Part 1 General

1.1 RELATED REQUIREMENTS

.1 This Specification shall revise, amend, and supplement the requirements of CW1110.

1.2 REFERENCE STANDARDS

.1 City of Winnipeg General Conditions for Construction, Revision 2019-09-01.

.2 City of Winnipeg Specification CW1110.

1.3 ADMINISTRATIVE

.1 Submit to the Contract Administrator submittals required by individual Specification sections for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until reviewed by the Contract Administrator.

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

.4 Where items or information is not produced in SI Metric units, converted values are acceptable. If both Imperial and SI Metric units are shown, SI Metric equivalent shall be the primary unit with the Imperial shown in parentheses.

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

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

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

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

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

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

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 The term “Shop Drawing” as defined in the City’s General Conditions for Construction (Revision 2020-01-31) means all drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are prepared by the Contractor, Subcontractor, manufacturer, supplier, or distributor and which illustrate some portion of the Work.

.2 Submit Shop Drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba if requested.

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

.4 Allow seven (7) Business Days for review of each submission by the Contract Administrator.

.5 The review by the Contract Administrator of the Shop Drawings is for the sole purpose of ascertaining conformance with the design concept.

.6 Adjustments made on Shop Drawings by the Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Contract Administrator prior to proceeding with Work.

.7 Make changes in Shop Drawings as the Contract Administrator may require, consistent with Contract. When resubmitting, notify the Contract Administrator in writing of revisions other than those requested.

.8 Accompany submissions with transmittal, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each Shop Drawing, product data, and sample.

.5 Other pertinent data.

.9 Submissions include:

.1 Date and revision dates.

.2 Project title and number.

.3 Section name and clause number equipment is specified under.

.4 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

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

.6 Details of appropriate portions of Work as applicable:

.1 Fabrication.

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

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.9 After the Contract Administrator's review, distribute copies as required.

.10 Submit electronic copy of Shop Drawings for each requirement requested in Specification sections and as the Contract Administrator may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in Specification sections and as requested by the Contract Administrator where Shop Drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in Specification sections and as requested by the Contract Administrator.

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

.2 Testing must have been within three (3) years of date of Contract award for project.

.13 Submit electronic copies of certificates for requirements requested in Specification sections and as requested by the Contract Administrator.

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

.2 Certificates must be dated after award of Contract and include the project name.

.14 Submit electronic copies of manufacturer's instructions for requirements requested in Specification sections and as requested by the Contract Administrator.

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

.15 Submit electronic copies of manufacturer's field reports for requirements requested in Specification sections and as requested by the Contract Administrator.

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

.17 Submit electronic copies of operation and maintenance data for requirements requested in Specification sections and as requested by the Contract Administrator

.18 Delete information not applicable to project.

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

.20 If upon review by the Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, a copy will be returned and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and resubmission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.5 DESCRIPTION OF CONSTRUCTION METHODS

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

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

1.6 REQUESTS FOR INFORMATION

.1 In the event that the Contractor, or any Subcontractor involved in the Work, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation by the Contract Administrator, the Contractor shall submit a Request for Information (RFI) in writing to the Contract Administrator.

.2 Submission Procedure:

.1 Submit RFI's to the Contract Administrator on the "Request for Information" form appended to this section. The Contract Administrator shall not respond to a RFI except as submitted on this form.

.2 Number RFI's consecutively in one sequence in order submitted, in a numbering system established by the Contract Administrator.

.3 Submit one distinct subject per RFI request. Do not combine unrelated items on one form.

.4 Where RFI form does not have sufficient space, attach additional sheets as required.

.5 Submit with RFI form all necessary supporting documentation.

.3 In the RFI, the Contractor shall clearly and concisely set forth:

.1 the issue for which clarification or interpretation is sought and why a response is needed from the Contract Administrator; and

.2 an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

.4 The Contract Administrator will review all RFIs to determine whether they are valid RFIs. If it is determined that the document is not a valid RFI, it will be returned to the Contractor not having been reviewed with an explanation why it was deemed not valid.

.5 A RFI response shall be issued within 14 Calendar Days of receipt of the request from the Contractor unless the Contract Administrator determines that a longer time is necessary to provide an adequate response. When the RFI submission is received by the Contract Administrator before noon, the review period commences on that Calendar Day. When the RFI submission is received by the Contract Administrator after noon, the review period commences on the subsequent Calendar Day.

.6 If, at any time, the Contractor submits a large number of RFIs or the Contract Administrator considers the RFI to be of such complexity that the Contract Administrator cannot process the RFIs within 14 Calendar Days, the Contract Administrator shall confer with the Contractor within five (5) Calendar Days of receipt of such RFIs and the

Contract Administrator and the Contractor will jointly prepare an estimate of the time necessary for processing same as well as an order of priority among the RFIs submitted. The Contractor shall accommodate such necessary time at no impact to the schedule and at no additional cost to the Contract.

.7 If the Contractor submits a RFI on an activity with 14 Calendar Days or less of available time to the impacted activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Contractor Administrator to respond to the request provided that the Contract Administrator responds within the 14 Calendar Days set forth above.

.8 A RFI response from the Contract Administrator will not change any requirement of the Contract. In the event the Contractor believes that the RFI response from the Contract Administrator will cause a change to the requirements of the Contract, the Contractor shall within 14 Calendar Days give written notice to the Contract Administrator stating that the Contractor believes the RFI response will result in a change in requirements to the Contract and the Contractor intends to submit a change request. Failure to give such written notice of 14 Calendar Days shall waive the Contractor's right to seek additional time or cost under the requirements of the Contract.

1.7 CLOSEOUT SUBMITTALS

.1 Refer to Section 01 78 00 – Closeout Submittals for closeout submittal requirements.

1.8 MISCELLANEOUS SUBMITTALS

.1 Prepare and submit submittals required by individual Specification sections.

.2 Copies: Submit one electronic copy to Contract Administrator. Method of electronic submission to be coordinated with Contract Administrator after execution of the Contract. Submit hard copies only where specifically required under individual Specification sections.

.3 Contract Administrator will review submittals for general conformance with design concept and intent, and general compliance with Contract.

.4 Contract Administrator's review does not relieve Contractor from compliance with requirements of Contract nor from errors in submittals or Contractor's design.

.5 Contractor is responsible for confirmation of dimensions at jobsite; fabrication processes; means, methods, techniques, sequences. and procedures of construction; coordination of work of all trades; and performance of Work in safe and satisfactory manner.

.6 At Contract Administrator's option, Contract Administrator's review comments and review stamp will be placed either directly on submitted copies of submittals or on separate submittal review comment form.

.7 Where work is to be designed by Contractor, comply with applicable codes and furnish submittals signed and sealed by professional engineer licensed in Province of Manitoba, as required by Specifications. If requested, calculations shall be submitted for review. Calculations shall also be signed and sealed by a professional engineer registered in the Province of Manitoba.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Request for Information (RFI)

RFI No. 0

For details and instructions on how to complete this document, click the [¶] icon under the Home tab to display the hidden text.

RFI Title: | **RFI No.:** 0

Date RFI initiated: | **Date Response Requested by:**

Date Response Issued:

Project Name:

Submitted To:

Contract Administrator (CA): | Consultant Ref. No.

Company/Dept.: | Tender No.

Requested By:		***For CA Use***	
Name:		City File No.:	
Title:		Project ID:	
Company:		Project Record Index No.:	
Email::		Purchase Order No.:	

Request/Question: (to be completed by Contractor)

Answer/Response: (to be completed by Contract Administrator)

Attachment(s):

Distribution (to be completed by Contract Administrator)

- Contract Administrator
- Contractor
- City Project Manager
- Other:

Part 1 General

1.1 INSPECTION

.1 Allow the Contract Administrator access to the Work. If part of the Work is in preparation at locations other than the Site, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if the Work is designated for special tests, inspections, or approvals by the Contract Administrator or inspection authorities.

.3 If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections, or approvals before such is made, uncover such Work at no additional cost and have inspections or tests satisfactorily completed and make good such Work.

.4 The Contract Administrator will order part of the Work to be examined if the Work is suspected to be not in accordance with the Contract. If, upon examination, such work is found not in accordance with the Contract, correct such Work and pay cost of examination and correction. If such Work is found in accordance with the Contract, the City shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 The Contract Administrator is to determine/approve the required inspection/testing. Independent inspection/testing agencies shall be engaged and coordinated by the Contractor for purpose of inspecting and/or testing portions of the Work. The Contract Administrator is to be copied on all inspection and/or testing results and correspondence from the inspection/testing agency. Additional tests required due to defective Work shall be paid by the Contractor at no additional cost to the Contract.

.2 The maximum allowed markup by the Contractor is 10% of the inspection/testing subcontractor costs. If additional inspection and/or tests are required due to defective Work by the Contractor, the additional costs will be borne by the Contractor.

.3 All equipment required for executing inspection and testing will be provided by the respective agencies.

.4 Employment of inspection/testing agencies does not relieve or relax the Contractor's responsibility to perform the Work in accordance with the Contract.

.5 If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain the full degree of defect. Correct the defect and irregularities as advised by the Contract Administrator at no cost to the City. The Contractor shall be responsible for the costs of the subsequent testing and inspection of the corrected Work. The City shall deduct such costs from the Contract, amount of which will be determined by the Contract Administrator.

1.3 ACCESS TO WORK

.1 The City, the Contract Administrator, and other inspection authorities shall have access to the Work.

1.4 REJECTED WORK

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

.2 Make good other contractor's work damaged by such removals or replacement of defective Work.

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

1.5 REPORTS

.1 Submit draft inspection and test reports to the Contract Administrator, prior to inclusion with the operation and maintenance manuals and in accordance with Section 01 33 00 – Submittal Procedures

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Submittals to include but are not limited to:

.1 Site plan as described in Part 1.2.

.2 Shop Drawings, including scaffolding and/or platforms as described in Part 1.3.

.3 Crane data and a hoisting plan as described in Part 1.4.

1.2 INSTALLATION AND REMOVAL

.1 Prepare and submit 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.

.1 Identify any areas which have to be gravelled to prevent tracking of mud.

.2 Indicate use of supplemental or other staging area.

.2 Provide construction facilities in order to execute the Work expeditiously.

.3 Remove from Site all construction facilities after use.

.4 Restore grassed areas damaged from construction activities.

1.3 SCAFFOLDING AND TEMPORARY PLATFORMS

.1 Scaffolding in accordance with:

.1 CAN/CSA-S269.2 – Access Scaffolding for Construction Purposes

.2 C.C.S.M.c W210 – Manitoba, The Workplace Safety and Health Act

.2 Provide and maintain scaffolding, platforms, and ladders.

.3 Submit Shop Drawings of scaffolding and/or platforms in accordance with Section 01 33 00 – Submittal Procedures where requested on the Drawings.

1.4 CRANING

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

.2 Cranes to be operated by a qualified operator.

.3 Crane movement and setup on the Site is subject to the Contract Administrator's approval based on pipe loading assessment.

.4 Submit the crane data and a hoisting plan in accordance with Section 01 33 00 – Submittal Procedures.

1.5 SITE STORAGE/LOADING

.1 Confine Work and operations of employees to the scope of the Contract. Do not unreasonably encumber premises with products.

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

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

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

.1 Flammable liquids are stored or handled.

.2 Welding or flame cutting is performed.

1.6 CONSTRUCTION PARKING

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

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

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

.3 Construction parking must not impede delivery access to the Chlorine Room or access to the Wilkes Reservoir compound gate.

1.7 OFFICES

.1 Provide a construction office heated to 22 degrees C, lighted 750 lx, and ventilated, of sufficient size to accommodate Site meetings and furnished with drawing laydown table.

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

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

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

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

.2 Suitable for all-weather use and capable of maintaining a temperature range between 20 and 25 degrees C.

.3 Equipped with fluorescent lights and 120 volt ac electrical wall outlets.

.4 Furnished with one desk, one filing cabinet, and two chairs, all satisfactory to the Contract Administrator.

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

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

1.8 EQUIPMENT, TOOL, AND MATERIALS STORAGE

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

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

1.9 SANITARY FACILITIES

.1 The Contractor may not use the existing washroom at the Hurst Regional Pumping Station.

.2 The Contractor shall provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.1 The Contractor shall post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.10 PROTECTION AND MAINTENANCE OF TRAFFIC ON HURST WAY

.1 Maintain and protect traffic on Hurst Way throughout Construction.

.2 If required, provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.

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

1.11 DISPOSAL OF WASTE MATERIALS

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

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

.3 When working anywhere within the Works, the Contractor shall at the end of each day remove the rubbish and leave the Site in a clean and tidy state, to the satisfaction of the Contract Administrator. If this is not done, the City may clean the Site and deduct such costs from the Contract, amount of which will be determined by the Contract Administrator.

1.12 FACILITY ELECTRICAL SUPPLY AND DISTRIBUTION

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

1.13 WARNINGS AND TRAFFIC SIGNS

.1 All Work affecting Site access must be authorized by the Contract Administrator. Provide a minimum of one week notice to the Contract Administrator when Work will affect Site access.

.2 When Work is performed within public areas, provide and erect adequate warning signs as necessary to give proper warning. Place signs sufficiently in advance to enable public to respond to directions.

.3 Provide and maintain signs and other devices required to indicate construction activities or other temporary or unusual conditions resulting from the Work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

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

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from Site all such work after use.

1.3 HOARDING

.1 Erect temporary site enclosures using construction grade lumber framing and exterior grade fir plywood to CSA O121.

.2 Provide hoarding and ventilation for the building as required to maintain operation of the pumping station.

1.4 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.

1.5 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts, and other openings in floors and roofs. Provide protection for the interior of the pumping station and existing equipment during re-roofing works (during removal of existing roof and installation of the new roof).

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

.3 Design enclosures to withstand wind pressure and snow loading, if applicable.

1.6 DUST TIGHT SCREENS

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

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

1.7 FIRE ROUTES

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

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.9 PROTECTION OF BUILDING FINISHES

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

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with the Contract Administrator locations and installation schedule three (3) Business Days prior to installation.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Maintain the 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 the Site at daily regularly scheduled times or dispose of as directed by the Contract Administrator. Do not burn waste materials on the Site.

.3 Clear snow and ice accumulations to maintain access to the pumping station building and drainage facility 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. Asbestos Containing Material shall be kept separate from other waste material and debris.

.6 Dispose of waste materials and debris off site. Asbestos Containing Material shall be shipped off site to an approved landfill in a separate covered vehicle.

.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 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 the 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.

1.2 FINAL CLEANING

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

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

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

.4 Remove waste products and debris other than that caused by the City or other contractors.

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

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

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

.8 Clean roofs, downspouts, and drainage systems.

.9 Remove debris and surplus materials from crawlspace areas and other accessible concealed spaces.

.10 Remove snow and ice from access to building.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to Total Performance with the Contract Administrator to:

.1 Verify project requirements.

.2 Review warranty requirements.

.2 The Contract Administrator will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determination of priorities for type of defects.

.3 Determination of reasonable response time.

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

1.2 OPERATION AND MAINTENANCE MANUALS

.1 General

.1 Provide operation and maintenance manuals in accordance with Section 01 33 00 – Submittal Procedures.

.2 An electronic draft copy of the operation and maintenance manuals shall be submitted (word version, if available) two (2) weeks prior to Substantial Performance of the Work for review and comments. Submission of individual data will not be accepted unless directed by the City. Make changes and incorporate the Contract Administrator's review comments as required and re-submit as directed by the Contract Administrator.

.3 After review and acceptance by the City, five (5) hard copies and one electronic (PDF) copy of the final operation and maintenance manuals shall be submitted. The final electronic copy shall be provided on a flash memory drive.

.4 Prepare operation and maintenance manuals using personnel experienced in maintenance and operation of described products.

.5 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 the form of approved Shop Drawings, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists.

.6 For the guidance of the City's operation and maintenance personnel, the Contractor shall prepare operation and maintenance manuals for the Work, describing in detail the construction of each part of the Work and the recommended procedure for operation, servicing, and maintenance.

.7 All instructions in these operation and maintenance manuals shall be in simple language to guide the City in the proper operation and maintenance of this installation.

.2 Format

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf, 8.5” by 11” with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings.

.1 Identify contents of each binder on spine and face.

.4 Cover: identify each binder with title sheet labelled "Operation and Maintenance Instructions", and containing project name and date, facilities covered in the manual, City’s Contract number, the name and address of the Contractor, and the issue date.

.5 Arrange content by Division and Section numbers and sequence of Table of Contents.

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

.7 Text: manufacturer's printed data or type written data.

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.3 Contents

.1 For each operation and maintenance manual volume, provide an overall title sheet that includes:

.1 The title "Operation and Maintenance Instructions";

.2 Project name and date;

.3 Facilities covered in the manual;

.4 City’s Contract number;

.5 Addresses and telephone numbers of Consultant and Contractor with name of responsible parties; and

.6 Schedule of products and systems, indexed to content of volume;

.2 For each operation and maintenance manual volume, provide an overall list of contents which includes the contents for all the operation and maintenance manual volumes.

.3 In addition to operation and maintenance information required in the individual Specification sections, include:

.1 Brochures/catalogue excerpts of all components of the Work.

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

.3 Documentation of all test results.

.4 Complete set of equipment and assembly drawings.

.5 Installation, start-up, individual equipment operation and maintenance manuals.

.6 Shop Drawings and cutsheets of all equipment and materials.

.1 Do not utilize the cutsheet and Shop Drawing submittals that were sent to the Contract Administrator for review as these may contain inaccurate information and markups. Only provide cutsheets and Shop Drawings representing the final materials and equipment supplied, without any markups from the Contract Administrator.

.2 For generic cutsheets and Shop Drawings that list multiple model numbers or configurations, place a rectangle around the specific model that was supplied and cross out other models.

.7 Sections for the record Drawings and as-built Drawings of all installations. Drafted record Drawings and as-built Drawings of size 432x279 mm (11 x 17") will be inserted by the Contract Administrator, based on the as-built Drawings marked up by the Contractor.

.8 Names, addresses, and telephone numbers of all major Subcontractors and suppliers.

.9 Certificate of Inspection from the inspection authority.

.10 Testing and commissioning documentation.

.11 Warranty certificate, signed and dated.

.12 Written process narratives outlining the programming of the PLC systems for individual processes or systems.

.13 Final instrumentation set points including but not limited to:

.1 Units

.2 Scale

.3 Alarm points (low-low, low, high, high-high)

.4 4-20 mA settings

.14 Logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 – Quality Control.

.4 General catalog data for the operations and maintenance manual is unacceptable. If manufacturer's specification sheets are generalized in any way, they shall be clearly marked to show exactly which item has been supplied, and the project designation for that item (e.g., SF-Y601) is to be noted on manufacturer's specification sheet which includes all details for this unit, including complete model number, serial number, and construction and performance data.

.4 Equipment and Systems

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics, and limiting conditions.

.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

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

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 Include summer, winter, and any special operating instructions.

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

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

.14 Additional requirements: as specified in individual Specification sections.

.5 Materials and Finishes

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.1 Provide information for re-ordering custom manufactured products if applicable.

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

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

.4 Additional requirements: as specified in individual Specifications sections.

1.3 AS-BUILT / RECORD DRAWINGS

.1 After award of Contract, the Contract Administrator will provide a complete set of Drawings for the purpose of maintaining project as-built and record Drawings. Accurately mark-up deviations from the Contract caused by the Site conditions and changes ordered by the Contract Administrator. Update daily.

.2 The Contractor shall keep one complete set of white prints at the Site during the Work, including all addenda, change orders, Site instructions, clarifications, and revisions for the purpose of the as-built and record Drawings. As the Work on-site proceeds, the Contractor shall clearly mark up the white prints in red pencil all the Work which

deviated from the original Contract. Identify Drawings as "Project Record Copy". Maintain in good condition and make available for inspection on-site by the Contract Administrator at all times.

1.4 WARRANTIES AND BONDS

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

.2 Submit warranty management plan, 30 days before planned pre-warranty meeting, to the Contract Administrator for approval.

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

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

.5 Submit warranty information, made available during construction phase, to the Contract Administrator for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work, and organize binder as follows:

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

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

.3 Obtain warranties and bonds, executed in duplicate by Subcontractors, suppliers, and manufacturers, within ten Business Days after completion of applicable item of Work.

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

.5 Co-execute submittals when required.

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

.7 Except for items put into use with the City's permission, leave date of beginning of time of warranty until date of Total Performance is determined.

.8 Include information contained in warranty management plan as follows:

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

.2 Listing and status of delivery of certificates of warranty for warranty items, to include roofs, HVAC balancing, pumps, and commissioned systems. Provide list for each warranted equipment, item, feature of construction, or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

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

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

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

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

.10 Cross-Reference to specific pertinent operation and maintenance manuals.

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

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

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

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

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

.10 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Contract Administrator to proceed with action against the Contractor.

1.5 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by the Contract Administrator.

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

.3 Leave date of acceptance until project is accepted.

.4 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 91 33 – Commissioning Forms.

.2 Section 01 91 41 – Commissioning Training.

1.2 GENERAL

.1 Provide a fully functional facility and ensure that:

.1 Systems replaced or modified under this project shall meet or exceed the functionality and performance of the existing systems prior to replacement.

.2 City personnel have been fully trained in aspects of installed systems.

.3 Documentation relating to installed equipment and systems has been completed.

.2 Use this Specification section as a master planning document for Cx as it:

.1 Outlines organization, scheduling, allocation of resources, and documentation pertaining to implementation of Cx.

.2 Communicates responsibilities of team members involved in Cx including scheduling, documentation requirements, and verification procedures.

.3 Sets out deliverables relating to operation, maintenance, process, and administration of Cx.

.4 Describes process of verification of how built Works meet design requirements.

.5 Sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

.1 An overview of Cx.

.2 A general description of elements that make up Cx Plan.

.3 A process and methodology for successful Cx.

1.3 ACRONYMS AND DEFINITIONS

.1 Bumping: short term start-up to prove ability to start and prove correct rotation.

.2 Cx - Commissioning.

.3 Commissioning Agent: Agent of the Contractor with experience in commissioning, satisfactory to the Contract Administrator, responsible for the oversight and execution of commissioning.

.4 Commissioning Plan: A Cx planning document as described in Item 3.2.

.5 Cx Report: the final Cx document as described in Item 3.8.

.6 PI - Product Information.

.7 PV - Performance Verification.

.8 TAB - Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

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

.2 Cx schedule to be submitted and accepted by the Contract Administer at the same time as the Contract schedule as per Item 3.1.

.3 Cx Plan to be submitted and accepted by the Contract Administer within 18 weeks of award of Contract or earlier if required by Contractor's project schedule as per Item 3.2.

.4 Cx Plan to be refined and resubmitted as required during the construction phase as per Item 3.3.

.5 Final Cx Report to be submitted electronically and accepted by the Contract Administer within two weeks of completion of the Cx and to be accepted by the Contract Administrator prior to Substantial Performance as per Item 3.8.

1.5 COMPOSITION, ROLES, AND RESPONSIBILITIES OF CX TEAM

.1 Cx Team to consist of the following members:

- .1 Contract Administrator who is responsible for:
  - .1 Monitoring Cx activities.
  - .2 Reviewing Contractor submissions.
  - .3 Assisting in the resolution of issues resulting from all tests.
  - .4 Reviewing the final Cx Report.
- .2 City personnel who are responsible for
  - .1 Providing modifications to the existing Regional SCADA system to incorporate the new SCADAPack I/O.
  - .2 Supporting network communication between the new SCADAPack and the Regional SCADA network.
  - .3 Attending Cx activities to verify re-installed existing equipment operates as per the original sequence of operations including but not limited to:
    - .1 Hurst Pumping Station rooftop air handling units AHU-1 and AHU-2 (Quantity: 2).
    - .2 Hurst Pumping Station condensing unit CU-1 (Quantity 1).
    - .3 Hurst Pumping Station rooftop exhaust fans EF-M1, EF-M2, and EF-M3 (Quantity: 3).
    - .4 Hurst Pumping Station Chlorine Room exhaust fans FAN-1 and EEF-1 (Quantity: 2).
    - .5 Hurst Pumping Station chlorine detection alarm panel HZ-920-AIY.
  - .4 Attending Cx activities to verify newly installed equipment operates as intended including but not limited to:
    - .1 Drainage Lift Station supply fan SF-Y601.
    - .2 Drainage Lift Station chemical dosing pumps P-Y101and P-Y102 (Quantity: 2).
    - .3 Drainage Lift Station sampling pump P-Y103.
    - .4 Drainage Lift Station RTU control panel CP-Y800.
    - .5 Drainage Lift Station low level float switch LSL-Y100 (associated with Chemical Batching Tank TK-Y100).
    - .6 Drainage Lift Station high level float switch LSH-Y802.
    - .7 Drainage Lift Station flap gate (FG-Y603).
    - .8 Hurst Pumping Station sump pump P-M500 and control panel CP-M500.
    - .9 Hurst Pumping Station Chlorine Room exhaust fan control panel CP-C800.

.10 Hurst Pumping Station Chlorine Room chlorine sensor horns and strobes AA-C801 and AA-C802 (Quantity: 2).

.3 Construction Team: Contractor, Subcontractors, suppliers, and support disciplines, whom are responsible for construction/installation in accordance with Contract Documents, including:

.1 Integrating commissioning activities into project schedule.

.2 TAB.

.3 Testing existing building equipment controls.

.4 Performing and documenting static verification.

.5 Performing and documenting start-up including installation/start-up checklists.

.4 Contractor's Commissioning Agent whom is responsible for implementing specified Cx activities including:

.1 Planning/preparing verification checklists (checklists, PI, and PV forms) and test procedures.

.2 Determining operational training requirements.

.3 Developing Cx Plan.

.4 Leading construction Cx phase kickoff and Cx progress meetings.

.5 Performing and documenting PV testing.

.6 Preparing and updating issues logs.

.7 Verifying, reviewing, and conducting training.

.8 Preparing final Cx report.

1.6 EXTENT OF CX

.1 Commission the following systems and associated equipment with the following control sequence specification:

.1 Mechanical systems – Hurst Pumping Station:

.1 Existing high temperature and LEL monitored roof exhaust fans EF-M1, EF-M2, and EF-M3 (Quantity: 3)

.1 Roof exhaust fans EF-M1, EF-M2, and EF-M3 are controlled through individual wall mounted thermostats that trigger operation of a specific fan based on unique temperature set points for staged operation. During operation of the roof fans, the existing inline fresh air fan SF-M1 and associated damper is also operating.

.2 Roof exhaust fans EF-M1, EF-M2, and EF-M3 are also controlled through a separate LEL monitoring control panel HZ-923 that activates all three roof exhaust fans and associated fresh air fan SF-M1 once the set point is reached.

.2 Existing rooftop air handling units AHU-1 and AHU-2 (Quantity: 2)

.1 Both air handling units AHU-1 and AHU-2 operate continuously when operators turn on the breaker for each fan starting in the spring and ending in the fall. During operation, the automated cooling control valve modulates the amount of chilled water entering to each air handling unit to cool the supply air into the building and meet the room set point.

.2 Both air handling units AHU-1 and AHU-2 also have their own internal controls to modulate the mixing box section dampers for

economizer functionality during days when the ambient air temperature is of suitable temperature to cool the building.

.3 Existing condensing unit CU-1 (Quantity: 1)

.1 The condensing unit is controlled through a wall mounted thermostat in the electrical room that triggers the operation of the condensing unit based on a unique temperature set point.

.4 Existing Chlorine Room exhaust fans FAN-1 and EEF-1 (Quantity: 2)

.1 Both Chlorine Room exhaust fans FAN-1 and EEF-1 are controlled by two new three-way toggle switches SW-C700 (located outside of the Chlorinator Room) and SW-C701 (located outside the Chlorine Storage Room). Both Chlorine Room exhaust fans operate together and will turn on or off by operation of either three-way toggle switch.

.2 In the event the Chlorine Rom's chlorine detector HZ-920-AIY senses a chlorine spill that is above the maximum allowable set point (1 PPM), Chlorine Room exhaust fans FAN-1 and EEF-1 turn off and are -interlocked so they cannot be turned on while the chlorine level is above 1 PPM.

.5 New sump pump P-M500 (Quantity: 1)

.1 Sump pump P-M500 switches on when the high-level switch is activated and switches off when the low-level switch is activated.

.2 The pump can also be controlled manually by a Hand-Off-Auto switch located on the front of the control panel CP-M500.

.3 If the high-level switch is activated, a horn and strobe mounted on the control panel are activated.

.2 Mechanical systems – Drainage Lift Station

.1 New chemical dosing pumps P-Y101 and P-Y102 (Quantity: 2)

.1 The new chemical dosing pump P-Y101 will turn on when existing lift pump P-Y1 is running. The receptacle feeding new chemical dosing pump P-Y101 will be interlocked with the existing lift pump P-Y1 control circuit located within the automation junction box JBA-Y801. The chemical dosing pump P-Y101 will automatically dose at a pre-set rate when energized.

.2 The new chemical dosing pump P-Y102 will turn on when existing lift pump P-Y2 is running. The receptacle feeding new chemical dosing pump P-Y102 will be interlocked with the existing lift pump P-Y2 control circuit located within the automation junction box JBA-Y801. The chemical dosing pump P-Y102 will automatically dose at a pre-set rate when energized.

.3 During typical operation of the sump pump (23 L/s) one chemical dosing pump is switched on. During periods of high flow, both chemical dosing pumps are in operation.

.4 Dosing rates are to be adjusted during commissioning through testing, to achieve a drainage station outlet chlorine concentration of 0.2ppm assuming an inlet chlorine concentration of 2ppm.

.2 New sampling pump P-Y103 (Quantity: 1)

.1 The new sampling pump P-Y103 will be controlled by a new wall

mounted start-stop pushbutton HS-Y103 located on the north wall of the Drainage Lift Station.

.2 The City will set the required dosing point for the chemical dosing pumps. The Contractor is to ensure that the sampling pump functions.

.3 New supply fan SF-Y601 with associated motorized damper (Quantity: 1)

.1 The new supply fan SF-Y601 will be controlled by a new wall mounted dehumidistat ME-Y601 located on the south wall of the Drainage Lift Station. When the humidity rises above the dehumidistat ME-Y601 setpoint, the supply fan SF-Y601 will turn on.

.2 The supply fan SF-Y601 and damper will be interlocked and both will be simultaneously actuated/powered by the dehumidistat ME-Y601.

.4 New flap gate FG-Y603 (Quantity: 1)

.1 The new flap gate will open during the operation of existing lift pump P-Y2.

.2 The new flap gate will close when the water in the Drainage Lift Station discharge chamber exceeds the elevation of the invert of the discharge for lift pump P-Y2.

.3 Electrical systems – Hurst Pumping Station:

.1 Existing chlorine detection equipment (Quantity: 2)

.1 This equipment is to be used to commission the new Chlorine Room control panel CP-C800 and new chlorine horns and strobes AA-C801 and AA-C802.

.2 New Chlorine Room fan control panel CP-C800 (Quantity: 1)

.1 Both Chlorine Room fans FAN-1 and EEF-1 operate together and are controlled by two new three-way toggle switches SW-C700 (located outside of the Chlorinator Room) and SW-C701 (located outside the Chlorine Storage Room). Both Chlorine Room fans will turn on or off by operation of either three-way toggle switch.

.2 Two normally closed contacts in the existing Chlorine Detection Alarm Panel HZ-920-AIY are wired to the new fan control panel CP-C800. The contacts open when chlorine levels are sensed at or above 1 PPM (by the existing chlorine detection equipment described above) which will deenergize both Chlorine Room fans FAN-1 and EEF-1, therefore prohibiting leaked chlorine to be exhausted to atmosphere.

.3 New chlorine horns and strobes AA-C801 and AA-C802 (Quantity: 2)

.1 Two normally closed contacts in the existing Chlorine Detection Alarm Panel HZ-920-AIY are wired to the new fan control panel CP-C800. The contacts open when chlorine levels are sensed at or above 1 PPM, which will energize the new chlorine horns and strobes AA-C801 and AA-C802.

.4 New sump pump control panel CP-M500 (Quantity: 1)

.1 If the sump pump high-level alarm switch is activated, a horn and strobe mounted on the control panel are activated.

.2 Auto or manual control can be achieved through a Hand-Off-Auto switch mounted on the front of the sump pump control panel CP-

M500.

.4 Electrical systems – Drainage Lift Station:

.1 New RTU control panel CP-Y800 (Quantity: 1)

.1 Level Controls

.1 A high level alarm shall be generated by the new high level float switch LSH-Y802 when the water level in the Drainage Lift Station wet well is above the top of the discharge of existing lift pump P-Y2. This alarm signal shall be wired to the new RTU control panel CP-Y800 as a digital input.

.2 A low level alarm shall be generated by the new low level float switch LSL-Y100 when the level in the existing chemical batching tank TK-Y100 is below 305 mm from the bottom of the tank. This alarm signal shall be wired to the new RTU control panel CP-Y800 as a digital input.

.2 Lift Pump Run Status

.1 Pump Run Status for the two existing lift pumps P-Y1 and P-Y2 will be wired to the new RTU control panel CP-C800 from the existing automation junction box JBA-Y801 as digital inputs. These statuses will indicate when the lift pumps are running.

.3 Communication

.1 Ethernet communications will be used between the new RTU control panel CP-Y800 and the Regional SCADA. The Contractor shall ensure communication between control panel CP-Y800 and the Regional SCADA is established during commissioning.

.2 Consult the individual sections for addition performance verification requirements.

Part 2 Products

2.1 EQUIPMENT

.1 Provide sufficient instrumentation to verify and commission the installed systems.

Part 3 Execution

3.1 CX SCHEDULES

.1 Prepare a detailed Cx schedule and submit to Contract Administrator for review and approval at the same time as the project construction schedule. Include:

.1 Milestones, testing, documentation, training, and Cx activities of components, equipment, subsystems, systems, and integrated systems.

.2 The majority of Cx activities must be completed before issuance of Substantial Performance.

.3 Seasonal commissioning of HVAC systems may be necessary during the warranty period.

.4 After approval, incorporate the Cx schedule into the construction schedule.

.5 Contractor, Contractor's Commissioning Agent, and Contract Administrator will monitor progress of Cx against the approved Cx schedule.

3.2 DEVELOPMENT OF CX PLAN

.1 Cx Plan to be 100% completed by Contractor's Commissioning Agent within 18 weeks of award of Contract or earlier if required by Contractor's project schedule.

.2 Cx Plan to take into account:

.1 Approved Shop Drawings and product data.
.2 Approved changes to Contract.
.3 Contractor's project schedule.
.4 Contractor's, Subcontractor's, and suppliers' requirements.
.5 Project construction team's and Cx team's requirements.

.3 Cx Plan to include:

.1 Cx schedule.
.2 Completed Product Information (PI) forms as specified in Section 01 91 33 - Commissioning (Cx) Forms,
.3 Installation/start-up check lists as specified in Section 01 91 33 – Commissioning (Cx) Forms.
.4 Performance verification (PV) forms as specified in Section 01 91 33 – Commissioning (Cx) Forms.
.1 PV forms to include testing parameters at full range of operating conditions to verify responses of equipment and systems.

.4 Submit completed Cx Plan to the Contract Administrator for review and acceptance.

3.3 REFINEMENT OF CX PLAN

.1 During the construction phase, revise, refine, and update the Cx Plan to include:

.1 Changes resulting from City Regional SCADA modifications.
.2 Approved design and construction changes.

.2 Revise, refine, and update Cx Plan during construction phase. At each revision, indicate revision number and date.

.3 Submit each revised Cx Plan to the Contract Administrator for review and acceptance.

3.4 PRE-CX ACTIVITIES

.1 Conduct pre-start-up pressure, static, flushing, cleaning, and "bumping" testing during construction as specified in the individual sections. This testing to be witnessed and certified by the Contract Administrator and does not form part of Cx specifications.

