Part 1 General

1.1 ADMINISTRATIVE

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

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

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

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

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

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

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.

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

.3 Submit one (1) electronic copies of test reports for requirements requested in specification Sections and as requested by Contract Administrator.

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

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

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

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

.2 Certificates must be dated after award of Project Contract complete with Project name.

.5 Submit one (1) electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Contract Administrator.

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

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

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

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

.8 Delete information not applicable to Project.

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

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

.11 Contractor will be charged for Contract Administrator subsequent reviews of submittal packages exceeding two submissions.

1.3 SAMPLES

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

.2 Deliver samples prepaid to Contract Administrator's business address.

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

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

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

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

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

Part 2 Products NOT USED

Part 3 Execution NOT USED

END OF SECTION

Part 1 General

1.1 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Contract Administrator for purpose of inspecting and/or testing portions of Work.

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

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

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

1.2 ACCESS TO WORK

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

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

1.3 PROCEDURES

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

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

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

1.4 REPORTS

.1 Submit four (4) copies of inspection and test reports to Contract Administrator.

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

1.5 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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

Part 2 Products NOT USED

Part 3 Execution NOT USED

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from Site all such Work after use.

1.3 TEMPORARY HEATING AND VENTILATION

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

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

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

- .1 Facilitate progress of Work.
- .2 Protect Work and products against dampness and cold.
- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.5 Ventilating:

- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of Work process to assure removal of harmful contaminants.

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

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

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

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

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

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

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

1.4 TEMPORARY POWER AND LIGHT

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

.2 Provide and maintain temporary lighting throughout Project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

1.5 TEMPORARY COMMUNICATION FACILITIES

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

1.6 FIRE PROTECTION

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

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

Part 2 Products NOT USED

Part 3 Execution NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

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

.2 Indicate use of supplemental or other staging area.

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

.4 Remove from Site all such Work after use.

1.4 HOISTING

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

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

1.5 SITE STORAGE/LOADING

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

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

1.6 CONSTRUCTION PARKING

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

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

1.7 SECURITY

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

1.8 OFFICES

.1 Provide 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 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.

1.9 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.

1.10 SANITARY FACILITIES

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

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

1.11 PROTECTION AND MAINTENANCE OF TRAFFIC

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

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

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

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

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

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

.7 Construct access and haul roads necessary.

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

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

.10 Provide snow removal during period of Work.

1.12 CLEAN-UP

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

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

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

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

1.13 FIRE ACCESS

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

Part 2 Products NOT USED

Part 3 Execution NOT USED

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from Site all such Work after use.

1.2 HOARDING

.1 Erect temporary Site enclosures.

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

1.3 GUARD RAILS AND BARRICADES

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

.2 Provide as required by governing authorities.

1.4 WEATHER ENCLOSURES

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

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

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

1.5 DUST TIGHT SCREENS

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

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

1.6 ACCESS TO SITE

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

1.7 PUBLIC TRAFFIC FLOW

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

1.8 FIRE ROUTES

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

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.10 PROTECTION OF BUILDING FINISHES

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

.2 Provide necessary screens, covers, and hoardings.

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

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

Part 2 Products NOT USED

Part 3 Execution NOT USED

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

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

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

.3 Include in request:

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

1.2 MATERIALS

.1 Required for original installation.

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

1.3 PREPARATION

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

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

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

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

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

1.4 EXECUTION

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

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

.3 Uncover Work to install ill-timed Work.

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

.5 Remove samples of installed Work for testing.

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

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

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

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

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

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

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

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

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

Part 2 Products NOT USED

Part 3 Execution NOT USED

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

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

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

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

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

.6 Dispose of waste materials and debris off Site.

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

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

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

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

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

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

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

.3 Copy will be returned after final inspection, with Contract Administrator's comments.

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

.5 Two (2) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, four final copies of operating and maintenance manuals in English.

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

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

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

.9 Pay costs of transportation.

1.2 FORMAT

.1 Organize data as instructional manual.

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

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

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

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

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

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

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

1.3 CONTENTS - EACH VOLUME

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

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

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

.2 For each product or system:

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

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

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

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

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

1.4 AS-BUILTS AND SAMPLES

.1 Maintain, in addition to requirements in General Condition, at Site for Contract Administrator one (1) record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

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

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

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

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

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of drawings.

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

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

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

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

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

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

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

1.6 EQUIPMENT AND SYSTEMS

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

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

.3 Include installed colour coded wiring diagrams.

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

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

1.7 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

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

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

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

1.8 SPARE PARTS

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

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

.3 Deliver to Site; place and store.

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

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

1.9 MAINTENANCE MATERIALS

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

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

.3 Deliver to Site; place and store.

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

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

1.10 SPECIAL TOOLS

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

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

.3 Deliver to Site; place and store. Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

1.11 STORAGE, HANDLING AND PROTECTION

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

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

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

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

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

1.12 WARRANTIES

.1 Assemble approved information in binder and submit upon acceptance of Work. Organize binder as follows:

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

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

.3 Obtain warranties, executed in duplicate by Subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of Work.

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

.5 Co-execute submittals when required.

.6 Retain warranties until time specified for submittal.

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

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

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

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

Part 2 Products

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 Training of City staff in the use of the Public Water Service Outlets Billing System to be provided a minimum of forty five (45) days prior to field installation

.2 Demonstrate operation and maintenance of equipment and systems to City's personnel one week prior to date of Substantial Performance.

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

1.2 QUALITY CONTROL

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

1.3 SUBMITTALS

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

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

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

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

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

1.5 PREPARATION

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

.2 Verify that designated personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

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

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

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

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

1.7 TIME ALLOCATED FOR INSTRUCTIONS

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

1.2 EXISTING CONDITIONS

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

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

1.3 DEMOLITION DRAWINGS

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

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

1.4 PROTECTION

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

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

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

Part 2 Products

Part 3 Execution

3.1 PREPARATION

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

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

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

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

3.2 DEMOLITION

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

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

.3 Demolish to minimize dusting.

.4 Do not sell or burn materials on Site.

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

3.3 SALVAGE

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

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

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

.2 CAN/CSA-O86-14, Engineering Design in Wood.

.3 CSA O121-08(R2003), Douglas Fir Plywood.

.4 CSA O151-09 (R2014), Canadian Softwood Plywood.

.5 CSA O153-13 Poplar Plywood.

.6 CAN/CSA-O325-07(R2012), Construction Sheathing.

.7 CSA O437 Series-93(R2011), 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.

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

1.3 DESIGN REQUIREMENT

.1 Design of concrete formwork and all temporary shoring systems are responsibility of the Contractor.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 If requested, submit shop drawings for formwork and falsework signed and sealed by professional Engineer registered or licensed in the Province of Manitoba, Canada.

.3 If requested, submit WHMIS MSDS - Material Safety Data for product provided.

.4 Submit shop drawings indicating 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.

.5 If requested, submit shop drawings indicating formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect all materials and Work from frost and adverse weather.

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.

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

.2 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.

.1 Spiral pattern to show in hardened concrete.

.3 Steel forms: Minimum 1.9 mm well matched, tight fitting, and adequately stiffened to support weight of concrete without deflection.

.4 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.5 Form liner:

.1 Plywood: medium density overlay Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151.

.6 Form release agent: non-toxic, biodegradable.

.7 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

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

.9 Sealant: to Section 07 92 10 – Joint Sealants.

.10 Void form: Moisture resistant Dynavoid® 40166 or approved equivalent for structural slab and Dynavoid® 40264 or approved equivalent for grade beams and pile caps. The void form must be structurally sufficient to support weight of wet concrete until final set.

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 approval from Contract Administrator 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 Apply form release agent on formwork in accordance with manufacturer's recommendations prior to placing reinforcing steel, anchoring devices, and embedded parts.

.6 Erect formwork to result in exposed concrete surfaces free of unsightly cold joints, blemishes, bug holes, honeycombing and cracking.

.7 Provide bracing to ensure stability of formwork.

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

.9 Provide Site drainage to prevent washout of soil supporting mud sills and shores.

.10 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.

.11 Align form joints and make watertight.

.1 Keep form joints to minimum.

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

.13 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated on the Drawings.

.14 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.

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

.16 Ensure piles Project into grade beams and pile caps as indicated on Drawings.

.17 Remove all loose concrete from tops of piles. Ensure tops of piles are sound concrete.

.18 Construct formwork to maintain the following maximum tolerances:

.1 Horizontal and vertical lines – 10 mm in 20 m.

.2 Building dimensions and position of columns, walls, partitions: 6 mm.

.3 Cross sectional dimensions of columns or beams: ±3 mm.

.4 Camber, beams: 0.2% of span.

.5 Camber, slabs: 0.1% of span for all spans over 3 m.

.19 Do not re-use formwork that contains surface defects that could impair the appearance of finished concrete.

.20 Do not patch formwork.

3.2 REMOVAL AND RESHORING

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

.1 Three (3) days for walls and sides of beams.

.2 Five (5) days for beam soffits, slabs, and other structural members, or three (3) days when replaced immediately with adequate shoring to standard specified for falsework.

.2 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.

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

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

.5 Do not wedge pry bars or hammers against concrete surfaces.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 SP-66-04, ACI Detailing Manual 2004.

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

.3 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

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

.5 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

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

.7 CAN/CSA-A23.3-14, Design of Concrete Structures.

.8 CSA-G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.

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

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

.11 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

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

.13 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 SHOP DRAWINGS

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

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice SP-66.

.3 Details in accordance with ACI 315 unless specifically detailed otherwise.

.4 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative with identifying code marks to permit correct placement without reference to structural drawings.

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

.5 Unless noted otherwise on Drawings, bar splices to be 40 bar diameters or 400 mm minimum for horizontal slices and 30 bar diameters or 350 mm minimum for vertical splices.

.6 Provide corner bars at corners and intersections of grade beams and walls, in accordance with the structural drawings.

.7 Include details of all doweling.

1.4 QUALITY ASSURANCE

.1 If requested, submit two copies of the following:

.1 Mill Test Report: upon request, provide certified copies of mill test report of reinforcing steel, minimum four (4) weeks prior to beginning reinforcing Work.

.2 Perform welding to CSA W186.

.3 Welders qualified under CSA W47.1.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Store materials off ground in clean, dry, and well-ventilated area.

.2 Protect materials from deterioration or contamination.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

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

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

.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.

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

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

.6 Welded steel wire fabric: to ASTM A185/A185M.

.1 Provide in flat sheets only.

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

.8 Tie wire: minimum 1.5 mm annealed type, or patented system approved by the Contract Administrator.

.9 Mechanical splices: subject to approval of the Contract Administrator.

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

.11 Galvanized reinforcement: to ASTM A123/A123M, minimum zinc coating 610 g/m^3.

2.2 FABRICATION

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

.2 Locate the reinforcement splices at points of minimum stress. Location of splices to be approved by the Contract Administrator.

.3 Upon approval of the Contract Administrator or the Engineer of Record, weld reinforcement in accordance with CSA W186. Do not weld reinforcing at any location without written approval of the Contract Administrator.

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

.5 Do bending cold unless approved by the Contract Administrator.

.6 Dowels columns and walls into foundations using the same reinforcing as that in columns and walls unless noted otherwise on Drawings.

.7 Provide horizontal L shape corner bars of same cross section and spacing as horizontal bars in walls and grade beams.

Part 3 Execution

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by 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 in accordance with the reviewed shop drawings and/or contract drawings.

.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 Cleaning reinforcing to CSA A23.1.

.4 Support and space reinforcement in alignment and position as follows:

.1 Concrete slab on grade: support reinforcement on support bars or concrete brick.

.2 Concrete structural slab and topping: support reinforcement on bar chairs.

.3 Provide minimum clear cover as follows unless detailed on Drawings:

Concrete Cover			
Exposure condition	**Exposure class**		
	N	F-1, F-2, S-1, S-2	C-XL, C-1, C-3, A-1, A-2, A-3
Cast against and permanently exposed to earth (foundations and piles)	-	75 mm	75 mm
Formed surfaces exposed to earth (piers, pile caps, grade beams, foundation walls, retaining walls)	40 mm	40 mm	60 mm
Slabs, walls, joints, stoops	20 mm	40 mm	60 mm
Sidewalks, curbs and gutters, splash pads and sump pits	-	-	30 mm
Ratio of cover to nominal bar diameter	1.0	1.5	2.0
Ratio of cover to nominal maximum aggregate size	1.0	1.5	2.0

.5 Place reinforcing to CSA A23.1. Refer to structural Drawing D-14916 for minimum splices. Splices to be class B unless noted otherwise.

.6 Use non-corrosive supports for reinforcing when concrete is exposed.

.7 Support chairs to not exceed 1200 mm spacing.

.8 Do not re-bend or straighten reinforcing steel after initial fabrication.

.9 Ensure reinforcement does not move during concrete pour.

.10 Ensure cover to reinforcement is maintained during concrete pour.

.11 Ensure minimum cover to reinforcing steel for fire rating as specified on the Drawings.

3.3 FIELD QUALITY CONTROL

.1 The Contract Administrator will periodically visit the Site.

.2 Field services by the Contract Administrator do not in any way relieve the Contractor’s responsibility to carry out Work as specified in the Contract documents.

.3 Notify the Contract Administrator for an inspection twenty-four (24) hours prior to concrete placement. Correct all identified deficiencies prior to pour.

.4 Contractor is responsible for reinforcing size, location and proper placement.

.5 Remove and replace reinforcement not in accordance with the drawings.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C494/C494M-15a, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.5 ASTM D412-15a2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.6 ASTM D624-00 (2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.7 ASTM D1751-04 (2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.8 ASTM D1752-04a (2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.9 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

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

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

.12 CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories.

.13 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ABBREVIATIONS AND ACRONYMS

.1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.

.1 Type GU, GUb and GUL - General use cement.

.2 Type MS and MSb - Moderate sulphate-resistant cement.

.3 Type MH, MHb and MHL - Moderate heat of hydration cement.

.4 Type HE, HEb and HEL - High early-strength cement.

.5 Type LH, LHb and LHL - Low heat of hydration cement.

.6 Type HS and HSb - High sulphate-resistant cement.

.2 Fly ash:

.1 Type F - with CaO content less than 15%.

.2 Type CI - with CaO content ranging from 15 to 20%.

.3 Type CH - with CaO greater than 20%.

.3 GGBFS - Ground, granulated blast-furnace slag.

1.4 DESIGN REQUIREMENTS

.1 Contractor shall be responsible for design of concrete formwork and shoring systems.

1.5 SHOP DRAWINGS AND SUBMITTALS

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

.2 If requested, at least four (4) weeks prior to beginning Work, provide test data and certification by a qualified and independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Joint filler.

.2 Waterstops.

.3 Supplementary cementing material.

.4 Blended hydraulic cement.

.5 Admixtures.

.6 Fine and coarse aggregates.

.3 Submit all concrete mix designs to the Contract Administrator for review two (2) weeks prior to beginning Work.

.4 Do not proceed without written approval when deviations from mix design or parameters are found.

.5 Submit shop drawings indicating proposed location and details for all construction joints to the Contract Administrator for review prior to concrete pour.

.6 Provide two (2) copies of WHMIS MSDS.

1.6 QUALITY ASSURANCE

.1 If requested, provide the Contract Administrator, minimum (four) 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.2 Minimum four (4) weeks prior to starting concrete work, provide proposed quality control procedures for review on following items:

.1 Hot weather concrete.

.2 Cold weather concrete.

.3 Curing.

.4 Finishes.

.5 Joints.

.3 The Contractor shall arrange and pay for tests to be performed by a testing laboratory approved by the City or the Contract Administrator. The tests shall include the following:

.1 Concrete tests:

.1 One (1) set of three (3) standard test specimens to be made for each class of concrete in any one day pour of more than 5 cubic meters for compressive strength tests.

.2 For pours of more than 60 cubic meters, add one set per each additional 60 cubic meters for compressive strength tests.

.3 For Work containing less than 5 cubic meters, one (1) set of three (3) standard test specimens shall be prepared for compressive strength tests.

.4 For cold weather concrete, one additional standard test specimens shall be prepared and cure the specimens on site under same conditions as concrete it represents for compressive strength tests.

.5 Concrete for tests to be sampled at the point of deposit of the concrete into the forms.

.6 Test specimens shall be cast, cured, and tested in accordance with CSA A23.2 by personnel from the testing laboratory.

.7 For each set of test specimens, a slump test and air content test (for air entrained concrete) shall be included.

.2 Test result reports shall include:

.1 Project name.

.2 Date and time of sampling.

.3 Date specimens received in the laboratory.

.4 Supplier, truck number, and time that concrete truck departs from the plant.

.5 Specified strength, slump, maximum aggregate, and air content.

.6 Cement type.

.7 Admixtures.

.8 Exact location in structure of sampled specimens.

.9 Slump.

.10 Maximum aggregate size.

.11 Air content, if applicable.

.12 Concrete strength and age at test.

.13 Technical information such as fails, curing, etc.

.3 Concrete will be considered satisfactory if the strength test result is no more than 3.5 MPa below the specified strength.

.4 Failure to comply with the requirements of this specification will result in the structure being considered potentially deficient. In such case, the City or Contract Administrator shall have the right to require one or more of the following:

.1 Changes in the mix proportions for the remainder of the Work.

.2 Additional curing on those portions of the structure represented by test specimens that failed to meet specified requirements.

.3 Non-destructive testing of concrete: to CSA A23.1/A23.2.

.4 Test cores drilled from portions of the structure in question in accordance to CSA A23.2.

.5 Load testing of the structure or structural element in question in accordance with CSA A23.3.

.6 Reinforce by additional construction or replace as directed by the Contract Administrator at the Contractor's expense when concrete is judged inadequate by structural analysis or be results of load tests.

.7 Such other tests as the City or the Contract Administrator may specify.

.8 Note that cores should not be drilled from the tension zone of a structural member.

.9 The Contractor pay for all costs of evaluation tests and additional engineering analysis that are required to demonstrate the adequacy of the structure where it does not meet the requirements of this specification and Drawings or where concrete has been placed before formwork and reinforcement have been inspected and approved.

