PART 1 GENERAL

1.1 Site Work

.1 After project completion return the outside site conditions back to original conditions. Photos of the Site will be taken before Work begins on Site to assist in confirming that after all Work is completed, the Site is returned to its original condition in accordance with City of Winnipeg Standard Specifications.

1.2 Use of Site and Facilities

.1 Contractor may place a construction trailer on the Site and store materials in designated areas.

.2 Make arrangements to provide drinking water for workers as required.

.3 Provide temporary ventilation and space heat as required during construction period.

.4 Provide portable washroom facilities outside the pumping station.

1.3 Regulations

.1 All Work shall be in full accordance with applicable Codes, Regulations, By-laws, and ordinances.

1.4 Permits, Fees and Inspections

.1 Except for the Waterways Permit, apply for all permits, supply all test certificates and pay all fees to authorities having jurisdiction regarding the installation and inspection of the systems installed under this Contract.

1.5 Existing Conditions and Other Trades

.1 Visit the Site to determine existing conditions affecting the Work of this Division.

.2 Examine all drawings and become fully familiar with the Work of other trades in all divisions under this Contract.

.3 Cooperate with other trades. Pay particular attention to the proximity of the Work to electrical cables, control conduits, and utilities. Maintain maximum clear ceiling heights throughout.

1.6 Metric Conversion

.1 All units in this division are expressed in SI units.

.2 Submit all Shop Drawings and maintenance manuals in SI units.

.3 On all submittals (Shop Drawings, etc.) use the same SI units as stated in the Specifications.

1.7 Cutting and Patching

.1 Provide holes and sleeves, cutting and fitting required for mechanical Work. Relocate improperly located holes and sleeves.

.2 Drill for expansion bolts, hanger rods, brackets, and supports.

.3 Obtain written approval from the Contract Administrator before cutting or burning structural members.

.4 Patch building where damaged from equipment installation, improperly located holes etc. Use matching materials.

1.8 Equipment Protection and Clean-up

.1 Protect equipment and materials in storage on-site during and after installation until final acceptance. Leave factory covers in place. Take special precautions to prevent entry of foreign material into working parts of piping systems.

.2 Protect equipment with crates and polyethylene covers.

1.9 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.

.5 Provide adequate ventilation to meet health regulations for safe working environment. A minimum of 6 ACH of continuous ventilation is required in below grade areas.

.4 Maintain temperatures of minimum 10 degrees C 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.

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

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

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

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

.8 Make good damage to electrical system caused by use under this Contract.

1.10 Temporary Power and Light

.1 Provide temporary power and light as required for temporary pumping, construction power, lighting, and other requirements during shutdowns.

.2 The existing power supply may be utilized for power, provided that there are no operational impacts associated with the use of the power. Maintain sufficient power for pump operation at all times.

.1 Connect to existing power supply in accordance with Canadian Electrical Code.

.2 Electrical power and lighting systems installed under this Contract may be used for construction requirements provided that guarantees are not affected.

1.11 Temporary Communication Facilities

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

1.12 Fire Protection

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

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

1.13 Temporary Usage

.1 Usage by the City of any process device, apparatus, machinery, or equipment prior to Total Performance being issued is not to be construed as acceptance.

1.14 Site Plan

.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.

1.15 Scaffolding

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

.2 Provide and maintain scaffolding and ladders.

1.16 Construction Parking

.1 Parking will be permitted on site provided it does not disrupt performance of Work or access by the City.

.1 Ensure that access and parking for a minimum of one truck is provided adjacent to the wastewater pumping station, for use by the City.

.2 Provide and maintain adequate access to project site.

1.17 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, and any other fall hazards

.2 Provide as required by governing authorities.

1.18 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.

1.19 Construction Plan

.1 Within limitations defined in these specifications, the Contractor shall be responsible for his project work plan and sequence of work. The station will be turned over to the Contractor, once temporary pumping has been commissioned and is performing reliably. This will give the contractor flexibility to develop a work plan that best meets his requirements.

1.20 Project Cleanliness

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

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the 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.

.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.

1.21 Site Sanitation

.1 The pumping station, piping and wet wells contain raw sewage. Also the station and piping contains accumulated debris and sludge. The Contractor shall ensure that all sewerage and related debris is handled and disposed of in a safe and appropriate manner.

.2 No claim by the Contractor shall be made with respect to Site sanitation.

1.22 Contractor Use of Premises

.1 There may be other contractors working on the Site. Co-ordinate use of the Site with the Contract Administrator.

.2 Obtain and pay for use of appropriate additional storage or Work areas needed for operations under this Contract.

.3 Remove or alter existing Work to prevent injury or damage to portions of existing Work which remain.

.4 Repair or replace portions of existing Work which have been altered during construction operations to match existing or adjoining work, as directed by Contract Administrator.

.5 Execute Work with least possible interference or disturbance to building operations, and normal use of premises. Arrange with Contract Administrator to facilitate execution of Work.

.6 Where security is reduced by Work, provide temporary means to maintain security.

1.23 Existing Services

.1 Notify Contract Administrator of intended interruption of any service required in order to complete Work, and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Contract Administrator 48 hours notice for necessary interruption of mechanical or electrical service throughout course of Work. Minimize duration of interruptions.

.3 Submit schedule to and obtain approval from Contract Administrator for any shut-down or closure of active service or facility including power services. Adhere to approved schedule and provide notice to Contract Administrator.

1.24 Documents Required

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

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

1.25 Building Smoking Environment

.1 Comply with smoking restrictions. Smoking is not allowed in any City buildings.

1.26 Offices

.1 Subcontractors to provide their own offices as necessary.

.2 Provide a heated, site trailer with electrical service for Contractor and Contract Administrator use. Trailer shall also be suitable for hosting site meetings. Provide suitable tables, chairs as required.

1.27 Demolition and Waste Disposal

.1 Unless specified otherwise, all material no longer required at the Site, including electrical MCCs, cabling, mechanical and civil/structural steel and other materials shall become the Contractor's property. Contractor may retain them for salvage value or dispose of them at an acceptable licensed disposal facility.

1.28 Cleaning

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

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

.3 Clean-up work area as Work progresses.

1.29 Submittals Procedures

.1 Administrative

.1 Submit to Contract Administrator for review. Submit with reasonable promptness and in orderly sequence so as not to cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of contract time and no claim for extension by reason of such default will be allowed. Work affected by submittals to proceed only after review is complete.

.2 Review submittals prior to submission to Contract Administrator. Stamp and sign submittals certifying review of submission. This review represents that necessary requirements have been checked and coordinated 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.

.3 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of contract documents stating reasons for deviations.

.4 Verify field measurements and that affected adjacent work is coordinated.

.5 Contractor’s responsibility for errors and omissions in submission is not relieved by Contract Administrator’s review of submittals.

.6 Contractor’s responsibility for deviation in submission from requirements of Contract Documents is not relieved by Contract Administrator review.

.7 Keep one reviewed copy of each submission on Site.

.2 Expedited Shop Drawings

.1 In order to expedite Shop Drawings with critical timeliness, the Lowest Responsive Bidder will be permitted, after receiving written approval from the Contract Administrator, to arrange for the preparation of Shop Drawings.

.2 If Award is made to the Lowest Responsive Bidder, no payment for the preparation of Shop Drawings will be made.

.3 If no contract is awarded, then the City of Winnipeg will pay the requested Bidder up to a maximum of five hundred dollars ($500.00) for each of the requested submissions noted above, for the preparation and delivery of Shop Drawings. Delivery of the Shop Drawings to the City and payment of the above amounts will constitute full and final consideration of each party to the other, and neither party will have any further liability to the other with respect to this Bid Opportunity.

.3 Shop Drawings

(a) This Specification shall revise, amend and supplement the requirements of CW 1110 of the City of Winnipeg's Standard Construction Specifications.

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

(ii) The Contractor shall submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be show on all submissions for Contract Administrator review.

(b) Shop Drawings

(i) Original drawings are to be prepared by the Contractor, Subcontractor, Supplier, Distributor, or Manufacturer, which illustrate appropriate portion of Work; showing fabrication, layout, setting or erection details as specified in appropriate sections.

(c) Contractor's Responsibilities

(i) Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.

(ii) Verify:
(a) Field measurements
(b) Field construction criteria
(c) Catalogue numbers and similar data

(iii) Coordinate each submission with requirements of Work and Contract Documents.
Shop drawings of separate components of a larger system will not be reviewed until all related drawings are available.

(iv) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.

(v) Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.

(vi) Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

(vii) 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.

(viii) After Contract Administrator's review and return of copies, distribute copies to sub- trades as appropriate.

(ix) Maintain one (1) complete set of reviewed shop drawings, filed by Specification Section Number, at the Site for use and reference of the Contract Administrator and Subcontractors.

(d) Submission Requirements

(i) Schedule submissions at least 14 Calendar days before dates reviewed submissions will be needed, and allow for a 14 Calendar day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.

(ii) Submit one (1) electronic .pdf copy of shop drawings. The Contractor is advised that the Contract Administrator will return an electronic copy to the Contractor.

(iii) Accompany submissions with transmittal letter, containing:

(a) Date
(b) Project title and Bid Opportunity number
(c) Contractor's name and address
(d) Number of each shop drawing, product data and sample submitted
(e) Specification Section, Title, Number and Clause
(f) Drawing Number and Detail/Section Number
(g) Other pertinent data

(iv) Submissions shall include:

(a) Date and revision dates.
(b) Project title and Bid Opportunity number.
(c) Name of:

- Contractor
- Subcontractor
- Supplier
- Manufacturer
- Separate detailer when pertinent

(d) Identification of product of material.
(e) Relation to adjacent structure or materials.
(f) Field dimensions, clearly identified as such.
(g) Specification section name, number and clause number or drawing number and detail/section number.
(h) Applicable standards, such as CSA or CGSB numbers.
(i) Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.

(e) Other Considerations

(i) Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.

(ii) Material and equipment delivered to the Site will not be paid for until pertinent shop drawings have been submitted and reviewed.

(iii) Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

(iv) No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of shop drawings.

1.30 Closeout Submittals

.1 Project Record Documents

.1 Maintain at construction Site, two sets of white prints for record drawing purposes. Mark one set "FIELD DRAWINGS" and use to record initial data when field measurements are made. Mark other set "RECORD DRAWINGS".

.2 Store record drawings in field office apart from other documents used for construction. Maintain record drawings in clean, dry and legible condition. Do not use record drawings for construction purposes.

.3 Record "as-built" information in red ink, accurately and concurrently with construction progress. Do not conceal Work until required information is recorded.

.4 Legibly mark each item to record actual construction, including:
.1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.2 Changes made by Addendum, Change Order or Field Instruction.
.3 Details not on original Contract Drawings.
.4 References to related shop drawings and modifications.
.5 At completion of project and prior to final inspection, neatly transfer "as-built" notations to second set of white prints and submit to Contract Administrator along with field drawings.

.5 Provide an electronic copy (PDF) of all final shop drawing in an orderly fashion on one CD.

.2 Spare Parts, Maintenance Materials And Special Tools

.1 Provide items of same manufacture and quality as items in Work, and of same production run and dye lot as installed materials.

.2 Provide special tools with tags identifying their associated function and equipment.

.3 Keys and Maintenance Tools for Hardware and Specialties.
.1 Turn over to Contract Administrator all keys and special tools required for maintenance of all finish hardware, cabinet hardware, equipment, etc. (including electrical and mechanical products) such as lock wrenches,

door closer wrenches, dogging keys, etc.

.2 Properly tag all keys and tools, giving names of equipment, hardware, or item to which they are used.

.4 Deliver all items to Site or location as directed by Contract Administrator.

.5 Receive and catalogue all items, and submit inventory listing to Contract Administrator. Include copy of inventory listing in Operation and Maintenance Manuals.

.6 Obtain receipt of delivered spare parts, maintenance and extra materials from Contract Administrator and submit with request for final payment.

.3 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 paints and freezable materials in heated and ventilated room.

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

.4 Operation And Maintenance Manuals

.1 Operation and maintenance instructions and technical data to be sufficiently detailed with respect to design elements, construction features, component function, correct installation procedure and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation. Technical data to be in form of approved shop drawings, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists.

.2 Combine operating and maintenance information of various components in binders with the project name identified on the cover. Divide the manual into appropriate sections for the components the information pertains to.

.3 Submit 3 complete copies of operating and maintenance manuals to the Contract Administrator for review. Revise initial manual as required by the Contract Administrator prior to final submission. Re-submit 6 complete copies. If there are no corrections, additions or revisions required to the original submission, provide 3 additional complete copies to the Contract Administrator.

.5 Warranties And Bonds

.1 Provide warranties and bonds as specified.

.2 Assemble warranties and bonds, executed by each of respective manufacturers, suppliers, and subcontractors.

.3 Provide Table of Contents neatly typed, in orderly sequence. Provide complete information for each item:

.1 Product or work item.
.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
.3 Date of beginning of warranty or bond.
.4 Duration of warranty or bond.
.5 Proper procedure in case of failure.
.6 Instances which might affect validity of warranty or bond.

.6 Except for items put into use with Contract Administrator's permission, leave date of beginning of time of warranty until Date of Total Performance is determined.

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

.8 Co-execute submittals when required.

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

.10 Submit with Contractor's Application for Certificate of Total Performance, warranties and bonds as required, executed in duplicate by subcontractors, suppliers, and manufacturers.

.11 For items of Work, where acceptance is delayed materially beyond Date of Total Performance, provide updated submittal within 10 calendar days after acceptance, listing date of acceptance as start of warranty period.

1.31 Equipment Installation

.1 Intent

. 1 This Section describes general requirements for all equipment supplied under the Contract relating to the supervision of installation, testing, operation, and performance verification. The Contractor shall be responsible for the supply, installation, testing, operation, and performance verification of the specified equipment.

.2 Definitions

.1 Manufacturer: the manufacturer is the person, partnership, or corporation responsible for the manufacture and fabrication of equipment provided to the Contractor for the completion of the Work.

.2 Manufacturer's Representative: the manufacturer's representative is a trained

serviceman empowered by the manufacturer to provide installation, testing, and commissioning assistance to the Contractor in his performance of these functions.

.3 Expertise and Responsibility

.1 The Contract Administrator recognizes the expertise of the manufacturer.

.2 Should the Contract Administrator issue a Field Order, Authorization for Contract Change, or Instruction to Change the Work, which would, in the opinion of the Contractor, compromise the success or safety of the Work, then it shall be incumbent on the Contractor to notify in writing the Contract Administrator to this effect within two days.

.4 Equipment Delivery

.1 Equipment shall be delivered to the construction Site to the Contractor who shall be responsible for taking delivery off-loading, and placing into storage of the equipment. Any minor damage identified during inspection of delivered materials shall be repaired as per the manufacturer's recommendations by the Contractor at no cost to the City. Any severe damage will be grounds for rejection of the equipment. Severely damaged equipment will be replaced at no cost to the City.

.2 Ten days before delivery, notice shall be given to the Contract Administrator so that arrangements for receipt and for inspection can be made. The shipping lists of materials will be carefully checked by the supplier in the presence of the Contract Administrator and the Contractor.

.4 The Contractor shall ensure that he is fully informed of precautions to be taken in the unloading of equipment and its subsequent storage.

.5 Installation Assistance

.1 Before commencing installation of equipment, the Contractor shall arrange for the attendance of the manufacturer's representative to provide instructions in the methods, techniques, precautions, and any other information relevant to the successful installation of the equipment.

.6 Installation

.1 Install all equipment as defined in the Specifications. If necessary, or if so directed by the Contract Administrator during the course of installation, contact the manufacturer to receive clarification of installation procedures, direction, or any other additional information necessary to continue or complete the installation in an appropriate manner.

.2 If it is found necessary, or if so directed by the Contract Administrator, arrange for the manufacturer's representative to visit the Site to provide assistance during installation.

.3 Prior to completing installation, inform the manufacturer and arrange for the

attendance at the Site of the manufacturer's representative to verify successful installation.

.4 The manufacturer's representative shall conduct a detailed inspection of the installation including alignment, electrical connections, rotation direction, running clearances, lubrication, workmanship, and all other items as required to ensure successful operation of the equipment.

.5 The manufacturer's representative shall identify any outstanding deficiencies in the installation.

.6 The deficiencies shall be rectified by the Contractor and the manufacturer's representative will be required to re-inspect the installation, at no cost to the City.

.7 Operation and Performance Verification

.1 Equipment will be subjected to a demonstration, running test, and performance tests after the installation has been verified and any identified deficiencies have been remedied.

.2 Inform the Contract Administrator at least 14 days in advance of conducting the tests and arrange for the attendance of the manufacturer's representative. The tests may be concurrent with the inspection of satisfactory installation if mutually agreed by the Contractor and the Contract Administrator.

.3 The manufacturer's representative will conduct all necessary checks to equipment and if necessary, advise the Contractor of any further checking, flushing, cleaning, or other Work needed prior to confirming the equipment is ready to run.

.4 Then operate the equipment for at least one hour to demonstrate the operation of the equipment and any required ancillary services. Any remedial measures required to ensure satisfactory operation shall be promptly undertaken.

.5 Then notify the Contract Administrator of readiness to demonstrate the operation of the equipment. The Contract Administrator shall attend, as expeditiously as possible.

