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 Present shop drawings, product data, samples and mock-ups in SI Metric units.

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

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

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

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

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

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

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

.4 The Contractor shall submit a Shop Drawings delivery schedule and provide Shop Drawings in an orderly sequence so as to cause no delay in the Work. Failure to submit Shop Drawings in ample time is not to be considered sufficient reason for an extension of Contract time and no claim for extension by reason of such default will be allowed. Jointly prepare a schedule fixing the dates for submission and return of Shop Drawings.

.5 The Contract Administrator will review and return Shop Drawings in accordance with the schedule agreed upon or otherwise with reasonable promptness so as to cause no delay in the Work.

.6 Submit three (3) copies of white prints, plus one (1) copy of reproducibles, and three (3) copies of all fixture cuts and brochures.

.7 Shop Drawing reviews by the Contract Administrator is solely to ascertain conformance with the general design concept. Responsibility for approval of detail design inherent in Shop Drawings rests with the Contractor and review by the Contract Administrator shall not imply such approval.

.8 Shop Drawings will be returned to the Contractor with one of the following notations:

- .1 When stamped "REVIEWED" or "NO EXCEPTIONS TAKEN", distribute additional copies as required for execution of the Work.
- .2 When stamped "REVIEWED AS MODIFIED" or "MAKE NOTED CORRECTIONS", ensure that all copies for use are modified and distributed, same as specified for "REVIEWED".
- .3 When stamped "REVISE AND RESUBMIT", make the necessary revisions, as indicated, consistent with the Contract Documents and submit again for review.
- .4 When stamped "NOT REVIEWED" or "REJECTED", submit other Drawings, brochures, etc., for review consistent with the Contract Documents.
- .5 Only Shop Drawings bearing "REVIEWED", "NO EXCEPTIONS TAKEN", "MAKE NOTED CORRECTIONS", or "REVIEWED AS MODIFIED" shall be used on the Work unless otherwise authorized by the Contract Administrator.

.9 After submittals are stamped "REVIEWED", "NO EXCEPTIONS TAKEN", "MAKE NOTED CORRECTIONS" or "REVIEWED AS MODIFIED", no further revisions are permitted unless re-submitted to the Contract Administrator for further review.

.10 Any adjustments made on Shop Drawings by the Contract Administrator are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as such in writing prior to proceeding with fabrication and installation of Work.

.11 Make changes in Shop Drawings, which the Contract Administrator may require, consistent with Contract Documents. When re-submitting, notify the Contract Administrator in writing of any revisions other than those requested by the Contract Administrator.

.12 Shop Drawings indicating design requirements not included in the Contract Documents require the seal of a qualified Professional Engineer, registered in the Province of Manitoba. Calculations shall be submitted for review, if requested, and sealed by a qualified Professional Engineer.

.13 Only two (2) reviews of Shop Drawings will be made by the Contract Administrator at no cost. Each additional review will be charged to the Contractor at the Contract Administrator's scheduled rates. The Contract Administrator's charges for the additional Work will be deducted from the Contractor's Progress Certificates.

.14 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data and sample.

.5 Other pertinent data.

1.3 PROCEDURES

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Within the text of the specifications, reference may be made to the following standards:

.1 ACI – American Concrete Institute
.2 ANSI - American National Standards Institute
.3 ASTM - American Society for Testing and Materials International
.4 CEC - Canadian Electrical Code (published by CSA)
.5 CEMA - Canadian Electrical Manufacturer's Association
.6 CISC - Canadian Institute of Steel Construction
.7 CPMA - Canadian Paint Manufacturer's Association
.8 CGSB - Canadian General Standards Board
.9 CSA - Canadian Standards Association
.10 ICEA - Insulated Cable Engineers Association
.11 IEEE - Institute of Electrical and Electronic Engineers
.12 MPI – Master Painters Institute
.13 NBC - National Building Code
.14 NEMA - National Electrical Manufacturers Association
.15 NETA – Inter National Electrical Testing Association
.16 RSIC – Reinforcing Steel Institute of Canada
.17 SSPC - The Society for Protective Coatings
.18 ULC - Underwriters' Laboratories of Canada

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

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

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

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

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

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies may be engaged by the City for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the City. Costs of additional tests required due to defective Work shall be paid by the Contractor.

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

.3 Employment of inspection/testing agencies does not relieve or 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 the Contract Administrator at no cost to the City. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

.1 The City, the Contract Administrator, and other authorities having jurisdiction shall have access to the work.

1.4 REJECTED WORK

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

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

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

1.5 REPORTS

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

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

1.2 CONTRACTOR'S OFFICE

.1 Accommodation for the Contractor's office, plant, tools, equipment, and materials (including fuel) shall be the responsibility of the Contractor. Such accommodation at the Site shall be located after consultation with the Contract Administrator. The Contractor shall be responsible for the protection of its plant, tools, equipment, and materials stored on-site. Materials stored on the City's premises shall be neatly stacked and protected from the weather.

.2 The Contractor shall confine their activities to the minimum area necessary for undertaking and completing the Work. Material and equipment storage areas shall be at locations acceptable to the Contract Administrator.

.3 The Contractor's construction activities shall not encroach or enter onto private property without written consent from the owner of the property concerned. The Contractor shall provide the Contract Administrator with a copy of the written agreement with the property owner.

1.3 LAYDOWN AND STORAGE

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

.2 Designated areas shall be used for storage of flammable and combustible liquids and gases, which shall be properly equipped for grounding and bonding when refueling vehicles and equipment. Spills shall be contained as required by Provincial Regulations.

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

.1 Flammable liquids are stored or handled.

.2 Temporary oil or gas fire equipment is used.

.3 Welding or flame cutting is performed.

1.4 TEMPORARY CONSTRUCTION MATERIALS

.1 Tarpaulins and plastic coverings shall consist of fire retardant materials, which are UL or FM listed or approved, or which have passed the Large Scale Test specified in NFPA-701.

1.5 TOILETS AND WASHROOMS

.1 Washroom facilities are available at the SEWPCC for the Contractor's use. Contractor is to ensure that washrooms are kept clean.

1.6 DISPOSAL OF WASTE MATERIALS

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

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

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

1.7 PARKING

.1 The Contractor parking shall be as designated by the Contract Administrator. The parking shall be arranged and maintained so that is does not disrupt the plant's operation and access for the City's operations and maintenance staff.

1.8 USE OF PERMANENT WATER SUPPLY, HEAT, POWER LIGHT, AND TELEPHONE

.1 The Contractor shall not make use of permanent water supply, heat, power, or telephone inside the SEWPCC without permission from the Contract Administrator.

1.9 SITE SECURITY

.1 The exterior of the SEWPCC facility is not secure. The City does not normally provide security forces to the plant Site. Contractor is responsible for all material and equipment stored on the site.

1.10 SCAFFOLDING

.1 Provide and maintain adequate scaffolding as required. Scaffolding is to be rigid, secure, and constructed to ensure adequate safety for workers. Erect without damage to the building or finishes.

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

1.11 HOISTING

.1 Use of the City's hoist to lower material into the dry well will be permitted. Coordinate with Site personnel and meet all Site safety requirements.

1.12 FACILITY ELECTRICAL SUPPLY AND DISTRIBUTION

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

1.13 ACCESS TO WORK

.1 Access to the facility will be during the period between 7:45 a.m. and 3:45 p.m., Monday to Friday, except holidays.

.2 The Contract Administrator shall be informed at least 24 hours in advance where the Contractor intends to carry out Work outside normal working hours and no such Work shall be done without the Contract Administrator's approval except when the Work is unavoidable or absolutely necessary for:

.1 Preventing injury to any person or saving the life of any person; or

.2 Preventing damage to property where the circumstances placing the property in danger could not reasonably have been foreseen and where the immediate carrying out of such Work is necessary in order to prevent damage to that property; in which case the Contractor shall immediately advise the Contract Administrator in writing that such Work outside the normal working hours is necessary and of the reasons for this. He shall also state the nature and extent of Work to be carried out.

.3 The Contractor is to coordinate activities with City personnel and any other contractors that may be working concurrently on the Site.

1.14 WARNINGS AND TRAFFIC SIGNS

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 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 Provide hoarding and ventilation for the Inlet Structure as required to perform the work..

1.3 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around open shafts, and open edges of floors.

.2 Ensure that access to City of Winnipeg equipment is not impeded for SEWPCC maintenance or operations personnel, except as approved by the Contract Administrator.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

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

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

1.2 QUALITY

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

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

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

.4 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 METRIC PROJECT

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

.2 During construction, when specified metric elements are unattainable at the time they are required to meet the construction schedule, the Contractor shall notify the Contract Administrator in writing and suggest alternative substitutions. Costs due to these substitutions shall be borne by the Contractor.

1.4 STORAGE, HANDLING AND PROTECTION

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

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

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

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

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

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

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

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

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

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

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

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

1.7 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.8 REMEDIAL WORK

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

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

1.9 LOCATION OF FIXTURES

.1 Inform the Contract Administrator of conflicting installation. Install as directed.

1.10 FASTENINGS

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

.2 Prevent electrolytic action between dissimilar metals and materials.

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

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

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

1.11 PROTECTION OF WORK IN PROGRESS

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 WORKMANSHIP

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

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

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

END OF SECTION

Part 1 General

1.1 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.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching to complete Work.

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

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

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

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

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

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

.8 Restore work with new products in accordance with requirements of Contract Documents.

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

.10 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material to the full thickness of the construction element.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

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

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

.3 Provide on-site containers for collection of waste materials and debris.

.4 Dispose of waste materials and debris off site.

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

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

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

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

.1 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) advance copies of the manuals shall be submitted prior to Substantial Performance of the Work for review and comments. After review, four (4) copies of the final manuals shall be submitted. Each copy shall be clearly titled to show all of the information required by the Specifications as well as operational information including: the item of Work concerned, a City's Contract number, the name and address of the Contractor, the issue date, operational information on equipment, cleaning and lubrication schedules, filters, overhaul and adjustment schedules.

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

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

.8 Pay costs of transportation.

1.2 OPERATING AND MAINTENANCE MANUALS

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

.2 For the guidance of the City's operating and maintenance personnel, the Contractor shall prepare O&M Manuals for the Work, describing in detail the construction of each part of the Work and the recommended procedure for operation, servicing and maintenance.

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

.4 In addition to information called for in the Specifications, include the following:

- .1 Title sheet, labelled "Operation and Maintenance Instructions", and containing project name and date.
- .2 List of contents.
  - .1 Brochures/catalogue excerpts of all components of the Work.
  - .2 Complete set of equipment and assembly drawings
  - .3 Installation, start-up, O&M Manuals
  - .4 Any specific product or maintenance manual requirements from the Specifications

.5 Reviewed Shop Drawings of all equipment.

.6 As-Constructed Drawings of all installations.

.7 Names, addresses, and telephone numbers of all major sub-contractors and suppliers.

.8 The Contractor shall modify and supplement the manual as required by the Contract Administrator.

.9 Format to be as follows:

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, 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 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 RECORD DRAWINGS

.1 After award of Contract, the Contract Administrator will provide a complete set of Drawings for the purpose of maintaining Project Record Drawings. Accurately record significant deviations from Contract Documents caused by Site conditions and changes ordered by the Contract Administrator. Update daily.

.2 Record locations of concealed elements of mechanical and electrical services.

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

.4 On completion of the Work, two weeks prior to final inspection, submit Record Drawings to Contract Administrator for review.

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 All codes and standards referenced in this section refer to the latest edition thereof.

.2 Canadian Standards Association (CSA International)

- .1 CSA-A231/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN3-G40.21 Structural Quality Steels
- .3 CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
- .4 CSA O121, Douglas Fir Plywood.
- .5 CSA O151, Canadian Softwood Plywood.
- .6 CAN/CSA-O325., Construction Sheathing.
- .7 CSA O437 Series-, Standards for OSB and Waferboard.
- .8 CSA S269.1, Falsework for Construction Purposes.
- .9 CAN/CSA S 269.2, Access, Scaffolding for Construction Purposes
- .10 CAN/CSA-S269.3, Concrete Formwork, National Standard of Canada

.3 American Concrete Institute (ACI)

- .1 ACI SP-4 Formwork for Concrete

1.2 SUBMITTALS

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

.2 Submit shop drawings for formwork and falsework.

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

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

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

.5 Indicate sequence of erection and removal of formwork/falsework as directed by the Contract Administrator.

.6 When slip forming and flying forms are used, submit details of equipment and procedures for review by the Contract Administrator.

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 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.

.3 Form liner:

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

.4 Form release agent:

.1 Non-staining compound, not injurious to the concrete, effective in preventing adhesion of concrete to forms and providing clean, oil and grease free concrete surfaces suitable for proper bonding of coatings to concrete :

.1 Sealtight-Duogard by W.R. Meadows

.2 Rich-Cote by Richmond Screw Anchor Co.

.3 Sternson C.R.A. by Sternson Ltd.

If concrete is to remain exposed, use the same form releasing agent for all applications

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

Part 3 Execution

3.1 Examination

.1 Prior to commencing installation, thoroughly examine other work upon which this Work is dependent. Report deficiencies discovered and propose adjustments to the Contract Administrator and obtain written authorization before proceeding.

3.2 FABRICATION AND ERECTION

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

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

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

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

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

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

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

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

.9 Align form joints and make watertight. Keep form joints to minimum.

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

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

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

.13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

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

3.3 REMOVAL AND RESHORING

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

- .1 3 days for walls and sides of beams.
- .2 5 days for columns.
- .3 14 days or until the concrete has attained the designed minimum 28 day compressive strength for beam soffits, slabs, decks and other structural members.
- .4 1 day for footings and abutments.

.2 Remove forms and form screws with care to prevent marring of the concrete surface and to leave neat holes. Plug holes using grey plastic buttons or grout and filling to ½" from the surface.

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

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

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

3.4 CLEANING

.1 Thoroughly clean concrete surfaces and remove fins and laitance

.2 Clean up all debris to the satisfaction of the Contract Administrator.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes and standards referenced in this section refer to the latest edition thereof.

.2 American Concrete Institute (ACI)

.1 ACI 315R Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.3 American National Standards Institute/American Concrete Institute (ANSI/ACI)

.1 ANSI/ACI 315 Details and Detailing of Concrete Reinforcement.

.4 American Society for Testing and Materials (ASTM)

.1 ASTM A 775/A 775M, Specification for Epoxy-Coated Reinforcing Steel Bars.

.5 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1 / A23.2 Concrete Materials and Methods of Concrete Construction / Methods of test and Standard Practices for Concrete.

.2 CAN3-A23.3 Design of Concrete Structures.

.3 CSA G30.3 Cold Drawn Steel Wire for Concrete Reinforcement.

.4 CSA G30.5 Welded Steel Wire Fabric for Concrete Reinforcement.

.5 CSA G30.14 Deformed Steel Wire for Concrete Reinforcement.

.6 CSA G30.15 Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

.7 CAN/CSA-G30.18 Billet-Steel Bars for Concrete Reinforcement.

.8 CAN/CSA-G40.21 Structural Quality Steels.

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

.10 CSA W186 Welding of Reinforcing Bars in Reinforced Concrete Construction

.6 Reinforcing Steel Institute of Canada (RSIC)

.1 Reinforcing Steel Manual of Standard Practice

1.2 SHOP DRAWINGS

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00- Submittal Procedures.

.2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by the Contract Administrator, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada, and ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.3 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated.

Part 2 Products

2.1 MATERIALS

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

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

.3 Cold-drawn annealed steel wire ties: to CSA G30.3.

.4 Deformed steel wire for concrete reinforcement: to CSA G30.14.

.5 Welded steel wire fabric: to CSA G30.5. [Provide in flat sheets only.]

.6 Welded deformed steel wire fabric: to CSA G30.15. [Provide in flat sheets only.]

.7 Epoxy coating of non-pre-stressed reinforcement: to ASTM A 775/A 775M.

.8 Galvanizing of non-pre-stressed reinforcement: to CSA G164, minimum zinc coating 610 g/m^2.

.9 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

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

.11 Plain round bars: to CAN/CSA-G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, ACI 315R and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.

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

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

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

2.3 SOURCE QUALITY CONTROL

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

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

Part 3 Execution

3.1 FIELD BENDING

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

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

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

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

.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

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

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

.5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.3 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 Codes and Standards referenced in this section refer to the latest edition thereof.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.

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

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

.4 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.5 ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.6 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.3 Canadian General Standards Board (CGSB)

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

.4 Canadian Standards Association (CSA)

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

.2 CAN3-A266.4, Guidelines for the Use of Admixtures in concrete.

.3 CSA A 283, Qualification Code for Concrete Testing Laboratories

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

1.2 ACRONYMS AND TYPES

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

.1 Type GU or GUb – General use cement

.2 Type HS or HSb – High Sulphate Resistant cement.

1.3 SUBMITTALS

.1 Shop Drawings

.1 Submit placing drawings prepared in accordance with drawings to clearly show size, shape, location and necessary details of reinforcing.

.2 Submit testing results and reports for review by Contract Administrator and do not proceed without written approval when deviations from mix design or parameters are found.

.3 Certificates:

.1 Minimum 4 weeks prior to starting concrete work submit to Contract Administrator manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Portland cement.

.2 Blended hydraulic cement.

.3 Supplementary cementing materials.

.4 Grout.

.5 Admixtures.

.6 Aggregates.

.7 Water.

.8 Waterstops.

.9 Waterstop joints.

.10 Joint filler.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1/A23.2.

1.4 SOURCE QUALITY CONTROL

.1 Have all concrete produced and delivered by a ready mixed concrete producer approved by the City.

1.5 QUALITY ASSURANCE

.1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Contract Administrator’s approval for following items:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed to Contract Administrator and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Contract Administrator.

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

.3 Waste Management and Disposal:

.1 Divert unused concrete materials from landfill to local facility approved by Contract Administrator.

.2 Provide an appropriate area on the job site where concrete trucks can be safely washed.