.5 Do not use contaminated materials.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching. Reject all concrete with hauling time exceed 120 minutes.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.2 Store and protect materials from damage by frost and weather.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Provide appropriate area on job site where concrete trucks can be safely washed.

.2 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site.

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

.4 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.5 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.

.6 Clean up and remove all rubbish and surplus materials from site.

Part 2 Products

2.1 MATERIALS

.1 Portland Cement: to CSA A3001.

.2 Concrete:

.1 Concrete shall have nominal compressive strength and meet the requirement for hardened concrete as specified in the following table.

EXP. CLASS	SUPPLY AND USE	MAX W/C	STRENGTH	CEMENT TYPE	SLUMP	MAX AGG. SIZE	AIR ENTRAINMENT	MAX FLY ASH CONTENT
S-1	FOUNDATION SLAB	0.4	35MPa @28 DAYS	HS	100 mm ±20 mm	19 mm	5%-8%	25%

.3 Water: to CSA A23.1.

.4 Aggregates: to CSA A23.1/A23.2.

.5 Admixtures:

.1 Air entraining admixture: to ASTM C260.

.2 Chemical admixture: to ASTM C494 ASTM C1017. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather placing.

.3 Do not use Calcium Chloride or any admixture containing Chloride iron.

.4 Admixtures must be used in strict accordance with the manufacturer's instruction.

.6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.

.7 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

.8 Waterstops: ribbed extruded PVC of sizes indicated with shop welded corner and intersecting pieces:

.1 Tensile strength: to ASTM D412, method A, Die “C”.

.2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.

.3 Tear resistance: to ASTM D624, method A, Die "B", minimum 30 kN/m.

.9 Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D1751.

.10 Polyethylene film: 10 mm to CAN/CGSB-51.34.

.11 Bonding adhesive: Polymer resin emulsion, for mixing with cement and water. For bonding two concretes: to CSA A23.1.

.12 Curing compound: Chlorinated liquid rubber type, membrane forming.

.13 Do not change concrete mix or source material without written approval of the Contract Administrator or the Engineer of Record.

Part 3 Execution

3.1 PREPARATION AND CONCRETE PLACEMENT

.1 Notify the Contract Administrator 24 hours prior to placing of concrete.

.2 Place concrete in accordance with CSA A23.1.

.3 Prior to placing of concrete submit a proposed method for protection of concrete during placing and curing in adverse weather to the Contract Administrator for approval.

.4 Use cold weather concrete, curing protection methods in accordance with CSA A23.1 when the ambient temperature falls below 5 degrees Celsius.

.5 When the ambient temperature rises above 25 degrees Celsius, use hot weather concrete, curing and protection methods.

.6 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.7 Clean previously placed concrete with steel brush and dampen prior to placing the next layer.

.8 Protect previous Work from staining.

.9 Pumping of concrete is permitted only after approval of equipment and mix.

.10 Ensure reinforcement and inserts are not disturbed during concrete placement.

.11 Place concrete in approximately horizontal layers such that each lift can be vibrated into the previous lift.

.12 Place concrete directly into its final position in forms. Do not spread concrete with vibrators.

.13 Maximum vertical free fall of concrete shall not exceed 1200 mm in unexposed Work or 800 mm in exposed Work. Confine concrete with a suitable vertical drop pipe to prevent segregation.

.14 Place concrete as a continuous operation, stopping only at construction joints indicated on the Drawings or approved proposed locations.

.1 At centre of span of structural suspended slab, beams, and joists.

.2 Immediately above or below floor construction joints in walls and columns.

.3 Maximum spacing of 12 m in walls and grade beams.

.4 Construction joints in walls must be watertight.

.15 Clean and remove stains prior to application for concrete finishes.

.16 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.17 Do not place load upon new concrete until authorized by the Contract Administrator.

.18 Honeycombing or embedded debris in concrete that exceed 150 mm in any direction are not acceptable. Notify the Contract Administrator upon discovery of such defects.

.19 Remove and replace defective concrete as directed by the Contract Administrator.

3.2 INSTALLATION/APPLICATION

.1 Perform cast-in-place concrete Work to CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Provide formed openings where required for pipes, conduits, sleeves and other embedded passing through concrete members.

.2 Sleeves and openings greater than 100 × 100 mm not indicated on Drawings must be reviewed by the Contract Administrator.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from the Contract Administrator before placing of concrete.

.4 Maximum size of electrical conduit in structural slab is 1/3 of slab thickness and the conduit shall be located within middle third of the thickness.

.5 Where there are more than two conduits adjacent to each other in structural slab, they shall be separated with at least 100 mm spacing.

.6 Confirm locations and sizes of sleeves and openings shown on Drawings.

.7 Do not use aluminum inserts or conduits.

.3 Anchor bolts:

.1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete. No wet set is allowed.

.2 Grout anchor bolts in preformed holes drilled after concrete has set only with written approval or specified in the Drawings.

.1 Formed holes: 100 mm minimum diameter.

.2 Drilled holes: to manufacturers' recommendations.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with epoxy grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Drainage holes and weep-holes:

.1 Form weep-holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.

.2 Install weep hole tubes and drains as indicated on the Drawings.

.5 Finishing and curing:

.1 Curing concrete to CSA A23.1.

.2 Basic curing: keep concrete surface continuously moist until concrete temperature due to hydration has peaked and dropped several degrees, or for three (3) days at a minimum temperature of 10 degrees Celsius.

.3 Additional curing: immediately following basic curing and before concrete has dried, cure for an additional four (4) days, maintaining the temperature of the air in contact with concrete above 10 degrees Celsius.

.4 Acceptable curing methods:

.1 Ponding or continuous sprinkling.

.2 Absorptive mat or fabric kept continuously wet.

.3 Damp sand, earth, or similar moist materials.

.4 Continuous steam vapour mist bath not exceeding 70 degrees Celsius.

.5 Curing compound.

.6 Waterproof paper or plastic film.

.7 Other moisture-retaining method approved by the Contract Administrator.

.5 Use procedures as noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.6 Finish concrete floor to CSA A23.1/A23.2.

.7 Concrete floor to have finish hardness equal to or greater than Mohs hardness to CSA A23.1/A23.2.

.8 Provide float finish unless otherwise indicated.

.9 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

.10 Protect freshly placed concrete against damage from adverse weather conditions.

.11 Exposed concrete walking surfaces not to receive an integral hardener: coat with curing compound of curing method that provides permanent seal.

.12 In areas with an exposed concrete floor surface, apply the hardener and dust-proofing agent strictly to the manufacturer’s instruction.

.13 Water for curing shall be clean and free from contamination or discoloring agent.

.14 If moist curing is not used, then sprayed curing compounds are to be used.

.15 Curing compounds.

.16 Do not use curing compound on concrete surfaces that are expected to receive topping or other type of bonded finish.

.17 Curing compounds to be of liquid membrane type and shall be applied in strict accordance with the manufacturer’s instructions.

.18 Curing compounds used for exposed concrete must not discolor the concrete.

.19 Apply sprayed curing compounds on horizontal surfaces immediately after the disappearance of surface moisture.

.6 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.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by the Contract Administrator.

.7 Joint fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by the Contract Administrator.

.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form isolation, construction, and expansion joints as indicated on the Drawings.

.8 Grouting:

.1 Grout beneath steel base and bearing plates after the steel has been erected. This grout is to be expanding type and be mixed and placed as per the manufacturer’s instruction.

3.3 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1 Straightedge Method FF = 25: FL = 20.

.2 Variation of linear building lines from established position in plan: 6 mm.

.3 Variation in cross-sectional dimensions: ±6 mm.

.4 Variation from the level or from grades indicated for surfaces of slab shall not exceed 3 mm in a 3 m straight edge immediately after trowelling.

.5 Remove and replace concrete that does not meet the requirement at no additional cost to the City.

3.4 PROTECTION

.1 Protection for concrete to CSA A23.1.

.2 Protect fresh concrete from adverse weather conditions. All forms and reinforcing in contact with fresh concrete must have surface temperature of greater than 5 degrees Celsius.

.3 Do not place concrete on frozen ground.

.4 Do not place concrete on soil that is subjected to change in moisture. Soil must be either all dried or wetted so that its moisture content is normal and equal to that of the surrounding soil.

.5 Provide and use tarpaulins or other protection material when necessary to completely cover or enclose all freshly placed concrete.

3.5 FIELD QUALITY CONTROL

.1 The Contract Administrator will periodically visit the site.

.2 Field inspection by the Contract Administrator does not in any way relieve the Contractor of his contractual responsibility.

3.6 HOT WEATHER CONCRETE

.1 When the ambient temperature is at or above 25 degrees Celsius or when there is a probability that the ambient temperature rising to or above 25 degrees Celsius during concrete placement, the temperature of concrete when deposited is not to be more than 25 degrees Celsius. To accomplish this, the mixing water, if necessary the aggregate, is be cooled.

.2 When pour are massive or where surfaces are to be trowel finished, or wood floated, use a retarder that will slow the initial set of the concrete.

.3 When the ambient temperature is at or above 25 degrees Celsius, exposed surface of the concrete are to be shaded from direct sun ray and sheltered from direct wind.

.4 Moist cure concrete instead of using curing compounds.

3.7 COLD WEATHER CONCRETE

.1 When the ambient temperature is at or below 5 degrees Celsius or when there is a probability that the ambient temperature dropping to or below 5 degrees Celsius during concrete placement, the temperature of concrete during placing shall be between 15 degrees Celsius and 25 degrees Celsius.

.2 Placed concrete shall be protected and maintained at a temperature of at least 10degrees Celsius for not less than three (3) days or not less than 20 degrees Celsius for two (2) days and all concrete to be maintained above freezing for a minimum of seven (7) days.

.3 Concrete shall be protected from alternate freezing and thawing for a minimum of fourteen (14) days.

.4 Protected and heated concrete to be brought gradually to ambient air temperature at a drop of not more than 15 degrees Celsius per twenty-four (24) hour period.

.5 Heating enclosure shall be clear of concrete and forming surfaces for air circulation.

.6 Frozen concrete will be rejected.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 General Conditions and Division 1 General Requirements govern work of this Section.

.2 All drawings, all specification sections apply to, and form an integral part of this Section.

1.2 REQUIREMENTS INCLUDED

.1 Provide all labour, materials, methods, equipment and accessories to complete waterproofing work, including, but not necessarily limited to following:

.1 Membrane waterproofing.

.2 Surface conditioner.

.3 Reinforcing membranes, sealants.

.4 Protection board, film.

.5 Damp proofing.

.6 Connect to, co-operate with Other Contractors waterproofing systems installation, materials.

.7 Sheet membrane waterproofing to temporary construction, similar.

1.3 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

.1 Section 03 30 00: Cast in place concrete, concrete topping, paving, patching cracks, holes, removing fins, projections on concrete, etc.

1.4 SAMPLES

.1 Submit samples if any, all materials requested, prepaid to Contract Administrator office.

1.5 MATERIAL DELIVERY, STORAGE, HANDLING

.1 Deliver waterproofing materials in manufacturer original, unopened packaging, seals intact.

.2 Protect materials; keep under cover in transit, at job site. Handle to prevent damage. Remove from delivery vehicles, place in stacking areas. Ensure materials are not dropped or thrown.

.3 Stack materials minimum 300 mm off ground on supports, away from deleterious moisture, weather conditions. Protect with waterproof covers, allow free ventilation.

.4 Assume responsibility for damage to waterproofing materials, caused by adverse conditions. Discard, replace damaged materials.

.5 Remove only quantities required for same day use.

1.6 PROTECTION

.1 Provide covering to adjacent walls, surfaces not receiving waterproofing where materials hoisted, used. Protect buildings from smoke, fumes.

.2 Provide warning signs, barriers. Maintain in good order until completion.

.3 Clean off drips, smears waterproofing material.

.4 Prevent traffic over completed areas except required by work.

.5 Comply with precautions deemed necessary by Contract Administrator. Repair damage caused by non-compliance.

.6 Protect completed work, materials out of storage, at end of each day's work, when stoppage occurs due to inclement weather.

1.7 ENVIRONMENT

.1 Exercise caution for proper adhesion, curing when ambient temperatures below 4 degrees Celsius.

.2 Do not proceed when temperature consistently below 18 degrees Celsius, when wind chill effect would set bitumen before proper adhesion.

.3 Apply damp proofing at minimum ambient temperature 4 degrees Celsius, rising.

.4 Use only dry materials, apply only during weather that will not introduce moisture into waterproofing system.

.5 Protect work, materials from snow, rain.

.6 Undertake only work to be completed same day, prior to precipitation.

.7 Continue work in adverse weather with suitably heated enclosures, when approved by Contract Administrator.

.8 Provide forced air circulation during curing periods for enclosed applications.

Part 2 Products

2.1 MATERIALS

.1 Membrane Waterproofing: to CGSB 37-GP50M.

.1 Surface conditioner: cutback asphalt to CGSB 37-GP-9M.

.2 Hot applied modified rubberized asphalt membrane: Hydrotech Membrane Corp., manufacture, membrane 6125.

.3 Reinforcing fabric: polyester fabric, Reemay Style 2016.

.4 Standard elastomeric reinforcing membrane: to manufacturer standard, width 900 mm elastosheet 6147.

.5 Heavy duty elastomeric reinforcing membrane: to manufacturer standard, width 900 mm elastosheet 6146.

.6 Cement: to CSA A5.

.7 Separation sheet: to CGSB 70-GP-1, polyethylene film, 4 mm thick.

.8 Protection board: 6 mm thick, water resistant board W.R. Meadow manufacture, “Vibraflex”, to protect membrane from site damage.

.2 Damp proofing: to CBSB 37-GP-2M, waterproof emulsion, asphalt dispersed in mineral colloid emulsifier, brush consistency, permeability 0.14 perms, “Bakelite 700-01”, Bakelite Thermosets Ltd. Manufacture.

.3 Sheet membrane: sheet EPDM, minimum 45 mil thick, complete with manufacturer standard adhesive, full sizes required, Marathon Equipment.

Part 3 Execution

3.1 INSPECTION

.1 Inspect surfaces, areas to receive waterproofing, damp proofing. Report defects, unsuitable conditions.

.2 Ensure surfaces firm, straight, smooth, dry, free of snow, ice, frost, concrete fins, projections, large holes. Sweep clean of dust, debris.

.3 Ensure all protrusions, drains, connected mechanical, electrical piping, conduit, equipment installed.

.4 Ensure cement parge coating on masonry surfaces to be waterproofed is dry, cured.

.5 Inspect surfaces, intersections of material with work of Other Contractors. Report defects, unsuitable conditions.

.6 Proceed when defects, unsatisfactory conditions corrected, other Sections, Other Contractors work complete.

3.2 PREPARATION

.1 Obtain, make ready, prepare all materials. Cause no delays to scheduling.

.2 Prepare all surfaces to receive waterproofing, dampproofing.

.3 Ensure independent specialist has examined surfaces to be covered, prior to commencing waterproofing, dampproofing.

3.3 PREPARING CONCRETE SURFACES FOR MEMBRANE WATERPROOFING

.1 Ensure concrete surfaces properly cured.

.2 Remove curing agents, oils, form break materials, other deleterious mater.

.3 Fill holes, rough surfaces over 12 mm deep, openings around stacks, drains, etc., with portland cement concrete, leveled smooth.

.4 Fill holes, rough surfaces, small depressions not over 12mm deep with cement, sand-asphalt mix, leveled smooth, to following proportions by volume:

.1 1 part portland cement

.2 4 part clean sand

.3 1-1/8 part asphalt emulsion to 37-GP-28M

.4 1/8 part clean, cool water

3.4 APPLYING MEMBRANE WATERPROOFING

.1 Ensure surfaces clean and dry.

.2 Do not apply in temperatures below 4.4 degrees Celsius.

.3 Ensure concrete surfaces wood float finished or better. Ensure surfaces free of loose concrete, films of oil, grease, debris, curing compounds, dust, frost, dampness.

.4 Apply membrane waterproofing systems where indicated, required, to concrete roof surfaces, wall surfaces, other surfaces to be waterproofed, returned down wall, up wall adjacent surfaces, other surfaces indicated, required, above, below grade, etc.

.5 Apply conditioner to entire concrete surface areas to be membrane waterproofed, evenly to all surfaces, maximum rate 3.8 L per 18 sq m, minimum rate 3.8 L per 27 sq m. depending on concrete surface. Allow to dry.

.6 Provide waterproof membrane in 22kg cakes, meeting manufacturer specifications.

.7 Melt membrane cakes in approved, double shell melter, under continuous agitation until material free flowing, lump free from kettle at temperatures no greater than 218.3 degrees Celsius.

.8 Do not melt cakes in direct heat type kettles.

.9 Do no use, allow open flame to aid material application by remelting.

.10 Apply membrane evenly in two (2) coats, at rate 3.40 kg per sq m per coat. Apply first coat in one direction, second coat at right angles while first coat still hot to provide continuous coating, not less than 4.8 mm, averaging 6.35 mm thick.

.11 Embed strips reinforcing fabric in waterproofing membrane over construction joints, all joints occurring along lengths precast concrete roof slabs, other locations, cracks up to 1 mm wide; strips standard elastomeric reinforcing membrane over non-moving construction joints, cracks over 1 mm, less than 6.35 mm wide, at junction horizontal, vertical surfaces, changes in plane, where indicated, required.

.12 Place strips reinforcing fabric, elastomeric membrane reinforcing along joint, crack extending minimum 150 mm either side, roll down into rubberized asphalt membrane while still warm.

.13 Apply strip heavy duty elastomeric reinforcing membrane at all expansion joints up to 12 mm wide, with designed, total movement less than fifty (50) percent, at all cracks exceeding 6 mm in width.

.14 Loop elastomeric reinforcing membranes minimum 150 mm each side of joint, fill expansion joint loop to finished level with waterproofing membrane.

.15 Extend elastomeric reinforcing membranes minimum 150 mm each side of joint, fill expansion joint loop to finished level with waterproofing membrane.

.16 Apply two (2) layers elastomeric reinforcing membrane with alternate coatings waterproofing membrane trowelled in where reinforcing membrane may be subject to unusual strain.