.2 Perform prestart up inspections prior to commencing Cx. Utilise approved installation/start-up check lists as specified in Section 01 91 33 – Commissioning (Cx) Forms. Rectify any deficiencies to the Contract Administrator's satisfaction.

.3 For HVAC and plumbing systems:

.1 Complete on Site visual inspections.

.2 Prior to demolition or construction, complete TAB to document existing system and confirm flow rates, pressures, and power requirements of the existing installation.
.3 Modulate chilled water control valves.

.4 "Bump" each item of equipment (AHUs, fans, and pumps) in its "stand- alone" mode.

.5 Complete pre-start-up checks and complete relevant documentation.

.6 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.

3.5 TESTS TO BE PERFORMED BY CITY

.2 City staff will complete programming and testing for the modifications to the existing Regional SCADA system as a result of the new SCADAPack equipment.

.3 For modifications to the existing Regional SCADA system, the Contractor shall provide to the City:

.1 A minimum of three weeks advance notice that Regional SCADA system modification will be required;

.2 Final programming of the system (after all reviews have been completed);

.3 Data mapping list for all signals, with Regional SCADA system modification to be clarified;

.4 Clarification of any questions or concerns related to the purpose and intention of the various signals; and

.5 Support for recommended adjustments and modifications to the existing Regional SCADA system.

.4 Where the items described in Item 3.5.3 are provided to the satisfaction of the City, the City anticipates approximately one month will be required to complete the Regional SCADA system modification. The City reserves the right to extend the time required to provide Regional SCADA system modification depending on qualified personnel availability.

.5 The Contractor shall coordinate with the Contract Administrator and City to ensure testing of the associated SCADA related components are completed with the Cx process.

3.6 START-UP AND CX

.1 Start up components, equipment, and systems.

.2 Equipment manufacturer, supplier, installing specialist, or Subcontractor, as appropriate, to start-up, under Contractor's direction, all systems.

.3 The Contract Administrator may monitor start-up activities.

.1 Rectify start-up deficiencies to the satisfaction of the Contract Administrator.

.4 PV:

.1 To be performed be the Contractor’s Commissioning Agent.

.1 Repeat when necessary until results are acceptable to the Contract Administrator.

.2 Use modified generic procedures to suit project requirements.

.3 The Contract Administrator to witness and certify reported results using the approved PI and PV forms.

.4 The Contract Administrator to approve completed PV reports.

.5 The Contract Administrator reserves right to verify up to 30% of reported results at random.

1. Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

.6 Provide TAB report for AHUs, fans, pumps, and chilled water control valves into AHU cooling coils.

1. For existing equipment, compare TAB report after commissioning has taken place to pre-construction TAB report see Item 3.4.3.2.

3.7 FINAL SETTINGS

.1 Upon completion of Cx to the satisfaction of the Contract Administrator, lock control devices in their final positions, indelibly mark settings, and include in the final Cx Report.

3.8 FINAL CX REPORT

.1 Contractor to submit the completed Cx Report within a maximum of two weeks of completion of the Cx. The final Cx report to be reviewed and accepted by the Contract Administrator prior to granting Substantial Performance.

.2 Final Cx Report to include:

.1 Startup, pre-Cx activities, and documentation for systems and equipment.

.2 Description of Cx activities and documentation.

.3 Description of Cx of integrated systems and documentation.

.4 Completed PI report forms.

.5 Completed installation checklists.

.6 Completed PV report forms.

.7 Pump performance curves (family of curves) with final point of actual performance.

.8 Completed testing and balancing report for AHUs, fans, pumps, and chilled water control valves into AHU cooling coils,

.9 Final settings of commissioned equipment.

.10 Training Plans.

.11 Prescribed activities to be undertaken by City personnel during the warranty period.

.3 Before the final Cx Report is accepted, individual reported results to be subject to verification by the Contract Administrator.

.4 If seasonal commissioning of HVAC systems is necessary during the warranty period, the Cx Report to be submitted without the HVAC systems Cx results. The Cx results for the HVAC systems to be submitted within one week of commissioning the HVAC systems for inclusion in the final Cx Report.

3.9 TRAINING PLANS

.1 Refer to Section 01 91 41 – Commissioning (Cx) – Training.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 91 33 – Commissioning (Cx) Plan.

.2 Section 01 91 41 – Commissioning Training.

1.2 GENERAL

.1 The Contractor's Commissioning Agent will develop all required forms and checklists for commissioning and submit them to the Contract Administrator for approval as detailed in Section 01 91 33 – Commissioning (Cx) Plan.

.2 Use the approved forms and checklists to verify product information, equipment installation, and equipment and system performance.

.3 Maintain hard copy of the forms and checklists on Site during start-up, testing, and commissioning period.

.4 Forms and checklists are to be type written when submitted as part of the final Cx Report and operation and maintenance manuals.

1.3 PRODUCT INFORMATION (PI) FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment and are typically produced by the equipment manufacturer.

.2 The PI forms to include nameplate information, parts list, operating instructions, maintenance guidelines, pertinent technical data, recommended checks that are necessary to prepare for start-up and functional testing, and operation and maintenance data.

.3 These forms are to be included in the operation and maintenance manuals at the completion of Work.

.4 The completed PI forms are to be submitted as a part of the Cx Plan. The Cx Plan is to be submitted and accepted by the Contract Administrator within eighteen (18) weeks of award of Contract or earlier if required by Contractor's project schedule.

1.4 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data in the installation/start-up check lists:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by the Contract Administrator, supplemental additional data lists may be required for specific project conditions.

.3 Use installation/start-up check lists for equipment installation. Document installation/start-up check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign installation/start-up check lists upon completion, certifying stated checks and inspections have been performed. Return the original completed installation/start-up check lists to the Contract Administrator to be reviewed and signed.

.5 The use of the installation/start-up check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

.6 Originals of completed installation/start-up check lists to be provided to the Contract Administrator. The installation/start-up check lists are to bear signatures of recording technician and reviewed and signed off by Contract Administrator

.7 The installation/start-up check lists are to be submitted as a part of the Cx Plan. The Cx Plan is to be submitted and accepted by the Contract Administer within eighteen (18) weeks of award of Contract or earlier if required by Contractor's project schedule.

.8 The completed installation/start-up check lists are to be submitted as a part of the final Cx Report. Contractor to submit the completed Cx Report within a maximum of two (2) weeks of completion of the Cx.

.9 The completed installation/start-up check lists are to be submitted as a part of the final operation and maintenance manuals.

1.5 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used to:

.1 Perform checks, running dynamic tests, and adjustments on equipment and systems.

.2 Ensure the equipment operates correctly and efficiently and functions independently and interactively with other systems as per design criteria and intent.

.3 Identify variances between the design and the actual operation. Contractor to provide reasons for these variances.

.4 Verify operation in specified normal and emergency modes and under specified load conditions.

.5 Record analytical and substantiating data.

.2 PV forms to record results in true measured SI unit values.

.3 PV forms include those developed by Contractor records measured data and readings taken during functional testing and PV procedures.

.4 PV form to bear signatures of recording technician and reviewed and signed off by Contract Administrator.

.5 Prior to performing PV of integrated system, complete PV forms of related equipment and systems and obtain approval from the Contract Administrator.

.6 Originals of completed PV forms to be provided to the Contract Administrator. The PV forms are to bear signatures of Contactor's Commissioning Agent and reviewed and signed off by Contract Administrator.

.7 The draft PV forms are to be submitted as a part of the Cx Plan. The Cx Plan is to be submitted and accepted by the Contract Administrator within eighteen (18) weeks of award of Contract or earlier if required by Contractor's project schedule.

.8 The completed PV forms are to be submitted as a part of the final Cx Report. Contractor to submit the completed Cx Report within a maximum of two (2) weeks of completion of the Cx.

.9 The completed PV forms are to be submitted as a part of the final operation and maintenance manuals.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

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

.2 The Contract Administrator has the authority to determine if the training is sufficient based on the lesson plan submitted by the Contractor.

.3 Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.

.4 Equipment requiring training has been identified in major equipment list included in the Contract Documents. Contractor to provide one training session for type of equipment that has been identified as requiring training.

1.2 SUBMITTALS

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

.2 Submit training proposal complete with schedule, lesson plan, and name of trainer(s) to the Contract Administrator thirty (30) Calendar Days prior to anticipated date of beginning of training.

.3 Submit training materials at least three (3) weeks prior to commissioning as described in Part 1.6 of this Specification.

1.3 TRAINEES

.1 Trainees: City personnel selected for operating and maintaining this facility.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.4 INSTRUCTORS

.1 Contractor to provide instruction on the following:

.1 Start-up, operation, and shut-down of equipment, components, and systems.

.2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance, and adjustment of systems, equipment and components.

1.5 TRAINING OBJECTIVES

.1 Training to be sufficiently detailed and of an appropriate duration to ensure the trainee:

.1 Can provide safe, reliable, cost-effective, and energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Can provide effective on-going inspection, measurements of system performance.

.3 Can apply proper preventive maintenance, diagnosis and trouble-shooting.

.4 Has the ability to update documentation.

.5 Can operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.6 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:

.1 "As-Built" Drawings.

.2 Operating manual.

.3 Maintenance manual.

.4 Management manual.

.5 TAB and PV Reports.

.3 Submit training manuals to the Contract Administrator for review and approval at least three (3) weeks prior to commissioning.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:

.1 Transparencies for overhead projectors.

.2 Multimedia presentations.

.3 Manufacturer's training videos.

.4 Equipment models.

1.5 SCHEDULING

.1 Include in Commissioning Schedule time for training.

1.6 RESPONSIBILITIES

.1 Contractor is responsible for:

.1 Implementation of training activities.

.2 Coordination among instructors.

.3 Quality of training and training materials.

.2 The Contract Administrator will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by instructors and witnessed by the Contract Administrator.

1.7 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Functional requirements.

.2 System philosophy, limitations of systems, and emergency procedures.

.3 Review of system layout, equipment, components, and controls.

.4 Equipment and system start-up, operation, monitoring, servicing, maintenance, and shut-down procedures.

.5 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings, and emergency procedures.

.6 Maintenance and servicing.

.7 Trouble-shooting diagnosis.

.8 Interaction among systems during integrated operation.

.9 Review of operation and maintenance materials.

.3 Provide specialized training as specified in relevant sections of the Specifications.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INTENT

.1 This specification is to supplement the health and safety requirements contained in the Section D of the Tender Documents, and the City of Winnipeg's "General Conditions for Construction".

1.2 REFERENCE STANDARDS

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

.2 Province of Manitoba

.1 The Workers Compensation Act RSM 1987 – Updated 2013.

.3 General Conditions for Construction, City of Winnipeg, Revision 2020-01-31.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit copies of reports or directions issued by federal, provincial and territorial health and safety inspectors.

.3 Submit copies of incident and accident reports.

.4 Submit WHMIS SDS – Safety Data Sheets where indicated in individual sections.

.5 The Contract Administrator will review Contractor's Site-specific Safe Work Plan and provide comments to the Contractor within three (3) Business Days.

.6 The Contract Administrator's review of Contractor's final Safe Work Plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction health and safety.

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

.1 Attend a general Site awareness orientation at the Hurst Pumping Station. The orientation will be approximately one (1) hour in length and will include an overview of the facility, potential hazards present, warning systems, and Site muster point. Ensure that all people performing Work at Site are aware of the requirements of the general Site awareness orientation.

.2 Schedule and administer a health and safety meeting with the Contract Administrator and City personnel prior to commencement of the Work.

1.6 REGULATORY REQUIREMENTS

.1 Do Work in accordance with all applicable regulatory requirements.

1.7 GENERAL REQUIREMENTS

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

.2 The Contract Administrator and the City may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

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

.2 Contractor will be responsible and assume the role of prime contractor as described in the Manitoba Workplace Safety and Health Act.

.3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with Site-specific Safe Work Plan.

1.9 COMPLIANCE REQUIREMENTS

.1 Comply with the Workers Compensation Act, Workplace Safety Regulation, Manitoba.

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

1.10 UNFORESEEN HAZARDS

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

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occurs during performance of Work, advise the Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of the Province of Manitoba and advise the Contract Administrator verbally and in writing.

1.11 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, a competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have site-related working experience.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's health and safety training sessions and ensuring that personnel not successfully completing required training are not permitted to enter Site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring Contractor's Safe Work Plan.

.2 The Health and Safety Co-ordinator's contact information should be prominently displayed in the construction Site office.

1.12 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on Site in accordance with Acts and Regulations of the Province of Manitoba and in consultation with the Contract Administrator.

1.13 CORRECTION OF NON-COMPLIANCE

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

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

.3 The Contract Administrator may issue a stop Work order if non-compliance of health and safety regulations is not corrected.

1.14 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from the Contract Administrator.

1.15 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 National Research Council Canada (NRC)

.1 National Building Code of Canada 2015 (NBC).

.2 National Fire Code of Canada 2015 (NFC).

1.2 SUBMITTALS

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

.2 Submit demolition drawings:

.1 Submit for review and approval by the Contract Administrator shoring and underpinning drawings stamped and signed by professional engineer registered or licensed in the province of Manitoba showing proposed method.

1.3 SITE CONDITIONS

.1 Review HMIS report titled "Confirmed Asbestos and Presumed Asbestos", dated July 02, 2019 and review the KGS report titled "Hurst Pumping Station Structural Repairs and Drainage Building Upgrades - Hazardous Materials Assessment", dated October 29, 2019 (both appended herein) and take precautions to protect environment.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 EXAMINATION

.1 Inspect building with the Contract Administrator and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage, and items to remain.

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

.1 Refer to the KGS Group Loading Assessment memorandum, dated June 2020 for details on loading restrictions in place at the Site.

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

.4 Disconnect, cap, plug, or divert, as required, existing utilities within the property where they interfere with the execution of the Work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the Site and indicate location (horizontal and vertical) on the record Drawings. Support, shore up, and maintain pipes and conduits encountered.

.1 Immediately notify the Contract Administrator and utility company concerned in case of damage to any utility or service, designated to remain in place.

.2 Immediately notify the Contract Administrator should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PREPARATION

.1 Protection of In-Place Conditions:

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

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

.3 Protect building systems, services, and equipment.

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

.5 Perform Work in accordance with Section 01 35 29.06 – Health and Safety Requirements.

.2 Demolition/Removal:

.1 Remove items as indicated.

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

.3 Trim edges of partially demolished building elements to tolerances as defined by the Contract Administrator to suit future use.

3.3 CLEANING

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

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

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

END OF SECTION

PART 1 GENERAL

1.1 General and Related Work

.1 Read this section in conjunction with all Drawings and all other sections so as to comply with the requirements of the General Conditions of the Contract.

.2 Related work specified elsewhere:

Section 02 82 11 Asbestos Abatement – Type 1

.3 The HMIS Report titled “Confirmed Asbestos and Presumed Asbestos” dated July 02, 2019 and the KGS report titled "Hurst Pumping Station Structural Repairs and Drainage Building Upgrades
- Hazardous Materials Assessment", dated October 29, 2019 (refer to Appendix B) and “Site Conditions” noted below, identifies the location and asbestos content of all known asbestos-containing materials (ACMs) to be disturbed by Work of this Contract. The information provided is for general reference only. Each Contractor must confirm existing conditions on Site prior to Tender close.

.4 This section shall govern over all Work of the Contract which will, or may, disturb ACMs or surfaces or materials which may have been or become contaminated by ACM either during or prior to the Work of this Contract.

.5 It is the intent that Work performed as per this section will result in the removal of all ACM and the decontamination of all surfaces or materials which may have been or become contaminated by ACM either during or prior to the Work of this Contract.

1.2 Outline of the Work

.1 Testing of vermiculite insulation in block walls prior to demolition.

.2 Refer to Section 02 82 11 Asbestos Abatement – Type 1for a specific outline of Work and specified personnel protective measures for the safe handling, removal, and clean-up of asbestos specific to each phase or work area.

.3 Visit the Site prior to Tender close to confirm the location and extent of any asbestos-containing or asbestos-contaminated materials.

.4 Protect surfaces, equipment, building fabrics, and items remaining within the Asbestos Work Area.

.5 Isolate the Asbestos Work Area from adjoining Occupied and Non-Occupied Areas whether present at an interior or exterior location.

.6 Perform selective demolition of mechanical and electrical equipment, building components, materials, and items scheduled for demolition at locations required to facilitate asbestos removal.

.7 Remove and dispose of only asbestos-containing waste, building components, materials, and items contaminated by asbestos that cannot be effectively cleaned.

.8 Apply lock-down agent to exposed surfaces throughout the Work area and to surfaces from which any asbestos had been removed.

.9 Unless otherwise specified, the handling, removal, clean-up, or repair of ACMs or surfaces contaminated with asbestos is to be performed following wet removal techniques.

.10 Site inspection and air monitoring services specified herein will be performed by the Asbestos Abatement Monitoring & Inspection Agent.

1.3 Site Conditions

.1 Immediately stop work in the area and notify the Contract Administrator should unexpected materials or materials suspected of containing asbestos be encountered. Do not resume work in the area until it has been determined if the material encountered contains asbestos and authorization to resume work is given by the Contract Administrator.

1.4 Schedule

.1 Provide necessary manpower, supervision, equipment, and materials to maintain and complete the Project on schedule.

.2 Provide 48 hours written notice to the Contract Administrator of any request to work outside normal working hours. Obtain written approval before proceeding.

1.5 Definitions

.1 Airlock: Temporary chamber which permits ingress or egress from an Asbestos Work Area without permitting air movement through to non-contaminated areas.

.2 Amended Water: Water with wetting agent added for the purpose of reducing surface tension to allow thorough wetting of ACM.

.3 Asbestos Abatement Monitoring & Inspection Agent: A person qualified to provide asbestos abatement monitoring and inspection services in the jurisdiction where the services are to be provided. The Asbestos Abatement Monitoring & Inspection Agent shall be retained by the Contractor via the cash allowance included in the Contract.

.4 Asbestos-Containing Material (ACM): Material identified under Site conditions including any debris, overspray, fallen material and settled dust.

.5 Asbestos Waste Container: Impermeable container acceptable to Manitoba Sustainable Development and disposal site.

.6 Asbestos Work Area: Area where work takes place which will, or may, disturb ACM.

.7 Authorized Visitors: City personnel, Contract Administrator, or designated representative, and persons representing regulatory agencies.

.8 Bridging Encapsulant: Bridging encapsulant for purpose of encapsulating remaining ACM at locations deemed to be inaccessible.

.9 Contaminated Waste: Material identified under Site conditions, including fallen material, settled dust, other debris and materials, or equipment deemed to be contaminated.

.10 Curtained Doorway: Doorway consisting of two (2) overlapping flaps of rip-proof polyethylene arranged to permit ingress and egress from one room to another while permitting minimal air movement between rooms.

.11 DOP Test: A testing method used to determine the integrity of the Negative Pressure unit or vacuum using dioctyl phthalate (DOP) HEPA filter leak test.

.12 fitting: Individual segments or pieces of a mechanical service line which may include but is not limited to the hangers, tees, elbows, joints, valves, unions, etc.

.13 Friable Material: Material that when dry can be crumbled, pulverized, or powdered by hand pressure and includes such material that is crumbled, pulverized, or powdered.

.14 Glove Bag: Prefabricated bag which provides a completely sealed envelope surrounding a given section of piping to permit the removal of asbestos-containing insulation from within the bag while maintaining the integrity of the bag and preventing the spread of airborne asbestos fibres.

.15 HEPA Filter: High Efficiency Particulate Aerosol filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.

.16 Milestone Inspection: Inspection of the Asbestos Work Area at a defined point in the abatement operation.

.17 Negative Pressure: A reduced pressure within the Asbestos Work Area (>0.02 in.) established by extracting air directly from Asbestos Work Area and discharging it to exterior of building. Volume of air extracted must be sufficient to provide one (1) air change every 15 minutes while ensuring that at all times, air movement flows into the Asbestos Work Area as determined by visual or smoke testing.

.18 Non-Friable Material: Material that when dry cannot be crumbled, pulverized, or powdered by hand pressure. Including but not limited to the following ACM: vinyl tiles, asbestos cement tiles, gaskets, seals, select packings, friction products, drywall joint compound, and asbestos cement products. Exclude from the above categorization, any material that is or may become crumbled, pulverized, or powdered by handling as described herein.

.19 Non-Occupied Area: Any non-occupied area of the building or adjoining space outside the Asbestos Work Area.

.20 Occupied Area: Any occupied area of the building or adjoining space outside the Asbestos Work Area.

.21 Pipewrap: Any thermal or vapour covering present on straight runs and/or fittings of mechanical services. Include with the above, metal or other rigid jacketing associated straps, ties, fastenings, etc.

.22 Polyethylene Sheeting: Polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection to underlying surfaces and to prevent the escape of airborne fibres.

1.6 Regulations

.1 Comply with Federal, Provincial, and local requirements, provided that in any case of conflict among those requirements or with these Specifications, the more stringent requirements shall apply. Work shall be performed under regulations in effect at the time the Work is performed.

.2 Perform all asbestos abatement in accordance with the Safe Work Manitoba "Guide for Asbestos Management" (May 2017).

1.7 Quality Assurance

.1 Removal and handling of asbestos-containing or asbestos-contaminated materials is to be performed by persons trained in the methods, procedures and industry practices for asbestos abatement.

.2 Ensure the Work proceeds to schedule, meeting all requirements of this Specification.

.3 Complete work so that at no time airborne dust, visible debris, or water runoff contaminates areas outside the Asbestos Work Area.

.4 Any contamination of surrounding area (indicated by visual inspection or air monitoring) shall necessitate the clean-up of affected area, and in the same manner applicable to an Asbestos Work Area at no cost to the City.

.5 All work of this section involving electrical, mechanical, carpentry, glazing, etc., shall be performed by licensed persons experienced and qualified for the work required.

1.8 Inspection

.1 Site inspection services as specified herein will be provided by the Asbestos Abatement Monitoring & Inspection Agent.

.2 The Asbestos Abatement Monitoring & Inspection Agent will perform at a minimum, one (1) randomly scheduled Site inspection per 8 hour work shift during all active removal, repair, or clean-up of asbestos- containing or asbestos-contaminated materials.

.3 From commencement of the Work until completion of clean-up operations, the Asbestos Abatement Monitoring & Inspection Agent will be empowered by the City to inspect for compliance with the requirements of governing authorities, adherence to specified procedures and materials, and to inspect for final cleanliness and completion.

.4 The Asbestos Abatement Monitoring & Inspection Agent is empowered by the City to order a shutdown of Work when leakage of asbestos from the controlled work area has occurred, or is likely to occur.

.5 Any deviation from the requirements of the Specifications or governing authorities that is not approved in writing may result in a stoppage of work, at no cost to the City.

.6 Additional labour or materials expended by the Contractor to rectify unsatisfactory conditions and to provide performance to the level specified, shall be at no additional cost to the City.

.7 Any inspections performed as a result of Contractor's failure to perform satisfactorily regarding quality, safety, or schedule shall be back-charged to the Contractor.

.8 Facilitate inspection and provide access as necessary. Make good work disturbed by inspection and testing at no cost to the City.

.9 Refer to Section 02 82 11 Asbestos Abatement – Type 1for specified milestone inspections which are to take place in addition to the above noted random inspections and at defined points throughout the abatement operation specific to each phase or work area.

.10 Provide 24 hours written notice to the Asbestos Abatement Monitoring & Inspection Agent of any request for scheduling of milestone inspections or transportation of waste through Occupied Areas.

.11 Do not proceed with next phase of the Work until written approval of each milestone is received from the Asbestos Abatement Monitoring & Inspection Agent.

1.9 Air Monitoring

.1 Refer to Section 02 82 11 Asbestos Abatement – Type 1for specific air monitoring requirements for asbestos abatement Type 1.

1.10 Supervision

.1 Provide a supervisor who has authority to oversee all aspects of the Work, including but not limited to, manpower and equipment requirements, and direct communication and coordination with the Contract Administrator.

.2 Supervisory personnel must hold a recognized certificate proving attendance at an asbestos removal training course (three (3) day minimum duration) and have performed supervisory functions on at least five (5) other asbestos abatement projects of similar size and complexity.

.3 At all times during work at risk of disturbing asbestos, the supervisor must be on Site. Failure to comply with this requirement will result in a stoppage of all Work, at no cost to the City.

.4 Replace supervisory personnel, with approved replacements, within three (3) working days of a written request from the Contract Administrator. The Contract administrator reserves the right to request replacement of supervisory personnel without explanation.

.5 Do not replace supervisory personnel without written approval from the Contract Administrator.

1.11 Notification

.1 Not later than five (5) days before commencing work on this project, notify in writing the director of the Workplace Safety and Health Branch before beginning work where ACMs may be released into the atmosphere.

.2 Notify sanitary landfill site as per local requirements.

.3 Inform all trades on Site of the presence and location of ACMs identified in the Contract documents.

1.12 Submittals

.1 Submit prior to starting work:

.1 Proof of required licensing for transportation of asbestos waste.

.2 Names and credentials of the designated supervisor.

.3 Proof in the form of a certificate that supervisory personnel have attended training courses on asbestos removal (three (3) day minimum duration) and have performed supervisory function on at least five (5) other asbestos projects of similar size and complexity.

.4 Proposed schedule (prepared in chart format) detailing the following:

.1 Duration of site preparation, contaminated preparation, removal, clean-up, and site dismantlement for each phase area.

.2 Proposed average daily work force and shifting.

.5 Shop Drawings for each Asbestos Work Area detailing the following:

.1 Location of waste and worker decontamination facilities.

.2 Any proposed deviation from Specifications, procedures, or Drawings.

.3 Platform layout, hoarding, and details to be submitted to the Contract Administrator for review prior to commencing the Work.

.4 Installation of negative air discharge units.

.6 Documentation including test results, fire and flammability data, samples, and Material Safety Data Sheets for chemicals or materials used in the course of the asbestos abatement portion of the Work including or not limited to:

.1 Encapsulants.

.2 Wetting agents.

.3 Lock-down agent.

.4 Rip-proof polyethylene.

.5 Any other chemicals or materials used in the course of asbestos abatement.

.7 Negative air unit performance data and results of DOP tests as required.

.8 Proof that all employees have been fit-tested for the respirator appropriate for the work being performed.

.9 Proof that all employees have had instruction (two (2) days minimum) on hazards of asbestos exposure, use of respirator, and all aspects of work procedures and protective measures.

.10 Proof that all employees are listed on an asbestos work report and have been given the required medical examinations.

.11 Copy of notification to governing authorities of commencement of the Work.

.2 Submit on a weekly basis, and at completion of the Work:

.1 Completed waste manifest forms.

.2 Pressure differential monitoring data.

1.13 Worker Protection

.1 General

.1 Instruct workers before allowing entry to the Asbestos Work Area. Instruction shall include training in use of respirators, dress, showering, entry and exiting from an Asbestos Work Area, and all other aspects of work procedures and protective measures.

.2 Workers shall not eat, drink, smoke, or chew gum or tobacco except in established locations outside the Asbestos Work Area.

.3 Workers shall be fully protected at all times when possibility of disturbance of asbestos exists.

.4 Provide and post at access points to the Asbestos Work Area, the procedures described under Worker Protection.

.2 Respiratory Protection

.1 Refer to Section 02 82 11 Asbestos Abatement – Type 1for specified type of respiratory equipment for each phase or work area.

.2 Provide and ensure the use of respiratory equipment appropriate for the work being performed for persons who are required to enter the Asbestos Work Area.

.3 Respiratory protective devices shall be certified by the National Institute of Occupational Safety and Health (NIOSH) or other testing agency acceptable to governing authorities.

.4 Maintain respiratory equipment in proper functioning and clean condition or remove from Site.

.5 Respiratory equipment shall be identified with permanent markings with current list of persons utilizing such equipment displayed in a clean area on Site.

.6 Filters used shall be tested following each use in accordance with the manufacturer's specifications or replaced at the following minimum frequency:

.1 Replace cartridge filters for negative pressure respirator every 16 hours of wear unless tested on Site.

.2 Replace powered air-purifying respirator (PAPR) cartridge filters every 8 hours of wear unless tested on Site.

.3 Mark filters for rotation and regular replacement. Once worn in an Asbestos Work Area, filters may not be removed from the project Site except for disposal.

.7 Ensure that no person required to enter an Asbestos Work Area has facial hair which affects the seal between respirator and face.

.8 Store respirators and tested filters that will be reused in an established clean area on Site. Charge batteries in this area.

.3 Protective Clothing and Equipment

.1 All personnel required to enter the Asbestos Work Area must use disposable full body coveralls with attached head covering. Once coveralls are worn, treat and dispose of as asbestos-contaminated waste.

.2 Use hard hats, safety shoes, and other protective apparel required by the applicable construction safety regulations.

.4 Asbestos Abatement Work Area Entry and Exit Procedures

.1 Refer to Section 02 82 11 Asbestos Abatement – Type 1for specified work area entry and exit procedures specific to each phase or work area.

1.14 Visitor Protection

.1 Provide clean protective clothing, equipment, and approved respirators to Authorized Visitors.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators, and Asbestos Work Area entry and exit procedures.

1.15 Signage/Labelling

.1 Work Area Signs: Post signs at access points to the Asbestos Work Area. Where possible, provide signage immediately prior to entering Asbestos Work Area but out of public view. The following is an example of an acceptable warning sign:

DANGER ASBESTOS – Inhalation Health Hazard

AUTHORIZED PERSONNEL ONLY

RESPIRATORS AND PROTECTIVE CLOTHING

REQUIRED IN THIS AREA

Site Contact:_____

.2 Container Signs: Label containers for the disposal of asbestos as per the following example of an acceptable warning sign:

DANGER CONTAINS ASBESTOS FIBRES

INHALATION HEALTH HAZARD

DO NOT DISTURB

1.16 Waste and Material Handling

.1 Provide the Asbestos Abatement Monitoring & Inspection Agent and the Contract Administrator with a copy of each completed waste transportation manifest verifying the safe transportation of waste to an authorized disposal site.

.2 Refer to Section 02 82 11 Asbestos Abatement – Type 1for specified waste and material handling procedures specific to each phase or work area.

.3 Asbestos-containing or asbestos-contaminated materials removed during the Work shall be treated, packaged, transported, and disposed of as asbestos-contaminated waste.

.4 Materials that could tear or puncture a 6 mil (0.15 mm) polyethylene bag shall be packaged and disposed of in sealed rigid waste containers specified.

.5 Redundant non-ACMs, rubble, and debris removed during contaminated work shall be treated, packaged, and disposed of as asbestos-contaminated waste. With written approval of the Asbestos Abatement Monitoring & Inspection Agent, non-porous materials may be cleaned, sprayed with a sealer and left behind for final disposal as clean waste.

.6 Waste must be transported by a hauler appropriately trained for the transportation of waste containing asbestos.

1.17 Dump Monitoring

.1 Co-operate with Manitoba Sustainable Development inspectors and immediately carry out instructions for remedial work at dump, at no additional cost to City.

.2 Ensure each shipment of containers is accompanied by a representative who will supervise dumping of containers and ensure all guidelines and regulations are followed.

.3 Equip each shipment of containers with full personal protective equipment and tools required to properly clean-up spilled asbestos in the case of a failure in an Asbestos Waste Container.

PART 2 PRODUCTS AND FACILITIES

2.1 Materials and Equipment

.1 Refer to Sections 02 82 11 Asbestos Abatement – Type 1for specified materials, equipment, or facilities specific to each phase or work area.

.2 Materials and equipment must be in good condition and free of asbestos, asbestos debris, and fibrous materials. Disposable items must be of new materials only.

.3 Asbestos Waste Container: Impermeable container acceptable to Manitoba Sustainable Development and disposal site. Labelled as required, comprised of the following:

.1 A sealed 6 mil (0.15 mm) polyethylene bag or glove bag, inside a second 6 mil (0.15 mm) sealed polyethylene bag.

.2 A sealed 6 mil (0.15 mm) polyethylene bag or glove bag, positioned inside or outside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation and disposal.

.4 Bridging Encapsulant: Bridging encapsulant for purpose of encapsulating remaining ACM at locations deemed to be inaccessible by the Asbestos Abatement Monitoring & Inspection Agent. Product shall be colour coded bright red and be capable of withstanding surface temperature of substrate. Product must have flame spread and smoke development ratings both less than
50. Apply product uniformly to minimum thickness of 10 mil. Acceptable product: Serpiflex Shield or approved equal.

.5 Differential Pressure Monitor: Acceptable Product: Magnehelic gauge (Cat. No. 2000-00) manufactured by Dwyer Instruments Inc.

.6 HEPA Vacuum: Vacuum with necessary fittings, tools and attachments. Discharged air must pass through a HEPA filter.

.7 Lock-down Agent: Sealant for purpose of trapping residual dust and shall be capable of withstanding surface temperature of substrate. Product must be compatible with replacement materials and must have flame spread and smoke development ratings of less than 50 and shall leave no stain when dry. Acceptable product: Serpiflex Shield or approved equal.

.8 Negative Air Exhaust Ducting (Flexible): Airtight tubing with metal reinforcement or approved equal. Mechanically affix each exhaust duct to the unit's exhaust with metal hose clamp. Diameter of duct to equal negative air discharge. Acceptable product: Thermalflex S-LP 10 flexible ducting as manufactured by Flexible Technologies.

.9 Negative Air Unit: Portable air handling system which extracts air directly from the Asbestos Work Area and discharges air to exterior of building. Equipped as follows:

.1 Pre-filter and HEPA filter. Air must pass HEPA filter before discharge.

.2 Pressure differential gauge to monitor filter loading.

.3 Auto shut off and warning system for HEPA filter failure.

.4 Separate hold down clamps to retain HEPA filter in place during change of pre-filter.

.10 Polyethylene Sheeting: 6 mil (0.15 mm) minimum thickness unless otherwise specified, in sheet size to minimize joints.

.11 Protective Coveralls: Disposable full body coveralls complete with hoods. Acceptable material: Tyvek coveralls or approved equal.

.12 Rip-Proof Polyethylene Sheeting: 8 mil (0.20 mm) fabric made up from 5 mil (0.13 mm) weave and two (2) layers of 1.5 mil (0.05 mm) poly laminate or approved equal. In sheet size to minimize on-site seams and overlaps.

.13 Shower Hose: Water lines for supply of hot and cold water to shower facilities to be rated for use at 200 psi (1380 kPa) or twice the working pressure whichever is greater. Supply lines to be continuous and free of fittings, joints or couplings. Acceptable Product: No. 71-92 Daco.

.14 Wetting Agent: Non-sudzing surface active agent. Acceptable product: Aqua-Gro or approved equal.

PART 3 EXECUTION

.1 Refer to Section 02 82 11 Asbestos Abatement – Type 1for specified procedures for work area preparation, maintenance, site dismantlement, waste handling, application of lock-down agent, and all other procedures for the safe handling, removal, and clean-up of asbestos specific to each phase or work area.

END OF SECTION

PART 1 GENERAL

1.1 General and Related Work

.1 Read this section in conjunction with all Drawings and all Specifications so as to comply with the requirements of the Contract.

.2 Related work specified elsewhere:

Section 02 82 10 Asbestos Abatement – General Provisions

.3 The intent of this section is to provide safe work practices and procedures to govern the handling, removal, and disposal of non-friable asbestos-containing materials (ACMs) to be disturbed by the Work of this Contract.

.4 Refer to Section 02 82 10 Asbestos Abatement – General Provisions for specified personnel protective measures and procedures for the handling, removal, and clean-up of non-friable ACM while in the vicinity of friable ACMs or surfaces contaminated with asbestos.

1.2 Outline of Work

.1 Supply all labour, material, plant, and equipment necessary to safely execute and complete all the Work of this section while in conjunction with the Work specified, required, or implied under Section 02 82 10 Asbestos Abatement – General Provisions.

.2 Isolate the Asbestos Work Area from adjoining spaces through the placement of specified barriers and partitions at the perimeter of each phase or work area.

.3 Remove and dispose of non-friable ACMs scheduled for removal at locations specified or as otherwise required to complete the Work of this Contract.

