixty (60) Hz.

.5 Temperature range: minus twenty (20) to sixty (60) degrees Celsius.

.6 Output contact rating: maximum voltage three hundred (300) V AC or DC. Current: 2A.

.7 Timing ranges: field adjustable, minimum 0.1s, maximum sixty (60) hours.

2.5 OPERATOR CONTROL STATIONS

.1 Enclosure: CSA Type 4, surface mounting.

2.6 PUSHBUTTONS

.1 Illuminated, heavy duty, thirty (30) mm, oil tight. Operator extend type, as indicated. Black, with 2-NO and 2-NC contacts rated at ten (10) A, AC, labels as indicated. Stop pushbuttons coloured red. Start pushbuttons coloured green.

2.7 EMERGENCY STOP PUSHBUTTONS

.1 Illuminated, Heavy duty oil tight, mushroom head, 2-position, Push-Pull operator, Red, with 2-NO and 2-NC contacts rated at ten (10) A, AC/DC, labels as indicated.

2.8 SELECTOR SWITCHES

.1 Maintained three (3) position labelled as indicated heavy duty, thirty (30) mm, oil tight, operators wing lever contact arrangement as indicated, rated one hundred twenty (120) V, ten (10) A, AC.

2.9 INDICATING LIGHTS

.1 Heavy duty, thirty (30) mm, oil tight, full voltage, LED type, push-to-test, lens colour: as indicated, supply voltage: one hundred twenty (120) V, lamp voltage: one hundred twenty (120) V, labels as indicated.

2.10 CONTROL AND RELAY PANELS

.1 CSA Type 12 sheet steel enclosure with hinged padlockable access door, accommodating relays timers, labels, as indicated, factory installed and wired to identified terminals.

2.11 CONTROL CIRCUIT TRANSFORMERS

.1 Single phase, dry type.

.2 Primary: six hundred (600) V, sixty (60) Hz ac.

.3 Secondary: one hundred twenty (120) V, AC.

.4 Rating: one hundred fifty (150) VA, or larger as required.

.5 Secondary fuse: ampacity as required.

.6 Close voltage regulation as required by magnet coils and solenoid valves.

2.12 THERMOSTAT LINE VOLTAGE

.1 Wall mounted, for exhaust fan control.

.2 Full load rating: eight (8) A at one hundred twenty (120) V.

.3 Temperature setting range: zero (0) to thirty (30) degrees Celsius.

.4 Thermometer Range: zero (0) to thirty (30) degrees Celsius.

.5 Markings in five (5) degree increments.

.6 Differential temperature fixed at one (1) degree Celsius.

2.13 IDENTIFICATION

.1 All control devices shall be labelled exactly as shown in the Drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices and interconnect.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work – Electrical.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one (1) section at time and check out operation of section.

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.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

END OF SECTION

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Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work – Electrical.

1.2 REFERENCES

.1 NEMA contactors and motor starters.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Indicate:

.1 Mounting method and dimensions;
.2 Starter size and type;
.3 Layout of identified internal and front panel components;
.4 Enclosure types;
.5 Wiring diagram for each type of starter; and
.6 Interconnection diagrams.

1.4 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for motor starters for incorporation into manual.

.2 Include operation and maintenance data for each type and style of starter.

1.5 EXTRA MATERIALS

.1 Provide maintenance materials.

.2 Provide listed spare parts for each different size and type of starter:

.1 Three (3) contacts, stationary.
.2 Three (3) contacts, movable.
.3 One (1) contacts, auxiliary.
.4 One (1) control transformer[s].
.5 One (1) operating coil.
.6 Two (2) fuses.
.7 Ten percent (10%) indicating lamp bulbs used.

Part 2 Products

2.1 MATERIALS

.1 Starters: NEMA standards, IEC rated equipment not allowed.

2.2 MANUAL MOTOR STARTERS

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 One (1) overload heater, manual reset, trip indicating handle.

.2 Accessories:

.1 Toggle switch, heavy duty oil tight labelled as indicated.

.2 Indicating light: heavy duty oil tight, LED type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Provide control signal interface to new PLC Control panel.

.2 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.5 Hand-Off-Auto selector switch mounted on starter door.

.6 Green running light.

.7 Amber alarm light.

.3 Combination type starters to include motor circuit interrupter with operating lever on outside of enclosure to control disconnect motor circuit interrupter, and provision for:

.1 Locking in "OFF" position with up to three (3) padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.4 Shut trip or under voltage trip protection not allowed.

.4 Accessories:

.1 Pushbuttons and selector switches: heavy duty, thirty (30) mm, oil tight labelled as indicated.

.2 Indicating lights: heavy duty, thirty (30) mm, oil tight, LED type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.4 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and one hundred twenty (120) V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus twenty percent (20%) spare capacity.

2.5 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 – Common Work – Electrical.

2.6 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work – Electrical.

.2 Manual starter designation label, black plate, white letters, size one (1), engraved as indicated.

.3 Magnetic starter designation label, black plate, white letters, size four (4) engraved as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

.3 Confirm operation of motor starters from level controller and PLC Control System.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work – Electrical and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

Part 1 General

1.1 SCOPE

.1 Division 26 Contractor shall supply, install, wire and connect, and program all VFD controllers and indicated on the Drawings.

1.2 STANDARD MOTOR

.1 All VFDs supplied under this Contract shall meet or exceed the following Specifications.

.2 Provide a complete inventory (as specified) of spare cooling fans, and fuses, for each VFD supplied.

.3 The adjustable frequency controller shall be designed to operate standard squirrel cage induction motor with a 1.15 S.F. or definite purpose motors meeting National Electric Manufacturers Association (NEMA) MG1 Part 31.

.4 Harmonic loading will not exceed a motor service factor of one (1.0).

.5 Products shall comply with Institute of Electrical and Electrical Engineers (IEEE) Standard 519.

.6 VFD unit shall be Underwriters Laboratories (UL) listed and Canadian Standards Association (CSA) certified.

.7 VFD unit shall comply with applicable requirements of the latest standards of CSA, American National Standards Institute (ANSI), IEEE and the Canadian Electrical Code.

1.3 TESTS

.1 Factory testing:

.1 VFD units are to be factory tested prior to shipment. Provide confirmation from factory of actual tests completed and results.

.2 Provide certified copies of production test results required by CSA and Electrical and Electronic Manufacturer's Association of Canada (EEMAC), prior to acceptance of the equipment.

.2 Field testing:

.1 The VFD supplier shall provide on-Site start-up, fine-tuning, commissioning, operator training and instruction.

.2 The VFD supplier shall provide Site functionality test reports indicating loading/current levels during testing as well as control point proving results.

.3 The VFD supplier shall ensure shaft to ground voltages do not exceed 1.5 V at any speed or load requirement.

.4 Allow for all costs and labour for as many trips as necessary to complete requirements.

.5 It is the intent of this Specification to provide a VFD installation that does not adversely affect the electrical system. Included in the Contract Documents is information on the electrical system including:

.1 Single line Drawing.

.2 Additional information on electrical system layout and load profile.

.3 The VFD supplier can use this information to evaluate the predicted effect of the VFD installation on the electrical system and advise the Contract Administrator of these effects. For the purposes of analysis, the point of common coupling (PCC) will be taken as the secondary of the main distribution transformers.

.3 Provide certified copies of all production test results required by CSA and NEMA.

.4 Provide and complete the City of Winnipeg standard VFD test form.

1.4 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Indicate:

.1 Mounting method and dimensions;

.2 Starter size and type;

.3 Layout of identified internal and front panel components;

.4 Enclosure types;

.5 Wiring diagram for each type of starter; and

.6 Interconnection diagrams.

1.5 CLOSEOUT SUBMITTALS

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

.2 Include operation and maintenance data for each type and style of VFD.

.3 Provide parameter settings for each VFD.

1.6 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.

.2 Provide listed spare parts for each different size and type of starter:

.1 Three (3) contacts, stationary.

.2 Three (3) contacts, movable.

.3 One (1) contacts, auxiliary.

.4 One (1) control transformers.

.5 One (1) operating coil.

.6 Two (2) fuses.

.7 Ten percent (10%) indicating lamp bulbs used.

Part 2 Products

2.1 VARIABLE FREQUENCY DRIVES

.1 Variable Frequency Drives as supplied by one (1) of the following acceptable manufacturers:

.1 Schneider Electric – Altivar Process ATV600.

.2 Purchasing and/or quotes shall reference the City of Winnipeg RFP 756-2013 for the City of Winnipeg discount pricing.

.2 Variable speed controller shall be electronic adjustable frequency and voltage output unit.

.3 The VFD shall employ a minimum 6-pulse pulse width modulated (PWM) inverter system utilizing Insulated Gate Bipolar Transistors (IGBT) power switching devices and come complete with line reactors or DC link filters.

.4 The drive shall be rated for continuous duty while operating a NEMA design induction motor of the sizes and operating voltages as shown in the following schedules and indicated on the Drawings. Drive output shall be sized for a one (1.0) motor service factor. The VFD shall have a current rating at least ten percent (10%) in excess of the motor full load amp rating. Overload service factors of one hundred ten percent (110%) for thirty (30) minutes and one hundred thirty-five percent (135%) for one (1) minute must be provided to ensure adequate safety margins. VFD selection shall be based on load current at constant torque ratings. Do not size VFD's based on variable torque maximums.

.5 Input voltage shall be as indicated on motor schedules and Drawings (line voltage variation plus or minus ten percent (±10%)) based on 347/600 volt systems (Not five hundred seventy-five (575) V). Line frequency variation plus or minus five percent (±5%). Output voltage shall vary with motor speed to nominal motor voltage. Speed stability shall be plus or minus one percent (±1%). Drive shall match torque characteristic of load.

.6 Input frequency setting signal will be selective between 4-20 mA or 0-10 v DC. Output speed monitoring signal shall be selective between 4-20 mA or 0-10 v DC.

.7 Enclosure:

.1 Drive shall be installed in the MCC as indicated on Drawings. Filters to be provided for any forced air-cooled enclosures as required by the supplier. VFD(s) shall be suitable for mounting in a typical building electrical room and shall be able to operate under these conditions with no special cleaning requirements. VFD cabinets shall be mounted in such a way that there is adequate room for ventilation and no buildup of heat.

.8 Protective devices to be incorporated are:

.1 Fast acting electronic circuit board protective devices for protection of electronic components.

.2 Three percent (3%) Line reactor.

.3 Drive output filter.

.4 Integral electronic motor overload protection adjustable up to one hundred fifty percent (150%) of motor rating for sixty (60) seconds.

.5 Overcurrent instantaneous trip two hundred fifty percent (250%).

.6 Programmable short-circuit protection.

.7 Programmable ground fault protection.

.8 Overvoltage/overcurrent DC bus monitor/protection.

.9 Undervoltage protection.

.10 Loss of phase and phase unbalance protection.

.11 Inverter over-temperature protection.

.12 Capable of running without motor for start-up.

.13 Maximum acceptable noise level is eighty (80) dBA at one (1) m.

.9 Operation features:

.1 Integral flush mounted display in VFD cover with keypad for programming, monitoring and operating of drive, accessible through password or other acceptable security measure only. Remote keypads, completely duplicating functions of integral keypads, shall also be provided for all VFD(s) that are not normally accessible such as located inside MCCs, fan plenums, etc. The remote keypads in these cases shall be located adjacent to the door entering the plenum.

.2 Fault shutdown and indication.

.3 Automatic restart following power outage.

.4 Ability to disconnect motor load for setup or trouble.

.5 Manual speed control potentiometer mounted on MCC door.

.6 Adjustable maximum and minimum speed.

.7 Acceleration and deceleration time adjustment.

.8 Controller “stop” interlock from a NC dry contact.

.9 Drive fault contact.

.10 Stop/start forward/start revers push buttons on keypad and MCC door.

.11 Transient voltage protection.

.12 Provide three (3) dry “C” type contacts programmable for any combination of the following:

.1 Running (output frequency being generated).

.2 Fault lockout.

.3 Stopped.

.4 At speed.

.5 Under speed.

.6 Forward/Reverse.

.7 Low reference.

.8 Manual/Auto Mode.

.9 Local/Remote Mode.

.13 Soft start sequence.

.14 Minimum of three (3) skip frequencies.

.15 Provide Hand/Off/Auto selector switch. Keypad HOA is not an acceptable replacement.

.16 Password protection of parameter programming or some method to prevent unauthorized changes.

.17 Output speed monitoring signal to be selective between 4-20 mA or 0-10 V.

.18 Data communication link:

.1 Data communication links shall be provided with various components in the electrical distribution system as defined in various section of this Division and as shown on Drawings. The data communication link shall be Modbus Ethernet.

.2 Motor control data communication link.

.3 Each variable frequency drive shall be provided with Ethernet data communication link capable of communicating with the Plant SCADA System.

.10 Environmental Capabilities: The drive shall operate without mechanical or electrical damage under any combination of conditions as follows:

.1 Ambient temperature minus zero (-0) degrees to forty (40) degrees Celsius.

.2 Humidity zero (0) to ninety percent (90%) (non condensing).

.3 Vibration up to 0.5 g.

.4 Altitude zero (0) to one thousand two hundred fifty (1,250) metres.

.11 Diagnostic and indicating features:

.1 Power On indication;

.2 Percentage speed indicator;

.3 Overload indication;

.4 Short circuit indication;

.5 Ground fault indication;

.6 Overvoltage indication;

.7 Undervoltage indication;

.8 High temperature (controller);

.9 AC voltmeter (output);

.10 AC ammeter (output);

.11 Inverter ready;

.12 Inverter fault; and

.13 External fault.

.12 Cooling System:

.1 VFD supplier to provide adequate proven cooling devices for VFD equipment.

.2 VFD supplier to ensure any enclosure utilized will not allow a buildup of heat. This can be accomplished by use of fans and/or sufficient guarded, filtered openings.

.13 Control wiring shall be TEW one hundred five (105) degrees Celsius rise.

.14 Terminal blocks in separate control enclosures for remote interface shall be Weidmueller SAK6N or approved equivalent.

.15 Provide wire markers at both ends of all control wires, Electrovert Type Z or approved equivalent.

Part 3 Execution

3.1 INSTALLATION

.1 Identify mounting requirements and include all materials and labour, including concrete pads for all floor-mounted equipment.

.2 Install VFD(s) in locations as indicated on Drawings, and connect up all necessary wiring. All VFD(s) are to be mounted in the electrical room. Follow manufacturer's recommendations for maximum distance between the VFD and the motor. The minimum clearance in front of VFDs is one (1) metre.

.3 Connect VFD output to motor using drive rated cable.

.4 Contractor shall connect all interlocks including (but not limited to) vibration switch, freeze stats, and fire alarms to the VFD. These interlocks will be active in both the Hand (local) and Auto (remote) configurations.

.5 Contractor shall program all VFD parameters to provide operation as indicated in the plans and Specifications.

.6 Contractor shall ensure that all control and stop commands shut down the drive as per manufacture's recommended procedure (example, ramp to stop, ramp and hold, or coast to stop). Contactors on the line or load side of the drive are not an approved method of control.

.7 MCC disconnect switch, VFD and motor isolation switch are to be labelled with proper shutdown procedures as follows:

"Caution"
"Ensure VFD is stopped before operating this switch"
"Record all faults before resetting"

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work – Electrical.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

.5 Contractor shall be responsible to bring Factory representative back to reset, repair, and re-commission the VFD during the two (2) year warranty period if problems arise with the normal operation of the VFD. This includes prevention of any motor shaft voltages exceeding 1.5 V when referenced to ground.

END OF SECTION

Part 1 General

1.1 REQUIREMENTS OF WORK

.1 Supply, install and commissioning a complete instrumentation and control (I&C) system for the pumping station as shown on the Drawings and as specified herein.

.2 Component subsystems of the I&C system will include, but are not limited to, the following:

.1 Primary elements and transmitters;

.2 Final control elements;

.3 RTU control panels;

.4 Instrumentation cabling;

.5 Instrumentation power supplies; and

.6 Conduit and cable tray.

.3 Where packaged, stand-alone control systems are supplied by others provide cabling to connect to the required remote monitoring and/or control functions. Provide end-to-end Commissioning of all required remote monitoring and/or control functions. Assist in ensuring the correct functionality of any equipment supplied by others.

.4 Documentation referred to in 1.1.1 to include as a minimum:

.1 Records of as-built information for the complete instrumentation system.

.5 Documentation provided is formatted as follows:

.1 Location Drawings – indicate in plan and/or elevation views where the instrument elements are physically located. These Drawings are provided to assist the Contractor in estimating the amount of cable and ducting required.

.2 Standard Details – provide a reference for installation, operation and other instructions pertinent to a particular device.

.3 Detailed Specification – lists qualifications, quality of materials and workmanship, and supplementary information.

.6 Definitions:

.1 Interpret specialized terms not explicitly defined herein in accordance with ISA-S51.1, NEMA-ICS-1, ANSI/IEEE-Std-100, and The Communications Standard Dictionary, by Martin H. Weik.

.7 References:

.1 This Specification contains references to the following Documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed Documents, the requirements of this Section prevail.

Reference	Title
API RP550	Manual on Installation of Refinery Instruments and Control Systems, Part I – Process Instrumentation and Control Sections 1 Through 13
ASME Section VII	Rules for Construction of Pressure Vessels
ASTM B68	Seamless Copper Tube
ASTM D883	Terms Relating to Plastics
IEEE 100	Dictionary of Electrical and Electronic Terms
ISA RP7.1	Pneumatic Control Circuit Pressure Test
ISA RP12.6	Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations
ISA S5.4	Instrument Loop Diagrams
ISA S18.1	Annunciator Sequences and Specifications
ISA S51.1	Process Instrumentation Terminology
NEMA 250	Enclosures for Industrial Controls and Systems
NEMA ICS 1	General Standards for Industrial Control and Systems
NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
NFPA 70	National Electrical Code (NEC)
SAMA PMC 17-10	Bushings and Wells for Temperature Sensing Elements
UBC	Uniform Building Code
UL 1012	Power Supplies
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances Weik, Martin H. Communications Standard Dictionary, Van Nostrand Reinhold Co.

.8 Related Work:

.1 Mechanical; and

.2 Electrical.

.9 Qualifications:

.1 The instrumentation Subcontractor shall be a firm normally engaged and fully competent in the type of Work described in this Section of the Specification. The firm shall have been continuously and successfully engaged in this business for at least five (5) years.

.2 Qualified journeyman instrument mechanics that are familiar with the devices being installed shall perform all instrument hook-ups, calibrations, and checkouts.

.3 Qualified journeyman electricians shall perform all control wiring installation and connections.

.10 Codes, Rules, Permits and Fees:

.1 Comply with all laws, ordinances, rules, regulations, codes and orders of all authorities having jurisdiction relating to this Work.

.2 Comply with all rules of the Electrical Safety Act of the Province, CSA Standards, the ULC and the applicable building codes, whether specifically shown on Drawings or not.

.3 Give all required notices, submit Drawings, obtain all permits, licenses and certificates and pay all fees required for this Work.

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.4 Furnish a certificate of final inspection and approvals from an inspection authority to the Contract Administrator.

.11 Standards of Workmanship:

.1 Execute all Work in a manner, which will result in the completed installation presenting an acceptable appearance, to a level of quality defined in the general conditions of this Specification.

.2 Employ a competent supervisor and all necessary licensed tradesmen to complete the Work in the required time.

.3 Arrange and install products to fit properly into designated building spaces.

.4 Install products in accordance with the recommendations and ratings of the product manufacturers.

.12 Contract Drawings and Specifications:

.1 Refer to Division 1.

.2 Provide all items and accessories required to install City supplied equipment.

.3 Perform all operations as designated by the Specification according to the methods prescribed, complete with all necessary labour and incidentals.

.4 Treat any item or subject omitted from this Division's Specifications or Drawings, but which is mentioned or reasonably specified in other Divisions' Specifications or Drawings and pertains to the instrumentation and control system, as being integral to the overall system. Provide such specified items or subjects.

.5 Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.

.6 If discrepancies or omissions in the Drawings or Specifications are found, or if intent or meaning is not clear, consult the Contract Administrator for clarification before submitting bid.

1.2 EQUIPMENT

.1 Receiving, Storing and Protection of Components during Construction:

.1 Examine each component upon delivery to Site. Report all damage noted to the Contract Administrator prior to accepting or rejecting delivery. All instrumentation primary elements, control components, panels, etc. shall be placed in a secure, dry, heated storage building. Maintain the space temperature above ten (10) degrees Celsius and the space relative humidity below fifty percent (50%).

.2 Perform a preliminary examination upon delivery to ensure that:

.1 All instrumentation and control components supplied for this Project under this Section of the Specification comply with the requirements stated in the instrument Specification sheets.

.2 All instrumentation and control components supplied by others, to be connected to instrumentation and control components comply with the requirements stated in the Contract Documents.

.3 Itemize all non-conformities noted above and forward them to the Contract Administrator.

.4 Do not install primary elements or other sensitive equipment until construction is sufficiently completed to provide an "operating condition" environment. Notify the Contract Administrator prior to installing any equipment of this type.

.5 Ensure that covers where required are properly installed on all equipment. Provide all covers, padding, guards, etc. as required to guard any equipment against damage.

.6 Return all damaged equipment to the supplier for total corrective repairs. If deemed necessary by the Contract Administrator, the damaged equipment shall be replaced with new product.

1.3 SITE

.1 Classification of Plant Areas:

.1 Building Superstructure: Ordinary; and

.2 Building Substructure: Category 1.

1.4 DOCUMENTATION

.1 Submittals:

.1 Submit Shop Drawings for all products supplied by this Division.

.2 Shop Drawings for City of Winnipeg supplied equipment will be provided to the Contractor.

.2 Construction Record Drawings:

.1 Maintain on Site a complete set of Construction Record Drawings as listed in Division 1 of this Specification.

.2 In addition to the requirements as stated in Division 1, record the following information on the Drawings:

.1 All changes, alterations or additions;

.2 All instrumentation cable and control tubing; and

.3 All changes to the numbers and location of outlets, motors, panels and end devices that may occur during the course of the Work.

.3 Before requesting the Certificate of Total Performance, make any necessary final corrections to the Drawings, sign each print as a certification of accuracy and deliver all sets to the Contract Administrator for approval.

Part 2 Products

2.1 GENERAL

.1 Refer to the requirements of Division 1.

.2 Selected Products:

.1 Provide products and materials that are new and free from all defects.

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.2 The design has been based on the use of the first named product where multiple products have been listed.

.3 Quality of Products:

.1 All products provided to be CSA and ULC approved where applicable.

.2 If products specified are not CSA approved, obtain approval of the relevant provincial regulatory authority. Pay all applicable charges levied and make all modifications required for approval.

.3 Refer to Division 1 of this Specification for further information.

.4 Uniformity of Manufacture:

.1 Unless otherwise specifically called for in the Specification, uniformity of manufacture to be maintained for similar products throughout the Work.

.5 Use of Products during Construction:

.1 Any equipment used for temporary or construction purposes is to be approved by the Contract Administrator. Clean and restore to "as new" condition all equipment prior to the time of Substantial Performance.

2.2 INSTRUMENTATION

.1 General:

.1 Instruments and installation methods to be suitable for the environmental conditions in which they are to be installed.

.2 Determine where injurious conditions may be expected to occur and make proper provision to protect the instruments to ensure their proper and reliable operation.

2.3 IDENTIFICATION

.1 Refer to City of Winnipeg Water and Waste Department – Identification Standard, Rev 4 for general identification requirements.

.2 Provide three (3) millimetres thick lamacoid nameplates with six (6) millimetres black lettering on white background. Identify the loop tag number (where applicable) and the device name, function, and instrument range or setpoint value on the nameplate.

.3 Where it is not possible to attach a lamacoid nameplate to a field instrument component, provide the component with a stainless steel metal tag firmly wired to the device and identified with the loop tag number.

.4 Identify all wires where they terminate at the marshalling panels, junction boxes and field devices with a heat shrink sleeve with machine printed labeling.

.5 Clearly mark all panels, pull boxes, junction boxes, etc. to indicate the nature of service.

.6 Provide neatly typed circuit directories for panel power distribution systems to indicate loops or devices powered by the circuit and the fuse size.

.7 Identify all exposed control conduits at all pull box locations, where the conduits enter or leave a room, and thirteen (13) metres on centre throughout the room.

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This shall apply to conduits above removable ceilings. Use Thomas & Betts TY-RAP 5532-M labels conduit identification.

.8 For direct current wiring use black for positive and white for negative.

.9 For thermistor wiring to motors use red and blue coloured, insulated wire.

Part 3 Execution

3.1 SITE EXAMINATION

.1 Refer to the requirements of Division 1.

.2 No additional compensation will be given for extra Work due to existing conditions that a Site examination prior to Bid should have disclosed.

3.2 COORDINATION WITH OTHER DIVISIONS

.1 Examine the Drawings and Specifications of all Divisions and become fully familiar with the Work. Before commencing Work, obtain a ruling from the Contract Administrator on any conflicting issues between Divisions. No compensation will be made for any costs arising from conflict not identified before Work has commenced.

.2 Coordinate the Work to be performed under this Section of the Specification with all Divisions installing equipment to ensure that there are no conflicts.

.3 Install anchors, bolts, pipe sleeves, hanger inserts, etc. required in ample time to prevent delays to other Division's installation Work.

.4 Lay out the Work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural Drawings take precedence over electrical Drawings regarding locations of walls, doors and equipment.

.5 Structural members shall not be cut without prior approval of the Contract Administrator.

.6 Examine previously constructed Work and notify the Contract Administrator of any conditions, which prejudice the proper completion of this Work.

3.3 PRODUCT HANDLING

.1 Use all means necessary to protect the products included in this Division before, during and after installation, and to protect products and installed Work of all other trades.

.2 Any damage to the products and/or installed Work shall be repaired or replaced by the Contractor at no additional cost to the City of Winnipeg and to the approval of the Contract Administrator.

.3 Remove advertising labels from all products installed that have such labels attached. Identification or CSA labels are not to be removed.

.4 Remove dirt, rubbish, grease, etc. resulting from Work performed under this Division of the Contract from all surfaces.

3.4 SEPARATION OF SERVICES

.1 Maintain separation between the electrical wiring system, piping, ductwork, and the instrumentation cables so that each system is isolated (except at approved connections to such systems) to prevent galvanic corrosion. In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is unacceptable.

.2 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings are not to be used for the support of wiring.

.3 Classifications of Circuits:

.1 The circuit categorization shall of first priority follow Canadian Electrical Code with respect to separation for electrical safety and the following shall apply with respect to electro-magnetic compatibility:

Very Noisy	High voltage circuits and their associated grounding
	High current (>200 A) LV circuits
	Harmonic-rich LV circuits
	DC circuits: un-suppressed or above fifty (50) V
Noisy	Low current class two (2) circuits
	Medium power pulsed or radio frequency circuits
Indifferent	ELV digital status circuits
	Intrinsically safe circuits
	Telecommunications circuits
	Fire alarm and emergency lighting circuits (note that some fire alarm circuits may fall into the category of signal circuits)
	Any other emergency, shutdown, or high integrity circuit (e.g. toxic gas alarm)
Sensitive	Analogue signal circuits
	Data communication circuits
Very Sensitive	Low level voltage and current signals (e.g. from instrument sensors)

.4 Separation of Circuits:

.1 This Section relates to the running of cables carrying differing types of circuit in close proximity to one another and to other services. Sensitive circuits shall normally be run in overall shielded cable. Very sensitive circuits shall normally be run in individually twisted pair shielded cable.

.2 For cables sharing the same support/containment system, the following shall provide guidance to minimize extraneous interference:

Segregation between Circuits	Very Noisy	Noisy	Indifferent	Sensitive	Very Sensitive
Very Noisy	Thermal grouping as per CE Code	150 mm	300 mm	300 mm	300 mm
Noisy	150 mm	Thermal grouping as per CE Code	150 mm	150 mm	150 mm
Indifferent	300 mm	150 mm	Separation of Circuit types	100 mm	100 mm
Sensitive	300 mm	150 mm	100 mm	Touching	50 mm
Very Sensitive	300 mm	150 mm	100 mm	50 mm	Touching

3.5 WIRE AND CABLE

.1 Refer Division 26.

3.6 CONTROL WIRING COLOUR IDENTIFICATION

.1 Colour Codes:

Conductor Purpose	Colour
Power, 120/208/240 VAC Supply	Black
Power, 120/208/240 VAC Neutral	White
Power, 24 VDC Supply (+)	Blue
Power, 24 VDC Common (-, or 0VDC)	Brown
Discrete Control AC	Red
Discrete Control DC	Blue
Intrinsically Safe	IS (light) Blue
Protective Earth (PE)	Green
Signal Ground/Instrumentation Earth (IE)	Green/Yellow

3.7 NETWORK CABLE – JACKET COLOUR

.1 Colour Codes:

Cable Purpose	Colour
Ethernet, CAT5E or CAT6	Blue
Profibus DP	Purple
Profibus PA, Non-Intrinsically Safe	Black
Profibus PA, Intrinsically Safe	Light Blue
Modbus/RTU (serial)	Grey

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3.8 EQUIPMENT CONNECTIONS

.1 Prior to the connection of signal wiring to process control and instrumentation devices, check the device voltage rating and polarity for compatibility with the corresponding loop and/or schematic diagram. Where device and circuit characteristics are found to be incompatible, the connections are not to be made. Report the condition immediately to the Contract Administrator.

.2 All control wiring diagrams illustrate typical control circuits applicable to the type of equipment specified. Control circuits may vary with different manufacturer's equipment. Verify all control circuits with the manufacturers of the equipment and make any corrections to the control wiring diagrams that may be required.

3.9 WIRING TO EQUIPMENT SUPPLIED BY OTHER DIVISIONS

.1 Equipment supplied by the City of Winnipeg or by other Divisions, that have external or field mounted control devices, are to be installed, wired and commissioned by this Division.

3.10 INSTRUMENT MOUNTING STANDS

.1 Supply and install instrumentation mounting stands as required. Stands are to be either floor or wall mounted. The mounting stands are to be fabricated from aluminum.

.2 Supply and install protective drip shields for any exterior stand-mounted instrumentation equipment. Drip shields are to extend fifty (50) millimetres past the front and side faces of the equipment. Drip shields are to be fabricated from aluminum.

3.11 SEALING OF WALL AND FLOOR OPENINGS

.1 Seal all conduit and cable entries passing through walls of buildings, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade.

.2 Seal openings after all wiring entries have been completed.

.3 Sealing material shall be fire resistant and shall not contain any compounds that could chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations, if required, are to be sealed. Submit Shop Drawing for rated assembly prior to installation of fire stop.

3.12 TAGGING STANDARDS FOR DEVICES AND WIRING

.1 Tag all devices, wires, and I/O using the assigned loop, equipment, or device tag name. Where tag naming and numbering is not specified, the Contract Administrator will provide naming and numbering that is consistent with the plant naming conventions.

3.13 TESTING OF INSTRUMENTATION LOOPS

.1 After all devices within a loop have been connected, check the loop for correct functioning and interaction with other loops, where applicable. Provide written notice to the Contract Administrator when the loops are going to be tested so that the tests may be witnessed at the Contract Administrator’s discretion.

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.2 Check the operation of final control elements such as solenoid valves, actuators, etc. by manual control before checking with automatic control.

.3 Check and simulate all alarms and shutdown functions.

.4 Test all tubing for leaks in compliance with ISA RP7.1. Isolate all instruments when tubing is being tested to protect against over pressure.

.5 Perform tests and record results on the test data forms that are included in this Section. Develop additional and/or more detailed test forms as necessary to suit more complex instrumentation.

.6 Sign and date all test reports. Submit the test reports to the Contract Administrator within five (5) Business Days of testing.

.7 Coordinate and cooperate with City of Winnipeg's staff while they verify the instrument loop I/O in the programmable logic controller (PLC) and on the supervisory control and data acquisition (SCADA) system.

3.14 CALIBRATION

.1 Instruments are to be factory pre-calibrated. Verify calibration after installation for all instruments installed under these Specifications. Provide a printed record of the factory calibration parameters for "smart" devices.

.2 Prior to calibration, completely program all "smart" transmitters including entries of the appropriate range and tag number. Provide a printed record of smart device serial numbers against their assigned tag number with all programmed parameters.

.3 Calibrate all instruments to an accuracy of 0.5% of full range, or to the manufacturer's stated accuracy of the instrument whenever an accuracy of 0.5% is not achievable.

.4 Prior to instrument installation perform the following applicable calibration for each instrument and its associated signal conditioning equipment:

.1 Calibrate online analyzers with known samples.

3.15 COMMISSIONING

.1 Refer to the requirements of Division 1 for additional requirements.

.2 Inspections:

.1 Provide two (2) weeks' written notice to the Contract Administrator prior to energizing any system to allow for inspection by the Contract Administrator of the following:

.1 Proper mounting; and

.2 Proper connections.

.2 During Commissioning, demonstrate to the Contract Administrator proper calibration and correct operation of instruments and gauges.

.3 Commissioning of the instrumentation and control system to include but not be limited to the following:

.1 Verify installation of components, wiring connections and piping connections.

.2 Supervise wiring continuity and pipe leak tests.

.3 Verify instrument calibration and provide written report.

.4 Function check and adjust the instruments and control equipment under operational conditions.

.5 Coordinate manufacturer's service personnel as required for complete system testing.

.6 Instruct plant personnel in correct method of instruments equipment operation.

.7 Direct plant personnel at hand-over as to final adjustment of the system for correct plant operation.

.8 Ensure that the Manufacturer's representatives cooperate to complete the Work of this Section.

.9 Verify signal levels and wiring connections to all instrumentation and control equipment.

.10 Work with control system programmer to verify all field devices, wiring, calibration and operation.

.11 Filling out standardized City of Winnipeg commissioning forms for all instruments and control devices.

END OF SECTION

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Part 1 General

1.1 REFERENCES – GENERAL

.1 Suppliers, Equipment, Products, and Execution must meet all requirements detailed in Section 29 05 00 – Common Work – Instrumentation and Control.

.2 Local control stations shall be supplied to house local control switches, push buttons and indictor lights associated with field devices (valves, drives etc.). The control stations shall be located in close proximity to their associated devices. Where a group of devices are located within close proximity to each other, the local controls may be combined into a single common local control panel. Line of site must be maintained between all devices and the respective local controls.

Part 2 Products

2.1 GENERAL

.1 Unless otherwise specified, provide outside finishes on all enclosures in ANSI 61 Grey.

.2 The enclosures must be suitable for carrying the weight of the equipment mounted inside the panel and on the doors without any warpage.

2.2 ENCLOSURES

.1 Provide Electrical EEMAC Type 12 enclosures for ordinary locations.

.2 Provide Electrical EEMA Type 4x enclosures for Category 1 and 2 locations.

2.3 WIRING AND ACCESSORIES

.1 Provide wiring inside the enclosures according to the following Specifications:

.1 Control wiring to be a minimum of #16 AWG tinned stranded copper; insulation rated at six hundred (600) V.

.2 Wiring for power distribution shall be a minimum of #14 AWG tinned stranded copper; insulation rated at six hundred (600) V.

.3 Install cables in accordance with the requirements of Division 26.

.2 Tag each wire at both ends with a heat shrink sleeve that is machine printed. Allow approximately twenty (20) millimetres of wire insulation between the tag and the bare wire.

.3 Wiring systems with different voltage levels or types shall be suitably segregated within the panel, according to relevant electrical codes.

.4 Run all wiring in enclosed plastic wireways such as Panduit. Size all wireways so that the total cross sectional area of the insulated wire and cable does not exceed forty percent (40%) of the cross sectional area of the wire way.

.5 Provide a minimum clearance of fifty (50) millimetres between wire ways and any point of wire termination.

.6 Terminate all wiring, incoming and outgoing, at terminal strips mounted inside the enclosure. Identify each terminal strip with a terminal strip number, defined as follows:

.1 Wire identification to use the connected field device tag name with the wire's corresponding end device terminal number appended to it.

.2 Identify every joint and/or terminal of the above wire run with the same identifier until the wire meets another tagged device, at which point the wire identifier will change to use the new device name and terminal number.

.3 For example, pressure transmitter FIT-740 located in the field has a one (1) PR-TPSH cable connected to it. The cable runs through a junction box to a marshaling panel. The wire identifiers for the pair of wires would be FIT-740 all the way to the marshaling panel.

.4 Identify spare wires by using the cable tag, wire number and an “-SP” suffix.

.5 Arrange wiring on terminal blocks such that all internal panel wiring terminates on the inboard side of the terminal blocks and all external wiring terminates on the outboard side.

.7 Provide sufficient terminals so that not more than two wires are connected under the same terminal. Provide twenty percent (20%) spare terminal capacity at each terminal block assembly.

.8 Terminals shall be Weidmuller W Series color coded as follows:

Red = positive twenty-four (24) VDC
Black = analog signal plus
White = analog signal common and VAC neutral
Grey = one hundred twenty (120) VAC
Green = ground

.9 Provide nameplates for each device on or within the panels and enclosures. Nameplates shall be white lamacoid with black lettering, a minimum of twenty-five (25) millimetres by seventy-five (75) millimetres in size with up to three (3) lines of five (5) millimetres lettering. Securely fasten nameplates in and situate them in a visible location.

2.4 PANEL GROUNDING

.1 Provide a ground system for the instrumentation circuits.

.2 Provide grounding lugs for each panel, suitable for termination of up to #2 AWG copper grounding conductor.

.3 Firmly bond all panel-mounted devices on or within the panels to ground. Provide supplementary bonding conductors for backpanels and doors. Attach a separate bonding conductor to all devices that are not firmly fastened to the panels with screws for such devices as case mounted instruments, meters, etc.

Part 3 Execution

3.1 MOUNTING HEIGHTS

.1 Unless otherwise specified or a conflict exists, mount all panels, starters and disconnects two thousand (2,000) millimetres to top of cover.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA-C22.2 No. 214, Communications Cables (Bi-National standard with UL 444); and

.2 CSA-C22.2 No. 232, Optical Fiber Cables.

.2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA):

.1 TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements;

.2 TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components;

.3 TIA/EIA-568-B.3, Optical Fiber Cabling Components Standard;

.4 TIA/EIA-606-A, Administration Standard for the Commercial Telecommunications Infrastructure;

.5 TIA TSB-140, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems; and

.6 TIA-598-C, Optical Fiber Cable Color Coding.

1.2 DEFINITIONS

.1 Refer to TIA/EIA-598-C, Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Division 26.

1.4 RELATED WORK

.1 Refer to Division 26.

1.5 INSPECTION

.1 Provide adequate notice to the Contract Administrator so that all cable installations can be inspected prior to energizing equipment.

1.6 STANDARDS

.1 All wire and cable shall be CSA approved.

Part 2 Products

2.1 TWISTED PAIR SHIELDED CABLES (TPSH)

.1 TPSH shall be constructed as follows:

.1 Two (2) copper conductors, stranded, minimum #18 AWG, PVC insulated, twisted in nominal intervals of fifty (50) millimetres.

.2 Insulated for six hundred (600) V, ninety (90) degrees Celsius.

.3 One hundred percent (100%) coverage aluminum foil or tape shield.

.4 Separate bare stranded copper drain wire, minimum #18 AWG.

.5 Overall flame retardant PVC jacket to CSA-C22.2.

.6 The entire cable assembly to be suitable for pulling in conduit or laying in cable tray.

.7 Interlocked aluminum armour and outer PVC jacket.

.8 Shaw Type 1751-CSA or Beldon equivalent.

.2 Where multi-conductor TPSH cables are called for, each pair shall be individually shielded, continuous number coded, and the cable assembly shall have an overall shield and overall flame retardant PVC jacket.

2.2 RTD AND MULTI CONDUCTOR SHIELDED CABLE

.1 RTD cables shall be CSA approved and shall be constructed as follows:

.1 Three or more copper conductors, stranded, minimum # 18 AWG.

.2 PVC insulated for six hundred (600) V.

.3 One hundred percent (100%) coverage aluminum foil or tape shield.

.4 Separate bare stranded copper drain wire.

.5 Interlocked aluminum armour and outer PVC jacket.

.6 Overall flame retardant PVC jacket to CSA-C22.2.

2.3 TECK CABLES

.1 As per Division 26.

2.4 WIRE

.1 As per Division 26.

2.5 100 BASE TX CATEGORY 6 COMMUNICATION CABLE

.1 Category 6 cable shall be CSA approved and constructed as follows:

.1 Four (4) bonded pairs, solid stranded, #24 AWG.

.2 Interlocked aluminum armour.

.3 Rip cord.

.4 PVC inner and outer jackets.

.5 UL verified to Category 6.

.6 Insulated for three hundred (300) V.

.7 Shielded.

Part 3 Execution

3.1 ANALOG SIGNALS

.1 Use TPSH cable for all low level analog signals such as 4-20 mA, pulse type circuits twenty-four (24) VDC and under, and other signals of a similar nature.

.2 Use RTD cable for connections between RTDs and transmitters or control system RTD inputs.

3.2 DIGITAL SIGNALS

.1 Use TPSH cable for all low level input (twenty-four (24) V and below) and output signals to the control system.

3.3 INSTRUMENT POWER

.1 Use wire and conduit for power to instruments, for one hundred twenty (120) V signals other than those mentioned above and as otherwise indicated on the Drawings. Use stranded wire and cable to supply power to instruments.

3.4 INSTALLATION

.1 Install instrumentation cables in conduits. Use a minimum of three hundred (300) millimetres and a maximum of one thousand (1,000) millimetres length of liquid tight flexible conduit to connect the field sensors to the conduit.

.2 At each end of the run leave sufficient cable length for termination.

.3 Do not make splices in any of the instrumentation cable runs.

.4 Cable shields shall be terminated on insulated terminals and carried through to the extent of the cable.

.5 Ground cable shields at one end only. Unless otherwise specified, ground the shields at the PLC control panel.

.6 Protect all conductors against moisture during and after installation.

3.5 CAT 6 INSTALLATION

.1 Always follow the Manufacturer's guidelines for minimum bend radius and tension.

.2 All installations and terminations shall be performed by personnel experienced in Cat 6 cable installation.

.3 Perform cable testing with time domain reflectometer instrument and provide complete detailed test report. Test all runs upon completion of permanent terminations, using instrumentation acceptable to Contract Administrator. Before commencing testing, submit sample test data sheets and information with respect to test instrumentation to be used.

.1 Test for the following:

.1 Continuity.

.2 Pair placement and polarity.

.3 DC resistance.

.4 Characteristics at highest contemplated frequency:

.1 Attenuation – data cable.

.2 Mutual Capacitance – data cable.

.3 Near-end crosstalk (NEXT) – data cable.

.5 Run length.

.2 Category 6 using certified level III tester to: TIA/EIA-568-B.2.

.3 Reconnect or re-install and retest as necessary to correct excessive variations.

3.6 FIELD QUALITY CONTROL

.1 Test horizontal UTP cables as specified below and correct deficiencies provide record of results as hard copy.

.1 Perform tests for Permanent Link on installed cables, including spares:

.1 Category 6 using certified level III tester to: TIA/EIA-568-B.2.

.2 Perform tests for Channel on one hundred percent (100%) of cross-connected data horizontal cabling installed from each telecommunications room, including shortest and longest drops from each telecommunications room.

.1 Category 6 using certified level III tester to: TIA/EIA-568-B.

3.7 CONDUCTOR TERMINATIONS

.1 All equipment supplied shall be equipped with terminal blocks to accept conductor connections.

.2 Instrumentation conductors, where terminated at equipment terminals other than clamping type terminal blocks, shall be equipped with Burndy-YAE-2 or STA-KON, self-insulated, locking type terminators, sized as required to fit conductors and screw terminals.

3.8 TESTING

.1 Test all conductors for opens, shorts, or grounds. Resistance values shall not be less than those recommended by the cable manufacturer.

3.9 IDENTIFICATION

.1 Identify all instrumentation cables.

.2 Identify each conductor with wire numbers using a machine printed Raychem TMS heat shrink wire marker or approved equal in accordance with B7.

END OF SECTION

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Part 1 General

1.1 REFERENCES – GENERAL

.1 Equipment, Products and Execution must meet all requirements detailed in Section 29 05 00 – Common Work – Instrumentation and Control.

Part 2 Products

2.1 MISCELLANEOUS PANEL DEVICES

.1 Ethernet Switch:

- .1 Install Ethernet switch in RTU control panel;
- .2 Eight (8) port unmanaged Ethernet switch;
- .3 Power Supply: twenty-four (24) VDC;
- .4 Mounting: DIN rail; and
- .5 Approved Product: Schneider Electric Connexium TCSEU083FN0.

.2 Cellular Modem/Router:

- .1 Industrial 4G LTE cellular router;
- .2 Power Supply: twenty-four (24) VDC;
- .3 Mounting: DIN rail;
- .4 Supplied by the City of Winnipeg; and
- .5 Contractor shall install in RTU control panel.

.3 Dialup Modem:

- .1 Industrial modem;
- .2 Power Supply: twenty-four (24) VDC;
- .3 Mounting: DIN rail;
- .4 RS-232;
- .5 PSTN-port; and
- .6 Phoenix Contact.

.4 Pilot Lights:

- .1 Provide LED transformer type pilot lights for extended lamp life, oil tight, push to test, complete with appropriate colour lenses. Normal colours used are run=red, stop=green, fault=amber. Refer to Division 26 for additional information.

.5 Terminals:

- .1 Provide strap screw type terminal blocks rated for six hundred (600) V.
- .2 Identify each terminal block within an enclosure with a unique machine printed terminal block number. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.
- .3 Connections to screw terminals to be locking fork tongue insulated crimp type wire connectors.

.4 Terminals to be Weidmuller or approved equal.

.5 Provide a group of terminals for each of one hundred twenty (120) VAC hot and neutral and twenty-four (24) VDC positive and negative power. Distribution wiring to have a thermal magnetic circuit breaker upstream of all major blocks of loads, adequately sized to protect the connected load while not causing nuisance tripping.

.6 Provide Weidmuller disconnect type terminal blocks for each load or loop powered from the marshalling panels.

.6 Nameplates

.1 Refer to Section 29 05 00 – Common Work – Instrumentation and Control.

Part 3 Execution

3.1 REFERENCES – GENERAL

.1 Refer to Section 29 05 00 – Common Work – Instrumentation and Control.

END OF SECTION

Part 1 General

1.1 REFERENCES - GENERAL

.1 Refer to Section 29 05 00 – Common Work – Instrumentation and Controls.

Part 2 Products

2.1 POWER SUPPLY AND CONDITIONING EQUIPMENT

.1 General:

.1 Provide all DC power supplies as required for all instrument circuits. All circuits are to be powered from the PLC control panels. Power supplies to be Hammond, G.F.C., Weidmuller or approved equal, complete with an over-voltage protection module.

.2 DC power supplies shall be fully redundant. Individual fault signals from each power supply shall be monitored by the PLC for alarming.

.3 Unless otherwise required, all DC power supplies to be rated twenty-eight (28) VDC, adjustable plus or minus five percent (5%), and set to provide 26.4 V on the panel direct current bus. Size the power supply for two (2) times the connected load, minimum size is two (2) amps.

.4 Twenty-four (24) VDC UPS system cable of four (4) hours operation during power supply failure.

2.2 NOISE SUPPRESSION

.1 Provide TVSS units in each panel to power AC instrumentation and control (I&C) loads. Power conditioners are to be SquareD, Cutler Hammer, Leviton.

Part 3 Execution

3.1 REFERENCES – GENERAL

.1 Refer to Section 29 05 00 – Common Work – Instrumentation and Controls, Part 3.

END OF SECTION

Part 1 General

1.1 REFERENCES – GENERAL

.1 Equipment, products, and execution must meet all requirements detailed in Section 29 05 00 – Common Work – Instrumentation and Controls.

1.2 GENERAL REQUIREMENTS

.1 Pumping station control system for facility:

.1 The control system shall consist of the Programmable Logic Controller (PLC), Remote Terminal Unit (RTU) and Operator Graphic Interface (OGI).

.2 The control system shall utilize an Ethernet backbone for communications. The Ethernet backbone shall be CAT6 cabling. The PLC and RTU shall communicate through the PLC rack backplane.

.3 Contractor shall supply all software, hardware, and labour to provide a fully functional and commissioned control system.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings for all hardware and software components.

.2 Submit graphic layout screens and variable declarations

Part 2 Products

2.1 OPERATOR GRAPHIC INTERFACE (OGI)

.1 The OGI shall be a 12.1”, 65536 colours, 1,024 x 600, TFT multi-touch resistive screen.

.2 Communications shall be Ethernet Modbus TCP/IP.

.3 OGI to be mounted in control panel.

.4 Operating System to be “Magelis”.

.5 Provide one (1) GB SD memory card.

.6 Power: twenty-four (24) VDC.

.7 Approved product: Schneider Electric Magelis GTU series.

2.2 CONFIGURATION

.1 Provide detailed graphic screens for the pumping station including:

.1 Wet well level;

.2 Plant effluent flow rate and totalized flow;

.3 Individual pump status, running forward, running reverse, fault, in-auto, in-hand, ready, motor speed setpoint and actual, motor current;

.4 Building security;

.5 Six hundred (600) VAC power phase voltage, phase current and power failure;

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.6 HVAC and Building temperature; and

.7 Building flood.

.2 Provide secured access screens for calibration of analog input and output signals including but not limited to level sensors, building temperature, pump speed and pump current.

.3 Provide trend screens for all analog input signals.

.4 Display all operational variables and equipment status.

.5 Configure alarm variables.

.6 Configure historical logging of all process variables onto SD memory card.

Part 3 Execution

3.1 INSTALLATION

.1 Configure IP address provided by the City of Winnipeg.

.2 Verify all communications.

.3 Provide startup and commissioning services.

.4 Coordinate verification checks with others.

.5 Provide training to City's personnel.

END OF SECTION

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Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Supply and install Programmable Logic Controller (PLC) based control panels for the pumping system, and building monitoring.

.2 The PLC Control Panel shall utilize a PLC for control and monitoring with a Remote Terminal Unit (RTU) interface card for connection to the City of Winnipeg's SCADA system.

.3 The PLC system shall consist of control panels, PLC processor, RTU interface card, I/O hardware, terminal blocks, and Ethernet network.

.4 PLC controllers, Input/Output (I/O) sub-systems, and operator interface terminals shall be housed in central control panels in each of the respective areas. General requirements for the control panels are defined in Section 29 10 01 – Enclosures.

.5 Coordinate and cooperate with other Contractors, suppliers, and the City of Winnipeg's Representatives during system programming, start-up, and commissioning of the complete control system and associated field devices and wiring.

.6 Provide complete PLC, RTU, and operator graphic interface programming, start-up and commissioning.

.7 Cell modem.

.8 PSTN modem.

1.2 SUBMITTALS

.1 Submit product data sheets.

.2 Submit Operator Graphic Interface (OGI) screens.

.3 Submit variable naming.

1.3 OPERATION AND MAINTENANCE MANUALS

.1 Include the following:

- .1 Product data sheets;
- .2 DNP3 mapping list, as provided in the Appendix;
- .3 PLC/OGI mapping list;
- .4 OGI screen printouts; and
- .5 Electronic copy of all programs with complete documentation.

Part 2 Products

2.1 PLC CONTROL PANEL

.1 General:

- .1 Wall (or floor with leg kit) mounted NEMA twelve (12) enclosure.
- .2 Cable entry via top and bottom.

.3 Terminate all field wiring on terminal blocks in PLC control panels.

.4 Provide fused terminal blocks for all field power sourced from the control panel.

.5 All spare I/O shall be wired to field terminal blocks.

.6 Provide LED light fixture inside panel c/w door open switch.

.7 Provide one hundred twenty (120) VAC receptacle on panel interior and door mounted.

.8 Provide ZipPort interface with RJ45 connector and USB.

.9 Provide folding shelf on panel door.

.2 Power Supply:

.1 Panel shall contain redundant twenty-four (24) VDC power supplies complete with twenty-four (24) VDC UPS.

.2 Panel shall accept a single one hundred twenty (120) VAC, fifteen (15) amp circuit.

2.2 PROGRAMMABLE LOGIC CONTROLLER

.1 General:

.1 PLC equipment shall be based on the Schneider M580 hardware platform.

.2 Provide all necessary racks, power supplies, cables, communication cards, and accessories to provide a complete and functioning system.

.3 Communication protocol for the PLC processor network to be MBTCP.

.4 I/O signal voltage to be based on the following:

.1 Digital inputs and outputs: twenty-four (24) VDC.

.2 Analog inputs and outputs: four (4) to twenty (20) mA, twenty-four (24) VDC.

.2 PLC Rack:

.1 X-bus and dual Ethernet;

.2 Twelve (12) slot; and

.3 Rack extender kit.

.3 PLC Power Supply:

.1 Source: twenty-four (24) VDC; and

.2 Power output: thirty-two (32) W.

.3 BMX CPS 3020.

.4 PLC Processor:

.1 BME P58 4040.

.5 Discrete Input Card:

.1 Twenty-four (24) VDC;

.2 Sixteen (16) channel; and

.3 BMX DAI 1602.

.6 Discrete Output Card:

.1 Twenty-four (24) VDC relay;
.2 Sixteen (16) channel; and
.3 BMX DDO 1602.

.7 Analogue Input Card:

.1 Four (4) to twenty (20) mA;
.2 Eight (8) channel, isolated; and
.3 BMX AMI 0810.

.8 Analogue Output Card:

.1 Four (4) to twenty (20) mA;
.2 Four (4) channel, isolated; and
.3 BMX AMO 0410.

.9 RTD Input Card:

.1 RTD 3-wire or 4-wire temperature input;
.2 Eight (8) channel, isolated; and
.3 BMX ART 0814.

.10 RTU Interface Card:

.1 DNP communication;
.2 BMX NOR 0200H; and
.3 Complete with one hundred twenty-eight (128) MB SD card.

2.3 PROGRAMMING

.1 Utilize Function Block programming language.

.2 Document all programming logic.

.3 Alarming functions to be generated in the PLC program and not the OGI.

.4 Provide the RTU programs and the operator interface program to the City of Winnipeg after the completion of the commissioning.

Part 3 Execution

3.1 INSTALLATION

.1 Install the hardware in accordance with the foregoing requirements to satisfy the performance requirements defined in this and other Divisions of the Specification.

.2 Cooperate with other contractors, suppliers, the City of Winnipeg and the Contract Administrator to commission and start-up the system as defined herein.

3.2 FACTORY ACCEPTANCE TESTING

.1 Contractor shall notify the Contract Administrator two (2) weeks prior to Factory Acceptance Testing (FAT) and submit a FAT plan at the time of notification.

.1 FAT Plan shall include the time and location of FAT testing, test procedures and forms to be completed, and sign-off sheet.

.2 Install the completed PLC and OGI programs in the completed PLC Control Panel and conduct the following tests:

.1 Complete I/O Testing of physical inputs;

.1 Wire test devices to each digital and analog input/output.

.2 Communication testing;

.1 Verify proper IP address settings;

.2 Verify communication between PLC, OGI, RTU interface card, and programming interface;

.3 Control testing;

.1 Verify proper control of pump operations;

.2 Verify control of auxiliary equipment;

.3 Verify feedback and visual display of inputs.

.4 Interlock testing;

.1 Verify interlocks prevent pump operation where appropriate;

.2 Verify interlock between pump and building systems.

.5 Alarm testing;

.1 Show that alarms trigger on appropriate alarm conditions;

.2 Verify proper naming and display of alarm banner.

.3 Simulate all control and interlock functions for the FAT. Additionally, simulate all alarm conditions for the FAT.

3.3 SITE ACCEPTANCE TESTING

.1 Provide testing protocol procedures for acceptance by the Contract Administrator two (2) weeks prior to startup.

.2 Perform complete loop testing from field device to PLC inputs and outputs.

.3 Confirm DNP3 mapping is correct and the City of Winnipeg SCADA system is receiving and transmitting the correct information.

.4 Simulate all alarm conditions using field devices.

3.4 TRAINING

.1 Provide a minimum of two (2) training sessions for City of Winnipeg personnel, each two (2) hours in length, and held on separate days.

.2 Training shall include:

.1 Operation of the pump station in manual mode and auto mode;

.2 Acknowledging alarms;

.3 Pump duty selection;

.4 Operating and alarm set-point changes; and

.5 Overview of the PLC program logic.

END OF SECTION

Part 1 General

1.1 REFERENCES – GENERAL

.1 The Work includes the provision of all instrument specification sheets.

.2 Refer to Section 29 05 00 – Common Work – Instrumentation and Control.

1.2 INSTRUMENT SPECIFICATION SHEETS

.1 Provide data sheets to itemize detailed as-built information regarding the Specification of instruments included as part of this Work for each instrument supplied. The data sheets already included in this Section list specific minimum requirements for particular applications.

.2 Use forms in accordance with the ISA Standard S20 as a template for the preparation of the Specification Sheets.

Part 2 Products

.1 Materials Supplied by City of Winnipeg:

.1 Vibration Sensors

.1	VT-L010-1	PUMP 1 DRIVE-END BEARING VIBRATION SENSOR X
.2	VT-L010-2	PUMP 1 DRIVE-END BEARING VIBRATION SENSOR Y
.3	VT-L010-3	MOTOR 1 DE BEARING VIBRATION SENSOR X
.4	VT-L010-4	MOTOR 1 DE BEARING VIBRATION SENSOR Y
.5	VT-L010-5	MOTOR 1 ODE BEARING VIBRATION SENSOR X
.6	VT-L010-6	MOTOR 1 ODE BEARING VIBRATION SENSOR Y
.7	VT-L020-1	PUMP 2 DRIVE-END BEARING VIBRATION SENSOR X
.8	VT-L020-2	PUMP 2 DRIVE-END BEARING VIBRATION SENSOR Y
.9	VT-L020-3	MOTOR 2 DE BEARING VIBRATION SENSOR X
.10	VT-L020-4	MOTOR 2 DE BEARING VIBRATION SENSOR Y
.11	VT-L020-5	MOTOR 2 ODE BEARING VIBRATION SENSOR X
.12	VT-L020-6	MOTOR 2 ODE BEARING VIBRATION SENSOR Y

.2 Temperature Sensors

.1	TE-L010-1	MOTOR 1 WINDING RTD 1
.2	TE-L010-2	MOTOR 1 WINDING RTD 2
.3	TE-L010-3	MOTOR 1 WINDING RTD 3
.4	TE-L010-4	MOTOR 1 WINDING RTD 4
.5	TE-L010-5	MOTOR 1 WINDING RTD 5
.6	TE-L010-6	MOTOR 1 WINDING RTD 6
.7	TE-L010-7	PUMP 1 DRIVE-END BEARING RTD

.8 TE-L010-8 PUMP 1 NON-DRIVE-END BEARING RTD
.9 TE-L020-1 MOTOR 2 WINDING RTD 1
.10 TE-L020-2 MOTOR 2 WINDING RTD 2
.11 TE-L020-3 MOTOR 2 WINDING RTD 3
.12 TE-L020-4 MOTOR 2 WINDING RTD 4
.13 TE-L020-5 MOTOR 2 WINDING RTD 5
.14 TE-L020-6 MOTOR 2 WINDING RTD 6
.15 TE-L020-7 PUMP 2 DRIVE-END BEARING RTD
.16 TE-L020-8 PUMP 2 NON-DRIVE-END BEARING RTD

.3 Seal Water Flow Switches

.1 FSL-L011 SEAL WATER FLOW SWITCH
.2 FSL-L021 SEAL WATER FLOW SWITCH

.4 Solenoid Valves

.1 XV-L011 SEAL WATER SOLENOID VALVE
.2 XV-L021 SEAL WATER SOLENOID VALVE

.2 Refer to the following Specification Sheets.

INSTRUMENT SPECIFICATION NUMBER:	**I-101**
DEVICE:	Flow Meter
TAG:	FIT-L201
TYPE:	Magnetic Flow Meter
SERVICE:	Waste Water
SIZE AND MATERIAL:	Size as per P&IDs
END CONNECTIONS:	Flanged
LINER MATERIAL:	PFA
ELECTRODES:	Stainless Steel
GROUNDING:	Stainless Steel grounding rings
RANGE:	Refer to Appendix A & B.
INACCURACY:	±0.2% for flows greater than 0.3 metres per second
OUTPUT:	Four (4) to twenty (20) mADC into five hundred (500) ohm load Scaled pulse output
POWER SUPPLY:	Twenty-four (24) VDC
INDICATION:	Local indication of flow rate and totalized flow
ELECTRONIC ENCLOSURE:	NEMA 4X. Remote wall-mount transmitter
MANUFACTURER AND MODEL:	Siemens Sitrans MAG 5,100 W. Purchases and quotes for this product shall reference RFP 449-2014 for City of Winnipeg discount pricing.

INSTRUMENT
SPECIFICATION NUMBER: I-102

DEVICE:	Temperature Sensors
TAGS:	TIT-L607, TIT-L608
SERVICE:	Space temperature
SPAN:	Minus ten (-10) to forty (40) degrees Celsius
SENSOR:	Three (3) wire RTD, PT one hundred (100)
INACCURACY:	±0.1% of span
OUTPUT:	Four (4) to twenty (20) mADC into five hundred (500) ohm
POWER SUPPLY:	Loop powered twenty-four (24) VDC
CONSTRUCTION:	Stainless steel wetted parts
ELECTRONIC ENCLOSURE:	Universal head, aluminum alloy
LOCAL DISPLAY:	Head mounted LCD Display
ACCESSORIES:	Mounting bracket
MANUFACTURER AND MODEL:	Siemens Sitrans TF

INSTRUMENT
SPECIFICATION NUMBER: I-103

DEVICE:	Magnetic Door Contact
TAGS:	DC-L531, DC-L532
SERVICE:	Door position monitoring
SENSOR:	Reed Switch
OUTPUT:	N.O. Contacts, rated 0.5A, thirty (30) VDC
MOUNTING:	Recessed into door frame
CONSTRUCTION:	Designed for use in Steel Doors
MANUFACTURER AND MODEL:	GE Interlogix

INSTRUMENT SPECIFICATION NUMBER:	**I-104**
DEVICE:	Level Transmitter (Pressure measurement based)
TAG:	LIT-L100-1, LIT-L100-2
SERVICE:	Wastewater
PROCESS CONNECTIONS:	Seventy-five (75) millimetres flange
RANGE:	Refer to Appendix A & B.
INACCURACY:	±1% of span or lower
OUTPUT:	Four (4) to twenty (20) mADC into five hundred (500) ohm load
POWER SUPPLY:	Loop powered twenty-four (24) VDC
CONSTRUCTION:	Three hundred sixteen (316) SST
ELECTRONIC ENCLOSURE:	EEMAC/NEMA 4X
LOCAL DISPLAY:	Unit mounted LCD Display
MANUFACTURER AND MODEL:	Siemens Sitrans P DS III. Purchases and quotes for this product shall reference RFP 449-2014 for City of Winnipeg discount pricing.

INSTRUMENT SPECIFICATION NUMBER:	**I-105**
DEVICE:	Float Switch
TAG:	LSHH-L101, LSH-L501, LSH-L502
SERVICE:	Refer to Instrument Index and P&ID Diagrams
OUTPUT:	SPDT Contacts
ENCLOSURE:	Polypropylene float casing with pre-terminated signal cable
MOUNTING:	Provide strain relief-type connectors to suspend float at desired location. Fabricate mounting brackets from 316 SS. Provide anti-sway rings to prevent sway in turbulent tanks.
MANUFACTURER AND MODEL:	Flygt ENM-10 Consolidated Electric Warwick Magnetrol

INSTRUMENT
SPECIFICATION NUMBER: I-106

DEVICE:	Power Fail Relay
TAGS:	ESL-L528
SERVICE:	MCC & Electrical
SPAN:	Five hundred (500) – Six hundred (600) Vac, Sixty (60) Hz
INACCURACY:	±15%
OUTPUT:	One (1) relay output, 24 VDC
POWER SUPPLY:	Six hundred (600) VAC
CONSTRUCTION:	DIN rail or surface mount w/ screw terminals
ACCESSORIES:	None.
MANUFACTURER AND MODEL:	Littelfuse DLMU Series

INSTRUMENT
SPECIFICATION NUMBER: I-107

DEVICE:	Occupancy Sensor Light Switch
TAGS:	HS-L600
SERVICE:	Detection of movement within given range
OUTPUT:	One (1) relay contact, 24 VDC rated.
POWER SUPPLY:	Twenty-four (24) VDC, external.
CONSTRUCTION:	Standard.
ACCESSORIES:	None.
MANUFACTURER AND MODEL:	Leviton, Hubbell.

INSTRUMENT
SPECIFICATION NUMBER: I-108

DEVICE:	Emergency Stop Push Button
TAGS:	HSS-L010-1, HSS-L010-2, HSS-L010-3, HSS-L020-1, HSS-L020-2, HSS-L020-3
SERVICE:	Emergency stop button for pump on each floor
SENSOR:	Push-to-Stop, Pull-to-Reset
OUTPUT:	Two (2) normally-closed (NC) contacts.
POWER SUPPLY:	Twenty-four (24) VDC, external.
CONSTRUCTION:	NEMA 4, 30 mm, oil-tight, mushroom style.
ACCESSORIES:	Single pushbutton enclosure c/w transparent cover.
MANUFACTURER AND MODEL:	Schneider Electric.

INSTRUMENT
SPECIFICATION NUMBER: I-109

DEVICE:	Current Transducer
TAGS:	IT-L010, IT-L020
SERVICE:	Instrument transformer for current sensing of pump power.
SPAN:	Zero (0) to twenty five (25) amps
SENSOR:	100:5 Current Transformer
INACCURACY:	±1% of span
OUTPUT:	Four (4) to twenty (20) mADC
POWER SUPPLY:	Twenty-four (24) VDC
CONSTRUCTION:	Standard.
LOCAL DISPLAY:	MCC Panel-mounted Ammeter
ACCESSORIES:	None.
MANUFACTURER AND MODEL:	Schneider Electric

INSTRUMENT
SPECIFICATION NUMBER: I-110

DEVICE:	Run Time Meter
TAGS:	KQI-L010, KQI-L020
SERVICE:	Run-time meter for individual pumps.
SPAN:	Seven digit display of hours run.
INACCURACY:	±1% of span
OUTPUT:	None.
POWER SUPPLY:	Twenty-four (24) VDC
CONSTRUCTION:	Standard.
ACCESSORIES:	Protective cover.
MANUFACTURER AND MODEL:	Schneider Electric

INSTRUMENT
SPECIFICATION NUMBER: I-111

DEVICE:	Level Controller
TAGS:	LIC-L100-1, LIC-L100-2
SERVICE:	Backup level control for pump setpoints.
SPAN:	Four (4) to twenty (20) mADC, input.
INACCURACY:	±0.1% of span
OUTPUT:	Two (2) NO/NC relay contacts.
POWER SUPPLY:	Twenty-four (24) VDC, external.
CONSTRUCTION:	Standard.
LOCAL DISPLAY:	Panel-mounted LCD Display
MANUFACTURER AND MODEL:	Precision Digital PD6000.

INSTRUMENT
SPECIFICATION NUMBER: I-112

DEVICE:	Power Meter
TAGS:	MCC-L71.PM
SERVICE:	Power monitoring of MCC-L71.
SPAN:	Zero (0) to six-hundred and ninety (690) Vac, sixty (60) Hz
SENSOR:	Three-phase current transformers (400:5)
INACCURACY:	±0.1% of span
OUTPUT:	One (1) output, and Ethernet connectivity. Modbus TCP/IP.
POWER SUPPLY:	Six-hundred (600) Vac, one-hundred and twenty (120) Vac
CONSTRUCTION:	IP54 from Front.
LOCAL DISPLAY:	Integrated color display, panel-mounted.
ACCESSORIES:	None.
MANUFACTURER AND MODEL:	Schneider Electric PM8000 Series.

INSTRUMENT
SPECIFICATION NUMBER: I-113

DEVICE:	Low Pressure Switch
TAGS:	PSL-L528
SERVICE:	Water service detection
SENSOR:	Diaphragm and micro-switch.
OUTPUT:	One (1) relay contact.
POWER SUPPLY:	Twenty-four (24) VDC, external.
CONSTRUCTION:	Stainless steel wetted parts, IP65.
ACCESSORIES:	Mounting bracket.
MANUFACTURER AND MODEL:	Siemens

INSTRUMENT
SPECIFICATION NUMBER: I-114

DEVICE:	Surge Protection Device
TAGS:	XS-L711
SERVICE:	MCC surge protection
SPAN:	Six-hundred (600) Vac, 240 kA, 4-wire
SENSOR:	Transient Voltage Surge Suppression MOVs.
OUTPUT:	One (1) relay contact, twenty-four (24) VDC.
POWER SUPPLY:	Six-hundred (600) Vac, twenty-four (24) VDC.
CONSTRUCTION:	Standard.
LOCAL DISPLAY:	MCC panel-mounted diagnostic lights and surge counter.
ACCESSORIES:	See above.
MANUFACTURER AND MODEL:	Schneider Electric

END OF SECTION

Part 1 General

1.1 OVERVIEW

.1 The Contractor shall provide complete PLC and Operator Graphic Interface (OGI) programming, testing, commissioning, training and warranty support services for the pumping station.

.2 Contractor shall supply all software, hardware, and labour to provide a fully functional and commissioned control system.

1.2 GENERAL REQUIREMENTS

.1 The control system for the pumping station shall consist of Programmable Logic Controllers (PLCs), Operator Graphic Interfaces (OGIs), Remote Terminal Unit (RTU) interface card, City operated Clearview SCADA system, and modem.

.2 PLC Control Logic, OGI Control Logic, and Graphic Screens shall be developed in accordance with the Riverbend Lift Pumping Station Process Control Narrative and Requirements.

.3 The Lift Station contains Combined Sewer Overflow (CSO) instrumentation which is monitored via SCADA. This instrumentation must remain monitored throughout the construction process.

1.3 SUBMITTALS

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

.2 Submit the following items for review:

.1 Submit proposed OGI graphic screen layouts and variable declarations.

.2 Submit proposed PLC/OGI mapping list.

.3 Submit proposed PLC function blocks logic.

.3 Submit all documentation listed in **Project Closeout**.

Part 2 Testing

2.1 FACTORY ACCEPTANCE TESTING

.1 Factory acceptance testing shall be conducted off-site at a control manufacturing facility in Winnipeg, Manitoba.

.2 Notify Contract Administrator five (5) business days prior to testing.

.3 Witnessing of factory acceptance testing shall be available to the Contract Administrator and City of Winnipeg personnel, with no limit on attendance.

.4 Factory Acceptance Testing shall include:

.1 Simulation and testing of pump control logic;

.2 Simulation and testing of all alarm conditions mentioned in the Alarm section;

.3 Testing of Ethernet network;

.4 Confirmation of OGI graphics;

.5 Confirmation of instrumentation trending;

.6 Testing and confirmation of the DNP3 mapping to the City of Winnipeg's Clearview SCADA system; and

.7 Testing of both cellular and telephone communications to City of Winnipeg's Clearview SCADA system.

.5 The Contractor shall document all testing procedures and results. Submit all testing documentation to the Contract Administrator two (2) days prior to Site Acceptance Testing.

.1 The results of the Factory Acceptance Testing (FAT) shall be sealed by an Engineer licensed to practice in the Province of Manitoba.

2.2 SITE ACCEPTANCE TESTING

.1 Site Acceptance Testing (SAT) shall be conducted on-Site and prior to Commissioning.

.2 Notification of the start of Site acceptance testing shall be provided to the Contract Administrator five (5) days prior to testing.

.3 Site Acceptance Testing shall include the following:

.1 Confirm function, measure, and display of correct field instrumentation reading.

.2 Testing of all control logic and alarm conditions.

.1 Force input signals to generate alarm conditions and verify correct PLC logic.

.3 Confirmation of connection to the City of Winnipeg SCADA system and verification of instrumentation readings and DNP3 mapping index.

.1 Functional testing to be completed with City of Winnipeg SCADA staff.

.4 The Contractor shall document all testing procedures and results. Submit all testing documentation to the Contract Administrator two (2) days prior to commissioning.

.1 The results of the Site Acceptance Testing (SAT) shall be sealed by an Engineer licensed to practice in the Province of Manitoba.

2.3 COMMISSIONING

.1 The Contractor shall submit a commissioning plan to the Contract Administrator ten (10) days prior to the proposed start date.

.2 Commissioning plan to include at a minimum:

.1 Contractor staff contact list.

.2 Emergency conditions and response plan.

.3 Detailed schedule of activities including start/stop times and dates for each activity.

.4 Support required from Contract Administrator and City of Winnipeg personnel.

.5 Additional actions as identified by the Contract Administrator.

.3 Throughout the construction and commissioning process, the control logic shall be modified at the request of the Contract Administrator or the City of Winnipeg to achieve desired operation of the pump station.

.1 These changes are to be provided at no additional expense.

.4 Commissioning shall be considered complete after facility operation without alarm conditions for a period of seven (7) consecutive days.

.5 Substantial Performance will not be granted until after successful completion of the commissioning and training.

Part 3 Project Closeout

3.1 TRAINING

.1 Training shall be provided to the City of Winnipeg personnel during and after the seven (7) day commissioning period.

.2 The Contractor shall provide a minimum of three (3) two (2) hour training sessions, each on a separate day.

.3 The Contractor shall provide a training schedule to the Contract Administrator three (3) days prior to training sessions.

3.2 WARRANTY SUPPORT

.1 The Contractor shall provide on-Site technical support for the facility's control system for one (1) year after Total Performance.

.2 Support personnel shall be available within twenty-four (24) hours of notification by the Contract Administrator or City of Winnipeg.

3.3 DOCUMENTATION

.1 The following documentation shall be provided during project closeout:

.1 All PLC programs;

.2 All OGI programs;

.1 All PLC and OGI programming shall be fully documented to the satisfaction of the Contract Administrator and City of Winnipeg personnel.

.2 PLC and OGI programs shall be provided to the Contract Administrator at successful completion of commissioning on USB memory sticks.

.3 A complete list of user names and passwords used for programming, as well as any user names and passwords required to access device or equipment interfaces.

.2 The PLC Program shall be submitted along with a letter indicating compliance with the Process Control Narrative and the Specifications. The PLC Program Letter shall be sealed by an Engineer licensed to practice in the Province of Manitoba.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Section Includes:

.1 Materials, applications, installation and verification for excavating, trenching and backfilling.

1.2 REFERENCES

.1 City of Winnipeg (CW):

.1 CW3110 – Sub-Grade, Sub-Base, and Base Course Construction;
.2 CW3170 – Earthwork and Grading; and
.3 CW3230 – Full-Depth Patching of Existing Slabs and Joints.

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

.1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing;
.2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;
.3 ASTM D422-63, Standard Test Method for Particle-Size Analysis of Soils;
.4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort;
.5 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort; and
.6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series; and
.2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.4 Canadian Standards Association (CSA International):

.1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005);
.2 CSA-A3001, Cementitious Materials for Use in Concrete; and
.3 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

1.3 DEFINITIONS

.1 Rock: any solid material in excess of one (1) cubic metre and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 cubic metres bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

□

.3 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.4 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than twenty-five (25) millimetres in any dimension.

.5 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.6 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.7 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials.

.3 Fine grained soils with plasticity index less than ten (10) when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136.

.4 Coarse grained soils containing more than twenty percent (20%) by mass passing 0.075 millimetres sieve.

.8 Sub-grade: the natural in-situ material.

.9 Sub-base: where required, the layer of material provided between the sub-grade and the base course.

.10 Base course: the layer of material immediately underlying the pavement.

Part 2 Products

2.1 MATERIALS

.1 Sub-Base Materials:

.1 Sub-base material of the type(s) shown on the Drawings or indicated in the Specifications will be supplied in accordance with the following requirements:

.1 Suitable site sub-base material will be of a type approved by the Contract Administrator.

.2 Clay borrow sub-base material will be of a type approved by the Contract Administrator.

.3 Crushed sub-base material will be crushed aggregate, crushed limestone or crushed concrete pavement.

.2 Crushed sub-base material will be well-graded and conform to the following grading requirements:

Canadian Metric Percent of Total Dry Weight Passing Each Sieve

Sieve Size	50 mm max.	100 mm max	150 mm max
150 000			90-100%*
100 000		97-100%	75-90%
50 000	100%		
25 000		30-50%	50% max.
5 000	25-80%		
80	5-18%	5% max.	

*The maximum allowable size is three hundred (300) millimetres

.3 One hundred fifty (150) millimetres crushed limestone material when subjected to the abrasion test will have a loss of not more than forty percent (40%) when tested in accordance with grading 1 of ASTM C535, Test for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.4 Fifty (50) millimetres crushed limestone material when subjected to the abrasion test will have a loss of not more than forty percent (40%) when tested in accordance with grading A of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.5 Crushed concrete sub-base material will be a mixture of reclaimed Portland Cement concrete and asphaltic concrete. The contents of the material will be limited to the following percentages based on weight:

.1 Minimum of eighty-five percent (85%) recycled Portland Cement concrete;
.2 Maximum of fifteen percent (15%) recycled asphaltic concrete;
.3 Maximum of three percent (3%) clay; and
.4 Maximum of one percent (1%) foreign material.

.2 Base Course Materials:

.1 Base course material will be approved by the Contract Administrator.

.2 Base course material will consist of sound, hard, crushed rock or crushed gravel and will be free from organic or soft material that would disintegrate through decay or weathering.

.3 The base course material will be well graded and conform to the following grading requirements:

Canadian Metric Percent of Total Dry Weight Passing each Sieve

Size	Granular	Crushed Limestone
25 000	100%	
20 000	80-100%	100%
5 000	40-70%	40-70%
2 500	25-50%	25-60%
315	13-30%	8-25%
80	5-15%	6-17%

□

.4 Base course material when subjected to the abrasion test will have a loss of not more than thirty-five percent (35%) when tested in accordance with grading B of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.5 The material passing the three hundred fifteen (315) sieve will have a liquid limit not greater than twenty-five (25) and a plasticity index not greater than six (6).

.6 Where base course is being placed under an asphaltic concrete pavement, the aggregate retained on a No. 5 000 sieve will contain not less than thirty-five percent (35%) crushed aggregate as determined by actual particle count. Crushed aggregate will be considered as that aggregate having at least one fractured face.

.3 Asphalt Cuttings for Base Course Material:

.1 Asphalt cuttings produced from planing of asphalt pavements or overlays in accordance with CW 3450 may be used as a base course material where indicated accordance with CW 3450 may be used as a base course material where indicated in the Specifications or as approved by the Contract Administrator.

.2 Asphalt cuttings will be well graded and have a maximum particle size of forty (40) millimetres.

.4 Lime or Portland Cement:

.1 Use either Lime or Type 10 normal Portland Cement for drying the sub-grade.

.2 Supply Lime in accordance with CSA A82.43.

.3 Supply Portland Cement in accordance with CSA A5.

.5 Imported Fill Material:

.1 Imported fill material will consist of low to medium plastic clays or mixtures of sand and clay, uniform in texture.

.2 The fill material shall be free of wood, vegetation, concrete rubble or stones larger than twenty-five (25) millimetres in diameter.

Part 3 Execution

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 PAVEMENT REMOVAL

.1 Remove existing concrete pavement, including curbs and asphalt overlays at locations as shown on the Drawings or as directed by the Contract Administrator. Remove all pavements to a combined thickness of three hundred (300) millimetres, unless otherwise indicated in the Specifications.

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.2 Remove existing asphalt pavement including curbs at locations as show on the Drawings or as directed by the Contract Administrator. Remove pavement to a maximum thickness of one hundred fifty (150) millimetres, unless otherwise indicated in the Specifications.

.3 Saw-cut the existing pavement full-depth along the limits designated for removal.

.4 Utilize backhoe type equipment unless approved other by the Contract Administrator.

.5 Dispose of material as per the following:

.1 Haul and dispose of waste material excavated from the Site including surplus, suitable, unsuitable and other materials removed in accordance with the Specifications to a disposal location approved by the Contract Administrator.

.2 The City reserves the right to direct material to be hauled to a local site indicated in the Specifications.

.3 Clean up material dropped or spilled during hauling operations as directed by the Contract Administrator.

3.3 EXCAVATION

.1 Excavate in-situ material to the depth to accommodate the pavement structure as shown on the Drawings or as directed by the Contract Administrator.

.2 Stockpile suitable in-situ material and suitable sub-base material at locations on Site as directed by the Contract Administrator.

.3 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.4 Dispose of surplus suitable site material and unsuitable material such as frost heaving clays, silts, rocks and rubble, as per section 3.2.5.

.5 Strip and stockpile topsoil from the site in a manner which will prevent contamination of topsoil with underlying soil materials. Stockpile the stripped topsoil at locations on Site for later use.

.6 The limits of excavation will be taken as a vertical plane four hundred fifty (450) millimetres beyond the limits of the proposed pavement except when slip form paving equipment is specified for placement of the concrete pavement, the limits of excavation will be increased to a vertical plane seven hundred fifty (750) millimetres beyond the limits of the proposed pavement.

.7 During excavation, the Contractor will be advised by the Contract Administrator as to which areas have an unsuitable sub-grade. Extend the excavation either to the lower limit of the unsuitable material or to a depth as directed by the Contract Administrator.

.8 Remove wooden poles, concrete bases, or tree stumps encountered under pavements to the top of subgrade or one (1) metre below the bottom of the pavement surface, whichever depth is greater.

.9 Backfill and compact over-excavated areas with sub-base material approved by the Contract Administrator.

.10 Excavate additional material beyond the boulevard grading and ditch grading limits as directed by the Contract Administrator.

3.4 PREPARATION OF SUB-GRADE AND PLACEMENT OF SUB-BASE

.1 Compact the sub-grade after the bottom of the excavation has been approved by the Contract Administrator.

.2 Compact areas of suitable sub-grade material, the full width of the excavation, to a minimum of ninety-five percent (95%) Standard Proctor Density.

.3 Place and compact suitable site sub-base material before placing any new sub-base material, as directed by the Contract Administrator.

.4 Place and compact crushed sub-base material with or without geogrid as directed by the Contract Administrator in accordance with CW 3135.

.5 Place and compact sub-base materials in layers to a depth of three (3) times the maximum aggregate size or as directed by the Contract Administrator. Compact to a minimum of one hundred percent (100%) Standard Proctor Density, for the full width of the excavation, and each layer must be levelled and approved by the Contract Administrator before the succeeding layer may be placed.

.6 Layering, mixing or blending of crushed concrete with crushed aggregate or crushed limestone sub-base materials is not allowed.

.7 Re-compact or replace any layer, which has been rejected as directed by the Contract Administrator.

.8 When excess water has been applied, either by sprinkling operations or by precipitation, to cause local or continuous pondage, soil compaction will not be permitted until sufficient soil drying has occurred, creating a condition lending itself favorably to compacting operations. Exercise necessary precautions to protect compacted areas against excess wetting from any natural or artificial sources of water application.

.9 Should excess moisture from continuous or heavy precipitation threaten to unduly delay the completion of the Contract. Apply in writing to the Contract Administrator requesting permission to use Lime or Portland Cement to dry out the clay sub-grade or sub-base material at specific location(s).

3.5 PLACEMENT OF SUB-BASE WITH GEOTEXTILE FABRIC

.1 Install separation or separation/reinforcement geotextile fabric in accordance with CW 3130.

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.2 For stable sub-grades, place and compact sub-base material to a minimum depth of one hundred fifty (150) millimetres.

.3 For unstable sub-grades, place and compact sub-base material to a minimum depth for three hundred (300) millimetres or greater thickness as directed by the Contract Administrator.

.4 Place sub-base material by end-dumping methods and level with front-end loader type of equipment as approved by the Contract Administrator to avoid damage to the geotextile fabric and minimize sub-grade failures.

.5 Layering, mixing or blending of crushed concrete with crushed aggregate or crushed limestone sub-base materials is not allowed.

.6 Avoid sudden stops or sharp turns by construction equipment during placement of sub-base materials.

.7 Construction traffic will not be allowed to travel on the placed sub-base material until approved by the Contract Administrator.

3.6 PLACEMENT OF BASE COURSE MATERIAL

.1 Place and compact base course material to a minimum seventy-five (75) millimetres thickness for pavement and approaches to a minimum of one hundred percent (100%) Standard Proctor Density for the full width of the excavation unless otherwise shown on the Drawings or as directed by the Contract Administrator.

.2 Level the compacted base course to the finished base course elevation.

.3 Maintain the finished base course until the pavement is placed.

.4 Place and compact base course material as a levelling course to a maximum thickness of fifty (50) millimetres for sidewalks and miscellaneous concrete slabs, to ninety percent (90%) Standard Proctor Density.

.5 Place and compact base course material immediately beneath pavement forms to provide firm support.

3.7 PLACEMENT OF IMPORTED FILL

.1 Place fill materials to satisfy the grading requirements of boulevard and ditches.

.2 Supply material in accordance with Section 2.5 of this Specification.

.3 Compact to a minimum of ninety percent (90%) Standard Proctor Density.

3.8 GRADING

.1 Grading of areas to receive sod will be understood to mean the required excavation or backfilling to a depth up to one hundred fifty (150) millimetres so that the areas medians, after compaction, are at a uniform depth of one hundred (100) millimetres below finished grade shown on the Drawings.

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.2 Grade the areas to receive sod, unless otherwise shown on the Drawings or as directed by the Contractor Administrator.

.3 Remove all debris, stones and concrete rubble from the boulevards and medians before commencing grading.

.4 Excavate to a depth of up to one hundred fifty (150) millimetres to meet the final grade one hundred (100) millimetres below finished boulevard grade.

.5 Place and compact suitable backfill material as approved by the Contract Administrator to a depth of up to one hundred fifty (150) millimetres to meet the final grade one hundred (100) millimetres below finished boulevard grade.

.6 Supply backfill material in accordance with Section 2.1 of this Specification.

.7 Compact backfill materials to a minimum of ninety percent (90%) Standard Proctor Density.

3.9 QUALITY OF SUB-GRADE, SUB-BASE AND BASE COURSE LAYERS

.1 Determine the Standard Proctor Density for the sub-grade, sub-base and base course materials at the optimum moisture content in accordance with ASTM Standard D698. The field density of each sub-grade, sub-base and base course layers will be a percentage of the applicable Standard Proctor Density, in accordance with in Sections 3.3, 3.4 and 3.5 of this Specification.

.2 Utilize quality control tests to determine the acceptability of the sub-grade, sub-base and base course layers, as placed and compacted before the succeeding layer may be applied.

.3 Verify the field density of the compacted layers by Field Density Tests in accordance with ASTM Standard D1556, Test for Density of Soil in Place by the Sand-Cone Method, or ASTM Standard D2922, Test of Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

.4 The frequency and number of tests will be as directed by the Contract Administrator.

.5 Fill promptly, holes made by the removal of samples from the layers with appropriate material and thoroughly compact so as to conform in every way with the adjoining material.

3.10 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Protect open excavations against flooding and damage due to surface run-off.

.3 Dispose of water in a manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

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3.11 BACKFILLING

.1 Vibratory compaction equipment is required.

.2 Do not proceed with backfilling operations until completion of the following:

- .1 The Contract Administrator approved installations construction below finished grade;
- .2 Inspection, testing, approval and recording location of underground utilities;
- .3 Removal of concrete form work; and
- .4 Removal of shoring and bracing, backfilling of voids with satisfactory soil material.

.3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.4 Do not use backfill material which is frozen or contains ice, snow or debris.

.5 Place backfill material in uniform layers not exceeding one hundred fifty (150) millimetres compacted thickness.

.6 Compact each layer before placing succeeding layer.

- .1 Place bedding and surround material as specified elsewhere.
- .2 Do not backfill around or over cast-in-place concrete within forty-eight (48) hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed one hundred fifty (150) millimetres.

.7 Install drainage system in backfill as directed by the Contract Administrator.

3.12 RESTORATION

.1 Prior to construction, inspect the grassed, pavement and gravel surfaces within and adjacent to the Site with the Contract Administrator to record the current condition. After construction and Site cleanup is complete, re-inspect the condition with the Contract Administrator.

.2 Restoration of grassed areas removed or damaged as result of construction activities will be restored in accordance with CW 3510. Restoration of grassed areas will not be measured for payment and shall be included as part of the Work being done.

.3 Pavement damaged or removed as a result of construction activities will be restored in accordance with CW3230 and CW 3410. Restoration of the pavement will not be measured for payment and shall be included as part of the Work being done.

END OF SECTION

□

Part 1 General

1.1 DESCRIPTION

.1 This Section specifies requirements for supplying and constructing force main piping and appurtenances, including:

- .1 Supplying and installing pipes, fittings and specials;
- .2 Excavating, bedding, tracer wire, backfilling and compacting trench;
- .3 Disposal of surplus excavated materials; shoring and bracing trench as required;
- .4 Supporting and protecting existing services, Site preparation, connecting to existing pipelines; and
- .5 Restoring and cleaning up Site and all other Work necessary to complete yard piping as specified.

1.2 RELATED REQUIREMENTS

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

.2 Section 40 05 13 – Process Piping.

1.3 MEASUREMENT AND PAYMENT

.1 Sewerage force main supply and installation will be measured on a length basis for each size, material, method of installation, type of bedding and type of backfill and paid for at the Contract Unit Price per metre for “Force Main” as shown in Form B: Prices, installed in accordance with this Specification, accepted and measured by the Contract Administrator.

- .1 Measurement for length of force main installed in a trench will be made horizontally at grade above the centreline of the pipe through fittings.
- .2 Measurement for length of force main installed using trenchless methods will be made horizontally above the centreline of the pipe through shafts. Measurement where the type of backfill used in shafts changes will be from the midpoint distance between adjacent shafts.
- .3 Extraction of existing pipe required to install new pipe will be included with payment for trenchless method of installation.
- .4 Force mains specified to be installed using trenchless methods but were installed in a trench due to field conditions will be paid for at the Contract Unit Price per metre for trenchless installation.
- .5 Repair of damage to underground and surface structures due to surface subsidence and soil heaving caused by trenchless methods will be at the Contractor’s own expense.
- .6 Correction of alignment and grade exceeding the allowable variance will be at the Contractor’s own expense.

.2 Hydrostatic leakage testing will be included with payment for “Force Main”.

.3 Cutting off and plugging existing force mains will be measured for payment on a unit basis for each size and paid for at the Contract Unit Price for "Plugging Existing Force Mains." Number of units will be paid for the total number of force mains plugged in accordance with this Specification, accepted and measured by the Contract Administrator.

.4 Fittings on force mains will be measured on a unit basis for each size and type and paid for at the Contract Unit Price per metre for "Fittings" as shown in Form B: Prices.

.1 Number of units to be paid for will be the total number of fittings supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.

.2 Construction of concrete thrust blocks and installation of mechanical restrainers and joint harnesses will be included with the installation of fittings.

.5 Connecting new force mains to existing structures will be measured for payment on a unit basis for each size and type of connection and paid for at the Contract Unit Price for the item of Work.

.6 Supply and installation of the Internal Drop Pipe in existing manhole will be measured and paid for as a lump sum.

.7 Renewal of existing concrete pavement slabs will be measured on a surface area basis per square metre in accordance with CW 3230 and CW 3235. Renewal of existing concrete curbs will be measured on a length basis per linear metre in accordance with CW 3240. No separate measurement or payment will be made for Drilled Dowels or Tie Bars, the cost for which shall be included in the prices Bid for the renewal of the concrete pavement.

.8 Restoration of boulevards and grassed areas disturbed by construction activities will be included with the force main work being done.

1.4 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C136-[06], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;

.2 ASTM D-3035-[21]. Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; and

.3 ASTM F-1055-[16a]. Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-8.2-[M88], Sieves Testing, Woven Wire, Metric; and

.2 CGSB 41-GP-25M-[77], Pipe, Polyethylene, for the Transport of Liquids.

.3 CSA Group (CSA):

.1 CAN/CSA-B70-[06], Cast Iron Soil Pipe, Fittings, and Means of Joining; and

.2 CSA B137 Series-[09], Thermoplastic Pressure Piping Compendium.

.4 City of Winnipeg Standard Construction Specifications (CW):

.1 CW 2030 – Excavation Bedding and Backfill; and

.2 CW 3230 – Full-Depth Patching of Existing Slabs and Joints.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Schedule Work to minimize interruptions to existing services.

.2 Maintain existing flow during construction.

.3 Submit schedule of expected interruptions to Contract Administrator for approval a minimum of three (3) weeks prior to commencement of Work and adhere to approved schedule.

.4 Notify Contract Administrator a minimum of twenty-four (24) hours in advance of interruption in service.

1.6 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 pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 At least two (2) weeks prior to commencing Work, inform the Contract Administrator of proposed source of bedding materials and provide access for sampling.

.4 Test and Evaluation Reports:

.1 At least four (4) weeks prior to commencing Work, submit manufacturer's test data and certification that pipe materials meet the requirements of this Section.

.2 Include manufacturer's Drawings, information and Shop Drawings where pertinent including pipe thrust restraint details and locations.

.5 Certification to be marked on pipe.

.6 Construction Waste Management in accordance with 01 74 19 – Waste Management and Disposal.

1.7 DELIVERY, STORAGE AND HANDLING

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

.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 accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19 – Waste Management and Disposal.

1.8 PROJECT RECORD DRAWINGS

.1 Provide data to produce Project Record Drawings, in accordance with Section 01 78 00 – Closeout Submittals.

Part 2 Products

2.1 MATERIALS

.1 Supply pipe in size and class as shown on Contract Drawings and/or as specified.

.2 Supply pipe of material as indicated.

.3 Supply fittings suitable for and compatible with class and type of pipe with which they will be used.

2.2 POLYETHYLENE PRESSURE PIPES (HDPE)

.1 High density polyethylene (HDPE) pipe: to CSA B182-6 and CGSB 41-GP-25.

.1 Size: as indicated.

.2 All Nominal pipe sizes to be outside diameters.

.3 Class: DR17 unless specified elsewhere

.4 Manufacturer: to CSA B137, ASTM D 3035 and D3350, and CGSB 41-GP-35M.

.2 Pipe shall be made from polyethylene resin compound with a minimum cell classification of PE 345464C for PE 3408 materials in accordance with ASTM D3350. This material shall have a Long Term hydrostatic Strength of one thousand six hundred (1,600) pounds per square inch when tested and analyzed by ASTM D2837, and shall be Plastic Institute (PPI) listed compound.

.3 The raw material shall contain a minimum of two percent (2%), well dispersed, carbon black. Additives which can be conclusively proven not to be detrimental to the pipe may also be used, provided the pipe produced meets the requirements of this standard.

.4 The pipe shall contain no recycled compound except that generated in the manufacturer’s own plant from resin of the same Specification and from the same raw material supplier. Compliance with the requirements of this Specification shall be certified in writing by the pipe supplier, upon request.

.5 The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 1.5 metres: name and/or trademark of the pipe

manufacturer, nominal pipe size, dimension ratio, letters PE followed by the polyethylene grade per ASTM D3350 followed hydrostatic design basis in 100's of PSI, manufacturing standard reference, and production code from which the date and place of manufacture can be determined.

.6 The pipe manufacturer shall provide upon request, an outline of quality control procedures performed on polyethylene system components.

.7 Pipe Joints:

.1 Thermal butt fusion welded, except flanged joints where necessary.

.2 Flanged joints: HDPE/steel and HDPE/HDPE flanges designed for pressure rating of each pipe dimension ratio.

.3 Blind flanged connections: to ANSI/AWWA C207 ductile iron, with flanged drilled to ANSI B16.5.

.4 Mechanical Connections: butt fused polyethylene stub end with slip-on metal flange (see "Fittings"). DR rating of stub end to match DR rating of pipe.

.8 Pipe Fittings:

.1 Polyethylene: to CGSB 41-GP-25-M.

.2 Slip-on Metal Flanges: ANSI B16.1 Class 125, Stainless Steel

.3 Bolts to ANSI 18.2.1, nuts to ANSI 18.2.2 Material: 304 grade stainless steel to ASTM F593-02e1 and ASTM F594 for Duckbill Valve.

.4 Gaskets: three (3) millimetres EPDM Garlock 3700 or approved equal.

.5 Bolts for concrete ballast as indicated on Drawings.

2.3 SLEEVE/TRANSITION COUPLINGS

.1 Sleeves: Carbon steel to ASTM A 53-90b; epoxy coated.

.2 Followers: Malleable iron ASTM A 47-90, ductile iron ASTM A 536-84(1993), or steel.

.3 Gaskets: Rubber suitable for intended service.

.4 Bolting: Stainless steel studs and nuts to ASTM A 193/A 193M-94b.

.5 Finish:

.1 Sleeves: fusion bonded epoxy to an average 0.3 millimetres thickness, suitable for potable water system.

.2 Followers: Shop coat enamel.

.6 Provide joint harnesses where shown on the Drawings and where required to prevent pipe movement.

.7 Joint harness design and construction to be in accordance with AWWA Manual M11, Steel Pipe Manual, Chapter 19.

.8 Acceptable products: Dresser, Rockwell, Baker, or approved equal.

2.4 PIPE BEDDING AND SURROUND MATERIALS

.1 Granular material or sand according to CW 2030.

2.5 BACKFILL MATERIAL

.1 Granular material or sand according to CW 2030.

Part 3 Execution

3.1 PREPARATION

.1 Follow pipe manufacturer’s handling and storage recommendations.

.2 Pipes and fittings to be clean and dry.

.3 Prior to installation, obtain Contract Administrator's approval of pipes and fittings.

.4 The Contractor shall verify all topographical survey information and confirm the depth and location of the buried facilities in the field prior to construction.

3.2 SHAFTS AND TRENCHING

.1 Excavate shafts and trenching in accordance with CW 2030 and Section 31 23 33.01- Excavating, Trenching and Backfilling.

3.3 GRANULAR BEDDING

.1 Place bedding materials to CW 2030.

.2 Place granular bedding in unfrozen condition.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least ninety-five percent (95%) of Standard Proctor Density.

.6 Keep pipe joints clear of bedding materials to permit jointing. After jointing is complete, place bedding material as specified.

3.4 INSTALLATION

.1 Pipe shall be installed using trenchless methods.

.1 Provide locations and sizes of shafts to the Contract Administrator for review prior to excavating.

.2 Join pipe sections together before inserting into the installation hole. Pull or push the entire length of pipe from the end of the last pipe into installation hole with bell ends facing away from the pulling or pushing direction. Installation methods where tension is applied to a pipe section will not be permitted.

.3 Apply force to the section of pipe being pulled or pushed into the installation hole according to manufacturer’s requirements.

3.5 CUTTING OF PIPE

.1 Whenever cutting of pipe is required, cut pipes using acceptable trade practices, and as recommended by pipe manufacturer.

.2 Method of cutting and cutting equipment to be subject to approval of Contract Administrator.

3.6 CHANGE IN LINE AND GRADE

.1 Provide fabricated bends for change in line and grade greater than pipe manufacturer’s recommended joint deflection.

.2 Deflections within manufacturer’s recommended tolerances may be made by pipe joint deflection.

.3 Do not exceed pipe manufacturer's recommendation in deflecting pipe joints.

3.7 THRUST BLOCKS

.1 Restrain bends, tees and fittings using concrete thrust blocks per SD-004.

.2 Place concrete for thrust block against undisturbed ground.

.3 Keep pipe couplings free of concrete.

.4 Bearing area of thrust blocks to be as indicated.

3.8 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Place cover materials from pipe bedding to two hundred (200) millimetres above top of pipe.

.3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding one hundred fifty (150) millimetres compacted thickness as indicated.

.1 Do not dump material directly on top of pipe.

.4 Place cover materials simultaneously on each side of pipe to prevent later displacement of pipe.

.5 Compact each layer to ninety-five percent (95%) Standard Proctor Density in accordance with ASTM D698.

.6 Provide three hundred (300) millimetres layer of cover material above pipe before using mechanical compactor on top of pipe.

3.9 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding one hundred fifty (150) millimetres compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least ninety-five percent (95%) Standard Proctor Density to ASTM D698. In other areas, compact to density of surrounding unexcavated material.

3.10 UNDERCROSSING

.1 Excavate working pit outside right-of-way to be crossed.

.2 Excavate working pit to minimum of 0.5 metres below lowest invert of encasing pipe.

.3 Dewater excavation.

.4 Dewater area of undercrossing.

.5 Install heavy timber backstop.

.6 Place pipe to exact line and grade as indicated.

.7 Join sewage force main pipe one length at time outside encasement pipe. Push sewage force main into position.

3.11 FIELD TESTING OF FORCE MAIN

.1 Testing of force main to be carried out in presence of Contract Administrator.

.2 Before commencing the test and only after a visual inspection by the Contract Administrator, backfill the trench enough to prevent movement of the pipeline, with joints, valves and fittings exposed. Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.

.3 All pipes shall be thoroughly flushed prior to pressure testing.

.4 Expel air from force main, by slowly filling main with water.

.5 Apply hydrostatic test pressure of one hundred fifty percent (150%) of operating pressure, but not less than seven hundred (700) kPa (one hundred (100) pounds per square inch).

.6 Apply pressure for two (2) hours for pressure test and two (2) hours for leakage test.

.7 Examine exposed pipe, joints and fittings while system is under pressure.

.8 Remove defective joints, pipe and fittings and replace with new sound material.

.9 Define leakage as amount of water supplied in order to maintain test pressure for two (2) hours.

.10 Do not exceed allowable leakage of 257.5 L/km of pipe.

.11 Locate and repair defects if leakage is greater than amount specified.

.12 Repeat test until leakage is within specified allowance for full length of force main.

.13 Complete backfill.

.14 Repeat test after completing backfill. Locate and repair defects and backfill. Repeat tests, repairs and backfills as needed until leakage is less than amount specified.

3.12 SURFACE RESTORATION

.1 Re-establish existing roads and all ground surfaces. Place sufficient backfill material over constructed outside services, to provide protection until final grading and finishes are completed.

3.13 PLUGGING AND ABANDONING FORCEMAINS

.1 Complete plug each end of forcemain with mortar or concrete a minimum of 300 mm thick.

3.14 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This Section specifies requirements for the supply of all materials, labour, process and equipment for the installation, testing and putting into satisfactory operation of all pumping station piping, fittings and appurtenances as shown on the Drawings. Connections to all equipment are included.

.2 This section also describes the supply and installation of two (2) Displaced Pressure (DP) Level Measurement System units.

.3 In-line devices are specified under other sections of these Specifications. The physical installation of all these devices in the lines, including the supply of all jointing materials, couplings, etc., unless otherwise noted, is specified under this Section.

.4 Process piping is all piping inside structure, above ground, exposed or underground to 0.5 metres (1.6 feet) outside of structure.

.5 Pipes fifty (50) millimetres (two (2) inches) and less may not be shown on the piping Drawings. Line to be field routed with the approval of the Contract Administrator. The Drawings designate the Site and line service Specifications of all pipes, fittings, valves and equipment to be supplied by the Contractor.

1.2 SUBMITTALS

.1 Produce Shop Drawings for Contract Administrator's review, as per Section 01 33 00 – Submittal Procedures. Details to include spool length, welds, unions, flange positions and articulation or expansion joints.

.2 Contractor to produce Pipe Support Drawing for all piping sealed by a Professional Engineer registered in Manitoba. Details to include location, size and type of supports. Pipe supports shown on Drawings are a minimum requirement.

.3 Material Certification:

.1 At least ten (10) Business Days prior to commencing Work; submit manufacturer's test data and certification that pipe materials meet the requirements of this Section. Include manufacturer's Drawings, information and Shop Drawings where pertinent.

1.3 CLOSEOUT SUBMITTALS

.1 Maintain operating and maintenance data, including Project record documents according to Section 01 78 00 – Closeout Submittals.

1.4 INSTALLATION OF PIPING, JOINTS, ETC.

.1 Install all piping, joints, fittings, valves and other items covered in this Section in accordance with the manufacturer's recommendations, except where there is conflict between the Contract Specifications and the manufacturer's recommendations, in which case the Contract Specifications shall govern.

.2 Submit welding procedures and copies of "Record of Qualifications" for each welder in accordance with ASME Code, Section IX and TSSA to the Contract Administrator. Welders shall be qualified for each separate material group.

.3 Seal all pipe penetrations to the building and substructure/wells. Submit Shop Drawings for approval.

1.5 PIPE LIST

.1 Pipe Drawings specify pipe diameters, materials, service and accessories.

.2 Pipe Drawings specify valves and inline devices.

.3 Piping Drawings indicate routing of pipe and joint connections.

1.6 HANDLING AND STORAGE OF MATERIALS

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

.2 Assume complete responsibility for the safe delivery to the site of all pipe and fittings.

.3 Store pipe and fittings on timber platforms or in a manner approved by the Contract Administrator and protect by weatherproof housings.

.4 Inspect all fabricated material for damage in transit before installation.

.5 Exercise particular care to avoid damage to internal and external coating on pipe and fittings. Repair damaged coating to the satisfaction of the Contract Administrator before installation.

.6 The Contract Administrator reserves the right to reject pipes and fittings that are damaged or defective.

1.7 FABRICATED ITEMS

.1 The Contractor shall assume full responsibility for detailed layout, coordination of system and field measurement for fabricated items.

1.8 PIPE IDENTIFICATION

.1 Follow City of Winnipeg Standards for pipe identification.

Part 2 Products

2.1 PIPES AND FITTINGS

.1 This Specification may include materials that are not required for the specific project.

.2 The Drawings take precedence for dictating piping for specific uses or applications unless otherwise indicated.

.3 The allowable pipe materials are carbon steel, stainless steel and ductile iron as specified below.

2.2 DUCTILE IRON PIPE (DI)

.1 Material: Ductile iron pipes and fittings.

.2 Pipe to be in accordance with the latest edition of ANSI/AWWA C151/A21.51 and CSA B131.13 and fittings to ANSI/AWWA C110/A21.10 with cement lining.

.3 Cement lining: All pipes and fittings to have cement lining to ANSI/AWWA C104/A21.4 latest edition.

.4 Pipe class: Class 52 unless higher class is specified elsewhere.

.5 Pressure temperature rating: one thousand fifty (1,050) kPa at forty (40) degrees Celsius.

.6 Joints:

.1 Indoors use all flanged one hundred fifty (150) pounds connections and victaulic couplings.

.2 Maintenance and connection to other pipe classes: flange adaptors or victaulic coupling.

.3 Adaptor flanges: Ductile Iron, Grade 65-45-12, conforming to the current ASTM Standard A536 for Ductile Iron Casting. Bolt holes shall be drilled in accordance with AWWA C1115 or ASME B16.1.

.4 Clamping screws on adaptor flanges shall be zinc-plated, heat treated steel with a minimum tensile strength of twenty-eight (28) MPa.

.7 Bolting: to ANSI/AWWA C207 (ASTM A 307 Grade B, ANSI B18.2.1) latest edition for diameters one hundred fifty (150) millimetres and larger or ASTM A193-B7 for smaller diameters. Corresponding nuts to be ASTM A 194/A 194M – Grade 2.

.8 Gaskets:

.1 Garlock 7797, or approved equal in accordance with B7.

.9 Painting:

.1 In accordance with Section 09 91 00 – Painting and Protective Coatings.

2.3 STAINLESS STEEL PIPE (SS)

.1 Material: Type 304 stainless steel pipe and fittings.

.2 Pipe: to ASTM/A778 for diameter larger than one hundred fifty (150) millimetres, and ASTM A 312, PE (plain end) for one hundred fifty (150) millimetres diameter or less. Minimum wall thickness as follows:

- .1 Thirteen (13) millimetres to fifty (50) millimetres diameter: Schedule 40.
- .2 Seventy-five (75) to three hundred (300) millimetres diameter: Schedule 10.
- .3 Three hundred fifty (350) to six hundred (600) millimetres diameter: 3.18 millimetres (eleven (11) gauge).
- .4 Seven hundred fifty (750) to one thousand two hundred (1,200) millimetres diameter: 4.76 millimetres (seven (7) gauge).

.3 Fittings: to ANSI B16.9 or MSS SP-43. Materials to conform to ASTM A 403. Smooth flow elbows shall be used where available from manufacturer. Larger elbows not manufactured in smooth flow type can be five (5) piece section type.

.4 Joints:

- .1 Maintenance: flanged, or groove coupling where necessary for ease of installation, disassembly and maintenance.
- .2 Normal: buttweld.
- .3 Instrument connections: threaded nipple.
- .4 Expansion: flexible stainless steel couplings by Straub Flex 2, or approved equal in accordance with B7.

.5 Fabricate stainless steel pipe systems as completely as possible in the shop to minimize connections by field welding.

.6 Welding materials, methods, operations and inspection shall be in accordance with current Provincial and Federal Regulations for welding of stainless steel. Use automatic welding techniques – Tungsten inert gas or metal inert gas method. Make circumferential welds using metallic arc process.

.7 Use welding rod or wire of the same composition or superior to the pipe and fittings material.

.8 Weld deposit at the seams shall have a slight crown on both sides of the weld. No cracks or crevices shall be allowed.

.9 Remove excessive weld deposits, slag, weld spatter and projections into the interior of the pipe by grinding.

.10 Secure all backing rings on spools to pipe flanges to prevent damage during shipment.

.11 Mark all spool items in the shop with Drawing and item numbers. Mark the type of stainless steel used.

.12 Flanges: Mild steel galvanized backing flanges drilled to ANSI B16.5 class 150# for all indoor locations. All other locations shall have 304SS flanges drilled to 150#. All flange connections on stainless steel pipes in tanks shall be 316 stainless steel flanges or 316 stainless Type B stud ends backing flanges with stainless steel bolts and nuts. Stainless steel grooved flanges and couplings installed in Schedule 40 spool pieces are an approved alternate.

.13 Bolting: to latest edition of ANSI/AWWA C207 (ASTM A 307 Grade B, ANSI B18.2.1) for diameters one hundred fifty (150) millimetres and larger or ASTM A 193/A 193M for smaller diameters. Corresponding nuts to be ASTM A 194/A 194M, Grade 2.

.14 Gaskets:

.1 Garlock 7797, or approved equal in accordance with B7.

.15 Fabricated stainless steel pipe to be as supplied by one (1) of the following, or approved equal in accordance with B7:

.1 Douglas Barwick Inc;

.2 The Robert Mitchell Company Ltd; or

.3 Atlas Alloys.

.16 Provide reinforcing saddles (re-pad) at all pipe support locations of similar material, tack welded to pipe.

2.4 DISPLACED PRESSURE LEVEL MEASUREMENT SYSTEM

.1 Two (2) new DP Level Measurement System will be installed in the lift station at the pump room level. They will be installed complete with isolation valves, sight glass, flush line, drain line and level transmitter.

.1 Sight glass piping and fittings to be Schedule 80 PVC.

.2 Four (4) fifty (50) millimetres (two (2) inch) PVC ball valves.

.3 Level Transmitter: Supply and Installation falls under the “Automation Work” line item on the Form B.

.2 Water Supply Connection for DP Level Measurement System:

.1 Water supply will be installed at the pump room level to the DP Level Measurement Systems as detailed on the Drawings.

2.5 PVC PIPING AND FITTINGS

.1 Schedule 80 PVC piping and fittings to ASTM D1785 – Standards for PVC Plastic Pipe.

.2 PVC Ball Valves (for use with PVC pipe only): shall have a PVC body conforming to the current ASTM Standard D1784, Standard for PVC Rigid PVC compound; ASTM D1785, Standard for PVC Plastic Pipe; ASTM D2467, Standard for PVC

Pipe Fittings (Schedule 80); and shall have an EPDM or Teflon seat, a hand operating lever and integral threaded union joints

.3 PVC Sight Glass Pipe: Transparent PVC pipe, fifty (50) millimetres (two (2) inch) diameter.

.4 Solvent welded joints: Primer and solvent cement shall conform to the current ASTM.

2.6 DISMANTALING JOINTS

.1 Use Dresser style 131 dismantling joint with tie rods or approved equivalent in accordance with B7.

.2 Materials:

.1 Spool Piece; Steel – AISI C1010-C1015.

.2 Flange Adaptor: Steel – AISI C1010-C1015.

.3 Tie Rods: Steel – ASTM A193 Grade B7.

.4 Nuts: ASTM A194 Grade 2H.

.5 Gasket: Grade 27 BUNA S.

.6 Coatings: Fusion Bonded Epoxy.

2.7 FASTENERS

.1 Flange nuts and bolts shall be ASTM A276, TYPE 316 stainless steel sized to requirements of flange. Thread on bolts to extend past nut minimum of six (6) millimetres.

.2 Anchors shall be Kwik-Bolt or Rawl Stud ASTM A276, Type 316 stainless steel. Embedment depth and size, where not shown on the Drawings, to be as required for load being carried or resisted.

2.8 PIPE COUPLINGS

.1 As a general rule, Piping ≥ one hundred (100) millimetres (four (4) inch) will be flanged, welded or grooved to provide rigid connections of "ferrous" piping. Smaller piping will be typically welded or have threaded connections. Other piping materials such as the various forms of plastic, non-ferrous metals etc. will be joined as recommended by the manufacturer and/or to suit project conditions as required by codes or good trade practice.

.2 Drawings will show where joints are required for serviceability. These will be required as a minimum. The Contractor will be allowed some flexibility on the type of material to be used, additional joints will be as required to suit the material e.g. welded steel piping vs. flanged ductile iron.

.3 Notwithstanding the previous comment, provide joints which may be disassembled within one (1.0) metre (3.3 feet) of any connection to equipment, on both sides of structural penetrations and within 0.6 metres (two (2) feet) of all threaded end valves.

.4 Where noted on the Drawings to allow for serviceability or flexibility, the Contractor shall supply and install "Victaulic" or Smith-Blair flange adapter couplings. The Victaulic couplings shall be Style 31 (or as indicated) for grooved end fitting. Smith-Blair flange adapters shall be Type 912 up to three hundred (300) millimetres (twelve (12) inch) and 913 for pipes greater than three hundred (300) millimetres (12 inch). Type 913 shall be hot dipped galvanized.

.5 Do not use slip-on flanges that are attached to a pipe by means of set screws and gaskets (Uni-flange, etc.) except as approved by the Contract Administrator. They may be considered within a restrained run of pipe or where connections are made to existing pipe where there may be no other means to make the connection and as long as the joint can be restrained in other ways.

.6 Provide for other methods of connection to external pipes as detailed on the Drawings or as directed by the Contract Administrator.

2.9 CONCRETE

.1 Concrete for anchor blocks, thrust block and other pipe supports: to be Class I.

2.10 FITTINGS

.1 Fittings for piping systems to be compatible for the piping material and service.

.2 Provide fittings with a wall thickness equal to or greater than the pipe.

.3 Provide eccentric reducers in horizontal lines with the flat side on top, unless shown otherwise. Provide concentric reducers in vertical lines unless indicated otherwise.

.4 Provide long radius elbows unless otherwise shown. Provide smooth flow carbon steel, ductile iron or stainless steel elbows three hundred fifty (350) millimetres (fourteen (14) inch) and less. Provide mitred elbows greater than three hundred fifty (350) millimetres (fourteen (14) inch) unless otherwise shown or specified.

2.11 EXPANSION JOINTS

.1 Design and fabricate expansion joints in accordance with EJMA standards.

.2 Provide expansion joints as shown and unless otherwise shown provide elastomer spool type expansion joints.

.3 Ensure corrugated type expansion joints are capable of a minimum ten thousand (10,000) pressure, temperature and deflection cycles, not concurrent.

.4 For metal expansion joints of the metal bellows type, in systems handling gases, air, water or other liquids, provide liners to produce a smooth flow path, reduce vibration and reduce noise through the expansion joint.

.5 Provide sufficient bends and expansion joints to allow for thermal movement of piping from zero (0) degrees Celsius to maximum service temperature.

.6 Provide factory pre-compressed expansion joints where required to suit installation temperature.

2.12 TAPPING FOR PRESSURE GAUGES OR INSTRUMENTS

.1 Provide twelve (12) millimetres (0.5 inch) diameter stainless steel tapping with stainless steel ball valve for temporary pressure gauge connections on discharge side of pumps where specified.

.2 Provide a tapping as described above compatible with pipe material for instrument connections or sampling points where shown complete with local isolation ball valve.

Part 3 Execution

3.1 GENERAL PIPE INSTALLATION AND LAYOUT

.1 Contractor must verify all dimensions and new equipment locations in the field prior to the start of Work. Install all piping and appurtenances to the dimensions indicated on the Drawings, square, straight, plumb and level.

.2 Carefully position pipe and fittings without strain or deflection and using proper appliances.

.3 Be aware of and contend with the wastewater in the existing forcemains when preparing to make the required piping modifications.

.4 Make due allowance for dimensional variation of equipment. Bring any dimensional discrepancies to the Contract Administrator's attention.

.5 The detailed layout of the piping, etc. is the responsibility of the Contractor. If required by the Contract Administrator, produce field Drawings to show relative positions of various services, and receive Contract Administrator's approval before the Work is started.

.6 Clear all foreign matter from inside piping and dispose of in accordance with proper environmental procedures.

.7 For pressure piping seventy-five (75) millimetres (three (3) inch) diameter and under, the Contractor may, subject to the Contract Administrator's prior approval, deviate locally from the layout indicated on the Drawings to suit local conditions and preserve proper headroom of 2.1 metres (6.9 feet) minimum under all exposed pipes, unless otherwise noted.

.8 Where piping is not shown or is shown diagrammatically, install the pipes neatly to suit the structure, subject to the Contract Administrator's prior approval.

.9 Bolt piping to equipment before grouting piping into walls.

.10 Before commencing installation, determine specific piping support and thrust restraint requirements to suit the materials of construction, the piping materials

and the operating conditions. Prepare and submit a detailed schedule of piping supports for the Contract Administrator's review.

.11 Make adequate provision in piping and pipe support systems for expansion, contraction, slope and anchorage.

.12 Install expansion joints where shown and at other locations as necessary to allow piping expansion and contraction.

3.2 PIPE CONNECTIONS TO EQUIPMENT, TANKS, ETC.

.1 The Contractor shall fully inform himself of the installation requirements and dimensions of equipment required to be connected to piping. Where piping is to tie into equipment, preliminary dimensions have been shown and are not guaranteed.

.2 Any change in such dimensions shall not relieve the Contractor of his responsibility to make the piping fit the equipment.

.3 Any fitting shown on the Drawings by a consistent symbol, but not described or scheduled, shall be incorporated into the work by the Contractor, who shall first determine from the Contract Administrator the requirements for such fitting.

.4 All connection fittings to tanks, equipment, etc. shall be such that the fittings may be easily removed from and replaced in the lines, or lines easily disconnected from equipment or tanks for maintenance purposes.

.5 Make connections compatible with that specified or shown on the Drawings for fittings, tanks or equipment, etc. or for intended service.

.6 In the event that the type of connection is not indicated on the Drawings or in the Specifications, use an approved flange, union or coupling.

.7 Unless otherwise shown or specified, install gauge taps on the suction and discharge of all pumps, fans, blowers, compressors and vacuum pumps. Attach gauge taps with a threaded nipple and valve to the pipeline, duct or equipment.

3.3 PIPE SUPPORTS, ANCHORS AND GUIDES

.1 Adequately support all piping, fittings and valves either from the floor on concrete piers or approved supports or from above with approved hangers.

.2 Design and place supports so that no weight will be taken directly on the equipment sleeve coupling or sleeves through walls, and will be satisfactory for the service intended.

.3 Provide supports for thrust forces as indicated on Drawing P-03.

.4 Adequately brace pipes and fittings cast into concrete floors, walls, etc. at each joint, to resist all buoyant or lateral forces imposed on the piping during concrete pours. Replace any piping or fittings found to yield from their intended position.

.5 Attach hangers to steelwork with approved clamps or welded tabs. Submit the proposed method of attaching pipe hangers to structural steelwork for approval.

.6 Attach hangers to concrete with approved threaded rod sockets cast into the concrete. Cinch anchor sockets may be permitted by the Contract Administrator in light duty service.

.7 Isolate supports and pipes of dissimilar materials using neoprene sheet or other approved material.

.8 Contractor to size and provide reinforcing saddles (re-pad) at all pipe support locations of similar material.

.9 Locate anchors and guides as shown on the Drawings and install elsewhere, as required by the piping systems. Design shall be adequate so that no stress is imposed on equipment and allowable stress in piping is not exceeded. Contractor to provide pipe support Drawings for Contract Administrator's review. Details to include location, size and type of supports.

.10 Acceptable manufacturers:

.1 Standon Pipe Supports; or

.2 Approved equal in accordance with B7.

3.4 PIPE JOINING

.1 Conform to requirements of ANSI B31 code for pressure piping.

.2 Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.

.3 Install groups of piping parallel to each other, spaced to permit application of insulation, identification and service access, on trapeze hangers.

.4 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets, i.e., with flat side up.

.5 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.

.6 Install flanged or welded nozzles, branch connections, welding outlets, adapters and taps, true and faced at right angles to the axis of the pipe. Do not extend connection inside of pipe.

.7 Make pipe ends round and true, suitable for weld connection as applicable. Prepare pipe ends in accordance with ANSI B16.25 for butt welding.

.8 Copper pipe and tubing to be free from surface damage. Replace damaged pipe or tubing. Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked.

.9 Ream ends of pipe and tubes before being made up.

.10 Use non-corrosive lubricant or Teflon tape applied to male thread only.

.11 Groove pipe ends, cut square, seating surface clean and free from indent and score marks.

.12 Install dielectric fittings wherever piping of dissimilar metals are joined.

.13 Clean ends of pipes or tubing and recesses of fittings to be brazed or soldered. Assemble joints without binding.

.14 Support piping during construction to prevent abnormal stresses on the pipe works.

.15 Do not weld adjacent to valves when the valve is in place to avoid heat damage to seats.

.16 The Contractor shall fully inform themselves of the installation requirements and dimensions of equipment required to be connected to piping. Where piping is to tie into equipment, preliminary dimensions have been shown and are not guaranteed.

.17 Any change in such dimensions shall not relieve the Contractor of their responsibility to make the piping fit the equipment.

.18 Any fitting shown on the Drawings by a consistent symbol, but not described or scheduled, shall be incorporated into the Work by the Contractor, who shall first determine from the Contract Administrator the requirements for such fitting.

.19 All connection fittings to tanks, equipment, etc. shall be such that the fittings may be easily removed from and replaced in the lines, or lines easily disconnected from equipment or tanks for maintenance purposes.

.20 Make connections compatible with that specified or shown on the Drawings for fittings, tanks or equipment, etc. or for intended service.

.21 In the event that the type of connection is not indicated on the Drawings or in the Specifications, use an approved flange, union or coupling.

3.5 PIPE DRAINAGE

.1 At the low points in piping systems and at other locations indicated on the Drawings, install drains to permit draining any system without breaking a joint.

.2 Drains shall be twenty-five (25) millimetres IPS for pipes larger than fifty (50) millimetres diameter, and thirteen (13) millimetres IPS for pipes fifty (50) millimetres diameter and under or as shown on Drawings. Terminate drains one hundred fifty (150) millimetres from the pipe in a valve suitable for the particular service and approved by the Contract Administrator. Plug or cap valves on the atmospheric side.

.3 Drain valves shall be accessible from the floor. Run drains to the collection point or provide quick disconnects at easily accessible locations.

3.6 CUTTING OF PIPE

.1 Whenever cutting of pipe is required, cut pipes as recommended by pipe manufacturer.

.2 Method of cutting and cutting equipment to be subject to the approval of the Contract Administrator.

3.7 PAINTING AND PROTECTIVE COATINGS

.1 Painting and protective coatings for pipe shall be in accordance with the foregoing and Section 09 91 00 – Painting and Protective Coatings.

3.8 PIPE INSPECTION AND TESTING

.1 General:

- .1 Provide all necessary equipment and perform all work required in connection with the tests.
- .2 Bear the cost of all testing, location and remedying of leaks and any necessary retesting and alignment.
- .3 All pipes shall be thoroughly flushed prior to pressure testing.
- .4 All tests shall be documented on application forms provided by the Contract Administrator.

.2 Testing of pressure piping systems:

- .1 Hydrostatically test all plant piping, other than non-pressure piping, in accordance with ANSI B31.1.0 at 1.5 times working pressure.
- .2 All liquid and chemical carrying pipes shall be watertight under the test pressure and all suction piping shall be straight.
- .3 Leave pipes uncovered in every part of the building until approved by the Contract Administrator.
- .4 Should any leak develop in any of the pipes, repair the leaks or replace the defective section at no cost to the City of Winnipeg.
- .5 Continue repairs and testing until the leakage has been stopped.
- .6 Extend each test over a period of at least two (2) hours, unless a short period complies with ANSI B31.1.0.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This Specification covers the installation and commissioning of the process valves which have been pre-purchased by the City of Winnipeg as specified in Division 01 11 20 – Pre-Selected and Pre-Purchased Equipment.

1.2 REFERENCES

.1 American Water Works Association (AWWA), American National Standards Institute (ANSI) / American society of Mechanical Engineers (ASME).

.2 ASNI/ASME Bl.20.1, Pipe Threads, General Purpose (Inch).

Part 2 Products

2.1 DESCRIPTION

.1 Materials Supplied by City of Winnipeg:

.1 Dry Pit Location:

.1 Two (2) three hundred (300) millimetre rising stem gate valves – manually actuated, **resilient seated**, for the suction side of the pumps. [SLG-L01B, SLG-L02B];

.2 Two (2) two hundred fifty (250) millimetre rising stem gate valves – manually actuated, **resilient seated**, for the discharge side of the pumps. [SLG-L01C, SLG-L02C].

.3 Two (2) three hundred (300) millimetre rising stem gate valves – manually actuated, **non-resilient seated**, for the suction side of the pumps. [SLG-L01B, SLG-L02B];

.4 Two (2) two hundred fifty (250) millimetre rising stem gate valves – manually actuated, **non-resilient seated**, for the discharge side of the pumps. [SLG-L01C, SLG-L02C].

.5 Two (2) two hundred fifty (250) millimetre check valves with “hold-open” device, for the discharge side of the pumps. [CV-L01A, CV-L02A].

.2 By-Pass Manhole Location:

.1 One (1) three hundred fifty (350) millimetre rising stem gate valve – manually actuated, resilient seated. [SLG-L03C];

.2 One (1) two hundred fifty (250) millimetre non-rising stem gate valve – manually actuated [SLG-L04C].

Part 3 Execution

3.1 GENERAL

.1 Supply all necessary labour and tools for the complete installation of all valves.

.2 Install all valves in strict accordance with the manufacturer's instructions and as specified.

.3 Install the new station piping and pumping equipment as indicated in this Specification and shown on the Drawings. Make no changes, revisions or substitutions to the layout without obtaining written approval from the Contractor Administrator.

3.2 INSTALLING VALVES

.1 Construct foundations for valves to provide support per industry standards. Temporarily support the equipment as may be required. All temporary supports shall be rigid and so constructed as not to subject the equipment to any undue stresses or cause any damage.

.2 Contractor to install City of Winnipeg supplied resilient seated gate valves SLG-L01B, SLG-L02B, SLG-L01C, SLG-L02C when available, then remove resilient seated gate valves and install City of Winnipeg supplied non-resilient seated gate valves once available.

3.3 HANDLING OF VALVES

.1 Do not place chains, cables and ropes through valve ports or attached to operating cylinders or hand wheels. Use slings either around the valve body or with bolts or rods through the flange bolt holes.

.2 Store valves in a cool location clear of moving vehicles or other objects. Dirt and debris shall be prevented from entering the valve internals. Do not rest valves on cylinders, hand wheels or operating shafts.

.3 Cover valves to shield them from dirt and to avoid exposing the seats to sunlight or mercury arc light.

3.4 PAINTING AND PROTECTIVE COATINGS

.1 Painting and protective coatings for valves shall be in accordance with the foregoing and Section 09 91 00 – Painting and Protective Coatings.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the installation and commissioning of two (2) one hundred fifty-four (154) L/s centrifugal vertical shaft pumps. The pumps shall be supplied by the City of Winnipeg. [P-L01, P-L02].

.2 The pumps must be installed and commissioned prior to April 1, 2023.

.3 Pumping equipment shall include motors, extended drive shafts, anchor bolts, base plates, supporting frame and all appurtenances required for an operating system.

.4 Coordinate with Division 26 – Electrical.

.5 In case of damage to pumps or pumping equipment, the Contractor shall repair or replace the damaged equipment, as directed by the Contract Administrator at the Contractors cost.

1.2 SUBMITTALS

.1 Provide submittals in this Specification accordance with Section 01 33 00 – Submittal Procedures.

Part 2 Products

2.1 CENTRIFUGAL PUMPS

.1 The pumps are supplied by the City of Winnipeg and issued for the Contractor:

- .1 Install and commission two (2) centrifugal vertical shaft pumps as detailed in this Specification.
- .2 The wastewater sewage pumps shall be installed complete with:
  - .1 Motor;
  - .2 Base (four (4) legged);
  - .3 Flanged suction and discharge piping connections;
  - .4 Extended drive shafts and guards;
  - .5 Couplings; and
  - .6 Mechanical seals and solenoid valves.

.2 To be supplied by the Contractor:

- .1 Pressure Gauge:
  - .1 Install diaphragm between pressure gauge inlet and wastewater flow; and
  - .2 Add liquid fill between diaphragm and pressure gauge.

2.2 EQUIPMENT MOUNTING

.1 Pump and motor shall be supported by a heavy cast-iron or fabricated steel base with four (4) legs. The height of the base shall be sufficient to permit the use of decreasing suction and increasing discharge elbows, which shall be provided when the nominal pump size is smaller than the suction line. The suction and discharge openings shall be flanged faced and drilled one hundred and twenty-five (125) pound American Standard.

.2 The pump must be secured to base at the factory or in the field, with bolts and/or dowels such that the motor-pump shaft shall be centered, in relation to the motor base within 0.1 millimetres (0.005 inch).

Part 3 Execution

3.1 GENERAL

.1 Prior to pumping unit installation, provide a portable sewage pump and discharge hose to remove remaining wastewater in the wet well. The wastewater shall be disposed as per Section E7 of the Tender.

3.2 SUPERVISION OF INSTALLATION

.1 All equipment and material shall be installed in a workmanlike manner, in accordance with the manufacturer’s recommendations.

.2 Supplier to provide installation instructions, in accordance with the manufacturer’s requirements, including details for anchor bolts, frames and other items to be cast into concrete work, prior to the installation of the equipment.

.3 The Contractor shall install the equipment where shown on the Drawings and in strict accordance with the manufacturer’s instructions and in compliance with applicable local, provincial and federal codes and regulations.

.4 Supplier to provide appurtenances, fittings, connecting piping, framing, accessories and anchor bolts not herein or elsewhere specifically mentioned or included, but necessary for the operation of the equipment package.

.5 The Contractor shall provide concrete and grout, final piping and electrical connections and other appurtenances not herein or elsewhere specifically mentioned or included, but necessary for the installation, operation and testing of the equipment, without additional payment.

.6 All possible precautions should be taken to ensure proper alignment of equipment shafts and pipe connections to avoid transmission of piping weight reactions to the equipment at pipe connections or equipment damage due to misalignment.

.7 Set anchor bolts for equipment at least one hundred fifty (150) millimetres (six (6) inches) into the concrete base.

.8 Comply with requirements of Hydraulic Institute Standards for installation of all pumps.

3.3 COMMISSIONING

.1 Provide two (2) weeks' notice to the Contract Administrator prior to commencement of commissioning to witness the activities.

.2 The manufacturer has included the following services in the pre-purchase contract including:

.1 Initial start-up inspection and testing for the pumping equipment.

.2 Two (2) days training for operation of pumping equipment.

.3 After the equipment has been installed and prior to final acceptance, protect the equipment from damage. Ensure that protection measures are to the satisfaction of the Contract Administrator.

.4 The Equipment Manufacturer's Technical Representative or approved alternate shall inspect the pump installation to ensure that the equipment has been installed in accordance with the manufacturer's requirements. If the installation is not in order, equipment manufacturer's technical representative shall provide instruction to the Contractor. The equipment shall be started and run, and adjustments made at this time.

.5 The manufacturer's technical representative, Contractor and Contract Administrator shall jointly commission the Works in accordance with the written procedure for commissioning. The Contractor shall provide sufficient manpower for the duration of the commissioning period. The Contractor shall make necessary adjustments during commissioning to put the Works into continuous operation.

.1 The Contract Administrator will request that the equipment be operated to demonstrate that it performs as specified. If the Contract Administrator notes deficiencies, the deficiency shall be corrected immediately by the Contractor. The Contractor shall advise the Contract Administrator, in writing, when the deficiencies have been corrected.

.2 Deficiencies of a serious nature, as determined by the Contract Administrator, shall be corrected by the manufacturer's representative.

3.4 PUMP TESTING

.1 Provide pump testing as specified in Section 01 91 00 – Commissioning, Start-Up and Field Trial Operation.

END OF SECTION