.17 Carry waterproofing membrane to minimum limits shown, required, advise Contract Administrator in writing if other special measures required for proper installation.

.18 Carry waterproofing membrane up over concrete curbs, etc., turn up, down at vertical angles on walls, other surfaces indicated, required.

.19 Embed minimum 460 mm sq drain flanges between two (2) layers membrane, secured by clamping rings, centered over drains. Seal around vents, pipes, conduit, rebar penetrating membrane plane.

.20 Apply polyethylene separation sheet with lapped joints before insulation is placed, when waterproofing membrane cooled, still tacky, before becoming dusty.

.21 Install protection board under all poured concrete slabs, curbs, etc. secured directly on top of membrane.

3.5 APPLYING DAMP PROOFING

.1 Apply damp proofing prior to application of waterproofing, insulation systems.

.2 Apply one (1) brush primer coat dampproofing to exterior concrete wall surfaces above grade, down below grade, adjoining membrane waterproofing systems, behind insulation, where indicated, required, reduced twenty (20) percent with water, at rate 3.78 L per 10 sq m.

.3 Apply two (2) full brush coats dampproofing to primed areas, to manufacturer directions, at rate approximately 11.34 L per 10 sq m.

.4 Allow to dry thoroughly between coats.

.5 Cover entire surfaces, no spots uncoated, no pin holes, open areas, make proper connection to/for other waterproofing materials.

.6 Protect damp proofing against freezing during storage, application, from damage after application until covered with insulation, backfill placed.

3.6 PROTECT OF FLEXIBLE MEMBRANE WATERPROOFING

.1 Avoid damage to waterproofing after applications.

.2 Membrane shall be covered with insulation within thirty (30) days of application.

.3 Provide necessary temporary protection, covering to prevent damage by mechanical gouging, scraping, squeezing, oil or solvent spillage and excessive heat until insulation is applied.

.4 Protect membrane on vertical surfaces to be backfilled with protection board placed against waterproofing membrane as backfill placed.

.5 Protect membrane with 6 mm hick asphalt impregnated protection board with 300 mm wide paper joint covers, after membrane cooled, dusted with cement powder, free from lumps, at rate one (1) bag per 100 sq m.

3.7 APPLYING SHEET MEMBRANE

.1 Apply sheet membrane in full width, length in strict accordance with manufacturer instructions.

.2 Ensure concrete, other surfaces prepared to receive membrane without damage.

.3 Apply membrane starting at lowest point, where indicated, required, lapping joints minimum 50 mm, set in full coat adhesive for complete bond. Seal joints at completion, prior to application metal flashings over.

3.8 EXAMINATION/TESTING

.1 Independent specialist, examining and testing company as appointed by Contractor, approved by Contract Administrator shall review all aspects of waterproofing, damp proofing work.

.2 Specialist examiner has authority to initiate minor ‘no cost’ changes to details, to suit job site conditions.

.3 Waterproofing, damp proofing examination shall be in accordance with inspection procedures outlined by Contract Administrator to ensure waterproofing, damp proofing adequate, watertight, including:

.1 Preliminary examination to ensure surfaces in proper condition to receiving waterproofing, dampproofing, notification to Contractor of deleterious conditions not corrected.

.2 Study of waterproofing specification, notification to Section 07 10 00 of any variances, discrepancies between good waterproofing practices, that specified.

.3 Examination of waterproofing, damp proofing materials on site, notification to Contract Administrator of variances from specified materials.

.4 Examination of workmanship, installation of waterproofing, damp proofing materials, minimum one trip per day during any waterproofing, damp proofing operation, made early each working day.

.4 Specialist examining and testing company shall submit written reports. Submit duplicate typewritten report, within one week final examination of any completed

area, based on examination trips, results of examinations, in accordance with outlined procedures for examinations.

.5 Specialist examining and Test Company shall take photographs of work in process, condition of surfaces, submit with written reports. Photographs shall state vantage point, date taken, any peculiarities or comments.

3.9 CLEAN UP

.1 Clean up rubbish, debris, packaging resulting from work promptly as work proceeds, at completion, at other times directed by Contractor. Remove from job site. Remove bitumen from metal flashings, surrounding surfaces.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Provide all labour, materials, methods, equipment and accessories to complete all modified bitumen sheet roofing, sheet metal work.

- .1 Gypsum board roof sheathing.
- .2 Roofing vapour retarder and primer.
- .3 Roof insulation, tapered insulation fill.
- .4 Modified bitumen sheet roofing.
- .5 Membrane flashings in roofing.
- .6 Caulking, sealing roofing, flashings.

.2 Install prefinished flat stock sheet metal, formed prefinished cap, and flashings.

1.2 RELATED SECTIONS

.1 Section 07 62 00: Sheet metal flashings, roof scuppers, etc.

1.3 SHOP DRAWINGS/ MAINTENANCE

.1 Submit full size details, largest scale possible of sheet metal work, pitch pockets, parapet drains, scuppers, expansion joints, control joints, equipment opening curbs, miscellaneous details, etc.

.2 At completion provide roof maintenance manual.

1.4 REGULATORY REQUIREMENTS

.1 Perform roofing work to procedures, methods established by Canadian Roofing Contractor's Association (CRCA) except as specified otherwise.

.2 Comply with applicable requirements of ULC, local authority having jurisdiction.

1.5 ENVIRONMENT

.1 Comply with manufacturer directions, restrictions when temperature falls below 0 degrees Celsius follow cold weather procedures, ensure full proper bond using additional asphalt glaze coating 9 kg square to base membrane with torch welding methods as directed by manufacturer.

.2 Protect work, materials from snow, rain.

.3 precipitation.

.4 Remove, replace vapour retarder damaged by weather.

1.6 WARRANTY

.1 Extend warranty required by General Condition GC 12.3, Standard Construction Document CCDC2 1994, to period two (2) years from date of Substantial Performance of the Work.

.2 Provide material manufacturer/supplier material warranty for leak proof warranty limited to cost of repairs including material replacement, labour costs necessary to maintain roof areas in watertight condition for period five (5) years from date of Substantial Performance, with inspection at end of two (2) years and any deficiencies made good by Roofing Contractor as approved applicator.

Part 2 Products

2.1 MATERIALS

.1 Gypsum board sheathing: to CSA A82.27, Type X, 12mm hick, Canadian Gypsum, Domtar manufacture.

.2 Vapour retarder sheet: to CGSB-37.56-M, 9th draft Elastophene SP 2.2, Soprema Inc. manufacture.

.3 Roof insulation.

.1 Poly-isocyanurate: to CAN/CGSB-51.26-M86, FM Class 1, R7 per1" thickness, 50mm or 25mm layers as noted, board size 1200mm x 2400mm, square edged, Celotex Corporation manufacture, "Thermax Hy-Therm AP".

.2 Tapered insulation: to CGSB 51-GP-20M, type 2, moulded expanded polystyrene, square edges, R4 per inch thickness, tapered as required to produce roof system slope approximately 9 mm per meter of slope in roof areas as indicated on the Drawings, required, minimum thickness 1 mm, sizes required.

.3 Fireguard tape, self-adhesive fire stop membrane, Soprema Inc. manufacture.

.4 Membrane base sheet, base sheet flashing Colvent -810, Soprema Inc. manufacture.

.5 Membrane cap sheet, cap sheet flashing Sopraply Traffic Cap -560, soprema Inc. manufacture.

.6 Primer: Concrete, gypsum board primer: Soprema manufacture "Elastocol 500".

.4 Accessories:

.1 Roofing nails: to CSA B111-1974, Table 12, large head galvanized steel nails, length to penetrate wood minimum 1 12 mm, plywood minimum 19mm.

.2 Gypsum board fasteners: #10 flat counter-sunk head, self-tapping, cadmium plated, 19 mm long.

.3 Insulation fasteners: Power driven screw type, self-drilling, recessed hexagon plate washer, screw length to penetrate insulation, steel deck minimum 25 mm, Anchor Construction Products distributor “Dekfast” system.

.4 Insulation fasteners to concrete: pre-drilled screw type, corrosion resistant finish, recessed hexagon plate washer, screw length to penetrate insulation, concrete deck minimum 25 mm Anchor Construction Products “Confas” system.

.5 Sheet metal: galvanized sheet metal to ASTM A526-80, commercial quality, minimum 24 ga. nominal core thickness, type, gauge thickness. Form as required by new roofing system.

Part 3 Execution

3.1 GYPSUM BOARD SHEATHING ON STEEL DECK

.1 Mechanically fasten gypsum board with screw fasteners, washers maximum 30 mm o.c. around board perimeter, 600 m o.c. down centre 1200 mm wide board.

3.2 VAPOUR BARRIER ON CONCRETE, GYPSUM BOARD STEEL DECKS

.1 Apply coating of primer cold to concrete, gypsum board deck areas to receive membrane vapour retarder. As per manufacturers recommendations.

.2 Install membrane vapour retarder in accordance with manufacturer instructions.

.3 Apply membrane with minimum side and end laps of 75 mm fused together. Provide surface free of air pockets, wrinkles, fishmouths, etc.

.4 Return membrane vapour retarder up parapet walls to connect with wall construction vapour barrier, fully seal.

3.3 APPLYING ROOF INSULATION

.1 Place tapered insulation to provide roof area back sloping, crickets, etc. as indicated on the Drawings, required for proper drainage. Do all cutting to fit insulation into place. Stagger, offset joints.

.2 Place layers of poly-isocyanurate insulation to, sloped insulation surfaces.

.3 Mechanically fasten poly-isocyanurate insulation to concrete deck, steel deck through vapour retarder, gypsum board sheathing with minimum five fasteners each 1200mm x 1200mm insulation board, and ten fasteners for each 1200 mm x 2400 mm insulated board, positioned to penetrate steel deck top flutes, in accordance with manufacturer directions.

.4 Co-operate with installation required blocking, etc. at roof edges, around roof mounted apparatus, at junction roof deck, vertical surfaces, curbs, other locations required.

3.4 MODIFIED BITUMEN ROOFING MEMBRANE APPLICATION

.1 Unroll base sheet dry over insulation for alignment, staring from low point. Each strip shall have 75 mm side laps, 25 mm end laps. Remove release paper and allow the sheet to adhere.

.2 Seal side and end joints and install mechanical fasteners as per manufactures specifications.

.3 After base flashing membranes are installed, apply cap membrane sheet granular side up. Fully heat-welded to base sheet.

.4 Lap sides 75 mm, ends 150 mm, minimum 300 mm offset from underlying laps of base sheet. Seal laps watertight by torching.

.5 Apply only membrane that can be completed same day. Replace damaged membranes.

3.5 MEMBRANE FLASHING

.1 Apply base, cap sheet membrane as flashings in conjunction with metal flashings, etc. in strict accordance with manufacturer directions using torched on adhesion welding method for cap sheet flashing membranes as required.

3.6 INSTALLING FLASHINGS

.1 Complete roofing membrane system, membranes flashings, metal flashings, scuppers etc. as required and detailed all to meet manufactures recommendations.

.2 Install roof jacks, metal caulking retainers, vent stack flashings, expansion joint flashings, other items, etc.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Provide all labour, materials, methods, equipment, accessories to complete sheet metal flashings, metal covers and water drainage, trim work etc.

.1 Fabrication.

.2 Galvanized and prefinished metal block flashing, other flashings indicated on the Drawings.

.3 Galvanized and prefinished metal wall cladding flashing.

.4 Galvanized and prefinished covers, eave and rake drip edges, fascia trim, etc.

.5 Prefinished metal rain water scuppers, downspouts, accessories, c/w elbows, drops, end caps, etc.

.6 Prefinished metal window, door opening flashings, etc.

.7 Other galvanized or prefinished sheet metal work indicated, required.

.8 Required accessories, installation clips, angles, bolts, fasteners.

.9 Caulking, backup material, sealing, bedding.

1.2 SHOP DRAWINGS

.1 Submit shop drawings.

.2 Indicate materials, profiles in large scale, construction of various parts, methods of joining, thickness, types of materials, finishes, anchorage details, joints, fastenings, sealants, adjacent materials, etc.

Part 2 Products

2.1 MATERIALS

.1 Galvanized sheet metal: to ASTM A526-80, commercial quality, minimum 26 gauge nominal core thickness, thickness indicated, required, Z275 zinc coating to ASTM A525-M.

.2 Prefinished galvanized sheet metal: baked enamel, Stelcolour 5000 series, minimum 1 mil thick including primer, colour selected by Consultant.

2.2 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint to CGSB 1-GP-108, Type 2.

.2 Plastic cement: to CGSB 37-GP-5Ma, plastic cut-back asphalt, Domtar manufacture “Fibregum”.

.3 Sealing compound: to CGSB 37-GP29M, rubber asphalt type.

.4 Cleats: same material, temper, thickness as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

.5 Fasteners: of same material as sheet metal, to CSA B111, ring thread, flat head roofing nails, length and thickness suitable for metal flashing application.

.6 Fasteners: purpose-made standard screw type approved by Consultant, oval head, sealing washers where indicated, required, sized to meet application requirements, exposed heads colour matched to attached materials.

.7 Caulking: manufacturer's standard, colour matched to adjacent materials. Provide approved rain water gutter interior sealing compound.

2.3 FABRICATION

.1 Comply with dimensions, profile limitations, gauges, fabrication details shown, detailed on shop, erection drawings.

.2 Fabricate components at factory, ready for field assembly in maximum lengths.

.3 Form metal flashings, cap, roof flashings, window sill, concrete block wall base flashings, over lintels, miscellaneous flashings, etc. to profiles indicated, required from minimum 26 gauge galvanized sheet steel, prefinished, required, to Contract Administrator approval.

.4 Form pieces in maximum 1800mm lengths. Make allowance for expansion at joints.

.5 Hem exposed edges on underside 12mm where abutting other surfaces, supporting soffit panels as indicated on the Drawings, required. Mitre, seal corners with sealant.

.6 Form wall scuppers, downspout sections, etc. from minimum 22 gauge thick prefinished sheet steel to profiles, sizes indicated, required.

.7 Form eave gutters to widths indicated, required with insert drop connectors to 150mm x 150mm square closed and open downspouts as indicated on the Drawings, c/w corners, elbows, end deflectors, brackets, etc. required.

.8 Allow for expansion, contraction, seal joints, connection watertight.

Part 3 Execution

3.1 INSTALLATION

.1 Install sheet metal work in accordance with CRCA specifications, manufacturer instructions, in conjunction with other Sections.

.2 Use concealed fastenings except where approved before installation.

.3 Counterflash bituminous flashings at intersection of flat roof areas with vertical wall surfaces, curbs, etc. Form joints using S-lock, tight fit over hook strips, as indicated on the Drawings.

.4 Form metal counter flashing with hemmed edges, locked joints. Extend to bottom of cant, in moderate contact with roof surface.

.5 Secure by concealed nailing at lock joints along top edge of blocking, adjoining surfaces.

.6 Do not fasten through roof membrane.

.7 Secure flashings to wood backing, other surfaces with galvanized nails, neoprene washers prior to finish material application, co-operate with other Sections.

.8 Secure fascia covers with purpose made fasteners maximum 400mm o.c.

.9 Lock end joints, caulk with sealant.

.10 Secure metal flashing to other materials, form weathertight junction.

.11 Caulk cap, other flashings to other materials, surfaces with sealant.

END OF SECTION

Part 1 General

1.1 Qualifications

.1 Only competent and qualified tradesmen shall execute the work of this section, using adequate plant facilities and equipment.

1.2 Protection

.1 Exercise care when working on or about roof surface to avoid damaging or puncturing membrane or membrane flashings.

.2 Place plywood panels on roof surfaces adjacent to work of this section. Keep in place until completion of the work.

Part 2 Products

2.1 Materials/Compounds

.1 Gutters and Downspouts: minimum 0.61 mm (24 ga.) Galvalume sheet steel coating conforming to CSA S136-94, Grade 230, coating designation AZ150 with Barrier Series factory applied enamel finish. Colour to match fascias.

.2 Bituminous Paint: Acid and alkali resistant type; black colour; conforming to requirements of CGSB 1-FP-108c.

.3 Anchorage Devices: Type recommended by manufacturer and acceptable to the Contract Administrator.

.4 Splash Pads: Precast concrete, 280 mm x 760 mm.

Part 3 PART 3 - Execution

3.1 Installation

.1 Fabricate gutters on site in continuous lengths, minimum 125 mm width.

.2 Install gutters and downspouts where indicated on drawings. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

.3 Apply bituminous paint on all surfaces to be in contact with dissimilar materials.

.4 Slope gutters minimum 6 mm per 1220 mm.

.5 Set splash pads under downspouts where and as indicated on the Drawings.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 30M-95, Standard for Steel Building Systems.

.2 Manitoba Building Code (MBC)

.3 National Building Code of Canada (NBC)

.4 Electrical devices to be ULC approved and installed in accordance with Canadian Electrical Code and codes of authorities having local jurisdiction.

.5 National Fire Code of Canada (NFC) and codes of authorities having local jurisdiction.

.6 National Energy Code for Building (NECB)

.7 CSA B64, Selection and Installation of Backflow Preventers / Maintenance and Field Testing of Backflow Preventers

.8 CSA C22.1, Canadian Electrical Code, Part 1

1.2 SYSTEM DESCRIPTION

.1 Pre-fabricated public water service outlet for single load-out 75 mm service. Package to include complete systems consisting of piping, control valves, bulk fill operator station, lighting, electrical panel, heating, and ventilation, etc.

.2 Magnetic flow meter will be provided by the City and installed by the Contractor

.3 Provide building structures and enclosures,4000 mm by 1625 mm, completely pre-fabricated and assembled for installation on a concrete base.

1.3 DESIGN REQUIREMENTS

.1 Provide insulated assemblies with minimum R values in accordance with the NECB 2011 for the environmental conditions of the site being Winnipeg, Manitoba.

.2 Design building to allow for thermal movement of component materials caused by ambient temperature fluctuations without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

.3 Building shall be watertight.

.4 Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with National Research Council Canada (NRC) "Rain Screen Principles".