.6 With the assistance of the manufacturer's representative, demonstrate that the equipment is properly installed. Alignment, piping connections, electrical connections, etc., will be checked and if appropriate, code certifications provided.

.7 The equipment shall then be run for one hour. Local controls shall be satisfactorily verified by cycling the equipment through several start-stop operations, modulating its output, or some combination. Operating parameters such as temperature, pressure, voltage, vibration, etc., will be checked to ensure that they are within the specified or manufacturer's recommended limits, whichever is more stringent.

.8 On satisfactory completion of the one-hour demonstration, the equipment will be stopped and critical parameters, such as alignment, will be rechecked.

.9 Then restart and run continuously for three days. During this period, as practicable, conditions will be simulated which represent maximum or most severe, average, and minimum or least severe conditions. These conditions will

be mutually agreed by the manufacturer's representative, the Contractor, and Contract Administrator on the basis of the information contained in the Specifications, as well as the methods utilized to create the simulated conditions and the time periods allotted to each.

.10 Performance tests will be conducted either concurrent with or subsequent to the running test, as practicable and agreed between the Contract Administrator, the manufacturer's representative, and the Contractor.

.11 Performance tests shall be as dictated in the Specifications for each item of equipment or as reasonably required by the Contract Administrator to prove adherence to the requirements listed in the Specification.

.12 Submit the results of the performance tests to the Contract Administrator, documented in a format acceptable to the Contract Administrator. The Contract Administrator reserves the right to request additional testing. No equipment shall be accepted and handed over to the City prior to the satisfactory completion of the performance tests and receipt of the test reports.

.13 All water, chemicals, temporary power, heating, or any other ancillary services required to complete the initial demonstration, running test and performance tests are the responsibility of the Contractor.

.14 Should the initial demonstration, running test or performance tests reveal any defects, then those defects shall be promptly rectified and the demonstration, running tests, and/or performance tests shall be repeated to the satisfaction of the Contract Administrator. Additional costs incurred by the Contractor, the Contract Administrator, or the City, due to repeat demonstration, running tests, and/or performance tests shall be the responsibility of the Contractor.

1.32 Training

.1 Description

.1 This Section contains requirements for training the City staff, by persons retained by the Contractor specifically for the purpose, in the proper operation and maintenance of the equipment and systems installed under this Contract.

.2 Training sessions are required during the equipment testing.

.3 As a minimum, the Contractor is to allow at least four hours of training per shift, as required for each item of equipment or system. Refer to the equipment Specifications for specific time periods.

.4 The intent is that the City should receive sufficient training on the equipment and systems that they are going to operate and maintain. The Contract Administrator shall have the authority to determine the duration and content of each training session required.

.2 Quality Assurance

.1 Where required by the equipment Specifications, provide on-the-job training of the City staff. Training sessions will be conducted by qualified factory-trained representatives of the various equipment suppliers with a minimum of two years experience. Training includes instruction of City staff in equipment operation and preventive maintenance and instruction on mechanics, electricians, instrumentation, and communications technicians in normal maintenance up to major repair.

.2 The trainers proposed by the Contractor shall be experienced in training plant operators and shall have relevant experience in similar Work.

.3 Submittals

.1 Submit the following information in accordance with this Section. For phased testing and start-up activities, separate submittals can be prepared for equipment items or systems. The material will receive a "REVIEWED" or "REVIEWED AS MODIFIED" status by the Contract Administrator no later than four weeks prior to delivery of the training:

.1 Lesson plans and training manuals, handouts, visual aids, and other reference materials for each training session to be conducted by the Contractor's trainer(s).

.2 Date, time, and subject of each training session.

.3 Training schedule. Concurrent classes will not be allowed.

.4 Location

.1 Where specified, conduct training sessions for the City staff, operations and maintenance personnel, on the operation, care, and maintenance of the equipment and systems installed under this Contract. Training will take place at the Site of the Work and under the conditions specified in the following paragraphs.

.2 Field training sessions will take place at the Site of the equipment. Classroom training is to take place in the Contractor’s site trailer. The Contract Administrator may direct the classroom training to take place at another suitable location.

.5 Lesson Plans

.1 Prepare formal written lesson plans for each training session and coordinate with the Contract Administrator. Lesson plans to contain an outline of the material to be presented along with a description of visual aids to be utilized during the session. Each plan will contain a time allocation for each subject. Furnish ten (10) copies of necessary training manuals, handouts, visual aids, and reference materials at least two weeks prior to each training session.

.6 Format and Content

.1 Include time in the classroom and at the location of the equipment or system for each training session. As a minimum, cover the following topics for each item of equipment or system:

.1 Familiarization
.2 Safety
.3 Operation
.4 Troubleshooting
.5 Preventive maintenance
.6 Corrective maintenance
.7 Parts
.8 Local representatives

.7 Video Recording

.1 Advise all suppliers providing training sessions that the training material may be videotaped. The City may record each training session, and the material may be edited and supplemented with professionally produced graphics to provide a permanent record for the City's use.

.8 General Requirements

.1 Conduct training in conjunction with the equipment testing period. Schedule classes such that classroom sessions are interspersed with field instruction in logical sequence. Arrange to have the training conducted on consecutive days, with no more than four hours of classes scheduled for any one shift.

.2 Provide final O&M Manuals, as defined in Section 1.24, for the specific equipment to the City at least four weeks prior to the start of any training. (Video recording may take place concurrently with all training session).

.9 Operator Classroom Training

.1 As a minimum, classroom equipment training for operations personnel will include:

.1 The equipment's specific location in the plant and an operational overview. Use slides and drawings to aid discussion.

.2 Purpose and plant function of the equipment.
.3 The operating theory of the equipment.

.4 Start-up, shutdown, normal operation, and emergency operating procedures, including system integration and electrical interlocks, if any.

.5 Safety items and procedures.

.6 Routine preventive maintenance.

.7 Operator detection, without test instruments, of specific equipment trouble symptoms.

.8 Required equipment exercise procedures and intervals.

.9 Routine disassembly and assembly of equipment if applicable for purposes such as operator inspection of equipment.

.10 Exam.

.10 Operator Hands-On Training

.1 As a minimum, hands-on equipment training for operations personnel will include:

.1 Identifying instrumentation: location of primary element; location of instrument readout; discuss purpose, basic operation, and information interpretation.

.2 Discussing, demonstrating, and performing standard operating procedures and daily visual inspection of system operation.

.3 Discussing and performing the preventive maintenance activities.

.4 Discussing and performing start-up and shutdown procedures.

.5 Performing the required equipment exercise procedures.

.6 Performing routine disassembly and assembly of equipment if applicable.

.7 Identifying and reviewing safety items and performing safety procedures, if feasible.

.11 Maintenance Classroom Training

. 1 Classroom equipment training for the maintenance and repair personnel will include:

.1 Basic theory of operation.

.2 Description and function of equipment.
.3 Routine start-up and shutdown procedures.

.4 Normal and major repair procedures.

.5 Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.

.6 Routine and long-term calibration procedures.

.7 Safety procedures.

. 8 Preventive maintenance and up to and including major repairs such as replacement of major equipment part(s) with the use of special tools.

.12 Maintenance Hands-on Training

.1 Hands-on equipment training for maintenance and repair personnel will include:

.1 Locating and identifying equipment components.

.2 Reviewing the equipment function and theory of operation.

.3 Reviewing normal repair procedures.

.4 Performing routine start-up and shutdown procedures.

.5 Reviewing and performing the safety procedures.

.6 Performing City approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.

.7 Reviewing and using Contractor's manuals in the hands-on training.

.13 Equipment and Systems for Training

.1 Provide training during the equipment testing period for the following equipment and systems:

.1 Sewage Pumps
.2 Magmeters
.3 Sewage Pump Soft Starts

.2 Coordinate and finalize with the Contract Administrator on training schedules and duration of each training session.

.14 Training Completion Forms and Payment

.1 Training for the Contract supplied equipment shall be conducted before the operation period.

.2 The Contract shall not be considered complete, for the purpose of issuing a Certificate of Substantial Performance, until the training has been provided.

1.33 Commissioning

.1 General

.1 At the time of commissioning, the Contract Administrator shall advise the Contractor of commissioning requirements.

.2 The Contractor shall refer to all Sections for details on commissioning procedures not included in this Section.

.3 Commissioning Support for the 3 process pumps will be provided by the pump supplier through an existing City Bid Opportunity.

.2 Intent

.1 This Section describes the Contractor's responsibilities in commissioning and handover of the process, electrical, and other systems to be installed as part of this Work.

.3 Definitions

.1 System: for the purpose of this Specification Section, a system shall be defined as the equipment, piping, controls, ancillary devices, electrical power, etc., which together perform a specific function at the facility.

.2 Commissioning: for the purpose of this Specification Section, commissioning shall be defined as the successful operation of a system in accordance with its design requirements for a period of 7 days, unless otherwise specified or authorized by the Contract Administrator

.3 Acceptance: for the purpose of this Specification Section, acceptance shall be defined as the formal turnover of a system to the City for their operation and maintenance. This shall occur after the successful end of commissioning of each system through a formal agreement between the Contract Administrator, the City, and the Contractor. Success of the commissioning period is determined by the Contract Administrator.

.4 Commissioning Team

.1 The Work of commissioning will be conducted by the Contractor, the City, and the Contract Administrator.

.2 The City's appointed staff shall represent process personnel and operating staff.

.3 The Contractor shall provide personnel representing the appropriate trades, including I&C personnel during the commissioning. These personnel shall be skilled workmen, able to expedite any minor repairs, adjustments, etc., as, required to complete commissioning with as few delays as possible.

.5 Commissioning Plan

.1 Develop a detailed methodology for the commissioning of each system at least 30 calendar days prior to planned start of commissioning. The plan shall be drafted by the Contractor and reviewed by the Contract Administrator and include the following:

.1 Detailed schedule of events, including but not limited to the schedule for completion of testing of all component parts of the system.

.2 Method for introducing process flow.

.3 Planned attendance schedule for manufacturer's representatives.

.4 Contingency plans in the event of a process malfunction.

.5 Drawings and sketches as required to illustrate the planned sequence of events.

.6 List and details for any temporary equipment required to facilitate Commissioning.

.7 List of all personnel required for commissioning and handover with information indicating their qualifications for this Work.

.2 The commissioning plan shall be reviewed prior to its implementation. The Contract Administrator shall be the final arbiter.

.6 Equipment

.1 All process, mechanical, electrical, control, and miscellaneous equipment related to a system shall be successfully installed and tested in accordance with Section 1.25 and any specific requirements noted in other Sections.

.2 O&M Manuals will be submitted and then reviewed by the Contract Administrator.

.3 Staff training sessions shall be completed.

.4 Temporary equipment will be installed and tested as necessary to ensure that it functions reliably and consistently through the commissioning period.

.7 Controls

.1 All controls which are the responsibility of this Contractor shall be installed and tested prior to commissioning.

.2 The Contract Administrator shall arrange for the simulation of the control sequences from the equipment under this scope, up to and including the terminations within the field termination enclosure (FTE) next to the RTU cabinet. All wiring, termination, verification and commissioning between the FTE and the RTU is by others. Every effort shall be made to ensure that the commissioning period provides for the full and comprehensive operation of the equipment under all anticipated normal and adverse operating conditions.

.8 Manpower

.1 Supply all staff required during commissioning as necessary to assist the City's staff in the operation of the station.

.2 Supply competent staff capable of maintaining, repairing, and adjusting the equipment and controls to achieve the intended design functions during the commissioning period.

.3 Ensure equipment manufacturer's representatives are available as necessary to certify adjustments in equipment, to guide in setting correct operating limits, and to generally provide input as required for the appropriate operation of the equipment.

.9 Operating Descriptions

. 1 Information outlining the operating requirements shall also be available from the Contract Administrator. The Contractor will review these descriptions and will make himself familiar with the requirements in order that he can undertake commissioning in an appropriate manner.

.10 Design Parameters

.1 Design parameters for the systems to be commissioned shall be as defined in the Specifications and/or the operating descriptions. The commissioning team will identify to the Contractor, which parameters shall be modified prior to commissioning and shall be responsible for any subsequent changes during the commissioning period.

.11 Preparation

.1 Each item of equipment included in the system to be commissioned shall be satisfactorily tested.

.2 Piping, wiring, and other conduit systems shall be finished and tested.

.3 Electrical connections shall be completed and inspected to the satisfaction of the governing authorities.

.4 All other regulatory inspections shall be completed to the satisfaction of the governing authorities.

.5 Control systems shall be completed and the related control software debugged.

.12 Sequence

.1 Systems shall be commissioned in a logical manner. Upstream components shall be commissioned first to the degree possible.

.2 The following sequence of events shall be followed:

.1 O&M Manuals shall be available at least 14 days prior to the start of commissioning.

.2 Initial operator training shall be undertaken prior to commissioning.

.3 Equipment performance tests shall be conducted successfully.

.4 Start and run system in manual mode.

.5 Turn separate items of equipment to automatic in a planned and logical manner. Ensure that the control system is operating the equipment in a manner which precludes damage of the equipment and which is consistent with the process operating requirements.

.6 Commence commissioning period of 7 days. The equipment shall operate continuously and successfully through the commissioning period. Minor failures shall not void the commissioning period. A minor failure is defined as one which does not present a safety hazard, does not impact overall process functioning and can be temporarily overcome by the use of available standby equipment. The commissioning period shall be re-started if a critical failure occurs. A critical failure shall be deemed as one, which prohibits the process from functioning successfully for an eight hour period or one, which creates a safety hazard.

.7 Upon completing the commissioning period, the system shall be granted formal acceptance by the Contract Administrator.

.13 Commissioning

.1 Water will be introduced to the system in a manner which precludes the damage of any equipment or structures.

.2 Twice during the commissioning period, plant component settings will be modified to ensure that the system is subjected to flows and loads as close to design conditions as possible. Where necessary to achieve this, flows to the area being commissioned will be augmented to exaggerate the naturally occurring flows and loads. Where it is necessary to modify settings outside the limits of this Contract area within the plant, coordinate the changes with plant staff.

.3 All components and systems shall be operated in the automatic/manual and the remote/local modes as required to prove proper operation.

.4 Ensure all bypasses and backup provisions function satisfactorily.

.5 All minor and major alarm conditions will be induced to ensure that the process reacts as intended and the applicable alarms are annunciated.

.14 Acceptance

.1 The commissioning of a system shall be considered acceptable when the process has operated in a stable manner, satisfying the design criteria for a period of 7 days of continuous operation.

.2 When a process system has been commissioned satisfactorily, the process system shall be formally accepted for operation and routine maintenance by the City's forces.

.3 An acceptance meeting must be held at the end of the 7 day test to confirm the status of each system.

Part 1 GENERAL

1.1 REFERENCES

.1 CSA International

.1 CAN/CSA-A82-[06], Fired Masonry Brick Made From Clay or Shale.

.2 CAN/CSA-A179-[04(R2009)], Mortar and Grout for Unit Masonry.

.3 CAN/CSA-A370-[04(R2009)], Connectors for Masonry.

.4 CAN/CSA A371-[04(R2009)], Masonry Construction for Buildings.

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

.1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Samples:

.1 Submit duplicate full size samples of masonry units.

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

.2 Store and protect masonry products from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MASONRY UNITS

.1 Burned clay brick: to CAN/CSA-A82.

.1 Type: to match existing.

.2 Grade: to match existing.

.3 Size: to match existing.

.4 Texture: to match existing.

2.2 REINFORCEMENT AND CONNECTORS

.1 Wire reinforcement: to CAN/CSA-A371.

.2 Connectors shall be corrosion resistant: to CAN/CSA-A370.

2.3 MORTAR AND GROUT

.1 Mortar: to CAN/CSA-A179.

.1 Colour: ground coloured natural aggregates or metallic oxide pigments.

.2 Mortar Type: S.

Part 3 EXECUTION

3.1 EXAMINATION

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

.1 Visually inspect substrate.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION

.1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.

.1 Bond: to match existing.

.2 Coursing height: to match existing.

.3 Jointing: tool to match existing where exposed or where paint or other finish coating is specified to provide smooth, compressed, concave surface].

.2 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.3 CONSTRUCTION

.1 Exposed masonry:

.1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.

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

.2 Building-in:

.1 Install masonry connectors and reinforcement.

.2 Install loose steel lintels over openings where indicated.

.3 Provision for movement:

.1 Leave 3 mm space below shelf angles.

.4 Interface with other work:

.1 Cut openings in existing work as indicated.

.2 Make good existing work. Use materials to match existing.

.5 Build in flashings in masonry in accordance with CAN/CSA-A371.

.1 Install flashings under steel angles over openings.

.2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:

.1 For masonry backing embed flashing 25 mm in joint.

.2 For wood frame backing, staple flashing to walls behind sheathing paper.

.3 Lap joints 150 mm and seal with adhesive.

.6 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

3.4 REINFORCING AND CONNECTING

.1 Install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371 and CSA S304.1 unless indicated otherwise.

.2 Prior to placing mortar and grout, obtain Contract Administrator's approval of placement of reinforcement and connectors.

3.5 BONDING AND TYING

.1 Bond walls of two or more wythes using metal connectors in accordance with CAN/CSA-A371, CSA S304.1 and as indicated.

.2 Tie masonry veneer to backing in accordance with NBC, CAN/CSA-A371, CSA S304.1 and as indicated.