.4 Perform all cutting, shaping, and drilling of non-friable ACMs as specified and at locations required to complete the Work of this Contract.

.5 Protect surfaces throughout the Work area and prevent the spread of dust by use of polyethylene drop sheets or other suitable materials.

1.3 Inspection

.1 The following Milestone Inspections are to take place during the Work of this section and are to be performed by the Asbestos Abatement Monitoring & Inspection Agent and to be witnessed by the Contract Administrator:

.1 Milestone Inspection A - Clean Site Preparation
Inspection of preparations and set-up prior to asbestos abatement work.

.2 Milestone Inspection B - Site Dismantlement
Inspection and air sampling within the Asbestos Work Area following completion of the Work but prior to Site dismantlement.

1.4 Worker Protection

.1 Provide protective disposable coveralls and non-powered half-face respirators with high efficiency particulate aerosol (HEPA) or P100 cartridge filters to abatement workers.

.2 Provide facilities for washing of hands and face to the workers which shall be used by every worker when leaving the Asbestos Work Area.

PART 2 PRODUCTS AND FACILITIES

2.1 Materials and Equipment

.1 Sprayer: Garden-type portable manual sprayer or water hose with spray attachment.

.2 The use of power tools that are not equipped with a HEPA filtered dust collection device is prohibited. Immediately cease the use power tools if any visible dust escapes from the HEPA filtered dust collection device.

PART 3 EXECUTION

3.1 Site Preparation

.1 Facilitate access to concealed ACMs at required locations.

.2 Ensure any non-asbestos debris or rubble generated during this selective demolition is removed from the immediate area prior to commencement of any asbestos removal.

.3 Segregate Asbestos Work Area and parts of building required to remain in use by closing doors, placing of barricades, or placing of tape barrier, etc.

.4 Provide tools, equipment, vacuum, materials, and waste receptors within the Asbestos Work Area.

.5 Post warning signs in all areas where access to the Asbestos Work Area is possible.

.6 HEPA vacuum or wet wipe dust from surfaces within the Asbestos Work Area.

.7 Cover floor and furnishings in the vicinity of the work with polyethylene before disturbing non-friable asbestos materials other than floor tiles.

.8 Do not commence the abatement work until authorized by the Asbestos Abatement Monitoring & Inspection Agent.

.9 Schedule and obtain written approval of Milestone Inspection A (Clean Site Preparation) before proceeding with the asbestos abatement work.

3.2 Removal of Non-Friable Asbestos Materials

.1 Wet all material to be disturbed while protecting all pumps, motors, and other equipment in the vicinity that are subject to be impacted.

.2 Undo fasteners, if necessary, to remove material. Break material only if unavoidable.

.3 Wet freshly exposed edges of broken materials.

.4 Wet material and use hand scraping to remove adhering material where sections are adhered to substrate.

.5 Place removed material into asbestos waste container.

.6 Clean Asbestos Work Area frequently and again at completion of the Work with a HEPA vacuum or with wet methods.

.7 At completion of the Work, clean the drop sheets to be reused with the HEPA vacuum or with wet methods. Dispose of the drop sheets not cleaned as asbestos waste.

.8 Schedule and obtain written approval of Milestone Inspection B (Site Dismantlement) before proceeding with the removal of perimeter barricades, etc.

3.3 Air Monitoring

.1 Air Monitoring for Type 1 abatement work to be performed by an Asbestos Abatement Monitoring & Inspection Agent during Milestone Inspection B - Site Dismantlement as described in Item 1.3.1.2.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Comply with requirements of this section when performing following Work:

.1 Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap.

.2 Removal of lead-containing coatings or materials using a power tool with an effective dust collection system equipped with a High Efficiency Particulate Air (HEPA) filter.

.3 Removal of lead-containing coatings or materials with non-powered hand tool, other than manual scraping and sanding.

1.2 RELATED REQUIREMENTS

.1 Section 02 41 99 – Demolition of Minor Works.

.2 Section 09 91 23 – Interior Painting.

1.3 REFERENCE STANDARDS

.1 Department of Justice Canada

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.2 Health Canada

.1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).

.3 Human Resources and Social Development Canada (HRSDC)

.1 Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.

.4 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 U.S. Environmental Protection Agency (EPA)

.1 EPA 747-R-95-007-[1995], Sampling House Dust for Lead.

.6 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)

.1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).

.7 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances

.1 Lead in Construction Regulation - 29 CFR 1926.62-[1993].

.8 Underwriters' Laboratories of Canada (ULC)

1.4 DEFINITIONS

.1 Amended Water: Water with wetting agent added for the purpose of reducing surface tension to allow thorough wetting.

.2 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.3 polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects over cuts and tears, and elsewhere as required to provide protection and isolation. For protection of underlying surfaces from damage and to prevent lead dust entering in clean area.

.4 lead dust: wipe sampling on vertical surfaces and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide proof satisfactory to the Contract Administrator that suitable arrangements have been made to dispose of lead based paint waste in accordance with requirements of the Authority Having Jurisdiction.

.3 Provide proof of Insurance.

.4 Quality Control:

.1 Provide necessary permits for transportation and disposal of lead based paint waste and proof that lead based paint waste has been received and properly disposed.

.2 Provide proof satisfactory to the Contract Administrator that employees have had instruction on hazards of lead exposure, respirator use, dress, and aspects of work procedures, and protective measures.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial, and local requirements pertaining to lead paint, provided that, in case of conflict among those requirements or with these Specifications, the more stringent requirement applies. Comply with regulations in effect at time Work is performed.

.2 Health and Safety:

.1 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers and visitors in work area include:

.1 Respirator: NIOSH approved and equipped with replaceable HEPA filter cartridges with an appropriate protection, acceptable to Authority Having Jurisdiction. Suitable for type of lead and level of lead dust exposure. Provide sufficient amount of filters.

.2 Half mask respirator: half-mask particulate respirator with suitable filter.

.2 Eating, drinking, chewing, and smoking are not permitted in Work area.

.3 Ensure workers wash hands and face when leaving Work area.

.4 Visitor Protection:

.1 Provide approved respirators to visitors to Work areas.

.2 Instruct visitors in the procedures to be followed in entering and exiting the Work area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials.

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

.3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, Territorial, and Municipal regulations. Dispose of lead waste in sealed double thickness 6mils bags or leak proof drums. Label containers with appropriate warning labels.

.4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 EXISTING CONDITIONS

.1 KGS Group has identified the presence of lead paint in the following locations as per the technical memorandum “Hazardous Materials Testing Summary”, dated October 29, 2019 and appended to this Tender:

.1 Existing interior cork insulation

.1 The existing off-white coating is not considered lead-based but does contain trace amounts of lead. Therefore these areas are not to be sanded as part of the surface preparation procedures.

.2 Rooftop ducts and fan and gooseneck intake covers

.1 The existing steel duct and fan cover coatings are lead-based but are not of a leachable type. Caution is to be exercised for those components to be repainted.

.2 Notify the Contract Administrator of lead-based paint discovered during Work and not apparent from Drawings, Specifications, or reports pertaining to the Work. Do not disturb such material until instructed by the Contract Administrator.

1.9 SCHEDULING

.1 Not later than two days before beginning Work on this project notify following in writing:

.1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.

.2 Provincial Ministry of Labour.

.3 Disposal Authority.

.2 Inform sub trades of presence of lead-containing materials identified in existing conditions.

.3 Provide the Contract Administrator a copy of notifications prior to start of Work.

1.10 PERSONNEL TRAINING

.1 Provide the Contract Administrator satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of respirators.

.2 Instruction and training related to respirators includes, at minimum:

.1 Proper fitting of equipment.

.2 Inspection and maintenance of equipment.

.3 Disinfecting of equipment.

.4 Limitations of equipment.

.3 Instruction and training must be provided by a qualified, Competent Person.

.4 Supervisory personnel to complete all required training.

Part 2 Products

2.1 MATERIALS

.1 Polyethylene: 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.

.2 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using Amended Water.

.3 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual lead paint residue.

.4 Lead waste containers: metal or fibre type acceptable to dump operator with tightly fitting covers and 0.15 mm thickness sealable polyethylene liners.

.1 Label containers with pre-printed bilingual cautionary “Warning Lead” clearly visible when ready for removal to disposal site.

Part 3 Execution

3.1 SUPERVISION

.1 One supervisor for every ten workers is required.

.2 Supervisor must remain within work area during disturbance, removal, or handling of lead based paints.

3.2 PREPARATION

.1 Remove and store items to be salvaged or reused.

.1 Protect and wrap items and transport and store in area specified by the Contract Administrator.

.2 Work Area:

.1 Shut off and isolate HVAC system to prevent dust dispersal into other building areas. Conduct smoke tests to ensure duct work is airtight.

.2 Pre-clean fixed casework and equipment within work area, using HEPA vacuum and cover and seal with polyethylene sheeting and tape.

.3 Clean work area using HEPA vacuum. If not practicable, use wet cleaning method. Do not raise dust.

.4 Seal off openings with polyethylene sheeting and seal with tape.

.5 Protect floor surfaces covered from wall to wall with polyethylene sheets.

.6 Maintain emergency fire exits or establish alternatives satisfactory to Authority Having Jurisdiction.

.7 Where water application is required for wetting lead containing materials, provide temporary water supply appropriately sized for application of water as required.

.8 Provide electrical power and shut off [for operation of powered tools and equipment]. Provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical cables and equipment.

.3 Do not start Work until:

.1 Arrangements have been made for disposal of waste.

.2 Tools, equipment, and materials waste containers are on Site.

.3 Arrangements have been made for building security.

.4 Notifications have been completed and preparatory steps have been taken.

3.3 LEAD ABATEMENT

.1 Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap; or removal equipped with HEPA filters; or removal with using power tools non-powered hand tool, other than manual scraping and sanding.

.2 Remove lead based paint in small sections and pack as it is being removed in sealable 0.15mm plastic bags and place in labelled containers for transport.

.3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to staging area. Clean external surfaces thoroughly again by wet sponging. Wash containers thoroughly pending removal to outside. Ensure containers are removed by workers who have entered from uncontaminated areas dressed in clean coveralls.

.4 After completion of stripping work, wire brush and wet sponge surface from which lead based paint has been removed to remove visible material. During this work keep surfaces wet.

.5 After wire brushing and wet sponging to remove visible lead based paint, and after encapsulating lead containing material impossible to remove, wet clean entire work area and equipment used in process. After inspection by the Contract Administrator apply continuous coat of slow drying sealer to surfaces of the Work area. Do not disturb the Work area for 8hours; no entry, activity, ventilation, or disturbance to take place during this period.

3.4 INSPECTION

.1 Perform inspection to confirm compliance with Specification and governing authority requirements. Deviations from these requirements not approved in writing by the Contract Administrator will result in work stoppage, at no cost to the City.

.2 The work will be inspected for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 LEAD SURFACE SAMPLING - WORK AREAS

.1 Final lead surface sampling to be conducted as follows:

.1 After Work area has passed a visual inspection for cleanliness approved and accepted, apply a coat of lock-down agent to surfaces within the enclosure.

After an appropriate setting period of 8 hours, perform lead wipe sampling.

.1 Final lead wipe sampling results from horizontal and vertical surfaces must show lead levels of less than 40 micrograms of lead in dust per square foot. Samples collected and analyzed in accordance with EPA 747-R-95-007.

.2 If wipe sampling results show levels of lead in excess of 40 micrograms per square foot, re-clean Work area at Contractor's expense and apply another acceptable coat of lock-down agent to surfaces.

.3 Repeat as necessary until fibre levels are less than 40 micrograms per square foot.

3.6 FINAL CLEANUP

.1 Following cleaning and when lead wipe surfaces sampling are below acceptable concentrations, proceed with final cleanup.

.2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.

.3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.

.4 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

.1 Repair or replace objects damaged in course of work to their original state or better.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 20 00 – Concrete Reinforcement.

.2 Section 03 30 00 – Cast-In-Place Concrete.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

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

.2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.

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

.4 CSA O151-04, Canadian Softwood Plywood.

.5 CSA O153-M1980(R2003), Poplar Plywood.

.6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.

.7 CSA O437 Series 93(R2006), Standards for OSB and Waferboard.

.8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.

.9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada

.2 Underwriters' Laboratories of Canada (ULC)

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

1.3 SUBMITTALS

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

.2 Submit Shop Drawings for formwork and falsework.

.3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.

.4 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series, and CSA-O153.

.2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

.3 Rigid insulation board: to CAN/ULC-S701.

.2 Form ties:

.1 Use snap ties complete with plastic cones and light grey concrete plugs.

.3 Form liner:

.1 Plywood: Canadian Softwood Plywood to CSA O151.

.4 Form release agent: non-toxic, biodegradable, low VOC.

.5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm^2/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

.6 Falsework materials: to CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with Drawings.

.2 Obtain Contract Administrator's approval for use of earth forms framing openings not indicated on Drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Refer to architectural Drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations, and levels indicated within tolerances required by CSA-A23.1/A23.2.

.9 Align form joints and make watertight.

.1 Keep form joints to minimum.

.10 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.11 Form chases, slots, openings, drips, recesses, expansion, and control joints as indicated.

.12 Construct forms for architectural concrete and place ties as directed.

.1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.14 Clean formwork, in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 7 days for walls.

.2 5 days for slabs.

.2 Remove formwork when concrete has reached 70 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 – Concrete Forming and Accessories

.2 Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

.1 City of Winnipeg (CW) Standard Construction Specifications

.1 CW 2160, Concrete Underground Structures and Works

.2 American Concrete Institute (ACI)

.1 SP-66, ACI Detailing Manual 2004.

.1 ACI 315, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.3 ASTM International

.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.4 CSA International

.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.

.3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.5 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC, Reinforcing Steel Manual of Standard Practice.

1.3 SUBMITTALS

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

.2 The Contractor shall submit Shop Drawings for the Contract Administrator's approval two weeks prior to the fabrication of any reinforcing steel.

.3 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.

.4 Shop Drawings:

.1 Submit Shop Drawings stamped and signed by a professional engineer registered in the Province of Manitoba.

.1 Indicate placing of reinforcement and:

.1 Bar bending details including bar size, grade, spacing, and bend;

.2 Quantities of reinforcement;

.3 Hooks, spacing, and supporting devices;

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Contract Administrator, with identifying code marks to permit correct placement without reference to structural Drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers, and hangers.

.2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials off ground in a dry location and in accordance with manufacturer's recommendations.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Contract Administrator.

.2 Reinforcing steel: billet steel, grade 400W, deformed bars to CSA-G30.18., unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.

.4 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.

.5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.1 Bar accessories shall be of type approved by the Contract Administrator. They shall be made from a non-corroding material and they shall not stain, blemish, or

spall the concrete surface for the life of the concrete. Bar chairs are to be PVC; galvanized bar chairs are not acceptable.

.2 Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract Administrator. Bar accessories are not shown on the Drawings. The supply and installation of bar accessories shall be considered incidental to the supply and placing of reinforcing steel.

.6 Mechanical splices: subject to approval of Contract Administrator.

.7 Plain round bars: to CSA-G40.20/G40.21.

.8 Replace defective or damaged materials with new.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315, CW 2160, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Contract Administrator's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Contract Administrator, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum four (4) weeks prior to beginning reinforcing work.

.2 Upon request, inform Contract Administrator of proposed source of material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by the Contract Administrator.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 When paint is dry, apply thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain the Contract Administrator's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 A minimum of 24 hours notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for observation of reinforcing steel.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 City of Winnipeg Construction Specification CW 2160.

.2 Section 03 10 00 – Concrete Forming and Accessories.

.3 Section 03 20 00 – Concrete Reinforcement.

.4 Section 01 45 00 – Quality Control.

1.2 REFERENCES

.1 Reference Standards:

.1 ASTM International

.1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.

.2 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: Convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure key personnel attend.

.1 Verify project requirements.

1.4 SUBMITTALS

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

.2 Shop Drawings:

.1 Submit Shop Drawings for reinforcing steel a minimum of four (4) weeks prior to the fabrication of any reinforcing steel.

.3 Mix Design Statement

.1 Provide a “Mix Design Statement” for each type of concrete as detailed in Item 2.4.1.6.

.4 Construction Method Submission

.1 Provide a “construction method submission” as detailed in Item 3.1.1.

.5 Product Technical Data Sheet for pre-mixed concrete products for exterior pre-cast cladding repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to the Site of Work and discharged within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Contract Administrator and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Contract Administrator.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Performance: to CSA A23.1/A23.2, and as described in Item 2.4 MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by the Contract Administrator.

.2 Quality Control: Concrete testing shall be performed by a CSA approved testing, qualified independent inspection laboratory company (to be paid for by the contractor). Three (3) concrete test cylinders and one slump test shall be taken for every 50 (or less) cubic meters, or each day concrete is placed, whichever is greater. Testing shall be in accordance with CSA A23.2-14. The test data results and certification are to be forwarded to the Contract Administrator.

.3 Quality Control Testing: Contractor is to follow and meet requirements outlined in Section 01 45 00 – Quality Control.

2.3 MATERIALS

.1 Portland Cement: to CSA A3001.

.2 Water: to CSA A23.1.

.3 Aggregates: to CSA A23.1/A23.2.

.4 Admixtures:

.1 All admixtures shall be compatible.

.2 Air entraining admixture: to ASTM C260.

.3 Chemical admixture: to ASTM C494.

.5 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.

.1 Compressive strength: 35 MPa at 28 days.

.2 Net shrinkage at 28 days: maximum 0%.

.3 Acceptable product: Sika Grout 212 SR.

.6 Curing compound: to CSA A23.1/A23.2 white.

.7 Hydrophilic waterstops: Sika Hydrotite profile # CJ 0725 or approved equal in accordance with B7.

.8 Bonding agent: Sika Latex R or approved equal in accordance with B7.

.9 Reinforcing steel bar accessories

.1 To be made of non-corroding material.

.2 Shall not stain, blemish, or spall the concrete surface for the life of the concrete.

.3 Shall be approved by the Contract Administrator.

.4 Bar chairs shall be PVC.

2.4 MIXES

.1 Performance Method: The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this Specification. Concrete shall be supplied in accordance with the requirements of CSA A23.1-09, with the minimum properties as provided below:

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance.

.2 Provide construction concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: S-2.

.2 Cement type: Type HS.

.3 Compressive strength at 56 day age: 32 MPa minimum.

.4 Maximum Water/Cementing Materials Ratio: 0.45.

.5 Entrained Air Content: 4%-7%.

.6 Aggregate size: 20 mm maximum.

.7 Intended application: Foundation walls.

.3 Provide exterior slab concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: C-2.

.2 Compressive strength at 28 day age: 32 MPa minimum.

.3 Maximum Water/Cementing Materials Ratio: 0.45.

.4 Entrained Air Content: 5%-8%.

.5 Aggregate size: 20 mm maximum.

.6 Intended application: Exterior non-structural slabs.

.4 Provide exterior wall/column and exterior slab concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: F-2.

.2 Compressive strength at 28 day age: 30 MPa minimum.

.3 Maximum Water/Cementing Materials Ratio: 0.45.

.4 Entrained Air Content: 5%-8%.

.5 Aggregate size: 20 mm maximum.

.6 Intended application: Exterior columns and walls.

.5 Provide lean mix concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: N.

.2 Cement type: Type GU.

.3 Slump/Flow: 80 mm.

.4 Compressive strength at 28 day age: 15 MPa minimum.

.5 Entrained Air Content: nil.

.6 Intended application: As required.

.6 Provide a “Mix Design Statement” for each type of concrete to be used certifying constituent materials and mixing proportions to the Contract Administrator at least 2 weeks prior to delivery of concrete to the Site. Supply reasonable evidence to the Contract Administrator that the mix proportions selected will produce concrete meeting the specified strength, workability, and yield.

.7 Provide product technical data sheets for pre-mixed concrete products for exterior pre-cast cladding repairs.

.8 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

Part 3 Execution

3.1 PREPARATION

.1 Construction method submission:

.1 No Work shall commence on construction of cast-in-place concrete until after the Contract Administrator’s review of the Contractor’s construction method submission.

.2 The Contractor shall prepare for the Contract Administrators review a construction method submission detailing:

.1 Construction sequence to be followed including all methods to be employed.

.2 Specialized equipment to be used.

.3 Any design revisions proposed to accommodate the Contractor’s proposed construction method.

.3 The Contractor shall respond to any concerns that may be raised by the Contract Administrator after review of the construction method submission.

.2 Obtain Contract Administrator’s written approval before placing concrete.

.1 Provide 48 hours minimum notice prior to placing of concrete.

.3 Place concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.

.4 During concreting operations:

.1 Development of cold joints is not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.5 Pumping of concrete is permitted only after approval of equipment and mix.

.6 Ensure reinforcement and inserts are not disturbed during concrete placement.

.7 Protect previous Work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Do not place load upon new concrete until authorized by Contract Administrator.

3.2 INSTALLATION/APPLICATION

.1 Do cast-in-place concrete work to CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes, or other openings to pass through joists, beams, column capitals, or columns, except where indicated or approved by Contract Administrator.

.2 Where approved by Contract Administrator, set sleeves, ties, pipe hangers, and other inserts and openings as indicated or specified elsewhere.

.3 Sleeves and openings greater than 100 x 100 mm not indicated must be reviewed by Contract Administrator.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Contract Administrator before placement of concrete.

.5 Confirm locations and sizes of sleeves and openings shown on Drawings.

.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.4 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.1 Landing pads – Broom Finish

.2 Use procedures as reviewed by Contract Administrator or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.

.5 Waterstops:

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place to reinforcement.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by Contract Administrator.

.6 Cast-in-place concrete:

.1 Construct cast-in-place concrete in accordance with CW 2160, except as supplemented, revised, or amended in this Specification and as indicated in the construction notes on the Drawings.

.2 Adjust the location of reinforcing steel adjacent to openings to frame those openings in accordance with good practice, and maintain the bar spacing intent.

.3 Do not use welded splices for reinforcing steel.

.4 Order all wall reinforcement steel in lengths to best suit the spacing of shoring whalers so that reinforcing bars will not be bent or misformed in order to remove the whalers.

.7 Backfill:

.1 Place and compact backfill material as indicated in the Drawings and in accordance with CW 2030.

.2 Do not place backfill material in a frozen state.

.3 Supply heating and hoarding in accordance with CW 2160 if required to ensure material does not freeze before compaction is complete.

.4 Notify the Contract Administrator at least one (1) full Business Day in advance of any backfilling operation. No backfill shall be placed against concrete until approved by the Contract Administrator and in no case before field cured test cylinders show the concrete strength to be 75% of that specified.

.8 Grout:

.1 Mix and apply grout in accordance with the manufacturer's instructions. Consistency is to be suitable for the intended application.

.9 Cold weather requirements:

.1 Should any concrete Work be required to be carried out when the daily mean temperature is below 5°C or anticipated to be below 5°C within the next 24 hours, cold weather requirements will be as specified herein.

.2 All freshly placed concrete shall be protected from the elements and from defacements due to construction operations.

.3 The following are minimum requirements for protecting concrete during and after placement during freezing weather, but mere adherence to these requirements will not relieve the Contractor of the necessity for producing concrete which has not been weakened or injured by frost or freezing, or replacing such damaged Work at no additional cost to the City;

.1 Before any concrete is placed, all ice, snow, and frost shall be completely removed from all formwork, and other surfaces against which concrete will contact. Temperatures of such surfaces shall be raised above 7°C for twenty-four (24) hours minimum prior to concreting. Where concrete Work is to come in contact with the earth, the surface of the earth shall be completely free of frost when concrete is placed thereon.

.2 Concrete aggregates and water shall be heated to not over 80°C. Concrete shall be not less than 20°C or more than 30°C in temperature when deposited. Concrete when placed during freezing weather, or if freezing is anticipated during curing period, shall be fully enclosed and the temperature of same maintained at not less than 20°C for five (5) days and not less than 5°C for an additional five (5) days.

.3 Heating enclosures shall be strong and wind-proof, well ventilated with heating units so located as to prevent local overheating or drying of the concrete or damage from combustion gases. Only indirect fired heaters will be accepted. Units must be vented outside the enclosure. No direct fired units will be accepted.

.4 The Contractor shall inform the Contract Administrator well in advance as to the methods of enclosure and frost protection he proposes to employ.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM A36/A36M-08, Standard Specification for Carbon Structural Steel.

.2 ASTM A193/A193M-08, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.

.3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.4 ASTM A325-07a, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.5 ASTM A325M-08, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).

.6 ASTM A490M-04ae, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).

.2 Canadian General Standards Board (CGSB)

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

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).

.1 Handbook of the Canadian Institute of Steel Construction.

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

.4 Canadian Standards Association (CSA International)

.1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

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

.3 CAN/CSA-S16-01(R2007), Limit States Design of Steel Structures.

.4 CAN/CSA-S136-07, North American Specifications for the Design of Cold Formed Steel Structural Members.

.5 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.

.6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.

.7 CSA W55.3-1965(R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

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

.5 Master Painters Institute

.1 MPI-INT 5.1-08, Structural Steel and Metal Fabrications.

.2 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications.

.6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International

.1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

1.3 SUBMITTALS

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

.2 Shop Drawings:

.1 Provide Shop Drawings in accordance Section 01 33 00 – Submittal Procedures.

.3 Erection drawings:

.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 Description of methods.

.2 Sequence of erection.

.3 Type of equipment used in erection.

.4 Temporary bracings.

.4 Fabrication Drawings:

.1 Submit for review and approval by the Contract Administrator fabrication drawings showing designed assemblies, components, and connections stamped and signed by qualified professional engineer registered or licensed in the Province of Manitoba.

.5 Source Quality Control Submittals:

.1 Submit copies of mill test reports 4 weeks prior to fabrication of structural steel.

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

.6 Fabricator Reports:

.1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

Part 2 Products

2.1 MATERIALS

.1 Structural steel – W-Shapes: to CSA-G40.20/G40.21 Grade 350W.

.2 Structural steel – Rolled shapes and plates: to CSA-G40.20/G40.21 Grade 300W.

.3 Structural steel – HSS sections: to CSA-G40.20/G40.21 Grade 350W Class C.

.4 Standard Pipe: to ASTM A53.

.5 Cold Formed Steel: to CSA-S136.

.6 Anchor bolts: to ASTM A307.

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

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

2.2 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved Shop Drawings.

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

2.3 GALVANIZING

.1 Provide hot dip galvanizing of all exterior exposed steel to CAN/CSA-G164, minimum zinc coating of 600 g/m^2.

.2 Field touch-ups to galvanizing with galvanizing solder to match finish. Acceptable product: Gal-viz or approved equal in accordance with B7. Use as per manufacturer's recommendations.

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 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16 and CAN/CSA-S136.

.2 Welding: in accordance with CSA W59.

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

3.3 CONNECTION TO EXISTING WORK

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

3.4 MARKING

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

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

3.5 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with approved erection drawings.

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

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

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

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Contract Administrator as required. Payment for this will be carried by the Contractor.

.2 Provide safe access and working areas for testing on the Site, as required by testing agency and as authorized by Contract Administrator.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

1.2 REFERENCES

.1 ASTM International

.1 ASTM B209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric.

.2 ASTM B210M-05, Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes Metric.

.3 ASTM B211M-03, Standard Specification for Aluminum and Aluminum Alloy Bar, Rod and Wire Metric.

.4 ASTM F593-02(2008), Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.2 American Welding Society (AWS)

.1 AWS - A5.10/A5.10M 1999(R2007), Specification for Bare Aluminum and Aluminum Alloy Welding Electrodes and Rods.

.3 CSA International

.1 CAN/CSA-S157/S157.1-05, Strength Design in Aluminum/Commentary on CAN/CSA-S157, Strength Design in Aluminum.

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

.3 CSA W59.2-M1991(R2008), Welded Aluminum Construction.

.4 Master Painters Institute (MPI)

.1 MPI - EXT 5.5D, Bituminous Finish.

1.3 SUBMITTALS

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

.2 Product Data:

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

.3 Shop Drawings:

.1 Submit Shop Drawings to include fabrication and erection documents consisting of connection and design details, shop details, erection diagrams, erection procedures, and material lists.

.2 Indicate cuts, copes, connections, holes, threaded fasteners, rivets, welds, and other items. Indicate welds using welding symbols as shown in Appendix A of CSA W59.2.

.3 Include description of methods, sequence of erection, and type of equipment to be used in erecting structural aluminum.

.4 Mill Test Reports

.1 Provide mill test reports as detailed in Item 1.4.1.

.5 Fabricator Affidavit

.1 Provide a fabricator affidavit as detailed in Item 1.4.2.

1.4 QUALITY ASSURANCE

.1 Submit copies of mill test reports showing chemical and physical properties and other details of aluminum to be incorporated into work, at least four weeks prior to fabrication of structural aluminum.

.2 Fabricator of structural aluminum to provide an affidavit stating that materials and products used in fabrication conform to applicable material and products standards called for by design Drawings and Specifications.

1.5 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to the 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 structural aluminum from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Aluminum bar, rod, wire: to ASTM B211M, Alloy 6061-T6511.

.2 Aluminum and Aluminum-Alloy Extruded Bar, Rods, Wire, Shapes, and Tubes: to ASTM B221M, Alloy 6061-T6.

.3 Aluminum sheet or plate: to ASTM B209M, Alloy 6061-T651.

.4 Aluminum drawn tubes: to ASTM B210M, Alloy 6061.

.5 Aluminum pipe: to ASTM B221, Alloy 6061-T6.

.6 Aluminum welding wire: to AWS - A5.10/A5.10M.

.7 Stainless steel bolts: to ASTM F593, Type 316.

.8 Bituminous paint: MPI - EXT 5.5D, without thinner.

2.2 FABRICATION

.1 Fabricate to CAN/CSA-S157 and in accordance with approved Shop Drawings.

2.3 FINISHES

.1 Finish: plain mill.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other sections or contracts are acceptable for structural aluminum installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

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

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

3.2 INSTALLATION

.1 Do structural aluminum work: to CAN/CSA-S157.

.2 Do welding: to CSA W59.2.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.2 for fusion welding of aluminum, and CSA W55.3 for resistance welding of structural components.

.4 Aluminum in contact with dissimilar metal anchor bolts to be installed with nylon isolation gaskets. Acceptable product: Nyltite Electrochemical Isolation Gaskets or approved equal in accordance with B7.

3.3 ERECTION

.1 Erect structural aluminum as indicated and to CAN/CSA-S157 and approved Shop Drawings.

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

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and quality of work will be carried out by testing laboratory designated by Contract Administrator as required. Payment for this will be carried by the Contractor.

.2 Provide safe access and working areas for testing on Site, as required by testing agency and as directed by Contract Administrator.

3.5 JOINT SEALING AND PAINTING

.1 Surface preparation of aluminum in contact with or embedded in dissimilar materials: to CAN/CSA-S157. Treat locations as if there is moisture present.

.2 Paint to CAN/CSA-S157.

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by structural aluminum for buildings installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 12 23 – Structural Steel.

.2 Section 05 14 11 – Structural Aluminum.

1.2 REFERENCES

.1 ASTM International

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

.2 ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 CSA International

.1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

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

.3 CSA S16-09, Design of Steel Structures.

.4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for sections, plates, pipe, tubing, bolts and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories for the Contract Administrator’s approval at least two weeks prior to fabrication.

.2 Indicate field measurements on Shop Drawings.

.4 Other Submittals:

.1 Provide product certificates as detailed in Item 1.4.

.2 Submit the qualifications of the fabricator and of the welders to the Contractor Administrator for acceptance.

.3 Submit mill certificates to the Contractor Administrator for acceptance.

.4 Submit welding procedures to the Contractor Administrator for acceptance.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and acceptance requirements: deliver materials to the 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 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

.1 All materials shall be of a type acceptable to the Contract Administrator and shall be subject to inspection and testing by the Contractor Administrator.

2.2 MATERIALS

.1 Welding materials: to CSA W59.

.2 Welding electrodes: to CSA W48 Series.

.3 Bolts and anchor bolts: to ASTM A307.

.4 Stainless steel tubing: to ASTM A269, Type 316

.5 Supply all items complete with all anchors and fastenings.

2.3 FABRICATION

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

.2 Confirm Site measurements for all fabrications before fabricating.

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

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

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

2.4 FINISHES

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

.2 Shop coat primer: in accordance with chemical component limits and restrictions requirements and VOC limits of CCD-047a.

.3 Zinc primer: zinc rich, Interzinc 52 or approved equal in accordance with B7, 2.5 mil DFT.

2.5 ISOLATION COATING

.1 Isolate aluminum from the following components by means of bituminous paint:

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

.2 Concrete, mortar, and masonry.

.3 Wood.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of conditions: verify conditions of substrates previously installed under other sections or contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform the Contract Administrator in writing of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Contract Administrator.

3.2 ERECTION

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

.2 Do aluminum welding work in accordance with CSA W59.2 unless specified otherwise.

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

.4 Provide suitable means of anchorage acceptable to the Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.5 Exposed fastening devices to match finish and be compatible with material through which they pass.

.6 Supply components for work by other trades in accordance with Shop Drawings and schedule.

.7 Make field connections with bolts to CSA S16 or weld field connection.

.8 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.9 Touch-up rivets, field welds, bolts, and burnt or scratched surfaces with primer after completion.

.10 Touch-up galvanized surfaces with galvanizing solder where burned by field welding.

3.3 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal fabrications installation.

3.4 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA International

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

.2 CSA O121-08, Douglas Fir Plywood.

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

.4 CSA O151-09, Canadian Softwood Plywood.

.5 CAN/CSA-O325.0-07, Construction Sheathing.

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

.2 Forest Stewardship Council (FSC)

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

.3 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2014.

.4 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

1.2 QUALITY ASSURANCE

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

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

.3 Plywood, OSB, and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

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 the 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 wood.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

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

- .1 CAN/CSA-O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 CAN/CSA-Z809 or FSC or SFI certified.

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

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

.3 Panel Materials:

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
  - .1 Urea-formaldehyde free.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
  - .1 Urea-formaldehyde free.
- .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.
  - .1 Urea-formaldehyde free.

2.2 ACCESSORIES

.1 Fasteners:

- .1 to CAN/CSA-G164, for interior highly humid areas, pressure- preservative, treated lumber.
- .2 to ASTM F2329/F2329M, for exterior work, treated lumber.

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

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

.4 Surface-applied wood preservative: as recommended by pressure impregnated material manufacturer in accordance with CAN/CSA O80.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that existing conditions of substrates are acceptable for rough carpentry installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in the presence of the Contract Administrator.
- .2 Inform the Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and witnessed by the Contract Administrator.

3.2 PREPARATION

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

.2 Apply preservative by dipping or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.

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

.4 Treat material as follows:

.1 Wood curbs, nailers, sleepers on roof deck.

3.3 INSTALLATION

.1 Comply with requirements of National Building Code, supplemented by the following:

.1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, and other work as required.

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

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

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

.5 Install wood backing, dressed, tapered, and recessed slightly below top surface of roof insulation for roof hopper.

.6 Install sleepers as indicated.

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

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

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

3.4 CLEANING

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

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

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 08 99 – Rough Carpentry for Minor Works.

.2 Section 07 62 00 – Sheet Metal Flashing and Trim.

.3 Section 07 92 00 – Joint Sealants.

.4 Section 01 74 11 – Cleaning.

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM D6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.

.2 ASTM D6163-00e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.

.3 ASTM D6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

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

.3 Canadian Roofing Contractors Association (CRCA)

.1 CRCA Roofing Specifications Manual-1997.

.4 Canadian Standards Association (CSA International)

.1 CSA A123.21-04, Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems.

.2 CSA O121-08, Douglas Fir Plywood.

.3 CSA O151-04, Canadian Softwood Plywood.

.4 CSA A231.1/A231.2, Precast Concrete Paving Slabs/Precast Concrete Pavers.

.5 Factory Mutual (FM Global)

.1 FM Approvals - Roofing Products.