.5 Provide continuous interior vapour barrier.

.6 Design members to withstand, within acceptable deflection limitations:

.1 Snow load of Ss = 0.7kPa Sr=0.4kPa, 1.0 kPa (minimum) plus loads for drifting.

.2 Lateral load of q30 = 0.43 kPa, q10 = 0.36 kPa.

.7 Design building enclosure elements to accommodate, by expansion joints, movement in wall and structural movements without permanent distortion, damage to in fills, racking of joints, breakage of seals, water penetration or glass breakage.

.8 Building will be supported on concrete slab on grade. Provide corrosion resistant anchor bolts and layout for incorporation in concrete work.

.9 All fasteners to be concealed or vandal proof.

.10 Exposed fasteners to be corrosion resistant, galvanized or stainless steel.

.11 Allow for ceiling, piping, conduit and other interior dead loads imposed on this structure.

.12 Provide swing door assemblies complete with vandal proof ball bearing stainless steel hinges, lever handle in brushed chrome finish, with keyed lock, fully weatherstripped with flexible, replaceable seals. Lock shall be Medco.

.13 Interior and exterior wall panels to be galvanized and pre-finished 16 gauge steel, with white gloss finish.

.14 Provide metal roof sloped to scupper drain with perimeter fascia panels in contrasting pre-finished metal, grey colour.

.15 Integrate square, 16 ga. rain water leader from roof scupper to splash pad at grade.

.16 Floor structure to be insulated and finished with steel plate.

.17 Provide electric heaters with remote thermostat to maintain temperature.

.18 Provide and coordinate exact location and rough-in requirements for electrical power.

.19 Provide interior wall space for on-site installation of SCADA RTU and communications systems.

.20 Provide 75 mm camlock fitting for dispensing water.

.21 Provide redundancy backflow preventer compliant with CSA B64.

.22 Provide ability to be connected to 100 mm water main.

.23 Provide ability to be connected to 600 mm sanitary line.

.24 Provide ability to be relocated.

.25 Drawings to be sealed by an engineer licensed in the Province of Manitoba.

1.4 PERFORMANCE REQUIREMENTS

.1 Maximum deflection for roof under full specified live load: 1/360 of clear span.

.2 Maximum deflection for exterior cladding under full specified exterior wind induced loads: 1/180 of clear span.

.3 Maintain following tolerances for building structure and enclosure elements.

.1 Maximum variation from plane or location shown on shop drawings: 1 mm/1 m of length and up to 1 mm/5 m maximum.

.2 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.

1.5 SHOP DRAWINGS AND SAMPLES

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

.2 Indicate plans and grid lines, structural members and connection details, bearing and anchorage details roof cladding, wall cladding, framed openings, accessories, schedule of materials and finishes, camber and loadings, fasteners and welds.

.3 Indicate detailed description of process, mechanical, electrical and other systems in work.

.4 Describe requirements of other systems of components related to this work but provided by others. Obtain necessary information required to detail this work including methods of integration and securing.

.5 Submit erection drawings for approval, before construction.

.6 Indicate erection dimensions and methods.

Part 2 Products

2.1 MATERIALS

.1 Building materials: non-combustible construction.

.2 Fire resistive building elements: in accordance with the NBC for intended use and occupancy.

2.2 FABRICATION

.1 Maintain air and vapour and thermal barrier throughout building enclosure elements.

.2 Locate vapour barrier on warm side of thermal insulation.

.3 Enclosure assembly shall be complete including exterior skin, access units doors, etc., inner air/vapour seal membrane, thermal insulation; interior finishes.

.4 Accurately fit and rigidly frame together joints, corners and mitres. Match components carefully to produce continuity of line and design. Make joints and

connections toward exterior weathertight. Materials in contact shall have hairline joints. Coordinate location of visible joints.

.5 Lifting hooks and other means of shipping are to be removed from installed product.

2.3 HAULER ACCESS TERMINAL INTERFACE

.1 Provide hauler access terminal as specified in Section 25 50 01 Public Water Service Outlets Billing System.

2.4 CONTROL VALVE

.1 One 75mm 24VDC Singer Model 106-SC flow control valve

.2 Opening and Closing speed controls to prevent water hammer

.3 Body and Cover meeting NSF61 requirements

2.5 FLOWMETER

.1 One 75mm magnetic flow meter supplied by the City and installed by the Contractor

2.6 BACKFLOW PREVENTER

.1 Provide an approved back flow device to prevent the contamination of the potable water system from backpressure or back siphon.

.2 The device shall be a 75mm Wilkins Series 375 reduced pressure zone assembly with air gap.

.3 The device shall be constructed with no-lead components.

.4 The assembly shall include an easily maintained strainer and shutoff valves for testing.

2.7 ISOLATION VALVE

.1 The valve shall be a full bore ball valve

2.8 PIPING

.1 All piping shall be 75mm Stainless Steel (304) piping.

.2 All piping connections shall be Victaulic Rigid Couplings (Style 107) and Victaulic VIC-Flange Adaptors (Style 741).

.3 Piping shall be secured with adequate supports for the operation of the station. Pipe hangers are not acceptable.

2.9 ELECTRICAL

.1 The building shall have a preinstalled power mast and meter base on the exterior of the building, securely mounted.

.2 Provide a 100 amp, 120/240 VAC electrical overhead service. Provide a twelve (12) circuit panel board complete with all breakers required plus six (6) spare 15 amp, 1 pole. Provide weather head and mast for field installation.

.3 Exterior lighting to be provided by LED fixtures sufficient to provide illumination to the work area.

.4 Using surface mounted LED strip fixtures the building lighting shall maintain measured lighting level of 500 lx at 1500 mm above finished floor, after building finishes and painting complete.

.5 A convenience GFI receptacle on the inside of the building shall be provided.

.6 Spare breakers shall be used for:

.1 Exterior yard Lighting (1 circuit);

.2 SCADA equipment (1 circuit); and,

.3 Intrusion Alarm Equipment (1 circuit).

2.10 HVAC

.1 Building interior environment shall be heated and cooled to maintain interior temperature of 10 degrees Celsius minimum to 35 degrees Celsius maximum. Ambient design conditions to comply with NBC of Canada for Winnipeg, Manitoba winter dry bulb and summer wet bulb temperatures.

.2 Approved Manufacturer: Flowpoint Environmental Systems LP.

Part 3 Execution

3.1 ERECTION

.1 Erect building structure and enclosure elements.

.2 Seal base at perimeter of building for weatherproof enclosure.

3.2 CLEANING

.1 Remove excess sealant by moderate use of mineral spirits or other solvent acceptable by sealant manufacturer.

.2 Clean surfaces.

3.3 PROTECTION

.1 Provide protection to finished surfaces with stripable coatings, stripable wrappers, plywood or sheet materials as required before acceptance of work.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Heat tracing cables and related equipment for snow and ice melt system.

1.2 REFERENCES

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

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 SNOW AND ICE MELT HEAT TRACE SYSTEM

.1 Design and supply a complete snow and ice melt system for a concrete pad as indicated drawing D-14911.

.2 System shall be designed to operate in Winnipeg, Manitoba.

.3 Ambient temperature of -30 degrees Celsius.

.4 Design to include selection of heating cable, installation details for spacing and layout, controls, and physical protection.

.5 System designed to operate at 347/600 VAC.

2.2 HEAT TRACE CABLES

.1 Cables to be mineral insulated, copper conductors, compacted magnesium oxide insulation, and seamless alloy 825 sheath.

.2 Voltage: 347/600 VAC

.3 Complete with cold lead of sufficient length for termination on building interior

2.3 CONTROL ENCLOSURE

.1 NEMA 12 enclosure

□

.2 Enclosure to house contactors, ground fault monitoring relays, hand-off-auto switch, and indicating lights

2.4 TEMPERATURE CONTROLS

.1 Adjustable remote bulb type control thermostat, -4 degrees Celsius to 163 degrees Ceelsius.

.2 Rating 120 VAC, 22 amps.

.3 NEMA 4 housing.

.4 Capillary length: 3000 mm.

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 heating cables in accordance with manufacturer's instructions. Co-ordinate installation with reinforcing steel and concrete works.

.2 Fasten cables to reinforcing steel at intervals required by manufacturer.

.3 Heating cables shall not cross.

.4 Install rigid galvanized steel conduit sleeves through foundation walls for heating cables and temperature thermostat.

.5 Install rigid galvanized steel conduits across control joints

.6 Mount power feed junction boxes in basement.

.7 Test heating cables prior to concrete pour.

.8 Make power and control connections.

3.3 FIELD QUALITY CONTROL

.1 Use Megger to test cables for continuity and insulation value and record readings before, during and after installation.

.2 Provide test results to Contract Administrator prior to concrete pour.

END OF SECTION

□

Part 1 General

1.1 SYSTEM DESCRIPTION

.1 Automated public water service outlet with integrated billing system utilizing a cloud based software system.

1.2 SUBMITTALS

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

.2 Include the following.

.1 Control panel layout and schematics.
.2 Installation details.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for public water service outlet billing system incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Provide following in English for incorporation into instruction manuals:

.1 Complete set of reviewed shop drawings.
.2 System description.
.3 Operations manual for using billing software.
.4 Trouble shooting guide for access terminals.

1.4 QUALITY ASSURANCE

.1 The equipment, control system and software furnished under this section shall be provided by a manufacturer who has been regularly engaged in the design and manufacture of systems for at least five (5) years.

.2 The approved manufacturer of this system shall be required to demonstrate a fully functional system that complies with this specification. An online presentation shall be provided with references and contact information for five (5) installations.

.3 The control systems shall be manufactured in accordance with all local and applicable standards and shall be inspected as an “Industrial Control Assembly” with either UL or CSA label identification.

.4 The manufacturer shall provide documentation necessary for the installation and operation of all associated components of the system.

1.5 TRAINING AND FIELD SERVICE

.1 The manufacturer shall provide in person and online orientation and web based training for initial software installation and configuration.

.2 The manufacturer shall provide three (3) separate trips, for onsite service for administrative training and field configuration/testing of the system.

.3 The manufacturer shall provide remote support during the warranty period.

1.6 USAGE AND LICENSING

.1 The manufacturer shall provide a multi-user license to allow the cloud based software to be accessed by multiple users (administrative office, lab, etc.) as is required.

1.7 SECURITY LEVELS

.1 Cloud based software shall provide different access rights on a user basis. Access rights shall provide the following functions:

.1 authorizing customers;
.2 entering rates;
.3 billing reports; etc.

1.8 SPARE PARTS

.1 Provide the following spare parts:

.1 PLC power supply.
.2 PLC rack.
.3 PLC CPU.
.4 PLC digital input card
.5 PLC digital output card.
.6 PLC analogue intput card.
.7 PLC analogue output card.
.8 HMI screen.

Part 2 Products

2.1 ACCESS TERMINAL USER INTERFACE

.1 The manufacturer shall provide three access terminal user interface panels.

.1 Two (2) panels to be located at the Chevrier Boulevard Public Water Service Outlet and one (1) panel to be located at the McCarthy Street Public Water Service Outlet.

.2 The access terminal user interfaces shall include a keypad, and digital display for users to log on and enter a specific volume of water to be dispensed and purchased.

.3 The access terminal user interfaces shall be an integral part of a comprehensive fully-managed public water service outlet, including the necessary software as described later in this specification.

.4 The access terminal user interfaces shall be constructed with corrosion resistant materials, with outer door and access panels that can be closed to enable a wash down without damaging the internal mounted electrical devices. The user access terminals shall be rated Type 3R.

.5 The access terminal user interfaces shall be provided with a daylight visible display and outdoor-rated, robust keypad. The display shall prompt the user with log-on instruction and display responsive messages that allow the unattended use of the facility.

.6 The access terminal user interfaces shall continue to function normally without a network connection to the cloud. All data shall be stored in non-volatile memory. When the network connection is re-established, all transaction data shall be automatically synchronized and securely stored to the cloud database.

.7 The access terminal user interfaces shall be provided with the following components:

- .1 Enclosure
  - .1 Powder coated marine grade aluminum NEMA 3R rated
  - .2 External swing-out door
  - .3 Lockable handle
- .2 Access Keypad
  - .1 Integrated keypad / HMI
  - .2 Secure, robust, and outdoor rated
  - .3 Clear, backlit LCD display, visible in all levels of light
  - .4 Advanced tamper-proof design
  - .5 Integrated stainless steel backlit buttons with LCD screen complete with Lexan Screen Protector
  - .6 Allen-Bradley
- .3 Programmable logic controller, PLC, including:
  - .1 Ethernet connection to billing system software
  - .2 Allen-Bradley 1769-L18 CompactLogix PLC
  - .3 Modbus TCP for connection to City Supervisory Control and Data Acquisition (SCADA) system
  - .4 Non-volatile memory
- .4 Cellular Gateway and Ethernet switch:
  - .1 Ethernet connection to billing system software
  - .2 Approved manufacturer: RuggedCom

2.2 MANAGEMENT SOFTWARE:

.1 The billing system shall include the necessary software to allow an internet networked PC or web enabled device to seamlessly interface with multiple public water service outlets using a cellular modem installed in the user access terminal interface.

.2 The billing system software shall allow the public water service outlet to connect and exchange data to one or more user access terminals.

.3 The billing system software shall be used to configure the public water service outlet's access device and enable/disable customer's access codes.

.4 The billing system software shall be used to configure the devices that shall measure the volume.

.5 The billing system software shall monitor each public water service outlet and automatically upload the customer's transaction data.

.6 The billing system data shall be stored into a secure Microsoft Azure cloud database. The data shall include public water service outlet ID, Station ID, Customer ID, Date and Time of Transaction, Volume loaded, Rate ID, and Volume Remaining,

.7 Software access is over a web based device over Internet, no local installation of software required.

2.3 CUSTOMER AND TRUCK FEATURES:

.1 The billing system software shall allow the City to create a list of customers that will be billed for the public water service outlet use. A user-friendly interface shall be provided for entering customer details and account number. Account applications can be made directly by either the customer on-line or the City through a secure dashboard.

.2 The billing system software shall allow the City to create multiple truck accounts and link these accounts to the customer (owner of truck). The cloud based software shall not limit the City as to the number of trucks that can be assigned to each customer.

.3 User-friendly interface shall be provided to enter the Customer ID and PIN.

.4 Once the customer's account has been approved the customer will be provided from the billing system software a Customer ED and 4-Digit PIN for each truck that will access the public water service outlets. PIN assignment can be unique per owned truck or common to all owned trucks, depending on facility and customer preference.

.5 The billing system software shall include an Overview Screen, divided into sections that shall display the Transaction Log, Customers, Truck Status, Customer Balances and quick-link to Reports. Data views shall be configurable to show customer and truck activity using built-in sorting tools.

.6 The billing system software shall allow the City to enable or disable a customer's access privilege. Once disabled, a customer's access shall be denied at all public water service outlets sites upon public water service outlet update. A message shall be displayed to inform the customer to contact the office.

.7 The billing system software shall have multiple pre-formatted reports that can be printed to a networked printer, emailed or exported using common file formats. As a minimum, the cloud based software shall include reports to show Activity with daily totals, Statements, and Customer and Truck usage.

.8 The billing system software shall allow the City to enter billing rates, alarm identification, public water service outlet name and location. This data shall be used in both the basic and advanced features of the system management.

2.4 BILLING RATE FEATURES:

.1 System software must accept 9998 user definable customer accounts.

.2 System software must allow for software upgrade of extra customer accounts

.3 System software must maintain information on customers (including company name, billing address and billing discount percentage), Carrier Trucks (including truck account number, PIN number, and account balance.

.4 System software must allow City to configure and communicate with multiple user access terminals interfaces located at the public water service outlets.

.5 System software must allow City to automatically upload customer truck account information to each user access terminal interface at a public water service outlet public water service outlet via remote cellular modem.

.6 System software must automatically collect all transactions from each user access terminal interface at a City defined interval.

.7 System software must have integrated on-line help screens.

.8 System software must allow City to define “Volume Units” for bill generation (i.e. m^3, ft^3, litres, US Gal, Imp Gal).

.9 System software must allow City to define billing method either by Volume or by Load and by Discountable Rate based on customer.

.10 System software must allow City to manage accounts on either a “Credit” basis or a “Pre-pay/Debit” basis.

.11 System software must allow City to print a detailed customer Reports.

.12 System software must allow City to print a batch of Bills for all or one customer

.13 System software must allow City to re-print a batch of Bills for all or one customer

.14 System software must allow the City to bill customers that include one or multiple trucks. Bills must include detailed information for each transaction including truck account number, public water service outlet, transaction date and time, quantity, unit factor and unit rate. The bill shall subtotal transactions by truck account number.

.15 The software shall allow the City to define a list of allowed billing rates for dispensed water. The billing rate per 1/10/100/1000 units is used by the software to calculate the transaction's amount. Multiple billing rates offer the City flexibility to allow volume or residential customers a discount. The use of different rates is not required to use the software. Units can be user-defined (Gallons, liters, etc.).

.16 The software shall total the truck volume discharge to the truck and calculate the total cost for the transaction.

2.5 BILLING AND PAYMENT FEATURES:

.1 The City shall be able to use the features of this software to substantiate the data recorded for each transaction and accurately calculate the total cost on a per customer basis.

.2 The City shall have the option to use the software to create a billing statement or export the data to the primary accounting software. Export options shall include be PDF, XML, CSV, Excel or HTML.

.3 The billing system software shall allow the City to manage each customer on a debit or credit basis. The customer is required to pay in advance or the customer can pay after usage of the public water service outlet.

.4 The billing system software shall debit the account balance automatically and auto-deactivate the customers access privilege should the customer's balance drop below a minimum.

.5 The billing system software shall allow the City to enter payments if required. The total balance shall automatically recalculate once a payment is applied. A customer's account that is deactivated shall be automatically activated once money is received.

2.6 OTHER FEATURES:

.1 The billing system software shall allow the City to define the public water service outlet Operating Time Schedule. Each day shall be configured with Open and Close times. If closed, public water service outlet shall prompt the hauler that the public water service outlet is CLOSED.