.3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Contract Administrator.

.4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Hydraulic Portland Cement to CAN/CSA –A3001, Type GU

.2 Hydraulic Cement: to CAN/CSA-A3001, Type HS

.3 Blended Hydraulic Cement: to CSA –A3001, Type HSb

.4 Water: to CAN/CSA-A23.1.

.5 Aggregates: to CSA-A23.1.

.6 Coarse aggregates to be normal density to CSA-A23.1/A23.2.

.7 Admixtures:

.1 Air entraining admixture: to ASTM C260.

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

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

.9 Water-Stop: Volclay Rx, expanding joint waterstop or approved equivalent in accordance with B6.

.10 Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D1751.

.11 Bonding Agent: Daraweld C or approved equivalent in accordance with B6.

.12 Corrosion Inhibiting Primer: CIMGUARD 20 or approved equivalent in accordance with B6.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CSA-A23.1/A23.2, Alternative 1 to give following quality and yield for all concrete:

.1 Cement:

.1 Beam at top of the Inlet Structure Roof and Drywell Isolation Wall: Type GU

.2 Inside the Inlet Structure: Type HSb

.2 Minimum compressive strength at 28 days: 35 MPa.

.3 Class of exposure:

.1 Beam at top of the Inlet Structure Roof: F-2

.2 Drywell Isolation Wall: N

.3 Inside the Inlet Structure: A-1

.4 Nominal size of coarse aggregate:

.1 Beam at Top of the Inlet Structure Roof and Drywell Isolation Wall: 20 mm

.2 All other Locations: 10 mm

.5 Slump at time and point of discharge: 100 mm.

.6 Air content: 5 to 8 %.

.7 Maximum Flyash Substitution to be 20% by weight.

.8 Chemical admixtures: admixtures in accordance with ASTM C494.

Part 3 EXECUTION

3.1 PREPARATION

.1 Obtain Contract Administrator’s approval before placing concrete. Provide 24 h notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 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.

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

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

.6 Prior to placing of concrete obtain Contract Administrator’s approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

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

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

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

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

.2 Sleeves and inserts.

.1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Contract Administrator.

.2 Where approved by Contract Administrator, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Contract Administrator.

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

.4 Check locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.2 With approval of Contract Administrator, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be to manufacturer’s recommendations.

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

.4 Set bolts and fill holes with shrinkage compensating 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 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.5 Finishing.

.1 Ensure concrete work is sound, watertight, repaired, made good where necessary, and finished in accordance with CAN/CSA – A23.1 / A 23.2 and acceptable to the Contract Administrator. Finish concrete in accordance with CSA-A23.1/A23.2.

.2 Provide a “non-slip” light hair broom finish on all exterior concrete surfaces, unless noted otherwise on the drawings, and to the satisfaction of the Contract Administrator.

.3 Maintain moist curing by approved means in accordance with CAN/CSA – A23.1/A23.2 and the following:

.1 Hot weather: Accomplish curing and protection in accordance with ACI 305.

.2 Cold weather: Accomplish curing and protection in accordance with ACI 306.

.4 Use procedures acceptable to Contract Administrator or those noted in CSA-A23.1/A23.2, to remove excess bleed water. Ensure surface is not damaged.

.5 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges 150 mm and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.

.6 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

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

.6 Waterstops.

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in such a 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 Contract Administrator.

3.3 SITE TOLERANCE

.1 Concrete tolerance in accordance with CSA-A23.1, Straight Edge Method F_F =30, F_L = 20.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1/A23.2, and Section 01 45 00 - Quality Control.

.2 Contract Administrator will pay for costs of tests. Costs of retesting due to deficient work will be paid for by contractor, by credit change order.

.3 Contract Administrator may take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.

.5 Provide Certificate of Field Quality Inspection and Testing to the Contract Administrator for inclusion in Commissioning Manual.

.6 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 All codes and standards referenced in this section refer to the latest edition thereof.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-A23.1 Concrete Materials and Methods of Concrete Construction

.3 American Society for Testing of Materials (ASTM)

.1 ASTM C 1107 – Standard specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)

.2 ASTM C 881 – Standard for Specification for Epoxy-Resin-Base Bonding Systems for Concrete

1.2 SUBMITTALS

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

.2 Shop Drawings

.1 Submit shop drawings for all non-shrink grouts and mortars. The shop drawings shall include product description and storage, handling, mixing, and placing instructions or recommendations.

.3 Certificates of Compliance

.1 Certificates of compliance shall be submitted for all non-shrink grouts and mortars stating that the material furnished meets the specified requirements.

1.3 DELIVERY, STORAGE AND HANDLING

.1 All non-shrink grouts and mortars shall be furnished and stored in the manufacturer's original containers.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Non-Metallic, non-shrinking, sulphate resistant, pre-blended grout.

.1 Acceptable products:

.1 Sika Grout 212R by Sika Canada Inc.

.2 Masterflow 928 by Master Buildings Technologies Ltd.

.3 Or approved equal in accordance with B6.

.2 Epoxy grout for minor concrete repairs and dowel anchorage:

.1 High modulus, two-component, moisture insensitive, 100 percent solids, thermosetting modified polyamid epoxy compound. The consistency shall be a

paste form capable of not sagging in horizontal or overhead anchoring configurations. The deflection temperature should be in excess of 130 degrees F. Material shall confirm to ASTM C881 Type 1, Grade3.

.2 Acceptable products:

.1 Sika Corporation Hi-Mod Series

.2 Master Builder Concresive 1440 Series

.3 Adhesive Technology Corporation Solidbond 200

.4 Or approved equal in accordance with B6.

.3 Epoxy grout for pressure grouting/ crack injection:

.1 High Modulus, two-component, moisture insensitive, injection grade, 100 percent solids, blend of epoxy-resin compounds. Material shall confirm to ASTM C881 Type 1 Grade 1.

.2 Acceptable products:

.1 Sika Corporations Sikadur 52

.2 Master Builders Concresive LPL,

.3 Adhesive Technology Corporation SLV 300 Series.

.4 Or approved equal in accordance with B6.

.4 Water: Clean and free from deleterious substances

2.2 MANUFACTURE

.1 Non-Metallic Non-Shrinking Grout: Factory pre-mixed requiring only water addition in the field

.2 Epoxy Grout

.1 Three Component epoxy resin system

.1 Two liquid epoxy components

.2 One inert aggregate filler component

.2 Each component furnished in a separate package for mixing at jobsite.

Part 3 EXECUTION

3.1 PREPARATION

.1 Non-Metallic Non-Shrinking Grout

.1 Clean concrete surface to receive grout

.2 Saturate concrete surface with water for 24 hours prior to grouting

.2 Epoxy Grout

.1 Apply only to clean dry, sound surface

3.2 APPLICATION

.1 Non-Metallic, Non –Shrinking Grout

.1 Mix in a mechanical mixer, using water as per the manufacturer's instructions

.2 Place in accordance with the manufacturer's instructions

.3 Completely fill all spaces and voids

.4 Protect against rapid moisture loss by covering wih wet rags or polyethylene sheets

.5 Wet cure grout for 7 days, minimum

.2 Epoxy Grout

.1 Mix and place in accordance with manufacturer's instructions

.2 Completely fill all cavities and spaces around dowels and anchors without voids

.3 Provide forms where required

.4 Obtain manufacturer's field technical assistance as required to ensure proper placement.

3.3 SCHEDULE

.1 Non-Metallic, Non-Shrinking Grout

.1 General use

.2 Concrete repairs as indicated on the drawings

.2 Epoxy Grout

.1 Grouting of dowels and anchor bolts into concrete

.2 Concrete repairs as indicated on the drawings

3.4 CLEANING

.1 Thoroughly clean concrete surfaces.

.2 Clean up all debris to the satisfaction of the contract Administrator.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes and standards referenced in this section refer to the latest edition thereof.

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

- .1 ASTM A36/A36M Specification for Structural Steel.
- .2 ASTM A193/A193M Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
- .3 ASTM A307 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .4 ASTM A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- .5 ASTM A325M Specification for High-Strength Bolts for Structural Steel Joints Metric.
- .6 ASTM A490M Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).

.3 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-85.10 Protective Coatings for Metals.

.4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

- .1 CISC/CPMA 1 Quick-Drying, One-Coat Paint for Use on Structural Steel.
- .2 CISC/CPMA 2 Quick-Drying, Primer for use on Structural Steel.

.5 Canadian Standards Association (CSA International)

- .1 CAN/CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CAN/CSA-S16 Limit States Design of Steel Structures.
- .4 CAN/CSA-S136 Cold Formed Steel Structural Members.
- .5 CSA-S136.1Commentary on CSA Standard S136.
- .6 CSA W47.1 Certification of Companies for Fusion Welding of Steel Structures.
- .7 CSA W48 Filler Metals and Allied Materials for Metal Arc Welding.
- .8 CSA W55.3 Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .9 CSA W59 Welded Steel Construction (Metal Arc Welding)

.6 Master Painters Institute

- .1 MPI-INT 5.1 Structural Steel and Metal Fabrications.

.7 The Society for Protective Coatings (SSPC)

.1 SSPC SP-6/NACE No. 3 Commercial Blast Cleaning.

1.2 DESIGN REQUIREMENTS

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

.2 Shear connections:

.1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.

.2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.

.3 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Province of Manitoba, Canada for non standard connections.

1.3 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 - Submittal Procedures.

.2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:

.1 Description of methods.

.2 Sequence of erection.

.3 Type of equipment used in erection.

.4 Temporary bracings.

.3 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the province of Manitoba, Canada.

1.4 QUALITY ASSURANCE

.1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

Part 2 Products

2.1 MATERIALS

.1 Structural steel shapes, plates and bars: to CAN/CSA-G40.21 Grade 350W.

.2 Bolts, nuts and washers: to ASTM A325.

.3 Concrete Anchor Bolts, Nuts and Washers: Galvanized/ 304 Stainless Steel Kwik Bolt 3 Expansion Anchor bolts and nuts, manufactured by Hilti (Canada) Ltd., as indicated.

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

.5 Shop paint primer: to CISC/CPMA2-75.

.6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 610 g/m^2.

2.2 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16-01 and in accordance with reviewed shop drawings.

.2 Verify all dimensions on site before preparing shop drawings or proceeding with shop work.

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

.4 The general dimensions and details of the metal fabrications are shown on the drawings where practical. Such details and designs are suggested concepts of design.

.5 Where possible, fit and shop assemble work in largest possible section, ready for erection.

.6 Thoroughly clean all surfaces of rust, scale, grease and foreign matter prior to prime painting or galvanizing.

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

2.3 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 and MPI INT 5.1,except where members to be encased in concrete.

.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC-SP-6.

.3 Apply one coat of primer in shop to steel surfaces, except:

.1 Surfaces to be encased in concrete.

.2 Surfaces and edges to be field welded.

.3 Faying surfaces of friction-type connections.

.4 Below grade surfaces in contact with soil.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

Part 3 Execution

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

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

.4 Touch-up galvanizing with minimum 2 coats of zinc rich primer.

3.2 CONNECTION TO EXISTING WORK

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

3.3 MARKING

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

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

3.4 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16-01 and in accordance with reviewed erection drawings.

.2 Make adequate provision for all erection loads, and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of necessary permanent bracing.

.3 Field connections are to be bolted wherever possible.

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

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

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

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by the Contract Administrator and paid for by the City.

.2 Provide safe access and working areas for testing on site, as required by testing agency.

.3 Submit test reports to Contract Administrator within two weeks of completion of inspection.

3.6 FIELD PAINTING

.1 Paint in accordance with existing site conditions.

.2 Colour to match existing, including:

.1 Handrails – Galvanized / Stainless Steel as noted on the drawings

.2 Ladders – Galvanized

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes and standards referenced in this section refer to the latest edition thereof.

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

.1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Steamless.

.2 ASTM A269, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A270 Specifications for Stainless Steel Bars and shapes .

.4 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40 Anti-corrosive Structural Steel Alkyd Primer.

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

.4 Canadian Standards Association (CSA International)

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

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

.3 CAN/CSA-S16.1, Limit States Design of Steel Structures.

.4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding

.5 CSA W59Welded Steel Construction (Metal Arc Welding).

.6 CSA 47.1 Classification of Companies for Fusion Welding of Steel

1.2 SUBMITTALS

.1 Product Data:

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

.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:

.1 For finishes, coatings, primers and paints.

.2 Shop Drawings

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

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

.3 Include erection drawings, elevations, and details where applicable.

.4 Indicate welded connections using CISC standard welding symbols. Clearly indicate net weld lengths.

.5 Shop drawings and design briefs are to be signed and sealed by a professional engineer registered in the Province of Manitoba.

1.3 QUALITY ASSURANCE

.1 Test Reports: Submit Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Submit Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

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

.2 Storage and Protection:

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

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

Part 2 Products

2.1 MATERIALS

.1 Stainless steel plates, sheets and strips: to ASTM A167 Standard Specifications for Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet, and Strip.

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

.3 Steel pipe: to ASTM A53/A53M Extra Strong galvanized/ Stainless Steel finish as indicated.

.4 Welding materials: to CSA W59.

.5 Welding electrodes: to CSA W48 Series.

.6 Bolts, Nuts and Washers : to ASTM A 320 Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low temperature Service

.7 Concrete Anchor Bolts, Nuts and Washers: Galvanized / 304 Stainless Steel Kwik Bolt 3 Expansion Anchor bolts and nuts, manufactured by Hilti (Canada) Ltd as indicated.

.8 Stainless Steel Bolts : to ASTM F 738 Stainless Steel Metric Bolts, Screws and Studs.

.9 Stainless Steel Nuts: to ASTM F594 Standard Specifications for Stainless Steel Nuts.

.10 Stainless steel tubing: to ASTM A269, Type 302 Seamless welded with AISI No. 4 finish.

.11 Grout: non-shrink, non-metallic cementitious, flowable.

.1 Acceptable manufacturers:

.1 SIKKA 212

.2 MASTERFLOW 713

.3 Or approved equal in accordance with B6.

2.2 FABRICATION

.1 Verify all dimensions on site before preparing shop drawings or proceeding with shop work.

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

.3 The general dimensions and details of the metal fabrications are shown on the drawings where practical. Such details and designs are suggested concepts of design.

.4 Where possible, fit and shop assemble work in largest possible section, ready for erection.

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

.6 Thoroughly clean all surfaces of rust, scale, grease and foreign matter prior to prime painting or galvanizing.

.7 Galvanize and prime paint items as shown. Do not shop prime surfaces in contact with or embedded in concrete or requiring field welding.

.8 Stainless steel grain direction: one direction throughout.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 610g/m^2 to CAN/CSA-G164.

.2 SPEC NOTE ENVIRONMENT: Solvent borne paints contain volatile organic compounds (VOCs) such as petroleum distillates. Every year thousands of tonnes of VOCs are released into the atmosphere. These VOCs react with nitrogen oxides in the presence of sunlight to produce ground level ozone and photochemical smog. The use of paints with reduced levels of VOCs will reduce these emissions thereby helping to reduce source emissions and possible adverse health effects. The Environmental Choice guideline CCD-47a and CCD-048 provides acceptable standards for products that provide reduced environmental impacts.

.3 Shop coat primer: to CAN/CGSB-1.40.

.4 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

.5 Remove rust and postweld discoloration from stainless steel by grinding, using only stainless steel tools.

.6 Passivate stainless steel, which was cleaned by grinding, with a solution of 12-15 percent nitric acid and 3 percent hydrofluoric acid.

2.4 SHOP PAINTING

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 5 degrees C.

.3 Clean surfaces to be field welded; do not paint.

Part 3 Execution

3.1 ERECTION

.1 Obtain Contract Administrator's permission prior to Site cutting or making adjustments which are not part of the scheduled Work.

.2 Install work of this Section using skilled craftsmen and in accordance with manufacturer's recommendations where applicable.

.3 Perform welding work in accordance with CSA W59 unless specified otherwise.

.4 Welding work to be peformed by a firm certified by the Canadian Welding Bureau to the requirements of CSA W47.1 in Division 1 or 2.

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

.6 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.7 Make provisions for erection stresses and temporary bracing. Keep work in alignment at all times.

.8 Replace items damaged in course of installation.

.9 Exposed fastening devices to match finish and be compatible with material through which they pass.

.10 Provide components for building by other sections in accordance with shop drawings and schedule.

.11 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.12 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.13 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

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

3.2 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Process Mechanical General Conditions 44 05 01 shall be part of this section.

1.2 WORK INCLUDED

.1 Work includes supply and installation of instrument air lines from existing lines at the drywell service level to two (2) new dewater control valves located near the floor of the drywell. Include all piping, fittings, block valves, pipe supports, painting, and identification for complete installation.

.2 Supply and install all fittings to connect to valve actuators, solenoid control valves, and flow control valves.

Part 2 Products

2.1 PIPE MATERIALS AND FITTINGS

.1 Compressed Air lines shall be Type “L” hard copper, ASTM B88M.

.2 Compressed air fittings shall be wrought copper or cast brass 95-5 solder ends.

2.2 VALVES

.1 All valves shall conform to the requirements of ANSI, ASTM and applicable MSS standards.

.2 Valve body shall be marked to show manufacturer’s name and pressure rating.

.3 Valve construction shall conform to relevant industry standards published by Manufacture Standards Society according to (MSS-SP-25).

.4 Instrument air block valves shall be forged brass ball valve, two piece body, ANSI B1.20.1 threaded ends, 600 psi WOG, blow out proof stem, PTFE seats, chrome plated ball, full port design, CSA certified.

.1 Acceptable products: M.A. Stewart/ Kitz No. 58 or approved equal in accordance with B6.

2.3 HANGERS AND SUPPORTS

.1 Copper piping supports shall be split clamp style hangers with rubber support inserts.