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

.1 Safety Data Sheets (SDS).

.7 The Workplace Health and Safety Act (Manitoba), Workplace Health and Safety Regulation.

.1 Safety Data Sheets (SDS).

.8 Underwriters Laboratories' of Canada (ULC)

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

.2 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meeting one week prior to beginning waterproofing Work, with roofing Contractor's representative and Contract Administrator to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

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

1.4 SUBMITTALS

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

.2 Product Data:

.1 Provide two (2) copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Manufacturer's Certificate: certify that products meet or exceed specified requirements.

.4 Test and Evaluation Reports: submit laboratory test reports certifying compliance of roofing felts, bitumens and membrane with Specification requirements.

.5 A written document expressing the warranty as described in Part 2.1.1 of this section.

.6 Written Declaration: submit written declaration that materials and components, as assembled in system are compatible as described in Part 2.1.1 of this section.

.7 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.

.8 Reports: indicate procedures followed, the ambient temperatures, and wind velocity during application.

.9 Submit Shop Drawings of the tapered (sloped) expanded polystyrene (EPS) rigid form insulation for review by the Contract Administrator.

1.5 QUALITY ASSURANCE

.1 Installer qualifications: company or person specializing in application of modified bituminous roofing systems approved by manufacturer with five (5) years documented experience.

1.6 FIRE PROTECTION

.1 Fire Extinguishers:

.1 Maintain one cartridge operated type with shut-off nozzle.

.2 ULC labelled for A, B, and C class protection.

.3 Size as per manufacturer's recommendations as indicated on roof per torch applicator, within 6 m of torch applicator.

.2 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.7 DELIVERY, STORAGE, AND HANDLING

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

.2 Storage and Handling Requirements:

.1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers, and caulking materials.

.2 Provide and maintain dry, off-ground weatherproof storage.

.3 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.

.4 Remove only in quantities required for same day use.

.5 Place plywood runways over completed Work to enable movement of material and other traffic.

.6 Store sealants at +5 degrees C minimum.

.7 Store insulation protected from daylight, weather, and deleterious materials.

1.8 SITE CONDITIONS

.1 Ambient Conditions

.1 Do not install roofing when temperature remains below -18 degrees C for torch application, or to manufacturers' recommendations.

.2 Minimum temperature for solvent-based adhesive is -5 degrees C.

.2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.9 WARRANTY

.1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, the membrane manufacturer will issue a written document in the City of Winnipeg's name, valid for a minimum 15 year period, saying that it will repair any leaks in the roofing membrane to restore the roofing system to a dry and watertight condition, to the extent that the membrane manufacturing or defects caused the infiltration. The warranty must cover the entire cost of the repair(s) during the entire warranty period. The warranty must be transferrable, at no extra cost to subsequent building owners. The contractor will issue a written and signed document in the owner's name, certifying that the roofing work executed will remain in place and free of workmanship defect for a period of two (2) years, starting from the date of Total Performance and/or the early start date of the warranty. The warranty certificate must reflect this requirement.

Part 2 Products

2.1 PERFORMANCE CRITERIA

.1 Compatibility between components of the roofing system is essential. Provide written declaration to Contract Administrator stating that materials and components, as assembled in system, meet this requirement.

.2 Roofing System: to CSA A123.21 for wind uplift resistance.

2.2 DECK COVERING

.1 Glass Mat, Gypsum Board: to ASTM C1177, 12.7mm thick.

.1 Acceptable product: DensDeck Prime by Georgia Pacific or approved equal in accordance with B7.

2.3 DECK PRIMER

.1 Asphalt primer: to CGSB 37-GP-9Ma.

.1 Elastocol Stick by Soprema or approved equal in accordance with B7.

2.4 VAPOUR RETARDER

.1 Self adhesive air/vapour barrier modified bitumen membrane.

.1 Sopravap'r by Soprema or approved equal in accordance with B7.

2.5 MEMBRANE

.1 Base sheet: to CGSB 37-GP-56M.

.1 Colvent Base 830, or approved equal in accordance with B7, adhered directly to insulation.

.2 ULC certification: Class A.

.2 Cap sheet membrane: to CGSB 37-GP-56M.

.1 Sopraply Traffic Cap, or approved equal in accordance with B7, heat welded to base sheet.

.2 ULC certification: Class A.

.3 Parapet base sheet: to CGSB 37-GP-56M

.1 Sopraply Flam Stick, or approved equal in accordance with B7, prime substrate with Elasticol Stick.

.4 Parapet cap sheet: to CGSB 37-GP-56M

.1 Sopraply Traffic Cap, or approved equal in accordance with B7, heat welded to base sheet.

2.6 EXPANDED POLYSTYRENE (EPS) INSULATION

.1 To CAN/ULC-S701.1, Type 3, tapered thickness to suit roof slope.

.2 Minimum R Value: 4.27 per inch.

.3 Compressive strength: 140 kPa (20 psi) minimum.

.4 Flexural strength: 275 kPa (40 psi) minimum.

.1 Approved product: PlastiSpan XD Insulation Board by PlastiFab or approved equal in accordance with B7.

2.7 CANT STRIPS

.1 Install for sloping transition of horizontal to vertical surfaces.

.2 To conform to ASTM C 208, Type II – Roof Insulation Board .

2.8 PITCH POCKET

.1 Approved product: Sopramastic Block System or approved equal in accordance with B7.

Part 3 Execution

3.1 QUALITY OF WORK

.1 Perform examination, preparation, and roofing Work in accordance with roofing manufacturer's specification manual and CRCA Roofing Specification Manual.

.2 Perform priming in accordance with manufacturers written recommendations.

.3 Assembly, component and material connections to be made in consideration of appropriate design loads.

3.2 EXAMINATION OF ROOF DECKS

.1 Verification of Conditions:

.1 Inspect with Contract Administrator the deck conditions including parapets, construction joints, roof drains, plumbing vents, and ventilation outlets to determine readiness to proceed.

.2 Evaluation and Assessment:

.1 Prior to beginning of work ensure:

.1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.

.2 Curbs have been built.

.3 Roof drains have been installed at proper elevations relative to finished roof surface.

.4 Plywood and lumber nailer plates have been installed to deck, walls, and parapets as indicated.

.3 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION OF IN-PLACE CONDITIONS

.1 Cover walls, walks, and adjacent work where materials are hoisted or used.

.2 Use warning signs and barriers. Maintain them in good order until completion of Work.

.3 Clean off drips and smears of bituminous material immediately.

.4 Dispose of rain water off roof and away from face of building until roof drains or hoppers are installed and connected.

.5 Protect roof from traffic and damage. Comply with precautions deemed necessary by the Contract Administrator.

.6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for Work in progress, completed Work, and materials out of storage.

.7 Metal connectors and decking to be treated with rust proofing or cold galvanizing compound.

3.4 PRIMING DECK

.1 Apply deck primer where applicable to at the rate recommended by the manufacturer.

3.5 VAPOUR RETARDER

.1 Adhere vapour retarder as per manufacturer's instructions.

3.6 (EXPOSED) CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION

.1 Insulation: fully adhered, adhesive application:

.1 Adhere insulation to vapour retarder as per manufacturer’s recommendations.

.2 Place boards in parallel rows with ends staggered, and in firm contact with one another.

.3 Cut end pieces to suit.

.2 Base sheet application:

.1 Apply in strict accordance with manufacturer’s recommendations.

.2 Adhere to support by peeling off release protection film.

.3 Apply pressure over entire surface using a membrane roller.

.4 Application to be free of blisters, wrinkles, and fishmouths.

.3 Cap sheet application:

.1 Apply in strict accordance with manufacturer’s recommendations.

.2 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align, and reroll from both ends.

.3 Unroll and heat weld cap sheet onto base sheet taking care not to burn membrane or its reinforcement.

.4 Application to be free of blisters, fishmouths, and wrinkles.

.4 Flashings:

.1 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.

.2 Adhere base sheet onto substrate.

.3 Lap flashing cap sheet to membrane cap sheet 250 mm minimum and torch weld.

.4 Provide 75 mm minimum side lap and seal.

.5 Properly secure flashings to their support without sags, blisters, fishmouths, or wrinkles.

.6 Do work in accordance with manufacturer's recommendations

.5 Roof penetrations:

.1 Install roof penetration flashings and seal to membrane in accordance with manufacturer's recommendations and details.

3.7 FIELD QUALITY CONTROL

.1 Inspections:

.1 Inspection and testing of roofing application will be carried out by testing laboratory designated by the Contract Administrator. Payment for this will be carried by the Contractor.

3.8 CLEANING

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

.2 Remove bituminous markings from finished surfaces.

.3 In areas where finished surfaces are soiled caused by Work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

.4 Repair or replace defaced or disfigured finishes caused by Work of this section.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian Roofing Contractors Association (CRCA)

.1 Roofing Specifications Manual 2012.

.2 ASTM International

.1 ASTM A 653/A 653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM B32-08(2014), Standard Specification for Solder Metal.

.3 ASTM B209-14 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 ASTM D523 Standard Test Method for Specular Gloss

.5 ASTM D822 Standard Practice for Filtered Open-Flame Carbon Arc Exposures of Paint and Related Coatings

.6 ASTM D4586 Standard Specification for Asphalt Roof Cement, Asbestos-Free

.7 ASTM D4587-11 Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings.

.8 ASTM F1667-15 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.3 CSA Group

.1 CSA A123.3-05(2015), Asphalt Saturated Organic Roofing Felt.

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

.1 Safety Data Sheets (SDS).

1.2 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit electronic copies of the Safety Data Sheets in accordance with Section 01 35 29.06 – Health and Safety Requirements.

.3 Shop Drawings:

.1 Submit Shop Drawings for all sheet metal fabrications.

.2 Indicate sheet thickness, flashing dimensions, and fastenings. Include anchorage, expansion joints, and other provisions for thermal movement.

.3 Submit manufacturer’s catalogue cut sheets for manufactured items.

.4 Samples:

.1 Submit 50 x 50 mm samples of each type of sheet metal material, finishes, and colour.

1.3 PRE-INSTALLATION MEETING

.1 Include sheet metal flashing and trim on agenda of pre-installation meetings of affected sections.

1.4 MOCK-UPS

.1 Include flashings in mock-ups as specified for work of other affected sections.

1.5 DELIVERY, STORAGE, AND HANDLING

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

.2 Handle and store flashing materials to prevent creasing, buckling, scratching, or other damage.

Part 2 Products

2.1 BASE SHEET METAL MATERIALS

.1 Provide sheet metal in 0.61 mm thickness, commercial quality to ASTM A 653/A 653M.

.2 Zinc coated steel sheet: Z275 designation zinc coating.

2.2 PREFINISHED STEEL SHEET

.1 Prefinished steel sheet with coating system consisting of base metal pre-treatment, primer, silicone modified polyester meeting requirements of CSSBI S8.

.1 Class F1S.

.2 Finished one side with wash coat and primer on back.

.3 Specular gloss: 30 units +/- 5 units in accordance with ASTM D 523.

.4 Exposed coating thickness: dry film coating system thickness not less than 25 micrometres.

.5 Colour to be approved by Contract Administrator from manufacturer's standard range.

.6 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less, and erosion rate less than 20 % to ASTM D 822 as follows:

.1 Outdoor exposure period 1000 hours.

.2 Humidity resistance exposure period 1000 hours.

2.3 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Fasteners: of same material as sheet metal, suitable for substrate and material being fastened, galvanized head with neoprene washer.

.3 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

.1 Fabricate sheet steel flashings and other sheet steel work as indicated on the approved Shop Drawings.

.2 Form pieces in 2400 mm maximum lengths.

.1 Make allowance for expansion at joints.

.3 Hem exposed edges on underside 12 mm.

.1 Mitre and seal corners with sealant.

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

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 METAL FLASHINGS

.1 Form flashings, copings, and fascias to profiles indicated of 0.61 mm thick prefinished steel.

2.6 PANS

.1 Form pans to receive roofing plastic from 0.61 mm galvanized prefinished steel with a minimum 75 mm upstand above finished roof and 100 mm continuous flanges with no open corners.

.1 Solder joints.

.2 Make pans a minimum 50 mm wider than member passing through roof membrane.

2.7 REGLETS AND CAP FLASHINGS

.1 Form recessed reglets and cap flashings with 0.61 mm sheet metal as detailed in the approved Shop Drawings.

.1 Provide slotted fixing holes and steel/plastic washer fasteners.

.2 Cover face and ends with plastic tape.

2.8 EAVES TROUGHS AND DOWNPIPES

.1 Form eaves troughs and downpipes from 0.61 mm thick galvanized prefinished steel,

.2 Sizes and profiles as indicated.

.3 Provide goosenecks, outlets, strainer baskets, and necessary fastenings.

2.9 SCUPPERS

.1 Form scuppers from 0.92 mm thick galvanized prefinished steel.

.2 Sizes and profiles as indicated.

.3 Provide necessary fastenings.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install sheet metal work as detailed in the approved Shop Drawings.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal.

- .1 Secure in place and lap joints 100 mm.
- .2 Provide self-adhesive membrane to tie into adjacent assemblies.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.

- .1 Flash joints using S-lock forming tight fit over hook strips.

.5 Lock end joints and caulk with sealant.

.6 Insert metal flashing into reglets to form weather tight junction.

.7 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.8 Caulk flashing at reglet and cap flashing with sealant.

.9 Install pans, where shown, around items projecting through roof membrane.

.10 Where flashing installed with mechanical fasteners, install fasteners in slots or oversize holes to allow expansion and contraction of flashings.

3.3 EAVES TROUGHS AND DOWNPIPES

.1 Install eaves troughs and secure to building at 600 mm on centre with eaves trough spikes through spacer ferrules.

- .1 Slope eaves troughs to downpipes as indicated.
- .2 Seal joints watertight.

.2 Install downpipes and provide goosenecks back to wall.

- .1 Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.

.3 Install precast concrete splash pads as indicated.

3.4 SCUPPERS

.1 Install scuppers as indicated.

3.5 CLEANING

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

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

.3 Leave work areas clean, free from grease, finger marks, and stains.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

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

.2 Canadian General Standards Board (CGSB)

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

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

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

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

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

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

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

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

.1 Safety Data Sheets (SDS).

1.2 SUBMITTALS

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

.2 Product Data:

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

.2 Manufacturer's product to describe:

.1 Caulking compound.

.2 Primers.

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

.3 Manufacturer's Instructions:

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

1.3 CLOSEOUT SUBMITTALS

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

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

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

.3 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

.1 Ambient Conditions:

.1 Proceed with installation of joint sealants only when:

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

.2 Joint substrates are dry.

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

.2 Joint-Width Conditions:

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

.3 Joint-Substrate Conditions:

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

1.6 ENVIRONMENTAL REQUIREMENTS

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

.2 Ventilate area of work as required by use of approved portable supply and exhaust fans.

Part 2 Products

2.1 SEALANT MATERIALS

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

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

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

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Urethanes one part:

.1 Non-sag: to CAN/CGSB-19.13, Type 2, colour to match adjacent areas.

.2 Silicones one part, mildew resistant: to CAN/CGSB-19.13.

.3 Acoustical sealant: to ASTM C919.

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

.1 Polyethylene, urethane, neoprene, or vinyl foam:

.1 Extruded closed cell foam backer rod.

.2 Size: oversize 30 to 50%.

.2 Neoprene or butyl rubber:

.1 Round solid rod, Shore A hardness 70.

.3 High density foam:

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

.4 Bond breaker tape:

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

2.3 SEALANT SELECTION

.1 Seal interior perimeters of exterior openings as detailed on Drawings. Sealant type: urethane.

.2 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls). Sealant type: urethane.

.3 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities). Sealant type: silicone.

2.4 JOINT CLEANER

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

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

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate.

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

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

3.2 SURFACE PREPARATION

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

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

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

.4 Ensure joint surfaces are dry and frost free.

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

3.3 PRIMING

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

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

3.4 BACKUP MATERIAL

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

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

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant:

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

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

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

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

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

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

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

.2 Curing:

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

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

3.7 CLEANING

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

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

.2 Clean adjacent surfaces immediately.

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

.4 Remove masking tape after initial set of sealant.

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

.1 Remove recycling containers and bins from Site and dispose of materials at appropriate facility.

3.8 PROTECTION

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

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

END OF SECTION

Part 1 General

1.1 Related Sections

.1 Section 07 92 10 – Joint Sealants: Caulking of joints between frames and other building components.

.2 Section 08 71 10 – Door Hardware – General: Supply of finish hardware, including weatherstripping and mounting heights.

.3 Section 09 91 23 – Interior Painting.

1.2 References

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

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

.2 ASTM B29, Specification for Refined Lead.

.3 ASTM B749, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.2 Canadian General Standards Board (CGSB)

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

.2 CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International)

.1 G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA W59, Welded Steel Construction (Metal Arc Welding) (Metric Version).

.4 Canadian Steel Door Manufacturers' Association, (CSDMA).

.1 CSDMA, Specifications for Commercial Steel Doors and Frames.

.2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors.

.5 National Fire Protection Association (NFPA)

.1 NFPA 80, Standard for Fire Doors and Fire Windows.

.2 NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN4-S104, Fire Tests of Door Assemblies.

.2 CAN4-S105, Fire Door Frames Meeting the Performance Required by CAN4-S104.

.7 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.8 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings.

.9 CAN/ULC-S704, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 Submittals

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

.2 Shop Drawings:

.1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazing, arrangement of hardware, fire rating, and finishes.

.2 Indicate each type of frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings reinforcing, fire rating, and finishes.

.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on Drawings and door schedule.

.4 Submit test and engineering data, and installation instructions.

1.4 Design Requirements

.1 Design exterior frame assembly to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.5 Requirements

.1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M for ratings specified or indicated.

.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled.

1.6 Waste Management and Disposal

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

Part 2 Products

2.1 Materials

.1 Hot dipped galvanized steel sheet: to ASTM A653M, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts, except:

.1 Doors: 1.2 mm (18 gauge).

.2 Frames: 1.6 mm (16 gauge).

.2 Reinforcement: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M.

2.2 Door Core Materials

.3 Stiffened: face sheets welded, insulated core.

.1 Polyurethane: to CAN/ULC-S704 rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m^3.

2.3 Adhesives

.1 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

2.4 Primer

.1 Touch-up prime CAN/CGSB-1.181.

2.5 Paint

.1 Field paint steel doors and frames. Protect weatherstrips from paint. Provide final finish which shall be free of scratches or other blemishes.

2.6 Accessories

.1 Door silencers: single stud rubber/neoprene type.

.2 Top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma steel.

.3 Metallic paste filler: to manufacturer's standard.

2.7 Frames Fabrication General

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Exterior frames: 1.6 mm welded, thermally broken type construction.

.4 Blank, reinforce, drill, and tap frames for mortised, templated hardware. Use templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Protect mortised cutouts with steel guard boxes.

.6 Prepare frame for door silencers, three (3) for single door, two (2) at head for double door.

.7 Manufacturer's nameplates on frames and screens are not permitted.

.8 Conceal fastenings except where exposed fastenings are indicated.

.9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.10 Insulate exterior frame components with polyurethane insulation.

2.8 Frame Anchorage

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide two (2) anchors for rebate opening heights up to 1520 mm and one (1) additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm o.c. maximum.

2.9 Frames: Welded Type

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails, and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in two (2) temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 Door Fabrication General

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Exterior doors: hollow steel construction.

.3 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler, and sand to a uniform smooth finish.

.4 Blank, reinforce, drill doors and tap for mortised, templated hardware.

.5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on Site, at time of hardware installation.

.6 Reinforce doors, where required, for surface mounted hardware. Provide flush top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict conformance with CAN4-S104 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.9 Manufacturer's nameplates on doors are not permitted.

2.11 Hollow Steel Construction

.1 Form each face sheet for exterior doors from 1.6 mm sheet steel.

.2 Reinforce doors with vertical stiffeners, securely laminated to each face sheet at 150 mm on centre maximum.

.3 Fill voids between stiffeners of exterior doors with polyurethane core.

2.12 Thermally Broken Doors and Frames

.1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.

.2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 Fabricate thermally broken frames separating exterior parts form interior parts with continuous interlocking thermal break.

.4 Apply insulation.

Part 3 Execution

3.1 Installation General

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.2 Frame Installation

.1 Set frames plumb, square, level, and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier.

3.3 Door Installation

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 – Door Hardware – General.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.3 Finished floor, and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

3.4 Finish Repairs

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

Part 1 General

1.1 References

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

.1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-69.17, Bored and Preassembled Locks and Latches.

.2 CAN/CGSB-69.18/ANSI/BHMA A156.1, Butts and Hinges.

.3 CAN/CGSB-69.19/ANSI/BHMA A156.3, Exit Devices.

.4 CAN/CGSB-69.20/ANSI/BHMA A156.4, Door Controls (Closers).

.5 CAN/CGSB-69.21/ANSI/BHMA A156.5, Auxiliary Locks and Associated Products.

.6 CAN/CGSB-69.24/ANSI/BHMA A156.8, Door Controls - Overhead Holders.

.7 CAN/CGSB-69.26/ANSI/BHMA A156.10, Power-operated Pedestrian Doors.

.8 CAN/CGSB-69.28/ANSI/BHMA A156.12, Interconnected Locks and Latches.

.9 CAN/CGSB-69.29/ANSI/BHMA A156.13, Mortise Locks and Latches.

.10 CAN/CGSB-69.31/ANSI/BHMA A156.15, Closer/Holder Release Device.

.11 CAN/CGSB-69.32/ANSI/BHMA A156.16, Auxiliary Hardware.

.12 CAN/CGSB-69.33/ANSI/BHMA A156.17, Self-closing Hinges and Pivots.

.13 CAN/CGSB-69.34/ANSI/BHMA A156.18, Materials and Finishes.

.14 CAN/CGSB-69.36/ANSI/BHMA A156.20, Strap and Tee Hinges and Hasps.

1.2 Submittals

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

.2 Product Data:

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

.3 Hardware List:

.1 Submit Contract hardware list.

.2 Indicate specified hardware, including make, model, material, function, size, finish, and other pertinent information.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.5 Closeout Submittals

.1 Provide operation and maintenance data for inclusion in the operation and maintenance manual in accordance with Section 01 78 00 – Closeout Submittals.

.2 Supply maintenance materials as described in Part 1.5.

1.3 Delivery, Storage, and Handling

.1 Packing, Shipping, Handling and Unloading:

.1 Package each item of hardware, including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.2 Storage and Protection:

.1 Store finishing hardware in locked, clean, and dry area.

1.4 Waste Disposal and Management

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

1.5 Maintenance

.1 Extra Materials:

.1 Supply two (2) sets of wrenches for door closers, locksets, and fire exit hardware.

Part 2 Products

2.1 Hardware Items

.1 Use one manufacturer's products only for similar items unless noted otherwise.

2.2 Door Hardware

.1 Hardware items as follows or approved equal in accordance with B7:

.1	Hinges	CB1960 114 x 102 NRP	630	Stanley
.2	Rim Exit Device	2100 x 217F	626	Yale
.3	Weatherstrip	W50		Crowder
.4	Sweep seals	W13S		Crowder
.5	Threshold	CT10		Crowder
.6	Door stop/holder	100H Series	630	Glynn Johnson

.2 Provide exit device with Medeco cylinder keyed to City requirements. The City will provide lock number before keying and will assist the Contractor to coordinate with the locksmith.

.3 Butts and hinges:

.1 Butts and hinges: to CAN/CGSB-69.18, listed in Hardware Schedule.

.4 Exit devices: to CAN/CGSB-69.19.

.5 Door Closers and Accessories:

.1 Door controls (closers): to CAN/CGSB-69.20, designated by letter C and numeral identifiers listed in Hardware Schedule, size in accordance with CAN/CGSB-69.20, table A1.

.2 Door controls - overhead holders: to CAN/CGSB-69.24, listed in Hardware Schedule.

.3 Closer/holder release devices: to CAN/CGSB-69.31, listed in Hardware Schedule.

.6 Auxiliary locks and associated products: to CAN/CGSB-69.21, listed in Hardware Schedule.

.7 Architectural door trim: to CAN/CGSB-69.22, listed in Hardware Schedule.

.1 Door protection plates: kick plate, 1.27 mm thick stainless steel.

2.3 Fastenings

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields, and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

2.4 Keying

.1 Provide door with Medeco cylinder master keyed to City requirements. The City will provide lock number before keying and will assist the Contractor to coordinate with the locksmith.

.2 Stamp keying code numbers on keys and cylinders.

.3 Provide construction cores.

Part 3 Execution

3.1 Manufacturer's Instructions

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

.2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 Installation

.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

.2 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.3 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.4 Remove construction cores when directed by Contract Administrator; install permanent cores and check operation of locks.

3.3 Adjusting

.1 Adjust door hardware, operators, closures, and controls for optimum, smooth operating condition, safety, and for weather tight closure.

.2 Lubricate hardware, operating equipment, and other moving parts.

.3 Adjust door hardware to provide tight fit at contact points with frames.

3.4 Cleaning

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

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.

.3 Remove protective material from hardware items where present.

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

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

.1 Safety Data Sheets (SDS).

.2 Master Painters Institute (MPI)

.1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM) - current edition.

.3 National Research Council Canada (NRC)

.1 National Fire Code of Canada 2015 (NFC).

.4 Society for Protective Coatings (SSPC)

.1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Submit Work schedule for various stages of painting to the Contract Administrator for review. Provide schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from the Contract Administrator for changes in Work schedule.

.3 Coordinate painting operations with other trades.

1.3 EXISTING LEAD PAINTS

.1 KGS Group has identified the presence of lead paint in the following locations as per the technical memorandum “Hazardous Materials Testing Summary”, dated October 29, 2019 and appended to this Tender:

.1 Existing interior cork insulation

.1 The existing off-white coating is not considered lead-based but does contain trace amounts of lead. Do not sand these areas as part of the surface preparation procedures.

.2 Rooftop Ducts, Fan Covers, and gooseneck air intake

.1 The existing steel duct, gooseneck air intake, and fan cover coatings are lead-based but are not of a leachable type. Caution is to be exercised for those components to be repainted.

1.4 SUBMITTALS

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

.2 Product Data:

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

.2 Submit copies of WHMIS SDS in accordance with Section 01 35 29.06 – Health and Safety Requirements. SDS for intumescent paint for cork to be provided during Shop Drawing stage for review

.3 Confirm products to be used are in MPI's approved product list.

.3 Upon completion, provide records of products used. List products in relation to finish system and include the following:

.1 Product name, type, and use.

.2 Manufacturer's product number.

.3 Colour number.

.4 MPI Environmentally Friendly classification system rating.

.5 Manufacturer's SDS.

.4 Manufacturer's Instructions:

.1 Provide manufacturer's installation instructions.

1.5 CLOSEOUT SUBMITTALS

.1 Provide in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into the operation and maintenance manual.

.3 Include:

.1 Product name, type, and use.

.2 Manufacturer's product number.

.3 Colour number, if applicable.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last three (3) comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeypersons to be engaged in painting Work.

.3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.

.4 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.

.5 Standard of Acceptance:

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

.2 Mock-Up (Cork Insulation Painting):

.1 Construct an approximately 2 m by 2 m mock-up prior to executing the Work.

.1 Mock-up will be used:

.1 To judge quality of Work, substrate preparation, operation of equipment and material application and skill to MPI Architectural Painting Specification Manual standards.

.2 Locate where directed by the Contract Administrator.

.3 Allow 24 hours for inspection of mock-up before proceeding with Work.

.4 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

.1 Labels: to indicate:

.1 Type of paint or coating.

.2 Compliance with applicable standard.

.3 Colour number in accordance with established colour schedule.

.3 Storage and Handling Requirements:

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

.2 Remove paint materials from storage only in quantities required for same day use.

.3 Comply with requirements of WHMIS regarding use, handling, storage, and disposal of hazardous materials.

.4 Fire Safety Requirements:

.1 Provide one 9 kg 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 the NFC.

1.8 SITE CONDITIONS

.1 Ambient Conditions:

.1 Heating, Ventilation, and Lighting:

.1 Co-ordinate use of existing ventilation system with the Contract Administrator and the City to ensure its operation during and after application of paint as required. Contractor to ensure adequate ventilation is provided during application of paint.

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

.3 Temperature, Humidity, and Substrate Moisture Content Levels:

.1 Unless pre-approved written approval by the product manufacturer, perform no painting when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.

.2 Test for moisture using calibrated electronic moisture meter. Test concrete floors for moisture using "cover patch test".

.4 Surface and Environmental Conditions:

.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.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.5 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

Part 2 Products

2.1 MATERIALS

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

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

.3 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids to be:

.1 Non-flammable.

.2 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.3 Manufactured without compounds which contribute to smog in the lower atmosphere.

2.2 COLOURS

.1 Colours to be as indicated on the Drawings.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to Site.

.2 Mix paste, powder, or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in strict accordance with paint manufacturer's instructions.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity. Strain as necessary.

2.4 INTERIOR PAINTING SYSTEMS

.1 Concrete horizontal surfaces: floors and stairs:

.1 INT 3.2L - Epoxy High Build low gloss with Shrinkage-reducing admixture (SRA) finish.

.2 Galvanized metal: doors and frames

.1 INT 5.3B - Waterborne light industrial semi-gloss coating.

.3 Existing Cork Insulation:

.1 One (1) prime coat of XIM 400W solvent based primer or approved equal in accordance with B7.

.2 One (1) coat of 10-10A Flame Control or approved equal in accordance with B7.

.1 Application rate to be a minimum of 3.5 mils dry film thickness.

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 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 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.

.2 Maximum moisture content as follows:

.1 Cork Insulation: 12%.

.2 Concrete: 12%.

3.4 PREPARATION

.1 Protection:

.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 the Contract Administrator.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect building occupants in the building.

.2 Surface Preparation:

.1 Mask electrical panels, structural steel members, light fixtures, and other surface mounted equipment prior to undertaking painting operations.

.2 Existing electrical conduits need not be masked.

.3 Move and cover equipment below areas to be painted as necessary to carry out painting operations. Replace as painting operations progress.

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

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths.

.2 Degrease surfaces with a tri-sodium phosphate solution using a soft nylon brush to remove dirt, oil, and other surface contaminants.

.3 Rinse surfaces with clean water and a damp sponge to remove tri-sodium phosphate residue.

.4 Allow surfaces to dry thoroughly.

.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 pre-treatment 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 Do not apply paint until prepared surfaces have been accepted by the Contract Administrator.

3.5 EXISTING CONDITIONS

.1 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.

.2 Maximum moisture content as follows:

.1 Cork Insulation: 12%.

3.6 APPLICATION

.1 Method of application to be as approved by the Contract Administrator. Conform to manufacturer's application instructions unless specified otherwise.

.2 Use dipping, sheepskins, or daubers only when no other method is practical in places of difficult access.

.3 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

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

3.7 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 FIELD QUALITY CONTROL

.1 Standard of Acceptance:

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

.2 Field inspection of painting operations will be carried out by the Contract Administrator.

.3 Advise the Contract Administrator when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.4 Cooperate with Contract Administrator and provide access to areas of Work.

3.9 CLEANING

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

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

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

3.10 RESTORATION

.1 Clean and re-install hardware items removed before undertaking painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of the Contract Administrator. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing, and handling of paint to clean condition as approved by the Contract Administrator.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for submersible drain water sampling pump (P-Y103) and associated hose and fittings.

1.2 REFERENCE STANDARDS

.1 CSA B137.1-13 Polyethylene (PE) pipe, tubing, and fittings for cold water pressure services

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.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, mounting, 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 Certificates: submit certificates signed by manufacturer certifying that Materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Operation and Maintenance Manuals:

.1 Provide operation and maintenance information in accordance with Section 01 78 00 - Closeout Submittals and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 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.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle Materials in accordance with this section and with manufacturer's written instructions.

.1 Delivery and Acceptance Requirements: deliver Materials to Site in original factory packaging.

Part 2 Products

2.1 SUBMERSIBLE DRAIN WATER SAMPLING PUMP (P-Y103)

.1 Capacity: 1.6 L/s (40 USGPM) at 75 kPa (25ft WC) head with NPS 25 mm (1") discharge.

.2 Motor: 500W, hermetically sealed, with automatic overload protection.

.3 Make/ Model: Tsurumi 1/4 hp F-13 Portable Dewatering Pump or approved equal in accordance with B7.

2.2 TUBING, FITTINGS, AND MOUNTS

.1 20 mm (3/4") welded 304 stainless steel tube, wall thickness 2mm, ASTM A269, annealed, cold finished.

.2 Swagelok swaged compression fittings or approved equal in accordance with B7.

.3 Wall mounts for stainless steel tubing, Swagelok P Clamp Support, 20 mm Tube Size or approved 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 data sheet.

3.2 INSTALLATION

.1 Make piping and electrical connections to sampling pump (P-Y103) and motor assembly and controls as indicated on Drawing 1-0650Y-M0001-001.

.2 Core 300 mm (12") diameter by 38 mm (1-1/2") deep circular cavity into concrete floor at the north-west corner near the invert of the 600 mm (24") outlet pipe of the Drainage Lift Station discharge chamber. Refer to Drawing 1-0650Y-M0001-001 for additional details.

.3 Place new sampling pump (P-Y103) into the cavity. Contractor to anchor sampling pump (P-Y103) to wall securely using suitably sized concrete anchors. Provide Shop Drawings detailing sampling pump (P-Y103) mounting to Contract Administrator for approval.

.4 Connect sampling pump (P-Y103) to the new panelboard (P-Y10). Supply and install new on-off pushbutton (HS-Y103) to control the new sampling pump.

.5 Route new 25 mm SS tubing from the sampling pump (P-Y103) up to the operations area of the Drainage Lift Station, secure the tubing to the Drainage Lift Station wall using suitable mounts.

3.3 PERFORMANCE VERIFICATION

.1 Verify operation of sampling pump (P-Y103), tubing, and new on-off pushbutton.

.2 Check removability of sampling pump (P-Y103) for servicing without interfering with installation or operation of other equipment.

.3 Verify non-clog capability and maximum size of solids, using procedures recommended by manufacturer.

.4 Sampling pump (P-Y103), piping, and connections shall be tested prior to acceptance. Performance tests to be witnessed by the Contract Administrator.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for the de-chlorination agent chemical dosing pump package (P-Y101 and P-Y102) and associated hose and fittings.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

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

.3 Shop Drawings.

.1 Submit chemical dosing package Shop Drawings to indicate:

.1 layout drawing and bill of material;

.2 component product data sheets;

.3 equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled;

.4 wiring and schematic diagrams;

.5 dimensions and recommended installation;

.6 pump performance and efficiency curves.

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

.5 Instructions: submit manufacturer's installation instructions.

.1 Operation and Maintenance Manuals:

.1 Provide operation and maintenance information in accordance with Section 01 78 00 – Closeout Submittals and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Include:

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

.2 Details of operation, servicing and maintenance.

.3 Control Narrative

.4 Recommended spare parts list with names and addresses.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle Materials in accordance with this section and with manufacturer's written instructions.

.1 Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging.

Part 2 Products

2.1 DE-CHLORINATION AGENT CHEMICAL DOSING PUMP PACKAGE (P-Y101 & P-Y102)

.1 The duplex chemical dosing pump package will include the following:

.1 Two (2ea) Pulsafeeder Pulsatron LPH6MA-KTC4, solenoid driven metering pump. Capacity: 18.9 L/hr (5 USGPH) at 690 kPa (100 psi) head with NPS 6.4 mm (1/4") discharge. Motor: 115 VAC, 1 phase, 60 Hz, 1.0 A.

.2 One (1ea) PP non metallic base & frame, with hardware complete with back mounting.

.3 Two (2ea) calibration column, 12mm NPT, PVC construction, 100 mL with top vent, Chemline CC or approved equal in accordance with B7.

.4 Two (2ea) pressure/safety relief valve, adjustable 10-150 psig, piped back to pump suction, Chemline SB12 with Chemflare ends or approved equal in accordance with B7.