2.7 ALARM SHUTDOWN:

.1 The system shall automatically disable if an alarm condition is triggered. The valve shall close and the screen shall display out of order.

2.8 INTERNET ACCESS

.1 The manufacturer shall provide cellular modem to be registered by the City.

.2 Provide remote antenna, antenna cabling, antenna mast, and surge protector to mount antenna on building exterior.

2.9 PLC PROGRAMMING

.1 The manufacturer shall provide all PLC and HMI documented programs in native format for the City to support and troubleshoot the system.

.2 Troubleshooting digital input and output modules.

.3 Troubleshooting analog input and output modules.

.4 Replacing PLC cards.

.5 Comparing the PLC with a backup copy and reloading the program if necessary.

.6 Provide Modbus mapping table of all I/O.

2.10 STANDARDS

.1 Label all wiring.

.2 The colour RED indicates a device is on.

.3 Submit instrument loop drawings complete with wire colours.

2.11 Privacy Provision

.1 Approved Manufacture:

.1 Flowpoint Water Exchange, Full version, or approved equal

Part 3 Execution

3.1 INSTALLATION

.1 Install the equipment in accordance with the manufactures recommendations.

3.2 TRAINING

.1 Provide in person demonstration and training to City personnel.

.2 Training to include three (3) separate training session trips, each consisting of a minimum two (2) days.

.3 Training topics shall include administrative functions and field configuration/testing of the system.

3.3 SUPPORT SERVICES

.1 Provide unlimited remote support services to City personnel during the warranty period

.2 Remote support services to be provided via telephone and web based training.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements that are common to National Master Specification sections found in Section 26 – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

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

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

.1 Material Safety Data Sheets (MSDS).

.4 City of Winnipeg Water and Waste Department – Electrical Design Guide, Rev 01

.5 City of Winnipeg Water and Waste Department – Automation Design Guide, Rev 00

.6 City of Winnipeg Water and Waste Department – Identification Standard, Rev 00

1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates for control items in English.

1.4 SUBMITTALS

.1 Quality Control:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to Site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of Contract.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.

.2 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within three (3) days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in Part 3.5 - Field Quality Control.

1.5 QUALITY ASSURANCE

.1 Quality Assurance:

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

1.6 SYSTEM STARTUP

.1 Instruct City's personnel in operation, care and maintenance of systems, system equipment and components.

.2 Assist City's personnel and the Contract Administrator in the start-up of equipment.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.7 Site

.1 Classification of areas

.1 Public Water Service Outlet Building: Ordinary

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to Site and submit such approval as described in Part 1 - Submittals.

.2 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls.

.2 Control wiring and conduit: in accordance with Division 29.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of inspection authorities.

.2 Lamacoid signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, white with black core, lettering accurately aligned and engraved into core mechanically attached with self-tapping stainless steel screws.

.2 Lamacoids as follows:

Application	**Text Size**	**Text**
Electrical Equipment - General	5 mm	Line 1: Identifier
Circuit Breaker - Separate	5 mm	Line 1: Identifier Line 2: Load Identifier Line 3: Load Description
Disconnect Switch - Separate	5 mm	Line 1: Identifier Line 2: Load Identifier Line 3: Load Description
Fire Alarm Devices	8 mm	Line 1: Identifier
Light Switches	3 mm	Source Panel and Circuit Number
Motor Control Centre	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By
Motor Starter or MCC Bucket	5 mm	Line 1: Load Identifier Line 2: Load Description
Panelboards	8mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By
Circuit Breaker	3 mm	Description
Receptacles	3 mm	Source Panel and Circuit Number
Switchgear	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage

		Line 4: Fed By
Switchgear Breaker	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By
Transformer - Indoor	8 mm	Line 1: Identifier Line 2: Rating, System Voltage Line 3: Fed By
Transformer – Outdoor	10 mm	Line 1: Identifier Line 2: Rating, System Voltage Line 3: Fed By

.2 Wording on nameplates to be approved Contract Administrator prior to manufacture.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes, and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

.4 Colour Codes

	Prime	**Auxiliary**
Power, 120/208/240 VAC	Black	
UPS Power, 120/208/240 VAC	Black	Green
Control Wiring, 120VAC	Black	Orange
Fire Alarm	Red	
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring, <50 V	Blue	Orange
Intrinsically Safe	Blue	White
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Other Communication Systems	Green	Blue

.5 Cable Colour Codes

	Prime	**Auxiliary**
Power, 120/208/240 VAC	Black	
UPS Power, 120/208/240 VAC	Black	Green
Control Wiring, 120VAC	Black	Orange
Fire Alarm	Red	
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring, <50 V	Blue	Orange
Intrinsically Safe	Blue	White
up to 600 V	Yellow	Green
Other Communication Systems	Green	Blue

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify by Contract Administrator before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1400 mm.

.2 Wall receptacles:

.1 General: 300 mm.

.2 In mechanical rooms: 1400 mm.

.3 Panelboards: as required by Code or as indicated on the Drawings.

.4 Control panels: as indicated on the Drawings.

3.4 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays, and fuses are installed to required values and settings.

3.5 FIELD QUALITY CONTROL

.1 Conduct following tests:

.1 Circuits originating from branch distribution panels.

.2 Lighting and its control.

.3 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 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.

.2 Carry out tests in presence of Contract Administrator.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of Project.

3.6 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2No.65, Wire Connectors.

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

.1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded copper conductors.

.2 Clamp for stranded copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

.1 CSA C22.2 No.0.3, Test Methods for Electrical Wires and Cables.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated on the Drawings, with thermoplastic insulation type TWU or TWH rated at 600 V.

2.2 CONTROL CABLES

.1 Type LVT: soft annealed copper conductors, with thermoplastic insulation, outer covering of thermoplastic jacket.

.2 600 V type: stranded annealed copper conductors, sizes as indicated with PVC insulation type TW, or cross-linked polyethylene type RW90 (x-link with shielding of metallized tapes over each pair of conductors and overall covering of thermoplastic jacket interlocked armour and jacket over sheath of PVC.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34

3.2 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

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

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)

.3 CSA C22.1, Canadian Electrical Code, Part 1

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed.

.3 Rod electrodes: copper clad steel 19 mm dia. by 3 m long.

.4 Grounding conductors: bare stranded copper, soft annealed.

.5 Insulated grounding conductors: green, type RW90.

.6 Ground bus: copper, size as required, complete with insulated supports, fastenings, connectors.

.7 Non-corroding accessories necessary for grounding system, type, size, 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.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.10 Ground secondary service pedestals.

3.2 ELECTRODES

.1 Install rod electrodes and make grounding connections.

.2 Bond separate, multiple electrodes together.

.3 Use size 2/0AWG copper conductors for connections to electrodes.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of primary 600 V system, secondary 208 V system.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.5 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections sized in accordance with the Canadian Electrical Code.

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to Site conditions and to approval of Contract Administrator.

.3 Perform tests before energizing electrical system.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Not Used

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape aluminum, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.5 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole stainless steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole stainless steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.6 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia. threaded rods and spring clips.

.2 Support two (2) or more cables or conduits on channels supported by 6 mm dia. threaded rod hangers where direct fastening to building construction is impractical.

.7 For surface mounting of two (2) or more conduits use channels at 1 m on center spacing.

.8 Provide metal brackets, frames, hangers, clamps, and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors.

.3 At least three (3) spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel 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.

2.3 CABINETS

.1 Sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

2.4 CUSTOMER SERVICE TERMINATION ENCLOSURE

.1 Welded 12 gauge sheet steel, hinged gasketed, pad-lockable door

.2 Weatherproof type 3R enclosure.

.3 Gray paint

.4 Wall mount.

.5 Copper lugs and bus bar.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

□

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor.

.3 Only main junction 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 - Electrical.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

□

Part 1 General

1.1 REFERENCES

.1 CSA C22.1, Canadian Electrical Code, Part 1.

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 (1) system are grouped.

2.2 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
- .2 CSA C22.2 No. 45, Rigid Metal Conduit.
- .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2 Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3, Flexible Nonmetallic Tubing.

Part 2 Products

2.1 CONDUITS

.1 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.2 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.

.3 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One-hole aluminum or stainless steel straps to secure surface conduits 50 mm and smaller. Two-hole aluminum or stainless steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two (2) or more conduits at 1 m on centre.

.4 Stainless steel threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Existing structure may contain asbestos. Confirm materials are free of asbestos before drilling or coring.

.3 Use PVC conduit inside building areas.

.4 Use epoxy coated conduit underground and in cast concrete.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.

.6 Minimum conduit size for lighting and power circuits: 19 mm.

.7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.8 Mechanically bend steel conduit over 19 mm dia.

.9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.10 Install fish cord in empty conduits.

.11 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.12 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

.1 Paint walls before installation of electrical equipment including conduits.

.2 Run parallel or perpendicular to building lines.

.3 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.4 Run conduits in flanged portion of structural steel.

.5 Group conduits wherever possible on suspended or surface channels.

.6 Do not pass conduits through structural members.

.7 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

.5 Do not place conduits is slabs in which slab thickness is less than four (4) times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.4 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.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC accepted) with heavy coat of bituminous paint.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

.2 Insulated Cable Engineers Association, Inc. (ICEA)

Part 2 Products

2.1 CABLE PROTECTION

.1 38 mm x 140 mm planks pressure treated with copper napthenate or five (5) percent pentachlorophenol solution, water repellent preservative.

Part 3 Execution

3.1 DIRECT BURIAL OF CABLES

.1 After 75 mm sand bed, is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.

.2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.

.3 Underground cable splices not acceptable.

.4 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, eight (8) times diameter of cable; for metallic armoured cables, twelve (12) times diameter of cables or in accordance with manufacturer's instructions.

.5 Cable separation:

.1 Maintain 75 mm minimum separation between cables of different circuits.

.2 Maintain 300 mm horizontal separation between low and high voltage cables.

.3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.

.4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.

.5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.

.6 Install treated planks on lower cables 0.6 m in each direction at crossings.

.6 After 75 mm sand protective cover spec is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks to cover length of run.

3.2 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.1 Do not pull spliced cables inside ducts.

.2 Install multiple cables in duct simultaneously.

.3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.4 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.

.5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.6 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

.1 Mark cable every 150 m along cable and duct runs and changes in direction.

.2 Mark underground splices.

.3 Where markers are removed to permit installation of additional cables, reinstall existing markers.

.4 Install concrete cable markers within 180 m from each side of runway centerline; 45 m from each side of taxi way centreline; 50 m from edge of taxi ramps or aprons.

.5 Install cedar post type markers.

.6 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests.

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.7 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and components for dry type transformers up to 600 V primary, equipment identification and transformer installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type).
.2 CSA C9, Dry-Type Transformers.

.2 National Electrical Manufacturers Association (NEMA)

1.4 PRODUCT DATA

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

Part 2 Products

2.1 TRANSFORMERS

.1 Use transformers of one manufacturer throughout project and in accordance with CAN/CSA-C22.2No.47.

.2 Design.

.1 Type: ANN.
.2 Windings: Copper
.3 Rating as specified.
.4 Voltage taps: standard.
.5 Insulation: 180 degrees C temperature rise.
.6 Basic Impulse Level (BIL): standard.
.7 Hipot :standard.
.8 Average sound level: standard
.9 Impedance at 17 degrees C: standard
.10 Enclosure: CSA 1, removable metal front panel c/w sprinkler sheild.
.11 Finish: in accordance with Section 26 05 00 - Common Work Results - Electrical.
.12 Acceptable manufactures: Schneider Electric, Eaton, Rex Manufacturing.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Nameplate wording example:

T-2
15kVA
600V – 120/208V

Part 3 Execution

3.1 INSTALLATION

.1 Mount dry type transformers up to 75 kVA as indicated in the Drawings.

.2 Mount dry type transformers above 75 kVA on floor.

.3 Ensure adequate clearance around transformer for ventilation.

.4 Install transformers in level upright position.

.5 Remove shipping supports only after transformer is installed and just before putting into service.

.6 Loosen isolation pad bolts until no compression is visible.

.7 Make primary and secondary connections in accordance with wiring diagram.

.8 Energize transformers after installation is complete.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

.3 Section 26 28 21 - Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

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

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one (1) manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 600 V panelboards: bus and breakers rated for 18kA (symmetrical) interrupting capacity.

.3 250 V panelboards: bus and breakers rated for 10kA (symmetrical) interrupting capacity.

.4 Panelboard width to be less than 230 mm.

.5 Integral TVSS.

.6 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.

.7 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on the Drawings.

.8 Two (2) keys for each panelboard and key panelboards alike.

.9 Copper bus with neutral of same ampere rating as mains.

.10 Mains: suitable for bolt-on breakers.

.11 Trim with concealed front bolts and hinges.

.12 Trim and door finish: baked grey enamel.

.13 Approved manufacture: Schneider Electric, Eaton

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise on the Drawings.

.3 Lock-on devices for fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results – Electrical.

.2 Provide nameplate for each panelboard.

.3 Provide Nameplate for each circuit in distribution panelboards

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on U-channel. Where practical, group panelboards on common supports.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - Electrical.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Measure load current on each phase and adjust phase loading for a balanced system.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA-C22.2 No.55, Special Use Switches.

.4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 SWITCHES

.1 20 A, 120 V, single pole, double pole, three-way, four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

.2 Manually-operated general purpose ac switches with following features:

.1 Terminal holes approved for No. 10 AWG wire

.2 Silver alloy contacts

.3 Urea or melamine moulding for parts subject to carbon tracking

.4 Suitable for back and side wiring

.5 Ivory toggle

.3 Toggle operated locking fully rated for tungsten filament and fluorescent lamps, and up to eighty (80) percent of rated capacity of motor loads.

.4 Switches of one (1) manufacturer throughout project.

.5 Acceptable materials: Leviton specification grade, Hubbell specification grade.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:

.1 Ivory urea moulded housing
.2 Suitable for No. 10 AWG for back and side wiring
.3 Break-off links for use as split receptacles
.4 Eight (8) back wired entrances, four 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 Ivory urea moulded housing
.2 Suitable for No. 10 AWG for back and side wiring
.3 Four (4) back wired entrances, two (2) side wiring screws

.3 Other receptacles with ampacity and voltage as indicated on the Drawings.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable materials: Leviton specification grade, Hubbell specification grade.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet stainless steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.5 Stainless steel or cast aluminum cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated on the Drawings.

.7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one (1) switch is required in one (1) location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results - Electrical.

.3 Where split receptacle has one (1) portion switched, mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

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

.2 Include time-current characteristic curves for breakers with ampacity of 90 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees Celsius ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from three (3) to eight (8) times current rating.

.5 Circuit breakers to have minimum symmetrical rms interrupting capacity rating matching panel board or switchboard containing breaker.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

Part 3 Execution

.1 N/A

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - For Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.

.2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 SUBMITTALS

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

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Heavy duty non-fusible, horsepower rated disconnect switch to CAN/CSA C22.2 No.4.

.2 Provision for padlocking in OFF position.

.3 Quick-make, quick-break action.

.4 ON-OFF switch position indication on switch enclosure cover.

.5 Category 1 locations: NEMA 4.

.6 Category 2 locations: NEMA 4x.

.7 Ordinary locations: NEMA 12.

.8 Outdoor: NEMA 3.

.9 Acceptable Manufacturer: Square D, Eaton, Hubbell, Pass & Seymour, Leviton.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - For Electrical.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches as required by CSA C22.1.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for industrial control devices including pushbutton stations, control and relay panels.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.14, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

1.4 SHOP DRAWINGS

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

.2 Include schematic, wiring, interconnection diagrams.

1.5 QUALITY ASSURANCE

.1 Submit to Contract Administrator copy of test results.

Part 2 Products

2.1 AC CONTROL RELAYS

.1 Control Relays: to CSA C22.2 No.14.

.2 Fixed contact plug-in type: general purpose heavy duty with two (2) poles. Coil rating: 120 V. Contact rating: 240V, 2 A.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

2.3 OILTIGHT LIMIT SWITCHES

.1 Snap action type: roller, rod, fork, lever, top, side, push, wobble stick actuator, CSA type 4 enclosure. Contact rating 240VAC, 2A

2.4 SOLID STATE TIMING RELAYS

.1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact.

.2 Operation: on-delay or off-delay.

.3 Potentiometer: self contained to provide time interval adjustment.

.4 Supply voltage: 120 V, AC, 60 Hz.

.5 Temperature range: minus 20 to 60 degrees Celsius.

.6 Output contact rating: maximum voltage 300 V AC or DC. Current: 2A

.7 Timing ranges: field adjustable, minimum 0.1s, maximum 60 hours.

2.5 OPERATOR CONTROL STATIONS

.1 Enclosure: CSA Type 4, surface mounting.

2.6 PUSHBUTTONS

.1 Illuminated, heavy duty oil tight. Operator extend type. Black, with 2-NO and 2-NC contacts rated at 10 A, AC, labels as indicated. Stop pushbuttons coloured red. Start pushbuttons coloured green.

2.7 SELECTOR SWITCHES

.1 Maintained three (3) position labelled as indicated heavy duty oil tight, operators wing lever contact arrangement, rated 120 V, 10A, AC.

2.8 INDICATING LIGHTS

.1 Heavy duty oil tight, full voltage, LED type, push-to-test, lens colour: as indicated on the Drawings, supply voltage: 120 V, lamp voltage: 120 V.

2.9 CONTROL AND RELAY PANELS

.1 CSA Type 12 sheet steel enclosure with hinged padlockable access door, accommodating relays timers, labels, factory installed and wired to identified terminals.

2.10 CONTROL CIRCUIT TRANSFORMERS

.1 Single phase, dry type.

.2 Primary: 600 V, 60 Hz ac.

.3 Secondary: 120 V, AC.

.4 Rating: 150 VA, or larger as required.

.5 Secondary fuse: ampacity as required.

.6 Close voltage regulation as required by magnet coils and solenoid valves.

2.11 THERMOSTAT LINE VOLTAGE

.1 Wall mounted, for exhaust fan control.

.2 Full load rating: 8A at 120 V.

.3 Temperature setting range: 0 to 30 degrees Celsius.