Part 3 Execution

3.1 GENERAL

.1 Provide sufficient hangers, supports, anchors, guides, vibration dampeners, flexible connectors, restraints and sway braces that will cope with the loads, moments and stresses developed in the piping system and prevent these loads and moments from being transferred to the equipment to which the piping is connected.

.2 Connect all piping systems to equipment without springing the pipes or transferring any loads or moments to the equipment.

3.2 VALVE INSTALLATION

.1 Install valves as shown on the drawings, and as may otherwise be required to allow for shutdown and repair for each fixture or group of fixtures in plumbing systems.

.2 Install shut off valves with unions or couplings on supply and return piping connections to each piece of equipment to facilitate repair shutdown.

.3 Install valves with stems in the horizontal or upright position. Valves installed with stems in an inverted position are unacceptable.

3.3 PIPE HANGING

.1 Piping suspended with hangers shall have the following hanger size and spacing:

Copper Pipe Size	Rod Diameter	Max Spacing
25 mm (1") & under	10 mm (3/8")	1825 mm (6')

.2 Install hangers within 300 mm (12") of each horizontal elbow.

.3 Vertical piping other than risers through floors shall be provided with suitable supports, sway braces, etc. Clamps should be located immediately below a coupling where possible. Risers up to 50 mm (2") size shall be braced at intervals not over 2100 mm (7'0").

3.4 PIPE CONNECTIONS

.1 Copper pipe jointing materials shall utilize silver solder to conform to the requirements of the Plumbing Authority and code.

3.5 EXPANSION PIECES

.1 Install piping to permit free movement of piping caused by thermal expansion and contraction, except where it is specifically noted as being secured.

3.6 PIPE IDENTIFICATION

.1 Paint and install pipe identification in accordance with Section 44 05 54.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1.

1.2 CODES AND STANDARDS

.1 Complete installation in accordance with CSA C22.1-2009 except where specified otherwise.

.2 Comply with all laws, ordinances, rules, regulations, codes, and orders of all authorities having jurisdiction relating to this Work.

1.3 DRAWINGS AND SPECIFICATIONS

.1 The intent of the Drawings and Specifications is to include all labour, products, and services necessary for complete Work, tested and ready for operation.

.2 These Specifications and the Drawings and Specifications of all other divisions shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.

.3 Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.

.4 If discrepancies or omissions in the Drawings or Specifications are found, or if the intent or meaning is not clear, advise the Contract Administrator for clarification before submitting Bid, in accordance with B4.

1.4 CARE, OPERATION AND START-UP

.1 Instruct City maintenance and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Where services of a manufacturer's factory service engineer is required, arrange and pay for services to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.5 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish a Certificate of Final Inspection and approvals from inspection authority to the Contract Administrator.

1.6 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Factory assemble control panels and component assemblies.

1.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor switchgear and distribution enclosures light grey to ANSI 61 grey enamel, unless otherwise specified.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.8 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:

.1 Lamicoid 3 mm thick plastic lamicoid nameplates, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters
Size 8	35 x 100 mm	3 lines	5 mm high letters

.3 Wording on nameplates to be approved by Contract Administrator prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be English.

1.9 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or 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 code: to CSA C22.1.

1.10 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 25 mm wide auxiliary colour.

SYSTEM	Prime Band	Auxiliary Band
347/600V	Dk. Blue	
120/208/240V	Lt. Blue	
UPS System (After UPS)	Lt. Blue	White
Fire Alarm	Red	

1.11 MANUFACTURERS AND CSA LABELS

.1 Visible and legible after equipment is installed.

1.12 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and the Contract Administrator.

.2 Lamicoid 3 mm thick plastic engraving sheet, red face, white core, mechanically attached with self tapping screws, 20mm text.

1.13 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

1.14 CONDUIT AND CABLE INSTALLATION

.1 Sleeves through concrete: schedule 40 galvanized steel pipe, sized for free passage of conduit.

.2 For wall, partitions, and ceilings the sleeve ends shall be flush with the finish on both sides but for floors they shall extend 100 mm above finished floor level.

.3 Fire stop opening with ULC approved assembly for the installation conditions.

1.15 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province of Manitoba.

.3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

1.16 TESTING

.1 All test instruments utilized are to have been calibrated within one year of the date utilized.

1.17 SUBMITTALS

.1 Within 15 days of award of Contract, the Contractor shall submit a completed equipment procurement schedule, which lists the Manufacturer and model of equipment, indicating the projected ordering, Shop Drawing submittal date and delivery dates of all Products to meet the required construction schedule.

.2 Prior to delivery of any Products to job Site and sufficiently in advance of requirements to allow ample time for checking, submit Shop Drawings for review as specified in Division 01.

.3 Submit Shop Drawings (including Product Data) for all equipment as required in each Section of this Specification.

.4 Prior to submitting the Shop Drawings to the Contract Administrator, the Contractor shall review the Shop Drawings to determine that the equipment complies with the requirements of the Specifications and Drawings.

.5 The term “Shop Drawing” means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work. Indicate materials, methods of construction and attachment of support wiring, diagrams, connections, recommended installation details, explanatory notes and other information necessary for completion of Work. Where equipment is connected to other equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross-references to Design Drawings and Specifications. Adjustments made on Shop Drawings by the Contract Administrator are not intended to change the contract price. If adjustments affect the value of the Work state such in writing to the Contract Administrator prior to proceeding with the Work.

.6 Manufacture of Products shall conform to revised Shop Drawings.

.7 Keep one (1) complete set of Shop Drawings at job Site during construction.

1.18 RECORD DRAWINGS

.1 The Contractor shall keep one (1) complete set of white prints at the Site during work, including all addenda, change orders, Site instructions, clarifications, and revisions for the purpose of Record Drawings. As the Work on-site proceeds, the Contractor shall clearly record in Red Pencil all as-built conditions, which deviate from the original Contract Documents. Record Drawings to include circuiting of all devices, conduit and feeder runs (complete with conductor size and number) and locations of all electrical equipment.

.2 On completion of the Work, two (2) weeks prior to final inspection, submit Record Drawings to Contract Administrator for review. The Contractor shall certify, in writing, that the As-built Record Drawings are complete and that they accurately indicate all electrical services, including exposed as well as concealed items

1.19 ARC FLASH SAFETY LABELLING

.1 The Contract Administrator will supply Arc Flash labels for equipment.

.2 Install supplied arc flash safety labelling on electrical equipment.

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 PRODUCT DATA

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

Part 2 Products

2.1 WIRES IN CONDUIT

.1 Wire: to CAN/CSA-C22.2 No. 38

.2 Conductors: stranded for 10 AWG and larger. Minimum size: 14 AWG.

.3 Copper conductors: size as indicated, with insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

.1 Insulation Voltage Rating:

.1 Conductors carrying 120/208V: 600V

.2 Conductors carrying 600V: 1000V

.4 Colour coding to Section 26 05 01, wires sized 2 AWG and smaller to be factory-coded, taping will not be accepted.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation: chemically cross-linked thermosetting polyethylene rated type RW90.

.1 Insulation Voltage Rating:

.1 Conductors carrying 120/208V: 600V

.2 Conductors carrying 600V: 1000V

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: polyvinyl chloride material.

.7 Fastenings:

.1 One hole aluminum straps to secure surface cables 50 mm and smaller. Two hole aluminum straps for cables larger than 50 mm.

.2 Channel type supports for two (2) or more cables at 1000 mm centers.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

2.3 ACIC/CIC CONTROL CABLE

.1 Cable: to CAN/CSA-C22.2 No. 239, Control and Instrumentation Cables.

.2 Conductors: copper, size as indicated.

.3 Insulation: chemically cross-linked thermosetting polyethylene rated type RW90, 300V.

.4 Shielding as indicated on the drawings.

.5 A higher level of shielded cable may be substituted for unshielded, or overall shielded cable, unless otherwise specified, provided that all appropriate shield grounding, as required by the Contract Administrator, is performed. All subsequent related changes, such as required conduit size, fittings, etc are the responsibility of the Contractor.

2.4 INDUSTRIAL DATA CABLE – RS-485

.1 Requirements:

.1 Type: Armoured

.2 Conductors: 22 AWG, copper, stranded.

.3 Shielded Twisted Pair.

.4 Nominal Capacitance

.1 Between conductors: 36.1 pF/m.

.2 Between one conductor and other conductors connected to shield: 68.6 pF/m.

.5 Shielding: overall foil shield and TC braid with drain wire.

.2 Approved products:

.1 Belden 123107A

.2 or approved equal in accordance with B6.

2.5 ETHERNET CABLE

.1 Requirements for wiring between panels in conduit:

.1 Industrial Grade Cat 5e Ethernet cable.

.2 Shielding: none.

.3 Conductors: 24 AWG, copper, solid.

.4 Heavy grade industrial jacket.

.5 Use Belden 7923A or approved equal in accordance with B6.

.2 Requirements for inner panel patch cables:

.1 Commercial Grade Cat 5e Ethernet cable.

.2 Shielding: none.

.3 Conductors: 24 AWG, copper, solid.

Part 3 Execution

3.1 GENERAL

.1 Do not splice cables. A continuous length is required for all feeds.

.2 Install in accordance with manufacturer's recommendations, observing requirements for minimum bending radius and pulling tensions.

.3 Exercise care in stripping insulation from wire. Do not nick conductors.

3.2 INSTALLATION OF WIRES IN CONDUIT

.1 Install in conduit as per Section 26 05 34.

.2 Ensure conduit is dry and clean prior to pulling wire. If moisture is present, thoroughly dry conduits. Vacuum as required.

.3 Utilize wire-pulling lubricant.

3.3 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Where surface mounted, provide clamps spaced a maximum of 1 m apart, unless otherwise indicated.

3.4 INSTALLATION OF CONTROL CABLES

.1 Ground shields at one end only. Where possible, ground shields at the end where power is supplied to the cable. Utilize shield grounding bar in panels, where present.

.2 Shield drain wires, at the ungrounded end, are to be taped back to the cable. Do not cut the shield drain wire off.

.3 CIC cable may not be installed in cable tray. Protection in conduit is required over the entire length.

.4 ACIC cable may be installed in cable tray, provided that:

.1 There is a barrier separating power and control cables within the tray, or

.2 The cable tray does not contain power cables, unless specifically authorized by the Contract Administrator in writing, and

.3 The ACIC cable voltage rating is equal or greater than the highest voltage contained in the cable tray.

3.5 INSTALLATION OF ETHERNET CABLES

.1 Install Ethernet cables in conduit as per Section 26 05 34.

3.6 TERMINATIONS AND SPLICES

.1 Exercise care in stripping insulation from wire. Do not nick conductors.

.2 Strictly follow manufacturer's instructions with regards to tool size and application methods of terminations and compounds.

3.7 RE-USE OF EXISTING WIRING

.1 Except where specifically identified or approved, reuse of existing wiring is not permitted.

.2 Ensure all existing wiring is tagged prior to disconnection equipment.

.3 Tag spare wires as “Spare”

3.8 TESTING

.1 Inspect and test all wires being reused. Inspection shall be comprised of the following:

.1 Inspect terminations and splices for physical damage and evidence of overheating and corona.

.2 Inspect compression applied connectors for correct cable match and indentation.

.3 Inspect grounding and cable/conduit support.

.4 Perform an insulation-resistance test on each conductor. Individually test each conductor with all other conductors and shields grounded. The test duration shall be one minute. Investigate resistances less than 1000 megaohms. The voltage applied shall be 500 Vdc for 300 V rated cables, and 1000 Vdc for 600 V or 1000 V rated cables.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 01 – Common Work Results - Electrical

Part 2 Products

2.1 FRAMING AND SUPPORT SYSTEM

.1 Materials:

.1 Conduit support structures shall employ an aluminum strut framing system together with the manufacturer's connecting components and fasteners for a complete system.

.2 Finishes:

.1 Wet locations: Aluminum.

.2 Indoors, dry locations: Aluminum.

.3 Nuts, bolts, machine screws: Cadmium plated.

.3 Unistrut

.1 As required for load and span, with mounting screws.

.2 Acceptable products:

.1 Unistrut P1000 or approved equal in accordance with B6.

2.2 CONCRETE AND MASONRY ANCHORS

.1 Materials: hardened steel inserts, zinc plated for corrosion resistance.

.2 Components: non-drilling anchors for use in predrilled holes, sized to safely support the applied load with a minimum safety factor of four.

.3 Manufacturer: Hilti (Canada) Limited or approved equal in accordance with B6.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with galvanized anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Do not drill through steel reinforcement encased in concrete.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten conduit to building construction or support system at intervals of 2.5m or less, unless otherwise noted.

.7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.8 Ensure adequate support for raceways and cables dropped vertically where there is no wall support.

.9 Do not use wire lashing or perforated strap to support or secure cables.

.10 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 SECTION INCLUDES

.1 Materials and components for splitters, junction, pull boxes, and cabinets.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2 No.76, Splitters

Part 2 Products

2.1 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.

Part 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

3.2 IDENTIFICATION

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

.2 Install size 3 identification labels indicating system voltage, phase, and source of feed.

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.

1.2 CONDUIT REQUIREMENTS

.1 The drawings do not show every specific conduit run. Supply and install conduit as required to provide a complete system.

.2 All conduits shall be surface mounted unless otherwise indicated in the specifications and/or shown on the drawings.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.

.2 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.3 Minimum conduit size: 19 mm, unless specifically indicated on the drawings or approved by the Contract Administrator.

2.2 CONDUIT FASTENINGS

.1 One hole aluminum straps to secure surface conduits 50 mm and smaller. Two hole aluminum straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT SPACERS

.1 Aluminum conduit spacers, approved for use, or aluminum channel.

.2 Minimum space: 12 mm

.3 Utilize for all surface mounted conduit in CEC Category 1 or CEC Category 2 Wet locations.

2.4 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Utilize insulated grounding bushings at all enclosure entries.

.3 Watertight connectors and couplings for EMT, where not in electrical or control room spaces. Set-screws are not acceptable.

.4 Elbows:

.1 Utilize factory elbows for 27mm and larger conduits.

.5 Explosion proof conduit sealing fittings:

.1 CSA Certified suitable for Hazardous Locations – Class I, Zone 1, Group IIA.

.2 Material: Cast aluminum.

.3 Sealing Compound. As recommended by manufacturer.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 All conduits entering outlet boxes and devices that are located in walls subject to movement shall be terminated by means of liquid-tight flexible conduit, approximately 450 mm in length between the conduit and the outlet box or device which is being supplied. All conduits, bus duct, wireways, etc., passing through or across expansion joints of the building shall be installed with the use of approved expansion fittings.

2.6 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 ROUTING

.1 Locate conduits containing communication and low voltage conductors away from conduits containing power wiring.

.2 Route conduits on existing or new pipe rack or suspended channels where possible.

.3 Avoid routes that would interfere with any potential maintenance activities.

.4 Where not specifically shown in detail on the drawings, review proposed conduit routing with Contract Administrator prior to installation. Comply with all routing changes requested by the Contract Administrator.

3.2 INSTALLATION - GENERAL

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.3 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.4 Do not include more than the equivalent of four (4) quarter bends. Provide pull boxes as required.

.5 Ensure electrical continuity in all conduit systems.

.6 All conduit shown exposed in finished areas is to be free of unnecessary labels and trade marks.

.7 Seal conduits with duct seal where conduits are run between heated and unheated areas. Where conduits, cables, or cable trays pierce fire separations, seal openings with Dow Corning 3-6548 sealant. Seal all conduits entering or leaving hazardous classified areas with approved seals.

.8 Where conduits pass through walls, group and install through openings. After all conduits shown on the Drawings are installed, close wall openings with material compatible with the wall construction.

.9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.10 Mechanically bend conduits over 19 mm in diameter.

.11 Dry conduits out before installing wire.

.12 Surface Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Group conduits wherever possible on suspended or surface channels.
- .3 Do not pass conduits through structural members except as indicated.
- .4 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 INSTALLATIONS IN CATEGORY 1 LOCATIONS

.1 Arrange to provide drainage at frequent intervals to suitable locations.

.2 Equip with approved fittings to permit the moisture to drain out of the system.

.3 Install the conduit with a minimum of 12mm space from the supporting surface.

.4 Install every joint to be water-tight.

.5 Where conduit leaves a warm room and enters a cooler atmosphere, seal the conduit and arrange the conduit in a manner to avoid condensation accumulation at the seal.

3.4 INSTALLATIONS IN CATEGORY 2 LOCATIONS

.1 Comply with all requirements of Category 1 locations.

3.5 INSTALLATIONS IN CATEGORY 2 WET LOCATIONS

.1 Comply with all requirements of Category 1 locations.

3.6 INSTALLATIONS IN HAZARDOUS CLASS I, ZONE 1 LOCATIONS

.1 Explosion proof conduit sealing fittings:

.1 Install sealing fittings as indicated and on all new conduit installations to meet CEC requirements.

.2 Add sealing compound following manufacturer's instructions.

3.7 INSTALLATIONS IN HAZARDOUS CLASS I, ZONE 2 LOCATIONS

.1 Explosion proof conduit sealing fittings:

.1 Install sealing fittings as indicated and on all new conduit installations to meet CEC requirements.

.2 Add sealing compound following manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No.126, Cable Tray Systems.

Part 2 Products

2.1 CABLE TRAY

.1 Cable trays shall be aluminum ladder type, CSA Class D1 loading with loading depth of 125mm (5 inches) minimum, 150mm (6 inch) rung spacing and in widths as shown on the drawings. Horizontal supports shall be installed at maximum intervals of 4000mm in strict accordance with the manufacturer recommendations for the loading class.

.2 Cable Channel shall be aluminum ventilated type with aluminum cover.

2.2 CABLE TRAY ACCESSORIES

.1 Cable tray accessories shall be supplied by the same manufacturer and shall be of the same model.

.2 Cable tray accessories shall include all supports, fittings, covers and bonding / grounding connectors.

2.3 FLOOR/WALL SEAL SYSTEMS

.1 Wall sealing systems shall be one-hour fire rated.