.5 Two (2ea) pressure gauge with PTFE Isolation seal/diaphragm, 0-100 psig, liquid filled, Chemline SG Series or approved equal in accordance with B7.

.6 6 (6ea) 12mm PVC manual isolation ball valves, Chemline Type 21 with Chemflare ends or approved equal in accordance with B7.

.7 Two (2ea) PVC check valves, Chemline BT with Chemflare ends or approved equal in accordance with B7.

.8 Two (2ea) inlet y-strainer complete with 6mm PVC drain valve (capped).

.9 Two (2ea) 9/12 mm PVC anti-syphon valve, Chemline SB12 or approved equal in accordance with B7.

.10 One (1ea) 9/12 mm tube connection PVC chemical Injector, Saf-T-Flo IQ injection quill or approved equal in accordance with B7

2.2 TUBING, FITTINGS, AND MOUNTS

.1 12mm (1/2") clear PFA or FEP tubing, Chemline Chemflare or approved equal in accordance with B7.

.2 12mm (1/2") fittings to be PFA or FEP. Chemline Chemflare or approved equal in accordance with B7.

.3 New industrial tubing wall mounts/clips Swagelok P Clamp Support, 1 in., 25 mm Tube Size or approved equal in accordance with B7

2.3 CHEMICAL MIXING TANK (TK-100)

.1 Re-use existing Pulsafeeder J40366 55 USG PE Heavy Duty Tapered Solution Tank (TK-100).

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 Make piping and electrical connections to chemical dosing pump package (P-Y101 & P-Y102) and motor assembly and controls as indicated on Drawing 1-0650Y-M0001-001.

.2 Mount new chemical dosing pump package (P-Y101 & P-Y102) on the wall of the Drainage Lift Station using fibreglass channel framing system, secured to the wall using suitably sized corrosion resistant concrete anchor screws.

.3 Install new 13 mm (1/2”) FEP tubing using mounts as shown in Drawing 1-0650Y-M0001-001 and 1-0650Y-M0001-002.

.1 Route tubing from the discharge of PY-101 to the chemical injector inserted into the 100 mm (4”) discharge line from the 300 L/s dewatering sump pump in the lift station suction chamber.

.2 Route tubing from the discharge of P-Y102 to the discharge at the crown of the 600 mm (24”) inlet pipe in the lift station suction chamber.

.3 Install new 12 mm (1/2”) FEP suction and re-circulation lines to and from the existing chemical batching tank (TK-Y100). Route tubing from the bottom of the existing PE chemical mixing tank to each new chemical dosing pump (P-Y101 & P-Y102).

3.3 PERFORMANCE VERIFICATION

.1 Verify operation of chemical dosing pump package (P-Y101 & P-Y102), tubing, and controls at each flow setting.

.2 Check removability of chemical dosing pump package (P-Y101 & P-Y102) for servicing without interfering with installation or operation of other equipment.

.3 Pump, piping, connections, and controls shall be tested prior to acceptance. Performance tests to be witnessed by the Contract Administrator.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for sump pump (P-M500), basin, and controls.

1.2 REFERENCES

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

.1 Safety Data Sheets (SDS).

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

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

.5 Instructions: submit manufacturer's installation instructions.

.6 Performance Verification Report; As detailed in Part 3.6.

.1 Operation and Maintenance Manuals:

.1 Provide operation and maintenance information in accordance with Section 01 78 00 - Closeout Submittals and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Include:

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

.2 Details of operation, servicing and maintenance.

.3 Performance Verification Report, as detailed in Part 3.6

.4 Recommended spare parts list with names and addresses.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle Materials in accordance with this section and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver Materials to Site in original factory packaging.

Part 2 Products

2.1 SUMP PUMP (P-M500) WITH BASIN AND CONTROLS

.1 Pump

.1 Construction: simplex CSA approved, housing epoxy coated cast iron, oil-fed cast iron upper and lower bearing, carbon and ceramic mechanical seals, non-clogging vortex engineered plastic impeller, stainless steel hardware, and neoprene gasket.

.2 Discharge Size: 50mmØ (2”Ø).

.3 Vent Size: 50mmØ (2”Ø).

.4 Solids Handling: 13mmØ (1/2”Ø).

.5 Cord Length: 5m (25’.)

.6 Operation: Automatic.

.7 Motor: Automatic reset thermal overload, permanent split capacitor, Class B insulation, 1725 RPM.

.8 Provide inline PVC check valve to suit discharge piping size. Chemline BT Series or approved equal in accordance with B7.

.2 Basin

.1 Construction: fiberglass Material, suitable for indoor buried installation within a crawlspace. Basin shall be constructed to allow for a maximum of up to four 100mmØ field cut inlet openings to accommodate various weeping tile connections. Basin shall incorporate an anti-floatation ring.

.2 Lid shall be single piece fiberglass water tight construction with two pump plates and one inspection plate. Predrilled holes for the discharge, vent, and cord with grommets shall be provided.

.3 Provide pump stand accessory and grommets to seal pipe penetrations.

.4 Provide galvanized steel guide rail system with stainless steel pump lifting chain, PVC discharge piping, fittings and inline components.

.3 Controls

.1 Pump activation shall be through an integral standard mechanical variable level control float switch (LS-M5002) provided by the vendor. Float shall be constructed of durable PVC/polypropylene with temperature rating of 60°C and adjustable weight. Contractor shall verify field conditions and select a suitable cord length to reach power receptacle.

.2 Provide a high-level float switch (LS-M5001) and control panel (CP-M500) to monitor the basin level. Verify cable length for float switch based on remote control panel (CP-M500) location relative to the sump basin.

.1 Control panel (CP-M500) shall include the following features:

.1 Electrical 115V/1Ph/60Hz.

.2 NEMA 4X enclosure with hinged cover.

.3 Receptacle for use with piggyback pump switch.

.4 Alarm horn.

.5 Terminal strip.

.6 Horn silence switch to turn alarm on or off.

.7 Red beacon indicator.

.8 Alarm float, cord and connection.

.4 Acceptable Products: Zoeller FM1494 simplex prepackaged system with model 161 pump, 72” fibreglass basin, and remote-control panel model 10-1019 or approved 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 data sheet.

3.2 INSTALLATION

.1 Place sand under sump basin to match elevation shown on 1-0650M-M0006-002

.2 Make piping and electrical connections to pump and motor assembly and controls as indicated.

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

.4 Align vertical pit mounted pump assembly after mounting and securing cover plate.

3.3 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Check power supply.

.2 Check starter protective devices.

.2 Start-up, check for proper and safe operation.

.3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

.4 Adjust flow from water-cooled bearings.

.5 Adjust impeller shaft stuffing boxes, packing glands.

3.4 START-UP

.1 General:

.1 Procedures:

.1 Check power supply.

.2 Start sump pump (P-M500), check impeller rotation.

.3 Check for safe and proper operation.

.4 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.

.5 Test operation of hands-on-auto switch.

.6 Test operation of alternator.

.7 Check base for free-floating. Confirm there are no obstructions under base.

.8 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.

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

.10 Verify lubricating oil levels.

3.5 PERFORMANCE VERIFICATION - SUMP PUMP (P-M500)

.1 Application tolerances:

.1 Flow: 45 USGPM plus 10%; minus 0%.

.2 Pressure: 40ft TDH plus 10%; Minus 5%.

.2 Performance Verification Procedures:

.1 Fill sump basin at rate slower than capacity of sump pump (P-M500).

.2 Record levels at which sump pump (P-M500) starts and stops. Determine flow rate by observing time taken to draw down water level in sump basin.

.3 Adjust water level controls as necessary.

.4 Check level at which high water level alarm starts and stops. Adjust as necessary.

.3 Check removability of sump pump (P-M500) for servicing without interfering with installation or operation of other equipment.

.4 Verify non-clog capability and maximum size of solids, using procedures recommended by manufacturer.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 The installation of roof drainage piping.

.2 Co-ordination with the roofing trades in order to locate new roof drains.

.3 The supply and installation of the roof drainage piping by the Contractor in accordance with the National Plumbing Code of Canada, Provincial Plumbing Code and the local authority having jurisdiction.

1.2 REFERENCE STANDARDS

.1 ASTM International Inc.

.1 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).

.1 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.

.2 CAN/CSA-B125.3-05, Plumbing Fittings.

.3 National Research Council Canada (NRC)

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance manufacturer’s requirements

.2 Deliver Materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 CAST IRON PIPING AND FITTINGS

.1 Above ground sanitary, storm and vent: to CAN/CSA-B70.Joints:

.1 Hub and spigot:

.1 Caulking lead: to CSA B67.

.2 Mechanical joints:

.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 In accordance with Section 23 05 05 – Installation of Pipework.

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

3.3 TESTING

.1 Pressure test buried systems before backfilling.

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

3.4 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 that cleanout rods can probe as far as the next cleanout, at least.

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

.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

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

.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 The supply and installation of the sump discharge piping by the Contractor in accordance with the National Plumbing Code of Canada, Provincial Plumbing Code and the local authority having jurisdiction.

1.2 REFERENCES

.1 ASTM International Inc.

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

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-B137.3 Series 13, Thermoplastic Pressure Pipe Compendium

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical General Provisions.

Part 2 Products

2.1 PIPING AND FITTINGS

.1 Poly Vinyl Chloride pressure piping drainage, waste, and venting (PVC-DWV):

.1 Schedule 80, solvent welded, PVC-DWV pipe, fittings, and solvent cement shall conform to CAN/CSA-B1800.

.2 Piping, fittings, flanges, flange gaskets, primer, and cement are to be the products of one manufacturer.

.3 Standard of Acceptance: IPEX PVC-DWV System XFR or approved equal in accordance with B7.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

2.3 VALVES

.1 NPT PVC manual isolation ball valve, Chemline Type 21 or approved equal in accordance with B7.

.2 NPT PVC check valves, Chemline BT or approved equal in accordance with B7.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 In accordance with the Canadian Plumbing Code and the local authority having jurisdiction.

3.3 PERFORMANCE VERIFICATION

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

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

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 Provide and install roof drains.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

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

.3 Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 ROOF DRAINS (RD-1)

.1 Cast iron deep sump roof drain with 381 mm (15”) diameter anchor flange, waterproofing membrane clamp ring with integral gravel stop, and self-locking dome strainer with a free area of 125 square inches.

.2 102 mm (4”) pipe size outlet, no-hub.

.3 Cast iron body, galvanized membrane clamp and galvanized dome strainer.

.4 Acceptable Product: MIFAB model R1200 or approved equal in accordance with B7.

2.2 FLOW CONTROL ROOF DRAINS (RD-2)

.1 Cast iron deep sump roof drain with 381 mm (15”) diameter anchor flange, waterproofing membrane clamp ring with integral gravel stop, self-locking dome and accuflow parabolic weir.

.2 76 mm (3”) pipe size outlet, no-hub.

.3 Number of Weir Slots: 2

.4 Cast iron body, galvanized membrane clamp and galvanized dome strainer.

.5 Acceptable Product: MIFAB model R1100-F or approved 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 data sheet.

3.2 INSTALLATION

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

.2 Install all equipment and ancillary products in accordance with the Drawings and the Shop Drawings reviewed by the Contract Administrator.

.3 Make all necessary adjustments to the equipment to provide a complete operational installation.

END OF SECTION

Part 1 General

2.1 INTENT

.1 All mechanical Drawings and all Division 22 and 23 sections of the Specifications shall apply to and form an integral part of this section.

.2 Provide fully tested and operational mechanical systems in complete accordance with applicable codes and bylaws.

.3 Contract Documents of this section are diagrammatic. They establish scope, Material, and installation quality and are not detailed installation instructions. Do not scale from the Drawings, exact dimensions are to be taken from the Site.

.4 Follow manufacturer's recommendations for installation supplemented by the Contract Documents, unless otherwise specified by the Contract Administrator.

.5 Connect to equipment specified in other sections. Uncrate equipment, move into place, install complete, start-up, test and commission.

.6 Division 1 shall apply to Work in this section.

2.2 SCOPE OF WORK

.1 Work to include labour, Materials, and equipment required for installing, testing, adjusting, balancing, and commissioning of the mechanical systems and the provision of as-built Drawings, operation and maintenance manuals and personnel training as detailed in this and other sections of Division 1, 22, and 23.

.2 In general, Work in this division includes the provision and installation of the following

.1 Hurst Pumping Station:

1. Installation of existing rooftop air handling equipment and new ductwork.
2. Installation of existing exhaust fans, new intake, and new ductwork.
3. Installation of existing condensing unit and associated refrigerant piping.
4. Installation of new roof drainage piping.
5. Installation of new sump pump for weeping tile system within the pumping station crawlspace.

.2 Drainage Lift Station:

1. Installation of new supply fan and related intake hood with motorized damper.
2. Installation of new chemical dosing equipment and piping system.
3. Installation of new sampling pump.
4. Installation of a new flap gate.

.3 It is the responsibility of the general mechanical Contractor to co-ordinate the Work among the various sub-trades to ensure complete functioning systems.

2.3 CO-ORDINATION OF WORK

.1 Make reference to all Drawings when setting out Work. Consult with respective divisions and the Contract Administrator to ensure the Work is correctly installed. Jointly resolve all conflicts on-Site before fabricating or installing any Materials or equipment.

.2 Accuracy of dimensions for new piping, flanges, valves, and other equipment items is the Contractor's responsibility. Any fit issues between Site conditions and new Materials to be installed remain with the Contractor.

.3 Where dimensional details are required, collect Site dimensions and coordinate with the applicable Drawings.

2.4 QUALITY OF WORK

.1 Maintain qualified job Site personnel consisting of licensed tradesmen and registered apprentices with proven experience in erecting, supervising, testing, and adjusting projects of comparable nature and complexity.

.2 All Work shall be by qualified tradesmen with valid Provincial Trade Qualification Certificates.

.3 Only first-class workmanship will be accepted, not only as regards to safety, efficiency, and durability but also as regards to neatness of detail. Pipework must be installed parallel or at right angles to building planes. The entire Work shall present a neat and clean appearance on completion.

.4 Work which does not conform to standards accepted by the Contract Administrator and the trade may be rejected.

2.5 QUALITY ASSURANCE

.5 Quality assurance submittals: submit quality assurance submittals in accordance with Section 01 33 00 – Submittal Procedures.

2.6 STANDARDS OF MATERIALS

.1 All Materials and equipment installed under this Contract shall be new unless otherwise noted.

.2 Materials and equipment specified and acceptable manufacturers are named in the Specifications for the purpose of establishing the standard of Materials and workmanship to which Contractor shall adhere. Contract Price shall be based on the use of Materials and equipment as specified.

.3 Provide new Material and equipment of first-class quality, delivered, erected, connected and finished in every detail, and supplied with the acceptance of the Contract Administrator. Assume responsibility of ensuring that provided equipment performs as specified.

2.7 EQUIPMENT IDENTIFICATION AND TAGGING

.1 Equipment identification and tagging shall be in accordance with the City of Winnipeg Identification Standard Rev.04. Lamicoid nameplates are to be provided for all equipment as indicated on the Drawings (e.g.: SF-Y601, etc.) and the major equipment list included in the Contract Documents or as specified elsewhere within this Specification. Manufacturers equipment nameplates shall conform to the requirements of Section 23 05 54 – Mechanical Identification.

.2 Valves are to be identified with the use of brass tags with 12 mm stamped code letters and numbers. Information on the valve tag shall be in accordance with the City of Winnipeg Identification Standard Rev.04.

2.8 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Deliver, store, and handle Materials in accordance with the manufacturer’s written directions.

.2 Delivery and Acceptance Requirements: deliver Materials to the Site in original unopened factory packaging, labelled with manufacturer's name and address, Material, products included and location of installation.

.2 Storage Requirements:

.1 Store Materials indoors in accordance with the manufacturer's recommendations for a clean, dry, and well-ventilated area.

.2 All shipping crates and packaging too heavy to be moved by hand are to have adequate lifting eyes and/or attachments for handling.

.3 All packaging will be opened during receiving for inspection. If damage is discovered during receiving inspection, the Contractor shall be responsible for determining the extent of the damage and for arranging for the necessary replacement or on-Site or remote repairs.

.4 All exposed machined metal surfaces shall be sprayed with anti-corrosion spray prior to shipping to the Site. The Contractor shall be responsible for cleaning off all necessary protective coatings.

.5 All tanks, piping, and the like are to be clean prior to shipping and shall be inspected upon delivery. If received with water and/or debris, the component(s) are to be cleaned appropriately.

.6 Desiccant bags are to be included in all crates. The size and number of desiccant bags is to be suitable for the size of the crate.

.7 All electrical components must be shipped in vacuum packaging.

.8 Store and protect equipment and Materials in storage from nicks, scratches, and blemishes during and after installation and final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign materials into the working parts of piping and duct systems.

.3 Waste Management, Disposal, and Cleanup:

.1 Remove tools, surplus and waste materials from the Site upon completion. Clean grease, dirt and excess materials from the walls, floors, ceiling and fixtures for which this Contract was responsible and leave the premise suitable for immediate use.

.2 Dispose of unused materials and waste at disposal sites approved by the authority having jurisdiction.

.3 Dispose of unused paint and/or other hazardous materials at official hazardous materials collection sites approved by the authority having jurisdiction. Do not dispose of unused paints or coating materials into the sewer system, into streams, lakes, onto the ground. or in locations where it will pose health or environmental hazard.

2.9 GUARDING

.1 Provide all equipment guarding for all rotating shafts, gears, pinch points, and the like for equipment to protect personnel from accidental contact.

.2 Machine guards shall be designed to meet the requirements of the Manitoba Workplace Health and Safety Regulations.

.3 Drive guards shall be securely fastened but removable for servicing and constructed of expanded metal screen welded to steel frames with sufficient clearances to allow for equipment movement.

2.10 EXAMINATION OF THE SITE AND DOCUMENTATION

.1 Verify that Materials and equipment can be delivered to the place of the Work and that sufficient space and access is available to permit installation thereof in locations shown on the Drawings.

2.11 CONTRACT DRAWINGS AND SPECIFICATIONS

.1 Drawings and Specifications are complementary each to the other, what is called for by one shall be binding as if called for by both. Many items, such as valves, vents, thermometers, pressure gauges, etc. are shown only on schematics and are not shown on plan and elevation views. Provide and install all items shown in any or all of the Drawings (or schematics).

.2 Examine all Contract Documents, including all Drawings, Specifications and work of other trades to ensure that the Work is co-ordinated and satisfactorily carried out without changes to the building or Contract Price.

.3 The Drawings for mechanical work are performance drawings. They are generally diagrammatic and are not to scale unless detailed otherwise. They establish scope, Material, and installation quality and are not detailed installation instructions showing every offset, fitting, valve or every difficulty encountered during execution of the Work and should not be used as an excuse for deficiencies or omissions.

.4 Follow the recommended installation details and procedures for equipment as found in supplier technical data, supplemented by Contract Document details.

.5 Install piping, ductwork, etc., generally in the locations and routes shown on the Drawings, close to the building structure to minimize furring and interference with other services or free space. Remove piping, ductwork, etc. that is not properly installed and replace to the satisfaction of the Contract Administrator at no additional cost.

.6 Be completely responsible for the acceptable condition and operation of systems and equipment components forming part of the installation or associated with it. Promptly replace defective Materials, parts, and equipment and repair related damage.

.7 The Drawings are intended to convey the scope of Work and indicate general arrangement and approximate location of apparatus and fixtures, and indicate the general location and route to be followed by pipes and ducts. Where required installations are not shown on Drawings or are only shown diagrammatically, install in such a way as to conserve headroom and interfere as little as possible with free use of space through which they pass, while allowing adequate space for service, maintenance, repair, or replacement for all equipment.

.8 All serviceable items, such as valves, controls, bearings, filters, and similar items, must be installed in such a manner as to be accessible for service, maintenance, repair, and replacement without the removal of other material or equipment, and without the need for specialized equipment such as lifts, harnesses, or other safety items. Work to be installed to allow easy equipment isolation and servicing functions while all surrounding systems continue to operate.

.9 All individual pieces of equipment shall be provided with appropriate means of isolation and bypass so that systems may continue to operate during maintenance of individual components. It is understood that this may not be possible in all situations, but this is a requirement where isolation is possible.

Drawings and Specifications to be considered as an integral part of Contract Documents and neither Drawings nor Specifications are to be used alone. Misinterpretation of requirements of Drawings or Specifications shall not relieve Contractor of responsibility of properly completing the Work to the approval of the Contract Administrator.

.10 Obtain information involving accurate dimensions from dimensions shown by Site measurement. Visit and inspect the Site to verify location and elevation of existing services before proceeding with Work. Make all necessary changes or additions to runs to accommodate structural conditions (pipes or ducts around beams, columns, etc.) without additional expense to the City. Locations of pipes, ducts, and other equipment to be altered without charge to City, provided change is made before installation and does not necessitate additional Materials and that all such changes are acceptable to the Contract Administrator and are suitably recorded on as-built Drawings.

.11 Confirm on the Site the exact location and mounting elevation of outlets and fixtures as related to existing mechanical and electrical components.

.12 As Work progresses and before installing piping, ductwork, fixtures, and equipment interfering with interior treatment and use of building, consult the Contract Administrator for appropriate action before proceeding. This applies to all levels and proper grading of piping. If the Contractor fails to perform the above checking and fails to inform the Contract Administrator of such interference, the Contractor to bear all subsequent expense to make good the installation.

2.12 SHOP DRAWINGS

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

.2 Check Shop Drawings for conformity to Drawings and Specifications prior to submission.

.3 Submit to the Contract Administrator for review one electronic PDF set of detailed Shop Drawings.

.4 Submit Shop Drawings as described in the individual sections of Divisions 22 and 23. For equipment, provide performance, physical, and operating data as described in the Specifications and listed in equipment schedules. Provide performance curves for all pumps and fans.

.5 Shop Drawings shall include copies of applicable brochure or catalogue material clearly indicating manufacturer and model. Ambiguous Shop Drawings will not be reviewed.

.6 Clearly mark submittal to indicate all differences from the specified Material. The Contract Administrator will require all options and Material indicated on the Shop Drawing to be provided and installed. Specifically note on the submittal specified features such as tank linings, pump seal materials, painting finish, etc.

.7 Include dimensional and technical data sufficient to determine if equipment meets requirements, including weights, loading points, electrical data and motor sizes.

.8 Identify the equipment by system name and number, e.g." Supply Fan SF-Y601".

.9 Installed Materials and equipment shall meet specified requirements regardless of whether or not the Shop Drawings were reviewed by the Contract Administrator.

.10 Clearly show division of responsibility. No item, equipment, or description of Work shall be indicated to be supplied or work to be done "By Others" or "By Purchaser". Any item, equipment, or description of Work shown on Shop Drawings shall form part of Contract, unless specifically noted to contrary.

.11 Take full responsibility for securing and verifying field dimensions. In cases where fabrication must proceed prior to field dimensions being available, check all Shop Drawings and approve for dimensions only. In this case, guarantee that dimensions will be worked to and ensure that other sub-trades are aware of these dimensions and shall comply with them.

.12 Review by the Contract Administrator shall be mutually understood to refer to general design only. If errors in detailed dimensions or interference with the Work are noticed, attention of Contractor will be called to such errors of interferences, but the Contract Administrator's review of the Shop Drawings will not in any way relieve Contractor from responsibility for said errors or interferences, or from necessity of furnishing such Work, and Materials as may be required for completion of the Work as called for in the Contract Documents.

.13 The review by the Contract Administrator is for the sole purpose of ascertaining conformance with the design concept.

.14 Do not order equipment until the Contract Administrator has reviewed and returned the reviewed Shop Drawings.

.15 Keep one set of Shop Drawings on the Site.

.16 Include a set of cutsheets and Shop Drawings representing the final materials and equipment supplied, without any markups from the Contract Administrator in each operating and maintenance manual in accordance with Section 01 78 00 – Closeout Submittals.

2.13 PERMITS, FEES AND INSPECTIONS

.1 Apply for, obtain, and pay for all permits, licences, inspections, examinations, and fees required for Work of Divisions 22 and 23.

.2 Review Drawings with authorities having jurisdiction to ensure compliance with all applicable codes and by-laws.

.3 In case of conflict, codes and regulations take precedence over the Contract Documents. In no instance, reduce the standard or scope of Work or intent established by the Drawings and Specifications by applying any of the codes referred to herein. Any discrepancies must be brought to the Contract Administrator's attention in writing.

.4 Before starting any Work, submit the required number of copies of Drawings and Specifications to the authorities having jurisdiction for their approval and comments. Comply with any changes requested as part of the Contract, but notify the Contract Administrator immediately of such changes. Prepare and submit any additional drawings, details, or information as may be required.

2.14 CUTTING AND PATCHING

.1 Provide scanning, coring, and drilling for installation of all mechanical equipment and systems through concrete or structural members. Ensure damage to structures or other systems does not occur.

.2 Cutting, core drilling, patching, and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment and piping, and/or installation of new equipment and piping to be included in the Work. Divisions 22 and 23 to employ and pay appropriate sub-trade whose work is involved, for carrying out work described above.

.3 The cutting of openings not requiring lintels or other structural support will be the responsibility of the trade requiring the opening, the opening size will be the minimum required, and that patching will be the responsibility of the trade making the opening to the original or specified conditions.

2.15 PAINTING

.1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and Site fabricated Work.

.2 Prime and paint marred finished paintwork to match original.

.3 Restore to new condition finishes which have been damaged too excessively to be merely primed and touched up.

2.16 OPERATION AND MAINTENANCE MANUALS

.1 Provide operation and maintenance manuals in accordance with Section 01 33 00 - Submittal Procedures and Section 01 78 00 – Closeout Submittals.

.2 Include the following information for the mechanical systems in the operation and maintenance manuals, as applicable:

- .1 Operation data to include:
  - .1 Operation instruction for systems and component.
  - .2 Description of actions to be taken in event of equipment failure.
- .2 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
- .3 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Special performance data as specified.
  - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
- .4 Lubrication information.
- .5 List of Contractors and equipment suppliers including contact information.
- .6 Parts and troubleshooting information.
- .7 Certification and identification
  - .1 Inspection certificates
  - .2 Balance reports

.8 Component information

.1 One section for each type of equipment to include Shop Drawings and installation and maintenance information.

.9 Safety information

.10 Additional information

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

2.17 COMMISSIONING

.1 Conduct commissioning in accordance with Section 01 91 31 – Commissioning (Cx) Plan.

.2 Pre-commissioning Requirements:

.1 The supplier and/or installation Contractor are to prepare pre-commissioning procedures and additional information as required for inclusion in the Cx Plan defined in Specification 01 91 31 Commissioning (Cx) Plan. The required information is to be submitted to the Contract Administrator for review and approval prior to commissioning of the system. Furthermore, the Contractor is to confirm in writing that they have adequate provisions for Testing, Adjusting and Balancing (TAB) and other aspects of the design and installation pertinent to the success of TAB. During construction, the supplier and/or installation Contractor is to coordinate the location and installation of TAB devices, equipment, accessories, measurement ports and fittings with the Contract Administrator. TAB personnel shall provide a pre-commissioning instrument setpoint list.

.3 Shop Testing Requirements:

.1 The Contract Administrator may appoint an inspector to provide inspection, quality assurance and testing supervision pertaining to the Work being performed at the Contractor's facility and those of its Subcontractors.

.2 Such tests shall be performed at the expense of the Contractor and shall be in accordance with the appropriate ASME, CSA, ASTM or other applicable standard(s).

.3 All pressure equipment shall be hydrostatically tested in accordance with the codes, standards and this Specification.

.4 Prior to leaving the Contractor's facility, the equipment shall be tested under load and operational tests shall be performed on all electrical and mechanical components to demonstrate that the equipment meets the requirements of this specification. All pressure relief valves are to be set in the shop.

.5 The Contractor shall also perform the following factory tests on the equipment electrical systems:

.1 Factory electrical wiring continuity and insulation tests.

.2 Motor insulation tests.

.3 Motor running current under no load and full load are within acceptable ranges.

.4 Field Testing and Commissioning Requirements:

.1 Systems commissioning will be conducted prior to Substantial Performance. The purpose of the commissioning is to ensure all systems are functioning as designed prior to Substantial Performance.

.2 The supplier and/or installation Contractor are to provide all of the necessary equipment for conducting the required field tests. Again, the supplier and/or installation Contractor are to prepare commissioning procedures and additional information as required for inclusion in the Cx Plan.

.3 The Site tests, at a minimum, shall prove the following:

.1 Static Tests – Static pressure tests and valve leak tests.

.2 Running Tests – After installation but before being placed into service, the equipment shall be powered and tested to prove the following:

.1 All clearances and alignments are in order.

.2 Lubrication (if applicable) is adequate.

.3 Operation of each controller, relay, limit switch and all other control device is satisfactory and operates correctly.

.4 All circuits, controls and interlocks sequence of operation is correct.

.5 All protective and indicating devices operate satisfactory.

.4 Testing, Adjusting and Balancing (TAB) shall be performed in accordance with the requirements of the Associated Air Balance Council (AABC). The recommendations and suggested practices contained in the TAB standard shall be considered mandatory.

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

.6 Firm and personnel performing TAB shall be qualified in accordance with the TAB standard.

.4 Commissioning will require the presence of knowledgeable representatives of the necessary mechanical trades. The mechanical Contractor shall include all necessary costs for systems commissioning. The Contract Administrator will participate to the extent deemed necessary.

.5 All HVAC control system testing is to be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Contract Administrator is notified of the system demonstration.

.6 All control wiring shall be verified for proper connections, free of all shorts, ground faults and that the terminations are tight. All input devices shall be calibrated individually with the calibration procedures recommended by the manufacturer.

.7 Verify that all binary output devices operate properly and that the normal positions are correct. The installation Contractor must also verify that all analog output devices are functional, that start and span are correct and that the direction and normal positions are correct.

.8 All aspects of mechanical systems operations will be operated, checked and verified. If any portion of the Work fails to meet design requirements, the commissioning procedure will be halted and only resumed when all necessary repairs are completed. All extra costs including costs for the Contract Administrator to revisit the Site resulting from this postponement will be borne by the Contractor.

.9 Verify that the system operation adheres to the sequence of operation. All modes of operation shall be simulated and observed by overriding and varying inputs and schedules.

.10 Submit, to the Contract Administrator, a commissioning report detailing the commissioning tests performed and the results of these tests. Format of report is described in Section 01 91 31 – Commissioning (Cx) Plan.

2.18 SUBSTANTIAL PERFORMANCE

.1 Prior to requesting any Substantial Performance inspection, complete all of the following items:

.1 All systems shall be operational with alarms, interlocks and control functions.

.2 Obtain all certificates of approval from the authorities having jurisdiction.

.3 All manufacturer start-ups shall be complete.

.4 Complete valve tagging and identification of all new mechanical systems and components.

.5 Lubricate all equipment as per manufacturers' instructions.

.6 Submit required documentation and perform operator training.

.7 Provide all manufacturers' reports required by the Specifications.

.8 Complete all previously identified deficiencies.

.9 Clean equipment both inside and out.

.10 Complete final air and water balancing and submit reports.

.11 Complete final calibration.

.12 Provide as-built Drawings in accordance with Section 01 78 00 – Closeout Submittals.

.2 After the completion of tests and adjustments, remove temporary covers, strainers and/or obstructions to flow. Drain, flush, and refill piping systems as often as required until all piping is clear of dirt and debris.

.3 Leave all mechanical Works in their specified working order.

.4 Provide spare components as specified in this and other sections of Divisions 22 and 23.

.5 Provide one set of all specialized tools required to service the equipment as recommended by the manufacturers.

2.19 DOCUMENTATION AND SYSTEMS ACCEPTANCE

.1 Provide the following prior to Substantial Performance:

.1 Operation and maintenance manuals as called for elsewhere in this Section and as described in Section 01 78 00 – Closeout Submittals.

.2 Site records (As-built/Record Drawings) as described in Section 01 78 00 – Closeout Submittals to be provided for review prior to Substantial Performance.

.3 TAB:

.1 Prior to start of TAB, finalize production of as-built Drawings.

.2 Perform TAB using the as-built Drawings.

.3 Air balancing report to be included in TAB report as described in Section 23 05 96 – Testing, Adjusting, and Balancing of HVAC.

.4 Extended warranty certificates where specified in other sections of Divisions 22 and 23.

2.20 SPECIAL TOOLS AND SPARE PARTS

.1 Prior to Substantial Performance, furnish the City with spare parts as follows:

.1 Spare parts as detailed in the individual sections of Division 22 and 23.

.2 One set of fan belts in addition to the final operating set.

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

.2 Provide one set of special tools required to service equipment as recommended by manufacturers.

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

Part 2 Products

3.1 NOT USED

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 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum the interior of the ductwork.

3.3 DEMONSTRATION

.1 Conduct demonstration and training in accordance with Section 01 91 41 – Commissioning Training.

.2 The Contract Administrator will use equipment and systems for test purposes prior to acceptance. Supply labour, Material, and instruments required for testing.

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

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

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

3.4 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 SCOPE OF WORK

.1 This section details the methods and guidelines for the installation of piping.

1.1 SUBMITTALS

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

.2 Product Data:

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

1.2 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to Site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

NOT USED

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 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves for isolation and ease of maintenance and assembly.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment, and components for observation of operation, inspection, servicing, maintenance, and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.

3.4 PIPEWORK INSTALLATION

.1 Screwed fittings jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Saddle type branch fittings may not be used.

.6 Install exposed piping, equipment, rectangular cleanouts, and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, and conserve space.

.8 Slope piping, except where indicated, in the direction of flow for positive drainage and venting.

.9 Group piping wherever possible. Group piping runs at common elevations.

.10 Ream pipes, remove scale and other foreign material before assembly.

.11 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.12 Provide for thermal expansion as indicated and specified.

.13 Valves:

- .1 Install in accessible locations.
- .2 Install with stems above horizontal position unless otherwise indicated.
- .3 Valves accessible for maintenance without removing adjacent piping.

3.5 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

- .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
- .2 Other floors: terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for firestopping.

.2 Maintain fire rating integrity.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.6 PREPARATION FOR FIRE STOPPING

.1 Install firestopping within annular space between pipes, ducts, insulation, and adjacent fire separation.

.2 Uninsulated unheated pipes not subject to movement: no special preparation.

.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fire stopping material or installation.

.4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.7 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush chilled water piping system after reconnection of chilled water piping system to existing rooftop air handling equipment.

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

3.8 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 The Contractor is to design, select, supply, and install HVAC and piping support systems suitable for the applications indicated.

.2 Provide accommodation for pipe expansion where required.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.3, Process Piping.

.2 ASME B31.9, Building Services Piping

.2 ASTM International

.1 ASTM A125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

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

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Submit Shop Drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba as specified.

.2 Submit Shop Drawings and product data for the following items:

.1 Bases, hangers, and supports for HVAC and piping.

.2 Connections to equipment and structures.

.3 Structural assemblies.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct pipe hangers and supports to the manufacturer’s recommendations utilizing manufacturer's regular production components, parts, and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.3, ASME B31.9, or MSS SP58.

.3 Ensure that supports, guides, and anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into HVAC ductwork or piping or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 GENERAL

.1 Fabricate hangers, supports, and sway braces in accordance with MSS SP58.

2.3 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports in pump rooms, electrical rooms, chlorine rooms, controls rooms, and stairwells: galvanized after manufacture.

.1 Use electro-plating galvanizing process

.2 Pipe hangers and supports in Drainage Lift Station: aluminium or fibreglass.

.2 Attachment to concrete:

.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless (forged) steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.

.2 Upper attachment structural: Suspension from lower flange of I-Beam.

.1 Cold piping NPS 2 maximum: Malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 9 mm UL listed,13 mm FM approved.

.2 Cold piping NPS 2 1/2 or greater, hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed, FM approved where required to MSS-SP58 and MSS-SP69.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 2 maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed FM approved where required to MSS SP69.