.4 Thermometer Range: 0 to 30 degrees Celsius.

.5 Markings in 5 degree increments.

.6 Differential temperature fixed at 1 degree Celsius.

Part 3 Execution

3.1 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices and interconnect.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Design, supply and install wireless Ethernet antenna, cable, mast for the McCarthy Street Public Water Service Outlet.

.2 The site shall have a 10 m steel pole. A Yagi directional antenna, lightning protection, and antenna cabling shall be provided.

.3 The modem will be supplied by the City and installed in the RTU panel by the Contractor.

1.2 REFERENCES

.1 Canadian Standards Association (CSA) International

.1 CAN/CSA-B72-M87(R1998), Installation Code for Lightning Protection Systems.

.2 CAN/CSA-S37-01, Antennas, Towers, and Antenna-Supporting Structures.

1.3 SHOP DRAWINGS

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

.2 Indicate:

.1 Dimensioned template of antenna base.

.2 Dimensions of structural members.

.3 Method of fastening antenna array to pole.

.4 Lightning protection.

.5 Antenna specifications.

.6 Antenna cable specifications.

Part 2 Products

2.1 TOWER LIGHTNING PROTECTION

.1 Protection in accordance with CAN/CSA-B72.

2.2 ANTENNA POLE

.1 Steel pole, 10 m tall, galvanized steel designed for:

.1 Wind load: 150 km/h.

.2 Antenna array load: 5 kg.

.3 Ice load: 12 mm ice.

.2 Precast concrete pole base.

2.3 ANTENNA ARRAY

.1 Minimum signal levels of:

.1 Yagi: 900 MHz, 14 dBm gain.

2.4 WIRING

.1 Ultra Low Loss (ULL) coaxial cable.

.2 Direct burial rated, rodent protected.

.3 Attenuation at 900 MHz not to exceed 0.14 dB/m.

.4 Connectors suitable for specified Ethernet radios.

Part 3 Execution

3.1 INSTALLATION

.1 Mount antenna and pole and connect antenna cable and route to radio transmitter.

.2 Optimize reception by making adjustments in height and direction for each antenna. Record signal levels

.3 Install lightning protection in accordance with CAN/CSA-B72.

3.2 FIELD QUALITY CONTROL

.1 Measure test lightning protection system resistance to ground. Resistance value of system network: 5 ohms or less.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Control panel.

.2 Detection Accessories.

.3 Communications.

.4 Environmental monitoring.

1.2 REFERENCE DOCUMENTS

.1 National Fire Protection Association (NFPA)

.1 NFPA 70, National Electric Code.

.2 NFPA 101, Life Safety Code.

.2 Electronic Industries Association (EIA)

.1 REC 12749, Power Supplies.

.2 RS 16051, Sound Systems.

1.3 REFERENCE STANDARDS

.1 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S302, Installation and Classification of Burglar Alarm Systems for Financial and Commercial Premises, Safes and Vaults.

.2 CAN/ULC-S303, Local Burglar Alarm Units and Systems.

.3 CAN/ULC-S304, Intrusion Detection.

.4 CAN/ULC-S306, Intrusion Detection Units.

.5 ULC-S318, Power Supplies for Burglar Alarm Systems.

.6 ORD-C634, Connectors and Switches for Use with Burglar Alarm Systems.

.2 Underwriters' Laboratories (UL)

.1 UL 603, Standard for Power Supplies For Use With Burglar-Alarm Systems.

.2 UL 639, the Standard for Intrusion-Detection Units.

1.4 DEFINITIONS

.1 PIR: Passive Infrared Detectors.

1.5 DESIGN PERFORMANCE REQUIREMENTS

.1 Design intrusion detection system using ULC/UL Listed products.

.2 Design intrusion detection system using, company specializing in intrusion detection systems.

.3 Design intrusion detection system as a certified alarm system.

.4 Design system as alarm monitoring system expandable, and easily modified for inputs, outputs and remote control stations.

.1 Design components in accordance with CAN/ULC-S306 and be capable of:

.1 Annunciating undesirable, abnormal or dangerous condition.

.2 Prioritizing alarms by alarm type; i.e. panic/duress, intrusion and tamper.

.3 Determining zone where alarm occurred.

.4 Annunciating power failure and power restoration.

.5 Annunciating low battery condition.

.6 Operate continuously for minimum period of 4 hours in the event of a power failure.

.5 Equip control panels with continuous tamper detection on door and wall.

.1 Tamper detection to trigger alarm.

.6 Design system with:

.1 Alarm masking.

.2 Remote maintenance or diagnostics with password activation and callback modem.

.3 Unique identifier for each authorized person.

.4 Arming and disarming capabilities: manual and automatic by time of day, day of week, or by operator command.

.5 Support both manual and automatic responses to alarms entering system.

.6 Zone or alarm location annunciated at monitoring station.

.7 Communications link: Security level of I as described in CAN/ULC-S304.

.8 Signal link: Security level of I as described in CAN/ULC-S304.

.9 Junction boxes: Tamper proof with continuous tamper-detection capability.

.10 Design system power supplies rated to provide cumulative load of all systems components plus safety factor of 50% or greater.

1.6 SUBMITTALS

.1 Product Data: Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section E3.

.1 Submit manufacture's literature for each control panel and detection accessory device.

.2 Submit:

.1 Functional description of equipment.

.2 Technical data for all devices.

.3 Typical devices connection detail drawings

.2 Maintenance Data: Submit maintenance data for incorporation into manual.

.1 Include:

.1 System configuration and equipment physical layout.

.2 Functional description of equipment.

.3 Instructions of operation of equipment.

.4 Illustrations and diagrams to supplement procedures.

.5 Operation instructions provided by manufacturer.

.6 Cleaning instructions.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Control Panel: ULC approved.

.1 Zones: 6.

.2 Expandable: 16 zones.

.3 Number of user codes required: 10.

.4 Number of Areas/Partitions required: 10.

.5 Keypads: LCD (liquid crystal display).

.6 Alarm: Monitored.

.7 System: Wired.

.8 Number of programmable outputs required: 2.

.9 System supervision: Battery, and AC power.

.10 Siren output.

.11 DCS PowerSeries PC1616, Main Control Module c/w cabinet, keypad, and power supply.

.12 Input from field mounted keyed selector switch for arming and disarming.

.2 Detection Accessories:

.1 Passive Infrared Detectors (PIR's) and Microwave:

.2 Door Contacts:

.3 Notification Devices:

.3 Connectors and switches: To ORD-C634.

.4 Power supplies: To ULC-S318 or UL 603.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and datasheet.

3.2 INSTALLATION

.1 Install panels, intrusion detection system and components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.

.2 Install panels, intrusion detection system and components secure to walls, ceilings or other substrates.

3.3 VERIFICATION

.1 Operational verification: Purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:

.1 Operation of each device individually and within its environment.

.2 Operation of each device in relation with programmable schedule and or/specific functions.

END OF SECTION

Part 1 General

1.1 REQUIREMENTS OF WORK

.1 Supply, install and commissioning a complete instrumentation and control (I&C) system for the Public Water Service Outlets as shown on the Drawings and as specified herein.

.2 Component subsystems of the I&C system will include, but are not limited to, the following:

.1 Primary elements and transmitters

.2 Final control elements

.3 RTU control panels

.4 Instrumentation cabling

.5 Instrumentation power supplies

.6 Conduit and cable tray

.3 Where packaged, stand-alone control systems are supplied by others provide cabling to connect to the required remote monitoring and/or control functions. Provide end-to-end commissioning of all required remote monitoring and/or control functions. Assist in ensuring the correct functionality of any equipment supplied by others.

.4 Definitions

.1 Interpret specialized terms not explicitly defined herein in accordance with ISA-S51.1, NEMA-ICS-1, ANSI/IEEE-Std-100, and The Communications Standard Dictionary, by Martin H. Weik.

.5 References

.1 This Specification contains references to the following Documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed Documents, the requirements of this Section prevail.

REFERENCE	TITLE
API RP550	Manual on Installation of Refinery Instruments and Control Systems, Part I--Process Instrumentation and Control Sections 1 Through 13
ASME Section VII	Rules for Construction of Pressure Vessels
ASTM B68	Seamless Copper Tube
ASTM D883	Terms Relating to Plastics
IEEE 100	Dictionary of Electrical and Electronic Terms
ISA RP7.1	Pneumatic Control Circuit Pressure Test
ISA RP12.6	Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations
ISA S5.4	Instrument Loop Diagrams
ISA S18.1	Annunciator Sequences and Specifications
ISA S51.1	Process Instrumentation Terminology
NEMA 250	Enclosures for Industrial Controls and Systems
NEMA ICS 1	General Standards for Industrial Control and Systems
NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
NFPA 70	National Electrical Code (NEC)
SAMA PMC 17-10	Bushings and Wells for Temperature Sensing Elements
UBC	Uniform Building Code
UL 1012	Power Supplies
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances Weik, Martin H. Communications Standard Dictionary, Van Nostrand Reinhold Co.

.6 Related Work:

.1 Mechanical

.2 Electrical

.7 Qualifications

.1 The instrumentation Subcontractor shall be a firm normally engaged and fully competent in the type of Work described in this Section of the Specification. The firm shall have been continuously and successfully engaged in this business for at least five (5) years.

.2 Qualified journeyman instrument mechanics that are familiar with the devices being installed shall perform all instrument hook-ups, calibrations, and checkouts.

.3 Qualified journeyman electricians shall perform all control wiring installation and connections.

.8 Codes, Rules, Permits, and Fees

.1 Comply with all laws, ordinances, rules, regulations, codes, and orders of all authorities having jurisdiction relating to this Work.

.2 Comply with all rules of the Electrical Safety Act of the Province, CSA Standards, the ULC and the applicable building codes, whether specifically shown on Drawings or not.

.3 Give all required notices, submit Drawings, obtain all permits, licenses and certificates and pay all fees required for this Work.

.4 Furnish a certificate of final inspection and approvals from an inspection authority to the Contract Administrator.

.9 Standards of Workmanship

.1 Execute all Work in a manner, which will result in the completed installation presenting an acceptable appearance, to a level of quality defined in the general conditions of this Specification.

.2 Employ a competent supervisor and all necessary licensed tradesmen to complete the Work in the required time.

.3 Arrange and install products to fit properly into designated building spaces.

.4 Install products in accordance with the recommendations and ratings of the product manufacturers.

.10 Contract Drawings and Specifications

.1 Refer to Division 1.

.2 Provide all items and accessories required to install the City supplied equipment.

.3 Perform all operations as designated by the Specification according to the methods prescribed, complete with all necessary labour and incidentals.

.4 Treat any item or subject omitted from this Division's Specifications or Drawings, but which is mentioned or reasonably specified in other Divisions' Specifications or Drawings and pertains to the instrumentation and control system, as being integral to the overall system. Provide such specified items or subjects.

.5 Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.

.6 If discrepancies or omissions in the Drawings or Specifications are found, or if intent or meaning is not clear, consult the Contract Administrator for clarification before submitting bid.

1.2 EQUIPMENT

.1 Receiving, Storing, and Protection of Components during Construction

.1 Examine each component upon delivery to Site. Report all damage noted to the Contract Administrator prior to accepting or rejecting delivery. All instrumentation primary elements, control components, panels, etc. shall be placed in a secure, dry, heated storage building. Maintain the space temperature above 10 degrees Celsius and the space relative humidity below fifty (50) percent.

.2 Perform a preliminary examination upon delivery to ensure that:

.1 All instrumentation and control components supplied for this project under this Section of the Specification comply with the requirements stated in the instrument Specification sheets.

.2 All instrumentation and control components supplied by others, to be connected to instrumentation and control components comply with the requirements stated in the Contract Documents.

.3 Itemize all non-conformities noted above and forward them to the Contract Administrator.

.4 Do not install primary elements or other sensitive equipment until construction is sufficiently completed to provide an "operating condition" environment. Notify the Contract Administrator prior to installing any equipment of this type.

.5 Ensure that covers where required are properly installed on all equipment. Provide all covers, padding, guards, etc. as required to guard any equipment against damage.

Return all damaged equipment to the supplier for total corrective repairs. If deemed necessary by the Contract Administrator, the damaged equipment shall be replaced with new product.

1.3 DOCUMENTATION

.1 Submittals

.1 Submit Shop Drawings for all products supplied by this Division.

.2 Shop Drawings for the City supplied equipment will be provided to the Contractor

Part 2 Products

2.1 GENERAL

.1 Refer to the requirements of Division 1.

.2 Selected Products:

.1 Provide products and materials that are new and free from all defects.

.2 The design has been based on the use of the first named product where multiple products have been listed.

.3 Quality of Products

.1 All products provided to be CSA and ULC approved where applicable.

.2 If products specified are not CSA approved, obtain approval of the relevant provincial regulatory authority. Pay all applicable charges levied and make all modifications required for approval.

.3 Refer to Division 1 of this Specification for further information.

.4 Uniformity of Manufacture

.1 Unless otherwise specifically called for in the Specification, uniformity of manufacture to be maintained for similar products throughout the Work.

.5 Use of Products during Construction

.1 Any equipment used for temporary or construction purposes is to be approved by the Contract Administrator. Clean and restore to "as new" condition all equipment prior to the time of Substantial Performance.

2.2 INSTRUMENTATION

.1 General

.1 Instruments and installation methods to be suitable for the environmental conditions in which they are to be installed.

.2 Determine where injurious conditions may be expected to occur and make proper provision to protect the instruments to ensure their proper and reliable operation.

2.3 IDENTIFICATION

.1 Refer to City of Winnipeg Water and Waste Department – Identification Standard, Rev 00 for general identification requirements.

.2 Provide 3 mm thick lamicoid nameplates with 6 mm black lettering on white background. Identify the loop tag number (where applicable) and the device name, function, and instrument range or setpoint value on the nameplate.

.3 Where it is not possible to attach a lamicoid nameplate to a field instrument component, provide the component with a stainless steel metal tag firmly wired to the device and identified with the loop tag number.

.4 Identify all wires where they terminate at the marshalling panels, junction boxes and field devices with a heat shrink sleeve with machine printed labelling.

.5 Clearly mark all panels, pull boxes, junction boxes, etc. to indicate the nature of service.

.6 Provide neatly typed circuit directories for panel power distribution systems to indicate loops or devices powered by the circuit and the fuse size.

.7 Identify all exposed control conduits at all pull box locations, where the conduits enter or leave a room, and 13 m on center throughout the room. This shall apply to conduits above removable ceilings. Use Thomas & Betts TY-RAP 5532-M labels conduit identification.

.8 For direct current wiring use black for positive and white for negative.

.9 For thermistor wiring to motors use red and blue coloured, insulated wire.

Part 3 Execution

3.1 SITE EXAMINATION

.1 Refer to the requirements of Division 1.

.2 No additional compensation will be given for extra Work due to existing conditions that a Site examination prior to Bid should have disclosed.

3.2 COORDINATION WITH OTHER DIVISIONS

.1 Examine the Drawings and Specifications of all Divisions and become fully familiar the Work. Before commencing Work, obtain a ruling from the Contract Administrator on any conflicting issues between Divisions. No compensation will be made for any costs arising from conflict not identified before Work has commenced.

.2 Coordinate the Work to be performed under this Section of the Specification with all Divisions installing equipment to ensure that there are no conflicts.

.3 Install anchors, bolts, pipe sleeves, hanger inserts, etc. required in ample time to prevent delays to other Division's installation Work.

.4 Lay out the Work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural Drawings take precedence over electrical Drawings regarding locations of walls, doors, and equipment.

.5 Structural members shall not be cut without prior approval of the Contract Administrator.

.6 Examine previously constructed Work and notify the Contract Administrator of any conditions, which prejudice the proper completion of this Work.

3.3 PRODUCT HANDLING

.1 Use all means necessary to protect the products included in this Division before, during and after installation, and to protect products and installed Work of all other trades.

.2 Any damage to the products and/or installed Work shall be repaired or replaced by the Contractor at no additional cost to the City and to the approval of the Contract Administrator.

.3 Remove advertising labels from all products installed that have such labels attached. Identification or CSA labels are not to be removed.

.4 Remove dirt, rubbish, grease, etc. resulting from Work performed under this Division of the Contract from all surfaces.

3.4 SEPARATION OF SERVICES

.1 Maintain separation between the electrical wiring system, piping, ductwork, and the instrumentation cables so that each system is isolated (except at approved connections to such systems) to prevent galvanic corrosion. In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is unacceptable.

.2 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings are not to be used for the support of wiring.

.3 Classifications of Circuits

.1 The circuit categorization shall of first priority follow Canadian Electrical Code with respect to separation for electrical safety and the following shall apply with respect to electro-magnetic compatibility:

Very Noisy	High voltage circuits and their associated grounding
	High current (>200 A) LV circuits.
	Harmonic-rich LV circuits
	DC circuits: un-suppressed or above 50 V
Noisy	Low current class two (2) circuits
	Medium power pulsed or radio frequency circuits
Indifferent	ELV digital status circuits
	Intrinsically safe circuits
	Telecommunications circuits
	Fire alarm and emergency lighting circuits (note that some fire alarm circuits may fall into the category of signal circuits).
	Any other emergency, shutdown, or high integrity circuit (e.g. toxic gas alarm).
Sensitive	Analogue signal circuits
	Data communication circuits
Very Sensitive	Low level voltage and current signals (e.g. from instrument sensors).

.4 Separation of Circuits

.1 This Section relates to the running of cables carrying differing types of circuit in close proximity to one another and to other services. Sensitive circuits shall normally be run in overall shielded cable. Very sensitive circuits shall normally be run in individually twisted pair shielded cable.

.2 For cables sharing the same support/containment system, the following shall provide guidance to minimize extraneous interference:

Segregation between circuits	**Very Noisy**	**Noisy**	**Indifferent**	**Sensitive**	**Very Sensitive**
Very Noisy	Thermal grouping as per CE Code	150 mm	300 mm	300 mm	300 mm
Noisy	150 mm	Thermal grouping as per CE Code	150 mm	150 mm	150 mm
Indifferent	300 mm	150 mm	Separation of circuit types	100 mm	100 mm
Sensitive	300 mm	150 mm	100 mm	Touching	50 mm
Very Sensitive	300 mm	150 mm	100 mm	50 mm	Touching

3.5 WIRE AND CABLE

.1 Refer Division 26.