3.6 GROUTING

.1 Grout masonry in accordance with CAN/CSA-A179, CAN/CSA-A371 and CSA S304.1 and as indicated.

3.7 ANCHORS

.1 Supply and install metal anchors.

3.8 LATERAL SUPPORT AND ANCHORAGE

.1 Supply and install lateral support and anchorage in accordance with CSA S304.1.

3.9 SITE TOLERANCES

.1 Tolerances of CAN/CSA-A371 apply.

3.10 FIELD QUALITY CONTROL

.1 Inspection will be carried out by Contract Administrator.

3.11 CLEANING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.12 PROTECTION

.1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.2 Repair damage to adjacent materials caused by masonry products installation.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

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

.1 ASTM C612-[04], Standard Specification for Mineral Fibre Block and Board Thermal Insulation.

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S702-[97], Standard for Thermal Insulation, Mineral Fibre, for Buildings.

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

.1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet.

.2 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 PRODUCTS

2.1 INSULATION

.1 Mineral fibre board: to ASTM C612.

.1 Type: IVA.

.2 Density: 64 kg/m³.

.3 Surfaces: unfaced.

.4 Thickness: as indicated.

.5 Size: 610mm x 1219mm.

.2 Acceptable product: Roxul Rockboard 40 or equal in accordance with B7.

2.2 ACCESSORIES

.1 Insulation clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

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 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 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.

3.3 EXAMINATION

.1 Examine substrates and immediately inform 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 Install mineral fibre insulation boards with insulation clips and disk,] per 600 x 1200 mm board minimum, fit boards tight, cut off fastener spindle 3 mm beyond disk.

3.5 CLEANING

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

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 ASTM International

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

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

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.32- [M77], Sheathing, Membrane, Breather Type.

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

.1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Samples:

.1 Submit 300 x 300 mm samples of each sheet metal material.

1.3 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect sheet metal roofing from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: to ASTM A653/A653M, commercial quality, with Z275 coating, smooth surface, prefinish, 24 gauge minimum base metal thickness.

2.2 PREFINISHED STEEL SHEET

.1 Prefinished steel with factory applied silicone modified polyester.

.1 Colour to match existing flood pump station parapet flashing from manufacturer's standard range.

.2 Acceptable products:

.1 Vicwest Prestige roofing (406mm width) or equal in accordance with B7.

.2 Titanium PSU 30 self-adhesive underlayment or equal in accordance with B7.

.3 Vented ridge cap, colour to match roof panels.

.4 Fascia to be 24 gauge minimum, colour to match roof panels.

2.3 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Underlay: dry sheathing to CAN/CGSB-51.32.

.3 Slip sheet: reinforced sisal paper or a heavy felt kraft paper.

.4 Sealant: Asbestos-free sealant, compatible with systems materials, recommended by system manufacturer.

.5 Rubber-asphalt sealing compound: to CAN/CGSB-37.29.

.6 Cleats: of same material, and temper as sheet metal:[50] mm minimum wide.

.1 Thickness same as sheet metal being secured.

.7 Fasteners: concealed.

.8 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.9 Touch-up paint: as recommended by sheet metal roofing manufacturer.

2.4 FABRICATION

.1 Fabricate aluminum sheet metal in accordance with AA ASM-35.

.2 Hem exposed edges on underside 12 mm, mitre and seal.

.3 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.4 Protect disimilar metals against oxidization by backpainting with isolation coating where required.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of existing substrate are acceptable for sheet metal roofing installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION

.1 Use concealed fastenings except where approved in by roofing manufacturer.

.2 Include underlay under sheet metal roofing.

.1 Secure in place and lap joints 100 mm minimum.

.3 Apply slip sheet over underlay as recommended by roofing manufacturer to prevent bonding between sheet metal and felt.

.1 Secure with anchorage and lap joints 50 mm minimum in direction of waterflow.

.4 Install sheet metal roof panels as per manufacturer's written instructions.

.5 Flash roof penetrations with material matching roof panels, and make watertight.

.6 Form seams in direction of water-flow and make watertight.

3.3 CLEANING

.1 Progress Cleaning: clean exposed exterior surfaces in accordance with manufacturer's instructions.

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

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by sheet metal roofing installation.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

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

.1 Material Safety Data Sheets (MSDS).

.2 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - [current edition].

.2 Maintenance Repainting Manual - [current edition].

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Submit copy of WHMIS MSDS for products used.

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 Provide and maintain dry, temperature controlled, secure storage.

.2 Store painting materials and supplies away from heat generating devices.

.3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.

.4 Fire Safety Requirements:

.1 Supply 1, 9 kg, 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.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.4 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.

.2 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.

.3 Additional application requirements:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Supply paint materials for paint systems from single manufacturer.

.2 Conform to latest MPI requirements for painting work including preparation and priming.

.3 Materials in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.

.4 Colours:

.1 Exterior masonry – Red to match existing, adjacent flood pump house.

.2 Exterior Steel door – Red to match door on existing adjacent flood pump house door.

.3 Exterior wood details – White to match existing.

.4 Interior plywood walls and ceilings – Grey.

.5 Interior concrete walls – White to match existing.

.6 Interior guardrails, ladders and lifting beam – Safety yellow.

.7 Submit proposed Colour Schedule to Contract Administrator for review.

.5 Mixing and tinting:

.1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations.

.2 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.

.6 Gloss/sheen ratings:

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Gloss Level-Category	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish	Max. 5	Max. 10
Gloss Level 2 - Velvet	Max.10	10 to 35
Gloss Level 3 - Eggshell	10 to 25	10 to 35
Gloss Level 4 - Satin	20 to 35	min. 35
Gloss Level 5 - Semi-Gloss	35 to 70	

Gloss Level-Category	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 6 - Gloss	70 to 85	
Gloss Level 7 - High Gloss	More than 85	

.2 Gloss level ratings of painted surfaces as indicated.

.7 Painting Systems:

.1 Concrete Vertical Surfaces:

.1 EXT 3.1A – Latex G1 matte finish premium grade.

.2 Acceptable product: Sherwin Williams Multi-Purpose Primer or equal in accordance with B7.

.2 Clay Masonry Units: (pressed and extruded brick)

.1 EXT 4.1A – Latex G1 matte finish premium grade.

.2 Acceptable product: Sherwin Williams A-100 Exterior Latex

.3 Shop Primed Steel:

.1 MPI EXT 5.1D – Alkyd G5 semi-gloss finish premium grade.

.4 Plywood Paneling:

.1 MPI EXT 6.4B – Alkyd GR semi-gloss finish premium grade.

Part 3 EXECUTION

3.1 GENERAL

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

.2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual.

3.2 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Contract Administrator damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.3 PREPARATION

.1 Protection of in-place conditions:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Contract Administrator.

.2 Protect factory finished products and equipment.

.2 Surface Preparation:

.1 Remove electrical cover plates, light fixtures, surface hardware on doors and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.2 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Contract Administrator.

.3 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.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 1000 mm.

.6 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.

.7 Touch up of shop primers with primer as specified.

.8 Clean and roughen existing interior concrete walls using abrasive blasting (sandblasting or light brush shotblast). Sweep and pressure wash surface after blasting to remove dust and debris. Patch holes and cracks with filler. Surface should be free from moisture before application of paint.

3.4 APPLICATION

.1 Paint only after prepared surfaces have been accepted by Contract Administrator.

.2 Apply paint by brush, roller, airless sprayer. Conform to manufacturer's application recommendations.

.3 Apply coats of paint in continuous film of uniform thickness.

.1 Repaint thin spots or bare areas before next coat of paint is applied. Provide additional coats at no additional cost to the Contract.

.4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.5 Sand and dust between coats to remove visible defects.

.6 Finish 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.

.7 Mechanical/Electrical Equipment:

.1 Do not paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, unless indicated.

.2 Do not paint over nameplates.

.3 Paint both sides and edges of backboards for telephone and electrical equipment before installation.

.1 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.5 CLEANING

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

.2 Place paint and primer defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

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

.1 Material Safety Data Sheets (MSDS).

.2 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - [current edition].

.2 Maintenance Repainting Manual - [current edition].

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Submit copy of WHMIS MSDS for products used.

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 Provide and maintain dry, temperature controlled, secure storage.

.2 Store painting materials and supplies away from heat generating devices.

.3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.

1.4 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, manufacturer's prescribed limits.

.2 Apply paint to adequately prepared surfaces, when moisture content is below manufacturer's prescribed limits.

.3 Additional application requirements:

.1 Apply coating in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Graffiti-resistant coating: one component, water based, non-sacrificial, clear penetrating sealer and liquid repellent.

.1 Acceptable product: Fabrikem Fabrishield Paint Repellant, PR-60 for concrete and PR-61 for clay brick.

Part 3 EXECUTION

3.1 GENERAL

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

3.2 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted.

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.3 PREPARATION

.1 Protection of in-place conditions:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Contract Administrator.

.2 Protect factory finished products and equipment.

.2 Surface Preparation:

.1 Remove electrical cover plates, light fixtures, surface hardware on doors and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.2 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Contract Administrator.

3.4 APPLICATION

.1 Apply coating using low pressure spraying apparatus, at recommended coverage rate for product and substrate. Conform to manufacturer's application recommendations.

.2 Apply in uniform, even coat to fully wet substrate, without flooding or rundowns.

.3 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.4 Apply graffiti-resistant coating to clay brick and above grade concrete foundation as indicated on the drawings.

3.5 CLEANING

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

.2 Place coating defined as hazardous or toxic waste, including containers, in containers or areas designated for hazardous waste.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Division 01 shall apply to all work in Division 10.

1.2 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-[M90(R1995)], Rating and Fire Testing of Fire Extinguishers and Class "D" Extinguishing Media.

1.3 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01 00 00 - Submittal Procedures.

1.4 Closeout Submittals

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

1.5 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 00 00.

PART 2 PRODUCTS

1.6 Multi-Purpose Dry Chemical Extinguishers

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection,USCG approved with proper bracket, red powder paint finish, nameplates, rechargeable, pressure gauge, c/w wall mounting bracket.

.2 Size 4.5 kg.

.3 Acceptable product: Pyro-chem or a equal in accordance with B7.

1.7 Extinguisher Brackets

.1 Type recommended by extinguisher manufacturer.

1.8 Identification

.1 Identify extinguishers in accordance with recommendations of NFPA 10.

.2 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

PART 3 EXECUTION

1.9 Installation

.1 Install extinguishers in complete accordance with NFPA 10.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 22

1.2 Submittals

.1 Submittals in accordance with Section01 0000 –Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.

.3 Shop Drawings.

.1 Submit shop drawings to indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.

.2 Wiring and schematic diagrams.

.3 Dimensions and recommended installation.

.4 Pump performance and efficiency curves.

.4 Instructions: submit manufacturer's installation instructions.

.5 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section01 00 00 –Closeout Submittals, include:

.1 Manufacturers name, type, model year, capacity and serial number.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list with names and addresses.

PART 2 PRODUCTS

2.1 Sump Pump Submersible

.1 Capacity: as indicated on the drawings.

.2 Motor :as indicated, hermetically sealed.

.3 Specific Requirements:

.1 Pump Tag: SP-L51

.1 Motor:

.1 Internal over load protection.

.2 120VAC, 1Ø

.2 Power Cable:

.1 Heavy duty rated, oil and water resistant.

.2 Epoxy seal on motor end

.3 Length:3m

.3 Control: integral diaphragm type level control.

.4 Manufacturer and Model

.1 GouldsSP035V, Little Giant 6 series, or equal in accordance with B7.

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 Make piping and electrical connections to pump and motor assembly and controls as indicated on the drawings, and as per manufacturer instructions.

.2 Ensure pump and motor assembly do not support piping.

.3 Align vertical pit mounted pump assembly after mounting and securing coverplate.

3.3 Start-Up

.1 General:

.1 Procedures:

.1 Check power supply.

.2 Check starter O/L settings.

.3 Start pump, check impeller rotation.

.4 Check for safe and proper operation.

.5 Check on/off level control settings.

.6 Adjust alignment of piping and conduit to ensure full flexibility.

.7 Eliminate causes of cavitation, flashing, air entrainment.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 22

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

.1 National Plumbing Code of Canada(NPC)-2010.

1.2 Submittals

.1 Submittals in accordance with Section01 0000 –Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.3 Instructions: submit manufacturer's installation instructions.

.4 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section01 00 00 –Closeout Submittals.

1.3 Delivery, Storage And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

PART 2 PRODUCTS

2.1 Piping

.1 Domestic waters system:

.1 10 mm - .035” wall, seamless, 316 ss., A269
.2 13 mm - .049” wall, seamless, 316 ss., A269
.3 19 mm - .065” wall, seamless, 316 ss., A269

2.2 Fittings

.1 25 mm and smaller – Parker CPI or Swagelok instrumentation tube fittings, 316 ss.

2.3 Joints

.1 Dielectric connections between dissimilar metals: dielectric fitting to ASTMF492, complete with thermoplastic liner.

2.3 Sump Pump Ball Valves - PVC

.1 One-piece molded PVC body, threaded ends, quarter turn ball valve.

.2 Acceptable product: Nibco, or equal in accordance with B7.

2.4 Sump Pump Check Valves - PVC

.1 All plastic construction with elastomer seals – no metal parts. Threaded ends.

.2 Angled seat and weighted flapper for low-pressure seal. External flow arrow direction designation.

.3 Suitable for vertical up-flow or horizontal installations.

.4 Acceptable product: Spears, or equal in accordance with B7.

2.5 Ball Valves

.1 860 kPa minimum working pressure, stainless steel body and ball, 2 pc body, full port, NPT connections, PTFE seat.

.2 Acceptable Product: Flow-Tek, MAS, Apollo, or equal in accordance with B7.

PART3 EXECUTION

3.1 Installation

.1 Install in accordance with Manitoba Plumbing Code and local authority having jurisdiction.

.2 Assemble piping using fittings manufactured to ANSI standards.

.3 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.4 Provide system drain at low point.

3.2 Valves

.1 Isolate equipment, fixtures and branches with ball valves.

3.3 Pressure Tests

.1 Testpressure:To860 kPa.

3.4 Pre-Start-Up Inspections

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

3.5 Start-Up

.1 Timing: Start up after:
- .1 Pressure tests have been completed.
- .2 Disinfection procedures have been completed.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:
- .1 Establish circulation and ensure that air is eliminated.
- .2 Check backflow preventer for correct operation.

.4 Rectify start-up deficiencies.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 22

.2 ASTM International Inc.

.1 ASTM D2564-04(2009)e1, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-Series B1800-06, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.

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

.1 Material Safety Data Sheets (MSDS).

1.2 Submittals

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

.2 Instructions: submit manufacturer's installation instructions.

.3 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 00 00 - Closeout Submittals.

1.3 Delivery, Storage And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

PART 2 PRODUCTS

2.1 Piping And Fittings

.1 Sump pump piping to:

.1 CAN/CSA B1800.

2.2 Joints

.1 Solvent weld for PVC: to ASTM D2564.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with Manitoba Plumbing Code and local authority having jurisdiction.

3.2 Testing

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

3.3 Performance Verification

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (sump pump discharge) c/w directional arrowsevery floor or 4 m (whichever is less).

3.4 Cleaning

.1 Clean in accordance with Section 01 0000.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 22

.2 American Water Works Association (AWWA).

.1 AWWA C511-07, Reduced-Pressure Principle Backflow Prevention Assembly.

.3 Canadian Standards Association (CSA International).

.1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.

1.2 Submittals

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.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 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 00 00 –Closeout Submittals, Include:

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

PART2 PRODUCTS

2.1 Reduced-Pressure Back Flow Preventer

.1 Preventer: to current CSA-B64 Series, reduced pressure principle type.

.2 Valvebody: 316 stainless steel.

.3 End connections: threaded, NPT.

.4 Maximumworkingpressure:1207 kPa.

.5 Temperaturerange:0.5to 82°C.

.6 Shut off valve: full port, resilient seated, stainless steel ball valve with stainless steel ball valve test cock.

.7 Accessories: strainer, drain line air gap fitting.

.8 Acceptable material: Watts SS009M3QT-S or approved equal in accordance with B7.

2.2 Hose Bibbs And Sediment Faucets

.1 Stainless steel construction complete with garden hose thread spout, ¼ turn handle, screwed end.

.2 Acceptable Product: American Granby IHBB75SS, or equal in accordance with B7.

2.3 Automatic Air Vent

.1 Standard float vent: brass body and NPS 8mm connection and rated at 1034kPa working pressure.

.2 Integral vacuum breaker to permit air into system to facilitate draining.

.3 Acceptable Product: Watts FV-4, or equal in accordance with B7.

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 in accordance with the National Plumbing Code of Canada and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 Back Flow Preventer

.1 Install in accordancewithCSA-B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate at high level in Lower Level 1.

3.4 Hose Bibbs And Sediment Faucets

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.5 Strainer

.1 Install with sufficient room to remove basket.

3.6 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.

.2 Provide continuous supervision during start-up.

3.7 Testing And Adjusting

.1 Backflow preventer:

.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventer.

.3 Verify visibility of discharge from open ports.

.2 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 23.

1.2 Submittals

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

.2 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 00 00 - Submittal Procedures. Identify section and paragraph number.

.5 Closeout Submittals:

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

.6 Colour coding chart.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section

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- Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit 1 copy of draft Operation and Maintenance Manual to Contract Administrator for approval. Submission of individual data will not be accepted unless directed by Contract Administrator.