.2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed, FM approved where required.

.5 Hanger rods: threaded rod material to MSS SP58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.6 Pipe attachments: material to MSS SP58:

.1 Attachments for steel piping: carbon steel galvanized.

.2 Oversize pipe hangers and supports for insulated pipes.

2.4 RISER CLAMPS

.1 Steel or cast-iron pipe: galvanized black carbon steel to MSS SP-58, type 42, UL listed FM approved where required.

.2 Bolts: to ASTM A307.

.3 Nuts: to ASTM A563.

2.5 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping: 64 kg/m^3 density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

2.6 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade stainless steel.

2.7 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.8 EXTERIOR ROOFTOP DUCTWORK

.1 Provide adjustable galvanized steel ductwork support system with rubber base.

.2 Refer to mechanical Drawings for details.

.3 Acceptable Product: C-Port model DSAW or approved 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:

.1 Manufacturer's instructions and recommendations.

.2 Provide supplementary structural steelwork where structural bearings do not exist.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to be to industry standards.

.3 Steel pipes: Install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: Install below joint.

.5 PVC pipes: Install to allow for thermal expansion and contraction of piping.

3.3 HANGER SPACING

.1 Plumbing piping: most stringent requirements of the Canadian Plumbing Code or the authority having jurisdiction.

.2 Within 300 mm of each elbow.

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Bending of hanger rod is not permitted.

.3 Adjust hangers to equalize load.

.4 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.3 Ensure proper grading of pipe.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 Materials and requirements for the identification of equipment, piping systems, ductwork, valves, and controllers, including the installation and location of identification systems.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

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

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.2 The City of Winnipeg, Water and Waste Department

.1 Identification Standard Rev 04.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Submit product data for paint colour samples and other products specified in this section.

.3 Submit samples of nameplates, labels, and tags prior to fabrication of these items.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate: mechanically fastened to each piece of equipment by the manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, and capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, and frame size.

2.2 SYSTEM NAMEPLATES

.1 Provide nameplates for all equipment designated by tags as indicated in the Drawings. e.g. P-M500.

.2 Colours:

.1 Hazardous: red letters, white background.

.2 Black letters, white background (except where required otherwise by applicable codes).

.3 Naming convention: as indicated on the Drawings and the City of Winnipeg, Water and Waste Identification Standard.

.3 Construction:

.1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.4 Sizes:

.1 Conform to following table:

Type	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20
10	35 diameter	1	5

.2 Use maximum of 25 letters/numbers per line.

.5 Locations:

.1 Pumps, fans: use Type #7 or #8.

.2 Air handling units, cooling towers, chillers, condenser: use Type #9.

.3 All valves, pipeline devices: use Type #10.

.4 All control devices: use Type #2 or #3.

.5 All other items confirm with Contract Administrator.

2.3 IDENTIFICATION OF PIPING SYSTEMS

.1 General

.1 The labels to identify the contents of the piping system are to include a background colour, commodity identification legend, and direction of flow by arrows.

.2 Labels installed are to be in accordance with CAN/CGSB 24.3.

.3 Commodity identification legend shall be block text all in capitals in sizes and colours listed herein.

.4 Arrows indicating the direction of flow shall be in sizes listed in Item 2.3.4 and colours listed in Item 2.3.3. Use double headed arrows where flow is reversible.

.5 The background colour marking shall be the full circumference of the pipe or insulation. The background colour marking shall be of length and colour identified herein.

.2 Materials for piping identification

.1 All sizes 20 mm and smaller: Waterproof and heat resistant pressure sensitive plastic marker tags.

.2 All other sizes: Pressure sensitive plastic-coated cloth or vinyl with protective over-coating, waterproof contact adhesive undercoating, suitable for ambient of 100 percent relative humidity and continuous operating temperature of 150 degrees Celsius and intermittent temperature of 200 degrees Celsius.

.3 Colours and Legends:

.1 Where a commodity is not listed obtain directions from the Contract Administrator.

.2 Colours for commodity identification legend, arrows, and background colours to the following table.

Commodity	Background Colour	Legend/Arrow Colour	Legend
Chilled Glycol Supply	Match existing pipe colouring	Match existing legend/arrow colouring	CH. GLYCOL SUPPLY
Chilled Glycol Return	Match existing pipe colouring	Match existing legend/arrow colouring	CH. GLYCOL RETURN
Refrigerant Suction	Yellow	Black	REF. SUCTION
Refrigerant Liquid	Yellow	Black	REF. LIQUID
Refrigerant Hot Gas	Yellow	Black	REF HOT GAS
Storm Water	Green	White	STORM
Sanitary	Green	White	SAN
Dechlorination Solution	Green	White	DECHLOR

.4 Sizes:

.1 Pipe marker size to the following table.

Outside Diameter of Pipe or Covering	Minimum Letter and Number Height	Minimum Length of Colour Field
19 mm to 32 mm	13 mm	200 mm
38 mm to 51 mm	19 mm	200 mm
64 mm to 150 mm	32 mm	300 mm
200 mm to 250 mm	64 mm	600 mm
Over 250 mm	89 mm	800 mm

2.4 LANGUAGE

.1 Identification in English

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

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

.3 Identify ducts using the following labels (at least once in each room): Supply, Relief.

2.6 VALVES, CONTROLLERS

.1 System nameplate: use Type #10.

2.7 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.

.2 Provide identification only after the completion of painting.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Perform pipe identification as piping is installed and insulated.

3.3 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.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas at not more than 10 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 piping or ductwork passes.

.3 At beginning and end points of each run and at each piece of equipment in run.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures where in plain sight of the equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Contract Administrator. Provide one copy (reduced in size if required) in each operation and maintenance manual.

.3 Number valves in each system consecutively and in accordance with City of Winnipeg Water and Waste Identification Standard.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Testing, Adjusting, and Balancing (TAB) is used throughout this section to describe the process, methods, and requirements of testing, adjusting, and balancing for HVAC.

.2 TAB will be conducted in accordance with requirements of Contract Documents and as specified in this section.

.3 TAB Standard means the testing and balancing standard under which the TAB personnel's qualifications are approved and include one of the following:

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

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems; or

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

1.2 SUBMITTALS

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

.2 Submit, prior to commencement of TAB, the qualifications of the TAB personnel as detailed in Item 1.3.

.3 Submit, in advance of the start of construction, confirmation in writing of the adequacy of provisions for TAB and other aspects of design and installation pertinent to the success of TAB as detailed in Item 1.8.

.4 Submit, prior to commencement of TAB, the proposed method for completing TAB.

.5 Submit the preliminary TAB Report as detailed in Item 1.15.

.6 Submit a TAB report on the existing systems prior to construction as detailed in Item 3.4.

.7 Submit the TAB Report as detailed in Item 1.16.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB and documentation confirming their qualifications under a TAB Standard to the Contract Administrator a minimum of two months prior to conducting TAB or earlier if required by the construction schedule.

1.4 GENERAL REQUIREMENTS OF TAB

.1 TAB shall be performed in accordance with the requirements of the TAB Standard.

.2 The recommendations and suggested practices contained in the TAB Standard are mandatory.

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

.4 Use TAB Standard for TAB, including qualifications for TAB personnel and calibration of TAB instruments.

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

.6 TAB Standard quality assurance provisions such as performance guarantees form part of this Contract.

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

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

1.5 PURPOSE OF TAB

.1 Document pre-construction conditions of existing systems.

.2 Verify proper and safe operation, determine actual point of performance, and evaluate qualitative and quantitative performance of equipment, systems and controls at design, average, and low loads using actual or simulated loads.

.3 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.

.4 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.6 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards must be completed to the satisfaction of authority having jurisdiction.

1.7 CO-ORDINATION

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

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.8 PRE-TAB REVIEW

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

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

.3 Prior to construction, conduct TAB on existing systems as described in Item 3.4.

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

.5 TAB personnel shall provide a pre-commissioning instrument setpoint list.

1.9 START-UP

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

1.10 OPERATION OF SYSTEMS DURING TAB

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

1.11 START OF TAB

.1 Notify the Contract Administrator five (5) Business Days prior to start of TAB.

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

.1 Installation of ceilings, doors, windows, and other construction affecting TAB,

.2 Application of weather-stripping, sealing and caulking.

.3 Provisions for TAB installed and operational.

.3 Prior to start-up, verification of normal and safe operation of mechanical, associated electrical, and control systems affecting TAB is required. The following is also required 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 , air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

.3 Hydronic systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

1.12 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 Air systems: plus 10% or minus 5%.

.2 Hydronic systems: plus or minus 10%.

1.13 ACCURACY TOLERANCES

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

1.14 INSTRUMENTS

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

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

.3 Calibrate instruments within three (3) months of TAB. Provide certificate of calibration to the Contract Administrator.

1.15 PRELIMINARY TAB REPORT

.1 Submit for review and approval of the Contract Administrator, prior to submission of formal TAB report, a sample of proposed TAB sheets. Include:

.1 Details of instruments used including serial numbers and calibration certificates.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.16 TAB REPORT

.1 Format in accordance with referenced TAB Standard.

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

.3 Final accepted TAB report to be included in operation and maintenance manual in accordance with 01 78 00 Closeout Submittals.

1.17 VERIFICATION

.1 Reported results contained in the TAB Report are subject to verification by the Contract Administrator.

.2 Provide personnel and instrumentation to verify up to 30% of reported results contained in the TAB Report.

.3 The number and location of verified results are as directed by the Contract Administrator.

.4 Results that are not to the satisfaction of the Contractor Administrator will be required to be repeated. The Contractor to pay costs to repeat TAB as required to satisfaction of Contract Administrator.

1.18 SETTINGS

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

.2 Permanently mark settings to allow restoration at any time during the life of facility. Do not eradicate or cover markings.

1.19 COMPLETION OF TAB

.1 TAB is considered complete when the final TAB Report detailed in Item 1.16 is received and approved by the Contract Administrator.

1.20 AIR AND HYDRONIC SYSTEMS

.1 Standard: TAB to most stringent of TAB Standard.

.2 Complete TAB of the following systems, equipment, components, and controls including all grilles, dampers and zone pressurization specified in Division 23:

.1 New supply fan (SF-Y601).

.2 Existing rooftop equipment (AHU-1 and AHU-2). Also complete an initial air flow measurement of the equipment prior to removal and provide a comparison within the air balancing report of before and after air flow rates.

.3 Existing rooftop exhaust fans (Quantity 5). Also complete an initial air flow measurement of the equipment prior to removal and provide a comparison within the air balancing report of before and after air flow rates.

.4 Flow through all grilles as shown on the Drawings.

.5 Measure water flow rates through existing rooftop equipment (AHU-1 and AHU-2) chilled water cooling coils. Also complete an initial water flow measurement of the chilled water cooling coils prior to removal and provide a comparison within the water balancing report of before and after water flow rates.

.3 For the above mentioned equipment, set airflow to values to match those from preconstruction inspection.

.4 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB.

.5 Quality assurance: perform TAB under direction of a supervisor qualified to the reference standards.

.6 Measurements: to include, as appropriate, for systems, equipment, components, and 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, and vibration.

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

.1 Inlet and outlet of dampers, filter, coil, fans or other equipment.

.2 At controllers, controlled device.

.8 Locations of systems measurements to include: main ducts, main branch, sub-branch, and run-out (or grille, register or diffuser).

1.21 PROJECT CONDITIONS

.1 City Occupancy: The facilities are intended to operate continuously and the City will operate the Site and existing building during the entire TAB period. Cooperate with City during TAB operations to minimize conflicts with City operations.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 GENERAL PROCEDURES FOR TESTING AND BALANCING

.1 Coordinate the location requirements for test probes to prevent the cutting of insulation, ducts, and pipes.

.2 Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices with permanent identification material to show final settings.

.3 Take and report testing and balancing measurements in SI units.

3.2 HYDRONIC SYSTEMS

.1 Prepare test reports for all pumps, coils and chiller associated with the final HVAC system. Obtain relevant documentation to determine TAB procedures or requirements for the installed system. The City will endeavor to supply Shop Drawings and equipment data for existing equipment, however if no information is available, the Contractor shall contact the manufacturers to obtain said information.

.2 Crosscheck the summation of required coil and chiller flow rates with pump design flow rate.

.3 Verify that hydronic systems are ready for testing and balancing:

- .1 Check air pressure in expansion tank.
- .2 Check that glycol makeup system has adequate pressure pump to the highest vent in the system.
- .3 Check that control valves are in their proper position.
- .4 Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- .5 Verify that motor starters are equipped with properly sized thermal protection.
- .6 Check that air has been purged from the system.

.4 Chilled Glycol Loop

- .1 Adjustment of the hydronic pumps to deliver total design flow rate
  - .1 Position valves for full flow through the coils and heat exchangers.
  - .2 Determine the flow of the pump through the installed triple duty valve.
- .2 Measurement of the pump’s total dynamic head
  - .1 Measure the discharge pressure of the pump directly at the pump outlet flange or in the discharge pipe prior to any valves.
  - .2 Measure the inlet pressure of the pump directly at the pump inlet flange or in the suction pipe prior to any valves or strainers.

.3 Convert the pressure to pump head and correct for any differences in gauge heights.

.4 Verify the pump impeller size by measuring the total dynamic head with the discharge valve closed. Note the point on the manufacturer's pump curve at zero flow and verify that the pump has the specified impeller size.

.5 With all the valves open, read the pump's total dynamic head. Adjust the triple duty valve on the pump discharge until design water flow is achieved.

.3 Monitor motor performance during procedures and do not operate motor in an overload condition.

.4 Adjustment of flow measuring devices installed in mains and branches

.1 Measure flow in main and branch pipes.

.2 Adjust main and branch balancing valves for design flows.

.3 Re-measure each main and branch after all balancing valves have been adjusted.

.5 Adjustment of flow measuring devices installed at devices to design water flows

.1 Measure flow at all devices.

.2 Adjust each device to the design flow.

.3 Re-measure each device after all the devices have been adjusted.

.4 Perform temperature tests after all flows have been balanced.

.6 Verify final system conditions as follows:

.1 Re-measure and confirm that the total glycol flow is within design tolerances.

.2 Re-measure all the final operating data, total dynamic head, electric parameters and static profile of the pumps.

.3 Mark all final settings.

.4 Verify that all memory stops have been set.

.5 Motors

.1 Motors, 373 W and Larger: Test the motors at the final balanced conditions and record the following data:

.1 Manufacturer's name, model number, and serial number.

.2 Motor horsepower or watts rating.

.3 Motor rpm.

.4 Phase/Hertz.

.5 The nameplate and measured voltage at each phase.

.6 The nameplate and measured amperage at each phase.

.7 Starter size and thermal-protection-element rating.

.8 Service factor and frame size.

.2 For motors driven by a variable frequency drive, test the manual bypass of the controller to prove proper operation.

.6 Chiller

.1 Balance water flow through the evaporators to within specified tolerances with the pump operating per design sequence. Record the following data with the chiller operating at design conditions:

.1 Evaporator-glycol entering and leaving temperatures, pressure drop, and flow rate.

.2 Power factor on the chiller display panel.

.3 Kilowatt input on the chiller display panel.

.7 Heat Transfer Coils

.1 Measure, adjust, and record the following data for each glycol cooling coil:

.1 Entering and leaving glycol temperature

.2 Glycol flow rate

.3 Glycol pressure drop for main cooling coil

.4 Dry-bulb temperature of entering and leaving air

.5 Wet-bulb temperature of entering and leaving air

.6 Airflow

3.3 AIR SYSTEMS

.1 Prepare test reports for fans and outlets associated with the final HVAC system. Obtain relevant documentation to determine TAB procedures or requirements for the installed system. The City will endeavor to supply Shop Drawings and equipment data for existing equipment, however if no information is available, the Contractor shall contact the manufacturers to obtain said information.

.2 Crosscheck the summation of required outlet volumes with required fan volumes.

.3 Prepare single-line schematic diagram of systems for the purpose of identifying HVAC components.

.4 Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

.5 Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

.6 Verify that motor starters are equipped with properly sized thermal protection.

.7 Check condensate drains for proper connections and functioning.

.8 Check for proper sealing of air-handling-unit components.

.9 Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

.1 Measure total airflow.

.1 Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.

.2 Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.

.3 Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

.4 If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

.2 Measure fan static pressures as follows:

.1 Measure static pressure directly at the fan outlet or through the flexible connection.

.2 Measure static pressure directly at the fan inlet or through the flexible connection.

.3 Measure static pressure across each component that makes up the air-handling system.

.4 Report any artificial loading of filters at the time static pressures are measured.

.3 Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

.10 Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

.1 Measure airflow of submain and branch ducts.

.2 Adjust sub-main and branch duct volume dampers for specified airflow.

.3 Re-measure each sub-main and branch duct after all have been adjusted.

.11 Verify final system conditions.

.1 Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.

.2 Re-measure and confirm total airflow is within design.

.3 Re-measure all final fan operating data, rpms, volts, amps, static profile.

.4 Mark all final settings.

.5 Test system in economizer mode. Verify proper operation and adjust, if necessary.

.6 Measure and record all operating data.

.7 Record final fan-performance data.

3.4 EXISTING SYSTEMS

.1 Perform a preconstruction inspection of existing equipment that is to remain and be reused.

.1 Obtain manufacturer’s Shop Drawings and equipment data where not available from the City.

.2 Measure and record the operating speed, airflow, and static pressure of each fan.

.3 Measure motor voltage and amperage. Compare the values to motor nameplate information.

.4 Check the condition of filters.

.5 Check the condition of coils.

.6 Report on the operating condition of the equipment and the results of the measurements taken include any deficiencies to the Contract Administrator.

.2 Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

.1 New filters are installed.

.2 Coils are cleaned and the fins are combed.

.3 Condensate drain pans are clean.

.4 Fans are clean.

.5 Deficiencies noted in the preconstruction report are corrected.

.3 Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

.1 Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed.

.2 Verify that the indicated airflows of the renovated work result in fan speeds that are within the acceptable limits defined by equipment manufacturer.

.3 Adjust fan speeds within the limits of the installed sheaves and belts to achieve design airflow.

.4 Balance system to design airflows indicated.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 Provide and install all duct insulation and jacketing.

1.2 REFERENCES

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

.1 ASTM B209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

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

.3 ASTM C411-97, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.2 Canadian General Standards Board (CGSB)

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

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

.1 TIAC Mechanical Insulation Best Practices Guide

.4 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings

1.3 SUBMITTALS

.1 Provide submittals: in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

.1 Provide manufacturer’s printed literature and data sheets for duct insulation, hangers, and supports and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Provide manufacturer’s catalogue literature for approval related to the installation sequence, fabrication, and special handling criteria for the duct jointing recommendations.

1.4 DEFINITIONS

.1 For purposes of this section:

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

.2 "EXPOSED" - will mean "not concealed" as specified.

.3 "CER" – will mean the external/outdoors installation of rigid insulation on ductwork in a commercial application.

.4 "CRF" – will mean the finish of rectangular ducts in a commercial application.

1.5 QUALITY ASSURANCE

.1 The Thermal Insulation Association of Canada (TIAC) Mechanical Insulation Best Practices Guide, together with authorized additions and amendments, shall be used as a reference standard and shall form part of this project specification.

.2 The Subcontractor responsible for mechanical insulation installation work shall keep a copy of the above mechanical insulation best practices guide available for reference.

.3 Specification code numbers quoted shall be taken to refer to that particular specification in the TIAC guide, with exceptions only as specified herein.

.4 Where modifications to the TIAC Mechanical Insulation Best Practices Guide are included in the project specification, then such modifications shall govern in case of conflict.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

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

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

.2 Storage and Protection:

.1 Protect from weather and construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified, includes rock wool, slag wool.

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

.3 TIAC Type C.1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma for outside layers.

.1 Acceptable Material: Knauf Insulation, Manson Insulation Ltd., Certain Teed Corp., Owens Corning Canada Inc., Roxul Inc or approved equal in accordance with B7.

2.3 JACKETS

.1 Aluminum:

.1 To ASTM B209 with moisture barrier.

.2 Thickness: 0.50mm sheet.

.3 Finish: Embossed.

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 Surfaces shall be clean, dry, and free from foreign material.

3.3 INSTALLATION OF INSULATION

.1 Refer to Section 13 of the TIAC Mechanical Insulation Best Practices Guide for installation details.

.2 Install in accordance with the following TIAC specification – CER/3 Outside Air Duct and Plenum

.1 Preparation: Fix mechanical fasteners to both horizontal and vertical surfaces at approximately 300 mm on centers, each direction. Minimum two rows each side.

.2 Application: Apply the first layer of rigid insulation without vapour retarder before applying layer of rigid insulation with vapour retarder. All joints shall be staggered. Cut insulation with integral vapour retarder to required size and apply to exterior of duct and/or plenum with vapour retarder with horizontal surfaces overlapping vertical surfaces. Butt edges together tightly. Secure insulation by impaling on mechanical fasteners. Where mechanical fasteners penetrate vapour retarder, and at all corners and joints, apply self-adhesive vapour retarder tape or vapour retarder strips adhered with vapour retarder adhesive. Where raised seams are encountered, add a strip of insulation above seam termination on each side of the seam, secure to the seams an overlapping strip of insulating material of equal thickness to the one required with integral vapour retarder to provide a continuous vapour retarder and seal all joints and edges with self- adhesive vapour retarder tape.

.3 Where the use of mechanical fasteners is unsuitable due to space limitations, wire fastenings, insulation adhesive, or other suitable method of attachment may be substituted.

.3 Horizontal surfaces of exterior ductwork shall be sloped to prevent ponding of water on the surface.

.4 Apply materials in accordance with manufacturer's instructions and as indicated.

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

.1 Hangers, supports to be outside vapour retarder jacket.

.6 Hangers and supports in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

3.4 INSTALLATION OF JACKET

.1 Install in accordance with the following TIAC specification – TIAC CRF/3 Outdoor

.1 Adhere vapour retarder tape over all joints and breaks in vapour retarder and at all corners of ductwork.

.2 Apply over the insulation surface a stucco embossed aluminum jacket secured with pop rivets or stainless steel self-tapping screws. All joints sealed or flashed to prevent water infiltration.

3.5 DUCTWORK SCHEDULE

.1 Rectangular Ducts:

.1 Insulation Type: C.1 with vapour retarder on external layer.

.2 Thickness: 75 mm.

.3 Jacket: embossed aluminum

3.6 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

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

1.2 REFERENCE STANDARDS

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

.1 ASHRAE Standard 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

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

.1 ASTM B209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

.2 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C534/C534M-19, Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

.4 ASTM C547-2003, Mineral Fiber Pipe Insulation.

.5 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.6 ASTM C1338-19, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

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

.3 Canadian General Standards Board (CGSB)

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

.2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

.5 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings

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

.1 TIAC Mechanical Insulation Best Practices Guide

1.3 DEFINITIONS

.1 For purposes of this section:

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

.2 "EXPOSED" – will mean "not concealed" as specified.

.3 “CPF” – will mean commercial pipe finish.

.4 “PVC” – will mean polyvinyl chloride.

1.4 SUBMITTALS

.1 Provide submittals: in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications, and datasheet. Include product characteristics, performance criteria, and limitations.

.3 Shop Drawings:

.1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

1.5 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.

.2 The Thermal Insulation Association of Canada (TIAC) Mechanical Insulation Best Practices Guide, together with authorized additions and amendments, shall be used as a reference standard and shall form part of this project specification.

.3 The Subcontractor responsible for mechanical insulation installation work shall keep a copy of the above mechanical insulation best practices guide available for reference.

.4 Specification code numbers quoted shall be taken to refer to that particular specification in the TIAC guide, with exceptions only as specified herein.

.5 Where modifications to the TIAC Mechanical Insulation Best Practices Guide are included in the Specifications, then such modifications shall govern in case of conflict.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

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

.2 Deliver Materials to Site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Protection:

.1 Protect from weather and construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

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

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

.3 Cold Piping

.1 Type A.1

.1 Preformed mineral fibre with integral jacket (low to medium temperature).

.1 Thermal conductivity: 0.033 W/m-°C.

.2 Will not support microbial growth when tested in accordance with ASTM C1338.

.2 Acceptable Material: Knauf Insulation, Manson Insulation Ltd., Owens Corning of Canada Inc., Roxul Inc., Industrial Insulation Group IIG-LLC or approved equal in accordance with B7.

.2 Type A.6

.1 CFC free flexible elastomeric insulation to ASTM C534.

.1 Thermal conductivity: 0.035 W/m-°C.

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

.1 Acceptable Material: K-Flex, Armacell, Aerofoam or approved equal in accordance with B7.

2.3 JACKETS

.1 PVC:

.1 One-piece moulded type and sheet to ASTM D1784 with pre-formed shapes as required.

.2 Colours: to match adjacent finish paint. Confirm colour with Contract Administrator.

.3 Minimum service temperatures: -20°C.

.4 Maximum service temperature: 65°C.

.5 Moisture vapour transmission: 0.02 perm.

.6 Thickness: 0.55 mm.

.7 Fastenings: solvent weld adhesive compatible with insulation to seal laps and joints.

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

.9 Acceptable Material: Ceel-Co, Childers, Belform Insulation Ltd., Proto Corp., Sure-Fit System, Speedline, Thermo-Cover Inc., Zeston or approved equal in accordance with B7.

.2 Aluminum:

.1 To ASTM B209.

.2 Thickness: 0.50 mm sheet.

.3 Finish: smooth.

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

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

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLATION REQUIREMENT

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

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

3.3 INSTALLATION

.1 Refer to Section 13 of the TIAC Mechanical Insulation Best Practices Guide for installation details.

.2 Install in accordance with the following TIAC specification codes.

.1 Type A.1- Preformed mineral fibre with integral jacket to TIAC code 1501-C.

.1 Piping: Apply pipe insulation with integral vapour retarder jacket to piping and hold in place by securing the jacket flap. Seal all flaps and butt strips with vapour retarder adhesive or alternately secure with staples on 75 mm centers and cover with vapour retarder tape. Pipe

insulation with integral self-sealing vapour retarder jacket will not require additional fastening.

.2 Screwed or welded fittings: Insulate fittings with section of the pipe insulation mitered to fit tightly. All seams shall be sealed using vapour retarder tape.

.3 Valves, Strainers: Insulate valve bodies, bonnets and strainers with fitted pipe insulation or mitered blocks all to thickness of adjacent pipe insulation, then seal all seams of vapour retarder with vapour retarder tape.

.4 Flanged and grooved fittings: Insulate with oversized pipe insulation or mitered blocks to the thickness of the adjacent pipe insulation, then seal all seams of vapour retarder jacket with vapour retarder tape.

.2 Type A.6 - CFC free flexible elastomeric insulation to TIAC code 1501-CA.

.1 Flexible foamed elastomeric or closed cell insulation shall be installed in accordance with the manufacturer's instructions.

.2 Ensure tight joints.

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

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

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

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

3.4 PIPING INSULATION SCHEDULES

.1 Thickness of insulation as listed in the following table.

Application	Insulation Type	Pipe sizes and insulation thickness (mm)				
		Less than 32	32 to 38	50 to 100	125 to 200	Greater than 200
Chilled Water	A.6	25	N/A	N/A	N/A	N/A
Chilled Water	A.1	N/A	38	38	38	38
Refrigerant Piping	A.6	19	N/A	N/A	N/A	N/A
Rain Water Leader	A.1 or A-6	25	25	25	25	25

3.5 FINISHES

.1 Insulation on concealed indoor piping will be left as factory finished with no further finish required.

.2 The following finishes apply to exposed piping only:

.1 CPF/3 Outdoor Metal Jacket

.1 Over the pipe insulation apply metal jacketing with a 60 mm overlap at 3 o'clock using necessary fastenings on approximately 150 mm centers.

.2 Over insulated fittings, (valve bodies, valve bonnets, strainers and flanges if specified) apply metal jacket or preformed metal fitting covers to provide a complete jacket system. Secure with necessary fastenings.

.2 CPF/4 Exposed indoors: PVC jacket

.1 Over the pipe insulation apply PVC jacketing, overlap each section a minimum 75 mm.

.2 Over insulated fittings, valve bodies, valve bonnets, strainers and flanges if specified) apply PVC jacket or preformed PVC fitting covers to provide a complete jacket system.

.3 Bond using an adhesive recommended by the manufacturer to provide continuous seal.

3.6 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.1-10, Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

.2 ASME B16.3-06, Malleable Iron Threaded Fittings: Classes 150 and 300.

.3 ASME B16.5-09, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.

.4 ASME B16.9-07, Factory-Made Wrought Buttwelding Fittings.

.5 ASME B18.2.1-10, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loaded Head and Lag Screws (Inch Series).

.6 ASME B18.2.2-10, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).

.2 ASTM International

.1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.2 ASTM E202-10, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.3 CSA International

.1 CSA B242-05(R2011), Groove and Shoulder Type Mechanical Pipe Couplings.

.2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.

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

.1 MSS-SP-67-2002a, Butterfly Valves.

1.2 SUBMITTALS

.1 Provide submittals in in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

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

.3 Operation and Maintenance Manuals:

.1 Provide operation and maintenance information in accordance with 017800 – Closeout Submittals and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Submit operation and maintenance data for hydronic systems for incorporation into the operation and maintenance manual.

.3 Include special servicing requirements.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging.

Part 2 Products

2.1 PIPE

.1 ACR Copper Tubing (Condenser Unit):

.1 Processed for refrigeration installation, deoxidized, dehydrated and sealed. Hard drawn, wrought copper to ASTM B280, ASME B16.22, and joined with silver solder and non-corrosive flux.

.2 Insulation to be 19 mm (3/4") thickness, expanded closed cell, flexible elastomeric thermal insulation with integral vapour barrier sized to suit pipe diameter and suitable for outdoor piping protection. Acceptable product: "Armaflex" or approved equal in accordance with B7.

.2 PVC Pipe (AHU):

To ASTM D1784 Type I, Grade I, Cell Classification 12454-B, ASTM D 1785, CSA B137.0, CSA B137.3, NSF 14 and as follows:

.1 Schedule 80 PVC

.2 Acceptable product: IPEX Xirtec 140 or approved equal in accordance with B7.

2.2 VALVES

.1 Connections:

.1 NPS 2 and smaller: Trunion.

.2 NPS 2-1/2 and larger: flanged ends.

.2 Butterfly valves: to MSS-SP-67

.1 application: isolating cells or section of multiple component equipment (i.e. multi-section coils, multi-cell cooling towers).

.2 NPS 2-1/2 and over: lug type.

.3 SS stem and disc

.3 PVC Ball valve:

.1 Acceptable product: Chemline Type 21 True Union Ball Valve or approved equal in accordance with B7.

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 hydronic systems installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

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

3.2 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 05 – Installation of Pipework.

3.3 CLEANING, FLUSHING, AND START-UP

.1 Clean and flush piping after installation and prior to start-up of equipment.

3.4 TESTING

.1 Leak test hydronic systems prior to filling in accordance with ASME 31.9, Item 937 – Leak Testing. Repair leaking joints, fittings, or valves.

3.5 BALANCING

.1 In accordance with Section 23 05 93- Testing, Adjusting, and Balancing of HVAC for applicable procedures.

3.6 CLEANING

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

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

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

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by hydronic systems installation.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 Materials and installation of low-pressure metallic ductwork, joints, and accessories.

1.2 REFERENCES

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

.2 ASTM International

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

.3 National Fire Protection Association (NFPA)

.1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

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

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

.2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.

Part 2 Products

2.2 DUCTWORK

.1 Material:

.1 Galvanized steel with Z90 designation zinc coating lock forming quality: to ASTM A653/A653M.

.2 Thickness: to SMACNA.

.2 Construction: round.

.1 Ducts: factory fabricated, spiral wound, with matching fittings and specials to SMACNA.

.2 Transverse joints up to 900 mm: slip type with tape and sealants.

.3 Transverse joints over 900 mm: Vanstone or approved equal in accordance with B7.

.4 Fittings:

.1 Elbows: smooth radius 3 piece (for 45 degrees) 5 piece (for 90 degrees). Centreline radius: 1.5 x diameter.

.2 Branches: conical transition with conical branch at 45 degrees and 45 degrees elbow.

.3 Construction: rectangular:

.2 Ducts: to SMACNA.

.3 Transverse joints: Welded SMACNA seal Class A.

.4 Fittings:

.1 Elbows: smooth radius; centreline radius 1.5x width of duct. No vanes.

.2 Branches: with conical branch at 45 degrees and 45 degrees elbow.

2.3 FIRE STOPPING

.1 50 x 50 x 3 mm retaining angles around duct, on both sides of fire separation.

.2 Fire stopping material must not distort duct.

2.4 SEAL CLASSIFICATION

.4 Classification as follows:

.1 Maximum Pressure 2500 Pa, SMACNA Seal Class A

.2 Maximum Pressure 1500 Pa, SMACNA Seal Class A

.3 Maximum Pressure 1000 Pa, SMACNA Seal Class A

.5 Seal classification:

.1 Class A: transverse joints, longitudinal seams and duct wall penetrations shall be sealed and connections made air tight with duct sealant. Maximum leakage rate of 2% to 5%.

2.5 SEALANT

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

.1 Acceptable Material: Duro Dyne S-2 or approved equal in accordance with B7.

2.6 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.7 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.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 mm.

.2 Hangers: galvanized steel angle with galvanized steel rods.

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	8
751 to 1050	40 x 40 x 3	8
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.3 Upper hanger attachments: Existing precast concrete panels.

.1 Manufactured mechanical or adhesive anchors designed for the individual installations.

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.

.1 Insulate strap hangers 100 mm beyond insulated duct.

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

3.2 ROOFTOP DUCTWORK SUPPORT

.1 Support ductwork in accordance with SMACNA requirements.

.2 Ductwork supports shall be provided within 600 mm of an elbow or change in direction.

.3 Maximum exterior horizontal ductwork support spacing shall be 1.8 m (6ft).

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:

.1 Fresh air intake.

.2 Relief discharges.

.2 Form bottom of horizontal duct without longitudinal seams.

.1 Solder or weld joints of bottom and side sheets.

.2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards louvers served.

3.4 SEALING AND TAPING

.1 Apply sealant to the outside of joints to manufacturer's recommendations.

3.5 CLEANING

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

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

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 Materials and installation for duct accessories including flexible connections.

1.2 REFERENCES

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

.1 SMACNA - HVAC Duct Construction Standards – Metal and Flexible, 2005.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

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

.2 Indicate:

.1 Flexible connections.

.2 Duct access doors.

.3 Instrument test ports.

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 with fabric clenched by means of double locked seams.

.2 Material:

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

2.3 TURNING VANES

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

2.4 INSTRUMENT TEST PORTS

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

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 Supply and return connections to existing air handling units AHU-1 and AHU-2.

.2 As indicated on Drawings.

.2 Length of connection: 100 mm.

.3 Flexible connections shall be a continuous section of material and installed as per the manufacturer's recommendation to reduce leakage.

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

.5 Install in accordance with recommendations of SMACNA.

.6 When fan is running:

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

.2 Ensure slack material in flexible connection.

.2 Turning Vanes:

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

.3 Instrument test ports.

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

.2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.

.4 Locate on main and sub-main ducts for traverse readings.

3.3 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 REFERENCES

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

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

1.3 CLOSEOUT SUBMITTALS

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

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

Part 2 Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm.

.4 Bearings: pin in bronze bushings.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution

3.1 INSTALLATION

.1 Install where indicated.

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

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration free.

.6 Ensure damper operators are observable and accessible.

3.2 CLEANING

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

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

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Supply, installation, testing, and commissioning of a combined unit supply fan (SF-Y601) and damper (FV-6010) for the Drainage Lift Station.

1.2 REFERENCES

.1 AMCA Publication 99-2003, Standards Handbook.

.2 AMCA 500-D – Laboratory Methods for Testing Dampers for Ratings.

.3 AMCA 511 – Certified Ratings Program for Air Control Devices.

.1 ANSI/AMCA 210-1999, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.2 UL 705 – Standard Power Ventilators.