Part 3 Execution

3.1 INSTALLATION

.1 Do not allow or cause any work performed or installed to be covered up or enclosed by work of this Section prior to the required inspections, tests and approvals.

.2 Inspect cable tray routing to determine any conflict with other trades. Inform the Contract Administrator of any conflicts and make adjustments as determined by the Contract Administrator.

.3 Install cable and channel tray in accordance with the drawings and the manufacturer’s recommendations.

.4 Install cable and channel tray of the size, type, and routing specified on the drawings. The installation shall be parallel to structure walls, straight and plumb.

.5 Install cable and channel tray and its support system suitable for the maximum allowable load based on the CSA Class of the tray.

.6 The drawings may not show all details required for mounting or installation. Supply and install any additional items required to complete the installation.

.7 Ensure that the cable and channel tray and supports are properly aligned with a minimum of distortion.

.8 All direction changes in main runs of cable tray shall be made using standard factory made fittings.

.9 Minimum cable and channel tray fitting radius shall meet or exceed the minimum bending radius of the cables installed.

.10 Cable tray sections shall be saw cut as required. Cut sections shall be square, deburred, and drilled for standard factory splice plates. Cutting by welding or burning is not permitted. Cut ends or defaced surfaces shall be painted or as directed by the Contract Administrator.

.11 Channels for cable and channel tray supports shall be saw cut as required. Cut sections shall be square and deburred. Cutting by welding or burning is not permitted. Cut ends or defaced surfaces shall be painted or as directed by the Contract Administrator.

.12 Cable tray supports shall be installed at every 4000mm interval or less as required.

.13 Cable tray fittings, expansion joints and the like shall be supported within 600mm of both sides of such connection.

.14 Locate splice plates within 600mm of a support.

.15 Where a cable tray support is installed at a location greater than 1200mm from a structural column, the horizontal strut of the cable tray support shall be supported by two structural steel members.

.16 Vertical cable trays shall have cable tray supports spaced at intervals not exceeding 1200mm and shall be open on one side to facilitate cable pulling.

.17 Expansion Joints.

.1 Install expansion joints complete with ground bond as indicated on the drawings.

.2 Install expansion joints at intervals not exceeding 30M.

.18 Install a bare copper grounding conductor in each interior tray. Bond the conductor to the cable tray at intervals not exceeding 6000mm and at all separate joints, fittings, tray sections.

.19 Bonding cables shall be 4/0 AWG copper.

.20 Repair or restore to original condition, any equipment or structure damaged during installation or before final acceptance at no additional cost.

.21 Restore to original condition any painted surfaces damaged during installation at no additional cost.

.22 Cables shall be installed uniformly across the width of the tray to minimize the number of layers.

.23 Install a barrier between 600V power cables and lower voltage instrumentation cables.

.24 Secure cables to cable tray/channel tray with cable clamps at intervals not exceeding 4500mm for horizontal runs and at intervals not exceeding 1200mm for vertical runs.

.25 Provide metal cable clamps (approved for use by the tray manufacturer) bolted to the side of the tray for all cables entering or exiting the cable tray.

.26 Remove all debris and foreign material from the complete cable tray system prior to installation of cables.

.27 Construct and use approved platforms, scaffolding and rigging systems for installation and access. The use of cable trays as walkways, "ladders", or structural rigging supports is not permitted.

.28 Following completion of cable and system tests install fire proofing-sealing system in cable tray wall/ceiling/floor entry into electrical rooms in accordance with manufacturer’s recommendations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association, (CSA International)

.2 Insulated Cable Engineers Association, Inc. (ICEA)

Part 2 Products

2.1 CABLE PROTECTION

.1 Pressure treated planks, minimum 38mm thick, with copper napthenate or 5% pentachlorophenol solution water repellent preservative.

2.2 MARKERS

.1 Caution tape: Allen marker fluorescent red tape 150mm wide.

Part 3 Execution

3.1 DIRECT BURIAL OF CABLES

.1 Inspect the area to be trenched, obtain information on the location of all underground services in the area from all service supply authorities, and the City. Perform a site survey and mark all services.

.2 Excavate and route to avoid damage to existing services. Routing shown on the drawings is an approximation only. Exact routing to be determined on site.

.3 Depth of excavation shall be sufficient to allow for cables to be installed as per CEC requirements and the requirements shown on the Drawings and Specifications.

.4 After 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.

.5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

.6 Maintain one cable diameter minimum separation between cables of different circuits.

.7 After sand protective cover of 75mm is in place, install continuous row of pressure treated planks to cover length of run. Planks shall extend at least 50mm beyond cables on each side of trench.

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END OF SECTION

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Part 1 General

1.1 REFERENCES

.1 NETA Acceptance Testing Specifications, 2003 (ATS-2003)

1.2 TESTING REPORT

.1 Prepare an overall inspection and test report that details all investigations and tests.

.2 The Contractor shall furnish five paper copies and two electronic copies on CD of each final report.

- .1 The electronic copies of the report, including the test forms, shall be provided in PDF format.
- .2 The Microsoft Word version of the all completed test forms provided to the Contractor shall also be included on the CDs.

.3 The report shall be neat and organized. Any omissions, inconsistencies, or incomplete work identified by the Contract Administrator shall be corrected and incorporated into the report in the appropriate section, and completely resubmitted.

.4 A draft of each report shall be completed and sent to the Contract Administrator for review a maximum of one month after the completion of the inspections at the Site.

.5 The final report shall be submitted a maximum of two weeks after the Contractor receives the mark-up of the draft report from the Contract Administrator.

.6 The report shall include the following:

- .1 Summary of project.
- .2 Testing Equipment.
- .3 Detail the type, manufacturer, model, and last calibration date of all testing equipment.
- .4 Description of equipment tested.
- .5 Description of all tests.
- .6 Typed inspection forms including:
  - .1 Identification of the testing organization.
  - .2 Equipment identification.
  - .3 Humidity, temperature, and other conditions that may affect the results of the tests/calibrations.
  - .4 Date of inspections, tests, maintenance, and/or calibrations.
  - .5 Identification of the testing technician.
  - .6 Indication of inspections, tests, maintenance, and/or calibrations performed and recorded, along with charts, and graphs as applicable. All measurements and readings taken shall be noted for inclusion in the report. Where repairs are made, measurements and readings before and after the repair shall be included.
  - .7 Indication of expected results, when calibrations are to be performed.

.8 Indication of “as-found” and “as-left” results, as applicable.

.7 Itemized list of all repaired deficiencies which shall include:

.1 Detailed description of the deficiency.

.2 The cost associated with the deficiency repair.

.8 Itemized list of all un-repaired deficiencies encountered which shall include:

.1 Detailed description of the deficiency.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 SCOPE OF TESTING

.1 MS-G105-GRP

.2 CP-G117-XV

.3 CP-G118-XV

.4 CP-G121-XV

.5 CP-G122-XV

.6 CP-G123-XV

.7 CP-G124-XV

3.2 INPECTION, TESTING AND MAINTENANCE PROCEDURES

.1 General

.1 All tests are based on NETA (InterNational Electrical Testing Association) standard ATS-2003. Where manufacturer’s specifications, tolerances, and/or published data are not available, refer to the appropriate tables in ATS-2003.

.2 Torque all accessible bolted electrical connections. Additional requirements apply as specified.

.3 Utilize the existing drawings for reference while performing the specified electrical inspection work. Where the existing installation deviates from that shown on the drawings, mark-up the drawings with red pen as required to reflect the installation. Include the marked-up drawings in the report.

.4 The scope of required drawing checks is limited to the equipment and components that are part of the electrical inspection work.

.5 Any repairs made that affect the accuracy of the drawings shall be marked up on the drawings.

.6 Drafting of drawings is not required.

.7 All inspection values, readings, corrections, and assessments shall be clearly recorded for inclusion within the report.

.8 Where corrections or repairs are made, record both as found/as left test readings on the inspection sheet. If space is not provided on the inspection form, record the readings in the Note fields or on a separate sheet.

.2 Inspection Forms

.1 The inspection forms to be completed by the Contractor are provided for reference in PDF format.

.2 Microsoft Word form templates will be provided prior to the work being initiated.

.3 Make appropriate print-outs of the inspection forms and utilize for entry of data and test results on site.

.4 Utilizing the Microsoft Word form templates, enter the data recorded manually into the forms electronically.

.5 Complete the inspection forms in the entirety and include them in the report.

.6 Submit electronic PDF copies of the inspection forms.

.7 The scope of work required in the specifications is in no way limited by the inspection forms, or spaces provided. Provide additional pages, documents, and forms as required to provide a complete report.

.8 The inspection forms may be updated during the Work by the City or Contract Administrator. Utilize the latest forms provided.

.9 Perform insulation resistance temperature correction calculations utilizing the following:

.1 To correct to 20°C, utilize Table 260805-1.

.2 To correct to 40°C, utilize Table 260805-2.

Table 260805-1

Insulation Resistance Correction Factors (20 °C)

Measured Temperature (°C)	Oil Immersed Insulation	Solid Insulation
-10	0.125	0.25
-5	0.18	0.32
0	0.25	0.40
5	0.36	0.50
10	0.50	0.63
15	0.75	0.81
16	0.80	0.85
17	0.85	0.89
18	0.90	0.92
19	0.95	0.96
20	1.00	1.00
21	1.08	1.05
22	1.16	1.10
23	1.24	1.15
24	1.32	1.20
25	1.40	1.25
30	1.98	1.58
35	2.80	2.00
40	3.95	2.50
45	5.60	3.15
50	7.85	3.98
55	11.20	5.00
60	15.85	6.30

Table 260805-2

Insulation Resistance Correction Factors (40 °C)

Measured Temperature (°C)	Oil Immersed Insulation	Solid Insulation
-10	0.03	0.10
-5	0.04	0.13
0	0.06	0.16
5	0.09	0.20
10	0.13	0.25
15	0.18	0.31
16	0.19	0.33
17	0.21	0.34
18	0.22	0.36
19	0.24	0.38
20	0.25	0.40
21	0.27	0.42
22	0.29	0.44
23	0.31	0.46
24	0.33	0.48
25	0.35	0.50
30	0.50	0.63
35	0.71	0.79
40	1.00	1.00
45	1.41	1.26
50	2.00	1.59
55	2.83	2.00
60	4.00	2.52

.3 Perform winding resistance temperature correction calculations utilizing the following:

.1 $$R_C = R_M \frac{T_C + T_K}{T_M + T_K}$$

.2 Where, RC = Resistance at corrected temperature.

RM = Resistance at measured temperature.
TC = Temperature to correct to in °C.
TM = Measured temperature in °C.
TK = Temperature Resistance Constant
(234.5 °C for copper, 226.0 °C for aluminum)

3.3 CABLES, < 1000 V (ALSO FEEDERS IN CONDUIT)

.1 Inspection and testing shall be comprised of the following:

.1 For cables/wires 4/0 AWG or larger, inspect bolted electrical connections for high resistance using a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate and correct values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.

.2 Torque all accessible bolted electrical connections.

.3 Inspect compression applied connectors for correct cable match and indentation.

.4 Inspect grounding and cable/conduit support.

.5 Verify that visible cable bends meet or exceed the minimum allowable bending radius.

.6 Measure length of cable/conduit and record in meters.

.7 If cables/wires are terminated through window-type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices.

.8 Perform an insulation-resistance test on each conductor. Individually test each conductor with all other conductors and shields grounded. The test duration shall be one minute. Investigate resistances less than 1000 megaohms. The voltage applied shall be 500 Vdc for 300 V rated cables, and 1000 Vdc for 600 V or 1000 V rated cables.

3.4 MOTOR STARTERS, 600 V

.1 Inspection and testing shall be comprised of the following:

.1 Note the equipment nameplate data for inclusion in the report.

.2 Record all adjustable settings, size of overload, etc.

.3 Inspect physical and mechanical condition.

.4 Inspect anchorage, alignment, and grounding.

.5 Verify the unit is clean.

.6 Torque all accessible bolted power connections.

.7 Inspect contactors for evidence of overheating or stress.

.8 Visually inspect and exercise circuit breaker.

.9 If power fuses are present, record fuse size and type. Measure the resistance of each fuse. Investigate inconsistent resistance values.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers and circuit breakers.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 SUBMITTALS

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

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, and Circuit breakers to CSA C22.2 No. 5

.2 Common-trip breakers: with single handle for multi-pole applications.

.3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.4 Circuit breakers to have minimum 10kA symmetrical rms interrupting capacity rating.

.5 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.

.6 Include:

.1 On-off locking device.

2.2 MOUNTED BREAKERS

.1 Enclosures to be suitable for installation into existing MCC, front mounted external operating handle, lockable in the “off” position with a padlock.

.2 Breakers are to be Cutler-Hammer HFD series or approved equal in accordance with B6.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

.2 Identification:

.1 In accordance with Section 26 05 01 – Common Work Results – Electrical

.2 For all individually mounted breakers and breakers in MCCs, CDPs and switchboards:

.1 Provide lamacoid plate on or adjacent to each breaker showing load being fed.

.2 Format:

.1 Line 1: The breaker identifier. Example: “CB-MTS-G1”.

.1 Where the breaker identifier is not specified, utilize “CB-“ followed by the immediate device being fed.

.2 Line 2: The ultimate load being fed, or a description of the breaker functionality. Example: “Load: UPS-G1” or “MCC-1G/MCC-2G Transfer Switch”.

END OF SECTION

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Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

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

.1 Provide shop drawings for each type of starter to indicate:

.1 Mounting method and dimensions.

.2 Starter size and type.

.3 Layout and components.

.4 Enclosure type.

1.2 CLOSEOUT SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit operation and maintenance data for each type and style of motor starter for incorporation into maintenance manual.

.3 Extra Materials:

.1 Provide listed spare parts for each different size and type of starter.

.1 All control fuses.

.2 1 indicating lamp bulb.

Part 2 Products

2.1 GENERAL

.1 Motor starters are to be completely compatible with existing MCC. Use products from the manufacturer of the existing MCC in order to ensure physical and electrical compatibility.

2.2 FULL VOLTAGE MAGNETIC STARTERS

.1 UL/CSA listed, NEMA size as shown on the drawings.

.1 Smallest size of starter: NEMA size 1, unless otherwise indicated

.2 IEC rated starters are not acceptable.

.2 Magnetic of size, type, rating and enclosure type as indicated with components as follows:

.1 All coils to be epoxy coated.

.2 Contactor solenoid operated, rapid action type.

.3 Motor overload protective device in each phase, manually reset from outside enclosure.

.4 Wiring and schematic diagram inside starter enclosure in visible location.

.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.3 Accessories:

.1 Selector switches: heavy-duty oil tight labelled as indicated.

.2 Indicating lights: heavy-duty oil tight type and color as indicated.

.3 1-N/O spare auxiliary contact.

2.3 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with primary and secondary fuses, installed in with starter as indicated.

.2 Size control transformer as indicated.

2.4 ACCESSORIES

.1 Pushbutton: heavy duty, oil tight as required.

.2 Selector switches: heavy duty, oil tight as required.

.3 Indicating lights: heavy duty, oil tight, type and colour as indicated.

2.5 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 01 - Common Work Results for Electrical.

2.6 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Magnetic starter designation label, white plate, black letters, as indicated on lamacoid schedule.

2.7 SPARE PARTS

.1 Fuses: two of each rating.

Part 3 Execution

3.1 INSTALLATION

.1 Install starters in existing MCC as shown on drawings.

.2 Install starters and control devices in accordance with manufacturer's instructions.

.3 Install and wire starters and controls as indicated.

.4 Ensure correct fuses installed.

.5 Confirm motor nameplate and adjust / replace overload device to suit.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 - Common Work Results for Electrical and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes and standards referenced in this section refer to the latest edition thereof.

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

- .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A90/A90M, Standard Test Method for Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- .3 ASTM A121, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
- .4 A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 ASTM C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

.3 Canadian General Standards Board (CGSB).

- .1 CAN/CGSB-138.1, Fabric for Chain Link Fence.
- .2 CAN/CGSB-138.2, Steel Framework for Chain Link Fence.
- .3 CAN/CGSB-138.3, Installation of Chain Link Fence.
- .4 CAN/CGSB-138.4, Gates for Chain Link Fence.
- .5 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

.4 Canadian Standards Association (CSA International).

- .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CAN/CSA-A3000, Cementitious Materials Compendium. Includes:
  - .1 CAN/CSA-A23.5, Supplementary Cementing Materials

.5 City of Winnipeg (CoW)

- .1 CW 3550 –R2 Chain Link Fence Specifications

.6 Department of Justice Canada (Jus).

- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

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

- .1 Material Safety Data Sheets (MSDS).

.8 The Master Painters Institute (MPI) - Architectural Painting Specification Manual - [March 1998].

- .1 MPI # 18, Organic Zinc Rich Primer.

.9 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.2 SUBMITTALS

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

.2 Submit WHMIS-MSDS – Material Safety Data Sheets

.3 Submit manufacturer's data sheets including:

.1 Fence fabric gauge and finsh.
.2 Post and rail dimension and finish.
.3 Gate frame dimensions and finish
.4 Exterior gate exit panic hardware including back plate and gate latch protector in galvanized finish.
.5 Attachment hardware, including post fasteners, latch strikes and receiving brackets in galvanized finish.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with section 03 30 00 Cast in Place Concrete.

.1 Nominal coarse aggregate size: 20mm
.2 Cement type: HSb
.3 Concrete: Compressive Strength 25 MPa at 28 days, air content 4-7%, slump 80 mm.

.2 Chain-link fence fabric: to CAN/CGSB-138.1.

.1 Type 1, Class A, heavy style, Grade 1.
.2 Height of fabric: as shown on drawings or required to match existing.

.3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated on drawings or required to match existing.

.4 Top and bottom tension wire: to CAN/CGSB-138.2, single strand, galvanized steel wire.

.5 Tie wire fasteners: to CAN/CGSB-138.1, Table 2 (steel wire), single strand galvanized steel wire confirming to requirements of fence fabric, 5 mm diameter.

.6 Tension bar: to ASTM A653/A653M, 5 x 20 mm minimum galvanized steel.

.7 Gates: to CAN/CGSB-138.4.

.8 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.

.1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding.
.2 Fasten fence fabric to gate with twisted selvage at top.

.3 Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.

.4 Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.

.9 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.

.1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.

.2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.

.3 Overhang tops to provide waterproof fit, to hold top rails and an outward projection to hold barbed wire overhang.

.4 Provide projection with clips or recesses to hold 3 strand of barbed wire spaced 100 mm apart.

.5 Projection of approximately 300 mm long to project from fence at 45 degrees above horizontal.

.6 Turnbuckles to be drop forged.

.7 Organic zinc rich coating: to CAN/CGSB – 1.181.

.8 Barbed wire: to CAN/CGSB-138.2, 2.5 mm diameter, 4 point barbs 150 mm spacing

.9 Grounding rod: 16 mm diameter copper well rod, 3 m long.

2.2 FINISHES

.1 Galvanizing:

.1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.

.2 For pipe: 550 g/m^2 minimum to ASTM A90.

.3 For barbed wire: to CAN/CGSB-138.2, class 2.

.4 For other fittings: to CAN/CSA-G164.

Part 3 Execution

3.1 GRADING

.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.

.1 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

3.2 ERECTION OF FENCE

.1 Erect fence along lines as indicated in drawings and to CAN/CGSB-138.3.

.2 Excavate post holes to 1800mm depth x 300 mm diameter by methods approved by Contract Administrator.

.3 Space line posts maximum 3 m apart, measured parallel to ground surface, unless indicated otherwise on the drawings.

.4 Space straining posts at equal intervals not to exceed 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 150 m.

.5 Install additional straining posts at sharp changes in grade and where directed by the Contract Administrator.

.6 Install corner post where change in alignment exceeds 10 degrees.

.7 Install end posts at end of fence and at buildings.

.1 Install gate posts on both sides of gate openings.

.8 Place concrete in post holes then embed posts into concrete to depths indicated.

.1 Extend concrete 50 mm above ground level and slope to drain away from posts.

.2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

.9 Do not install fence fabric until concrete has cured minimum of 5 days.

.10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.

.1 Install braces on both sides of corner and straining posts in similar manner.

.11 Install overhang tops and caps.

.12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.

.13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

.14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.

.1 Knuckled selvedge at bottom.

.2 Twisted selvedge at top.

.15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.

.1 Give tie wires minimum two twists.

.16 Install barbed wire strands and clip securely to lugs of each projection.

.17 Install grounding rods as indicated.

3.3 INSTALLATION OF GATES AND HARDWARE

.1 Install gates in locations as indicated.

.2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.

.3 Determine position of centre gate rest for double gate.

.1 Cast gate rest in concrete as directed.

.2 Dome concrete above ground level to shed water.

.4 Install gate stops where indicated.

3.4 TOUCH UP

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas.

.1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.5 CLEANING

.1 Clean and trim areas disturbed by operations.

.1 Dispose of surplus material as directed by the Contract Administrator.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Sections of Division 40. This section supplements requirements of Division 1.

1.2 CODES AND STANDARDS

.1 Do complete installation in accordance with CSA C22.1-2009 except where specified otherwise.

.2 Comply with all laws, ordinances, rules, regulations, codes, and orders of all authorities having jurisdiction relating to this Work.

1.3 DRAWINGS AND SPECIFICATIONS

.1 The intent of the Drawings and Specifications is to include all labour, products, and services necessary for complete Work, tested and ready for operation.

.2 These Specifications and the Drawings and Specifications of all other divisions shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.

.3 Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.

.4 If discrepancies or omissions in the Drawings or Specifications are found, or if the intent or meaning is not clear, advise the Contract Administrator for clarification before submitting Bid, in accordance with B4.

1.4 CARE, OPERATION AND START-UP

.1 Instruct City maintenance and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 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 with all aspects of its care and operation.

1.5 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish a Certificate of Final Inspection and approvals from inspection authority to the Contract Administrator.

1.6 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Factory assemble control panels and component assemblies.

.4 Minimum enclosure type to be used is NEMA 12 unless otherwise specified.

1.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor switchgear and distribution enclosures light grey to ANSI 61 grey enamel, unless otherwise specified.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.8 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:

.1 Lamicoid 3 mm thick plastic lamicoid nameplates, white face, black lettering, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters
Size 8	35 x 100 mm	3 lines	5 mm high letters

.3 Wording on nameplates to be approved by Contract Administrator prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be English.

.6 Schedule 400501-1 identifies required nameplates. The list in the schedule is not necessarily exhaustive. Provide nameplates for all items in Schedule 400501-1, as well as any other applicable equipment not specifically identified in the schedule.

1.9 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings on both ends of phase conductors of feeders and branch circuit wiring.

.1 Wire tags to be heat shrink type with black letters on white background.

.2 Use colour coded wires in communication cables, matched throughout system.

1.10 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

1.11 SUBMITTALS

.1 Prior to delivery of any Products to job Site and sufficiently in advance of requirements to allow ample time for checking, submit Shop Drawings for review as specified in Division

.2 Submit Shop Drawings (including Product Data) for all equipment as required in each Section of this Specification.

.3 Prior to submitting the Shop Drawings to the Contract Administrator, the Contractor shall review the Shop Drawings to determine that the equipment complies with the requirements of the Specifications and Drawings.

.4 The term “Shop Drawing” means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work. Indicate materials, methods of construction and attachment of support wiring, diagrams, connections, recommended installation details, explanatory notes and other information necessary for completion of Work. Where equipment is connected to other equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross-references to Design Drawings and Specifications. Adjustments made on Shop Drawings by the Contract Administrator are not intended to change the contract price. If adjustments affect the value of the Work state such in writing to the Contract Administrator prior to proceeding with the Work.

.5 Manufacture of Products shall conform to revised Shop Drawings.

1.12 RECORD DRAWINGS

.1 The Contractor shall keep one (1) complete set of white prints at the Site during work, including all addenda, change orders, Site instructions, clarifications, and revisions for the purpose of Record Drawings. As the Work on-site proceeds, the Contractor shall clearly record in Red Pencil all as-built conditions, which deviate from the original

Contract Documents. Record Drawings to include circuiting of all devices, conduit and feeder runs (complete with conductor size and number) and locations of all electrical equipment.

1.13 O&M MANUAL

.1 Operations and Maintenance Manuals

.1 Refer to Section 01 78 00 for general O&M Manual requirements.

.2 In addition to the general requirements, provide the following information:

.1 Table of Contents – Arrange contents sequentially by systems under Section numbers. Label tabs of dividers between each to match section numbers in the Table of Contents.

.2 Systems Descriptions – A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.

.3 Manuals containing all pertinent information, drawings and documents of the Contractor's supply and/or documentation included with the instruments supplied by others, such as:

.1 Mechanical drawings of the equipment.

.2 Installation drawings and procedures.

.3 Instrument model numbers.

.4 Equipment specifications.

.5 Detailed utility requirements.

.6 Replacement parts list with model numbers.

.7 Recommended preventative maintenance frequency.

.8 Troubleshooting procedures.

.9 Procedures for dismantling.

.10 Procedure to operate the equipment/instruments.

.11 Recommended cleaning procedure.

.12 Recommended list of supplies to be used in conjunction with the operation and maintenance of the equipment.

.13 Recommended spare parts list

.4 A copy of all wiring diagrams complete with wire coding.

.5 Include type and accuracy of instruments used.

.6 Set of final reviewed Shop Drawings.

.7 Testing documentation including commissioning checklists.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

Schedule 400501-1 : Nameplate Schedule

Qty	Type	Line 1	Line 2	Line 3
1*	2	JBA-G1		
1*	2	JBNM-G1		
1*	2	JBA-G2		
1*	2	JBA-G561		
1*	7	NP-G1	Process Network Panel	
1*	7	NP-M1	Process Network Panel	
1	8	G117-XZ	Inlet Sluice Gate	West Wet Well
1	8	G118-XZ	Inlet Sluice Gate	East Wet Well
1	8	G121-XV	Suction Valve for	G101-RSP
1	8	G122-XV	Suction Valve for	G102-RSP
1	8	G123-XV	Suction Valve for	G103-RSP
1	8	G124-XV	Suction Valve for	G104-RSP
1	8	G105-GRP	Grit Removal Pump	

* Nameplate to be attached by panel manufacturer.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Submit commissioning plans and procedures, in writing, at least 10 Working days prior to commissioning.

1.2 CLOSEOUT SUBMITTALS

.1 Final Report:

- .1 Include measurements, final settings and certified test results.
- .2 Include completed commissioning forms
- .3 Bear signature of commissioning technician and supervisor
- .4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications as set during commissioning and submit to the Contract Administrator in accordance with Section 01 78 00 - Closeout Submittals.
- .5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.3 COMMISSIONING FORMS

.1 The Contract Administrator will provide the required commissioning forms.

.2 Supplement the provided forms as required to make a complete commissioning report package.

1.4 COMMISSIONING

.1 Carry out commissioning under direction of the Contract Administrator and in the presence of representatives of the Contract Administrator and the City.

.2 Inform, and obtain approval from the Contract Administrator in writing at least 14 days prior to commissioning or each test. Indicate:

- .1 Location and part of system to be tested or commissioned.
- .2 Testing/commissioning procedures, anticipated results.
- .3 Names of testing/commissioning personnel.

.3 Correct deficiencies and re-test until satisfactory performance is obtained.

.4 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.

.5 Perform tests as required.

1.5 COMPLETION OF COMMISSIONING

.1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by the Contract Administrator.

Part 2 Products

2.1 EQUIPMENT

.1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.

.2 Test instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.

.3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 6 months prior to tests.

Part 3 Execution

3.1 STATUS PRIOR TO COMMISIONING

.1 Prior to commissioning, ensure that the following is completed:

.1 Installation of all panels and completion of all wiring connections.

.2 Testing wiring for continuity from the field device to the control panel.

3.2 PROCEDURES

.1 Provide a minimum of one qualified technician to test and commission the control system.

.2 Test each I/O point from the instrument to the DCS or Field Device Panel.

.1 Test both states of discrete points.

.2 Test, at minimum, two values for analog points.

.3 Test each piece of equipment individually for complete functionality.

.4 Completely test the E-Stop functionality of each piece of equipment, as provided.

.5 All modifications to the software program, to bypass interlocks or sensors, shall be recorded and documented clearly in a separate document, and the software.

.1 Any software bypasses that remain, prior to leaving site, must be authorized by the Contract Administrator or designated representative.

.6 All deficiencies must be corrected by the Contractor.

.7 Commission each system using procedures prescribed by the Contract Administrator.

.8 Optimize operation and performance of systems by fine-tuning control loops and PID values.

3.3 SYSTEM SOFTWARE

.1 Changes to the control system software are to be carried out by City Personnel only.

3.4 CHECKLISTS, FORMS, AND REPORTS

.1 Complete checklists, forms, and reports for each instrument, loop, and control device.

- .1 Instrument Switch Checklist
- .2 Instrument Transmitter Loop Checklist.
- .3 Modulating Control Device Checklist
- .4 Discrete Control Device Checklist

3.5 DEMONSTRATION

.1 Demonstrate to the Contract Administrator operation of systems including sequence of operations under all potential conditions, start-up, shut-down interlocks and lock-outs.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 NEMA 250-2003, Enclosures for Electrical Equipment (1000 Volts Maximum).

.2 Canadian Standards Association (CSA International).

.1 CSA-C22.1-2009, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

1.2 SUBMITTALS

.1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 01 33 00 – Submittal Procedures.

.2 Manufacturer's Instructions:

.1 Include manufacturer's installation instructions for specified equipment and devices in O&M Manuals.

1.3 STORAGE

.1 Store instruments in their original shipping containers in a dry location that is free of fumes and vapors. Never store an instrument in an area where desensitizing agents (such as paint or silicone) may be present.

Part 2 Products

2.1 GENERAL

.1 Provide products and materials that are new and free from all defects.

.2 Products and materials called for on the Drawings or in the Specifications by trade names, manufacturer's name and catalogue reference are those which are to be used as the basis for the Bid.

.3 The design has been based on the use of the first named product, where applicable equivalent products are listed.

.4 Quality of Products

.1 All products provided to be CSA Approved, and Underwriters' Laboratories of Canada listed where applicable.

.2 If products specified are not CSA approved, obtain approval. Pay all applicable charges levied and make all modifications required for approval.

.5 Products to be manufacturers’ standard finish.

.6 Instruments are to be suitable for the environmental conditions in which they are to be installed.

.7 Determine where injurious conditions may be expected to occur and make proper provision to protect the instruments to ensure their proper and reliable operation.

.8 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

2.2 VALVE ACTUATORS

.1 See Specification 440520.

2.3 SOLENOIDS

.1 Notify the Contract Administrator when the seal water solenoids are available for inspection and wait for authorization to proceed or change notice for replacement solenoids.

.2 Requirements for de-watering solenoids:

.1	Type:	3-Way, Speed Controlled
.2	Enclosure Rating:	NEMA 4X
.3	Material:	Aluminum
.4	Voltage:	120 VAC
.5	Mounting:	Wall
.6	Acceptable Products:	
	.1 Bray 63 with Series 55 speed control	
	.2 or approved equal in accordance with B6.	

.3 Requirements for other solenoids

.1	Type:	General Purpose
.2	Enclosure Rating:	NEMA 4X
.3	Material:	Stainless Steel
.4	Voltage:	120 VAC
.5	Mounting:	Wall
.6	Acceptable Products:	
	.1 Asco 8210	
	.2 or approved equal in accordance with B6.	

2.4 PRESSURE SWITCHES

.1 Notify the Contract Administrator when the seal water pressure switches are available for inspection and wait for authorization to proceed or change notice for replacement pressure switches.

.2 Requirements:

.1	Type:	Electro-mechanical
.2	Voltage:	120 VAC
.3	Connection	2 wire single switch
.4	Operating Temperature	10°C to 30°C

.5 Mounting: Wall.
.6 Enclosure Rating: NEMA 4
.7 Approvals: CSA
.8 Acceptable Products:
.1 United Electric 100 Series
.2 or approved equal in accordance with B6.

2.5 PRESSURE GAUGES

.1 Notify the Contract Administrator when the seal water pressure gauges are available for inspection and wait for authorization to proceed or change notice for replacement pressure gauges.

2.6 PRESSURE REGULATORS

.1 Notify the Contract Administrator when the seal water pressure regulators are available for inspection and wait for authorization to proceed or change notice for replacement pressure regulators.

2.7 MAGNETIC FLOW METERS

.1 Service:

.1 Fluid: Wastewater
.2 Fluid Temperature: -10°C to 50°C
.3 Ambient Temperature: 0°C to 40°C
.4 Pressure: 0 – 100 kPa

.2 Accuracy: 0.5% of span.

.3 Flowtube Requirements:

.1 Area Classification: unclassified
.2 Size: see drawings
.3 Flange Material: Carbon Steel
.4 Electrodes: 316L Stainless Steel or Tantalum
.5 Electrode Housing: Sealed, welded housing.
.6 Lining: Neoprene or Teflon
.7 Grounding: Straps or rings.
.8 Enclosure: NEMA 4X rated.
.9 Approvals: CSA or equivalent.

.4 Transmitter Requirements:

.1 Mounting: Integral
.2 Local Display: LCD
.3 Units of Operation: L/s
.4 Power Supply: 120 VAC
.5 Output: 4-20 mA with HART.
.6 Approvals: CSA or equivalent.

.7 Enclosure: NEMA 4X rated.

.5 Acceptable Products:

.1 Rosemount 8705 flowtube with 8712D transmitter
.2 ABB Magmaster MF series
.3 E&H Promag 33
.4 or approved equal in accordance with B6.

2.8 SUBMERSIBLE LEVEL TRANSMITTERS

.1 Service:

.1 Fluid: Wastewater
.2 Fluid Temperature: -10°C to 50°C
.3 Sensing range: 0 – 20m H_2O

.2 Requirements:

.1 CSA Class 1 Div II Groups A, B, C & D certified
.2 F.M. approved
.3 Sensor Body: Titanium or Stainless Steel
.4 Pressure Connection: Elastomeric diaphragm
.5 Ingress Protection: IP68
.6 Electrical Connection: Leads in submersible cable assembly.
.7 Electrical Signal: 2 wire, 4-20 mA,
.8 Cable Length: As per drawings
.9 Accuracy: <±0.25% full scale
.10 Pressure compensation through vented cable.
.11 Acceptable Products:
.1 GE Druck PTX 1290
.2 or approved equal in accordance with B6.

2.9 SUBMERSIBLE LEVEL SWITCH

.1 Requirements:

.1 Type: Mechanical switch in plastic casing.
.2 Fluid: Wastewater
.3 Temperature Range: 0 to 50°C
.4 Ingress Protection: IP68
.5 Output: Form C dry contact
.6 Electrical Connection: Leads in submersible cable assembly.
.7 Approvals: CSA
.8 Acceptable Products:
.1 Flygt ENM-10
.2 or approved equal in accordance with B6.

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

.3 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.

.4 Electrical:

- .1 Complete installation in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Install communication wiring in conduit or utilizing ACIC cabling if shown on the drawings.
  - .1 Provide complete conduit /cable system to link instrumentation and the control panel(s).
  - .2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.
  - .3 Maximum conduit fill not to exceed 40%.
  - .4 Design drawings do not show conduit layout.
- .3 Equipment installed in Category 2 wet locations shall be mounted a minimum of 12 mm from supporting surface as per the Canadian Electrical Code Section 22.

.5 Locations of all field instruments are subject to modification by the Contract Administrator who reserves the right to move any item up to 3 meters from the position shown, without change to the contract price, provided notice is given before the related work has commenced.

.6 Exact locations of all field instruments shall be site determined by the Contractor to the satisfaction of the Contract Administrator to ensure proper operation of the device.

3.2 IDENTIFICATION

.1 Identify field devices with lamacoids. Install in a conspicuous location.

3.3 TESTING AND COMMISSIONING

.1 Calibrate and test field devices for accuracy and performance in accordance with Section 40 80 11 - Automation Commissioning.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

Part 2 Products

2.1 COMPONENTS

.1 Terminals

.1 Terminals in existing control panels shall be Weidmuller SAK 4 type.

.2 Terminal blocks shall be designed for the size of the wires to be connected to them. Terminal blocks used for analog, digital, and power cables shall be identified and physically separated from each other.

.3 Each terminal shall bear an identification number on both sides.

.4 Drawings and templates supplied may not detail all hardware components such as labels, stoppers, rail lifters, end plates, separators, etc. The supplier must supply and install such components when required.

.2 Switches and Pilot Lights

.1 Switches and pilot lights shall be the same make and model as switches and pilot lights on the existing control panel. If the make and model of the existing switches and pilot lights are obsolete, then those similar in appearance may be used.

.3 General Purpose Relays

.1 Relays shall be the same make and model as relays in the control panel in which they will be installed. If the make and model of the existing relays are obsolete, then relays similar in function by the same manufacturer may be used.

.4 Wiring

.1 All conductors shall be securely fastened to terminals at both ends; no splices are allowed inside the panel.

.2 No more than two (2) conductors may be terminated under each terminal screw. All internal panel conductors shall be connected to the same side of a terminal block, and external conductors to the other side. The only exception is for fused terminals which require connection to the field side for internal wiring.

.3 All wires and cables inside the control panels shall be identified on both ends with non-erasable markers from.

.4 Identification shall follow the supplied documents, such as wiring diagrams.

.1 Label both ends of each wire.

.2 Utilize machine printed non-slip labels.

.3 Wherever possible wire labels shall be positioned to be read from the panel opening without removal of wire duct covers or other wiring.

.5 Individual conductors or wires exiting a cable shall be identified using non-erasable markers.

.6 The routing of all analog, digital, and power cable wiring inside control panels shall be segregated as much as possible, in distinct wiring ducts, by the type of signal they are carrying. All wires shall be physically protected by wiring ducts with covers. The wiring ducts shall be of sufficient size to be filled to a maximum of 50% when all wires are inside.

.7 All analog signal wiring shall be 18 AWG shielded twisted pairs. Shield wires exiting the jacket must be covered with a black heat shrink, and the overall cable at the jacket end must also be covered with a heat shrink.

.8 All 24 VDC or 120 VAC discrete signal panel wiring shall be 16 AWG TEW stranded conductor.

.1 Increase the size of power wiring, 12 AWG minimum.

.9 The sizes and colours of wires shall be in accordance with the CSA and the Canadian Electrical Code.

.10 The panel builder shall group and form wiring into a loop when going from a fixed part of the panel to a door. Each end of the loop shall be properly supported.

.5

Part 3 Execution

3.1 COMPONENT INSTALLATION

.1 Components on the front of the panel shall be identified with an individual permanent nameplate installed in an organized manner. The nameplate must identify the component's function.

.2 Each component inside the control panel shall be identified with a nameplate corresponding to the drawings.

.3 All non-DIN rail mountable devices in the control panel shall be mechanically affixed to the back panel with either tapped or self-tapping screws.

.4 All control devices shall be mounted so that any component can be replaced without removing the sub-panel.

.5 Components and/or auxiliary instruments mounted at the rear of the panel shall be readily accessible and their installation shall not be affected by, or interfere with the removal of any panel instrument.

.6 Nameplates shall be made of lamacoid material with a white background and engraved black letters for internal and external components. Nameplates must resist harsh industrial conditions.

.7 Supply and install all required fuses.

.8 Control devices must be spaced adequately to allow for cooling, replacement, servicing, and wiring access.

.9 Control devices shall be grouped according to voltage and function to reduce electrical noise.

3.2 IDENTIFICATION

.1 Perform terminal identification using a computerized device. Handwriting is not acceptable.

.2 Label terminals as shown on drawings.

.3 Install label above each terminal block with terminal block name.

END OF SECTION

Part 1 General

1.1 REFERENCES

Part 2 Products

2.1 ETHERNET NETWORK SWITCH

.1 NP-G1 Switch requirements:

- .1 Fully IEEE 802.3 compliant.
- .2 Fully compliant with Modbus TCP.
- .3 Seven 10/100BaseTX RJ-45 ports and three 10/100/1000BaseTX RJ-45 ports.
- .4 Enclosure fit for industrial environments.
- .5 Power Requirements: 24 VDC terminal block
- .6 Manufacturer and Model:
  - .1 Moxa, EDS-510A
  - .2 Or approved equal in accordance with B6.

.2 NP-M1 Switch requirements:

- .1 Fully IEEE 802.3 compliant.
- .2 Fully compliant with Modbus TCP.
- .3 Nine 10/100/1000BaseTX RJ-45 ports – five configurable as 1000BaseSX Fiber ports.
- .4 Provide two 1000BaseSX SFP modules for each switch.
- .5 Enclosure fit for industrial environments.
- .6 Power Requirements: 24 VDC terminal block
- .7 Manufacturer and Model:
  - .1 Moxa, EDS-G509 with SFP-1GSXLC Fiber modules.
  - .2 Or approved equal in accordance with B6.

2.2 MODBUS RTU TO MODBUS TCP CONVERTERS

.1 Requirements:

- .1 Fully IEEE 802.3 compliant.
- .2 One 10/100BaseTX RJ-45 port capable of communicating Modbus TCP.
- .3 One RS-485 terminal block capable of communicating Modbus RTU.

.2 Power Requirements: 24 VDC terminal block

.3 Manufacturer and Model:

- .1 Digi, Digi One IA
- .2 or approved equal in accordance with B6.

2.3 POWER SUPPLY FOR NETWORK EQUIPMENT

.1 Provide all necessary power supplies with capacity to power connected equipment. Requirements:

- .1 Mounting: DIN Rail
- .2 Voltage: 120 VAC input / 24 VDC output
- .3 Approvals: CSA or cUL

.2 Manufacturer and model:

- .1 SolaHD
- .2 or approved equivalent in accordance with B6.

2.4 ETHERNET PATCH PANEL

.1 Requirements for 19” Rack Networking Panel applications:

- .1 19” Rack mount
- .2 24 ports
- .3 Rated for Cat 6 wiring
- .4 Manufacturer and Model:
  - .1 Hubbell Premise Wiring, P624U
  - .2 Or approved equal in accordance with B6.

.2 Requirements for DIN Rail mount applications:

- .1 35mm DIN Rail mount
- .2 8 ports
- .3 Rated for Cat 5e wiring
- .4 Manufacturer and Model:
  - .1 Pheonix Contact, VS-PP-R-8XRJ45/5-LSA
  - .2 Or approved equal in accordance with B6.

2.5 FIBER OPTIC PATCH PANEL

.1 Requirements:

- .1 19” Rack mount
- .2 36 ports
- .3 LC Duplex connectors
- .4 Manufacturer and Model:
  - .1 Hubbell Premise Wiring, FPR3SP
  - .2 Or approved equal in accordance with B6.

2.6 NETWORKING CABINET

.1 Administration Building cabinet requirements:

- .1 Floor mounted
- .2 Suitable for mounting 19” rack equipment.
- .3 Minimum 42 rack units

.4 Front and rear access.

.5 Front and Rear Doors: perforated mesh

.6 Extra wide to allow for wireways on the enclosure sides

.7 Manufacturer and Model:

.1 Hubbell Premise Wiring, H1N84E

.2 Or approved equal in accordance with B6.

.2 Grit Control Room panel requirements:

.1 NEMA 12 rated

.2 Continuous hinge with clamps for closing.

.3 Manufacturer:

.1 Hoffman

.2 Or approved equal in accordance with B6.

Part 3 Execution

3.1 Wiring

.1 See Section 26 05 21.

3.2 Configuration

.1 Configure process control network equipment so as to create a correctly communicating installation.

.2 Ethernet installations shall be certified to Category 5e standards.

.3 Ethernet equipment shall be installed in panels by a CSA certified panel shop.

END OF SECTION

Part 1 General

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 Enclosures shall be NEMA 4 rated unless located in electrical or control rooms.

.2 Enclosures shall have a continuous hinge with clamps for closing.

.3 Manufacturer: Hoffman or approved equal in accordance with B6.

2.3 WIRING AND ACCESSORIES

.1 Provide wiring inside the panels 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 panels. Identify each terminal strip with a terminal strip number, as per the drawings.

.7 Provide sufficient terminals so that not more than two wires are connected under the same terminal.

.8 Provide nameplates for each device on or within the enclosure.

2.4 PANEL GROUNDING

.1 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 GENERAL CONDITIONS

.1 In addition to the requirements of Division 01, this section shall apply to and govern all sections of Division 44.

1.2 SCOPE

.1 The Process Mechanical Contractor shall supply all labour, materials, equipment and services required for complete safe installation of process mechanical work in accordance with the intent of this specification and as shown on the drawings.

1.3 WORK OF OTHER TRADES

.1 Cooperate and coordinate the work specified in this section with the requirements of other units of work specified in other sections.

.2 The process mechanical contractor shall rough in for and/or connect up all equipment requiring mechanical services, as shown on drawings or noted elsewhere in the Specifications.

.3 Supply other trades with all necessary details, roughing-in drawings, wiring diagrams, etc. as required.

.4 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations, without prior approval of the Contract Administrator.

1.4 INTENT

.1 Work shall be in accordance with the Drawings and Specifications and their intent, complete with all necessary components, including those not normally shown or called for, and ready for operation before acceptance.

.2 Where contradictions in specifications and drawings are implied obtain ruling from the Contract Administrator. Where ruling is not obtained, include the item or arrangement of better quality, greater quantity, or higher cost in bid price.

1.5 RELATED WORK SPECIFIED ELSEWHERE

.1 Work Excluded from Process Mechanical Division

.1 Concrete pits, pads and bases - see Section 03 30 00.

.2 Electric wiring and connections - see Division 26.

1.6 REGULATORY AGENCIES

.1 Promptly advise the Contract Administrator of any specified equipment, material, or installation of same which appears inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; of any necessary items of work omitted from the Contract Documents, or any discrepancies in the Specification.

.2 Make timely application for all permits and certificates necessary to carry out the work. Supply and submit all drawings, application forms and fees payable to the relevant authorities.

.3 On completion of the work, submit, certificate of acceptance from inspection authority to the Contract Administrator.

.4 The Regulations of the A.S.M.E. Code and the Local Labour Department shall cover the design, manufacture, installation, welding and tests of piping and other equipment as specified hereafter. The Contractor shall complete and provided to the Contract Administrator for review and certification, data reports for each pressure piping system.

.5 Make reasonable changes and alterations required by inspection authority without additional cost.

1.7 SCAFFOLDING, RIGGING AND HOISTING

.1 Provide scaffolding, rigging, hoisting and related installation services for work under this Division, except where otherwise specified. The scaffolding, rigging and hoisting provided shall meet the regulations of the Construction Safety Code.

1.8 STANDARDS

.1 Within the text of these specifications, reference is made to the following standards:

.1	SAE	- Society of Automotive Contract Administrators
.2	ASTM	- American Society of Testing Materials
.3	CSA	- Canadian Standards Association
.4	ASME	- American Society of Mechanical Contract Administrators
.5	ANSI	- American National Standards Institute
.6	ULC	- Underwriters' Laboratories of Canada.
.7	EEMAC	- Electrical Equipment Manufacturers' Association of Canada.

.2 Materials to carry CSA approval and to conform with applicable standards.

1.9 DEFINITIONS

.1 Unless specifically indicated or noted otherwise, the following words, used in this specification or on related drawings, shall have the following meanings:

.1 "Furnish" or "provide". To supply, install and connect up complete and ready for safe and regular operation.

.2 "Install". To erect, mount and connect up complete with all related accessories necessary or required for safe and regular operation.

.3 "Supply". To purchase, procure, acquire, deliver complete with all related accessories necessary or required.

.4 "Indicated" or "shown". As indicated or shown on the drawings.

.5 "Noted". As indicated or shown on the drawings.

.6 "Detailed". As indicated or shown on drawings.

1.10 INSPECTION

.1 The Contract Administrator will complete periodic or specific visits to the site to observe work in progress. When specific or milestone visits are identified by the Contract Administrator as necessary, provide 48 hours notice or when the milestones are expected to be met.

1.11 SHOP DRAWINGS

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

.2 Prior to submitting shop drawings for the Contract Administrator's review, the Contractor shall review all shop drawings to confirm their meeting all requirements of the project, and mark and sign his approval on the drawings.

.3 Each shop drawing must be certified by the manufacturer and, as such, shall indicate that all product engineering has been performed to ensure that product will meet the requirements of the intended installation.

.4 Include all electrical wiring diagrams and installation drawings for electrically powered equipment.

.5 Whenever documents are provided in S.I. units, all performance and dimensional data shall be submitted in S.I. units.

1.12 RECORD DRAWINGS

.1 Refer to Division 01.

.2 Record drawings to show all field modifications.

.3 Obtain a separate set of drawings and mark all as-built information as work progresses. Show inverts of all underground services.

1.13 WORKMANSHIP

.1 Workmanship shall be in accordance with well established practice and standards accepted and recognized by Design Authorities and the trade.

.2 The Contract Administrator shall have the right to reject any item of work that does not conform to the Contract Documents and accepted standards of performance.

.3 Employ only tradesmen holding valid Provincial Trade Qualification certificates. Tradesmen shall perform only work that their certificate permits. Certificates shall be available for inspection by the Contract Administrator.

1.14 PROTECTION OF WORK

.1 Protect equipment and material stored or in place during construction from weather, moisture, dust and physical damage.

.2 Any equipment that has operating parts, bearings or machined surfaces that show signs of rusting, pitting or physical damage will be rejected.

.3 Refinish damaged or marred factory finishes to the satisfaction of the Contract Administrator.

1.15 PAINTING AND FINISHES

.1 All new pipe supports are to be hot dipped galvanized.

.2 For modified/relocated pipe and ferrous supports, remove loose materials and apply at least one coat of corrosion resistant primer paint and one top coat. Match paint and color to existing.

1.16 DESIGN AUTHORITY'S APPROVAL

.1 It is not incumbent upon the Contract Administrator to superintend the work so as to relieve the Contractor of any responsibility.

.2 Permission to proceed does not constitute approval of the work, or portion thereof.

.3 Approval of the work shall be made only upon the successful conclusion of tests and satisfactory performance under design operating conditions.

1.17 OPERATING AND MAINTENANCE INSTRUCTION

.1 Instruct City personnel on the system operating and maintenance procedures, using the assistance of specialist sub-trades and manufacturer's representatives, and provide manufacturer's explanatory literature. If proper instructions are not provided, in the Contract Administrator's opinion, instructions shall be provided or arranged and the costs involved shall be charged to the relevant section.

.2 Deliver to the Contract Administrator prior to the scheduled takeover date, three (3) sets of all brochures and literature supplied by the manufacturers of each piece of equipment, bound into hardback binders with suitable identification on the cover. Information shall include, but not be limited to, the following:

.1 Complete list of all contractors with addresses and phone numbers.

.2 Complete list of mechanical equipment supplied and installed under each section, including description, make, type, size, capacity, serial number and list of repair and replacement parts, with names and addresses of suppliers.

.3 Correct installation procedure.

.4 Illustrated parts list for all equipment.

.5 Manufacturer's recommended operating and maintenance instructions.

.6 Final corrected shop drawings for all equipment.

.7 Separate lubrication schedule, including each piece of equipment and showing frequency of service and grade of oil or grease required. This schedule shall be inserted at the front of the manuals.

.8 Copy of flow diagrams for each system complete with valve schedule.

.3 Include in the front of each manual, a maintenance schedule showing equipment name and location, type and frequency of required maintenance, with referral to manufacturer's maintenance sheet.

1.18 SPECIAL TOOLS

.1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 017800 - Closeout Submittals.

1.19 SUPPORTS AND BASES

.1 Supply and erect all special structural work required for installation of process mechanical equipment.

.2 Supply and install all anchor bolts and fasteners.

1.20 IDENTIFICATION

.1 Ensure that equipment name plates, showing size, name of equipment, serial number and all other information usually provided, including name and address of manufacturer, are not painted over or removed, and where apparatus is insulated, provide adequate viewing openings.

1.21 INSTALLATION AND ERECTION

.1 Information involving dimensions of building shall be taken from the appropriate drawings, and checked by site measurement. Refer to drawings of appropriate section for accurate information.

.2 Drawings show general location and route to be followed by pipes, etc. Make necessary changes or additions to runs to accommodate site conditions. Location of pipes and other equipment shall be altered without charge, provided change is made before installation, and does not necessitate change in quantity of materials.

.3 Install all piping and ductwork parallel to building walls and ceilings unless otherwise indicated.

.4 Install all piping to for minimum interference to free use of space through which they pass. Consideration must also be given to accessibility for service and maintenance.

.5 Check all levels shown before commencement of work to ensure adequate falls for graded pipes and report discrepancies immediately. Failure to so check and report does not relieve this section from responsibility for consequent extra expenditures.

.6 Before installation of fixtures, fittings and equipment, consult detail drawings or obtain instructions for each location where details are not available.

.7 Secure approval prior to cutting holes. Employ section whose work is involved, cut openings no larger than necessary and without damage to adjoining work, and provide for repair of all damage to match adjacent work. This Division is responsible for all required cutting and patching relating to work in this Division, unless specifically noted otherwise.

.8 Prior to the cutting of any openings in walls, ensure that the wall does not serve a load bearing function. All openings in load bearing walls and other structural members shall be approved by the Contract Administrator.

.9 Provide and set bolts, templates, sleeves and fixing materials for fastening work under this section securely to work provided under other sections, in advance of other work, where required.

.10 Locate all openings in walls, partitions, beams, etc. required for installation of pipes and equipment, etc. specified in this Section of the specifications, and frame all openings as required.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.3 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.4 AIR VENTS

.1 Install manual air vents at high points in piping systems.

.2 Install drain piping to approved location and terminate where discharge is visible.

3.5 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: Isolating flanges.

3.6 PIPEWORK INSTALLATION

.1 Screwed fittings jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.9 Ream pipes, remove scale and other foreign material before assembly.

.10 Use eccentric reducers at pipe size changes to ensure positive drainage and venting, unless noted otherwise.

.11 Provide for thermal expansion as indicated.

.12 Valves:

.1 Install in accessible locations.
.2 Remove interior parts before soldering.
.3 Install with stems above horizontal position unless otherwise indicated.
.4 Valves accessible for maintenance without removing adjacent piping.

.13 Check Valves:

.1 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.7 FLUSHING OUT OF PIPING SYSTEMS

.1 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 – Cleaning.

.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition.

3.8 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Contract Administrator 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections of Division 44.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Division 44.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in the presence of the Contract Administrator or designate representative.

.6 Pay costs for repairs or replacement, retesting, and making good. Contract Administrator to determine whether repair or replacement is appropriate.

3.9 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Contract Administrator.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Contract Administrators (ANSI/ASME)

- .1 ANSI/ASME B31.1 - Power Piping.
- .2 ANSI/ASME B31.3 - Process Piping
- .3 ANSI/ASME Boiler and Pressure Vessel Code:
  - .1 Section I: Power Boilers.
  - .2 Section V: Nondestructive Examination.
  - .3 Section IX: Welding and Brazing Qualifications.

.2 American National Standards Institute/American Water Works Association (ANSI/AWWA)

- .1 ANSI/AWWA C206, Field Welding of Steel Water Pipe.

.3 American Welding Society (AWS)

- .1 AWS C1.1, Recommended Practices for Resistance Welding.
- .2 AWS Z49.1, Safety Welding, Cutting and Allied Process.
- .3 AWS W1, Welding Inspection Handbook..
- .4 ANSI/AWS D10.4-86 (R2000) Austenitic Chromium-Nickel Stainless Steel Piping and Tubing, Recommended Practices for Welding

.4 Canadian Standards Association (CSA International)

- .1 CSA W48-06 - Filler Metals and Allied Materials for Metal Arc Welding.
- .2 CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.
- .3 CSA-W117.2, Safety in Welding, Cutting and Allied Processes.
- .4 CSA W178.1, Certification of Welding Inspection Organizations.
- .5 CSA W178.2, Certification of Welding Inspectors.

.5 Manitoba Department of Labour.

1.2 QUALIFICATIONS

.1 Welders

- .1 Welding qualifications in accordance with CSA B51.
- .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.
- .3 Furnish welder's qualifications to Contract Administrator.
- .4 Each welder to possess identification symbol issued by authority having jurisdiction.

.2 Inspectors

.1 Inspectors qualified to CSA W178.2.

1.3 QUALITY ASSURANCE

.1 Registration of welding procedures in accordance with CSA B51.

.2 Copy of welding procedures available for inspection.

.3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

Part 2 Products

2.1 ELECTRODES

.1 Electrodes: in accordance with ANSI/AWS D10.4.

Part 3 Execution

3.1 WORKMANSHIP

.1 Welding: in accordance with ANSI/ASME B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS, and applicable requirements of provincial authority having jurisdiction.

3.2 INSTALLATION REQUIREMENTS

.1 Identify each weld with welder's identification symbol.

.2 Backing rings:

.1 Where used, fit to minimize gaps between ring and pipe bore.

.2 Do not install at orifice flanges.

.3 Fittings:

.1 NPS 2 and smaller: install welding type sockets.

.2 Branch connections: install welding tees or forged branch outlet fittings.

3.3 INSPECTION AND TESTS - GENERAL REQUIREMENTS

.1 Review weld quality requirements and defect limits of applicable codes and standards with Contract Administrator before work is started.

.2 Formulate "Inspection and Test Plan" in co-operation with Contract Administrator.

.3 Do not conceal welds until they have been inspected, tested and approved by inspector.

.4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.4 SPECIALIST EXAMINATIONS AND TESTS

.1 General

.1 Perform examinations and tests by specialist qualified in accordance with CSA W178.1 and CSA W178.2 and approved by Contract Administrator.

.2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.

.3 Inspect and test welds in accordance with "Inspection and Test Plan" by visual examination and non-destructive testing.

.2 Hydrostatically test welds to requirements of ANSI/ASME B31.1.

.3 Visual examinations: include entire circumference of weld externally and wherever possible internally.

.4 Failure of visual examinations:

.1 Upon failure of welds by visual examination, perform additional testing as directed by Contract Administrator of total of up to 10 % of welds, selected at random by Contract Administrator.

.5 All prefabricated pipes (shop or field) and all field welds during installation shall be non-destructively examined and tested as follows with additional testing at the discretion of the Contract Administrator.

.1 For Butt Joints
- 5% UT (ultrasonic) or RT (radiographic) and
- 100% visual and
- Hydrostatically tested.

.2 For Socket Joints:
- 5% LT (liquid penetrant) or MT (mag particle) and
- 100% visual and
- Hydrostatically tested.

.6 Radiographic tests for piping systems.

.1 Spot radiography.

.1 Conduct spot radiographic tests of welds, selected at random by Contract Administrator from welds which would be most difficult to repair in event of failure after system is operational.

.2 Radiographic film:

.1 Identify each radiographic film with date, location, name of welder, and submit to Contract Administrator. Replace film if rejected because of poor quality.

.3 Interpretation of radiographic films:

.1 By qualified radiographer.

.4 Failure of radiographic tests:

.1 Extend tests to welds by welder responsible when those welds fail tests.

3.5 DEFECTS CAUSING REJECTION

.1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.

3.6 REPAIR OF WELDS WHICH FAILED TESTS

.1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

3.7 CLEANING

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This specification details the requirements for electric motor driven valve actuators employed to operate two (2) plant influent sluice gates and four (4) raw sewage pump suction valves at the South End Water Pollution Control Center (SEWPCC).

1.2 REFERENCES

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

.2 ANSI/AWWA C540, AWWA Standard for Power-Actuating Devices for Valves and Slide Gates

1.3 RELATED WORK

.1 Section 44 05 01 – Process Mechanical General Requirements.

.2 Section 44 05 30 – Sluice Gates.

1.4 SUBMITTALS

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

.1 Submit shop drawings and product data for actuators specified in this section including: two sluice gate actuators G117-XZ, G118-XZ, and four suction valve actuators G121-XV, G122-XV, G123-XV, and G124-XV.

.2 Closeout submittals:

.1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 ACTUATORS

.1 General Requirements

.1 The actuators shall be suitable for use on a nominal 600 volt, 3 phase, 60 Hz power supply and are to incorporate motor, integral reversing starter, local control facilities and terminals for remote control and indication connections housed within a self contained, sealed enclosure.

.2 In order to maintain the integrity of the enclosure, setting of the torque levels, position limits and configuration of the indication contacts etc shall be carried out without the removal of any actuator covers over an Infra red interface. Sufficient commissioning tools shall be provided with the actuators and must meet the enclosure protection and certification levels of the actuators. Commissioning tools shall not form an integral part of the actuator and must be removable for secure storage/authorised release. In addition, provision shall be made for the

protection of configured actuator settings by a means independent of access to the commissioning tool.

.3 The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel irrespective of the connection sequence of the power supply. No failsafe position is required.

.2 Actuator sizing

.1 The actuator shall be sized to guarantee valve closure at the specified differential pressure and temperature. The safety margin of motor power available for seating and unseating the valve shall be sufficient to ensure torque switch trip at maximum valve torque with the supply voltage 10% below nominal.

.2 The actuator and gearbox assembly shall be designed for a minimum maintenance free life of 10,000 open/close/open cycles with rated seating/unseating torque at stroke-end and an average of 1/3 rated seating torque during stroke.

.3 A minimum 25% safety factor should be applied to the most demanding valve operating criteria.

.4 For sluice gate actuators G117-XZ, G118-XZ :

.1 Rising stem design.

.2 The operating speed shall be such as to give valve closing and opening at approximately 10-12 inches per minute.

.3 The actuator shall be selected to overcome cracking thrust loads of the existing 48” x 48” sluice gate, based on 35’ seating head, 10’ unseating head, 600lb stem weight, and 1750lb gate weight. Calculated normal running thrust is 12,750lbf (54.7 kN). Calculated cracking thrust is 22,300lbf (99.0 kN).

.4 Extended stem is 49’ long, bronze, ACME 2” thread, single start.

.5 Actuator location: Outdoors.

.6 Provide low temperature capability for operation down to -40°C.

.7 Manufacturer and model:

.1 Rotork IQ35Z

.2 or approved equal in accordance with B6.

.5 For raw sewage pump suction valve actuators with integral gearboxes G121-XV, G122-XV, G123-XV, and G124-XV:

.1 Existing 30” McAvity Milwood gate valves, non-rising stem, Style “N” Converto Gearing. Existing handwheels and Converto Gear unit to be removed.

.2 Present configuration requires 269 turns to operate the valves.

.3 Design and provide adaptors to mount the actuators to the valves.

.4 Maximum 15 minute operating time.

.5 Actuator location: Indoors, non-hazardous rated area.

.6 Manufacturer and model:

.1 Rotork IQ25

.2 or approved equal in accordance with B6.

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.3 Environmental

.1 Actuators shall be suitable for indoor and outdoor use. Actuators located indoors shall be capable of functioning in an ambient temperature ranging from 0°C (32°F) to 120°C (248°F), up to 100% relative humidity. Actuators located outdoors shall be capable of functioning in an ambient temperature ranging from -40°C (-40°F) to 120°C (248°F), up to 100% relative humidity.

.2 Actuators for hazardous area applications shall meet the area classification, gas group and surface temperature requirements specified in data sheet.

.3 All components of the actuator drive train shall be designed with adequate heat capacity for the actuator being operated at the specified motor duty cycle, travel times and torque requirements.

.4 Enclosure.

.1 Actuators shall be O-ring sealed, watertight to IP68 7m for 72hrs, NEMA 4, 4X and 6.

.2 The motor and all other internal electrical elements of the actuator shall be protected from ingress of moisture and dust when the terminal cover is removed at site for cabling, the terminal compartment having the same ingress protection rating as the actuator with the terminal cover removed.

.3 Enclosure must allow for temporary site storage without the need for electrical supply connection.

.4 All external fasteners shall be zinc plated stainless steel. The use of unplated stainless steel or steel fasteners is not permitted.

.5 Motor.

.1 The motor shall be an integral part of the actuator, designed specifically for valve actuator applications. It shall be a low inertia high torque design, class F insulated with a class B temperature rise giving a time rating of 15 minutes at 40°C(104°F) at an average load of at least 33% of maximum valve torque. Temperature shall be limited by thermostats embedded in the motor end windings and integrated into its control.

.2 Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gearcase.

.6 Motor Heaters

.1 Motor heaters are to be provided at the discretion of the vendor based on the environmental requirements. Heaters are to be rated 120V AC and are to be supplied by the integral control transformer.

.7 Motor Protection

.1 Protection shall be provided for the motor as follows:

.1 Stall - the motor shall be de-energized within 8 seconds in the event of a stall when attempting to unseat a jammed valve.

.2 Over temperature - thermostat will cause tripping of the motor. Auto-reset on cooling

□

.3 Single phasing - lost phase protection.

.4 Direction – phase rotation correction.

.8 Gearing.

.1 The actuator gearing shall be totally enclosed in an oil-filled gearcase suitable for operation at any angle. Grease lubrication is not permissible.

.2 If the the actuator is shipped without lubricant then each actuator shall be tagged to this effect.

.3 All drive gearing and components must be of metal construction and incorporate a lost-motion hammerblow feature.

.4 For rising spindle valves the output shaft shall be hollow to accept a rising stem, and incorporate thrust bearings of the ball or roller type at the base of the actuator.

.5 The design should be such as to permit the opening of the gearcase for inspection or disassembled without releasing the stem thrust or taking the valve out of service.

.9 Hand Operation.

.1 A handwheel shall be provided for emergency operation, engaged when the motor is declutched by a lever or similar means, the drive being restored to power automatically by starting the motor. This lever shall be padlockable in either the handwheel or motor operation mode.

.2 The handwheel or selection lever shall not move on restoration of motor drive.

.3 Provision shall be made for the hand/auto selection lever to be locked in both hand and auto positions. It should be possible to select hand operation while the actuator is running or start the actuator motor while the hand/auto selection lever is locked in hand without damage to the drive train.

.4 Clockwise operation of the handwheel shall give closing movement of the valve unless otherwise stated in the data sheet. An arrow indicating the direction of rotation to close the valve shall be permanently engraved on the handwheel.

.5 For linear valve types the actuator handwheel drive must be mechanically independent of the motor drive and should be such as to permit valve operation in a reasonable time with a manual force not exceeding 200N through stroke and 400N for seating/unseating of the valve.

.10 Drive Bushing

.1 The actuator shall be furnished with a drive bushing easily detachable for machining to suit the valve stem or gearbox input shaft. Normally the drive bushing shall be positioned in a detachable base of the actuator. Thrust bearings, when housed in a separate thrust base should be of the sealed for life type.

.11 Torque and turns limitation

.1 Torque and turns limitation to be adjustable as follows:

.1 Position setting range – multi-turn: 2.5 to 100,000 turns, with resolution to 15 deg. of actuator output.

.2 Torque setting: 40% to 100% rated torque. S**eparate torque settings for each direction (open/close**).

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.2 Measurement of torque shall be from direct measurement of force at the output of the actuator. Methods of determining torque-using data derived from the motor such as motor speed, current, flux etc are not acceptable.

.3 A means for automatic "torque switch bypass" to inhibit torque off during valve unseating and "latching" to prevent torque switch hammer under maintained or repeated control signals shall be provided.

.4 The electrical circuit diagram of the actuator should not vary with valve type, remaining identical regardless of whether the valve is to open or close on torque or position limit.

.12 Remote valve position/actuator status indication

.1 Four contacts shall be provided which can be selected to indicate any position of the valve. Provision shall be made for the selection of a normally closed or open contact form. Contacts shall maintain and update position indication during handwheel operation when all external power to the actuator is isolated.

.2 The contacts shall be rated at 5A, 250V AC, 30V DC.

.3 As an alternative to providing valve position any of the four above contacts shall be selectable to signal one of the following:

.1 Valve opening, closing or moving

.2 Thermostat tripped, lost phase

.3 Motor tripped on torque in mid travel, motor stalled

.4 Remote selected

.5 Actuator being operated by handwheel

.13 Local Position Indication

.1 The actuator display shall include a dedicated numeric/symbol digital position indicator displaying valve position from fully open to fully closed in 1% increments. Valve closed and open positions shall be indicated by symbols showing valve position in relation to the pipework to ensure that valve status is clearly interpreted. With main power on the display shall be backlit to enhance contrast at low light levels and shall be legible from a distance of at least 6 feet (2m).

.2 Red, green, and yellow lights corresponding to open, closed, and intermediate valve positions shall be included on the actuator display when power is switched on. The digital display shall be maintained and updated during handwheel operation when all power to the actuator is isolated.

.3 In addition, the actuator display shall include a separate text display element with a minimum of 32 characters to display operational, alarm and configuration status. The text display shall be English. Provision shall be made to upload a different language without removal of any covers or using specialized tools not provided as standard with the actuator.

.14 Local Torque Indication

.1 The digital display shall be capable of indicating real time torque and valve position simultaneously, both being displayed in 1% increments of valve position and actuator rated torque. In addition torque shall also be displayed in horizontal bar graph form.

.15 Integral starter and transformer

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.1 The reversing starter, control transformer and local controls shall be integral with the valve actuator suitably housed to prevent breathing and condensation. The starter shall be suitable for 60 starts per hour and of rating appropriate to motor size. The controls supply transformer shall be fed from two of the incoming three phases and incorporate overload protection. It shall have the necessary tappings and be adequately rated to provide power for the following functions:

.1 Energization of the contactor coils.

.2 24V DC output for remote controls.

.3 Supply for all the internal electrical circuits.

.16 Local controls

.1 The actuator shall incorporate local controls for Open, Close and Stop and a Local/Stop/Remote mode selector switch lockable in any one of the following three positions: local control only, stop (no electrical operation), remote control plus local stop only. It shall be possible to select maintained or non-maintained local control.

.2 The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

.3 Provision shall be made to orientate the local controls through increments of 90º.

.17 Control facilities

.1 The necessary control, wiring and terminals shall be provided in the actuator for the following functions:

.2 Open and close external interlocks to inhibit local and remote valve opening and/or closing control. It shall be possible to configure the interlocks to be active in remote control only.

.3 Remote controls fed from an internal 24V DC supply and/or from an external supply between 20V and 120V AC or 20V and 60 V DC, to be suitable for any one or more of the following methods of control:

.1 Open, Close and Stop control.

.2 Open and Close maintained or “push to run” (inching) control.

.3 Overriding Emergency Shut-down to Close (or Open) valve from a normally closed or open contact.

.4 Two-wire control, energise to close (or open), de-energise to open (or close).

.4 It shall be possible to reverse valve travel without the necessity of stopping the actuator. The motor starter shall be protected from excessive current surges during rapid travel reversal.

.5 The internal circuits associated with the remote control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 2kV.

.6 Actuator to be supplied with Modbus module for Modbus network communication. Specifications include:

.1	Type:	Single Highway plus Analog Input
.2	Communication protocol:	RS485, 2-wire half-duplex
.3	Modbus Transmission Mode:	RTU (8 bit binary data)
.4	Maximum data rate:	115.2 kbaud

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.5 Optional termination resistor integral to module.

.6 Modbus module assembly to fit inside of actuator electrical housing.

.7 Manufacturer and Model:

.1 Rotork Modbus Module Mk2 Option Card – Single Highway plus Analog Input

.2 Or approved equal in accordance with B6.

.18 Monitoring facilities

Facilities shall be provided for monitoring actuator operation and availability as follows:

.1 Monitor (availability) relay, having one change-over contact, the relay being energized from the control transformer will de-energise under any one or more the following conditions:

.1 Loss of main or customer 24V DC power supply

.2 Actuator control selected to local or stop

.3 Motor thermostat tripped

.4 Actuator internal fault

.2 Where specified, provision shall be made for contacts to provide discreet indication of one or more of the following:

.1 Remote selected

.2 Thermostat trip

.3 Actuator fault

.3 Actuator text display indication of the following status/alarms:

.1 Closed Limit, open limit, moving open, moving closed, stopped

.2 Torque trip closing, torque trip opening, stalled

.3 ESD active, interlock active

.4 Thermostat trip, phase lost, 24V supply lost, Local control failure

.5 Configuration error, Position sensor failure, Torque sensor failure

.6 Battery low, power loss inhibit

.4 Integral datalogger to record and store the following operational data:

.1 Opening last /average torque against position

.2 Closing last /average torque against position

.3 Opening motor starts against position

.4 Closing motor starts against position

.5 Total open/closed operations

.6 Maximum recorded opening and closing torque values

.7 Event recorder logging operational conditions (valve, control and actuator)

.5 The datalogger shall record relevant time and date information for stored data.

.6 Datalogger data is to be accessed via non-intrusive IrDA communication. Sufficient standard intrinsically safe tools shall be provided for downloading

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datalogger and actuator configuration files from the actuators and subsequent uploading to a PC. The actuator manufacturer shall supply PC software to enable datalogger files to be viewed and analysed.

.19 Wiring and terminals

.1 Internal wiring shall be tropical grade PVC insulated stranded cable of appropriate size for the control and 3-phase power. Each wire shall be clearly identified at each end.

.2 The terminals shall be embedded in a terminal block of high tracking resistance compound.

.3 The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal and shall be provided with a minimum of 2 threaded cable entries with provision for a maximum of 4.

.4 All wiring supplied as part of the actuator to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable.

.5 A durable terminal identification card showing plan of terminals shall be provided attached to the inside of the terminal box cover indicating:

.1 Serial number

.2 External voltage values

.3 Wiring diagram number

.4 Terminal layout

.6 The code card shall be suitable for the contractor to inscribe cable core identification alongside terminal numbers.

.20 Start-up kit

.1 Each actuator shall be supplied with a start-up kit comprising installation instruction manual, electrical wiring diagram and cover seals to make good any site losses during the commissioning period. In addition, sufficient actuator commissioning tools shall be supplied to enable actuator set up and adjustment during valve/actuator testing and site installation commissioning.

.21 Performance test certificate

.1 Each actuator must be performance tested and individual test certificates shall be supplied free of charge. The test equipment should simulate a typical valve load, and the following parameters should be recorded.

.1 Current at maximum torque setting

.2 Torque at max. torque setting

.3 Flash test voltage

.4 Actuator output speed or operating time.

.2 In addition, the test certificate should record details of specification such as gear ratios for both manual and automatic and second stage gearing if provided, drive closing direction, wiring diagram number.

2.2 PEDESTALS FOR SLUICE GATE ACTUATORS

.1 Provide two pedestals to support the sluice gate actuators. Pedestal top flange to match actuator thrust base. Pedestal base plates with 150mm dia. minimum hole for stem and anchor bolt holes size and spacing as shown on the drawings.

.2 Carbon steel construction. 9.5mm minimum pipe wall/eccentric reducer thickness.

.3 Finish: Hot dip galvanized.

2.3 ADAPTERS FOR SUCTION VALVE ACTUATORS

.1 The suction valve actuators are intended to be retrofitted on an in-service valve. Perform a site visit in order to obtain the necessary dimensional data.

.2 Supply the necessary adaptation components for field retrofitting of an actuator to a valve.

2.4 STEM COVERS

.1 Provide stem covers for sluice gate actuators G117-XZ and G118-XZ.

.2 A clear plastic, UV stabilized, stem cover with closed, open, ¼, ½, and ¾ position indicator decals shall be supplied for each rising stem.

2.5 LABELLING

.1 All actuators to be labelled with stainless steel tags with their identification number as indicated on the drawings.

.2 Actuator nameplate to be permanently affixed to equipment and stamped or marked with weather resistant markings; and removable tag with lubrication types and quantities on each actuator.

2.6 SHIPPING

.1 The actuators, gearboxes and any other components shall be set on pallets for ease in shipping and handling and the shall be tagged or marked with:

a) purchase order number;

b) shipping tag number; and

c) weight.

These markings are for use in material shipping and handling and so must be readily visible.

.2 The actuator shall be shipped with sufficient protection and packaging to prevent handling damage.

.3 Handwheels shall be removed from the shaft and securely fastened to the actuator. Bolts, nuts, indicator rod, indicator rod cover and any other loose components shall be attached to each actuator.

Part 3 Execution

3.1 INSTALLATION

.1 If the actuator cannot be installed immediately store it in a dry place until it can be connected to incoming cables.

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.2 If the actuator has to be installed but cannot be cabled it is recommended that the plastic transit cable entry plugs are replaced with metal plugs which are sealed with PTFE tape.

.3 Complete installation in accordance with manufacturer's written instructions unless otherwise indicated.

.4 Do not lift the actuator by the handwheel. Do not lift the actuator and valve combination via the actuator.

.5 The actuator should be fully supported until full valve stem engagement is achieved and the actuator is secured to the valve flange.

.6 Perform commissioning procedure as indicated in manufacturer written documentation.

3.2 PRE-START-UP INSPECTIONS

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

3.3 START-UP

.1 Provide continuous supervision during start-up.

.2 Start-up procedures:

.1 Perform commissioning procedure as indicated in manufacturer written documentation.

.2 For sluice gate actuators, **set closing torque limit to ensure unit does not produce closing thrust greater than 89kN (20,000 lbf) to prevent damage to the stems.**

.3 Rectify start-up deficiencies.

3.4 PERFORMANCE VERIFICATION

.1 Procedures:

.1 The actuator shall be tested at the specified application torque and output rpm.

.2 Each actuator shall be performance tested to verify conformity to specified operating conditions including:

.1 voltage, phase, and Hertz;

.2 stroke time (seconds);

.3 unseating (or maximum dynamic) torque;

.4 closing torque;

.5 cracking load and seating load amperes; and

.6 torque-switch and limit-switch function.

.3 Each actuator shall be cycled through at least two strokes (open-close and close-open). Specified seating (or maximum dynamic) torque shall be applied during 10% of actuator travel in both directions. Actual stroke time shall be within ±10% of specified stroke time. Limit-switch and torque-switch functions shall be verified in both directions. Torque switches shall be demonstrated to limit torque

output to 110% of required torque. Amperes at running and seating loads are to be monitored and shall not exceed motor ratings.

.2 Reports:

.1 Provide Start-up and Commissioning Reports for each actuator.

.2 Each report shall include the following at a minimum:

.1 Actuator-unit housing or frame size and model number;

.2 Actuator serial number;

.3 Power, voltage, phase, hertz;

.4 Stroke time, seating/unseating (or dynamic) torque, and seating/unseating (or dynamic) amps;

.5 Limit switch functional check;

.6 Torque switch functional check; and

.7 Switch and indicating lights functional checks.

.8 List of all programmable settings configured.

END OF SECTION

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Part 1 General

1.1 REFERENCES

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

.1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).

.2 ANSI/ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings, Class 125.

.3 ANSI/ASME B16.34, Valves - Flanged, Threaded and Welding End.

.4 ANSI/ASME B16.10, Face to Face and End to End Dimensions of Valves.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01330 - Submittal Procedures.

.2 Submit data for valves specified this section.

1.3 CLOSEOUT SUBMITTALS

.1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 GENERAL

.1 Except for specialty valves, to be of single manufacturer.

.2 Products to have CRN registration number where applicable.

2.2 ECCENTRIC PLUG VALVES - FLANGED ENDS

.1 General:

.1 Dead-tight shut-off on liquids and gases at pressure differentials up to 1.2 MPa in forward direction, 520 kPa in reverse direction.

.2 NPS 2 1/2 to NPS 4, flanged ends:

.1 Body: cast iron to ASTM A-126 Class B.

.2 Plug: cast iron with BUNA-N coating.

.3 Weld–in Nickel seating surface.

.4 Round port with minimum 81% port area

.5 Journal Bearings: permanently lubricated, SAE 841 bronze bearings.

.6 BUNA-N stem seals.

.7 End connections: Flanged to ANSI B16.1 Class 125.

.8 Operators: lever.

.3 Acceptable manufacturer and models:

.1 Milliken 601N plug valve, WR

.2 or approved equal in accordance with B6.

2.3 ECCENTRIC PLUG VALVES WITH PNEUMATIC OPERATOR

.1 General:

.1 Dead-tight shut-off on liquids and gases at pressure differentials up to 1.2 MPa in forward direction, 520 kPa in reverse direction.

.2 Eccentric plug valve as per item 2.2 less lever operator.

.3 It is intended that the valve be located in a normally dry location and used for dewatering control. The valve must also operate reliably when submerged to 5meters. All electrical/control solenoids are installed above the submergence level.

.2 Pneumatic Actuator:

.1 Direct mounting to valve.

.2 Pneumatic Operator Service: on – off service

.3 Air Supply: 80 psig, 140 psig maximum

.4 Function: air operated open, spring return close

.5 Body: Extruded aluminum alloy, anodized

.6 Body coating: polyester coated

.7 End Caps: Die cast aluminum alloy with corrosion resistant polyester coating

.8 Fasteners: stainless steel

.3 Acceptable manufacturer and models:

.1 Bray Series 93

.2 Flowserve Super Nova Series B

.3 or approved equal in accordance with B6.

2.4 BALL VALVES – STAINLESS STEEL

.1 Stainless steel 2000 WOG ball valves, 2":

.1 Two piece Body: stainless steel 316 – A 351 CF8M

.2 Ball: stainless steel 316 – A 351 CF8M

.3 Seat: reinforced Teflon

.4 Gasket: PTFE

.5 Stem: stainless steel 316 A276

.6 Handle, locking device, handle nut, stem washer: stainless steel 304 A276.

.7 Port: full

.8 NPT ends to ANSI B1.20.1

.9 Blow out proof stem

.10 Adjustable packing gland

.11 Locking lever handle

.2 Acceptable manufacturer and models:

.1 M.A.Stewart G Series (match to existing)
.2 or approved equal in accordance with B6.

2.5 CHECK VALVES

.1 Stainless steel swing check valves, 4":

.1 Body: stainless steel 316 ASTM A351 Gr. CF8M
.2 Disc: stainless steel 316 ASTM A 351 Gr. CF8M
.3 Flanged ends to ANSI B16.5 Class 150
.4 Wall thickness: ANSI B16.34
.5 Gasket: PTFE

.2 Acceptable manufacturer and models:

.1 PinAcle
.2 or approved equal in accordance with B6.

2.6 SLIDE GATE VALVE

.1 Gravity drain valve, 20 psig rating, 4":

.1 Body: PVC
.2 Shaft and Paddle: stainless steel 304
.3 Ends: PVC hubs
.4 Seals: Sarlink
.5 Handle: Die Cast Aluminum

.2 Acceptable manufacturer and models:

.1 Valterra
.2 or approved equal in accordance with B6.

Part 3 Execution

3.1 INSTALLATION

.1 Valves shall be installed in accordance with manufacturer's written installation and operation manual.

.2 Install eccentric plug valves with line pressure acting to hold plug against body port which is to be cut-off from higher pressure.

.3 Flanged valve boltholes shall straddle vertical centreline of pipe. Clean flange faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

.4 Install slide gate valve in existing concrete drain trench. Chip concrete to fit valve low in trench for improved drainage.

3.2 TESTING AND COMMISSIONING

.1 Test and commission valves to demonstrate proper operation.

.2 Valves are to open and close smoothly under operating pressure conditions.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A276 - 10 Standard Specification for Stainless Steel Bars and Shapes.

.2 ASTM B584 - 09a Standard Specification for Copper Alloy Sand Castings for General Applications

1.2 PRODUCT DATA

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

.2 Submit data for all valve stems, couplers, guides, and anchors specified in this section.

.3 Submit Certification, Mill test reports, and heat identification or traceability details for stems.

1.3 CLOSEOUT SUBMITTALS

.1 Submit as-built drawings.

Part 2 Products

2.1 GENERAL

.1 Provide new sections of stems, couplers, guides, and anchor bolts for modification of the existing inlet chamber sluice gates.

2.2 STEMS AND COUPLINGS

.1 Stems shall be ASTM A276 type 316(L) stainless steel. Solid stems shall be 2” dia. (50mm) by lengths shown on the drawings with threaded ends to suit couplers. Refer to Drawing No. GA-976 for details of existing stems and couplers. (Refer to Appendix for drawing). Contractor to verify drawing details with existing installation.

.2 Stem couplers shall be ASTM B584 CA954 bronze or ASTM A276 type 316(L) stainless steel.

2.3 STEM GUIDES

.1 Stem guides shall be cast iron with bronze bushings, adjustable in 2 directions to provide full adjustment for proper alignment with the stem. Bushing to be machine bored 1/16” larger than the stem diameter.

.2 Guide bushings shall conform to ASTM B584 CA 932 bronze.

2.4 ANCHOR BOLTS

.1 Concrete Anchor Bolts, Nuts and Washers: HAS –R-304 anchor rods with HVU adhesive capsules, manufactured by Hilti (Canada) Ltd.. Size as shown on the drawings.

Part 3 Execution

3.1 INLET CHAMBER SLUICE GATES REFURBISHMENT AND MODIFICATIONS

.1 Disassemble and remove items that are not required for reuse including extension shaft and geared floor stands.

.2 Disassemble, remove, clean, and refurbish as required all gate components to be reused and/or modified and reused including gate stems, stem couplers, stem guides, stem block, gate wedges, and sluice gates.

.3 The Contractor shall assume that the gate discs, frames and guides are fundamentally sound and can be returned to serviceable condition by cleaning using hand tools. Should deficiencies requiring more extensive repair be discovered once the gates are disassembled, the Contract Administrator shall be notified immediately, and further work held until alternative repair plans are established.

.4 Refurbishing of the gate discs shall include, but not be limited to, removal of all surface accretions, power tool cleaning of the key and mating surfaces that run against the vertical gate guides, power tool cleaning of the disc bottom where it rests on the resilient seat, and careful hand scraping of the bronze seating strips by a qualified millwright to achieve a water tight seal with the companion gate frame seating strips.

.5 Refurbishing of the gate frame and guide assemblies shall include, but not be limited to, removal of all surface accretion, power tool cleaning of the guide slots and mating surfaces that run against the gate discs, and careful hand scraping of the bronze seating strips by a qualified millwright to achieve a water tight seal with the companion gate disc seating strips.

.6 Refurbishing of the gate wedges shall include removal, cleaning, inspection, and dressing of wedge surfaces.

.7 Refurbishing of the gate lifting stems (ASTM B21 C48200 bronze) and couplings shall include removal, cleaning and inspection.

.8 Remove and replace the urethane resilient seats at the bottom of the gate frames.

.9 Remove, disassemble, clean and inspect the stem guides and bushings. If the stem diameter to guide bushing diameter clearance exceeds specifications, supply, fabricate and install new bronze bushings.

.10 Carefully inspect the lead screws machined into the top section of each gate stem and confirm that they are suitable in design, size and condition for reuse with the new actuators. If the lead screws are judged unsuitable for refurbishing and reuse, immediately bring the deficiency to the Contract Administrator’s attention.

.11 Reinstall the refurbished gate stems, stem guides and stem blocks along with new stem sections, couplers, guides, and other parts for a complete installation. Stem guide spacing has been reduced from the existing installation.

.12 Reinstall the refurbished gate discs and gate wedges.

3.2 ADJUSTMENT AND TESTING

.1 Upon completion of the work on each gate the entire assembly shall be adjusted and aligned in accordance with the original gate specification and supply documents. The gate shall operate freely, to the satisfaction of the Contract Administrator, through its entire range of movement in both the lifting and lowering directions. Any deficiencies in operation of the refurbished gate shall be rectified to the full satisfaction of the Contract Administrator.

.2 Test each gate for leakage against a seating head of 3 meters, in accordance with AWWA C501. Develop and submit a testing procedure to the Contract Administrator for approval. The testing procedure is to include several trials starting with no flow and increasing the seating head in increments of 1 meter.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

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

.2 CAN/CGSB-24.3, Identification of Piping Systems.

1.2 PRODUCT DATA

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

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

1.3 SAMPLES

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

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

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers to be raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: Manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: Use size # 5.

.2 Equipment in Mechanical Rooms: Use size # 9.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Contract Administrator.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 All other pipes: Pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100%RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Contract Administrator.

.2 Colours for legends, arrows: To following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Grit Removal	Blue Stripe (stainless steel piping)	GRIT REMOVAL
Flushing Water	Light Blue	FLUSHING WATER
Compressed air (<700kPa)	Green	COMP. AIR
Instrument air	Green	INSTRUMENT AIR
Control air tubing Conduit for low voltage control wiring		

2.5 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.6 CONTROLS COMPONENTS IDENTIFICATION

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

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

2.7 LANGUAGE

.1 Identification to be in English

Part 3 Execution

3.1 TIMING

.1 Provide identification only after all painting has been completed.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC or CSA registration plates as required by respective agency.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection

.1 Do not paint, insulate or cover in any way.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: At not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

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

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification to be easily and accurately readable from usual operating areas and from access points.

.1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Number valves in each system consecutively.

END OF SECTION