3.6 CONTROL WIRING COLOUR IDENTIFICATION

.1 Colour Codes

Conductor Purpose	Colour
Power, 120/208/240 VAC Supply	Black
Power, 120/208/240 VAC Neutral	White
Power, 24 VDC Supply (+)	Blue
Power, 24 VDC Common (-, or 0VDC)	Brown
Discrete Control AC	Red
Discrete Control DC	Blue
Intrinsically Safe	IS (light) Blue
Protective Earth (PE)	Green
Signal Ground/Instrumentation Earth (IE)	Green/Yellow

3.7 NETWORK CABLE – JACKET COLOUR

.1 Colour Codes

Cable Purpose	Colour
Ethernet, CAT5E or CAT6	Blue
Modbus/RTU (serial)	Grey

3.8 EQUIPMENT CONNECTIONS

.1 Prior to the connection of signal wiring to process control and instrumentation devices, check the device voltage rating and polarity for compatibility with the corresponding loop and/or schematic diagram. Where device and circuit characteristics are found to be incompatible, the connections are not to be made. Report the condition immediately to the Contract Administrator.

.2 All control wiring diagrams illustrate typical control circuits applicable to the type of equipment specified. Control circuits may vary with different manufacturer's equipment. Verify all control circuits with the manufacturers of the equipment and make any corrections to the control wiring diagrams that may be required.

3.9 WIRING TO EQUIPMENT SUPPLIED BY OTHER DIVISIONS

.1 Equipment supplied by the City or by other Divisions, that have external or field mounted control devices, are to be installed, wired and commissioned by this Division.

3.10 SEALING OF WALL AND FLOOR OPENINGS

.1 Seal all conduit and cable entries passing through walls of buildings, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade.

.2 Seal openings after all wiring entries have been completed.

.3 Sealing material shall be fire resistant and shall not contain any compounds that could chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations, if required, are to be sealed. Submit shop drawing for rated assembly prior to installation of fire stop.

3.11 TAGGING STANDARDS FOR DEVICES AND WIRING

.1 Tag all devices, wires, and I/O using the assigned loop, equipment, or device tag name. Where tag naming and numbering is not specified, the Contract Administrator will provide naming and numbering that is consistent with the City's naming conventions.

3.12 TESTING OF INSTRUMENTATION LOOPS

.1 After all devices within a loop have been connected, check the loop for correct functioning and interaction with other loops, where applicable. Provide written notice to the Contract Administrator when the loops are going to be tested so that the tests may be witnessed at the Contract Administrator's discretion.

.2 Check the operation of final control elements such as solenoid valves, actuators, etc. by manual control before checking with automatic control.

.3 Check and simulate all alarms and shutdown functions.

.4 Test all tubing for leaks in compliance with ISA RP7.1. Isolate all instruments when tubing is being tested to protect against over pressure.

.5 Perform tests and record results on the test data forms that are included in this Section. Develop additional and/or more detailed test forms as necessary to suit more complex instrumentation.

.6 Sign and date all test reports. Submit the test reports to the Contract Administrator within five (5) Business Days of testing.

.7 Coordinate and cooperate with the City's staff while they verify the instrument loop I/O in the Remote Terminal Unit (RTU) and on the supervisory control and data acquisition (SCADA) system.

3.13 CALIBRATION

.1 Instruments are to be factory pre-calibrated. Verify calibration after installation for all instruments installed under these Specifications. Provide a printed record of the factory calibration parameters for "smart" devices.

.2 Prior to calibration, completely program all "smart" transmitters including entries of the appropriate range and tag number. Provide a printed record of smart device serial numbers against their assigned tag number with all programmed parameters.

3.14 COMMISSIONING

.1 Refer to the requirements of Division 1 for additional requirements.

.2 Inspections

.1 Provide two weeks' written notice to the Contract Administrator prior to energizing any system to allow for inspection by the Contract Administrator of the following:

.1 Proper mounting; and,

.2 Proper connections.

.2 During Commissioning, demonstrate to the Contract Administrator proper calibration and correct operation of instruments and gauges

.3 Commissioning of the instrumentation and control system to include, but not be limited to, the following.

.1 Verify installation of components, wiring connections and piping connections.

.2 Supervise wiring continuity and pipe leak tests.

.3 Verify instrument calibration and provide written report.

.4 Function check and adjust the instruments and control equipment under operational conditions.

.5 Coordinate manufacturer’s service personnel as required for complete system testing.

.6 Instruct City personnel in correct method of instruments equipment operation.

.7 Direct City personnel at hand-over as to final adjustment of the system for correct operation.

.8 Ensure that the Manufacturer’s representatives cooperate to complete the Work of this Section.

.9 Verify signal levels and wiring connections to all instrumentation and control equipment.

.10 Work with control system programmer to verify all field devices, wiring, calibration and operation.

3.15 TEST FORMS

Form No.	Title
.1 ITR	Instrument Test Report
.2 LCR	Loop Check Report

LOOP CHECK REPORT

☐ CHECKED OUT OK
☐ NOT APPLICABLE
☐ FURTHER ACTION REQUIRED

INSTRUMENT TAG NO.									
LOOP NO. _____ SHEET NO. _____ P & I DWG. NO.									
INSTALLATION COMPLETE									
Primary Element									
Impulse Lines									
Block and Drain Valves									
Air Supply/Filter/Reg.									
Wiring									
Tracing/Insulation/Housing									
Mounting and Location									
PLC/SCADA I/O & Status									
CALIBRATED									
Impulse Lines Press. Tested									
LOOP CHECKED									
Element To Receiver									
X Mtr. to Receiver									
X Mtr./Trans. to Receiver									
X Mtr./Trans. to Switches									
Switches to Annunciator									
Interlocking Circuit									
Controller to Valve									
Controller Action D or R									

REMARKS:

READY FOR START-UP

DATE: _____

Installed by: _____

Checked by: _____

INSTRUMENT TEST REPORT

SYSTEM: _____

SERVICE: _____ TAG NO._____

LOCATION: _____ _____

MAKE: _____ MODEL: _____

SERIAL NO.: _____ CSA: _____

ELEMENT: _____ RANGE: _____

DESIGN SETTING/RANGE: _____ CONTACT TO: _____ ON: _____

SIGNAL IN:_____ OUT:_____ ASSOCIATED INSTRUMENT: _____

INSTRUMENT CONDITION: _____ CONFORM TO SPEC: _____

PROJECT NO.:_____ DATA SHEET: _____

	TEST 1				TEST 2			
TEST METHOD								
	INPUT		**OUTPUT**		**INPUT**		**OUTPUT**	
PROCESS	**INC.**	**DEC.**	**INC.**	**DEC.**	**INC.**	**DEC.**	**INC.**	**DEC.**
TEST POINT 1								
TEST POINT 2								
TEST POINT 3								
TEST POINT 4								
TEST POINT 5								
COMMENTS								
GRAPHS								

TESTED BY: _____ CHECKED BY: _____

DATE: _____ DATE: _____

END OF SECTION

Part 1 General

1.1 REFERENCES - GENERAL

.1 Suppliers, Equipment, Products, and Execution must meet all requirements detailed in Section 29 05 00 – Common Work Instrumentation.

.2 Local control stations shall be supplied to house local control switches, push buttons and indicator lights associated with field devices (valves, drives etc.). The control stations shall be located in close proximity to their associated devices. Where a group of devices are located within close proximity to each other, the local controls may be combined into a single common local control panel. Line of site must be maintained between all devices and the respective local controls.

Part 2 Products

2.1 GENERAL

.1 Unless otherwise specified, provide outside finishes on all enclosures in ANSI 61 Grey.

.2 The enclosures must be suitable for carrying the weight of the equipment mounted inside the panel and on the doors without any warpage.

2.2 ENCLOSURES

.1 Provide Electrical EEMAC Type 12 enclosures for ordinary locations.

.2 Provide Electrical EEMA Type 4x enclosures for Category 1 and 2 locations

2.3 WIRING AND ACCESSORIES

.1 Provide wiring inside the enclosures according to the following Specifications:

.1 Control wiring to be a minimum of #16 AWG tinned stranded copper; insulation rated at 600 V.

.2 Wiring for power distribution shall be a minimum of #14 AWG tinned stranded copper; insulation rated at 600 V.

.3 Install cables in accordance with the requirements of Division 26.

.2 Tag each wire at both ends with a heat shrink sleeve that is machine printed. Allow approximately 20 mm of wire insulation between the tag and the bare wire.

.3 Wiring systems with different voltage levels or types shall be suitably segregated within the panel, according to relevant electrical codes.

.4 Run all wiring in enclosed plastic wireways such as Panduit. Size all wireways so that the total cross sectional area of the insulated wire and cable does not exceed 40 percent of the cross sectional area of the wire way.

.5 Provide a minimum clearance of 50 mm between wire ways and any point of wire termination.

.6 Terminate all wiring, incoming and outgoing, at terminal strips mounted inside the enclosure. Identify each terminal strip with a terminal strip number, defined as follows:

.1 Wire identification to use the connected field device tag name with the wire's corresponding end device terminal number appended to it.

.2 Identify every joint and/or terminal of the above wire run with the same identifier until the wire meets another tagged device, at which point the wire identifier will change to use the new device name and terminal number.

.3 Identify spare wires by using the cable tag, wire number and an “-SP” suffix.

.4 Arrange wiring on terminal blocks such that all internal panel wiring terminates on the inboard side of the terminal blocks and all external wiring terminates on the outboard side.

.7 Provide sufficient terminals so that not more than two wires are connected under the same terminal. Provide 20 percent spare terminal capacity at each terminal block assembly.

.8 Terminals shall be Weidmuller W Series color coded as follows:

Red = positive 24 VDC
Black = analog signal plus
White = analog signal common and VAC neutral
Grey = 120 VAC
Green = ground

.9 Provide nameplates for each device on or within the panels and enclosures. Nameplates shall be white lamicoid with black lettering, a minimum of 25 mm x 75 mm in size with up to three lines of 5 mm lettering. Securely fasten nameplates in and situate them in a visible location.

2.4 PANEL GROUNDING

.1 Provide a ground system for the instrumentation circuits.

.2 Provide grounding lugs for each panel, suitable for termination of up to #2 AWG copper grounding conductor.

.3 Firmly bond all panel-mounted devices on or within the panels to ground. Provide supplementary bonding conductors for backpanels and doors. Attach a separate bonding conductor to all devices that are not firmly fastened to the panels with screws for such devices as case mounted instruments, meters, etc.

Part 3 Execution

3.1 MOUNTING HEIGHTS

.1 Unless otherwise specified or a conflict exists, mount all panels, starters and disconnects 2000 mm to top of cover.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No. 214, Communications Cables (Bi-National standard with UL 444).

.2 CSA-C22.2 No. 232, Optical Fiber Cables.

.2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)

.1 TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.

.2 TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.

.3 TIA/EIA-568-B.3, Optical Fiber Cabling Components Standard.

.4 TIA/EIA-606-A, Administration Standard for the Commercial Telecommunications Infrastructure.

.5 TIA TSB-140, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.

.6 TIA-598-C, Optical Fiber Cable Color Coding.

1.2 DEFINITIONS

.1 Refer to TIA/EIA-598-C, Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.3 RELATED SECTIONS

.1 Refer to Division 26.

1.4 INSPECTION

.1 Provide adequate notice to the Contract Administrator so that all cable installations can be inspected prior to energizing equipment.

1.5 STANDARDS

.1 All wire and cable shall be CSA approved.

Part 2 Products

2.1 TWISTED PAIR SHIELDED CABLES (TPSH)

.1 TPSH shall be constructed as follows:

.1 Two (2) copper conductors, stranded, minimum #18 AWG, PVC insulated, twisted in nominal intervals of 50 mm.

.2 Insulated for 600 V, 90 degrees Celsius.

.3 100% coverage aluminum foil or tape shield.

.4 Separate bare stranded copper drain wire, minimum #18 AWG.

.5 Overall flame retardant PVC jacket to CSA-C22.2.

.6 The entire cable assembly to be suitable for pulling in conduit or laying in cable tray.

.7 Interlocked aluminum armour and outer PVC jacket.

.8 Shaw Type 1751-CSA or Beldon equivalent.

.2 Where multi-conductor TPSH cables are called for, each pair shall be individually shielded, continuous number coded, and the cable assembly shall have an overall shield and overall flame retardant PVC jacket.

2.2 RTD AND MULTI CONDUCTOR SHIELDED CABLE

.1 RTD cables shall be CSA approved and shall be constructed as follows:

.1 Three (3) or more copper conductors, stranded, minimum # 18 AWG.

.2 PVC insulated for 600 V.

.3 100% coverage aluminum foil or tape shield.

.4 Separate bare stranded copper drain wire.

.5 Interlocked aluminum armour and outer PVC jacket.

.6 Overall flame retardant PVC jacket to CSA-C22.2.

2.3 TECK CABLES

.1 As per Division 26.

2.4 WIRE

.1 As per Division 26.

2.5 100 BASE TX CATEGORY 6 COMMUNICATION CABLE

.1 Category 6 cable shall be CSA approved and constructed as follows:

.1 Four (4) bonded pairs, solid stranded, #24 AWG.

.2 Interlocked aluminum armour.

.3 Rip cord.

.4 PVC inner and outer jackets.

.5 UL verified to Category 6.

.6 Insulated for 300 V.

.7 Shielded

Part 3 Execution

3.1 ANALOG SIGNALS

.1 Use TPSH cable for all low level analog signals such as 4-20 mA, pulse type circuits 24 VDC and under, and other signals of a similar nature.

.2 Use RTD cable for connections between RTDs and transmitters or control system RTD inputs.

3.2 DIGITAL SIGNALS

.1 Use TPSH cable for all low level input (24 V and below) and output signals to the control system.

3.3 INSTRUMENT POWER

.1 Use Teck cable or wire and conduit for power to instruments, for 120 V signals other than those mentioned above and as otherwise indicated on the Drawings. Use stranded wire and cable to supply power to instruments.

3.4 INSTALLATION

.1 At each end of the run leave sufficient cable length for termination.

.2 Do not make splices in any of the instrumentation cable runs.

.3 Cable shields shall be terminated on insulated terminals and carried through to the extent of the cable.

.4 Ground cable shields at one end only. Unless otherwise specified, ground the shields at the PLC control panel.

.5 Protect all conductors against moisture during and after installation.

3.5 CAT 6 INSTALLATION:

.1 Always follow the Manufacturer's guidelines for minimum bend radius and tension.

.2 All installations and terminations shall be performed by personnel experienced in Cat 6 cable installation.

.3 Perform cable testing with time domain reflectometer instrument and provide complete detailed test report. Test all runs upon completion of permanent terminations, using instrumentation acceptable to Contract Administrator. Before commencing testing, submit sample test data sheets and information with respect to test instrumentation to be used.

.1 Test for the following:

.1 Continuity.

.2 Pair placement and polarity.

.3 DC resistance.

.4 Characteristics at highest contemplated frequency:

.1 Attenuation - data cable.

.2 Mutual Capacitance - data cable.

.3 Near-end crosstalk (NEXT) - data cable.

.5 Run length.

.2 Category 6 using certified level III tester to: TIA/EIA-568-B.2.

.3 Reconnect or re-install and retest as necessary to correct excessive variations.

3.6 CONDUCTOR TERMINATIONS

.1 All equipment supplied shall be equipped with terminal blocks to accept conductor connections.

.2 Instrumentation conductors, where terminated at equipment terminals other than clamping type terminal blocks, shall be equipped with Burndy-YAE-2 or STA-KON, self-insulated, locking type terminators, sized as required to fit conductors and screw terminals.

3.7 TESTING

.1 Test all conductors for opens, shorts, or grounds. Resistance values shall not be less than those recommended by the cable manufacturer.

3.8 IDENTIFICATION

.1 Identify all instrumentation cables.

.2 Identify each conductor with wire numbers using a machine printed Raychem TMS heat shrink wire marker.

END OF SECTION

Part 1 General

1.1 REFERENCES - GENERAL

.1 Equipment, Products and Execution must meet all requirements detailed in Section 29 05 00 - Common Work Instrumentation.

Part 2 Products

2.1 MISCELLANEOUS PANEL DEVICES

.1 Ethernet Switch

- .1 Install Ethernet switch in RTU control panel
- .2 Eight (8) port Ethernet switch
- .3 Two (2) 100 FX multimode ST connectors
- .4 Power Supply: 24 VDC
- .5 Mounting: DIN rail
- .6 Approved Product: Ruggedcom i800

.2 Pilot Lights

- .1 Provide LED transformer type pilot lights for extended lamp life, oil tight, push to test, complete with appropriate colour lenses. Normal colours used are run=red, stop=green, fault=amber.

.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.
- .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 for each load or loop powered from the marshalling panels.

.4 Nameplates

- .1 Refer to Section 29 05 00 - Common Work Instrumentation.

Part 3 Execution

3.1 REFERENCES - GENERAL

.1 Refer to Section 29 05 00 - Common Work Instrumentation.

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END OF SECTION

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Part 1 General

1.1 REFERENCES - GENERAL

.1 Refer to Section 29 05 00 - Common Work - Instrumentation and Controls.

Part 2 Products

2.1 POWER SUPPLY AND CONDITIONING EQUIPMENT

.1 General

.1 Provide all DC power supplies as required for all instrument circuits. All circuits are to be powered from the PLC control panels. Power supplies to be Hammond, G.F.C., Weidmuller or approved equal, complete with an over-voltage protection module.

.2 DC power supplies shall be fully redundant. Individual fault signals from each power supply shall be monitored by the PLC for alarming.

.3 Unless otherwise required, all DC power supplies to be rated 28 VDC, adjustable plus or minus five (5) percent, and set to provide 26.4 V on the panel direct current bus. Size the power supply for two (2) times the connected load, minimum size is 2 amps.

2.2 NOISE SUPPRESSION

.1 Provide TVSS units in each panel to power AC I&C loads. Power conditioners are to be SquareD, Cutler Hammer, Leviton.

2.3 UPS POWER SUPPLY

.1 Two (2) sources of 120 VAC power will be supplied to each control panel: UPS power for critical loads and non-UPS power for non-critical loads.

.2 Control and operator interface system hardware including but not limited to programmable logic controllers (PLCs), PLC I/O racks, PLC communication modules, wireless radios, auto dialers, and industrial network switches shall be powered from the UPS.

.3 VAC instrument power, non-critical loads include control panel interior lights and receptacles shall be powered from the non-UPS power.

.4 Provide the total expected critical and non-critical loads fed from each control panel as a Shop Drawing submittal so that the external power sources and UPS can be properly sized.

.5 Mount UPS control panel.

.6 Provide plug and cap wiring to allow for by-passing the UPS.

.7 Batteries sized for fifteen (15) minutes of runtime.

.8 UPS: Eaton PW9130.

Part 3 Execution

3.1 REFERENCES - GENERAL

.1 Refer to Section 29 05 00 - Common Work - Instrumentation and Controls, Part 3.

END OF SECTION

Part 1 General

1.1 REFERENCES – GENERAL

.1 Refer to Section 29 05 00 Common Work Instrumentation.

1.2 RTU I-O INDEX

.1 The following spreadsheet gives an itemized list of the new Remote Terminal Unit (RTU) System inputs and outputs. It is intended to serve as an aid for determining the cabling requirements for the Work specified in this Division.

Part 2 Products

.1 Not used

Part 3 Execution

.1 Not used

END OF SECTION

RTU I/O INDEX

			DESCRIPTION			I/O SPECIFICATION										
RECORD NO.	REV. N0.	TAG NAME	FUNCTION	SERVICE	P&ID DRAWING	ENG. UNITS	SCALE LOW	SCALE HIGH	ALARMS LOW	ALARMS HIGH	RTU CABINET	I/O TYPE	I/O ADDRESS	I/O EXPANSION CARD	I/O TERMINAL BLOCK	I/O POINT
0001	0	0801-JA-001	Power Fail Alarm	120 VAC Power						On	RTU-0801	DI	10001	0	P7	0
0002	0	0801-JA-002-A	Power Fail Alarm	24 VDC Power Supply 1						On	RTU-0801	DI	10002	0	P7	1
0003	0	0801-JA-002-B	Power Fail Alarm	24 VDC Power Supply 2						On	RTU-0801	DI	10003	0	P7	2
0004	0	0801-LA-003	Float Switch	Building Basement Flood Detection						On	RTU-0801	DI	10004	0	P7	3
0005	0	0801-ZA-005	Security Alarm	Buidling Security System						On	RTU-0801	DI	10005	0	P7	4
0006	0	0801-HS-007	Fill Station Lockout	Fill Station Lockout						On	RTU-0801	DI	10006	0	P7	5
0007	0		Spare								RTU-0801	DI	10007	0	P7	6
0008	0		Spare								RTU-0801	DI	10008	0	P7	7
0009	0	0801-TI-004	Temperature Transmitter	Space Temperature		C	-10	40	4	N/A	RTU-0801	AI	40001	0	P4	0
0010	0	0801-FI-008	Flow Transmitter	Discharge Flow - 100mm Camlock					N/A	N/A	RTU-0801	AI	40002	0	P4	1
0011	0	0801-FI-009	Flow Transmitter	Discharge Flow - 100mm Camlock					N/A	N/A	RTU-0801	AI	40003	0	P4	2
0012	0	0801-PI-010	Pressure Transmitter	Service Main		kPa	0	1000	100	800	RTU-0801	AI	40004	0	P4	3
0013	0		Spare								RTU-0801	AI	40005	0	P4	4
0014	0		Spare								RTU-0801	AI	40006	0	P4	5
0015	0		Spare								RTU-0801	AI	40007	0	P4	6
0016	0		Spare								RTU-0801	AI	40008	0	P4	7
0017	0	0802-JA-001	Power Fail Alarm	120 VAC Power						On	RTU-0802	DI	10001	0	P7	0
0018	0	0802-JA-002-A	Power Fail Alarm	24 VDC Power Supply 1						On	RTU-0802	DI	10002	0	P7	1
0019	0	0802-JA-002-B	Power Fail Alarm	24 VDC Power Supply 2						On	RTU-0802	DI	10003	0	P7	2
0020	0	0802-LA-003	Float Switch	Building Basement						On	RTU-0802	DI	10004	0	P7	3
0021	0	0802-ZA-005	Security Alarm	Buidling Security System						On	RTU-0802	DI	10005	0	P7	4
0022	0	0802-HS-007	Fill Station Lockout	Fill Station Lockout						On	RTU-0802	DI	10006	0	P7	5
0023	0		Spare								RTU-0802	DI	10007	0	P7	6
0024	0		Spare								RTU-0802	DI	10008	0	P7	7
0025	0	0802-TI-004	Temperature Transmitter	Space Temperature		C	-10	40	4	N/A	RTU-0802	AI	40001	0	P4	0
0026	0	0802-FI-008	Flow Transmitter	Discharge Flow - 75mm Camlock					N/A	N/A	RTU-0802	AI	40002	0	P4	1
0027	0	0802-PI-009	Pressure Transmitter	Service Main		kPa	0	1000	100	800	RTU-0802	AI	40003	0	P4	2
0028	0		Spare								RTU-0802	AI	40004	0	P4	3
0029	0		Spare								RTU-0802	AI	40005	0	P4	4
0030	0		Spare								RTU-0802	AI	40006	0	P4	5
0031	0		Spare								RTU-0802	AI	40007	0	P4	6
0032	0		Spare								RTU-0802	AI	40008	0	P4	7

Part 1 General

1.1 REFERENCES - GENERAL

.1 Refer to Section 29 05 00 - Common Work Instrumentation.

1.2 INSTRUMENT INDEX

.1 The following spreadsheet gives an itemized list of the instrumentation included as part of this Work.

Part 2 Products

.1 Not used

Part 3 Execution

.1 Not used

END OF SECTION

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INSTRUMENTATION INDEX

RECORD NO.	REV. NO.	TAG NAME	INSTRUMENT TYPE	SERVICE	POWER SUPPLY	CALIBRATED RANGE	MOUNTING	SUPPLIED BY	INSTALLED BY	COMMENTS	SPEC. DATA SHEET	P&ID DRAWING
0001	0	0801-LA-003	Float Switch	Building Basement Flood Detection	24 VDC		Suspended	Contractor	Contractor		I-103	
0002	0	0801-TIT-004	Temperature Transmitter	Building Space	24 VDC	-10 to 40°C	Wall	Contractor	Contractor		I-104	
0003	0	0801-FIT-008	Magnetic Flow Transmiter	Discharge Flow - 75mm Camlock	24 VDC	0 to 50 L/sec	Flange	City	Contractor		I-101	
0004	0	0801-FIT-009	Magnetic Flow Transmiter	Discharge Flow - 50mm Camlock	24 VDC	0 to 50 L/sec	Flange	City	Contractor		I-101	
0005	0	0801-PIT-010	Pressure Transmitter	Service Main	24 VDC	0 to 1000 kPs	25 mm NPT	Contractor	Contractor		I-102	
0007	0	0802-LA-003	Float Switch	Building Flood Detection	24 VDC		Suspended	Contractor	Contractor		I-103	
0008	0	0802-TIT-004	Temperature Transmitter	Building Space	24 VDC	-10 to 40°C	Wall	Contractor	Contractor		I-104	
0009	0	0802-FIT-008	Magnetic Flow Transmiter	Discharge Flow - 75mm Camlock	24 VDC	0 to 50 L/sec	Flange	City	Contractor		I-101	
0010	0	0802-PIT-009	Pressure Transmitter	Service Main	24 VDC	0 to 1000 kPs	25 mm NPT	Contractor	Contractor		I-102	

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Supply and install Remote Terminal Unit (RTU) based control panels for the public water service outlets.

.1 Coordinate and cooperate with other Contractors, suppliers, the Contract Administrator, and the City staff during system programming, start-up, and commissioning of the complete control system and associated field devices and wiring.

.2 Provide complete RTU programming, start-up and commissioning.

1.2 SUBMITTALS

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

.2 Include the following.

.1 Control panel layout and schematics.

.2 Installation details.

.3 Loop diagrams.

Part 2 Products

2.1 REMOTE TERMINAL UNITS

.1 General

.1 Wall mounted NEMA 12 enclosures.

.2 Cable entry via bottom.

.3 Terminate all field wiring on terminal blocks in RTU control panels.

.4 Provide fused terminal blocks for all field power sourced from the control panel.

.5 Label all wiring.

.6 Instrument loop drawings to include wiring colours.

.2 RTU Processor

.1 Approved Product: Schneider Electric Scadapack 357E.

.3 RTU Expansion I/O Hardware

.1 Approved Product: Schneider Electric Scadapack E 5606.

.4 Power Supply

.1 Panel shall contain 24VDC power supply.

.2 Panel shall contain a UPS.

.3 Panel shall accept a single 120VAC, 15 amp circuit and a 120 VAC UPS circuit.

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.4 Panel door shall have red “Power On” lights for normal 120 VAC and UPS 120 VAC power.

2.2 PROGRAMMING

.1 Document all programming logic.

.2 Provide the RTU programs to the City after the completion of the commissioning.

.3 Map all PLC I/O from billing system PLC.

Part 3 Execution

3.1 INSTALLATION

.1 Install the hardware in accordance with this and other Divisions of the Specification.

.2 Cooperate with other contractors, suppliers, the City and the Contract Administrator to commission and start-up the system as defined herein.

END OF SECTION

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Part 1. General

1.1 REFERENCES - GENERAL

.1 The Work includes the provision of all instrument specification sheets.

.2 Refer to Section 29 05 00.

1.2 INSTRUMENT SPECIFICATION SHEETS

.1 Provide data sheets to itemize detailed as-built information regarding the Specification of instruments included as part of this Work for each instrument supplied. The data sheets already included in this Section list specific minimum requirements for particular applications.

.2 Use forms in accordance with the ISA Standard S20 as a template for the preparation of the specification sheets.

Part 2. Products

.1 Refer to the following specification sheets.

INSTRUMENT SPECIFICATION NUMBER:	I-101
DEVICE:	Magnetic Flow Meter
TAG:	Refer to Instrument Index, Section 29 40 21
TYPE:	Magnetic Flow Meter
SERVICE:	Potable Water
SIZE AND MATERIAL:	Size as per P&IDs
END CONNECTIONS:	Flanged
LINER MATERIAL:	PFA
ELECTRODES:	Stainless Steel
GROUNDING:	Stainless Steel grounding rings
RANGE:	Refer to Instrument Index, Section 29 40 21
INACCURACY:	±0.2% for flows greater than 0.3 m per second
OUTPUT:	4 to 20 mADC into 500 ohm load Scaled pulse output
POWER SUPPLY:	120 VAC, 60 Hz
INDICATION:	Local indication of flow rate and totalized flow
ELECTRONIC ENCLOSURE:	NEMA 4X. Integral transmitter. Remote wall-mount transmitter when flow tube is more than 1.5 m AFF.
MANUFACTURER AND MODEL:	City Supplied.
MOUNTING:	Install with the manufactures recommendations for straight pipe lengths on the upstream and downstream sides of the flow tube.

INSTRUMENT SPECIFICATION NUMBER:	I-102
DEVICE:	Pressure Transmitter
TAG:	Refer to Instrument Index, Section 29 40 21
SERVICE:	Potable Water
PROCESS CONNECTIONS:	0.50 inch NPTF
RANGE:	Refer to Instrument Index, Section 29 40 21
INACCURACY:	±1% of span or lower
OUTPUT:	4 to 20 mA DC into 500 OHM load
POWER SUPPLY:	Loop powered 24 VDC
CONSTRUCTION:	316 SST
ELECTRONIC ENCLOSURE:	EEMAC/NEMA 4X
LOCAL DISPLAY:	Unit mounted LCD Display
ACCESSORIES:	Block & bleed manifold
MANUFACTURER AND MODEL:	Siemens

INSTRUMENT SPECIFICATION NUMBER:	I-103
DEVICE:	Float Switch
TAG:	Refer to Instrument Index, Section 29 40 21
SERVICE:	Refer to Instrument Index and P&ID Diagrams
OUTPUT:	SPDT Contacts
ENCLOSURE:	Polypropylene float casing with pre-terminated signal cable
MOUNTING:	Provide strain relief-type connectors to suspend float at desired location. Fabricate mounting brackets from 316 SS. Provide anti-sway rings to prevent sway in turbulent tanks.
MANUFACTURER AND MODEL:	Flygt ENM-10

INSTRUMENT SPECIFICATION NUMBER:	I-104
DEVICE:	Temperature
TAG:	Refer to Instrument Index, Section 29 40 21
SERVICE:	Space temperature
SPAN:	-10 to 40°C
SENSOR:	3 wire RTD, PT 100
INACCURACY:	±0.1% of span
OUTPUT:	4 to 20 mA DC into 500 OHM
POWER SUPPLY:	Loop powered 24 VDC
CONSTRUCTION:	Stainless steel wetted parts
ELECTRONIC ENCLOSURE:	Universal head, aluminum alloy
LOCAL DISPLAY:	Head mounted LCD Display
ACCESSORIES:	Mounting bracket
MANUFACTURER AND MODEL:	Siemens

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for the supply of all materials, labor, process and equipment for the installation, testing and putting into satisfactory operation of all public water service outlet piping, fittings and appurtenances as shown on the drawings.

1.2 PIPE IDENTIFICATION

.1 Follow City of Winnipeg Standards for pipe identification.

Part 2 Products

2.1 PIPE AND FITTINGS

.1 This specification may include materials that are not required for the specific project or provide alternatives, which may be considered. The drawings take precedence for dictating piping for specific uses or applications unless otherwise indicated.

.2 New pipe and fittings shall match the existing materials.

2.2 EXTERIOR FINISHES – SHOP APPLIED

.1 Provide products with factory applied coatings and finishes.

2.3 PIPE SUPPORTS AND HANGERS

.1 Design hangers and supports to provide sufficient support to retain the piping system without exerting undo strain on the pipe, the attached equipment or the supporting structure. Design hangers and supports to the building code and ASME 31.3 at pipe pressure rating.

.2 The systems are to allow for pipe movement related to thermal expansion. Sagging or excessive movement from system operation is not acceptable.

.3 Support systems are to allow for the partial dismantling of the piping system especially around equipment or fittings without having to provide supplementary supports. Specific supplementary supports of fittings such as valves are to be provided in addition to piping supports using the support provisions of the fitting.

.4 Provide piping supports, whether indicated on the Drawings or not, where necessary, to the satisfaction of the Contract Administrator. Hot-dip galvanize all piping supports after fabrication with galvanized fastenings as a minimum standard.

.5 Provide painting and protective coating. Exterior ferrous supports shall be hot-dipped galvanized, unless otherwise noted.

.6 Contractor to provide pipe support drawing. Details to include location, size and type of supports. Pipe supports shown on drawings are a minimum requirement. All appropriate supports shall be detailed, supplied and installed by the Contractor.

2.4 FITTINGS

.1 Fittings for piping systems to be compatible for the piping material and service.

.2 Provide fittings with a wall thickness equal to or greater than the pipe.

.3 Provide eccentric reducers in horizontal lines with the flat side on top, unless shown otherwise. Provide concentric reducers in vertical lines unless indicated otherwise.

.4 Provide long radius elbows unless otherwise shown. Provide smooth flow carbon or stainless steel elbows 350 mm and less. Provide mitred elbows greater than 350 mm unless otherwise shown or specified.

2.5 FLEXIBLE JOINT SPECIFICATION

.1 Flexible expansion and deflection joint shall be installed in the location shown on the Drawings.

.2 Material: Ductile iron to ANSI/AWWA C153/A21.53.

.3 Joint shall be able to expand and deflect simultaneously at least 100 mm expansion and 15º deflection.

.4 Acceptable products: "Ex-Tend 200" and "Flex-Tend", as manufactured by EBAA Iron Sales Inc. - 800-433-1716, with flanged restrained connection.

2.6 TAPPING FOR PRESSURE GAUGES OR INSTRUMENTS

.1 Provide a tapping compatible with pipe material for instrument connections or sampling points complete with local isolation ball valve.

Part 3 Execution

3.1 GENERAL PIPE INSTALLATION AND LAYOUT

.1 Contractor must verify all dimensions and new equipment locations in the field prior to the start of work. Install all piping and appurtenances square, straight, plumb and level.

.2 Carefully position pipe and fittings without strain or deflection and using proper appliances.

.3 The detailed layout of the piping, etc. is the responsibility of the Contractor.

.4 Where piping is not shown or is shown diagrammatically, install the pipes neatly to suit the structure, subject to the Contract Administrator's prior approval.

.5 Bolt piping to equipment before grouting piping into walls.

.6 Use appropriate bending tools (cold bending only) for copper pipe to produce smooth, even curves. Review and be familiar with all applicable codes pertaining to the works. The Contractor will be responsible to comply with all applicable Codes whether there has been a specific reference to the Code or not.

.7 Before commencing installation, determine specific piping support and thrust restraint requirements to suit the materials of construction, the piping materials and the operating conditions. Prepare and submit a detailed schedule of piping supports for the Contract Administrator's review.

.8 Make adequate provision in piping and pipe support systems for expansion, contraction, slope, and anchorage.

.9 Install expansion joints where shown and at other locations as necessary to allow piping expansion and contraction.

3.2 PIPE SUPPORTS, ANCHORS AND GUIDES

.1 Adequately support all piping, fittings and valves either from the floor.

.2 Design and place supports so that no weight will be taken directly on the equipment sleeve coupling or sleeves through walls, and will be satisfactory for the service intended.

.3 Adequately brace pipes and fittings cast into concrete floors, walls, etc. at each joint, to resist all buoyant or lateral forces imposed on the piping during concrete pours. Replace any piping or fittings found to yield from their intended position.

END OF SECTION