.3 ASTM C1363-97 – Thermal performance test in accordance with Architectural Testing Laboratories (ATI).

.4 IECC - International Energy Conservation Code

.5 ASHRAE Standard 62 – Ventilation for Acceptable Indoor Air Quality

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

.3 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210.

3.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheets include product characteristics, performance criteria, and limitations.

.2 Submit product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit fan performance curves showing point of operation with the flow, static pressure and horsepower clearly plotted.

.4 Provide fan electric motor data.

.5 Provide manufacturer’s certification that the fans are licensed to bear Air Movement and Control Associations (AMCA), Certified Rating Seal for sound and air performance.

.3 Operation and Maintenance Manuals:

.1 Provide operation and maintenance information in accordance with 01 78 00 – Closeout Submittals and Section 23 05 00 – Mechanical HVAC General Provisions.

.2 Provide manufacturer's operation and maintenance manual, including instructions on installation, operations, maintenance, pulley adjustment, receiving, handling, storage, safety information and cleaning. Include troubleshooting guides, parts lists, warranty and electrical wiring diagrams.

Part 2 Products

2.1 GENERAL

.1 Motors:

.1 High efficiency motors are to be provided.

.2 Flexible connections: in accordance with Section 23 33 00 – Air Duct Accessories.

.3 Manufacture to SMACNA standards.

2.2 WALL PROPELLER SUPPLY FAN (SF-Y601)

.1 General Description

.1 Fan arrangement shall be supply.

.2 Sidewall mounted applications.

.3 Maximum continuous operating temperature 54.4 degrees Celsius (130 degrees Fahrenheit).

.4 Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.

.5 Fan should be constructed for service in a lift station

.2 Wheel

.1 Propeller shall be aluminum blade riveted to steel hub.

.2 A standard square key and set screw or tapered bushing shall lock the propeller to the motor shaft.

.3 Statically and dynamically balanced in accordance with AMCA Standard 204-05.

.4 The propeller and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.

.3 Motors

.1 Motor enclosures: TEFC.

.2 Motors are permanently lubricated, sleeve bearing type on sizes 8-12 and ball bearing type on sizes 14-24 to match with the fan load and furnished at the specific voltage and phase.

.3 Accessible for maintenance.

.4 Drive Frame

.1 Drive frame assemblies and fan panels shall be galvanized steel.

.2 Drive frame shall have welded wire or formed channels and fan panels shall have pre-punched mounting holes, formed flanges, and a deep formed one-piece inlet venturi.

.5 Finishes

.1 Types: Permatector.

.6 Wall Housing

.1 Mounting arrangement: Flush exterior.

.2 Constructed of galvanized steel with heavy gauge mounting flanges and pre-punched mounting holes.

.3 Housing shall include OSHA approved motor guard.

.7 Motor Side Guard

.1 Guard type: OSHA Guard.

.2 Protective guard completely enclose the motor and drive side of the fan.

.3 Coated with Permatector, a thermal setting polyester urethane.

.8 Weatherhood

.1 Shall shield wall opening and dampers from rain and snow.

.2 Material type: Galvanized.

.3 Turndown Angle: 90 degrees.

.4 Screen: Insect screen (removable type).

.5 Finishes: Permatector.

.9 Fan controls shall be through local wall mounted de-humidistat to start the fan upon sensing a high relative humidity within the space.

.10 Performance Requirements:

.1 Air Flow: 71 L/s @ 37 Pa ESP (150 CFM @ 0.15” W.C. ESP).

.2 Electrical: 120V/1PH/60Hz.

.11 Acceptable product: Greenheck Model AER-S20C-610-VG or approved equal in accordance with B7.

2.3 MOTORIZED DAMPER (FV-Y6010)

.1 General:

.1 Low leakage thermally insulated damper with extruded airfoil blades.

.2 Type: insulated motorized.

.3 Prevents outside air from entering back into the building when fan is off.

.4 Balanced for minimal resistance to flow.

.5 Galvanized frames with pre-punched mounting holes.

.6 Damper operation shall be interlocked with the associated supply fan.

.7 Guard shall completely enclose the damper or wall opening on the discharge side of the fan.

.2 Leakage:

.1 Dampers shall have a maximum leakage of Class 1A @ 1 in. wg as defined by AMCA (Leakage class 1A is defined as 3 cfm/ sq. ft. @ 1 in. wg. at -40°F). Tested in accordance with AMCA standard 500-D.

.3 Construction:

.1 Frame: Damper frame shall be aluminum formed into a. structural hat channel. Frame shall be 4-piece construction with integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking. Damper frame to be thermally broken from connecting ductwork.

.2 Blades: Damper blades shall be heavy gauge extruded aluminum airfoil shape with metal blade to blade overlap. Blade orientation is horizontal, and operation is parallel. Polyurethane foam fills the airfoil blade cavity giving the blade its thermal transfer properties. Ends of blade have a thermal break to isolate the transfer of heat/cold through the aluminum material from one side of the blade to the other.

.3 Seals:

.1 Blade Edge: Silicone blade seals come standard which are mechanically fastened to each blade.

.2 Jamb seal: silicone.

.4 Linkage: Concealed in frame out of the airstream, plated steel material.

.5 Axles: Minimum 13 mm dia. plated steel. Stainless steel axle is optional. Removable control shaft extends 150 mm. beyond the damper frame.

.6 Bearings: Dual bearing with acetal inner sleeve, flanged outer bearing resulting in no metal-to-metal or metal-to-plastic contact.

.7 Finish: Mill aluminum finish.

.8 Temperature Rating: -57° C to 93° C (-70° F to 200° F).

.4 Actuator:

.1 Electric type, external mounting, two position, 24V AC electrical power requirements.

.2 Control: Damper actuator shall be interlocked with operation of side wall fan (SF-Y601) and shall be electrically powered through the fan, requiring no external control or power supply.

.5 Acceptable product: Greenheck Model ICD-44 or approved 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 fan and damper assembly in accordance with the manufacturer’s instructions.

.2 Ensure housing does not touch rigid duct while in operation.

.3 Ensure no unusual vibration or noise is present.

.4 Use vibration isolation as specified above.

.5 Fan and damper must be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish any access doors or removable section of duct in ductwork or plenums required to provide this access. The general Contractor shall furnish any access doors required in walls, ceilings, or other general building construction.

.6 Install fan and damper assembly square and free from racking.

.7 The installing contractor shall provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure.

.8 Do not compress or stretch the frame into the duct or opening.

.9 Attach multiple section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.

.10 Handle the fan and damper assembly using the frame or sleeve. Do not lift or move dampers using blades, actuator or jackshaft.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

.2 Indicate following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.5 Neck velocity.

Part 2 Products

2.1 GENERAL

.1 To meet flow rate requirements as indicated on drawing.

.2 Material: Aluminum construction

.3 Frame Border Style: 32 mm (1-1/4”) width

.4 Concealed manual opposed blade volume control damper operators.

.5 Colour: Confirm all colours/finishes with Consultant.

.6 Acceptable Manufacturer: Refer to grille schedule below or approved equivalent in accordance with B7 of the Tender documents.

Grille Tag	Manufacturer	Model	Comments
G1	EH Price	750x750 / 610D / F / L / A	Aluminum Single Deflection Supply Grille with Balancing Damper
G2	EH Price	300x300 / 610D / F / L / A	Aluminum Single Deflection Supply Grille with Balancing Damper

2.2 MANUFACTURED UNITS

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

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Install with stainless steel (or colour matched) screws in countersunk holes where fastenings are visible.

.3 Adjust supply air grille pattern per manufacturer's instruction for high bay cooling air distribution.

3.2 CLEANING

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

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

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results – for Electrical.

1.2 REFERENCES

.1 City of Winnipeg Water and Waste Department Standards

.1 Electrical Design Guide Rev 04

.2 Identification Standard Rev 04

1.3 SYSTEM DESCRIPTION

.1 Refer to Drawing1-0650A-E0002-001 for system architecture.

.2 Work covered by this section consists of fully operational control systems, including, but not limited to, the following:

.1 Control devices.

.2 Data communications equipment.

.3 Field control devices.

.4 Software/hardware complete with full documentation.

.5 Complete operation and maintenance manuals.

.6 Training of personnel.

.7 Acceptance tests, technical support during commissioning, full documentation.

.8 Wiring interface co-ordination of equipment supplied by others.

.9 Miscellaneous work as specified in these sections and as indicated.

.3 Language Operating Requirements:

.1 Provide English operator selectable access codes.

.2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English.

.3 Operating system executive: provide primary hardware-to-software interface with associated documentation to be in English.

1.4 SUBMITTALS

.1 Submit Shop Drawings, product data, and other submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit for review:

.1 Shop Drawings including schematic, elementary and wiring diagrams.

.2 Control narratives.

.3 Major hardware and software product data.

.4 Test report as described in Item 1.5

.3 Quality control in accordance with Section 26 05 00 – Common Works Results – for Electrical.

1.5 EXISTING- CONTROL COMPONENTS

.1 Utilize existing control wiring as indicated.

.2 Re-use field control devices, where indicated, that are usable in their original configuration.

.1 Do not modify original design of existing devices without written permission from the Contact Administrator.

.2 Provide for new, properly designed device where re-usability of components is uncertain.

.3 Inspect and test existing devices intended for re-use prior to installation of new devices. Ensure testing has been completed with sufficient time for replacement of existing devices with new if required.

.1 Furnish test report listing each component to be re-used and indicate whether the device is in good working condition, requires repair, or requires replacement to the Contract Administrator.

.4 Non-functioning items:

.1 Provide with test report, specification sheets or written functional requirements to support findings.

.2 The Contractor shall repair or replace existing items judged defective yet deemed necessary for operation of the control system. The Contractor shall submit a Proposed Change Notice to the Contact Administrator.

.5 Submit written request to the Contract Administrator for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.

.6 Assume responsibility for controls to be incorporated into the control system after written receipt of approval from the Contract Administrator.

.1 Be responsible for repair costs due to negligence or abuse of equipment.

.2 Responsibility for existing devices terminates upon Total Performance.

.7 Remove existing controls not re-used or not required. Turn over to the City.

Part 2 Execution

2.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation: to manufacturer's recommendations.

2.2 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Section 26 05 00 Common Works Results – for Electrical.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

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

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

.4 Section 26 27 26 - Wiring Devices.

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

1.3 SUBMITTALS

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

.2 Submit Shop Drawings for specified equipment and devices demonstrating product requirements as outlined in Part 2 below.

.3 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.

.4 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: -40 to +40 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 ofsensors and controls.

.7 Outdoor installations: use weatherproof construction in NEMA 4 enclosures.

2.2 LEVEL SWITCHES

.1 Drainage Lift Station high level - LSH-Y802

.1 Float

.1 Fluid: Water
.2 Type: Float ball
.3 Application: Wet well level
.4 Function: High Level
.5 Process Connection: Suspended by float switch cable
.6 Material: Polypropylene
.7 Cable length: 10 m
.8 Cable Material: PVC or NBR/PVC Nitrile/PVC Rubber
.9 Approvals: CSA

.2 Switch

.1 Type: Changeover
.2 Function: High level
.3 Power Wiring: 24 VDC

.3 Acceptable product: Wika SLS-MS1-UL or approved equal in accordance with B7.

.2 Drainage Lift Station chemical batching tank low level – LSL-Y100

.1 Float

.1 Fluid: Vita-D-Chlor
.2 Type: Float switch
.3 Application: Chemical batching tank level
.4 Function: Low level
.5 Process Connection: ¾ inch NPT
.6 Orientation: Vertical
.7 Material: 304 stainless steel
.8 Cable length: 2 m
.9 Cable Material: PVC or NBR/PVC Nitrile/PVC Rubber
.10 Fail Safe: Yes
.11 Approvals: CSA

.2 Switch

.1 Type: SPST

.2 Function: Low level

.3 Power wiring: 24 VDC

.4 Case material: 304 stainless steel

.3 Acceptable product: Omega LVK-204 or approved equal in accordance with B7.

2.3 ELECTROMAGNETIC RELAYS

.1 Requirements:

.1 Double voltage, DPDT, plug-in type with termination base.

.2 Coils: rated for 120 Vac or 24 Vdc. Other voltage: provide transformer.

.3 Contacts: rated at 5 amps at 120 Vac.

.4 Relay to have visual status indication

2.4 PANELS

.1 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.

2.5 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

2.6 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 I 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 them from dust, dirt, paint spray, insulation materials, etc. Protect from mechanical damage.

.9 Set output pressure of local air sets to pressure recommended for instrument to which it is to be connected.

.10 Independently support solenoids, regulators or similar control devices on solid, vibration free structures and not on control valves. Minimize load on pneumatic tubing.

.11 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 Drawings.

.12 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 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.

.13 Electrical:

.1 Provide and route all instruments, power and control signal cabling.

.2 Complete installation in accordance with Section 26 05 00 - 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 controllers, field panels and operator work station(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.

2.7 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.

2.8 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.

2.9 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.

2.10 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.

2.11 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 26 05 00 – Common Work Results for Electrical.

2.12 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 25 Integrated Automation, Division 26 Electrical, and Division 40 Process Integration. This section supplements the requirements of Division 1 General Requirements.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-06, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 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.

.3 City of Winnipeg Water and Waste Department Standards

.1 Electrical Design Guide Rev 04

.2 Identification Standard Rev 04

.3 InterNational Electrical Testing Association (NETA)

.1 ANSI/NETA ATS-2017: Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

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 DRAWINGS AND SPECIFICATIONS

.1 The intent of the Drawings and Specifications is to include all labour, products, and services necessary for the completion and testing of the Work, and to render the system ready for operation.

.2 These Specifications and the Drawings and Specifications of all other divisions shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.

.3 Provide all items and Work that are not shown or specified but which are reasonably necessary to complete the Work.

1.5 PERMITS, FEES AND INSPECTION

.1 Submit to the inspection authority the necessary number of Drawings and Specifications required for examination and approval prior to commencement of the Work.

.2 Pay associated fees.

.3 Notify the Contract Administrator of changes required by inspection authority prior to making changes.

.4 Furnish a Certificate of Final Inspection and approvals from the inspection authority to the Contract Administrator.

1.6 ELECTRICAL EQUIPMENT MODIFICATION

.1 Where electrical equipment is field modified, arrange for special inspection from the inspection authority and pay all associated fees.

1.7 TESTING

.1 All test instruments utilized are to have been calibrated within one year of the date utilized.

.2 Perform tests on all electrical and instrumentation in accordance with the latest version of InterNational Electrical Testing Association (NETA) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems.

1.8 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 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.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.9 SUBMITTALS

.1 Prior to delivery of any products to Site and sufficiently in advance of requirements to allow ample time for checking, submit Shop Drawings and submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

.1 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.

.2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.3 Indicate on Shop Drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.4 Submit copies of 600 x 600 mm minimum size Shop Drawings and product data to inspection authorities.

.5 If changes are required, notify Contract Administrator of these changes before they are made.

.3 Quality Control:

.1 Provide CSA certified equipment and Material. Where CSA certified equipment and Material is not available, submit such equipment and Material to inspection authorities for special approval before delivery to Site.

.2 Submit test results of installed electrical systems and instrumentation.

.3 Submit, upon completion of Work, load balance report as described in PART 3, Item 3.7 FIELD QUALITY CONTROL.

.4 Submit certificate of acceptance from inspection authority upon completion of Work to Contract Administrator.

.5 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within three (3) days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3, Item 3.7 FIELD QUALITY CONTROL.

.5 Provide closeout submittals in accordance with Section 01 78 00 – Closeout Submittals,

1.10 QUALITY ASSURANCE

.1 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. The activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a Contractor who holds a valid Master Electrical contractor license as issued by the Province of Manitoba.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Contract Administrator with schedule within two (2) weeks prior to start of construction.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

1.12 SYSTEM CARE, OPERATION AND START-UP

.1 Conduct commissioning in accordance with Section 01 91 31 – Commissioning (Cx) Plan.

.2 Provide training in accordance with Section 01 91 40 – Commissioning Training.

.3 Instruct City maintenance and operating personnel in operation, care, and maintenance of systems, system equipment and components.

.4 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.

.5 Provide these services for such period, and for as many visits as necessary, to put equipment in operation, and ensure that City operating personnel are conversant with aspects of its care and operation.

1.13 OPERATING INSTRUCTIONS

.1 Provide operating instructions for each system and principal item of equipment as specified in technical sections for use by City operation and maintenance personnel.

.2 Operating instructions to include the following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.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.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified Material and equipment is not available, obtain special approval from inspection authorities before delivery to Site and submit such approval as described in PART 1, Item 1.9 SUBMITTALS.

.2 Factory assemble control panels and component assemblies.

.3 Minimum enclosure type to be used is NEMA 12 unless otherwise specified.

.4 All enclosures located within the Chlorine Storage Room, the Chlorine Scale Room and the Chlorinator Room shall be NEMA 4X.

2.2 ELECTRIC MOTORS, EQUIPMENT, AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment, and controls, as indicated.

.2 Control wiring and conduit: in accordance with Section 26 29 03 – Control Devices 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: as specified and in accordance with requirements of inspection authorities and Contract Administrator.

.2 Lamacoid 3 mm thick plastic engraving sheet, red face, white core, mechanically attached with self tapping screws, 20 mm text.

2.4 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, and screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 All equipment identification shall conform to the City of Winnipeg WWD Identification Standard Rev.04. All equipment shall be identified as indicated on the Drawings and shall be identified in the field and in software, where applicable, with the same identifier. Nameplates and labels shall be as follows:

.1 Nameplates: Lamacoids to be 3 mm thick plastic, white face, black lettering.

.2 Mechanically attached with self-tapping stainless steel screws, except where not possible.

.3 Apply lamacoids as per the City of Winnipeg WWD Electrical Design Guide Rev.04.

.4 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

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
Size 8	35 x 100 mm	3 lines	5 mm high letters

.2 Wording on nameplates and labels to follow guidelines set out in Table 2-1 of the Electrical Design Guide and are to be approved by Contract Administrator prior to manufacture.

.3 Allow for minimum of twenty-five (25) letters per nameplate and label.

.4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.5 Identify equipment with Size 3 labels engraved as directed by Contract Administrator. Eg. “CP-Y800”

.6 Disconnects, starters, and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

.1 Wire tagging shall be in accordance with the latest version of the City of Winnipeg WWD Identification Standard Rev 04.

.2 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.1 Wire tags to be heat shrink type with black letters on white background.

.3 Maintain phase sequence and colour coding throughout.

.4 Colour coding for applicable wiring shall be in accordance with the latest versions of the City of Winnipeg WWD Standards. All other wiring colours to be in accordance with CSA C22.1.

.5 Use colour coded wires in communication cables, matched throughout system.

.6 Identify each wire at termination points with unique wire tag, generally as shown on the Drawings. Markers shall consist of machine printed sleeves.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Conduit and cable shall be identified in accordance with the latest City of Winnipeg WWD Standards.

.2 Colour code conduits, boxes and metallic sheathed cables.

.3 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.4 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

.5 Colour code as indicated in the following table:

System	Prime Band	Aux. Band
Medium Voltage (>750 V)	Orange	
347/600 V	Yellow	
120/208/240 V Power	Black	
UPS 120/208/240 V Power	Black	Green
Control Wiring (120 V)	Black	Orange
Fire Alarm	Red	
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring (<50 V)	Blue	Orange
Intrinsically Safe	Blue	White
Grounding	Green	

2.9 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 ANSI 61 grey enamel, unless otherwise specified.

2.10 SCOPE OF WORK

.1 The scope of the electrical work includes all items identified on the Drawings and the Specifications. The following list of major work items has been provided to provide a high level overview.

.1 Installation of electrical feed from Panel BB to the Drainage Lift Station.

.2 Supply and installation of Drainage Lift Station Splitter (SPL-Y1).

.3 Supply and installation of Drainage Lift Station RTU Control Panel (CP-Y800).

.4 Installation of Ethernet communication between the Drainage Lift Station RTU Control Panel and the Hurst Pumping Station control room for high and low level alarms and pump run statuses in the Drainage Lift Station.

.5 Installation of high level float switch (LSH-Y802) in the Drainage Lift Station wet well.

.6 Electrical installation of two chemical dosing pumps (P-Y101 and P-Y102) and associated chemical batching tank low level float switch (LSL-Y100) including wiring modifications to JBA-Y801 for chemical dosing pump controls in the Drainage Lift Station.

.7 Supply and installation of panelboard PNL-Y10 in the Drainage Lift Station.

.8 Electrical installation of supply fan SF-Y01 and associated control and instrumentation in the Drainage Lift Station.

.9 Electrical installation of Drainage Lift Station sampling pump (P-Y103) and associated start-stop pushbutton.

.10 Electrical installation of sump pump (P-M500) and associated control panel (CP-M500) located within the Hurst Pumping Station crawlspace.

.11 Installation of switches (SW-C700 and SW-C701) to control chlorine room exhaust fans at two entries to the chlorine room including interlocking with the existing chlorine sensor in the Hurst Pumping Station.

.12 Supply and installation of fan control panel CP-C800 and fan motor starter MS-EEF-1 in the Hurst Pumping Station.

.13 Supply and installation of indicator light and annunciator (AA-C801 and AA-C801) at two entries to the chlorine room including interlocking with the existing chlorine sensor in the Hurst Pumping Station.

.14 Supply and installation of disconnect switches and new feeds for two roof-top air handling units (AHU-1 and AHU-2) in the Hurst Pumping Station.

.15 Supply and installation of disconnect switches for process area rooftop exhaust fans (EF-M1, EF-M2, and EF-M3) in the Hurst Pumping Station.

.16 Supply and installation of disconnect switches for chlorine room rooftop exhaust fans (FAN-1 and EEF-1) in the Hurst Pumping Station.

.17 Supply and installation of disconnect switch for rooftop condensing unit (CU-1) in the Hurst Pumping Station.

.18 Installation of rooftop convenience receptacles in the Hurst Pumping Station.

Part 3 Execution

3.1 INSTALLATION

.1 Provide complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Provide overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels, and identification nameplates are visible and legible after equipment is installed.

.2 All identification and labelling shall be in accordance with the City of Winnipeg Water and Waste Department Identification Standard Rev 04.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 galvanized steel pipe, sized for free passage of conduit.

.2 For wall, partitions, and ceilings the sleeve ends shall be flush with the finish on both sides but for floors they shall extend 100 mm above finished floor level.

.3 Fire stop opening with Underwriters Laboratories of Canada approved assembly for the installation conditions.

.4 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.5 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.

.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 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 For mounting heights, equipment to be mounted in accordance with Code requirements.

.3 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 Television outlets: 300 mm.

.9 Wall mounted speakers: 2100 mm.

.10 Clocks: 2100 mm.

.11 Door bell pushbuttons: 1500 mm.

.12 Emergency stop switches: 1500 mm to top

.13 Motor disconnect switches: 1800 mm to top

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, Item 1.9 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 following tests:

.1 Circuits originating from branch distribution panels.

.2 Lighting and its control.

.3 Motors, heaters, and associated control equipment including sequenced operation of systems where applicable.

.4 Systems: Ethernet communications.

.5 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 Carry out tests in presence of Contract Administrator.

.4 Provide instruments, meters, equipment, and personnel required to conduct tests during and at conclusion of project.

.5 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, Item 1.9 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, Item 1.10 QUALITY ASSURANCE.

3.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from the 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.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Contract Administrator.

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

.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.

3.9 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.

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

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

.3 Remove recycling containers and bins from the Site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2 No.18.1-13 (R2018), Metallic outlet boxes (Tri-national standard, with UL 514A and ANCE NMX-J-023/1)

.2 CSA C22.2 No.65-18, 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 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 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 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.

.3 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

.2 Section 26 05 20 – Wire and Box Connectors (0 - 1000 V).

.3 Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings.

1.2 REFERENCES

.1 CSA C22.1-2018, Canadian Electrical Code, Part 1.

.2 CSA C22.2 No. 0.3-09 (R2014), Test Methods for Electrical Wires and Cables.

.3 CAN/CSA-C22.2 No. 38, Thermoset-Insulated Wires and Cables.

.4 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

.5 CAN/CSA-C22.2 No. 239, Control and Instrumentation Cables.

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

Part 2 Products

2.1 GENERAL

.1 Wire: to CAN/CSA-C22.2 No. 38

.2 Conductors:

.1 Size as indicated. Minimum size for power wires: 12 AWG unless noted otherwise on the Drawings.

.2 Stranded for 10 AWG and larger and as specifically indicated herein.

.3 All conductors to be copper.

.3 Voltage rating:

.1 Power circuits 480 V and less: 600 V

.2 Power circuits > 480 V: 1000 V

.3 Insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

.4 Power supply conductor colour coding shall be in accordance with the Canadian Electrical Code. Wires sized 2 AWG and smaller to be factory-coded, taping will not be accepted.

.5 Control / Automation Wire Color Coding

.1 Utilize the following wire colours for the types of voltage/signals indicated:

.1	120VAC Line:	Black
.2	120VAC Control:	Red
.3	120VAC Neutral:	White
.4	24VDC Supply:	Blue
.5	24VDC Control:	Blue
.6	24VDC Common:	Brown
.7	4-20mA Signal:	White (+), Black (-)
.8	Protective Earth:	Green
.9	Signal Ground:	Green/Yellow

.6 Acceptable cable manufacturer: Belden, Nexans, General Cable, Southwire, or approved equal in accordance with B7.

2.2 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.

2.3 1 KV TECK 90 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 malleable iron / 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: 8 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, explosion-proof approved for TECK cable:

.1 an elastomeric bevelled bushing.

.2 a funnel entry, splined gland nut.

.3 a taper threaded hub.

.4 a hexagonal body and gland nut

.9 Acceptable cable manufacturer: Nexans, General Cable, Southwire, or approved equal in accordance with B7.

2.4 600 V TECK90 POWER AND CONTROL CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Control circuit conductors: copper, size as indicated. (14 AWG minimum where not indicated).

.3 Power 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, 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:

.1 One-hole aluminum straps to secure surface cables 50 mm and smaller. Two-hole aluminum straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 300 mm centers.

.3 Threaded rods: 8 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, explosion-proof approved for TECK cable.

.9 Acceptable cable manufacturer: Nexans, General Cable, Southwire, or approved equal in accordance with B7.

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-linked thermosetting polyethylene rated type RW90 XLPE, 600V.

.4 Suitable for installation in temperatures down to -40 °C.

.5 90 °C conductor operating temperature.

2.6 CABLE AND WIRING IDENTIFICATION

.1 Provide cable and wiring identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Cable and conduit tags to be Brady B33-7515-7643 or approval equal in accordance with B7.

.3 Wire tags to be Brady polyolefin wire marking sleeves, suitable for the wire size or approval equal in accordance with B7.

.4 Provide cable tags at both ends for all cables.

.5 All marking shall be typewritten in permanent ink.

.6 Affix tags using plastic tie-wraps.

Part 3 Execution

3.1 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with the Drawings.

.2 Do not splice cables. A continuous length is required for all feeds.

.3 Install in accordance with the manufacturer's recommendations, observing requirements for minimum bending radius and pulling tensions.

.4 Exercise care in stripping insulation from wire. Do not nick conductors.

.5 Provide bonding conductors as required by Code as a minimum, or larger if indicated in the Contract.

.6 Provide scanning, coring, and drilling for installation of all wires and cables through concrete or structural members. Ensure damage to structures or other systems does not occur.

3.2 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.

3.3 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors (0 -1000 V).

.2 Provide cable tray for all Teck 90 cable runs.

.3 Where surface mounted, provide clamps spaced a maximum of 1 m apart, unless otherwise indicated.

.4 Perform an insulation-resistance test on each conductor, prior to termination, utilizing a megohmmeter with a voltage output of 1000 volts DC.

.1 Individually test each conductor with all other conductors and shields grounded. The test duration shall be one minute.

.2 Investigate resistances less than 50 megaohms or deviations between parallel conductors.

.3 Conductors with insulation resistance values, at one minute, less than 25 megaohms or that deviate from other similar conductors by more than 50% will be rejected.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors (0 - 1000 V).

3.5 TERMINATIONS AND SPLICES

.1 Wire nuts are permitted only in the following circuits:

.1 Lighting circuits.

.2 Receptacle circuits.

.2 Terminate wiring on terminal blocks located inside junction boxes for other circuits:

.1 Controls and instrumentation.

.2 Communications.

.3 Exercise care in stripping insulation from wire. Do not nick conductors.

.4 Strictly follow the manufacturer's instructions with regards to tool size and application methods of terminations and compounds.

.5 Where screw-type terminals are provided on equipment and instrumentation, terminate field wiring with insulated fork tongue terminals.

.1 Manufacturer: Thomas and Betts, Sta-Kon, or approved equal in accordance with B7.

3.6 INSTALLATION IN CONDUIT

.1 Utilize cable grips, appropriately selected to accommodate the type and geometry of the cable.

.2 Utilize cable pulling lubricant, compatible with the cable and conduit.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

1.2 REFERENCES

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

.1 ANSI/IEEE 837-2014, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International).

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required.

.2 Grounding conductors: bare stranded copper, soft annealed, size as indicated. Provide insulated grounding conductor when installed within PVC conduits and other locations required by CEC, size as indicated.

.3 Insulated grounding conductors: green, type RW90.

.4 Ground bus: copper, size 2/0 AWG, complete with insulated supports, fastenings, connectors.

.5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.
.2 Protective type clamps.
.3 Bolted type conductor connectors.
.4 Thermit welded type conductor connectors.
.5 Bonding jumpers, straps.
.6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Use Burndy compression connectors, or approved equal in accordance with B7, for all grounding splices and terminations, unless otherwise indicated.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at one end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Bond single conductor, metallic armoured cables to cabinet at supply end and load end.

.9 Ground secondary service pedestals.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of primary 600 V system and secondary 120 V system.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to the 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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

.2 Utilize strut framing and support systems from a single manufacturer.

.3 Preferred framing and support material: Galvanized steel.

.4 Preferred hardware material: Stainless steel.

.5 Aluminum shall not be used for equipment located in the Chlorinator Room, Chlorine Room, or Chlorine Storage Room.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to solid masonry, tile, or plaster surfaces with galvanized anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit, or cables using clips, spring loaded bolts, or cable clamps designed as accessories to basic channel members.

.6 Maximum spacing between conduit supports:

.1	16 mm conduit:	1.0 m
.2	21 mm conduit:	1.5 m
.3	27 mm conduit	1.5 m
.4	35 mm conduit	2.0 m
.5	41 mm conduit and larger	2.5 m

.7 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole aluminum straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole aluminum 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 8 mm dia threaded rods and spring clips.

.2 Support two or more cables or conduits on channels supported by 8 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.9 For surface mounting of two or more conduits use channels with maximum centre spacing as indicated above.

.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 Do not install conduit directly onto concrete. Provide offset supports.

.12 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.13 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.14 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Contract Administrator.

.15 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with the manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2 No.76, Splitters

1.3 SUBMITTALS

.1 Submit product data and Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

.1 Include construction details, dimensions, capacities, weights of equipment or material.

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.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction or 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 CSA Enclosure type 4X for exterior mounted junction boxes and pull boxes and junctions and pull boxes located in the Chlorinator Room, Chlorine Room, or Chlorine Storage Room.

2.3 CABINETS

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing sheet steel backboard for surface mounting.

.3 CSA Enclosure type 4X for exterior mounted cabinets or cabinets located in the Chlorinator Room, Chlorine Room, or Chlorine Storage Room.

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 except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Cabinets to be either floor mounted or metal framing channel back-mounted. For metal framing channel back-mounted cabinets, provide metal framing channel support structures behind cabinet for mounting.

.5 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 00 – Common Work Results for Electrical.

.2 Install size 3 identification labels indicating system name, voltage and phase.

.3 Install a permanent label or lamacoid on the cover of all junction boxes indicating the circuit(s) contained within.

.1 Example: Y10-2 (Panelboard PNL-Y10, circuit 2)

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-2018, Canadian Electrical Code, Part 1.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.3 CONDUIT BOXES

.1 PVC boxes, or Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

.2 Aluminum shall not be used for equipment located in the Chlorinator Room, Chlorine Room, or Chlorine Storage Room.

2.4 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 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, foam, or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 Vacuum clean interior of outlet boxes before installation of wiring devices.

.4 Provide correct size of openings in boxes for conduit and armoured cable connections. Do not install reducing washers.

.5 Provide permanent lamicoid label for all device boxes indicating the circuit(s) contained within.

.1 Example: Y10-13 (Panelboard PNL-Y10, circuit 13)

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.2 No. 18.1-13 (R2018), Metallic outlet boxes(Tri-national standard, with UL 514A and ANCE NMX-J-023/1).

.2 CSA C22.2 No. 45-M1981(R2008), Rigid Metal Conduit.

.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight FlexibleMetal Conduit.

.4 CSA C22.2 No. 211.2, Rigid PVC (Un-plasticized) Conduit.

.5 CAN/CSA C22.2 No. 227.3, Flexible Non-metallic Tubing.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.

.2 Flexible conduits are permitted in areas where they are required for maintenance of equipment or in areas where the equipment is subject to vibrations during operation (compressors, motors, etc.), to reduce the effect on connections.

.3 EMT may be utilized within office areas if there are no environmental issues.

.4 Material Requirements:

.1 Outdoor and Buried: PVC.

.2 Office and similar areas without environmental contamination: Electrical Metallic Tubing (EMT).

.3 Main Floor, Instrumentation / Process Related: Rigid Metal.

.4 Main Floor, Lighting / Receptacles: Rigid Metal.

.5 Chlorine Room: PVC

.6 Wetwell, Explosion Proof Lighting: Rigid Metal.

.7 Wetwell, Instrumentation / Process Related: Rigid Metal.

.8 Conduits that transition into areas requiring metal conduit must be Rigid Metal conduit in their entirety.

2.2 ELECTRICAL METALLIC TUBING

.1 Meet the requirements of C22.2 No. 211.2.

.2 Materials: steel, electroplated outside finish, aluminum painted inside walls.

.3 Minimum conduit size: 21 mm, unless specifically indicated on the Drawings or approved by the Contract Administrator.

2.3 RIGID METAL CONDUIT

.1 Meets CSA C22.2 No. 45, aluminum threaded.

.2 Minimum conduit size: 19 mm, unless specifically indicated on the Drawings or approved by the Contract Administrator.

2.4 RIGID PVC CONDUIT

.1 Meets CSA C22.2 No. 211.2.

.2 Minimum conduit size: 19 mm, unless specifically indicated on the Drawings or approved by the Contract Administrator.

2.5 FLEXIBLE METAL CONDUIT

.1 To CSA C22.2 No. 56, liquid-tight flexible metal.

.2 Minimum conduit size: 19 mm, unless specifically indicated on the Drawings or approved by the Contract Administrator.

2.6 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Strap material to match conduit material.

.3 Beam clamps to secure conduits to exposed steel work.

.4 Channel type supports for two or more conduits at 1.5 m oc or as shown in the Drawings.

.5 Threaded rods, 8 mm dia., to support suspended channels.

2.7 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

.4 Ensure fittings allow cable/conductor bending radius to be maintained.

.5 All fittings to be liquid and dust tight.

.6 Enclosure Connections:

.1 Connections in dry locations (bottom or side)

.1 Locknuts inside and outside enclosures.

.2 Insulated bushings Thomas & Betts Series 222 or approved equal in accordance with B7.

.2 Connections in wet locations and tops of enclosures in dry locations

.1 Liquid-tight threaded hubs.

.2 Insulated bushings Thomas & Betts Series 222 or approved equal in accordance with B7.

.3 Utilize insulated grounding bushings at all non-metallic enclosure entries for metallic conduit, or as required for bonding in accordance with Canadian Electrical Code and good practice.

.7 Threaded Hubs for Metal Conduit

.1 Liquid and dust tight with insulated throat.

.2 Approved products

.1 Thomas & Betts "Bullet Hub" 370AL Series.

.2 Or approved equal in accordance with B7.