.2 Make changes as required and re-submit as directed by Contract Administrator.

.7 Additional data:

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

.8 Site records:

.1 Keep one (1) complete set of white prints at the site during work marking changes as work progresses and as changes occur, including all addenda, change orders, site instructions, clarifications and revisions for the purpose of As-Built Drawings.

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

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

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

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

.3 Submit to 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.

.10 Submit copies of as-built drawings for inclusion in final TAB (Testing, Adjusting & Balancing) report.

1.3 Maintenance

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

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

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

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

PART 2 PRODUCTS

2.1 Materials

.1 Not Applicable.

PART 3 EXECUTION

3.1 Painting Repairs And Restoration

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

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

3.2 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 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 and as-built drawings as part of instruction materials.

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

.4 The City may record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 23.

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

.1 ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.3 Electrical Equipment Manufacturers' Association Council (EEMAC)

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

.1 Material Safety Data Sheets (MSDS).

1.2 Submittals

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 00 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 00 00 - Submittal Procedures.

.3 Closeout Submittals

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 00 00 - Closeout Submittals.

1.3 Quality Assurance

.1 Regulatory Requirements: work to be performed in compliance with applicable Provincial regulations.

1.4 Delivery, Storage, And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

PART 2 PRODUCTS

2.1 GENERAL

.1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

2.2 Motors

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 373 W: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

2.3 Temporary Motors

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Contract Administrator for temporary use. Work will only be accepted when specified motor is installed.

2.4 Drive Guards

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;

- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
- .3 38 mm dia holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.-

.5 Guard for flexible coupling:

- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:

- .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

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 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

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 - 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 Cleaning

.1 Proceed in accordance with Section 01 00 00.

.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 Division 01 shall apply to all work in Division 23.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.

1.2 Submittals

.1 Product Data:

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

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:

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

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.3 Quality Assurance

.1 Quality assurance submittals: submit following in accordance with Section 01 00 00 - Submittal Procedures.

1.4 Delivery, Storage, And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

PART 2 PRODUCTS

2.1 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.

2.2 Identification Ductwork Systems

.1 50 mm high directional arrows 150 mm long x 50 mm high.

.2 Colours: black, or co-ordinated with base colour to ensure strong contrast.

2.3 Controls Components Identification

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

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 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.

3.3 Location Of Identification On Ductwork Systems

.1 On long straight runs in open areas:
at not more than 4 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 At least once in each small room through which ductwork passes.

.3 On both sides of visual obstruction or where run is difficult to follow.

.4 On both sides of separations such as walls, floors.

.5 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.

.6 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.

3.4 Cleaning

.1 Proceed in accordance with Section 01 00 00.

.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 Division 01 shall apply to all work in Division 23.

1.2 Definitions

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.3 Qualifications Of Tab Personnel

.1 Submit names of personnel to perform TAB to Contract Administrator within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

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 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 satisfaction of authority having jurisdiction.

1.6 Co-Ordination

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

1.7 Pre-Tab Review

.1 Review contract documents before project construction is started and confirm in writing to Contract Administrator adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Contract Administrator in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.8 Start-Up

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.9 Operation Of Systems During Tab

.1 Operate systems for length of time required for TAB and as required by Contract Administrator for verification of TAB reports.

1.10 Start Of Tab

.1 Notify Contract Administrator 3 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.1 Application of weatherstripping, sealing, and caulking.

.2 Provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts and air shafts are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

1.11 Application Tolerances

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 5%, minus 5%.

1.12 Accuracy Tolerances

.1 Measured values accurate to within plus or minus 2 % of actual values.

1.13 Instruments

.1 Prior to TAB, submit to Contract Administrator list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Contract Administrator.

1.14 Submittals

.1 Submit, prior to commencement of TAB proposed methodology and procedures for performing TAB if different from referenced standard.

1.15 Preliminary Tab Report

.1 Submit for checking and approval of Contract Administrator, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.16 Tab Report

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Submit 1 copy of TAB Report to Contract Administrator for verification and approval, in D-ring binders, complete with index tabs.

1.17 Verification

.1 Reported results subject to verification by Contract Administrator.

1.18 Settings

.1 After TAB is completed to satisfaction of Contract Administrator, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time.

1.19 Completion Of Tab

.1 TAB considered complete when final TAB Report received and approved by Contract Administrator.

1.20 Air Systems

.1 Standard: TAB to most stringent of TAB standards of AABC and SMACNA.

.2 Do TAB of following systems, equipment, components, controls:

.1 Supply Fan.

.2 Grilles.

.3 Dampers.

.4 Louvers.

.3 Qualifications: personnel performing TAB current member in good standing of AABC.

.4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC.

.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: to include as appropriate:

.1 Inlet and outlet of dampers, filter, coil, fan, other equipment causing changes in conditions.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, louvre or diffuser).

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 23.

.2 Definitions:

.1 For purposes of this section:

.1 "EXPOSED" - means "not concealed" as previously defined.

.2 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

.2 CRF: Code Rectangular Finish.

.3 Reference Standards:

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

.1 ANSI/ASHRAE/IESNA 90.1-07, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International Inc.

.1 ASTM C518-10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

.2 ASTM C209-10, Standard Test Methods for Cellulosic Fiber Insulating Board.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

.5 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 Action And Informational Submittals

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

.2 Product Data:

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

.3 Manufacturers' Instructions:

.1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

1.3 Quality Assurance

.1 Qualifications:

.1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, member of TIAC.

1.4 Delivery, Storage And Handling

.1 Deliver, store and handle in accordance with Section 01 00 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.

PART 2 PRODUCTS

2.1 Fire And Smoke Rating

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 Insulation

.1 Elastomeric Nitrile-rubber foam insulation that is closed cell, flexible, and has a built-in vapour barrier with silver finish (as scheduled in PART 3 of this Section).

.2 Insulation must have a thermal conductivity of $\leq$ 0.034 W/(m.K) at 0°C and $\leq$0.036 W/(m.K) at 24°C when measured according to ASTM C177, ASTM C518 or EN ISO 8497. Insulation must have water vapour permeability of 0.13 μgm/(N.h) when measured to BS4370-2:1993.

.3 Acceptable Product: Armacell Armaflex Duct

2.3 Accessories

.1 As necessary per manufacturer’s recommendations and printed instructions.

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 Pre-Installation Requirements

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are 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 as indicated.

.3 Hangers and supports in accordance with Section 23 31 14 - Metal Ducts - Low Pressure to 500 Pa.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

3.4 Ductwork Insulation Schedule

.1 Insulation types and thicknesses: conform to following table:

Location	Insulation	Vapour Retarder	Thickness (mm)
Outside air duct to duct heater	Armaflex	Built-in	25

3.5 Cleaning

.1 Clean in accordance with Section 01 00 00.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 23.

.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

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

.1 ASTM A480/A480M-10, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A635/A635M-09, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

.3 ASTM A653/A653M-09, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition 2005.

1.2 Submittals

.1 Submit shop drawings and product data in accordance with Section 01 00 00 - Submittal Procedures.

PART 2 PRODUCTS

2.1 Seal Classification

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C

.2 Seal classification:

.1 Class C: transverse joints and connections made air tight with tape. Longitudinal seams unsealed.

2.2 Sealant

.1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

2.3 Tape

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 Fittings

.1 Fabrication of all fittings, elbows, branches, transitions, etc.: to SMACNA.

2.5 Galvanized Steel

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA.

2.6 Hangers And Supports

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500.

.2 Hanger configuration: to SMACNA.

.3 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

PART 3 EXECUTION

3.1 General

.1 Do work in accordance with SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2 Hangers

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA

3.3 Sealing And Taping

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Division 01 shall apply to all work in Division 23.

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

.1 Material Safety Data Sheets (MSDS).

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2006.

1.2 Submittals

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:

.1 Flexible connections.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

.3 Instructions: submit manufacturer's installation instructions.

.4 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 00 00 - Closeout Submittals.

PART 2 PRODUCTS

2.1 General

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 Flexible Connections

.1 Frame: galvanized sheet metal frame 75 mm thick with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at -40°C to +90°C, density of 1.3 kg/m^2.

2.3 Access Doors In Ducts

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks.

2.4 Turning Vanes

.1 Factory or shop fabricated single thickness, to recommendations of SMACNA and as indicated.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

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

3.2 Installation

.1 Flexible Connections:

.1 Install in following locations:

.1 Inlet and outlet to supply air fan.

.2 Length of connection: 100 mm.

.3 Minimum distance between metal parts when system in operation: 75 mm.

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels:

.1 Size:

.1 150 x 150 mm for viewing.

.2 Locations:

.1 Control dampers.

.2 Devices requiring maintenance.

.3 Required by code.

.4 Heating coils.

.3 Instrument Test Ports:

.1 General:

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locations:

.1 For traverse readings:

.1 Inlets and outlets of fan systems.

.2 Main and sub-main ducts.

.4 Turning vanes:

.1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 Cleaning

.1 Perform cleaning operations as specified in Section 01 00 00 and in accordance with manufacturer's recommendations.

.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 Summary

.1 Section Includes:

.1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

1.2 References

.1 Division 01 shall apply to all work in Division 23.

.2 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 00 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Indicate the following:

.1 Performance data.

.2 Quality assurance submittals: submit following in accordance with Section 01 00 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.

.1 Contract Administrator will make available 1 copy of systems supplier's installation instructions.

.3 Closeout Submittals

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

1.4 Delivery, Storage, And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

PART 2 PRODUCTS

2.1 General

.1 Manufacture to SMACNA standards.

2.2 Manual Blast Gate (Slide) Balancing Dampers

.1 Size and configuration to recommendations of SMACNA.

.2 Locking screw for full volume control.

.3 Fabricated of same material as adjacent duct, complete with appropriate ends for round or rectangular ducting.

.4 Acceptable Product: Sheet Metal Connectors, Unitex, KB Duct or equal in accordance with B7.

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 where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Runouts to supply grilles: install balancing damper located as close as possible to main ducts.

.4 Dampers: vibration free.

.5 Ensure damper operators are observable and accessible.

.6 Mark balanced position on blast gate damper blade with permanent marker.

3.3 Cleaning

.1 Proceed in accordance with Section 01 00 00 - 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 Division 01 shall apply to all work in Division 23.

1.2 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 00 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Indicate the following:

.1 Performance data.

.2 Quality assurance submittals: submit following in accordance with Section 01 00 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.

.1 Contract Administrator will make available 1 copy of systems supplier's installation instructions.

.3 Closeout Submittals

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

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

PART 2 PRODUCTS

2.1 Multi-Leaf Dampers

.1 Opposed blade type as indicated.

.2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded thermally broken aluminum frame.

.3 Pressure fit self-lubricated bronze bearings.

.4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

.5 Operator:

.1 Provide spring return for "fail-safe" in normally closed position.

.2 Size operators to control dampers against maximum pressure or dynamic closing pressure, whichever is greater.

.3 Provide operators with adjustable spring and stroke. Provide adjustable external stops to limit stroke in either direction.

.6 Performance:

.1 Leakage: in closed position less than 15.2 l/s/m² of rated air flow at 250 Pa differential across damper.

.2 Pressure drop: at full open position less than 7 Pa differential across damper at 5.08 m/s.

.7 Refer to motorized damper schedule on drawings.

.8 Acceptable materials: Tamco 9000BF or equal in accordance with B7.

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 as shown on drawings.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.

3.3 Cleaning

.1 Proceed in accordance with Section 01 00 00.

.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 Division 01 shall apply to all work in Division 23.

.2 Air Conditioning and Mechanical Contractors (AMCA)

.1 AMCA Publication 99-2003, Standards Handbook.

.2 AMCA 300-2008, Reverberant Room Method for Sound Testing of Fans.

.3 AMCA 301-2006, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

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

.1 ANSI/AMCA 210-2007, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

1.2 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 in force.

.2 Capacity: flow rate, total static pressure, kW, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.

.3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.

.4 Sound ratings: comply with AMCA 301, tested to AMCA 300.

.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210. Supply unit with AMCA certified rating seal.

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 00 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Shop Drawings:

.1 Submit shop drawings and product data in accordance with Section 01 00 00 - Submittal Procedures.

.3 Provide :

.1 Fan performance curves showing point of operation, kW and efficiency.

.2 Sound rating data at point of operation.

.4 Indicate:

.1 Motors, sheaves, bearings, shaft details.

.5 Quality assurance submittals: submit following in accordance with Section 01 00 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.

.6 Closeout Submittals:

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

1.4 Maintenance

.1 Extra Materials:

.1 Furnish list of recommended spare parts for equipment, include:

.1 Bearings and seals.

.2 Addresses of suppliers.

.3 List of specialized tools necessary for adjusting, repairing or replacing.

1.5 Delivery, Storage, And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

PART 2 PRODUCTS

2.1 Fans General

.1 Motors:

.1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC Equipment supplemented as specified herein.

.2 For use with variable speed controllers.

.3 Sizes as indicated.

.2 Factory primed before assembly in colour standard to manufacturer.

.3 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

2.2 Inline Centrifugal Fan

.1 Duct mounted supply fan shall be of the centrifugal, direct-driven, inline type. The fan housing shall be of a square design constructed of heavy-gauge galvanized steel and shall include square duct mounting collars.

.2 The fan wheel shall be centrifugal, backward-inclined, constructed of aluminum, and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

.3 Provide speed controller, hangers, and vibration isolators.

.4 Acceptable product: Greenheck, Twin City, or equal in accordance with B7.

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 Fan Installation

.1 Install fans as indicated, complete with spring isolators, flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

.2 Bearings and extension tubes to be easily accessible.

3.3 Cleaning

.1 Proceed in accordance with Section 01 00 00.

.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 Division 01 shall apply to all work in Division 23.

1.2 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.

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 00 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Indicate following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.2 Quality assurance submittals: submit following in accordance with Section 01 00 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.

1.4 Delivery, Storage, And Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 00 00.

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

1.5 Maintenance

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 00 00 - Closeout Submittals.

.2 Include:

.1 Keys for volume control adjustment.

.2 Keys for air flow pattern adjustment.

PART 2 PRODUCTS

2.1 General

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level as indicated.

.2 Frames:

.1 Full perimeter gaskets.

.3 Concealed manual volume control damper operators.

.4 Finish and colour: as directed by Contract Administrator.

2.2 Manufactured Units

.1 Grilles, louvres, and diffusers of same generic type, products of one manufacturer.

2.3 Supply Grilles

.1 General: with opposed blade dampers.

.2 Type SC: steel, 32 mm border, single deflection with airfoil shape horizontal face bars.

.3 Acceptable materials: Price 510D or equal in accordance with B7.

2.4 Fixed Louvres - Aluminum

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: Drainable blades, 35° angle

.4 Frame, head, sill and jamb: 152 mm deep one piece extruded aluminum, minimum 2 mm thick.

.5 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.6 Screen: 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.7 Acceptable materials: E.H. Price DE635 or equal in accordance with B7.

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 in accordance with manufacturer’s instructions.

.2 Install with oval head cadmium plated screws in countersunk holes where fastenings are visible.

3.3 CLEANING

.1 Proceed in accordance with Section 01 00 00.

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

.1 ASHRAE 52.2-2007, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-115.18- M85, Filter, Air, Extended Area Panel Type, Medium Efficiency.

.3 Underwriters' Laboratories of Canada

.1 ULC -S111- 07, "Fire Tests for Air Filter Units".

1.2 Shop Drawings And Product Data

.1 Submit shop drawing and product data in accordance with Section 01 00 00 - Submittal Procedures.

1.3 Closeout Submittals

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

1.4 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01 00 00 - Closeout Submittals.

.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.

1.5 Extra Materials

.1 Spare filters: in addition to filters to be installed immediately prior to acceptance by Contract Administrator, supply 1 complete set of filters for each filter unit or filter bank in accordance with section 01 00 00 - Closeout Submittals.

PART 2 PRODUCTS

2.1 General

.1 Media: suitable for air at 100% RH and air temperatures between -40 and +50°C.

2.2 Accessories

.1 Holding frames: permanent channel section construction of extruded aluminum, 1.6 mm thick, except where specified otherwise.

.2 Seals: to ensure leakproof operation.

2.3 Cotton Panel Filters

.1 Disposable pleated reinforced cotton dry media: to CAN/CGSB 115.18.

.2 Holding frame: galvanized steel, or slide in channel for side access.

.3 Performance: MERV 8 to ASHRAE 52.2

.4 Nominal thickness:

.1 Size to ensure airflows shown on drawing can be maintained up to end of filter lifespan

.5 Fire Rated: to ULC -S111.

.6 Acceptable product: Camfil Farr 30/30 or equal in accordance with B7.

PART 3 EXECUTION

3.1 Installation General

.1 Install in accordance with manufacturer's recommendations and with adequate space for access, maintenance and replacement.

3.2 Replacement Media

.1 Replace all media with new upon acceptance.

.2 Filter media to be new and clean.

END OF SECTION

PART 1 GENERAL

1.1 Summary

.1 Section Includes:

.1 General requirements for Control Systems that are common to NMS Control Sections.

.2 Related Sections:

.1 Section 25 05 54 - Controls: Identification.

.2 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.2 References

.1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).

.1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).

.1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 Canadian Standards Association (CSA International).

.1 CAN/CSA-Z234.1-89(R1995), Canadian Metric Practice Guide.

.4 Electrical and Electronic Manufacturers Association (EEMAC).

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

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

.1 Material Safety Data Sheets (MSDS).

1.3 System Description

.1 The controls shall include but not be limited to:

.1 Magnetic flow meters (FIT-L011, FIT-L021 and FIT-L-031)

.2 Level transmitters (LIT-L100-1 and LIT-L100-2)

.3 Level switches (LSH-L511)

.4 Temperature transmitters (TT-L612 and TT-L614)

.5 RTU control panel

.6 Termination of control wiring to terminals within existing field termination section.

1.4 Scope of Control Work

.1 Design and installation to be in accordance with the City of Winnipeg Electrical Design Guide and Identification Standard, refer to Appendix E and F respectively.

.2 The Contractor shall engage a factory trained representative to supervise the installation, setup, calibrate and operationally verify and commission the following:

.1 Magnetic flow meters
.2 Differential pressure level transmitters
.3 Level switches
.4 Temperature transmitters
.5 RTU control panel

.3 The Contactor shall provide a certified instrument technician in order to operate all field devices that are wired to the RTU control panel in order for City of Winnipeg staff to verify the loop is correctly wired.

.4 The Contractor shall submit written reports identifying the commissioning work, together with any parameter settings and final adjustments.

.5 The Contractor is responsible for the supply and installation of the RTU control panel, termination of field wiring for power, controls and instrumentation to the terminals within the RTU control panel. All programming of the RTU control panel is to be provided by the contractor. Coordinate all remote interface and alarm points with City of Winnipeg.

1.5 Submittals

.1 Make submittals in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Submit for review:

.1 Equipment list and systems manufacturers 10 days after award of contract.

PART 2 PRODUCTS

.1 Not Used

PART 3 EXECUTION

3.1 Manufacturer's Recommendations

.1 Installation: to manufacturer's recommendations.

3.2 Painting

.1 Painting: as follows:

.1 Clean and touch up marred or scratched surfaces of factory finished equipment to match original finish.
.2 Restore to new condition, finished surfaces too extensively damaged to be primed and touched up to make good.
.3 Clean and prime exposed hangers, racks, fastenings, and other support components.
.4 Paint unfinished equipment installed indoors to EEMAC 2Y-1.

END OF SECTION

PART 1 GENERAL

1.1 Summary

.1 Section Includes.

.1 Requirements and procedures for identification of devices, sensors, wiring tubing, conduit and equipment, the Control System Work and nameplates materials, colours and lettering sizes.

.2 Related Sections.

.1 Section 25 05 01 - Controls: General Requirements.

.2 Section 26 05 01 - Common Work Results - Electrical.

.3 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.2 References

.1 Canadian Standards Association (CSA International).

.1 CSA C22.1-06, The Canadian Electrical Code, Part I (20th Edition), Safety Standard for Electrical Installations.

1.3 Definitions

.1 For acronyms and definitions refer to Section 25 05 01 - Controls: General Requirements.

1.4 System Description

.1 Language Operating Requirements: provide identification for control items in English.

1.5 Submittals

.1 Submittals in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions supplemented and modified by requirements of this Section.

.2 Submit to Contract Administrator for approval samples of nameplates, identification tags and list of proposed wording.

PART 2 PRODUCTS

2.1 Nameplates for Panels

.1 Provide panel identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Nameplate for each panel size 4 engraved as indicated.

.3 Nameplate for each panel mounted device size 2 engraved as indicated.

2.2 Nameplates for Field Devices

.1 Provide field device identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Nameplate for field device size 7 engraved as indicated.

.3 Nameplate shall be attached by chain.

2.3 Wiring

.1 Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets and outlet boxes.

.2 Colour coding: to CSA C22.1. Use colour coded wiring in communications cables, matched throughout system.

.3 Power wiring: identify circuit breaker panel/circuit breaker number inside each control panel.

PART 3 EXECUTION

3.1 Nameplates and Labels

.1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.

END OF SECTION

PART 1 GENERAL

1.1 Summary

.1 Section Includes:

.1 Control processors integral to the Control System: SCADA system, displays, HMI interface.

.2 Related Sections:

.1 Section 25 05 01 - Controls: General Requirements.

.2 Section 25 05 54 - Controls: Identification.

.3 Section 26 05 01 - Common Work Results - Electrical.

.4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

.5 Section 26 27 26 - Wiring Devices.

.6 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.2 References

.1 American National Standards Institute (ANSI).

.1 ANSI C12.7-1993(R1999), Requirements for Watthour Meter Sockets.

.2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.

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

.1 ASTM B148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.

.3 National Electrical Manufacturer's Association (NEMA).

.1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).

.4 Canadian Standards Association (CSA International).

.1 CSA-C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

1.3 Definitions

.1 Acronyms and Definitions: refer to Section 25 05 01 - Controls: General Requirements.

1.4 Submittals

.1 Submit shop drawings and manufacturer's installation instructions in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Pre-Installation Tests.

.1 Test all I/O points, components and wiring within the RTU control panel prior to shipment from control panel manufacturer. Replace devices not meeting specified performance.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

PART 2 PRODUCTS

2.1 General

.1 Control devices of each category to be of same type and manufacturer.

.2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant assembly.

.3 Operating conditions: 0 - 32 degrees C with 10 - 90 % RH (non-condensing) unless otherwise specified. Provide control panel environmental controls as required.

.4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.5 Control panel equipment to be unaffected by external transmitters including walkie talkies.

2.2 Process Controller

.1 Process Controller Requirements:

.1 32 bit controller
.2 32 MHz clock & integrated watchdog timer
.3 16MB flash ROM, 4MB CMOS RAM, 4kB EEPROM
.4 Analog inputs - five (5) selectable as 0-10VDC or 0-20mA with removable terminal blocks
.5 Analog output – two (2) at 0-20mA with removable terminal blocks
.6 Discrete inputs/outputs – 8 user selectable as dry contact inputs or open drain outputs, with removable terminal blocks
.7 Communication ports:
.1 Three (3) RS-232/485 serial ports,
.2 One (1) RJ-45 10/100Base-T Ethernet port
.3 Two (2) USB 2.0 compliant ports
.8 Power supply – 11 – 30 VDC, 12W at 24VDC maximum
.9 Three (3) year warranty

.2 Additional I/O Board:

.1 Analog inputs - eight (8) selectable as 0-10VDC or 0-20mA with removable terminal blocks
.2 Analog output – two (2) at 0-20mA with removable terminal blocks
.3 Discrete inputs – 32 at 12/24VDC, with removable terminal blocks
.4 Discrete outputs – 16 dry contact relay outputs, with removable terminal blocks

Approved Manufacture; Schneider Electric model TBUP357-1-A-2-0-A-B-2-0. No alternates will be accepted.

.3 Programming to be provided by contractor according to the control narrative. Contractor to coordinate all SCADA communication I/O points with City of Winnipeg between lift station control panel and the McPhillips Street control station

2.3 Level Display

.1 Level display to act as backup to the process controller and provide pump control based on water level.

.2 Requirements:

.1 Dual line 6 digit programmable display and function keys
.2 Front display and keypad to be rated NEMA 4X, IP65
.3 One (1) 4-20mA input
.4 Four (4) relay outputs
.5 12/24VDC input power
.6 Alarm status indicators

Approved Manufacturer; Precision Digital model PD6000-7R4

2.4 HMI Display

.1 Display to provide operator interface to view status and alarms of lift station.

.2 Requirements:

.1 Backlit colour LCD touchscreen panel.
.2 Display size 12.1 inch
.3 Application memory flash EPROM 32 MB
.4 Data backup SRAM 512kB with lithium battery
.5 Communication ports:
.1 Two (2) USB type A ports
.2 One (1) RS-232/422/485 through SUB-D 9 port
.3 One (1) RS-485 through RJ45 port
.4 One (1) Ethernet TCP/IP through RJ45 port
.6 30W, 24VDC power supply
.7 Flush mounting rated IP65 or NEMA 4X

Approved Manufacturer; Schneider Electric model Magelis XBT-GT

2.5 Surge Protection Device

.3 Maximum rated surge current – 20kA per phase

.4 Rated applications – ANSI-IEEE C62.41 Location C, B & A

.5 Fail safe design with dual component-level fusing

.6 ET recognized component under UL 1449 3rd Edition as a type 4 SPD

.7 Input frequency - 47 to 64 Hz

.8 Maximum continuous operating current – 15 amps

.9 Modes of protection – L-N, L-G, N-G

.10 Status indicating light

.11 Short circuit rating – 100kAIC short circuit current rating with a 15 amp Class T fuse

.12 Din-Rail mounted or screw down

.13 Acceptable material – Total Protection Solutions model LoadTrack LT-15A

2.6 UPS and Power Supply

.1 Combined power supply unit with UPS power backup

.2 120VAC input

.3 24VDC output, capable of delivering 2 amps for a duration of one hour with utility power failure

.4 Din-Rail mounted

.5 Acceptable material – Phoenix Contact model TRIO-PS/1AC/24DC/20

2.6 Panels

.1 Free-standing or wall mounted enamelled steel cabinets with hinged and key-locked front door.

.2 Multiple panels as required to handle requirements with additional space to accommodate 25% additional capacity as required by Contract Administrator without adding additional cabinets.

.3 Panels to be lockable with same key.

PART 3 EXECUTION

3.1 Installation

.1 Control panel to be manufactured within a CSA approved facility.

.2 Provide terminal blocks and wireways within control panel as required.

.3 Install panel in location as indicated on drawings.

.4 Connect all field wiring to control panel and terminate.

.5 Power to be applied to control panel after installation of panel is complete and all field wiring has been terminated and verified.

.6 Provide all programming for all components as required. Any and all custom objects or applications that have been used in the development of the programs for all devices shall have full source code turned over to The City. There shall be no custom objects that are locked preventing The City from modifying the object and/or application. No intellectual property rights on the programs, objects or applications are permitted. The City to have

full access to all aspects of programs, objects and applications. Provide a hard copy of all files to be included within the O&M manuals.

.7 Programming language shall be ladder logic format complete with full descriptions of all program elements and rungs.

3.3 Control Narrative

.1 Pump Controls (P-L01, P-L02, & P-L03):

.1 The RTU will monitor the following for each pump and provide indication on the HMI:

.1 Selector switch in Auto control mode

.2 Selector switch in Hand control mode

.3 Motor ready status

.4 Pump run status

.5 Pump fault status

.6 Selector switch in Bypass mode

.7 Control power status

.8 E-stop activated status

.9 Pump current consumption

The RTU will also provide an output signal to each pump for start/stop control, and indicate on the HMI the status of the start/stop command signal.

.2 The RTU will have start/stop control of a pump when the following conditions are met:

.1 None of the E-stop buttons are activated

.2 Pump ready status is confirmed

.3 No Pump fault status is detected

.4 Selector switch is in Auto control mode

.3 The RTU will start/stop the pumps based on water level within the wet well. All three (3) pumps will operate in a lead/lag fashion with rotating duty. Only two (2) pumps will be permitted to operate simultaneously. If any pump does not meet the criteria stated in item 2 above, that pump will be removed from the pump rotation until all criteria are met. The lead pump will start when the wet well level reaches 1 meter and shutdown when the level drops to 0.5 meters. The lag pump will start when the wet well level reaches 1.5 meters, and shutdown when the level drops to 1 meter. All start/stop setpoints shall be configurable through the HMI.

.4 The following alarms shall be generated on the HMI for each pump:

.1 E-stop activated

.2 Pump fault status

.3 Control power status

.4 Motor ready status

.2 Wet Well Level Controls:

.1 The level in the wet well will be monitored by two differential pressure transmitters. The RTU will select the higher level signal of the two. Both level signals will be indicated on the HMI.

.2 The following alarms shall be generated on the HMI based on the following level conditions:

.1 Wet well high level

.2 Wet well high-high level

.3 Difference between two level signals is greater than 0.2 meters

All level alarm setpoints shall be configurable through the HMI.

.3 Ventilation System Controls:

.1 The ventilation system consists of the following components:

.1 Supply fan SF-L61

.2 Fresh air damper FCV-L611-1

.3 Recirculation air damper FV-L611-2

.4 Exhaust air damper FCV-L611-3

.2 The RTU will monitor the following and provide indication on the HMI:

.1 Occupied/Unoccupied mode toggle switch

.2 Building internal temperature

.3 Supply fan run status

.4 Supply fan current switch status

The RTU will provide one (1) discrete output signal to control motorized dampers, FCV-L611-3 provide two (2) analog output signals to control the position of dampers FCV-L611-1 and FCV-L611-2.

.3 The ventilation system shall operate as follows:

.1 When in Occupied mode, the RTU will send an analog output to fully open FCV-L611-1, and send an analog output to fully close FCV-L611-2.

.2 When in Unoccupied mode, the RTU will send an analog output to dampers FCV-L611-1 and FCV-L611-2 to provide 75% recirculated air and 25% fresh air. The position of the dampers is to be determined during air balancing to provide the required fresh and recirculated air flows.

.3 When the building low temperature alarm is generated, the ventilation system shall engage the Unoccupied mode and energize the signal to close damper FV-L611-3.

.4 When the building high temperature alarm is generated, the ventilation system shall engage the Occupied mode.

.5 All temperature setpoints and damper position presets shall be configurable through the HMI.

.4 The following ventilation system alarms shall be generated on the HMI:

.1 Supply fan run status is OFF

.2 Supply fan low current

.3 Building low temperature

.4 Building high temperature

.4 CSO Chamber Controls:

.1 The CSO Chamber controls consist of the following components:

.1 Hydrostatic level transmitter LT-551

.2 Hydrovision flow transmitter FT-651

.2 The RTU will monitor the following and provide indication on the HMI:

.1 CSO chamber water level

.2 CSO chamber water flow

.3 CSO chamber water velocity

.3 The following alarms shall be generated on the HMI based on the following conditions:

.1 CSO chamber high level

.2 CSO chamber high-high level

.3 CSO chamber high flow

.4 CSO chamber high-high flow

All alarm setpoints shall be configurable through the HMI.

.5 Miscellaneous Controls:

.1 The RTU shall monitor the following instruments and provide indication on the HMI:

.1 Pump room high level switch

.2 Communitor chamber high level switch

.3 Pump P-L01 discharge flow rate

.4 Pump P-L02 discharge flow rate

.5 Pump P-L03 discharge flow rate

.6 MCC-L71 power supply status

.7 MCC surge protection status

.8 RTU panel UPS fault status

.9 RTU panel UPS battery mode status

.10 RTU panel UPS charging mode status

.11 RTU panel supply power status

.2 The following alarms shall be generated on the HMI:

.1 Pump room high level

.2 Communitor chamber flood

.3 MCC-L71 power failure

.4 MCC surge protection fault

.5 RTU panel UPS fault

.6 RTU panel supply power failure

3.2 Testing and Commissioning

.1 Calibrate and test control panel devices for accuracy and performance.

.2 Verify control system operates as specified in control narrative.

END OF SECTION

PART 1 GENERAL

1.1 Summary

.1 Section Includes:

.1 Instrumentation devices integral to the Control System: transmitters, sensors, controls, meters, switches, dampers, damper operators, valves, valve actuators, and low voltage current transformers.

.2 Related Sections:

.1 Section 25 05 01 - Controls: General Requirements.

.2 Section 25 05 54 - Controls: Identification.

.3 Section 26 05 01 - Common Work Results - Electrical.

.4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

.5 Section 26 27 26 - Wiring Devices.

.6 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.2 References

.1 American National Standards Institute (ANSI).

.1 ANSI C12.7-1993(R1999), Requirements for Watthour Meter Sockets.

.2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.

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

.1 ASTM B148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.

.3 National Electrical Manufacturer's Association (NEMA).

.1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).

.4 Canadian Standards Association (CSA International).

.1 CSA-C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

1.3 Definitions

.1 Acronyms and Definitions: refer to Section 25 05 01 - Controls: General Requirements.

1.4 Submittals

.1 Submit shop drawings and manufacturer's installation instructions in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Pre-Installation Tests.

.1 Submit samples at random from equipment shipped, as requested by Contract Administrator, for testing before installation. Replace devices not meeting specified performance and accuracy.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

PART 2 PRODUCTS

2.1 General

.1 Control devices of each category to be of same type and manufacturer.

.2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant assembly.

.3 Operating conditions: 0 - 32 degrees C with 10 - 90 % RH (non-condensing) unless otherwise specified.

.4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.5 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.

.6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

.7 Outdoor installations: use weatherproof construction in NEMA 4 enclosures.

2.2 Magnetic Flow Meter and Transmitter

.1 Magnetic Flow Meter Requirements:

.1 Magnetic Flowmeter Flow tube,
.2 Lining Material: Polyurethane,
.3 Electrode Material: 316L Stainless Steel,
.4 Electrode Type: Standard, Two Measurement Electrodes,
.5 Line Size: refer to mechanical drawings,
.6 Housing (electrode): Sealed, Welded Housing,
.7 Safety Approvals: FM/CSA Class 1, Div.2 Approval.

Approved Manufactures; Rosemount, Endress & Hauser, ABB, Yokogawa.

.2 Remote Magnetic Flow Transmitter Meter Requirements:

.1 Remote Magnetic Flow Meter,
.2 Transmitter Class: Standard,
.3 Surface mount
.4 Power supply: AC (90 to 250V AC, 60Hz),
.5 Outputs: 4-20 mA Digital Electronics (HART Protocol), field configurable to be active or passive,
.6 Saftey Approvals: FM/CSA Class 1 Div. 2,

.7 Display Option: Local Operator Interface (LOI)

Approved Manufactures; Rosemount, Endress & Hauser, ABB, Yokogawa.

2.3 Level Transmitter

.3 Level transmitter requirements:

.1 Differential pressure type.
.2 Cast aluminum epoxy painted housing with FM/CSA Class 1, Div.2 Approval.
.3 ¾" NPT electrical connections
.4 Rated pressure of 300 PSI
.5 38 mm process connection, coordinate with mechanical contractor
.6 316 stainless steel diaphragm and other components exposed to process
.7 2-wire with 4-20mA output, and HART protocol, scaled 0 to 3 meters of water head pressure
.8 Complete with local indication and shall be field configurable
.9 Provide a ¼ turn ball valve to isolate transmitter from process
.10 Coordinate with mechanical contractor for transmitter mounting

Approved Manufactures; Rosemount, Endress & Hauser, ABB, Yokogawa.

2.4 Temperature Transmitter

.1 Temperature transmitter requirements:

.1 Cast aluminum epoxy painted housing with FM/CSA Class 1, Div.2 Approval, complete with wall mounting brackets
.2 ¾" NPT electrical connections
.3 2-wire with 4-20mA output, and HART protocol, scaled -40 to +40 degrees Celsius
.4 Complete with local indication and shall be field configurable
.5 PT100 RTD sensor

.2 Approved Manufactures; Rosemount, Endress & Hauser, ABB, Yokogawa.

2.5 Wireless Discrete Transmitter and Receiver

.1 Wireless discrete transmitter requirements:

.1 Cast aluminum housing with polyurethane paint, rated IP67
.2 ½" NPT conduit entry
.3 Dual SPST dry contact inputs
.4 Battery powered with replaceable intrinsically safe power module with a maximum 10 year life

Acceptable material: Rosemount model 702DX-22D1-I6 with accessories as required.

.2 Wireless receiver requirements:

.1 Compatible with wireless discrete transmitter

.2 Suitable for up to 25 remote wireless devices

.3 Single Ethernet connection with Modbus TCP/IP protocol

.4 Modbus RTU via RS-485 serial communication

.5 Remote antenna

Acceptable material: Rosemount model 1410-A2A-D1-WL2-NA.

2.6 Electromechanical Relays

.1 In accordance with Section 26 29 03 – Control Devices

2.7 Watthour Meters and Current Transformers

.1 Requirements:

.1 Include three phases, test and terminal blocks for watthour meter connections and connections for monitoring of current. Accuracy: plus or minus 0.25 % of full scale.

.2 Watthour meter sockets: to ANSI C12.7.

.3 Potential and current transformers: to ANSI/IEEE C57.13.

.4 Potential transformers: provide two primary fuses.

.5 Demand meters: configure to measure demand at 15 minute intervals.

2.8 Panels

.1 Free-standing or wall mounted enamelled steel cabinets with hinged and key-locked front door as indicated on drawings.

.2 Multiple panels as required to handle requirements with additional space to accommodate 25% additional capacity as required by Contract Administrator without adding additional cabinets.

.3 Panels to be lockable with same key.

2.9 Wiring

.1 In accordance with Section 26 27 26 - Wiring Devices.

.2 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.

.3 Wiring must be continuous without joints.

.4 Sizes:

.1 Field wiring to digital device: #14 AWG Teck 90 Cu or RW90 Cu in conduit in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Analog input and output: shielded #18 minimum stranded twisted pair ACIC Cu.

PART 3 EXECUTION

3.1 Installation

.1 Instrument components are not specifically located on drawings, but located on drawings in the general vicinity. The instrument components shall be field located as defined by mechanical piping and in accordance with the following:

.1 Instrument components shall not be attached to vibrating equipment, but shall be remotely mounted to a solid structure or on approved instrument mounting stands.

.2 Location of instruments, when shown on the drawings, is only approximate. The Contractor is responsible for actual location of field devices and must avoid interferences between conduit, pipes, equipment and instruments while providing maximum accessibility.

.3 Locate instruments components at eye level and in an easily accessible location.

.4 Instrument components that must be removed for servicing shall be installed with re-usable connectors, unions and flexible conduit.

.5 Electrical connections and terminations for field instruments and other field devices shall be in strict compliance with the manufacturer's instructions and loop drawings. This will include wire, wire termination, labelling, rigid and flexible conduit, fittings, and seals where required.

.2 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in NEMA 12 enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.

.4 Support field-mounted panels, transmitters and sensors on wall or pipe stands with approved mounting brackets or stands at a nominal height of 1.4 meters off floor.

.5 For instruments with pre-terminated cable lengths provide a junction box as close as practical to connect with armoured cable or cable in conduit.

.6 Allow for a variation of 3 meters from locations of devices as shown on drawings without extra cost provided pertinent information is provided prior to installation. Exact location will be determined by the installation of piping and mechanical equipment.

.7 Threaded fastenings for mounting instrument components shall have either lock nuts or double nuts.

.8 Cover locally mounted instrument components, after installation, with plastic bags to protect then from dust, dirt, paint spray, insulation materials, etc. Protect from mechanical damage.

.9 Field instruments located out doors shall be winterized to prevent process or measurement fluids from freezing. The use of steam or electrical tracing, fill fluids, or enclosures will be shown on the Installation Detail drawings.

.10 All instrument signal wiring and 120 Vac wiring shall be run by the Contractor from the field instrument to the field device as shown on the loop drawings. This includes wiring, rigid and flexible conduit, fittings and seals where shown. Conduit penetrations are not permitted into the top of any field junction box.

.11 Electrical:

.1 Provide and route all instruments, power and control signal cabling.

.2 Complete installation in accordance with Section 26 05 01 - Common Work Results - Electrical.

.3 Refer to electrical control schematics included as part of control design schematics on drawings. Trace existing control wiring installation and provide updated wiring schematics including additions, deletions to control circuits for review by Contract Administrator before beginning Work.

.4 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

.5 Install communication wiring in conduit.

.1 Provide complete conduit system to link Building Controllers, field panels and OWS(s).

.2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.

.3 Maximum conduit fill not to exceed 40%.

.4 Design drawings do not show conduit layout.

.6 Install conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

3.2 Instrument Supports

.1 Clean and paint fabricated galvanized carbon steel mounting stands and brackets.

.2 Before a mounting stand is attached to a concrete floor the surface of the concrete to be in contact with grout shall be roughed and cleaned of all dirt, oil, grease and loose material.

3.3 Temperature and Humidity Sensors

.1 Stabilize to ensure minimum field adjustments or calibrations.

.2 Readily accessible and adaptable to each type of application to allow for quick easy replacement and servicing without special tools or skills.

3.4 Panels

.1 Arrange for conduit and tubing entry from bottom or either side.

.2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.

.3 Identify wiring and conduit clearly.

3.5 Calibration Tagging

.1 When satisfactorily inspected and calibrated, the item shall have a tag affixed to it in an immediately visible location, which shall indicate that the device has been calibrated, by whom and the date of the calibration. Calibration procedures and records shall be available to the Contract Administrator throughout the course of the project and shall be delivered to the Contract Administrator upon the completion of work.

3.6 Identification

.1 All field-mounted instrument items shall have an approved identification tag permanently attached by the Contractor upon completion of the initial inspection and calibration. This tag shall reflect the device's identification as shown on the appropriate drawing.

.2 The tag will be permanently attached to the instrument with screws, rivets, or stainless steel or Monel wire, as appropriate. If an instrument is inside a protective enclosure or mounted behind a panel, instrument identity tags shall be mounted twice, once on the instrument and again on the enclosure. All instruments mounted on a control panel shall have an identity tag mounted on the instrument body and again on the face of the panel below the instrument face.

.3 Identify field devices in accordance with Section 25 05 54 - Controls: Identification.

3.7 Testing and Commissioning

.1 Calibrate and test field devices for accuracy and performance.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 This section covers items common to sections of Division 26.

.2 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.2 References

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.2 EEMAC Y1-1-1955, Equipment Green Colour for Outdoor Electrical Equipment.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 Definitions

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

1.4 Design Requirements

.1 Operating voltages: to CAN3-C235.

.2 Design and installation to be in accordance with the City of Winnipeg Electrical Design Guide and Identification Standard, refer to Appendix E and F respectively.

.3 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.4 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 Submittals

.1 Submittals: in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Submit for review single line electrical diagrams and locate under plexiglass as indicated.

.1 Electrical distribution system in main electrical room.

.3 Shop drawings in accordance with the City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

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

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit copies of 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.

.6 If changes are required, notify Contract Administrator of these changes before they are made.

.4 Quality Control in accordance with the City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.1 Provide CSA certified equipment and material. 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.

.2 Submit test results of installed electrical systems and instrumentation.

.3 Permits and fees: in accordance with General Conditions of contract.

.4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.

.5 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.6 Quality Assurance

.1 Quality Assurance in accordance with the City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices 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.

1.7 Delivery, Storage and Handling

.1 Material Delivery Schedule: provide Contract Administrator with schedule within 2 weeks after award of Contract.

1.8 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling.

.2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.

.3 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

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

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

.6 Place materials defined as hazardous or toxic waste in designated containers.

.7 Ensure emptied containers are sealed and stored safely for disposal away from children.

.8 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.

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

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

.11 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Contract Administrator.

1.9 Care, Operation and Start-up

.1 Instruct Contract Administrator in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.10 Operating and Maintenance Manuals

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Service instructions: Including a list of spare parts and replacement parts and the names and addresses of all suppliers.

.3 Maintenance instructions: Including start up, proper adjustment, lubrication and shutdown procedures.

.4 Installation instructions.

.5 Operating instructions.

.6 Safety precautions.

.7 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Operating instructions have to be laminated and placed within the station next to its equipment. Operating instructions to be reviewed by Contract Administrator prior to laminating.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.11 Potential Asbestos Hazard

.1 There is some asbestos content in some of the existing building materials. Coordinate with other trades on precautions taken during demolition of existing electrical equipment.

PART 2 PRODUCTS

2.1 Materials And Equipment

.1 Provide material and equipment.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from Electrical Inspections Department before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.2 Electric Motors, Equipment And Controls

.1 Provide all power and control wiring and connections including mechanical control wiring as specified on mechanical and electrical drawings.

.2 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.3 Control wiring and conduit: in accordance with Section 250501 - Controls: General Requirements except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.3 Warning Signs

.1 Warning Signs: in accordance with requirements of Electrical Inspection Department and Contract Administrator.

.2 Decal signs, minimum size 175 x 250 mm.

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 and labels as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Contract Administrator prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with Size 3 labels engraved with equipment tag.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

2.6 Wiring Identification

.1 Identify wiring with permanent indelible identifying markings, using Electrovert Type Z cable markers (or equal in accordance with B7), 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.

.5 Use number coded wires in control cables, matched throughout system. Identify conductors with permanent indelible identifying markings, numbered on both ends.

.6 Use number coded pairs in instrument cables, matched throughout system. Pairs shall be also colour coded black and white for polarity indication. Identify conductor pairs with permanent identifying markings at both ends.

2.7 Finishes

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.

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

2.8 Electrical Single Line Diagrams

.1 Provide electrical single line diagrams under plexiglass as follows:

.1 Electrical distribution system: locate in main electrical room

.2 Drawings: 280 x 432 mm minimum size.

PART 3 EXECUTION

3.1 Installation

.1 Do complete installation in accordance with the current edition of the Canadian Electrical Code, CSA C22.1, except where specified otherwise.

.2 Do overhead and underground systems in accordance with the current edition of CSA C22.3 No.1 except where specified otherwise.

.3 Perform all work in accordance with local codes and bylaws.

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 Conduit and Cable Installation

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: pvc, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 Location of Outlets

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings, and as shown on the drawings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.5 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. Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1400 mm.

.2 Wall receptacles:

.1 General: 300 mm.

.2 Above top of continuous baseboard heater: 200 mm.

.3 Above top of counters or counter splash backs: 175 mm.

.4 In mechanical rooms: 1400 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 300 mm.

.5 Wall mounted telephone and interphone outlets: 1500 mm.

.6 Fire alarm stations: 1500 mm.

.7 Fire alarm bells: 2100 mm.

.8 Wall mounted speakers: 2100 mm.

3.6 Co-ordination of Protective Devices

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

3.7 Field Quality Control

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct and pay for the following tests in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.1 Point to point wire continuity test for all conductors.

.2 Power generation and distribution system including phasing, voltage, grounding and load balancing.

.3 Circuits originating from branch distribution panels.

.4 Lighting and its control.

.5 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.6 Systems: fire alarm system and communications.

.7 Test resistance to ground of the completed grounding electrode.

.8 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.4 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.

.5 Submit test results for Contract Administrator’s review.

3.8 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-C22.2 No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2 No.65-93(R1999), Wire Connectors.

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 Clamps or connectors for armoured cable and flexible conduit 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.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.3 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions

1.2 References

.1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131-M89(R1994), Type TECK 90 Cable.

1.3 Product Data

.1 Submit product data in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

PART 2 PRODUCTS

2.1 Building Wires

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

2.2 1 kV TECK90 Power Cable

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated. (#12 AWG minimum where not indicated)

.3 Insulation:

- .1 Type: ethylene propylene rubber.
- .2 Chemically cross-linked thermosetting polyethylene rated type RW90, 1000 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:

- .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 300 mm centers.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, explosion-proof approved for TECK cable.

2.3 600 V TECK90 Control Cable

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated. (#14 AWG minimum where not indicated)

.3 Insulation:

.1 Type: ethylene propylene rubber.

.2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 300 mm centers.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, explosion-proof approved for TECK cable.

2.4 300 V Instrument Cable – Armoured

.1 Conductors: #14 AWG, 7 strand concentric lay, Class B tinned copper, twisted pairs/triads.

.2 Insulation: PVC TW75, 75°C Wet, 105 °C Dry (-40 °C), 300 Volt.

.3 Twisted pairs/triads cabled with staggered lays.

.4 Shielding: Individual twisted pair(s)/triads Aluminum/mylar shield with ST drain wire, 100% shield. Overall aluminum/mylar shield with ST drain wire. Individual drain wires one size smaller than conductor AWG. Overall drain wire the same AWG as conductors.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material (90°C, -40°C).

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 300 mm centers to prevent cable from drooping.

.8 Connectors:

.1 Watertight, explosion proof approved for armoured cable.

2.5 Type RW90 Conductor

.1 In accordance with CSA C22.2 No.38

.2 Circuit conductors shall be concentric stranded soft copper, size as indicated (#12 AWG minimum where not indicated).

.3 Insulation to be chemically cross-lined thermosetting polyethylene rated type RW90 XLP, 1000V

.4 Suitable for installation in temperatures down to minus 40°C.

.5 90°C conductor operating temperature.

2.6 Type TEW Conductor

.1 Circuit conductors shall be stranded soft copper, as per ASTM B-3 and B-8.

.2 Insulation to be thermoplastic compound meeting the requirements of Canadian Standards Association Type TEW, per CSA 22.2 Part 1, No.127.

.3 Insulation rated to 600 Volts.

.4 Suitable for installation in temperatures down to minus 40°C

.5 105°C conductor operating temperature.

.6 Use #16 AWG for PLC cabinet internal wiring.

2.7 Wiring Identification

.1 Provide wiring identification in accordance with Section 26 05 01 – Common Work Results – For Electrical.

PART 3 EXECUTION

3.1 Installation of Building Wires

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

3.2 Installation of TECK Cable 0 -1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Install cable in trenches in accordance with the current edition of CSA C22.3 No.1 except where specified otherwise.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0-1000V.

3.3 Installation of Armoured Cables

.1 Group cables wherever possible.

.2 Install cable in trenches in accordance with the current edition of CSA C22.3 No.1 except where specified otherwise.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0-1000V.

3.4 Installation of Control Cables

.1 Install control cables in conduit.

.2 Ground control cable shield at one end only, and isolate opposite end.

.3 The ground conductor within control cables to be bonded to ground at both ends.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 26 05 01 - Common Work Results - Electrical.

1.2 References

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

1.3 Description

.1 Supply and install a complete grounding system. Securely and adequately ground all components of the electrical system in accordance with the requirements of all related sections in the current edition of the Canadian Electrical Code, CSA C22.1, as adopted by the Province of Manitoba.

.2 The system to consist of cables, ground rods, supports, and all necessary materials and inter-connections to provide a complete system. Measured resistance to ground of the network shall not exceed 5 ohms.

PART 2 PRODUCTS

2.1 Equipment

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as required.

.3 Rod electrodes: copper clad steel 19 mm diameter by 3 m long.

.4 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.

.5 Insulated grounding conductors: stranded copper type RW90 complete with a green jacket where indoors, and RWU90 complete with green jacket where installed underground as indicated on drawings.

.6 Ground bus: copper, size as required, complete with insulated supports, fastenings, connectors.

.7 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 Compression type conductor connectors.
- .4 Exothermic welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

PART 3 EXECUTION

3.1 Installation General

.1 Connect grounds to existing building grounding system.

.2 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.3 Install connectors in accordance with manufacturer's instructions.

.4 Protect exposed grounding conductors from mechanical injury.

.5 Make buried connections, and connections to ~~conductive water main,~~ electrodes, using copper welding by exothermic welding process.

.6 Use mechanical connectors for grounding connections to equipment provided with lugs.

.7 Soldered joints not permitted.

.8 Include a separate green ground wire in all power conduits including branch circuit wiring sized to Table 16 of the current edition of the Canadian Electrical Code.

.9 Expansion joints and telescoping sections of raceways shall be bonded using jumper cables as per the current edition of the Canadian Electrical Code.

.10 Use Burndy compression connectors or equal in accordance with B7 for all grounding splices and terminations unless otherwise shown on the Drawings. For bolted ground connections use Burndy Engineering Company's "Durium" hardware or equal in accordance with B7.

.11 Connect all transformer neutrals to the main building ground wire, using compression terminations.

.12 Install rigid conduit sleeves c/w bushings where ground wires pass through concrete slab.

.13 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.14 Connect building structural steel and metal siding to ground by welding copper to steel.

.15 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.16 Bond single conductor, metallic armoured cables to cabinet at supply end, and load end.

.17 Ground secondary service pedestals.

3.2 System And Circuit Grounding

.1 Install system and circuit grounding connections to neutral of secondary 120 V system.

3.3 Equipment Grounding

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

.2 All frames and metallic enclosures of all electrical equipment and electrically operated equipment shall be grounded through the conduit system and/or via a ground wire.

.3 All transformers, switchgear, motor control centres, panelboards and splitters fed from the main distribution center shall be grounded by grounding conductors sized in accordance with the current edition of the Canadian Electrical Code. The ground wire shall be terminated at each end with an appropriate grounding lug which shall be connected to the equipment ground bus.

.4 All sub panels such as lighting panels, local distribution panels, etc., shall be grounded with a green ground wire run back to the panel from which it is fed. The ground conductor shall be sized according to the current edition of the Canadian Electrical Code.

.5 All main distribution centres, switchgear, motor control centres, and all panels requiring equipment grounds shall contain a ground bus of adequate size, and tapped for lugs for the ground wire required.

.6 All motors shall be grounded by means of an adequately sized ground wire contained within the feeder conduit.

3.4 Field Quality Control

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Contract Administrator and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

PART 2 PRODUCTS

2.1 Support Channels

.1 U shape, size 41 x 41 mm, 2.5 mm thick, solid configuration surface mounted or suspended, hot-dipped galvanized steel.

PART 3 EXECUTION

3.1 Installation

.1 Secure equipment to solid concrete or steel structures.

.2 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors and to toggle bolts.

.3 Secure equipment to poured concrete with expandable inserts.

.4 Secure equipment to wood trusses with ¼" lag screws.

.5 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.6 Support equipment, conduit or armoured cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.7 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.8 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.9 For surface mounting of two or more conduits use channels at spacing as per Rule 12-1010(1) of the current edition of the Canadian Electrical Code.

.10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.12 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.13 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.

.14 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 Related Sections

.1 The City of Winnipeg Standard Construction Specification Section CW1110 – General Instructions

1.2 Shop Drawings And Product Data

.1 Submit shop drawings and product data for cabinets in accordance with The City of Winnipeg Standard Construction Specification Section CW1110 – General Instructions.

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 spare terminals on each set of lugs in splitters less than 400 A.

.4 EEMAC 12 or 4 enclosure rating.

2.2 Junction And Pull Boxes

.1 PVC construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

.3 EEMAC 4X enclosure rating.

2.3 Cabinets

.1 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing sheet steel backboard for surface mounting. EEMAC 12 or 4 enclosure rating.

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 2 m 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 30 m of conduit run between pull boxes.

3.3 Identification

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Install size 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, Safety Standard for Electrical Installations.

PART 2 PRODUCTS

2.1 Outlet and Conduit Boxes General

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates with gasket for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

.7 Complies with EEMAC type 4 when suitable cover or device is installed.

2.2 Conduit Boxes

.1 Cast FS or FD copper free aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle for rigid conduit or TECK Cable.

.2 Cast round copper free aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of light fixtures and junction boxes for rigid conduit or TECK Cable.

.3 PVC boxes for PVC conduit.

2.3 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 32 mm 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 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN/CSA C22.2 No. 18-98, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.

.3 CSA C22.2 No. 45-M1981(R1992), Rigid Metal Conduit.

.4 CSA C22.2 No. 211.2-M1984(R1999), Rigid PVC (Unplasticized) Conduit.

1.2 Preferences

.1 In general power and control wiring shall be by TECK or armoured cable. Where suitable, PVC or aluminum conduit may be used in wet areas and RGS may be used in dry areas.

PART 2 Products

2.1 Conduits

.1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.

.2 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.3 Minimum conduit size to be 21mm.

2.2 Conduit Fastenings

.1 One hole steel straps to secure surface conduits 53 mm and smaller. Two hole steel straps for conduits larger than 53 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at spacing as per Rule 12-1010 of the current edition of the Canadian Electrical Code for rigid metal conduit.

.4 Channel type supports for two or more conduits at spacing as per Rule 12-1114 of the current edition of the Canadian Electrical Code for PVC conduit.

.5 Threaded rods, 6 mm diameter to support suspended channels.

2.3 Conduit Fittings

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for 27 mm and larger conduits.

2.4 Expansion Fittings for Rigid Conduit

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection 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 Rigid aluminum conduits shall be used when there is the potential for mechanical damage. For example conduit running vertical between the different levels would be subject to potential mechanical damage on pump replacement.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.3 Surface mount conduits.

.4 Install conduit sealing fittings in hazardous areas. Fill with compound.

.5 Minimum conduit size for lighting and power circuits: 21 mm.

.6 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.7 Mechanically bend steel conduit over 21 mm dia.

.8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.9 Install fish cord in empty conduits.

.10 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.11 Dry conduits out before installing wire.

.12 Connect conduit to equipment securely to maintain continuity for the purpose of bonding to ground.

.13 Provide for expansion and contraction of the conduit system.

3.2 Surface Conduits

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on suspended or surface channels.

.4 Do not pass conduits through structural members except as indicated.

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 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-over's.

3.5 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 SECTION INCLUDES

.1 Materials and installation for service entrance board.

1.2 RELATED SECTIONS

.1 Section 01 00 00 – General Provisions.

.2 Section 26 05 01 - Common Work Results - Electrical.

1.3 REFERENCES

.1 CAN/CSA-C22.2 No.31-M89 (R2000), Switchgear Assemblies.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 00 00 – General Provisions.

.2 Indicate on shop drawings.

- .1 Floor anchoring method and foundation template.
- .2 Dimensioned cable entry and exit locations.
- .3 Dimensioned position and size of bus.
- .4 Overall length, height and depth.
- .5 Dimensioned layout of internal and front panel mounted components.

.3 Include time-current characteristic curves for circuit breakers and fuses.

1.5 QUALITY ASSURANCE

.1 Submit copies of certified test results.

1.6 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for service entrance board for incorporation into manual specified in Section 01 00 00 – General Provisions.

.2 Submit copies maintenance data for complete assembly including components.

1.7 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 00 00 – General Provisions.

Part 2 PRODUCTS

2.1 SERVICE ENTRANCE BOARD

.1 Service Entrance Board: to CAN/CSA-C22.2 No.31.

.2 Confirm access requirements, provide narrow depth board if required.

.3 Rating: as indicated on drawings.

.4 Cubicles: Pad mounted Type 3R or Type 4 enclosure, main breaker compartment to be arc resistant enclosure complete with arc vents as required.

.5 Barrier metering section from adjoining sections.

.6 Provision for installation of power supply authority metering in barriered section.

.7 Manitoba Hydro metering.

.8 Distribution section.

.9 Access panels with captive screws.

.10 Bus bars and main connections: 99.3% copper.

.11 Cable from load terminals of main breaker to metering section and cable from metering section to lugs of distribution section.

.12 Identify phases with colour coding.

.13 Stainless steel continuous hinged doors, internal 3-point latch and Type 316L stainless steel padlocking capabilities in 2 locations on doors.

2.2 MOULDED CASE CIRCUIT BREAKERS

.1 Refer to 26 28 21.

2.3 FUSIBLE DISCONNECTS AND FUSES

.1 N/A.

2.4 GROUNDING

.1 Copper ground bus extending full width of cubicles and located at bottom.

.2 Lugs at each end for size 4/0 grounding cable.

2.5 POWER SUPPLY AUTHORITY METERING

.1 Separate cubicle compartment and metal raceway for exclusive use of power supply authority metering.

.2 Mounting accessories and wiring for metering supplied by Contractor in accordance with power supply authority:

.1 potential transformers.

.2 current transformers.

.3 Watthour meter.

.4 Demand meter with kW.h register.

2.6 FINISHES

.1 Apply finishes in accordance with Section 26 05 01 - Common Work Results - Electrical.

.1 Service entrance board exterior: grey.

2.7 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Nameplates:

.1 White plate, black letters, size 7.

.2 Complete board labelled: "347/600V."

.3 Main disconnect labelled: "Main Breaker".

.4 Branch disconnects labelled: as indicated.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Locate service entrance board and fasten to fibreglass pad.

.2 Connect main secondary service to line terminals of main breaker.

.3 Connect load terminals of distribution breaker's to feeders.

.4 Check factory made connections for mechanical security and electrical continuity.

.5 Run grounding conductor 4/0 AWG bare copper from ground bus to ground rods indicated on drawings.

.6 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

.7 Provide labelling indicating “Arc-Fault Hazard” as per the NFPA requirements.

END OF SECTION

PART 1 GENERAL

1.1 Section Includes

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 Related Sections

.1 Section 26 05 01 - Common Work Results - Electrical.

.2 Section 26 28 21 - Moulded Case Circuit Breakers.

.3 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.3 References

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.29-M1989(R2000), Panelboards and enclosed Panelboards.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.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 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.

.2 250 V panelboards: Bus and breakers rated as indicated on drawings. 10 kA (symmetrical) interrupting capacity minimum.

.3 600 V panelboards: Bus and breakers rated as indicated on drawings. 25 kA (symmetrical) interrupting capacity minimum.

.4 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.

.5 Panelboards: tin plated copper mains, number of circuits, and number and size of branch circuit breakers as indicated.

.6 Two keys for each panelboard and key panelboards alike.

.7 Tin plated copper bus with neutral of same ampere rating as mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked grey enamel.

2.2 Breakers

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to City of Winnipeg.

2.3 Surge Protection Device

.1 Able to withstand a maximum surge current of 40 kA per phase.

.2 SCCR Rating of 120 kA.

.3 Acceptable Product: Square D Part No. SDSA3650

2.4 Equipment Identification

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.5 Acceptable Product

.1 Cuttler-Hammer, Square –D or equal in accordance with B7.

PART 3 EXECUTION

3.1 Installation

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Connect loads to circuits.

.3 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 26 29 10 – Motor Starters to 600 V

1.2 Submittals

.1 Provide submittals in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.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 and cleaning procedures.

.4 Submit shop drawings and 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.
- .6 Schematic and wiring diagrams.
- .7 Short circuit current rating

.5 Closeout Submittals: provide operation and maintenance data for motor control centre for incorporation into manual specified in Section 10000 - General Requirements, Closeout Submittals.

- .1 Include data for each type and style of starter.

1.3 Waste Management And Disposal

.1 Separate waste materials for reuse and recycling.

.2 Collect, package and store existing busbars, wireways, sills, copper ground straps and other associated components for recycling and reuse.

1.4 Extra Materials

.1 Provide maintenance materials in accordance with Section 10000 - General Requirements, Closeout Submittals.

Part 2 PRODUCTS

2.1 Metering

.1 Each MCC shall utilize a metering system capable of measuring and displaying at minimum the following on a digital display.

.1 Voltage L-N
.2 Voltage L-L
.3 Current per phase
.4 Watts
.5 VAr
.6 VA
.7 Frequency
.8 Power factor
.9 Watt hrs
.10 VAr hrs
.11 VA hrs

.2 Metering devices shall utilize three (3) current transformers and three (3) potential transformers.

.3 Separate potential transformer secondary fuses, shall be used for relaying and metering.

.4 Each meter to have at minimum 2 programmable 4-20 mA analog outputs and 2 programmable discrete relay outputs (pulse).

.5 The metering equipment shall be capable of transmitting all data via Modbus TCP protocol over an Ethernet network.

.6 Acceptable products include Cutler-Hammer, Allen-Bradley, Square-D or equal in accordance with B7.

2.2 General Description

.1 Compartmentalized vertical sections with common power busbars.

.2 Floor mounting, free standing, enclosed dead front.

.3 Indoor CSA 1 gasketted enclosure, front mounting.

.4 Class II, Type B.

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 305 mm 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 cover plates, in side of vertical sections for horizontal wiring between sections.

.7 Cables to enter at top and/or bottom as required.

.8 Removable lifting means.

.9 Provision for future extension of both ends of motor control centre including busbars without need for further drilling, cutting or preparation in field.

.10 Divide assembly for shipment to site, complete with hardware and instructions for re-assembly.

2.4 Sills

.1 Continuous channel iron floor sills for mounting bases with 19 mm diameter holes for bolts.

2.5 Busbars

.1 Main horizontal and branch vertical, three phase and neutral high conductivity tin plated copper busbars in separate compartment bare self-cooled, extending entire width and height of motor control centre, supported on insulators and rated:

.1 Main horizontal busbars: 600 A as indicated.

.2 Branch vertical busbars: 300 A as indicated.

.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 35 kA 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 Neutral Bus

.1 Provide a neutral connection plate isolated from ground and located as close a possible to the main incoming breaker.

2.7 Ground Bus

.1 Copper ground bus extending entire width of motor control centre.

.2 Vertical ground bus strap, full height of section, tied to horizontal ground bus, engaged by plug-in unit ground stab.

2.8 Motor Starters and Devices

.1 As per Section 26 29 10 – Motor Starters to 600 V.

.2 Quantity and ratings as per single line drawings.

2.9 Starter Unit Compartments

.1 Units EEMAC size 5 and smaller, circuit breaker units 225A and smaller, plug-in type with self-disconnect. Guide rail supports for units to ensure that stabs make positive contact with vertical bus. Provision for units to be installed or removed, off load, while buses energized.

.2 Unit mounting:

.1 Engaged position - unit stabbed into vertical bus.

.2 Withdrawn position - unit isolated from vertical bus but supported by structure. Terminal block accessible for electrical testing of starter.

.3 Provision for positive latching in either engaged or withdrawn position and padlocking in withdrawn position.

.4 Stab-on connectors free floating tin plated clips, self-aligning, backed up with steel springs.

.3 External operating handle of circuit switch interlocked with door to prevent door opening with switch in "on" position. Provision for 3 padlocks to lock operating handle in "off" position and lock door closed.

.4 Hinge unit doors on same side.

.5 Overload relays manually reset from front with door closed.

.6 Pushbuttons and indicating lights mounted on door front.

.7 Devices and components by one manufacturer to facilitate maintenance.

.8 Pull-apart terminal blocks for power and control to allow removal of starter units without removal of field wiring.

2.10 Wiring Identification

.1 Provide wiring identification in accordance with Section 26 05 01 - Common Work Results - For Electrical.

2.11 Equipment Identification

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - For Electrical.

.1 Motor control centre main nameplate: size No. 7, engraved “MCC-L71”.

.2 Individual compartment nameplates: size No. 5, engraved as indicated.

2.12 Finishes

.1 Apply finishes in accordance with Section 26 05 01 - Common Work Results - For 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.

2.14 Packaging

.1 Shipping sections to be packaged and braced to suit entry through existing doorway. Contractor to confirm if shipping sections must be positioned horizontally to suit entry through existing doorway, and manufacturer to provide packaging and bracing to suit.

2.15 Acceptable Product

.1 Cutler-Hammer, Allen-Bradley, Square-D or equal in accordance with B7.

Part 3 EXECUTION

3.1 Installation

.1 Set and secure motor control centre in place on channel bases, rigid, plumb and square to building floor and wall.

.2 Make field power and control connections as indicated.

.3 Ensure correct overload heater elements are installed.

3.2 Field Quality Control

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - For Electrical.

.2 Ensure moving and working parts are lubricated where required.

.3 Operate starters in sequence to prove satisfactory performance of motor control centre during 8 hours period.

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 26 05 01 - Common Work Results - Electrical.

.2 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions

1.3 References

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.42-99(R2002), General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA-C22.2 No.55-M1986(July 2001), Special Use Switches.

.4 CSA-C22.2 No.111-00, 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 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

PART 2 PRODUCTS

2.1 Switches

.1 20 A, 120 V, single pole, double pole, three-way, four-way industrial grade switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111 as required.

.2 Manually-operated general purpose ac switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver cadmium oxide contacts.

.3 Fully enclosed with urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 Brown toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

.5 Acceptable materials: Hubbell 1200 Series or equal in accordance with B7..

2.2 Receptacles

.1 Duplex receptacles, CSA type 5-15R and type 5-20R, 125 V, 15 A and 20 A respectively, U ground, to: CSA-C22.2 No.42 with following features:

- .1 Brown 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 back wired entrances, four side wiring screws.
- .5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:

- .1 Brown urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable materials: Hubbell 5252 or equal in accordance with B7.

2.3 Cover Plates

.1 Stainless steel or PVC cover plates for wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.5 Weatherproof double lift spring-loaded stainless steel or PVC cover plates, complete with gaskets for duplex receptacles as indicated on the drawings.

.6 Weatherproof spring-loaded stainless steel or PVC cover plates complete with gaskets for single receptacles or switches as indicated on the drawings.

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 switch is required in one location.
- .3 Mount toggle switches at height in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.4 Mount lighting fixture receptacles local to fixtures.

.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, circuit breakers, and ground-fault circuit-interrupters, fused circuit breakers, and accessory high-fault protectors.

1.2 Related Sections

.1 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.3 References

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-02, 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 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Include time-current characteristic curves for breakers with ampacity of 600 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

PART 2 PRODUCTS

2.1 Breakers General

.1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters, Fused circuit breakers, and Accessory high-fault protectors: to CSA C22.2 No. 5

.2 Bolt-on and Plug-in moulded case circuit breaker: quick-make, quick-break over center switching mechanism that is mechanically trip-free, for manual and automatic operation with temperature compensation for 40 degrees C ambient. Automatic tripping of the breaker shall be clearly indicated by the handler position. Contacts shall be non-welding silver alloy, and arc extinguishing shall be accomplished by means of DE-ION arc chutes.

.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 3-8 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

.6 Circuit breakers to have minimum symmetrical rms interrupting capacity rating as indicated on the drawings.

.7 Circuit breakers identified as MCP will operate on the magnetic principle with a current sensing element in each pole.

.8 Circuit breakers 600 A through 2500 A frame shall be Cutler-Hammer Series C with microprocessor-based RMS sensing trip units or equal in accordance with B7.

.1 Each moulded case circuit breaker microprocessor-based tripping system shall consist of three current transformers, and a flux-transfer shunt trip. The trip unit shall use microprocessor-based technology to provide the adjustable time-current protection functions. True RMS sensing circuit protection shall be achieved by analysing the secondary current signals received from the circuit breaker current transformers and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached.

.2 Interchangeable rating plugs shall establish the continuous trip ratings of each circuit breaker. Rating plugs shall be fixed. Rating plugs shall be interlocked such that a breaker cannot be closed and latched with the rating plug removed.

.3 The microprocessor-based trip unit shall have thermal memory capabilities to prevent the breaker from being reset following an overload condition until after a preset time delay.

.4 When the adjustable instantaneous setting is omitted, the trip unit shall be provided with an instantaneous override. Internal ground fault protection adjustable pick-up ratings shall not exceed 1200 amperes.

.5 Breakers shall have built-in test points for testing the long time delay, instantaneous, and ground fault functions of the breaker by means of a 120 Volt operated test set. Provide one test set capable of testing all breakers 600 ampere frame and above.

.6 System coordination shall be provided by the following microprocessor-based time-current curve shaping adjustments:

.1 Adjustable long time pick-up and delay.

.2 Adjustable short time pick-up and delay.

.3 Adjustable instantaneous pick-up.

.7 Circuit Breakers shall be Cutler-Hammer Series C circuit breakers, microprocessor-based RMS sensing trip units type Digitrip RMS 310 LSI or LSIG trip units or equal in accordance with B7.

.8 Accessories:

.1 Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

.9 Enclosure:

.1 All enclosed circuit breakers shall have EEMAC 12 general purpose enclosures.

.2 All enclosed circuit breakers shall have metal nameplates, front cover mounted, that contain a permanent record of catalog number and maximum rating. Provide handle mechanisms that are padlockable in the “OFF” position.

2.2 Thermal Magnetic Breakers

.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 Acceptable Product: Cutler-Hammer Series C or equal in accordance with B7.

2.3 Magnetic Breakers

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

PART 3 EXECUTION

3.1 Factory Testing

.1 Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of CSA standard.

3.2 Installation

.1 Install circuit breakers as indicated on drawings per the manufacturer's recommendations.

3.3 Field Settings

.1 The contractor shall perform field adjustments of the circuit breakers as required to place the equipment in final operating condition. The settings shall be in accordance with the drawings.

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 01 - Common Work Results - Electrical.

.2 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions

1.3 References

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.

.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 Submittals

.1 Submit product data in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

PART 2 PRODUCTS

2.1 Disconnect Switches

.1 Fusible, non-fusible, horsepower rated disconnect switch in CSA type 12 Enclosure, to CAN/CSA C22.2 No.4 sized as per drawings.

.2 Provision for padlocking in off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated on drawings.

.5 Fuseholders: to CSA C22.2 No.39 relocatable and suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

.8 Provide auxiliary SPST contact to open before circuit contacts open when switch handle is moved from on to off position.

2.2 Equipment Identification

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 EXECUTION

3.1 Installation

.1 Install disconnect switches complete with fuses if applicable.

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 26 05 01 - Common Work Results - Electrical.

.2 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.3 References

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.14-95(R2001), Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 1-2001, Industrial Control and Systems: General Requirements.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Include schematic, wiring, interconnection diagrams.

1.5 Quality Assurance

.1 Submit to Contract Administrator one copy of test results.

1.6 Waste Management And Disposal

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all 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 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

Part 2 PRODUCTS

2.1 AC Control Relays

.1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.

.2 Convertible contact type: contacts field convertible from NO to NC, electrically held, with poles to suit. Coil rating: 120 Vac. Contact rating: 120 Vac, 10 A minimum or 24 Vdc, 2 A minimum as required.

.3 Fixed contact plug-in type: general purpose with poles to suit. Coil rating: 120 V. Contact rating: 120 Vac, 10 A minimum or 24 Vdc, 2 A minimum as required.

.4 Relay to have visual status indication.

2.2 DC Control Relays

.1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.

.2 Convertible contact type: contacts field convertible from NO to NC, electrically held, with poles to suit. Coil rating: 24 Vdc. Contact rating: 120 Vac, 10 A minimum or 24 Vdc, 2 A minimum as required.

.3 Fixed contact plug-in type: general purpose with poles to suit. Coil rating: 24 Vdc. Contact rating: 120 Vac, 10 A minimum or 24 Vdc, 2 A minimum as required.

.4 Relay to have visual status indication.

2.3 Relay Accessories

.1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

2.4 Solid State Timing Relays

.1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact. Timing circuit and output contact completely encapsulated to protect against vibration, humidity and atmospheric contaminants.

.2 Operation: on-delay or off-delay, or as indicated on drawings.

.3 Supply voltage: 120 V, AC, 60 Hz.

.4 Temperature range: minus 20 degrees C to 60 degrees C.

.5 Output contact rating: maximum voltage 300 V AC or DC. Current: NEMA ICS 1.

.6 Timing ranges: minimum 1.0 s, maximum 12 minutes.

.7 Relay to have visual status indication.

2.5 Operator Control Stations

.1 Enclosure:

.1 In general CSA Type 4X, surface mounting.

2.6 Pushbuttons

.1 Heavy duty Oil tight. Operator extend type. Black, with 1-NO and 1-NC contacts rated at 2 A minimum, AC, labels as indicated. Stop pushbuttons coloured red, labelled as indicated.

2.7 Selector Switches

.1 Maintained, 2 or 3 position as required, labelled as indicated on drawings, heavy duty oil tight operators standard, contact arrangement as indicated, rated 120 V, 2 A minimum, or 24 Vdc, 2 A minimum as required.

2.8 Indicating Lights

.1 Heavy duty Oil tight, full voltage, LED type, lens colour as indicated, supply voltage: 120 V, lamp voltage: 120 V, labels as indicated.

2.9 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.

2.10 Control Circuit Transformers

.1 Single phase, dry type.

.2 Primary: 600 V, 60 Hz ac.

.3 Secondary: 120 V, AC.

.4 VA Rating: as required by loads plus 20%.

.5 Secondary fuse rating: as required by loads

.6 Close voltage regulation as required by magnet coils and solenoid valves.

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 01 - Common Work Results - Electrical.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

END OF SECTION

Part 1 GENERAL

1.1 Related Sections

.1 Section 26 05 01 - Common Work Results - Electrical.

1.2 References

.1 National Electrical Manufacturer's Association (NEMA)

.1 NEMA Standards Publication ICS 2-2000: Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

1.3 Shop Drawings And Product Data

.1 Submit shop drawings in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.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.

.6 Interconnection diagrams.

1.4 Closeout Submittals

.1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 01 00 00 - General Provisions, Closeout Submittals.

.2 Include operation and maintenance data for each type and style of starter.

1.5 Extra Materials

.1 Provide listed spare parts for each different size and type of starter:

.1 3 contacts, stationary.

.2 3 contacts, movable.

.3 1 contacts, auxiliary.

.4 1 control transformer.

.5 1 operating coil.

.6 2 fuses.

.7 10% indicating lamp bulbs used.

1.6 Waste Management And Disposal

.1 Separate and recycle waste materials.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 PRODUCTS

2.1 Materials

.1 Starters: to NEMA ICS 2-2000

2.2 Manual Motor Starters

.1 Three 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 Three overload heaters, manual reset, trip indicating handle.

.2 Accessories:

.1 Pushbutton: heavy duty oil tight labelled as indicated.

.2 Indicating light: heavy duty oil tight type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 Full Voltage Magnetic Starters

.1 NEMA rated magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Solid state 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.

.2 Combination type starters to include motor circuit interrupter with operating lever on outside of enclosure to control motor circuit interrupter, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 Pushbuttons and selector switches: heavy duty oil tight labelled as indicated.

.2 Indicating lights: LED full voltage, heavy duty oil tight type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.4 Electronic Soft Starters

.1 Design Requirements:

.1 Solid state microprocessor-controlled starter for three-phase motors.

.2 Advanced I^2t electronic motor overload protection functions with the following features:

.1 A minimum of forty standard NEMA style overload curves available for use.

.2 Overloads that can be individual, the same or completely disabled.

.3 Reduced voltage starting and soft stopping

.4 Closed-loop motor current control, power (kW) control, torque control

.5 Programmable motor protections

.6 Programmable operating parameters

.7 Programmable metering

.8 Modbus\TCP Communications

.2 Soft Starters:

.1 Operating Voltage: 600 VAC

.2 Rated Amperes: 77 A

.3 Control Voltage: 120 VAC

.4

.3 Soft starter shall be rated heavy duty capable of 500% FLA for 30 seconds or 125% FLA continuous.

.4 Soft starter shall have a NEMA rated FVNR starter as a bypass. Additionally the soft starter shall have NEMA rated isolation contactors on the input and output of the soft start.

.5 Soft starter and bypass starter shall be fully enclosed within a single MCC section.

.6 Acceptable Product: Benshaw RediStart Solid State Starter Model RB3-1-S-096A-13C or equal in accordance with B7.

2.5 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.6 Finishes

.1 Apply finishes to enclosure in accordance with Section 26 05 01 - Common Work Results - Electrical.

2.7 Equipment Identification

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, size 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 The Contractor shall engage a factory trained representative to supervise the installation, setup, and operationally verify and commission all starters.

3.2 Field Quality Control

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results - 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 Related Sections

.1 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

1.2 References

.1 CSA International

.1 CSA C22.2 No.5.1, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, NMX-J-266-ANCE-2010).

.2 CSA C22.2 No. 5.2, Moulded Case Switches

.3 CSA C22.2 No. 4, Safety Switches

.4 CSA C22.2 No. 178, Transfer Switches

1.3 Submittals

.1 Submit in accordance The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

.2 Product Data:

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

.3 Shop Drawings:

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

.1 Indicate on drawings:

.1 Master drawing index.

.2 Dimensioned outline drawings.

.3 Schematic diagrams.

.4 Component list.

.5 Conduit entry/exit locations.

.6 Assembly ratings including short circuit rating, voltage, and continuous current.

.4 Closeout Submittals: provide operation and maintenance data for incorporation into manual specified in Section 10000 - General Requirements, Closeout Submittals.

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 a clean, dry, well-ventilated area.

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

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 Equipment Description

.1 Manual load transfer equipment:

.1 The Contractor shall furnish and install the low-voltage (600 volts and below) manual transfer switches having the ratings, features/accessories, enclosures, as specified herein and as shown on the contract drawings.

.2 Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of transfer switches. The experience shall include applications of equipment and materials of the same design and/or rating as the transfer switch(es) specified.

.2 Generator termination panel:

.1 The Contractor shall furnish and install the generator termination panel having the ratings, features/accessories, enclosure, as specified herein and as shown on the contract drawings.

2.2 Manual Transfer Switch

.1 Ratings:

.1 The transfer switch shall be capable of transferring its load circuit to an emergency or alternate power supply upon failure of its normal or preferred source.

.2 The transfer switch shall have withstand, closing and interrupting ratings sufficient for the voltage and the available short circuit current at the point of application as shown on the drawings.

.3 The voltage rating of the transfer switch shall be no less than the system voltage rating. The continuous current rating of the transfer switch shall be no less than the maximum continuous current requirements of the system.

.4 The transfer switch shall be 100% equipment rated for continuous duty as shown on the drawings and shall conform to the applicable requirements of CSA C22.2 No. 178 for emergency system total load.

.5 All pilot devices shall be of the industrial type with self-cleaning contacts and rated 10 amperes.

.6 The transfer switches shall be fully rated to protect all types of loads, inductive and resistive, from loss of continuity of power, without de-rating, either open or enclosed.

.2 Construction:

.1 The transfer switches shall consist of completely enclosed contact assemblies.

.2 Transfer switches shall be capable of being operated manually under full load conditions. Manual operation shall be accomplished via a permanently affixed manual operator or integrally mounted pushbutton operators located on the face of the contact assemblies. Removable manual operating handles and handles

which move in the event that electrical operators should suddenly become energized while performing a manual transfer operation are not acceptable.

.3 Each transfer switch shall be positively interlocked mechanically to prevent simultaneous closing of both sources under manual operation. Main contacts shall be mechanically locked in position in both normal and emergency positions. Each transfer switch shall have a manual neutral position for load circuit maintenance. A transfer switch position indicator shall be visible from the front of the switch to show to which source the transfer switch is connected.

.4 All three-phase four-wire transfer switches used on systems with ground fault equipment shall be true four-pole switched neutral type with all four poles for each source being fully rated and connected to a common shaft. The fourth (neutral) pole contacts shall be of identical construction as, and operate simultaneously with, the main power contacts. Add-on or overlapping neutral contacts are not acceptable. Provide a fully rated solid neutral bar for systems without ground fault equipment.

.5 Main contacts shall be designed and type tested to withstand multiple fault currents and shall meet CSA 22.2 No. 178.

.6 Enclosure door must be opened in order to access manual operator handle or pushbutton operators and shall be dead front design.

.3 Wiring & Terminations

.1 Terminal facilities shall be arranged for entrance of external conductors from the top or bottom of the enclosure. The main transfer switch terminals shall be suitable for the termination of conductors shown on the plans.

.4 Auxiliary contacts: silver plated, to indicate position of transfer switch in both normal and emergency positions.

.5 Enclosure:

.1 Rated EEMAC 4X

.2 Minimum 14 gauge 304 stainless steel bodies and doors

.3 Seams continuously welded and ground smooth

.4 Seamless foam-in-place gasket

.5 Internal 3-point latch and Type 316L stainless steel padlocking capabilities in 2 locations on door

.6 Stainless steel continuous hinged door

.7 Wall mounted with mounting feet external to enclosure

2.3 Generator Termination Panel

.1 Construction:

.1 Provide a receptacle panel for connection of portable generator, rated up to 400 amps continuous, 600 volts AC, 3 phase, 4 wire plus ground. Receptacles to be female, colour coded to indicate phase polarity and ground connections, and all receptacles to be interlocked such that plugs must be inserted into the receptacles sequentially, starting with the ground plug, followed by the phase plugs.

.2 Acceptable material includes Crouse-Hinds Posi-Lok receptacle panel model E0400-1685.

.3 Plugs for connections to portable generator cables to be provided by City of Winnipeg.

.4 Receptacle panel to be installed within enclosure described below, complete with distribution terminal blocks for terminating cable from manual transfer switch, and to interconnect to receptacles.

.5 Entire generator termination panel assembly to be CSA approved.

.2 Enclosure:

.1 Rated EEMAC 4X

.2 Minimum 14 gauge 304 stainless steel bodies and doors

.3 Seams continuously welded and ground smooth

.4 Seamless foam-in-place gasket

.5 Quarter turn latches and Type 316L stainless steel padlocking capabilities in 2 locations on door

.6 Stainless steel continuous hinged door

.7 Wall mounted with mounting feet external to enclosure

.8 Provide a continuously hinged door on bottom of enclosure complete with quarter turn latches and provisions for padlocking. Door on bottom of enclosure is intended for quick entry of generator cables with Cam-Lok plugs.

.9 Dead front design such that live components are not exposed when front door and quick access hatch are open.

2.4 Equipment Identification

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - For Electrical.

.1 Manual transfer switch nameplate: size No. 7, engraved “MANUAL TRANSFER SWITCH MTS-L70”.

.2 Generator termination panel nameplates: size No. 7, engraved “GENERATOR TERMINATION PANEL”.

2.5 Source Quality Control

.1 Operate equipment both mechanically and electrically to ensure proper performance.

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 transfer switches 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 and after receipt of written approval to proceed from Contract Administrator.

3.2 Installation

.1 Locate, install and connect equipment as indicated and as per manufacturer's recommendations.

END OF SECTION