.8 Fittings for Metal Conduit

.1 Cast metal.

.2 Gasketed covers.

.3 Approved products

.1 Crouse-Hinds Canada Ltd. "Condulet" series.

.2 Or approved equal in accordance with B7.

.9 Explosion proof conduit sealing fittings:

.1 CSA Certified suitable for Hazardous Locations – Class I, Zone 1, Group IIA.

.2 Material: Cast aluminum.

.10 Sealing Compound. As recommended by manufacturer.

2.8 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.

2.9 CONDUIT SPACERS

.1 PVC coated malleable iron spacers, CSA approved for the purpose.

.2 Aluminum channel may be utilized where conduits are grouped, however a non-metallic spacer must be provided between the aluminum channel and concrete.

2.10 FISH CORD

.1 Polypropylene.

2.11 CONDUIT TAGS

.1 Cable and conduit tags to be Brady B33-7515-7643 or approval equal in accordance with B7.

.2 All marking shall be typewritten in permanent ink.

.3 Affix tags using plastic tie-wraps.

Part 3 Execution

3.1 ROUTING

.1 Locate conduits containing communication and low voltage conductors away from conduits containing power wiring.

.2 Route conduits on existing or new pipe rack or suspended channels where possible.

.3 Avoid routes that would interfere with any potential maintenance activities.

.4 Where not specifically shown in detail on the Drawings, review proposed conduit routing with the Contract Administrator prior to installation. Comply with all routing changes requested by the Contract Administrator.

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits in finished areas.

.3 Surface mount conduits except in mechanical and electrical service rooms and in unfinished areas.

.4 Provide conduit tags, for all conduits, at both ends, plus at every pull box and junction box.

.5 Use rigid aluminum threaded conduit except where specified otherwise.

.6 Use explosion proof flexible connection for connection to explosion proof motors.

.7 Install conduit sealing fittings in hazardous areas. Fill with compound.

.8 For areas where conduit is installed and there is a risk of migration of gases and vapour, the conduits are to be sealed with suitable conduit seals to prevent entry of moisture, vapour and gases into another area, panel enclosure, etc.

.9 Minimum conduit size is 21 mm.

.10 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.11 Do not include more than the equivalent of four (4) quarter bends. Provide pull boxes as required.

.12 Mechanically bend steel conduit over 19 mm dia.

.13 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.14 Install fish cord in empty conduits.

.15 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.

.16 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.17 Dry conduits out before installing wire.

.18 Ensure electrical continuity in all metallic conduit systems.

.19 Seal conduits with duct seal where conduits are run between heated and unheated areas. Where conduits, cables, or cable trays pierce fire separations, seal openings with Dow Corning 3-6548 sealant or approved equal in accordance with B7. Seal all conduits entering or leaving hazardous classified areas with approved seals.

.20 Where conduits pass through walls, group and install through openings. After all conduits shown on the Drawings are installed, close wall openings with material compatible with the wall construction and provide fire stopping.

.21 For metallic conduits, install within a PVC sleeve for holes / penetrations through concrete walls and slabs.

.22 Install ground bonding wire in all conduits. Size ground wire as per Canadian Electrical Code Table 16.

.23 Colour Coding

- .1 Apply plastic tape or paint colour coded bands to conduits at points where conduit or cable enters wall, ceiling, or floor, and at 5 m intervals.
- .2 Bands: 38 mm wide prime colour and 19 mm wide auxiliary colours.
- .3 Band colours in accordance with Section 26 05 00 – Common Work Results for Electrical.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

.7 Provide stand-of conduit clamp / clip.

.8 Provide a minimum space of 12 mm between conduits.

.9 Install spacers as required to provide a space between the conduits and the supporting surface, with a minimum space as follows:

.1 Above grade spaces not classified as Canadian Electrical Code Category 1 or 2:

.1 Drywall / Wood surfaces: no space required

.2 Masonry / concrete surfaces: 6 mm

.2 Below grade spaces: 12 mm

3.4 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.

3.5 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-overs.

.8 Where EMT and PVC conduit is used, provide a separate green insulated ground wire in each conduit.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 PVC CONDUIT

.1 Concrete Penetrations:

.1 Seal and firestop penetration around conduit with Underwriters Laboratories of Canada approved assembly for the installation conditions.

.2 Maximum spacing between supports for rigid PVC conduit:

.1	27 mm conduit	0.75 m
.2	35 mm conduit	0.75 m
.3	41 mm conduit	1.2 m
.4	53 mm conduit	1.5 m
.5	63 mm conduit	1.5 m
.6	78 mm conduit	1.5 m
.7	91 mm conduit and larger	2.0 m

3.9 METAL CONDUIT

.1 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.2 Mechanically bend conduits over 19 mm in diameter.

.3 Concrete Penetrations:

.1 Sleeves for Aluminum Conduit

.1 Install schedule 40 galvanized steel pipe, sized for free passage of conduit.

.2 Seal and firestop penetration around conduit with Underwriters Laboratories of Canada approved assembly for the installation conditions.

.3 For wall, partitions, and ceilings the sleeve ends shall be flush with the finish on both sides but for floors they shall extend 50 mm above finished floor level or housekeeping pad level.

.4 Maximum spacing between supports for rigid metallic conduit:

.1	16 mm conduit:	1.0 m
.2	21 mm conduit:	1.5 m
.3	27 mm conduit	1.5 m
.4	35 mm conduit	2.0 m
.5	41 mm conduit and larger	2.5 m

3.10 LIQUID-TIGHT FLEXIBLE CONDUIT

.1 Use as raceways at all motors, pipe-mounted control devices, and other devices subject to movement or water.

.2 At all motors, provide a short length before connecting to the motor terminal box. Minimum length shall be 450 mm plus four times the conduit diameter.

.3 Provide a separate ground wire within the flexible conduit, bonded to motor frames and system ground.

3.11 INSTALLATIONS IN CATEGORY 1 LOCATIONS

.1 Arrange to provide drainage at frequent intervals to suitable locations.

.2 Equip with approved fittings to permit the moisture to drain out of the system.

.3 Install the conduit with a minimum of 12 mm space from the supporting surface.

.4 Install every joint to be water-tight.

.5 Where conduit leaves a warm room and enters a cooler atmosphere, seal the conduit and arrange the conduit in a manner to avoid condensation accumulation at the seal.

3.12 INSTALLATIONS IN CATEGORY 2 LOCATIONS

.1 Comply with all requirements of Category 1 locations.

3.13 INSTALLATIONS IN CATEGORY 2 WET LOCATIONS

.1 Comply with all requirements of Category 1 locations.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.126.1-17, Metal Cable Tray Systems.

1.2 SUBMITTALS

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

.2 Product Data: submit manufacturer's product data sheets for cable tray indicating dimensions, materials, and finishes, including classifications and certifications.

Part 2 Products

2.1 CABLE TRAY

.1 Cable tray and fittings: to CAN/CSA C22.2 No.126.1.

.2 Ladder type, to CAN/CSA C22.2 No. 126.1.

.3 Trays: Select cable tray material as per Table 4-6 of the WWD Electrical Design Guide R04, width as indicated on Drawings.

.1 Minimum tray width is 152 mm (6”).

.2 Tray to be CSA, cUL listed.

.3 Cable tray load ratings are to be sufficient for the cables installed and any additional loads such as snow, ice and wind, where applicable.

.4 Allow for spare cables in the cable tray loading calculations. For trays where cables may be installed with no spacing, assume the tray will be filled in the future.

.5 Minimum load rating for indoor tray: CSA Class C1.

.6 Minimum load rating for outdoor tray: CSA Class D.

.4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cable tray supplied.

.1 Radii on fittings: 600 mm minimum.

.5 Use cable tray covers in dust areas, outdoors, for aesthetic reasons and for cable trays passing under walkways or where there is a risk of falling debris.

.6 Use barriers where different voltage systems are in same cable tray.

.7 Ground cable trays with #2 AWG bare copper conductor attached to each tray section in accordance with Canadian Electrical Code requirements.

.8 Provide fire stop material at firewall penetrations.

2.2 SUPPORTS

.1 Provide splices, supports for a continuously grounded system as required.

.2 Use stainless steel SS316 bolting and fixing hardware.

Part 3 Execution

3.1 INSTALLATION

.1 Install complete cable tray system.

.2 Support cable tray on both sides.

.3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

3.2 CABLES IN CABLE TRAY

.1 Install cables individually.

.2 Lay cables into cable tray. Use rollers when necessary to pull cables.

.3 Secure cables in cable tray at 2 m centres, with nylon ties.

.4 Identify cables every 8 m with size 2 nameplates.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

1.2 SUBMITTALS

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

.2 Submit Shop Drawings and product data.

.1 Indicate construction details, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

Part 2 Products

2.1 MATERIALS

.1 NEMA 4X rated enclosure for all locations except within electrical rooms and control rooms.

.2 NEMA 12 rated enclosures for devices within electrical rooms or control rooms unless otherwise specified.

.3 Door: minimum 1 m wide, hinged, minimum 3 point latching, with padlocking means.

.4 Door interlocks.

Part 3 Execution

3.1 INSTALLATION

.1 Assemble enclosure in accordance with manufacturer's instructions and securely mount on building structure with channels, supports and fastenings.

.2 Mount equipment in enclosure.

.3 Label electrical cabinets and enclosures as per Section 26 05 00 – Common Work Results for Electrical.

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 00 – Common Works Results for Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.42-10 (R2015), General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA-C22.2 No.42.1-13 (R2017), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA-C22.2 No.55-15, Special Use Switches.

.4 CSA-C22.2 No.111-18, General-Use Snap Switches (Trinational standard with UL 20 and NMX-J-005-ANCE).

Part 2 Products

2.1 SWITCHES

.1 15 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.

.1 Acceptable manufacturer: Hubbell 1200 Series or approved equal in accordance with B7.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:

.1 Ivory or 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.

.1 Acceptable manufacturer: Hubbell 5252 or approved equal in accordance with B7.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Stainless steel or PVC cover plates for wiring devices.

.3 Cover plates from one manufacturer throughout project.

.4 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.5 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.6 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.7 Weatherproof double lift spring-loaded stainless steel or PVC cover plates, complete with gaskets for duplex receptacles as indicated on the Drawings.

.8 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 00 – Common Work Results for 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 00 – Common Work Results for 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.

.4 Install a permanent label or lamacoid for all wiring devices indicating the circuit(s) contained within.

.1 Example: Y10-2 (Panelboard PNL-Y10, circuit 2)

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Works Results for Electrical.

.2 Section 26 28 13 01 – Fuses – Low Voltage.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4-16, Enclosed and Dead-front Switches.

.2 CSA C22.2 No.39-13 (R2017), Fuseholder Assemblies.

.2 City of Winnipeg Water and Waste Department Standards

.1 Electrical Design Guide Rev 04

1.4 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheets and include product characteristics, performance criteria (including interrupting rating), enclosure rating and limitations.

.3 Shop Drawings:

.1 Indicate:

.1 Mounting method and dimensions.

.2 Enclosure types.

.4 Spare Parts:

.1 Submit spare parts as described in Part 2.1.7 of this section and in accordance with Section 01 78 00 – Closeout Submittals.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure, to CAN/CSA C22.2 No.4 sized as per Drawings.

.2 Provision for padlocking in off switch position by three locks.

.3 Disconnect switches shall be CSA enclosures type 2 (for interior dry, clean areas) and CSA enclosure type 4X (for exterior, wet, or chlorine areas).

.4 Mechanically interlocked door to prevent opening when handle in ON position.

.5 Disconnects for motor loads to be heavy duty, motor rated.

.6 Disconnect switches shall have the appropriate interrupting rating (kAIC). Minimum rating is 10 kAIC. For interrupting ratings greater than 10 kAIC, utilize fused disconnects.

.7 Provide fuses as indicated on the Drawings (or as needed to increase the kAIC rating). Provide 3 spare fuses for every type.

.8 For switches 100A and over, provide non-tracking arc shrouds.

.9 Solderless pressure lugs for cable connectors.

.10 All switch poles to operate together, simultaneously with a common operating bar.

.11 Fuses: size as indicated on Drawings, in accordance with Section 26 28 13 01 – Fuses - Low Voltage.

.12 Fuseholders: to CSA C22.2 No.39 relocatable and suitable without adaptors, for type and size of fuse indicated.

.13 Quick-make, quick-break action with self-wiping contacts.

.14 Highly visible ON-OFF switch position indication on switch enclosure cover.

2.2 APPROVED MANUFACTURERS.

.1 Schneider Electric, Eaton, Hubbell or approved equal in accordance to B7.

.2 All disconnect switches to be of one manufacturer for the entire project. Split packages (multiple vendors) will be rejected.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Indicate equipment identifier, as shown on the Drawings, on size 4 nameplate.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

.2 Connect line and load cables to all disconnect switches.

.3 Connect electrode ground to ground terminal within service entrance rated disconnect switches.

.4 Ensure neutral-ground bonding link is installed in service entrance rated disconnect switches.

.5 Install fusing.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Works Results for Electrical.

.2 Section 26 29 03 – Control Devices.

1.2 REFERENCE STANDARDS

.1 CSA International.

.1 CSA C22.2 No.14-18, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA).

.1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

1.3 SUBMITTALS

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

.2 Product Data:

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

1.4 CLOSEOUT SUBMITTALS

.1 Provide closeout submittals in accordance with Section 01 78 00 – Closeout Submittals.

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

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

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONTACTORS

.1 Contactors: to CSA C22.2 No.14.

.2 Electrically held and controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.4 Mount in NEMA 4 Enclosure.

.5 Include all options as indicated on the Drawings.

.6 Control transformer: Factory wired and installed in contactor enclosure.

2.2 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 – Common Work Results for Electrical.

Part 3 Execution

3.1 INSTALLATION

.1 Install contactors and connect power wires and auxiliary control devices.

.2 Identify contactors with nameplates or labels indicating panel and circuit number.

.3 Test contactors in accordance with 26 05 00 – Common Work Results for Electrical.

3.2 PROTECTION

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

.2 Repair damage to adjacent materials caused by contactor installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Works Results for Electrical.

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.14-18, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA).

.1 NEMA ICS 1-2000(R2008), Industrial Control and Systems: General Requirements.

1.3 SUBMITTALS

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

.2 Product Data:

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

.3 Shop Drawings:

.1 Include schematic, wiring, interconnection diagrams.

1.4 QUALITY ASSURANCE

.1 Conduct tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

1.5 CLOSEOUT SUBMITTALS

.1 Provide closeout submittals in accordance with Section 01 78 00 – Closeout Submittals.

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

1.6 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 the Site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect control devices from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 AC CONTROL RELAYS

.1 Control Relays: to NEMA ICS 1 CSA C22.2 No.14.

.2 Convertible contact type: contacts field convertible from NO to NC, permanent magnet latched electrically held, double-voltage type with sliding barrier to permit access to contacts only or coil only, with pneumatic, solid state timer. Coil rating: overlap type.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open - convertible to normally closed in field.

2.3 START-STOP PUSHBUTTONS

.1 Industrial grade. Operator extend type. Black, with 1-NO and 1-NC contacts rated at 2 A minimum, AC, labelled as indicated. Contacts shall be latching type. Stop pushbuttons coloured red, Start pushbuttons coloured green.

2.4 SELECTOR SWITCHES

.1 Standard 2 position and labelled as indicated.

2.5 INDICATING LIGHTS

.1 Standard, full voltage, type, lens colour: as indicated, supply voltage: as indicated, lamp voltage, labels as indicated.

2.6 CONTROL AND RELAY PANELS

.1 CSA Type 4X enclosure with hinged padlockable access door, accommodating control devices as indicated, factory installed and wired to identified terminals.

.2 Terminals:

1. Provide strap screw type terminal blocks rated for 600 V.
2. Identify each terminal block within an enclosure with a unique machine printed terminal block number. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.
3. Connections to screw terminals to be locking fork tongue insulated crimp type wire connectors.
4. Terminals to be Weidmuller or approved equal in accordance with B7. Where indicated on Drawings, install terminal blocks that match existing terminal block style.
5. Provide a group of terminals for each of 120 VAC hot and neutral and 24 VDC positive and negative power. Distribution wiring to have a thermal magnetic circuit breaker upstream of all major blocks of loads, adequately sized to protect the connected load while not causing nuisance tripping.

6. Provide Weidmuller disconnect type terminal blocks or approved equal in accordance with B7 for each load or loop powered from the marshalling panels.
7. New terminal blocks shall be color coded as follows:
    1. Red = positive 24 VDC
    2. Black = analog signal plus
    3. White = analog signal common and VAC neutral
    4. Grey = 120 VAC
    5. Green = ground

.3 Control and relay panels shall be CSA certified.

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 control devices installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

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

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

3.2 INSTALLATION

.1 Install start-stop pushbutton stations, control and relay panels, and control devices.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and confirm 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 00 – Common Works Results for Electrical.

.2 Section 26 29 01 – Contactors.

.3 Section 26 29 03 – Control Devices.

1.2 REFERENCE STANDARDS

.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 SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications, and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Provide Shop Drawings for each type of starter to indicate:

.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout of identified internal and front panel components.
.4 Wiring diagram for each type of starter.
.5 Interconnection diagrams.
.6 Layout and components.
.7 Enclosure type.

1.4 CLOSEOUT SUBMITTALS

.1 Provide closeout submittals in accordance with Section 01 78 00 – Closeout Submittals.

.2 Submit operation and maintenance data for each type and style of motor.

.3 Submit spare parts as listed below for each different size and type of starter:

.1 3 contacts, stationary.
.2 3 contacts, movable.
.3 1 contacts, auxiliary.
.4 1 operating coil.
.5 2 fuses.
.6 10% indicating lamp bulbs used.

Part 2 Products

2.1 MATERIALS

.1 Starters: to NEMA ICS 2-2000

2.2 FULL VOLTAGE STARTERS

.1 UL/CSA listed, NEMA size as shown on the Drawings.

.1 Smallest size of starter: NEMA size 1, unless otherwise indicated

.2 IEC rated starters are not acceptable.

.2 Magnetic and combination magnetic starters of size, type, rating, and enclosure type as indicated with components as follows:

.1 All coils to be epoxy coated.

.2 Contactor solenoid operated, rapid action type.

.3 Motor overload protective device in each phase, manually reset from outside enclosure, electronic type. Heater element type overload protection is not acceptable.

.4 Wiring and schematic diagram inside starter enclosure in visible location.

.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.3 Accessories:

.1 Pushbuttons and selector switches: heavy-duty oil tight labelled as indicated.

.2 Indicating lights: heavy-duty oil tight type and color as indicated.

.3 Terminals:

1. Provide strap screw type terminal blocks rated for 600 V.
2. Identify each terminal block within an enclosure with a unique machine printed terminal block number. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.
3. Connections to screw terminals to be locking fork tongue insulated crimp type wire connectors.
4. Terminals to be Weidmuller or approved equal in accordance with B7. Where indicated on Drawings, install terminal blocks that match existing terminal block style.
5. Provide a group of terminals for each of 120 VAC hot and neutral and 24 VDC positive and negative power. Distribution wiring to have a thermal magnetic circuit breaker upstream of all major blocks of loads, adequately sized to protect the connected load while not causing nuisance tripping.
6. Provide Weidmuller disconnect type terminal blocks or approved equal in accordance with B7 for each load or loop powered from the marshalling panels.
7. New terminal blocks shall be color coded as follows:
    1. Red = positive 24 VDC
    2. Black = analog signal plus
    3. White = analog signal common and VAC neutral
    4. Grey = 120 VAC
    5. Green = ground

.4 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.3 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary and secondary voltage as indicated, complete with primary and secondary fuses, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.4 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 – Common Work Results for Electrical.

2.5 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

Part 3 Execution

3.1 INSTALLATION

.1 Install starters and control devices in accordance with manufacturer’s instructions.

.2 Install and wire starters and controls as indicated.

.3 Ensure correct fuses and overload devices elements are installed.

.4 Confirm motor nameplate and adjust / replace overload device to suit.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical and manufacturer's instructions.

.2 Operate switches and 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 Section 26 05 00 – Common Works Results – For Electrical

1.2 REFERENCES

.1 National Electrical Manufacturer's Association (NEMA)

.1 NEMA 250-2003, Enclosures for Electrical Equipment (1000 Volts Maximum).

.2 Canadian Standards Association (CSA International)

.1 CSA-C22.1-2015, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

1.3 SUBMITTALS

.1 Submit Shop Drawings and manufacturer's installation instructions in accordance with Section 01 33 00 – Submittal Procedures.

.2 Manufacturer's Instructions:

.1 Include manufacturer's installation instructions for specified equipment and devices in operation and maintenance manuals.

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.

.3 Operating conditions: 0 - 35°C with 5 - 95% RH (non-condensing) unless otherwise specified.

.4 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

2.2 DRAINAGE LIFT STATION DEHUMIDISTAT (ME-Y601)

.1 Requirements:

.1	Functionality:	Dual setpoint for heating and cooling
.2	Outputs:	Qty 2, SPDT dry contacts, independently adjustable
.3	Operating Temperature:	-10°C to 40°C minimum
.4	Sensor:	Local

.5 Mounting: Wall

.6 Environment: Suitable for outdoor installation.

.2 Acceptable Products:

.1 Johnson Controls W43A.

.2 Or approved equal in accordance with B7.

2.3 CHLORINE ALARM HORNS AND STROBES (AA-C801 AND AA-C802)

.1 Requirements:

.1 Voltage Rating: 120 VAC

.2 Signal: Horn and strobe to operate simultaneously.
Strobe lens to be red.
Adjustable audible signal.
Audible output: Minimum 70 dB at 3 m.

.3 Enclosure Rating: NEMA 4X
Corrosion resistant

.4 Operating Temperature: -40°C to 40°C minimum

.5 Environment: Weatherproof,
Suitable for indoor and outdoor installation.

.2 Acceptable products:

.1 Federal Signal Model: G-MSC-2B-120-SR-NN

.2 Federal Signal Model: G-MSC-2B-120-LR-NN

.3 Or approved equal in accordance with B7.

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

.3 Install in a manner to allow easy removal of the transducer and cable assembly for maintenance purposes.

.4 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.

.5 Electrical:

.1 Complete installation in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Provide complete conduit/cable system to link instrumentation and the control panel(s).

.3 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.

.4 Maximum conduit fill not to exceed 40%.

.5 Design Drawings do not show conduit layout.

3.2 SWITCHES AND SENSORS

.1 Stabilize to ensure minimum field adjustments or calibrations.

.2 Mount in readily accessible location to allow for quick easy replacement and servicing without special tools or skills.

.3 Field adjust setpoints on switches and sensors as per the Drawings.

.4 Make adjustments as directed by the Contract Administrator.

3.3 CHLORINE ALARM HORNS AND STROBES

.1 Mount devices in locations as shown on Drawing 1-0650M-E0023-001. Ensure strobe is visible and not obstructed by adjacent equipment.

.2 Audible signal level shall be minimum 70 dB at 3 m.

3.4 INSPECTION AND INSTRUCTION

.1 Provide for a factory-trained representative who shall give instructions regarding the installation of the equipment.

.2 The factory-trained representative shall visit the site as required to ensure that the installation work is being performed in a proper and workmanlike manner. Allow for a minimum of one (1) full day.

.3 The factory-trained representative shall be present to supervise the commissioning, initial operation, and functional testing of the equipment.

3.5 IDENTIFICATION

.1 Identify field devices with lamacoids. Install in a conspicuous location.

3.6 TESTING AND COMMISSIONING

.1 Calibrate and test field devices for accuracy and performance.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 25 05 01 – Controls: General Requirements

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

.3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings

.4 Section 26 27 26 – Wiring Devices

.5 Section 26 29 03 – Control Devices

.6 Section 01 91 31 – Commissioning (Cx) Plan

.7 Section 01 91 41 – Commissioning Training

1.2 REFERENCES

.1 American National Standards Institute (ANSI).

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

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

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

.3 Canadian Standards Association (CSA International).

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

.4 International Electrotechnical Commission (IEC)

.1 IEC 61131-3: Programming Industrial Automation Systems

.5 City of Winnipeg Water and Waste Department Standards

.1 Electrical Design Guide Rev 04

.2 Identification Standard Rev 04

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for RTU control panel CP-Y800 and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Include on drawings:

.1 Electrical detail of panel, field wiring termination, bill of materials, equipment layout and enclosure dimensions.

.2 Electrical loop wiring diagrams outlining each electrical loop from the control panel to the field instruments. Loop diagrams shall include control panel and field termination details, cable tags, cable data, process controller I/O details and any other relevant electrical loop information.

.4 Factory Acceptance Test.

.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.

.2 Perform testing in presence of Contract Administrator.

.3 Submit Factory Acceptance Test procedure two (2) weeks prior to testing to the Contract Administrator for review.

.5 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

1.4 CLOSEOUT SUBMITTALS

.1 Provide closeout submittals in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for RTU control panel CP-Y800 for incorporation into manual.

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, heat resistant assembly.

.3 Operating conditions: 0 to 32 degrees C with 10 - 90 % RH (non-condensing) unless otherwise specified. Provide control panel environmental controls as required (heating and cooling) to maintain internal control panel temperature between 10^0C and 30^0C.

.4 Terminals:

.1 Provide strap screw type terminal blocks rated for 600 V.

.2 Identify each terminal block within an enclosure with a unique machine printed terminal block number. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.

.3 Connections to screw terminals to be locking fork tongue insulated crimp type wire connectors.

.4 Terminals to be Weidmuller or approved equal in accordance with B7. Where indicated on Drawings, install terminal blocks that match existing terminal block style.

.5 Provide a group of terminals for each of 120 VAC hot and neutral and 24 VDC positive and negative power. Distribution wiring to have a thermal magnetic circuit breaker upstream of all major blocks of loads, adequately sized to protect the connected load while not causing nuisance tripping.

.6 Provide Weidmuller disconnect type terminal blocks or approved equal in accordance with B7 for each load or loop powered from the marshalling panels.

.7 New terminal blocks shall be color coded as follows:

.1 Red = positive 24 VDC

.2 Black = analog signal plus

.3 White = analog signal common and VAC neutral

.4 Grey = 120 VAC

.5 Green = ground

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 – eight (8)

.5 Analog output – two (2)

.6 Digital Inputs – sixteen (16)

.7 Digital Outputs – ten (10)

.8 Counter Inputs – three (3)

.9 Communication ports:

.1 One (1) RS-232 serial port

.2 Two (2) RS-232/485 serial ports

.3 One (1) RJ-45 10/100Base-T Ethernet port

.4 Two (2) USB ports

.10 Power supply – 11 to 30 VDC

.11 Three (3) year warranty

Approved Product; Schneider Electric SCADAPack model 334 or approved equal in accordance with B7.

.2 The Contractor is responsible for programming and documentation of programming (Functional Description, etc.) of the SCADAPack in the Drainage Lift Station.

.1 The City will provide modification of the existing Regional SCADA to incorporate the new SCADAPack.

.2 For modifications to the existing HMI, the Contractor shall provide to the City:

.1 a minimum of three weeks advance notice that Regional SCADA modification will be required;

.2 final programming of the system (after all reviews have been completed);

.3 data mapping list for all signals, with Regional SCADA modification to be clarified;

.4 clarification of any questions or concerns related to the purpose and intention of the various signals; and

.5 support for recommended adjustments and modifications to the existing Regional SCADA system.

.3 Where the items described in Section 2.2.2.2 are provided to the satisfaction of the City, the City anticipates approximately one month will be required to complete the Regional SCADA modification. The City reserves the right to extend the time required to provide Regional SCADA modification depending on availability of qualified personnel.

2.3 POWER SUPPLY

.1 120VAC input

.2 24VDC output

.3 Din-Rail mounted

.4 Acceptable product – Phoenix Contact model UNO-PS/1AC/24DC/240W or approved equal in accordance with B7.

2.4 NETWORK SWITCH

.1 24VDC input

.2 Transmission speed: 10/100 Mbps

.3 Power over Ethernet (POE) capable

.4 No. of channels 5

.5 Minimum one POE port

.6 Din-Rail mounted

.7 Acceptable product – Phoenix Contact model FL SWITCH 1001T-4POE or approved equal in accordance with B7.

2.5 ENCLOSURE

.1 Wall mount enclosure with hinged and key-locked front door.

.2 Sized appropriately to accommodate 25% additional capacity.

.3 Enclosure to be NEMA 4X rated.

Part 3 Execution

3.1 INSTALLATION

.1 RTU control panel to be manufactured within a CSA approved facility and come complete with CSA certification.

.2 Provide terminal blocks and wireways within control panel as required.

.3 Install panel in location as indicated on Drawing 1-0650Y-E0003-001.

.4 Wire all spare digital and analog signals to terminal blocks.

.5 Connect all field wiring to control panel and terminate.

.6 Power to be applied to control panel after installation of panel is complete and all field wiring has been terminated and verified.

.7 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. City to have full access to all aspects of programs, objects and applications. Provide a hard copy of all files included with the operation and maintenance manuals.

.8 Programming as per IEC 61131-3 including ladder diagram and function block diagram programming languages complete with full descriptions of all program elements and rungs.

3.2 CONTROL NARRATIVE

.1 Level Controls:

.1 A high level alarm shall be generated by LSH-Y802 when the water level in the Drainage Lift Station wet well is above the top of the discharge. This alarm signal shall be wired to CP-Y800 as a digital input.

.2 A low level alarm shall be generated by LSL-Y100 when the level in the chemical batching tank is below 305 mm from the bottom of the tank. This alarm signal shall be wired to CP-Y800 as a digital input.

.2 Lift Pumps

.1 Pump Run status for lift pumps P-Y1 and P-Y2 will be wired to the RTU control panel CP-Y800 from the automation junction box JBA-Y801. These statuses will indicate when the lift pumps are running.

3.3 TESTING AND COMMISSIONING

.1 Calibrate and test control panel devices for accuracy and performance.

.2 Verify control system operates as specified in control narrative.

.3 Perform loop checks for all connected I/O, instrumentation and devices.

.4 Perform all commissioning in accordance with Section 01 91 31 – Commissioning (Cx) Plan and perform all required training as per Section 01 91 41 – Commissioning Training.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 25 05 01 – Controls: General Requirements

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

.3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings

.4 Section 26 27 26 – Wiring Devices

.5 Section 26 29 03 – Control Devices

.6 Section 01 91 31 – Commissioning (Cx) Plan

.7 Section 01 91 41 – Commissioning Training

1.2 REFERENCES

.1 American National Standards Institute (ANSI).

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

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

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

.3 Canadian Standards Association (CSA International).

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

.4 International Electrotechnical Commission (IEC)

.1 IEC 61131-3: Programming Industrial Automation Systems

.5 City of Winnipeg Water and Waste Department Standards

.1 Electrical Design Guide Rev 04

.2 Identification Standard Rev 04

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for fan control panel CP-C800 and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Include on drawings:

.1 Electrical detail of panel, field wiring termination, bill of materials, equipment layout and enclosure dimensions.

.4 Factory Acceptance Test.

.1 Test all I/O points, components and wiring within the fan control panel prior to shipment from control panel manufacturer. Replace devices not meeting specified performance.

.2 Perform testing in presence of Contract Administrator.

.3 Submit Factory Acceptance Test procedure two (2) weeks prior to testing to the Contract Administrator for review.

.5 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

1.4 CLOSEOUT SUBMITTALS

.1 Provide closeout submittals in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for fan control panel CP-C800 for incorporation into manual.

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, heat resistant assembly.

.3 Terminals

.1 Provide strap screw type terminal blocks rated for 600 V.

.2 Identify each terminal block within an enclosure with a unique machine printed terminal block number. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.

.3 Connections to screw terminals to be locking fork tongue insulated crimp type wire connectors.

.4 Terminals to be Weidmuller or approved equal in accordance with B7. Where indicated on Drawings, install terminal blocks that match existing terminal block style.

.5 Provide a group of terminals for each of 120 VAC hot and neutral and 24 VDC positive and negative power. Distribution wiring to have a thermal magnetic circuit breaker upstream of all major blocks of loads, adequately sized to protect the connected load while not causing nuisance tripping.

.6 Provide Weidmuller disconnect type terminal blocks or approved equal in accordance with B7 for each load or loop powered from the marshalling panels.

.7 New terminal blocks shall be color coded as follows:

.1 Red = positive 24 VDC

.2 Black = analog signal plus

.3 White = analog signal common and VAC neutral

.4 Grey = 120 VAC

.5 Green = ground

.4 Electromagnetic relays as per Section 26 29 03.

2.2 ENCLOSURE

.1 Wall mount enclosure with hinged and key-locked front door.

.2 Sized appropriately to accommodate 25% additional capacity.

.3 Enclosure to be NEMA 4X rated.

Part 3 Execution

3.1 INSTALLATION

.1 Fan control panel to be manufactured within a CSA approved facility and come complete with CSA certification.

.2 Provide terminal blocks and wireways within control panel as required.

.3 Install panel in location as indicated on drawing 1-0650M-E0023-001.

.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 Control power to be fed from UPS panel, see drawing 1-0650C-E0003-001. Coordinate UPS source location with the City.

.7 Contacts from Chlorine Detection Alarm Panel HZ-920-AIY to be wired to the fan control panel CP-C800 and terminated on terminal blocks. Coordinate termination points with the City.

3.2 CONTROL NARRATIVE

.1 Chlorine Exhaust Fan Controls:

.1 Chlorine exhaust fans EEF-1 and FAN-1 are controlled by two three-way toggle switches SW-C700 and SW-C701. Both chlorine exhaust fans will turn on or off by operation of either three-way toggle switch.

.2 Two normally closed contacts in the Chlorine Detection Alarm Panel (HZ-920-AIY) are wired to the fan control panel CP-C800. The contacts open when chlorine levels are sensed at or above 1 PPM which will deenergize both chlorine exhaust fans, therefore prohibiting leaked chlorine to be exhausted to atmosphere.

.2 Chlorine Sensor Indication:

.1 Two normally closed contacts in the Chlorine Detection Alarm Panel (HZ-920-AIY) are wired to the fan control panel CP-C800. The contacts open when chlorine levels are sensed at or above 1 PPM which will energize the chlorine sensor horn/strobes AA-C801 and AA-C802.

3.3 TESTING AND COMMISSIONING

.1 Calibrate and test control panel devices for accuracy and performance.

.2 Verify control system operates as specified in control narrative.

.3 Perform loop checks for all connected I/O, instrumentation and devices.

.4 Perform all commissioning in accordance with Section 01 91 31 – Commissioning (Cx) Plan and perform all required training as per Section 01 91 41 – Commissioning Training.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results for Electrical.

.2 Section 26 28 16.02 – Moulded Case Circuit Breakers.

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.29-15, Panelboards and Enclosed Panelboards.

1.3 SUBMITTALS

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

.2 Product Data:

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

.3 Shop Drawings:

.1 Include on Shop Drawings:

.1 Electrical detail of panel, branch breaker type, quantity, ampacity, and enclosure dimension.

1.4 CLOSEOUT SUBMITTALS

.1 Provide closeout submittals in accordance with Section 01 78 00 – Closeout Submittals.

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

1.5 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 the Site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store and protect panelboards from nicks, scratches, and blemishes.

.2 Replace defective or damaged materials with new.

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.

.3 Panelboards to be surface mount type.

.2 120/240 V panelboards: bus and breakers rated for 10 kA.

.3 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.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Minimum of 2 flush locks for each panel board.

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with neutral of equal ampere rating of mains.

.8 Mains: suitable for bolt-on breakers.

.9 NEMA 4 Enclosure.

.10 Trim with concealed front bolts and hinges.

.11 Trim and door finish: baked enamel.

.12 Isolated ground bus.

.13 Include grounding busbar with minimum 3 terminals for bonding conductor equal to breaker capacity of the panel board.

.14 Panelboard shall be complete with Surge Protection Device (SPD).

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 – 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.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for 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, mounted in plastic envelope at inside of panel door.

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 panelboard installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

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

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results for Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 PROTECTION

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

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION