SUMMARY OF WORK

1. GENERAL

1.1 Work Covered by Contract Documents

.1 Work of this Supply Contract comprises generally of the supply of a Scum Dewatering Equipment complete with all electrical and control appurtenances. Work also includes start-up, commissioning, training, performance testing and O&M manuals.

.2 The Work includes, but is not limited to the following elements:

.1 Supply of two (2) Rotary Dewatering Presses complete with all appurtenances.

.2 Supply of one (1) polymer dosing skid complete with all appurtenances.

.3 Storage of equipment until installation can be completed.

.4 Start-up, commissioning, performance testing and O&M manuals.

.5 Equipment to be installed under a separate contract, with installation guidance from the Rotary Press supplier.

.6 Coordinate delivery, installation, training, start-up and commissioning with the Construction Contractor.

1.2 Work Sequence

.1 Co-ordinate Progress Schedule with the City and Contract Administrator during construction to minimize disruption.

.2 Proposed stages include:

.1 Award of Contact.

.2 Review of Shop Drawings.

.3 Delivery to Site.

.4 Start-up, commissioning and training.

1.3 Work Coordination

.1 Co-ordinate work with General Contractor in regard to equipment delivery, installation, start-up, commissioning and training.

1.4 City of Winnipeg Personnel Occupancy

.1 City of Winnipeg personnel will work around Site during entire construction period for execution of normal operations.

.2 Co-operate with City of Winnipeg personnel in scheduling operations to minimize conflict.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION

SUBMITTAL PROCEDURES

1. GENERAL

1.1 Description

.1 Submit to the Contract Administrator the submittals required by individual Specification Sections for review. Submit promptly and in an 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 the submittal until reviewed by the Contract Administrator.

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

.1 Where items or information is not produced in SI Metric units, converted units are acceptable.

.4 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.

.5 The review by the Contract Administrator is for the sole purpose of ascertaining conformance with general concept. It does not provide 'approval' of the detail design inherent in Shop Drawings (which remains with the Contractor), nor does it relieve the Contractor of responsibility for errors or omissions in Shop Drawings or for meeting all requirements of the construction and Contract Documents.

.6 Verify that field measurements and affected adjacent Work are coordinated.

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

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

.9 Keep one (1) reviewed hard copy of each submission on Site filed by Division.

1.2 Submittal Procedures

.1 Direct submittals to the Contract Administrator.

.2 Hardcopy Submittals: Submit hard copies only where specifically required under individual Specifications sections.

.3 Electronic Submittals: Submittals made in electronic format shall be as follows:

.1 Each submittal shall be electronic file in Adobe Acrobat Portable Document Format (PDF), and native files (e.g. Word, Excel, AutoCAD, etc.). Use 2010 version or newer.

.2 Electronic files that contain more than ten (10) pages in PDF format shall contain internal book marking from index page to major sections of document.

.3 PDF files shall be set to open “Bookmarks and Page” view.

.4 Add general information to each PDF file, including title, subject, author, and keywords.

.5 PDF files shall be set up to print legibly at 215.9 mm by 279.4 mm (8.5” by 11”), 279.4 mm by 431.8 mm (11” by 17”), or ISO A1 (594 mm by 841 mm). No other paper sizes will be accepted.

.6 Submit new electronic files for each resubmittal.

.7 Include copy of transmittal of Contractor’s submittal.

.8 Contract Administrator will reject submittals that are not accompanied by an electronic copy.

.9 Provide authorization for Contract Administrator to reproduce and distribute each file as many times as necessary for Project documentation.

.10 Shop Drawings requiring an engineering seal shall be updated at project closeout and assigned a City of Winnipeg Water and Waste drawing number, sheet number, revision number and drawing size. Include fields in the Shop Drawing title block to incorporate the information.

.4 Schedule of Submittals:

.1 Prepare a table listing all anticipated submittals required to complete the Work.

.2 For each Specification Section show, at a minimum, the following:

.1 Specification Section.

.2 Total number of submittals for each Specification Section.

.3 Identify each submittal by its submittal number in accordance with a numbering and tracking system.

.4 Identify each submittal by its name or title.

.5 Identify the estimated date of submission to the Contract Administrator.

.6 State the revision number and status for each submittal.

.3 On a monthly basis, submit an updated schedule of submittals to the Contract Administrator if changes have occurred.

.5 Transmittal of Submittal:

.1 Stamp each submittal with uniform approval stamp before submitting to Contract Administrator.

.1 Stamp to include project name, submittal number, Specification number, Contractor's reviewer name, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with Contract.

.2 Contract Administrator will not review submittals that do not bear Contractor's approval stamp and will return them without action.

.3 Contract Administrator will not review submittals received directly from a Subcontractor and will return them without action.

.4 Complete, sign, and transmit with each submittal package, one (1) transmittal of Contractor's submittal form.

.2 Identify each submittal with the following:

.1 Numbering and tracking system:

.1 Sequentially number each submittal.

.2 Resubmission of submittal shall have original number with sequential alphabetic suffix.

.2 Specification Section and paragraph to which submittal applies.

.3 Project title and City Tender number.

.4 Date of transmittal.

.5 Name of Contractor.

.3 Include Contractor's written response to each of Contract Administrator's review comments with resubmission of submittals stamped "Exceptions Noted, Resubmit".

.6 Format:

.1 Do not base Shop Drawings on reproductions of Contract Documents.

.2 Package submittal information by individual Specification Section. Do not combine different Specification Sections together in submittal package, unless otherwise directed in Specification.

.3 Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract.

.4 Index with labeled tab dividers in orderly manner.

.7 Timeliness:

.1 Schedule and submit submittals in accordance with schedule of submittals and requirements of individual Specification Sections.

.2 Submit Shop Drawings and samples well in advance of scheduled delivery date for associated equipment or material and in an orderly sequence so as to cause no delay in the Work.

.8 Processing Time:

.1 Time for review shall commence on Contract Administrator's receipt of submittal.

.2 Contract Administrator will act upon Contractor's submittal and transmit response to Contractor not later than ten (10) Business Days after receipt, unless otherwise specified.

.3 Resubmittals will be subject to the same review time.

.4 The review time required will not alleviate the Contractor of his responsibility to deliver the completed Work within the required time frame and schedule. Planning for submittal reviews and the risk to the construction schedule remains the Contractor's sole responsibility.

.9 Resubmittals:

.1 Clearly identify each correction or change made and include revision date.

.2 No adjustment of the schedule outlined in the Supplemental Conditions or Contract Price will be allowed due to delays in progress of Work caused by rejection and subsequent resubmittals.

.10 Incomplete Submittals:

.1 The Contract Administrator will return the entire submittal for the Contractor's revision if preliminary review deems it incomplete.

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

.3 When any of the following are missing, the submittal will be deemed incomplete:

.1 Contractor's review stamp, completed and signed.

.2 Transmittal of Contractor's Submittal form, completed and signed.

.3 Insufficient number of copies.

.4 All requested information is not provided.

.5 Submittals missing professional engineer's seal and signature, where it is required.

.11 Submittals not required by Contract:

.1 Will not be reviewed and will be returned stamped "RECEIVED FOR INFORMATION".

.2 Contract Administrator will keep one (1) copy of all Shop Drawings and Product Data.

1.3 Shop Drawings and Product Data

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

.2 In general, all equipment to be installed at the Site will require Shop Drawings, which shall be submitted to the Contract Administrator.

.3 Sales bulletins or other general publications are not acceptable as submittals for review except where necessary to provide supplemental technical data.

.4 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 All Shop Drawings are to include details as follows:

.1 Indicate dimensions, operating weights, materials, methods of construction, and attachment of support wiring, diagrams, connections, recommended installation details, explanatory notes, and other information necessary for completion of Work.

.2 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 Drawings and Specifications.

.3 Indicate clearances for operation, maintenance, and replacement of operating equipment devices.

.6 Electrical and instrumentation and control system Shop Drawings to include additional details as follows:

.1 Elevation layouts, bill of materials (BOM), fuse charts, schematics, interconnections, point-to-point wiring diagrams, loop wiring diagrams, motor control diagrams, single line diagram, 3-line diagram, and CSA/cUL panel plates in addition to the other wiring and detail requirements of the Contract.

.1 Panel plates shall be included in submissions, to be affixed on the front exterior door of the enclosure. They shall contain all information required under CSA C22.1 and C22.2. At a bare minimum the short circuit current rating (SCCR) of panel plates shall be equal to the MCC or Panelboard from which they are fed from.

.2 Wiring diagrams shall mark conductor identification, field terminals, changes, etc.

.3 Detailed listing of all nameplates.

.4 Identification in accordance with the City of Winnipeg Water & Waste Identification Standard (https://winnipeg.ca/waterandwaste/pdfs/dept/IdentificationStandard.pdf).

.2 Instrument Loop Diagrams (ILDs) – detailed drawings showing typical interconnections for the specified instrumentation and control devices. The Contractor is to reproduce an ILD for each device and record all relevant notes and installation-specific information on

each sheet. Update the ILDs as necessary and fill in all terminal and wiring numbers, etc. from relevant Shop Drawings as they become available.

.1 Loop wiring diagrams shall follow ISA 5.4 for standard drawing layout, symbols, and wiring depictions.

.3 Motor Control Schematics (MCS) – when these are included, they are detailed drawings showing typical interconnections of motor control equipment. The Contractor is to reproduce a MCS for each motor and record all relevant notes and installation-specific information on each sheet. Update the MCS as necessary and fill in all terminal and wiring numbers, etc. from relevant Shop Drawings as they become available.

.4 Equipment descriptive data and detailed information for the system hardware and software (i.e., cutsheets or product literature). Failure to provide product literature or cutsheets with drawing submissions is grounds for marking the submission “Revise and Resubmit” without review.

.1 High-light only relevant information for the products provided. The intent of the literature is a technical review of the products suitability, technical ratings and limitations, and the installation/application. Do not include sales literature, or custom-made sheets, or sales declarations. Only manufacturer issued technical literature will be accepted.

.2 Where products have configurable part numbers, the part number options shall be broken down and either circled in red or highlighted in yellow.

.3 All cutsheets and product literature shall be provided showing CSA or cUL markings either circled in red or highlighted in yellow.

.4 Where hazardous location products are required, they shall also be submitted with their CSA or cUL certificates, and CSA or cUL required wiring diagrams for hazardous installations. The control system wiring diagrams shall capture these requirements, provide intrinsically safe barriers and methods as required, and provide notes for the electrical installer.

.5 Drawings for cabling:

.1 Provide Termination drawings with complete list of materials and nameplate engraving list.

.2 Provide Interconnection wiring diagrams for the complete system showing every fibre in each cable.

.6 Records of as-built information for the complete instrumentation and control system.

.1 Provide Enclosure/Cabinet temperature control calculations for heating and cooling loads. Appropriate temperature control shall be provided whenever required and maintain the enclosures CSA/NEMA rating.

.1 Temperature calculations shall be provided whenever Variable Frequency Drives (VFD), Variable Speed Drives (VSD), internally mounted transformers, or other components/devices may produce sufficient heat within the enclosure, or as requested by the Contract Administrator.

.7 Notify the Contract Administrator in writing of any deviations in Shop Drawings from the requirements of the Contract.

.1 Contract Administrator will not assume the responsibility for searching out deviations in the Contractor's drawings.

.8 Submit Shop Drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba as required in the Specifications. The following components require sealed Shop Drawings:

.1 Metal fabrications.

.2 Control Panels.

.3 Instrument Loop Wiring Diagrams

.9 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. Examination of each Shop Drawing shall be indicated by stamp, date, and signature of a responsible person of the Subcontractor for supplied items and of the Contractor for fabricated items. Shop Drawings not stamped, signed, and dated will be returned without being reviewed and stamped " REVISE AND RESUBMIT ". Ensure that the following are verified:

.1 Field measurements.

.2 Field construction criteria.

.3 Catalogue numbers and similar data.

.10 Submittals shall be in one (1) of the following formats:

.1 Submit three (3) copies of white prints and three (3) copies of all fixture cuts and brochures.

.2 Submit one (1) electronic PDF copy.

.11 Shop Drawings will be returned to the Contractor with one (1) 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 and submit again for review.

.4 When stamped "NOT REVIEWED" or "REJECTED", submit other Shop Drawings, brochures, etc., for review consistent with the Contract.

.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.

.12 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.

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

.14 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 payment to the Contractor.

1.4 Description of Construction Methods

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

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

.3 Other Considerations:

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

1.5 Requests for Information

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

.2 Submission Procedure

.1 Submit RFI's to the Contract Administrator on the "Request for Information" form appended to this Section. The Contract Administrator shall not respond to a RFI except as submitted on this form. The link to the City's RFI form is provided below:

https://www.winnipeg.ca/infrastructure/templates/ExecutionControl/Request_for_Information_(RFI)_v2.0.docx

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

.3 Submit one (1) distinct subject per RFI request. Do not combine unrelated items on one (1) form.

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

.5 Submit with RFI form all necessary supporting documentation.

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

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

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

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

.5 An RFI response shall be issued within ten (10) Business Days of receipt of the request from the Contractor unless the Contract Administrator determines that a longer time is necessary to provide an adequate response. When the RFI submission is received by the Contract Administrator before noon, the review period commences on that Business Day. When the RFI submission is received by the Contract Administrator after noon, the review period commences on the subsequent Business Day.

.6 If, at any time, the Contractor submits a large number of RFI's or the Contract Administrator considers the RFI to be of such complexity that the Contract Administrator cannot process the RFI's within ten (10) Business Days, the Contract Administrator shall confer with the Contractor within five (5) Business Days of receipt of such RFI's and the Contract Administrator and the Contractor will jointly prepare an estimate of the time necessary for processing same as well as an order of priority among the RFI's submitted. The Contractor shall accommodate such necessary time at no impact to the schedule and at no additional cost to the Contract.

.7 If the Contractor submits a RFI on an activity with ten (10) Business Days or less of available time to the impacted activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Contractor Administrator to respond to the request provided that the Contract Administrator responds within the ten (10) Business Days set forth above.

.8 An RFI response from the Contract Administrator will not change any requirement of the Contract. In the event the Contractor believes that the RFI response from the Contract Administrator will cause a change to the requirements of the Contract, the Contractor shall within ten (10) Business Days give written notice to the Contract Administrator stating that the Contractor believes the RFI response will result in a change to the Contract and the Contractor intends to submit a change request. Failure to give such written notice of ten (10) Business Days shall waive the Contractor's right to seek additional time or cost under the requirements of the Contract.

1.6 Closeout Submittals

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

1.7 Miscellaneous Submittals

.1 Prepare and submit submittals required Contract Documents.

.2 Copies: Submit one (1) electronic copy to Contract Administrator. Method of electronic submission to be coordinated with Contract Administrator after execution of the Contract.

.1 Submit hard copies for paint samples and other submittals where specifically required under individual Specifications Sections.

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

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

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

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

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

1.8 General Requirements for Submittals

.1 Details regarding submittals can be found in the individual Specification Sections.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

SUBMITTAL PROCEDURES

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

RFI Title: _____ **RFI No.:** 0

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

Date Response Issued: _____

Project Name: _____

Submitted To:			
Contract Administrator (CA):		Consultant Ref. No.	
Company/Dept.:		Tender No.	

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

Request/Question: (to be completed by Contractor)

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

Attachment(s):

Distribution (to be completed by Contract Administrator)

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

END OF SECTION

COMMON PRODUCT REQUIREMENTS

1. GENERAL

1.1 References

.1 Within text of each Specification Section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in the Specifications.

.3 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.

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

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids.

1.2 Quality

.1 Products, materials, equipment and articles incorporated in the Work shall be new, not damaged or defective, and of the best quality for the 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 a precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should disputes arise as to quality or fitness of products, decision rests strictly with the Contract Administrator based upon the requirements of the Construction Contract Documents.

.4 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item.

.5 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 Availability

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

.2 In event of failure to notify Contract Administrator at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Contract Administrator

reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 Storage, Handling and Protection

.1 Handle and store products in a 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 the Work.

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

.4 Store materials on flat, solid supports and keep clear of ground. Slope to shed moisture.

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

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

.7 The Supplier shall be responsible for off-Site storage of the equipment, appurtenances, and materials and for protection against weather, loss, damage, or theft providing Separate Price Item No. 3 is awarded until Construction contractor is ready to install the equipment and issues a delivery order.

.8 The storage is per thirty (30) day period or portion there of. Storage is to be paid in thirty (30) day increments and is not tied to calendar days.

1.5 Transportation

.1 Pay costs of transportation of products required in performance of Work. Goods shall be delivered DDP (Delivery Duty Paid) destination, freight prepaid to:

North End Water Pollution Control Centre
2230 Main Street
Winnipeg, MB R2V 4T8

.2 The Construction Contractor shall be responsible for receiving, off-loading, and placing into storage all equipment at the Site.

1.6 Manufacturer's Instructions

.1 Unless otherwise indicated in the Specifications, install or erect products in accordance with the 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 the Specifications and the Manufacturer's instructions, so that the Contract Administrator will establish 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 Construction Contract Price or Construction Contract Time.

1.7 Quality of Work

.1 Ensure Quality of Work is of the 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.

1.8 Location of Fixtures

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

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

1.9 Fastenings

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

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

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

.4 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.5 Use heavy hexagon heads, semi-finished unless otherwise specified. Use 304 stainless steel unless specified otherwise.

.6 Bolts may not project more than one diameter beyond nuts.

.7 Use soft-gasket lock-type washers at attachments prone to vibration. Use resilient washers with stainless steel.

.8 Prevent electrolytic action between dissimilar metals and materials.

.9 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION

EQUIPMENT INSTALLATION

1. GENERAL

1.1 Intent

.1 This Section describes general requirements for all equipment supplied under this Contract relating to factory inspections, equipment delivery, equipment installation training, equipment installation, commissioning, equipment performance testing, and process performance tests.

.2 At least thirty (30) days prior to commencing equipment operation and performance testing, the Supplier shall assist the Construction Contractor to prepare and submit a detailed start-up plan to indicate the schedule and sequence of equipment installation checks and tests required for the Contract Administrator's review and inputs. No testing Work can commence until this plan has been discussed by all parties involved and accepted by the Contract Administrator.

1.2 Definitions

.1 Supplier's Representative: A Supplier's Representative is a trained serviceman empowered by the Supplier to provide:

.1 Witnessing of delivery.

.2 Installation and process training.

.3 Witnessing of equipment installation.

.4 Assistance in commissioning and equipment performance testing.

.5 Assistance in commissioning and process performance testing.

.6 Participation in the Guaranteed Performance Acceptance Testing (GPAT).

.7 Provide training to the City's staff.

1.3 Expertise and Responsibility

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

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

1.4 Inspection at Factory

.1 The City and/or Contract Administrator may, before or after selection of equipment has been made, inspect or have an authorized representative inspect the manufacturing, assembling, and testing facilities at the Supplier's or Subcontractor equipment factory, to satisfy themselves of the capability of the Supplier or Subcontractor equipment to supply the specified equipment.

.2 The City and/or the Contract Administrator may inspect or have an authorized inspector inspect the equipment factory or the process of manufacture or testing of the equipment at the Supplier's or Subcontractor equipment factory at any reasonable time. The City and/or the Contract Administrator or the inspector may notify the Supplier or Subcontractor at any time of unsatisfactory materials, workmanship, or processes.

.3 The Supplier, as the case may be, shall provide every reasonable facility, access, and co-operation to assist the City and/or the Contract Administrator or an authorized inspector in carrying out inspection or testing at the equipment factory or facility.

.4 Inspection or testing carried out by the City and/or the Contract Administrator or an authorized inspector shall not relieve the Supplier of the responsibility for supplying equipment in accordance with the Contract and good engineering practice.

1.5 Equipment Delivery

.1 Delivery shall be coordinated with and made to the Construction Contractor. Written acceptance of receipt, at delivery, by the Construction Contractor shall constitute “Delivery to Site” under this Contract. The shipping lists of materials will be carefully checked by the Supplier’s Representative in the presence of the Contract Administrator and the Construction Contractor. When the Construction Contractor accepts the equipment delivery, he shall certify the delivery by completing Form 100 – Certificate of Equipment Delivery, attached to this Specification.

.2 The Supplier shall provide a schedule within fifteen (15) calendar days after notification of acceptance of Shop Drawings. No delivery to the Site of the Work shall occur until Reviewed Shop Drawings are received by the Supplier.

.3 The schedule shall allow for:

.1 A period for the Contract Administrator allow four (4) weeks to review and comment on the Supplier’s Shop Drawings for the equipment to be supplied.

.4 The Supplier will be entitled to an extension of the quoted delivery period on account of:

.1 Delay attributable to Acts of God or other matters, which were not the fault of the Supplier and over which it had no control, provided that the Supplier took all possible action to reduce delays and notified the City promptly of the occurrence of such delays.

.5 Ten (10) days before delivery, notice shall be given to the Contract Administrator so that arrangements for receipt and for inspection can be made. The shipping lists of materials will be carefully checked by the Supplier in the presence of the Contract Administrator and the Construction Contractor.

.6 The Supplier shall clearly mark each item to be shipped and identify and reference it to the packing lists and to bills of materials on the Shop Drawings. The lists will be used by the Supplier, the Construction Contractor, and the Contract Administrator to check the contents of each delivery. No shipments will be off-loaded until itemized packing lists have been received by the parties mentioned herein.

.7 The Supplier shall adequately pack and crate each component to provide protection during transport, handling, and storage. Equipment suitable for outside storage will be stored to the satisfaction of the Supplier and the Contract Administrator. The Supplier shall identify each

component with durable labels or tags securely attached to each piece of equipment, crate, or container.

.8 The Supplier shall protect polished and machined metal surfaces from corrosion and damage during shipment and storage and shall carefully pack and crate the equipment for shipment. The Supplier shall protect threaded connections with threaded plugs or caps and shall protect open plain end pipes with caps. He shall especially pack electrical equipment and control panels to prevent scratching, access by dirt, moisture, or dust, or damage to insulation and shall cover equipment having exposed bearings and glands to exclude foreign matter. All openings in the equipment shall be covered before shipment. Sufficient lifting hooks shall be supplied for handling all crates or boxes and heavy pieces.

.9 The equipment may have to be stored on the Site for an extended period of time before installation and equipment performance testing. Accordingly, the Supplier shall provide any special packaging and protective coatings, lubricants, etc., which the Supplier deems necessary to protect the equipment during the protracted storage and prior to equipment performance testing. The Construction Contractor will be responsible for removing any protective coatings prior to installation and equipment performance testing in accordance with the Supplier's written instructions.

.10 The Supplier's Representative shall be at the delivery Site to check the delivery and to examine the equipment for damage or loss, and to inspect the Construction Contractor's storage facilities for the equipment supplied for compliance with the Supplier's recommendations. The Supplier shall maintain an inventory of all equipment supplied and delivered to the Construction Contractor.

.11 The Construction Contractor shall be responsible for receiving, off-loading, and placing into storage all equipment at the Site.

.12 The Supplier shall be responsible for providing the Construction Contractor with full instructions in writing of all precautions to be observed in connection with the storing and protection of the equipment. A copy of all instructions shall be provided to the Contract Administrator.

.13 Where the equipment is to be stored on Site for any period of time exceeding one week, the Supplier shall instruct the Construction Contractor Site staff of the specific storage requirements to ensure there is no uneven wear or distortion of equipment component parts.

1.6 Installation Assistance

.1 Unless otherwise specifically stated in the Specifications, the Supplier shall provide, a factory-trained representative who, in conjunction with the Contract Administrator or his agent, shall give instructions regarding the installation of the equipment.

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

.3 The Supplier shall inform the Contract Administrator, in writing, of the attendance at the Site of any Supplier's Representative for installation training at least fourteen (14) days prior to arrival.

.4 When the Supplier's Representative is satisfied that the Construction Contractor is aware of all installation requirements, he shall so certify by completing Form 101 – Certificate of Readiness to Install attached to this Specification.

.5 The completed form shall be delivered to the Contract Administrator prior to departure of the Supplier's Representative from the Site.

.6 Installation of the equipment shall not commence until the Contract Administrator has advised that he has received the completed Form 101.

.7 Separate copies of Form 101 shall be used for different equipment.

1.7 Installation

.1 If necessary, or if so directed by the Contract Administrator during the course of installation, the Construction Contractor shall contact the Supplier's Representative to receive clarification of installation procedures, direction, or any other additional information necessary to continue or complete the installation in an appropriate manner.

.2 If it is found necessary, or if so directed by the Contract Administrator, the Construction Contractor shall arrange for the Supplier's Representative to visit the Site to provide assistance during installation, all at the Construction Contractor's cost.

.3 Prior to completing installation, the Construction Contractor shall inform the Supplier's Representative and arrange for the attendance at the Site of the Supplier's Representative to verify successful installation.

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

.5 The Supplier's Representative shall identify any outstanding deficiencies in the installation.

.6 The deficiencies shall be rectified by the Construction Contractor and the Supplier's Representative will be required to re-inspect the installation, at the Construction Contractor's cost.

.7 When the Supplier's Representative accepts the installation, he shall certify the installation by completing Form 102 – Certificate of Satisfactory Installation, attached to this Specification.

.8 Deliver the completed Form 102 to the Contract Administrator prior to departure of the Supplier's Representative from the Site.

.9 Tag the equipment with a 100 mm by 200 mm card stating "EQUIPMENT CHECKED. DO NOT RUN." stencilled in large black letters. Sign and date each card.

.10 Provide separate copies of Form 102 for different equipment.

1.8 Operation and Performance Verification

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

.2 During the demonstration, running tests, and performance tests, the Construction Contractor shall operate equipment as required to complete the Performance Verification required from all Divisions of this Specification.

.3 Inform the Contract Administrator at least fifteen (15) days in advance of conducting the tests and arrange for the attendance of the Supplier's Representative. The tests may be concurrent with the inspection of satisfactory installation if mutually agreed by the Construction Contractor and the Contract Administrator.

.4 The Supplier's Representative shall conduct all necessary checks to the equipment and if necessary, advise the Construction Contractor of any further checking, flushing, cleaning, or other work needed prior to confirming the equipment is ready to run.

.5 The Construction Contractor shall then operate the equipment for at least one (1) hour to demonstrate the operation of the equipment and any required ancillary services. Any remedial measures required to ensure satisfactory operation shall be promptly undertaken.

.6 Demonstration:

.1 The Construction Contractor shall then notify the Contract Administrator of his readiness to demonstrate the operation of the equipment. The Contract Administrator shall attend, as expeditiously as possible.

.2 With the assistance of the Supplier's Representative, the Construction Contractor shall demonstrate that the equipment is properly installed. Alignment, piping connections, electrical connections, etc. will be checked and if appropriate, code certifications provided.

.3 The equipment shall then be run for one (1) hour. Local controls shall be verified by cycling the equipment through several start-stop operations, modulating its output, or some combination. Operating parameters such as temperature, pressure, voltage, vibration, etc., will be checked to ensure that they are within the specified or Supplier's Representative's recommended limits, whichever is more stringent.

.4 On satisfactory completion of the one (1) hour demonstration, the equipment shall be stopped and critical parameters, such as alignment, shall be rechecked.

.7 Running Test:

.1 The equipment shall be restarted and run continuously for a minimum of three (3) days (seventy-two (72) hours) with clean water or as specified. During this period, as practicable, conditions shall be simulated which represent maximum or most severe, average, and minimum or least severe conditions. These conditions will be mutually agreed to by the Supplier's Representative, the Construction Contractor, and the Contract Administrator on the basis of the information contained in the technical specifications, as well as the methods utilized to create the simulated conditions and the time periods allotted to each.

.8 Performance Tests:

.1 Performance tests shall be conducted either concurrently with or subsequent to the running test, as practicable and agreed between the Contract Administrator, the Supplier's Representative, and the Construction Contractor.

.2 The equipment shall be run continuously for a minimum of seven (7) days (one hundred sixty-eight (168) hours) or as specified.

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

.4 The Construction Contractor shall submit the results of the performance tests within twenty-four (24) hours to the Contract Administrator, and final documented and summarized results in a format acceptable to the Contract Administrator within seven (7) calendar days. The Contract Administrator reserves the right to request additional testing. No equipment shall be accepted and handed over to the City prior to the satisfactory completion of the performance test(s) and receipt of the test reports.

.9 The Construction Contractor shall supply all water, scum feed, chemicals, temporary power, heating, and/or any other ancillary equipment or services required to complete the initial demonstration, running test and performance tests.

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

.11 Forms 103 and 104 are provided in 01 91 31 Commissioning Plan.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

CERTIFICATE OF EQUIPMENT DELIVERY
FORM 100

We certify that the equipment listed below has been received and delivered into the care of the Construction Contractor. The equipment has been found to be in satisfactory condition. No defects in the equipment were found.

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

_____ _____
(Authorized Signing Representative of the Construction Contractor) Date

_____ _____
(Authorized Signing Representative of the Supplier) Date

_____ _____
(Authorized Signing Representative of the Contract Administrator) Date

CERTIFICATE OF READINESS TO INSTALL
FORM 101

I have familiarized the Construction Contractor of the specific installation requirements related to the equipment listed below and am satisfied that he understands the required procedures.

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

_____ _____
(Authorized Signing Representative of the Supplier) Date

I certify that I have received satisfactory installation instructions from the equipment Supplier.

_____ _____
(Authorized Signing Representative of the Construction Contractor) Date

CERTIFICATE OF SATISFACTORY INSTALLATION
FORM 102

I have completed my check and inspection of the installation listed below and confirm that it is satisfactory and that defects have been remedied to my satisfaction except any as noted below:

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

OUTSTANDING DEFECTS: _____

_____ _____
(Authorized Signing Representative of the Supplier) Date

_____ _____
(Authorized Signing Representative of the Construction Contractor) Date

_____ _____
(Authorized Signing Representative of the Contract Administrator) Date

CLOSEOUT SUBMITTALS

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 the maintenance and operation of described products.

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

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

.5 Four (4) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator six (6) final paper copies of the Operating and Maintenance (O&M) Manuals and one (1) electronic copy (PDF) on USB drive in S.I. Units.

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

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

1.2 Format

.1 Organize data as an instructional manual.

.2 Binders shall be vinyl, hard covered, 3 'D' ring, loose leaf with spine and face pockets. The maximum width of each binder shall not exceed 125 mm; where there is more data than will fit in a binder of 125 mm maximum width, the number of binders shall be as required.

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

.4 Covers shall be used to identify each binder with type or printed title "Operation and Maintenance Manual"; list date, title of project, the City, Construction Contractor and Contract Administrator, and identify subject matter of contents.

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

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

.7 The text shall be manufacturer's printed data, or typewritten data.

.8 Drawings shall be provided with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format on a USB drive.

.10 Provide one (1) electronic copy (on USB drive) of the entire manual. The electronic copy shall have a linked Table of Contents to each section and shall be word searchable.

1.3 Contents - Each Volume

.1 Table of Contents: provide title of project:

.1 Date of submission; names.

.2 Addresses and telephone numbers of the Contract Administrator and Contractor with the names of responsible parties.

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

.2 For each product or system:

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

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

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Drawings larger than 210 mm x 300 mm (A4) shall be contained in plastic pouch. Provide a separate panel for each drawing.

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

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

1.4 As-Builts and Samples

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

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed Shop Drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

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

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

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

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

1.5 Recording Actual Site Conditions

.1 Record information on set of Issued for Construction drawings.

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

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

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

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related Shop Drawings and modifications.

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

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

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

.7 Provide digital photos, if requested, for site records.

1.6 Equipment and Systems

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

.2 Provide copy of reviewed submittals.

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

.4 Include installed colour coded wiring diagrams.

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

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

.7 Provide a servicing and lubrication schedule, and a list of lubricants required.

.8 Include Manufacturer's printed O&M instructions.

.9 Include the sequence of operation by the controls Manufacturer.

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

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

.12 Additional requirements: as specified in individual Specification Sections.

1.7 Materials and Finishes

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

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

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

.4 Additional Requirements: as specified in individual Specifications Sections.

1.8 Spare Parts

.1 Provide spare parts, in quantities specified in individual Specification Sections.

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

.3 Deliver to Site; place and store.

.4 Receive and catalogue items. Submit inventory listing to the Contract Administrator. Include approved listings in O&M Manual.

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

1.9 Maintenance Materials

.1 Provide maintenance and extra materials, in quantities specified in the individual Specification Sections.

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

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to the Contract Administrator. Include approved listings in the O&M Manual.

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

1.10 Special Tools

.1 Provide special tools, in quantities specified in individual Specification Section.

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

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to the Contract Administrator. Include approved listings in the O&M Manual.

1.11 Storage, Handling and Protection

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

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

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

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

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

1.12 Warranties and Bonds

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

.2 Submit warranty management plan, thirty (30) days before planned pre-warranty conference, to Contract Administrator approval.

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

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

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

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

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

.2 List Subcontractor, Supplier, and Manufacturer, with name, address, and telephone number of responsible principals.

.3 Obtain warranties and bonds, executed in duplicate by Subcontractors, Suppliers, and Manufacturers, within ten (10) days after completion of the applicable item of Work.

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

.5 Co-execute submittals when required.

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

.7 Conduct a joint ten (10) month warranty inspection, measured from the time of acceptance, by the Contract Administrator.

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

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

.2 Provide a list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of Manufacturers or Suppliers.

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

.6 Warranties and terms of warranty: include one (1) year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of the warranty period.

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

.10 Cross-Reference to specific pertinent O&M Manuals.

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

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

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

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

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

.10 Written verification will follow oral instructions. Failure to respond will be cause for the City to proceed with action against the Construction Contractor.

1.13 Warranty Tags

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

.2 Attach tags with a durable plastic tie.

.3 Leave the date of acceptance until project is accepted for occupancy.

.4 Indicate the following information on the tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Construction Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION

OPERATION AND MAINTENANCE DATA

1. GENERAL

1.1 Section Includes

.1 Detailed information for the preparation, submission, and Contract Administrator's review of operations and maintenance (O&M) data, as required by individual Specification sections.

1.2 Definitions

.1 Preliminary Data: Initial and subsequent submissions for Contract Administrator's review.

.2 Final Data: Contract Administrator-accepted data, submitted as specified herein.

.3 Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations include but are not limited to lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

.4 Instructional Manual: An organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual systems, subsystems and components as specified in individual sections of this Specification.

1.3 Sequencing and Scheduling

.1 Equipment and System Data:

.1 Preliminary Data:

.1 Do not submit until Shop Drawing for equipment or system has been reviewed and returned stamped "NO EXCEPTIONS TAKEN" or "EXCEPTIONS NOTED" by Contract Administrator.

.2 Submit prior to shipment date.

.2 Final Data:

.1 Submit Instructional Manual not less than 30 days prior to equipment or system field Functional Testing.

.2 Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Performance of Project.

1.4 Data Format

.1 Preliminary Manual Format:

.1 Binder: Commercial quality, permanent, three-ring binders with durable plastic cover.

.1 Three hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data

.2 Size: 8-1/2 inches by 11 inches, minimum.

.3 Cover: Identify manual with typed or printed title "OPERATION AND MAINTENANCE DATA, VOLUME NO._OF____"," and list:

.1 Project title.

.2 Contractor's name, address, and telephone number.

.3 If entire volume covers equipment or system provided by one supplier include the following:

.1 Identity of general subject matter covered in manual.

.2 Identity of equipment number and Specification section.

.4 Provide each volume with title page and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.

.5 Table of contents neatly typewritten, arranged in a systematic order:

.1 Include list of each product, indexed to content of each volume.

.2 Designate system or equipment for which it is intended.

.3 Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.

.6 Section Dividers:

.1 Heavy, 80 pound cover weight, tabbed with numbered plastic index tabs.

.2 Fly-Leaf:

.1 For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.

.2 List with each product:

.1 Name, address, and telephone number of Subcontractor, supplier, installer, and maintenance contractor, as appropriate.

.2 Identify area of responsibility of each.

.3 Provide local source of supply for parts and replacement.

.3 Identity of separate structure as applicable.

.4 Maintenance Summary (Format in accordance with paragraph 1.6.D).

.7 Assemble and bind material in same order as specified in the Contract Documents.

.8 Material shall be suitable for reproduction, with quality equal to original.

.2 Final Instructional Manual Format:

.1 Compile all Contract Administrator-accepted preliminary O&M data into a hard-copy, hard-bound set as detailed in Section B above and in electronic media format as described in paragraph C.

.3 Electronic Media Format:

.1 Portable Document Format (PDF):

.1 After all preliminary data has been found to be acceptable to Contract Administrator, upload electronic copies of O&M data to the City's DMS (Aconex) in PDF format and in native file format as applicable.

.2 Files to be exact duplicates of Contract Administrator-accepted preliminary data. Arrange by specification number and name.

.3 Files to be fully functional and viewable in most recent version of Adobe Acrobat.

.4 PDF files to be indexed and searchable.

.5 CD Cover: Identify with typed or printed title "OPERATION AND MAINTENANCE DATA, VOLUME NO.____OF____"," and list:

.1 Project title.

.2 Contractor's name, address, and telephone number.

.3 Identity of equipment number and Specification section.

1.5 Submittals

.1 Informational:

.1 Data Outline: Submit an electronic copy of a detailed outline of proposed organization and contents of final data prior to preparation of preliminary data.

.2 Preliminary Data:

.1 Submit three (3) hard copies for Contract Administrator's review.

.2 If data meets conditions of the Contract:

.1 One (1) copy will be returned to Contractor.

.2 One (1) copy will be forwarded to The City.

.3 One (1) copy will be retained in Contract Administrator's file.

.3 If data does not meet conditions of the Contract:

.1 Two (2) copies will be returned to Contractor with Contract Administrator's comments (on separate document) for revision.

.2 One (1) copy with comments will be retained in Contract Administrator's file.

.3 Resubmit three (3) copies revised in accordance with Contract Administrator's comments.

.3 Final Data: Submit six (6) hard copies in format(s) specified herein.

1.6 Data For Systems, Subsystem and Components

.1 Content For Each Unit (or Common Units) and System unless otherwise specified:

.1 Product Data:

.1 Include only those sheets that are pertinent to specific product.

.2 Clearly annotate each sheet to:

.1 Identify specific product(s) or part(s) installed.

.2 Identify data applicable to installation.

.3 Delete references to inapplicable information.

.3 Function, normal operating characteristics, and limiting conditions.

.4 Serial Numbers.

.5 Performance curves, engineering data, nameplate data, and tests reports for all pumps.

.6 Complete nomenclature and commercial number of replaceable parts.

.7 Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.

.8 Spare parts ordering instructions.

.9 Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).

.2 As-installed, color-coded piping diagrams.

.3 Charts of valve tag numbers, with the location and function of each valve.

.4 Drawings: Supplement product data with Drawings as necessary to clearly illustrate:

.1 Format:

.1 Provide reinforced, punched, binder tab; bind in with text.

.2 Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.

.3 Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.

.4 Identify Specification section and product on Drawings and envelopes.

.2 Relations of component parts of equipment and systems.

.3 Control and flow diagrams.

.4 Coordinate drawings with Project record documents to assure correct illustration of completed installation.

.5 Instructions and Procedures: Within text, as required to supplement product data.

.1 Format:

.1 Organize in consistent format under separate heading for each different procedure.

.2 Provide logical sequence of instructions for each procedure.

.3 Provide information sheet for The City's personnel, including:

.1 Proper procedures in event of failure.

.2 Instances that might affect validity of guarantee or Bond.

.2 Installation Instructions: Including alignment, adjusting, calibrating, and checking.

.3 Operating Procedures:

.1 Start-up, break-in, routine, and normal operating instructions.

.2 Test procedures and results of factory tests where specified.

.3 Regulation, control, stopping, and emergency instructions.

.4 Description of operation sequence by control manufacturer.

.5 Shutdown instructions for both short and extended duration.

.6 Summer and winter operating instructions, as applicable.

.7 Safety precautions.

.8 Special operating instructions.

.4 Maintenance and Overhaul Procedures:

.1 Routine maintenance.

.2 Guide to troubleshooting.

.3 Disassembly, removal, repair, reinstallation, and re-assembly.

.6 Guarantee, Bond, and Service Agreement: In accordance with Section 01 78 00, Closeout Procedures.

.2 Content for Each Electric or Electronic Item or System:

.1 Description of Unit and Component Parts:

.1 Function, normal operating characteristics, and limiting conditions.

.2 Performance curves, engineering data, nameplate data, and tests.

.3 Complete nomenclature and commercial number of replaceable parts.

.4 Interconnection wiring diagrams, including control and lighting systems.

.2 Circuit Directories of Panelboards:

.1 Electrical service.

.2 Controls.

.3 Communications.

.3 List of electrical relay settings, and control and alarm contact settings.

.4 Electrical interconnection wiring diagram, including control and lighting systems.

.5 As-installed control diagrams by control manufacturer.

.6 ISA S20 data sheets for all instruments.

.7 Operating Procedures:

.1 Routine and normal operating instructions.

.2 Sequences required.

.3 Safety precautions.

.4 Special operating instructions.

.8 Maintenance Procedures:

.1 Routine maintenance.

.2 Guide to troubleshooting.

.3 Adjustment and checking.

.4 List of relay settings, control and alarm contact settings.

.9 Manufacturer's printed operating and maintenance instructions.

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

.3 Content for Programmable Devices/Components/Sub-systems:

.1 The following requirements are minimum requirements applicable to programmable equipment such as VFDs, ASDs, microprocessor based devices, PLCs, Human-Machine- Interfaces, computers, and other programmable devices. Additional requirements may be specified elsewhere.

.2 As-Constructed version of Shop Drawings.

.3 Functional description.

.4 Wiring details.

.5 Configuration Records; record of switch settings, program listings and parameter settings, after commissioning.

.6 Maintenance manuals.

.7 User guides, technical reference and programming manuals.

.8 CD-ROMs copies of:

.1 Manuals.

.2 Settings, databases and templates. Include both native format of files and ASCII-exported version.

.3 Application programs.

.9 Cable and software for use on The City's notebook computer for revising/downloading the settings and software.

.4 Maintenance Summary:

.1 Compile individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.

.2 Format:

.1 Use Maintenance Summary Form bound with this section or electronic facsimile of such.

.2 Each Maintenance Summary may take as many pages as required.

.3 Use only 8-1/2-inch by 11-inch size paper.

.4 Complete using typewriter or electronic printing. Hand-written and hand-printed entries are will not be accepted.

.3 Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.

.4 Recommended Spare Parts:

.1 Data to be consistent with manufacturer's bill of materials/parts list furnished in O&M manuals.

.2 "Unit" is the unit of measure for ordering the part.

.3 "Quantity" is the number of units recommended.

.4 "Unit Cost" is the current purchase price.

1.7 Data For Materials and Finishes

.1 Content for Architectural Products, Applied Materials, and Finishes:

.1 Manufacturer's data, giving full information on products:

.1 Catalog number, size, and composition.

.2 Color and texture designations.

.3 Information required for reordering special-manufactured products.

.2 Instructions for Care and Maintenance:

.1 Manufacturer's recommendation for types of cleaning agents and methods.

.2 Cautions against cleaning agents and methods that are detrimental to product.

.3 Recommended schedule for cleaning and maintenance.

.2 Content for Moisture Protection and Weather Exposed Products:

.1 Manufacturer's data, giving full information on products:

.1 Applicable standards.

.2 Chemical composition.

.3 Details of installation.

.2 Instructions for inspection, maintenance, and repair.

1.8 Supplements

.1 The supplements listed below, following “End of Section”, are part of this Specification.

.1 Forms: Maintenance Summary Form.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION

DEMONSTRATION AND TRAINING

1. GENERAL

1.1 Description

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

.2 The Contract Administrator will develop the overall training plans for Unit Processes and Facility Areas with input from the Contractor, Manufacturers or vendors, and the City. The Supply Contractor shall be responsible for providing qualified training instructors and field lesson plans as detailed in the Specifications and as described herein.

.3 Arrange for Supplier's Representatives to supply detailed classroom and hands-on training to the City's operations personnel, maintenance personnel, and select on-call personnel on operation and maintenance of specified product (system, subsystem, and component) and as may be required in applicable Specifications.

.4 The City will require training for at least two (2) shifts for each specified training session. Allow at least the minimum specified number of hours or days of training for each City staff shift for each specified product (system, subsystem, and component).

.5 To facilitate scheduling of the City personnel, the City may elect to divide sessions into operation-specific topics and maintenance-specific topics as applicable, to allow operations/ on-call staff and maintenance staff to attend separately. The Contractor shall coordinate with the Contract Administrator and the City.

.6 Training will be scheduled at least four (4) weeks in advance of the respective training sessions.

.7 Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with the City and familiar with operation and maintenance manual information specified in Section 01 78 23, Operation and Maintenance Data.

.8 Training sessions to be conducted by qualified Supplier's Representatives, with a minimum of two (2) years' experience. Supplier's Representatives shall be familiar with facility operation and maintenance requirements as well as with specified equipment.

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

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

1.2 Submittals

.1 Submit the following information to the Contract Administrator thirty (30) days prior to the first training session. The material will be returned as either "NO EXCEPTIONS TAKEN", "EXCEPTIONS NOTED" or "EXCEPTIONS NOTED - RESUBMIT".

.1 Lesson plan and supplemental training manuals, handouts, visual aids and other reference material required for each training session.

.2 Submit proposed lesson plan not less than twenty-one (21) days prior to scheduled training and revise as necessary for acceptance.

.3 Lesson Plan: When training of the City personnel is specified, prepare for each required course, a lesson plan containing but not limited to the following information:

.1 Title and objectives.

.2 Recommended types of attendees (e.g., managers, engineers, operators, maintenance).

.3 Course description and outline of course content.

.4 Format (e.g., lecture, self-study, demonstration, hands-on).

.5 Instruction materials and equipment requirements, including supplemental training manuals, handouts, visual aids and other reference material required for each training session.

.6 Resumes of instructors providing the training.

.4 Training Schedule:

.1 Submit not less than twenty-one (21) calendar days prior to start of equipment installation and revise as necessary for acceptance.

.2 List specified equipment and systems that require training services and show:

.1 Respective manufacturer.

.2 Estimated dates for installation completion.

.3 Estimated training dates.

.3 Adjust schedule to ensure training of appropriate personnel as deemed necessary by the City, and to allow full participation by Manufacturers' Representatives. Adjust schedule for interruptions in operability of equipment.

.4 Individual sessions shall not exceed four (4) hours. A break should be incorporated into sessions that exceed two (2) hours. Training session anticipated to exceed four (4) hours can be assigned to multiple-sessions; however, no more than one (1) - 3-hour and one (1) - 4-hour sessions (seven (7) hours total) may be delivered to the same participants in a single day. Two (2) successive 4-hour sessions may be delivered to alternating shifts of attendees in a single day (i.e., one group of attendees in the morning, and a second group of attendees in the afternoon). Training sessions requiring more than seven (7) hours may be delivered on separate days.

.5 Classes shall not be scheduled concurrently.

1.3 Location and Training Facilities

.1 The City will provide the classroom training facilities.

.2 Field training sessions shall take place at the equipment location.

1.4 Format and Content

.1 The training sessions shall be comprised of both classroom training and field training. As a minimum, they shall cover the following topics for each item of equipment or system:

.1 Training will cover:

.1 Familiarization.

.2 Safety.

.3 Operation.

.4 Troubleshooting.

.5 Preventative and predictive maintenance.

.6 Corrective maintenance.

.7 Parts.

.8 Local representation.

.2 Classroom Training:

.1 As a minimum, classroom equipment/system training must be completed prior to Functional Testing and will include:

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

.2 Purpose and function of the equipment/system.

.3 The operating theory of the equipment/system.

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

.5 Safety items, standard operation procedures (SOPs), and safe work procedures (SWPs) related to operation of the equipment.

.6 Routine and preventative and predictive maintenance.

.7 Disassembly and assembly of equipment if applicable.

.8 Normal and major repair procedures.

.9 Inspection and troubleshooting procedures including the use applicable test instruments and the “pass” and “no pass” test instrument readings.

.10 Calibration procedures.

.2 The Contractor shall integrate a PCS Demonstration System into any classroom training course where:

.1 The content includes equipment monitoring and control via the HMI.

.2 The content includes alarming and alarm response.

.3 The content includes coordination of maintenance events and states to PCS/HMI status indications.

.4 The use of the PCS Demonstration System would clarify and/or aid in the training of the Training Participants.

.5 Where use of the PCS Demonstration System is included in a training course, the Contractor shall:

.1 Provide the PCS Demonstration System in accordance with the Specifications.

.2 Make certain that the PCS Demonstration System in no way impacts the actual operating PCS or in any other way expose the PCS to any risk of inadvertent operation.

.3 Provide a second projector and screen to display the HMI Operator Workstation to all participants.

.3 Field Training:

.1 As a minimum, field equipment training for operations personnel shall include:

.1 Identification of equipment: location of primary element; location of instrument readout; discussion on purpose, basic operation, and information interpretation.

.2 Discussion and demonstration of standard operating procedures, safe work procedure, and daily visual inspection of system operations.

.3 Discussion and demonstration of the preventative maintenance activities, and predictive maintenance activities where applicable.

.4 Discussion and demonstration of start-up and shutdown procedures.

.5 Demonstration of routine disassembly and assembly of equipment if applicable.

.6 Identification and review of safety items and demonstration of safety procedures, if feasible.

.7 Review of Contractor prepared Operation and Maintenance Manuals.

.8 Demonstration of operating parameter adjustment for optimized equipment/system operation.

1.5 Video Recording

.1 The Contractor shall notify all training providers that the training sessions will be videotaped.

.2 Supply video recording of instruction sessions, including manufacturers' representatives' hands-on equipment instruction and classroom sessions.

.3 Arrange for and carry the cost of videotaping one complete training session for each item of equipment and each system.

.4 The video record of training shall be provided in MPEG-4(.mp4) format. The digital file must be named with course title and reference to the training plan. The files shall be fully indexed and cataloged with file labels stating equipment or system, classroom or field session, and date recorded.

.5 Videotaping shall be by a professional commercial videographer, experienced in shooting training videos, in both good and inclement weather.

.6 Video Format and Quality:

.1 Digital (MPEG-4), with sound.

.2 Video:

.1 Produce bright, sharp, and clear images with accurate colors, free of distortion and other forms of picture imperfections.

.2 Electronically, and accurately display the month, day, year, and time of day of the recording.

.3 Audio:

.1 Audio recorded during documentation shall be done clearly, precisely, and at a moderate pace.

.7 Documentation:

.1 Digital Video Disc (DVD) Label:

.1 Tape number (numbered sequentially, beginning with 001).

.2 Project Name.

.1 Facility name.

.2 Process area and equipment.

.8 The digital files shall be fully indexed and cataloged with file labels stating equipment or system, classroom or field session, and date recorded.

.9 Acceptable videographer is McNeill Media Creations (Don McNeill, (204) 224-2578, mmc@shaw.ca) or approved equal in accordance with B8.

1.6 Equipment and Systems for Training

.1 Provide Training for the equipment and systems listed in the following table, and as otherwise Specified:

Equipment / System	Specification Reference	Minimum Number of Person Days for Training, per Shift
Polymer Pumps	46 66 20	1 person days
Rotary Press and Flocculation	46 71 33	4 person days

1.7 Training Completion Forms

.1 Form T-1 to be signed by the trainer, the Contract Administrator, and by a City Staff representative for each City shift when classroom training has been completed. One (1) form is to be used for each item of equipment and each system for which training has been provided. Once all classroom training sessions have been completed, Form T1 is to be submitted to the Contract Administrator.

.2 Form T-2 to be signed by the trainer, the Contract Administrator, and by a City Staff representative for each City shift when field training has been completed. One (1) form is to be used for each item of equipment and each system for which training has been provided. Once all field training sessions have been completed, Form T2 is to be submitted to the Contract Administrator.

.3 The supply of adequate training, including completion of Forms T-1 and T-2 is a required prerequisite for handover of equipment, Unit Processes and Facility Areas as appropriate to the City.

1.8 Supplement

.1 Supplements listed below, following “End of Section,” is a part of this Specification:

.1 Form T-1 Certificate of Satisfactory Classroom Training.

.2 Form T-2 Certificate of Satisfactory Field Training.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION

CERTIFICATE OF SATISFACTORY TRAINING
FORM T1

We certify that the initial training for the equipment listed below has been provided as per the Specifications.

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

_____ _____

(Authorized Signing Representative of the City) Date

CERTIFICATE OF SATISFACTORY TRAINING
FORM T2

We certify that the final training for the equipment listed below has been provided as per the Specifications.

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

REFERENCE SPECIFICATION: _____

_____ _____

(Authorized Signing Representative of the City) Date

COMMISSIONING PLAN

1. GENERAL

1.1 Description

.1 Provide a complete and fully functional system ensuring that:

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

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

.2 The Supply Contractor shall cooperate with Construction Contractor in all commissioning activates pertaining the supplied equipment.

.3 The Supply Contractor shall cooperate with Construction Contractor to develop a Detailed Commissioning Plan and Commissioning Schedule using this Section as a Base Commissioning Plan.

.4 Use this Section as a master planning document for Commissioning as it:

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

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

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

.4 Describes how the process of verification meets the design requirements of the completed Works.

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

.1 An overview of Commissioning.

.2 A general description of elements that make up the Detailed Commissioning Plan.

.3 A process and methodology for successful Commissioning.

.5 The Contract Administrator shall witness and certify tests and reports of results.

.6 Commissioning activities must be completed before issuance of Substantial Performance.

1.2 Definitions

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

.2 Base Commissioning Plan: General Commissioning requirements within this Section to be used in the development of a Detailed Commissioning Plan.

.3 Bumping:

.1 Used to Commission mechanical systems and associated equipment.

.2 Used to Commission, test, and tune instrumentation and process loops.

.4 Process systems:

.1 Dewatering equipment.

.2 Polymer feed equipment.

.5 Low voltage below 750 V:

.1 Low voltage equipment.

.6 Instrumentation and control systems:

.1 PLC automation system.

.2 Instrumentation.

.3 Communication with the Process Control System.

.7 Commissioning: for the purpose of this Specification Section, Commissioning shall be defined as the successful operation of components, equipment, systems, subsystems, or integrated systems in accordance with its design requirements for a period of ten (10) days, the last seven (7) of which shall be consecutive, unless otherwise specified.

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

.9 Commissioning Report: the final Commissioning document as described in Item 3.14.

.10 Commissioning Schedule: Gantt chart showing planned dates for performing all activities related to commissioning of all upgraded systems. The Commissioning Schedule is to be developed by the Contractor and submitted to the Contract Administrator for review, as described in Item 3.1.

.11 Demonstration: a one-hour demonstration of the successful installation and operation of the equipment.

.12 Detailed Commissioning Plan: Commissioning Plan developed by Contractor from the Base Commissioning Plan to be submitted and reviewed by the Contract Administrator, as described in Item 3.2. Unless defined as “Base Commissioning Plan”, all other instances of “Commissioning Plan” refer to the Detailed Commissioning Plan.

.13 Running Test: a test in which equipment is run continuously for a minimum of three (3) days (seventy-two (72) hours) or as specified for different equipment. During this period, as

practicable, conditions shall be simulated which represent maximum or most severe, average, and minimum or least severe conditions. Successful completion of the Running Test is required for Form 103.

.14 Performance Test: a test in which the equipment is run continuously for seven (7) days (168 hours) or as specified for different equipment. Successful completion of the Performance Test is required for Form 104.

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

1.3 Submittals

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

.2 Commissioning Schedule to be submitted and accepted by the Contract Administrator as per Item 3.1.

.3 Detailed Commissioning Plan to be submitted and accepted by the Contract Administrator as per Item 3.2.

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

1.4 Composition, Roles, and Responsibilities of Commissioning Team

.1 Commissioning Team to consist of the following members:

.1 Contract Administrator who is responsible for:

.1 Monitoring Commissioning activities.

.2 Witnessing and certifying reported results.

.3 Reviewing and approving Contractor submissions.

.4 Assisting in the resolution of issues resulting from all tests.

.5 Reviewing the final Commissioning Report.

.2 City personnel who are responsible for:

.1 Attending Commissioning activities to verify re-installed existing equipment, including but not limited to any removed flow meters, operates as per the original sequence of operations.

.2 Attending Commissioning activities to verify newly installed equipment operates as intended.

.3 Performing necessary testing as noted in Item 3.11.

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

.1 Testing.

.2 Mechanical testing, adjusting and balancing (TAB).

.3 Integrating Commissioning activities into the Contractor's Project Schedule (Project Schedule).

.4 Performing and documenting equipment installation as per Section 01 65 00 - Equipment Installation.

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

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

.1 Planning/preparing checklists (installation/start-up checklists as required, product information) and test procedures.

.2 Determining operational training requirements.

.3 Developing a Detailed Commissioning Plan, updating information provided in the Base Commissioning Plan.

.4 Performing and documenting Running Testing and Performance Testing.

.5 Preparing and updating issues logs.

.6 Verifying, reviewing, and conducting training.

.7 Preparing final Commissioning Report.

1.5 Extent of Commissioning

.1 Testing of electrical panels must be completed before proceeding with Commissioning activities.

.1 Testing after the electrical modifications shall conform to CSA C22.2 No. 14, CSA C22.2 No. 286 and related CSA standards. CSA special inspections shall be coordinated by the Contractor after operation is confirmed.

.2 Process systems:

.1 Dewatering equipment.

.2 Polymer feed equipment.

2. PRODUCTS

2.1 Equipment

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

3. EXECUTION

3.1 Commissioning Schedule

.1 Prepare a detailed Commissioning Schedule and submit to the Contract Administrator for review and approval at the same time as the Project Schedule. Include milestones, testing, documentation, training, and Commissioning activities of components, equipment, subsystems, systems, and integrated systems.

.2 After approval, incorporate the Commissioning Schedule into the Project Schedule.

.3 Contractor, Contractor's Commissioning Agent, and Contract Administrator will monitor progress of Commissioning against the approved Commissioning Schedule.

3.2 Development of Commissioning Plan

.1 This Section is to be considered a Base Commissioning Plan for the dewatering systems, to be used by the Contractor in the development of a Detailed Commissioning Plan.

.2 The Detailed Commissioning Plan and associated Commissioning Schedule is to be approved by the Contract Administrator at least twenty (20) Business days prior to the planned start of Commissioning. The plan shall comply with the requirements that have been established by the Contract Administrator.

.3 The Detailed Commissioning Plan shall be drafted by the Contractor and reviewed by the Contract Administrator and shall incorporate the contents of the Base Commissioning Plan as specified in this Section. The Detailed Commissioning Plan shall include the following:

.1 A detailed schedule of Commissioning events to be incorporated into the Project Schedule, including but not limited to, the schedule for completion of testing of all component parts of the system.

.2 A sampling and analytical program for tests necessary to verify compliance with the performance specifications.

.3 Inform the Contract Administrator at least fifteen (15) Business Days in advance of conducting the tests and arrange for the attendance of the Manufacturer’s Representative. The tests may be concurrent with the inspection of satisfactory installation if mutually agreed by the Contractor and the Contract Administrator.

.4 The Manufacturer’s Representative shall conduct all necessary checks to the equipment and if necessary, advise the Contractor of any further checking, flushing, cleaning, or other work needed prior to confirming the equipment is ready to run.

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

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

.7 List and details for all temporary equipment or component (additional spool pieces, etc.) required to facilitate Commissioning.

.8 List of all personnel who the Contractor plans to be in attendance for Commissioning and handover with information indicating their qualifications for this Work.

.4 The Detailed Commissioning Plan to take into account:

.1 Approved Shop Drawings and product data.

.2 Approved changes to the Contract.

.3 Project Schedule.

.4 Contractor's, Subcontractor's, and suppliers' requirements.

.5 Project construction team's and Commissioning team's requirements.

.5 The Detailed Commissioning Plan to include:

.1 Commissioning Schedule.

.2 Installation/start-up check lists provided by manufacturers and suppliers.

.3 Manufacturer Performance Testing forms provided by manufacturers and suppliers.

.1 Forms to include testing parameters at full range of operating conditions to verify responses of equipment and systems.

.6 Submit the completed Detailed Commissioning Plan to the Contract Administrator for review and acceptance. The Detailed Commissioning Plan shall be reviewed prior to its implementation. The Contract Administrator shall be the final arbiter.

3.3 Refinement of Commissioning Plan

.1 During the construction phase, revise, refine, and update the Detailed Commissioning Plan to include approved design and construction changes.

.1 At each revision, indicate revision number and date.

.2 Submit each revised Detailed Commissioning Plan to the Contract Administrator for review and acceptance.

3.4 Equipment

.1 All process, electrical, control, and miscellaneous equipment related to the system shall be successfully installed and tested in accordance with Section 01 65 00, this Section, and any specific requirements noted in other Divisions. Form 103 and Form 104 shall be executed for each piece of major equipment.

.2 Temporary equipment or components will be installed and tested as necessary to ensure that it functions reliably and consistently through the Commissioning period.

3.5 Controls

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

.2 The Contract Administrator shall arrange for the simulation of the control sequences or shall allow for the operation of the system without the features included in the Work of others. Every effort shall be made to ensure that the Commissioning period provides for the full and comprehensive operation of the equipment under all anticipated normal and adverse operating conditions.

3.6 Plant Utility Service

.1 The City will provide power and other ancillary services as necessary to operate the facility through the Commissioning period. Provision of these services shall be limited to reasonable levels.

3.7 Manpower

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

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

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

3.8 Operating Descriptions

.1 Operating descriptions shall be prepared by the Contract Administrator for the facility systems. Other information outlining the operating requirements shall also be available from the Contract Administrator. The Contractor will review these descriptions and will make themselves familiar with the requirements in order that they can undertake Commissioning in an appropriate manner.

.1 Operating descriptions shall be considered part of documentation for systems as listed in Item 3.14.2.

3.9 Design Parameters

.1 Design parameters for the system to be commissioned shall be as defined in the Specifications and/or the operating descriptions.

3.10 Pre-Commissioning Activities

.1 Conduct pre-start-up pressure, static, flushing, cleaning, "bumping" testing, and loop validation during construction as specified in the individual sections. This testing to be witnessed and

certified by the Contract Administrator and does not form part of Commissioning specifications. Include completed documentation with the Final Commissioning Report.

.2 Perform prestart up inspections prior to commencing Commissioning. Utilise approved installation/start-up check lists if required. Rectify any deficiencies to the Contract Administrator's satisfaction. Include completed documentation with the Final Commissioning Report.

.3 Pre-commissioning activities shall include, at minimum:

.1 Process systems:

.1 "Bump" each item of equipment in its "stand-alone" mode.

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

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

3.11 Tests to be Performed by City

.1 City staff may conduct additional sampling for microbiological and/or chemical analysis at their own discretion to supplement testing required by the Contractor as part of this Work.

3.12 Commissioning of Instrumentation and Control

.1 Commissioning activities shall only proceed after instrumentation and control tests have been completed.

.2 A minimum written notice of two (2) weeks is required prior to commencing with process commissioning activities. In order to qualify for process commissioning the following activities must be completed:

.1 Instrument Calibrations;

.2 Initial Control Settings and adjustments have been made;

.3 All field devices have been set-up;

.4 Forms (i.e., misc. 100 forms; signed off where required) have been completed;

.5 PLC/SCADA IO and loop checks have been completed; and

.6 Proper mounting and connections have been made.

.3 During Commissioning, demonstrate to the Contract Administrator proper calibration and correct operation of instruments and gauges.

.4 Commissioning of the instrumentation and control system to include but not be limited to the following:

.1 Verify installation of components, wiring connections, and piping connections.

.2 Verify wiring continuity and pipe leak tests.

.3 Verify instrument calibrations and loop tests and provide a written report.

.1 The report shall include record of functional checks and any adjustments required for the instruments and control equipment under operational conditions.

.4 Coordinate instruments and control equipment supplier's service personnel as required for complete system testing.

.5 Coordinate and cooperate with the City, Contract Administrator, and other contractors to commission the Control System I/O points.

.6 Direct plant personnel at hand-over as to final adjustment of the system for correct operation of plant.

.7 Ensure that the instrumentation and control equipment suppliers cooperate to complete the Work.

.8 Verify signal levels and wiring connections to all instrumentation and control equipment.

3.13 Start-Up and Commissioning of Process Equipment

.1 A Manufacturer’s Representative shall conduct all necessary checks to the equipment prior to start-up as described in Section 01 65 00 - Equipment Installation.

.2 Following the installation and calibration of the equipment, the Contractor shall perform a Demonstration, Running Test, and Performance Test of the full system. It will be the responsibility of the Contractor to communicate to arrange the times for testing and start-up activities. The Contractor must confirm that these times are acceptable to the Contract Administrator and the City.

.1 During the Demonstration, Running, and Performance tests, the Contractor shall operate equipment as required to meet the requirements from all Divisions of this Specification.

.2 If required, the Contractor shall supply any ancillary equipment or services required to complete the initial Demonstration, Running Test, and Performance Tests.

.3 Should the initial Demonstration, Running Test, or Performance Tests reveal any defects, then those defects shall be promptly rectified and the Demonstration, Running Tests, and/or Performance Tests shall be repeated to the satisfaction of the Contract Administrator.

.4 Additional costs incurred by the Contractor due to repeat Demonstration, Running Tests, and/or Performance Tests shall be borne by the Contractor.

.3 On successful completion of the Demonstration and Running Test, Form 103 – Certificate of Equipment Satisfactory Running Test Performance (Form 103) (attached to this Specification) will be signed by the Manufacturer’s Representative, the Contractor, and the Contract Administrator. Form 103 is required for each piece of major equipment, which includes its associated electrical/control modifications by extension.

.4 On successful completion of the Performance Test, Form 104 – Certificate of Equipment Satisfactory Performance Test Performance (Form 104) (attached to this Specification) will be signed by the Manufacturer's Representative, the Contractor, and the Contract Administrator. Form 104 is required for each piece of major equipment, which includes its associated electrical/control modifications by extension.

.5 Demonstration:

.1 The Contractor shall notify the Contract Administrator of their readiness to demonstrate the operation of the equipment. The Contract Administrator shall attend.

.2 With the assistance of the Manufacturer's Representative, the Contractor shall demonstrate that the equipment is properly installed. Alignment, piping connections, electrical connections, etc. will be checked and if appropriate, code certifications provided.

.3 The equipment shall then be run for one (1) hour. Local controls shall be verified by cycling the equipment through several start-stop operations, modulating its output, or some combination. Operating parameters will be checked to ensure that they are within the specified or Manufacturer's Representative's recommended limits, whichever is more stringent. This step shall be repeated for each modified system.

.4 On satisfactory completion of the one (1) hour demonstration, the equipment shall be stopped and critical parameters shall be rechecked.

.6 Running Test:

.1 The Running Test shall be performed subsequent to modification and successful Demonstration of equipment.

.2 The equipment shall be restarted and run continuously for a minimum of three (3) days (seventy-two (72) hours) or as specified. During this period, as practicable, conditions shall be simulated which represent maximum (or most severe), average, and minimum (or least severe) conditions. These conditions will be mutually agreed to by the Manufacturer's Representative, the Contractor, and the Contract Administrator on the basis of the information contained in the technical specifications, as well as the methods utilized to create the simulated conditions and the time periods allotted to each. This step shall be repeated for each piece of major equipment.

.3 Conduct daily sampling throughout the Running Test.

.1 Submit samples to an accredited laboratory for analysis.

.4 The Running Test shall be completed as follows:

.1 To perform the Running Test, the Contractor, with supervision by the Manufacturer's Representative, shall operate all controls and other devices to ensure they are functional.

.2 The purpose of the Running Test shall be to demonstrate the effectiveness of all system components and control features in all modes of control.

.1 Local control of all devices when local controllers and/or HMI are not in service.

.2 Automatic shutoff and alarm for various failure modes. This includes air monitoring, process monitoring, and shutdown sequences are operating as intended for both life safety and process safety.

.3 Automatic switchover from normal power to emergency power, and emergency power to normal power, if this function has been disturbed by modifications.

.4 Operation of mechanical cleaning system and chemical cleaning system where applicable.

.5 Operation of all monitoring instruments.

.6 All control functions, both at local system, HMI, and SCADA OIT(s).

.5 The Contractor shall submit results of the Running Test within twenty-four (24) hours to the Contract Administrator. Final documented and summarized results shall be submitted in a format acceptable to the Contract Administrator within five (5) Business days.

.1 Results shall include, at a minimum, Pass or Fail status of all tasks and commentary on the performance of each task.

.6 The Contractor, with assistance from the Manufacturer's Representative, shall complete the Running Test to the satisfaction of the Contract Administrator and the City prior to commencing the Performance Test.

.7 Performance Tests:

.1 Following completion of the Demonstration and Running Tests, the Contractor in cooperation with the City's operating staff shall conduct the Performance Test with supervision assistance from the Manufacturer's Representative. The Manufacturer's Representative shall submit to the Contractor, the City, and the Contract Administrator a complete testing plan.

.2 A Performance Test shall be restarted if a critical failure occurs. A critical failure shall be deemed as a failure which prohibits the process from functioning successfully or which creates a safety hazard.

.3 Performance Tests shall be as dictated in this Section, the technical specifications for each piece of equipment, and as reasonably required by the Contract Administrator to prove adherence to the requirements listed in the Specification.

.4 Conduct daily sampling of raw feed throughout the Performance Testing.

.1 Submit samples to an accredited laboratory for analysis.

.5 The Contractor shall submit the initial results of each Performance Test within twenty-four (24) hours to the Contract Administrator. Final documented and summarized results shall be submitted in a format acceptable to the Contract Administrator within five (5) Business days.

.6 The Contract Administrator reserves the right to request additional testing. No equipment shall be accepted and handed over to the City prior to the satisfactory completion of the Performance Tests and receipt of the test reports.

.7 To perform the Performance Test, the Contractor in cooperation with City's operating staff shall operate the system with supervision assistance from the Manufacturer's Representative over a seven (7) day test period and collect and summarize data to demonstrate that the system meets the Performance Test requirements for the parameters listed below.

.8 In all cases, compliance with the requirements of this Specification shall be determined for each day of the testing period.

.9 The Manufacturer's Representative shall be responsible for confirming instruments are within the accuracy tolerances required for system operation and performance.

.10 Should the Manufacturer's Representative be off-Site during the Performance Test, the Manufacturer's Representative is to provide full technical supervision (24/7) with telephone support and performance monitoring.

.11 During the Performance Test, the City shall have the option of collecting samples for independent analyses to confirm measurements and analyses conducted by the Manufacturer's Representative and the Contractor. The Contract Administrator and the City shall have the option of witnessing all testing performed by the Manufacturer's Representative and the Contractor.

.12 The Manufacturer's Representative and the Contractor shall provide the Performance Test Report within five (5) Business days of completion of the Performance Test.

.1 The Performance Test Report shall include the following as a minimum:

.1 Performance Test conditions and procedures.

.2 Corrective actions taken.

.3 Retesting results (if necessary).

.4 Other pertinent information (if any).

.5 Conclusions.

.6 Recommendations for future actions.

3.14 Final Commissioning Report

.1 Contractor to submit the completed Commissioning Report within a maximum of two (2) weeks of completion of Commissioning. The final Commissioning Report is to be reviewed and accepted by the Contract Administrator prior to granting Substantial Performance.

.2 Final Commissioning Report to include:

.1 Start-up, pre- Commissioning activities, and documentation for systems and equipment.

.2 Description of Commissioning activities and documentation.

.3 Description of Commissioning of integrated systems and documentation.

.4 Completed installation checklists if required by manufacturer.

.5 Completed Running and Performance Test Report(s).

.6 Final settings of commissioned equipment.

.7 Training Plans.

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

3.15 Training Plans

.1 Refer to Section 01 79 00 - Demonstration and Training.

CERTIFICATE OF EQUIPMENT SATISFACTORY PERFORMANCE RUNNING TEST FORM 103

We certify that the equipment listed below has been operated and tested as per the Specifications and that the equipment meets its Running Testing criteria. No defects in the equipment were found. The equipment is therefore classed as "conforming".

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

_____ _____
(Authorized Signing Representative of the Manufacturer) Date

_____ _____
(Authorized Signing Representative of the Contractor) Date

_____ _____
(Authorized Signing Representative of the Contract Administrator) Date

Acknowledgement of Receipt of O&M Manuals.

_____ _____
(Authorized Signing Representative of the City) Date

CERTIFICATE OF SATISFACTORY PERFORMANCE TEST PERFORMANCE FORM 104

We certify that the equipment listed below has been operated and tested as per the Specifications and that the equipment meets its Performance Testing criteria. No defects in the equipment were found. The equipment is therefore classed as “conforming”.

PROJECT: _____

SYSTEM DESCRIPTION: _____

_____

TAG NO (S): _____

REFERENCE SPECIFICATION (S): _____

_____ _____
(Authorized Signing Representative of the Manufacturer) Date

_____ _____
(Authorized Signing Representative of the Contractor) Date

_____ _____
(Authorized Signing Representative of the Contract Administrator) Date

_____ _____
(Authorized Signing Representative of the City) Date

1. GENERAL

1.1 Related Sections

.1 Requirements specified within this section apply to all sections in Division 26, Electrical. This section supplements requirements of other Divisions.

1.2 Codes and Standards

.1 Manitoba Building Code (MBC).

.2 Electrical and Electronic Manufacturers Association of Canada (EEMAC).

.3 National Electrical Manufacturers Association (NEMA).

.4 Institute of the Electrical and Electronic Engineers (IEEE).

.5 Insulated Cable Engineers Association (ICEA).

.6 Canadian Standards Association (CSA):

.1 CSA C22.1 Canadian Electrical Code - Part 1 (CEC).

.2 CSA C22.2 No. 0 General Requirement - Canadian Electrical Code - Part 2.

.3 CAN3-C235 Preferred Voltage Levels for AC Systems, 0-50,000 V.

.7 Underwriters Laboratories Canada (ULC).

.8 American National Standards Institute (ANSI).

.9 National Fire Protection Agency (NFPA).

.10 City of Winnipeg:

.1 Automation Design Guide.

.2 Electrical Design Guide.

.3 Identification Standard.

.4 Tag Naming Standard.

.5 Historical Data Retention Standard.

.6 HMI Layout and Animation Plan.

.7 Winnipeg Electrical By-Law (WEB).

.8 Information Bulletins.

.11 Comply with the most current locally enforced edition of CSA C22.1 Canadian Electrical Code - Part 1, Winnipeg Electrical By-law, Provincial Safety Electrical Authority Codes and Bulletins.

.12 Comply with all laws, ordinances, rules, regulations, codes, and orders of all Authorities Having Jurisdiction relating to this Work. Where these regulations conflict, comply with the most stringent condition.

.13 Comply with latest editions of the CSA Certification Standards and Bulletins.

1.3 Drawings and Specifications

.1 All materials, equipment, labor, work denoted on the Drawing set is to be considered as new work, to be provided by the Contractor unless specifically noted otherwise. Some of the electrical and automation Drawings show existing systems (with modifications to these systems). These Drawings specifically indicated that there are existing systems shown. Where Drawings do not specifically indicate that existing systems are depicted, the Contractor shall assume that the materials, equipment, labor, work indicated will form part of his scope, and the Contractor shall include all costs (including materials, labor, etc.) to perform the Work.

.2 The electrical Drawings in some cases indicate the size of cables, breakers, conduits, etc. These sizes are based on the supply of specific sizes of equipment. For cases where the Contractor supplies equipment that varies from these assumptions it is the responsibility of the Contractor to provide the correct size of breaker, cable, etc. to suit the installation, at no additional cost to the Contract.

.3 The intent of the Drawings and Specifications is to indicate labor, products, and services necessary for a complete, installed, tested, commissioned and functional installation.

.4 To provide sufficient detail and maximum degree of clarity on the Drawings, symbols used for various electrical devices, particularly wall mounted devices, take up more space on the Drawings than devices physically do. Locate devices with primary regard for convenience of operation, accessibility and space utilization, rather than locating devices to comply with the exact scaled locations of the electrical symbols.

.5 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 a Bid.

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

1.4 Care, Operation, and Start-Up

.1 Assist the Installing Contractor with demonstrating to the City’s 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 factory service engineer support for such a period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are familiar and fully trained with all aspects of its care and operation.

1.5 Definitions

.1 The following are definitions used in Division 26.

.1 Inspection Authority means agent of any authority having jurisdiction over construction and safety standards associated with any part of electrical Site Work.

.2 Supply Authority or Supply Utility means electrical power company or commission responsible for delivering electrical power to the Project Site.

.3 Electrical Code or Code means the Electrical Code in force at the project location.

.4 CEC means Canadian Electrical Code (latest edition being enforced by law).

.5 Contractor and Electrical Contractor means the entity retained to perform the Work listed herein.

.6 Contract Administrator means the person with the authority to make decisions and administer the Contract on behalf of the City.

.7 Provide means to supply, install, wire, connect, test, commission and leave in complete and working order.

.8 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.

1.6 Design Requirements

.1 Design equipment, anchorage, and support systems for vertical and lateral loading in accordance with MBC.

.2 Operating voltages to be within those defined in CAN3-C235.

.3 Verify before energization that equipment supplied under this Contract is compatible with the site electrical power supply system.

.4 All equipment, devices and installation methods (even where not specifically expressed on the Drawings) shall comply with the Manitoba Energy Code for Buildings (MECB).

1.7 Electrical Coordination

.1 Coordinate package with available electrical supply on Site.

1.8 Submittals

.1 Shop Drawings shall indicate materials, methods of construction and attachment of support, wiring diagrams, connections, recommended installation details, explanatory notes and other

information necessary for completion of the 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 so in writing to the Contract Administrator prior to proceeding with the Work.

.2 Shop Drawings shall indicate all certification labels and nameplates to be affixed to the panel.

.3 Manufacture of products shall conform to the revised Shop Drawings. Failure to supply a product based on the revised, marked up Shop Drawings may require on site product revisions or modifications, which will be at the cost of the Contractor.

.4 Prior to shipping prefabricated control panels, photos of completed panels shall be sent to the Contract Administrator of final review. The resolution of the photos should be such that individual wire tags can be read.

.5 Shop Drawings shall have the specific equipment numbers on all pages to clearly indicate which piece of equipment the Shop Drawing refers to. In addition, the entire product part number or catalog number should be adjacent to the tag.

1.9 As-Built Drawings

.1 Refer to Section 01 78 00, Closeout Procedures - for additional requirements for As-Built Drawings. Comply with all City of Winnipeg standards and requirements.

1.10 Operations and Maintenance (O&M) Manuals

.1 Provide operation and maintenance manuals as specified herein and in accordance with the general conditions. Refer to Section 01 78 00 - Operations and Maintenance Data.

.2 Include in the operations and maintenance manuals a minimum of:

.1 Stamped and signed Shop Drawings.

.2 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of portions or features of the installation.

.3 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature not acceptable.

.4 All test results performed. This includes, but is not limited to, fire alarm V.I report, grounding system tests, battery bank test results, genset tests, switchgear tests, operation tests, cable tests, MCC tests, load balancing tests, Hi Pot tests, Megger tests, factory tests of all major systems, etc. Submit test results on COW approved test sheets.

.5 Panel schedules (hardcopy and Microsoft Excel format).

.6 Software copies of controllers and relay settings.

.7 As-Built drawings.

.8 Signed and dated warranty certificate.

.9 All other requirements outlined in the Specifications.

.3 Submit draft document prior to the start of Commissioning.

.4 Comply with all other City standards and requirements.

1.11 Environmental Conditions

.1 Equipment and systems are to be rated to correctly operate in the environment in which they are to be installed.

.2 Exterior devices shall be rated to operate in an exterior environment with temperature range of -40°C to +40°C.

1.12 Quality Assurance

.1 Qualifications: Refer to Section 01 61 00 - Common Product Requirements.

2. PRODUCTS

2.1 Accepted Materials

.1 Materials: approved by and bearing a CSA or cUL label. Where there is no alternative to supplying equipment or material that is not approved or certified as indicated, obtain and pay for a CSA Special Inspection.

.2 Factory assemble control panels and component assemblies. Control panels to be CSA certified. Include current interrupting rating on the front panel. Shop Drawings for custom built control panels (which are not designed and sealed as part of the Issued for Construction documents) shall be signed and sealed by an engineer, registered in the Province of Manitoba.

.3 Minimum enclosure type to be NEMA 12 unless otherwise specified. Refer to the Drawings and other Specification section for specific requirements.

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

2.2 Equipment Finish

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

.2 Panel exteriors shall be ANSI 61 grey enamel, unless otherwise specified.

2.3 Equipment Identification

.1 Identify electrical equipment with nameplates as described below.

.2 Nameplates:

.1 Lamacoid, 3 mm thick plastic nameplates, mechanically attached with self tapping stainless steel screws, white face with black lettering. Note: “Sheet Metal Screws” or other sharp pointed screws are NOT acceptable.

.2 Sizes as follows:

Table 2.1: Nameplate Sizes

Size	Dimension	Lines of Text	Text Height
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	40 x 90 mm	2 lines	8 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	5 mm high letters
Size 8	35 x 100 mm	3 lines	5 mm high letters
Size 9	45 x 100 mm	4 lines	5 mm high letters
Size 10	75 x 160 mm	3 or 4 lines	8 mm high letters
Size 11	150 x 250 mm	3 or 4 lines	10 mm high letters

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

.4 Allow for average of fifty (50) letters per nameplate.

.5 Identification to be in English and by tag.

.6 Provide nameplates for the following, sizes as shown:

.1 Cabinets – Size 8.

.2 Small Junction Boxes (150mm x 150mm or smaller) – Size 1.

.3 Large Junction Boxes – Size 2.

.4 Control panels – Size 8.

.5 Contactors – Size 8.

.6 Motor starters – Size 8.

2.4 Disconnect switch – Size 8.Wiring Identification

.1 Identify wiring using heat shrink labels with mechanically printed black letters on white background. Label 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.

.4 Use colour coded wires in communication cables, matched throughout system.

2.5 Conduit and Cable Identification

.1 Colour code conduits, boxes and cables.

.2 Colours: 38 mm wide prime colour and 19 mm wide auxiliary colours.

Table 2.2: Conduit and Cable Colour Code

System	Prime Band	Aux. Band
347/600 V	Yellow	
120/208/240 V Power	Black	
UPS 120/208/240 V Power	Black	Green
Control Wiring (120 V)	Black	Orange
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring (<50 V)	Blue	Orange
Intrinsically Safe	Blue	White
Ground	Green	

.3 Cable Identification: Supply and install lamacoid type cable identification tags for all cables. Install identification tag at both ends.

3. EXECUTION

3.1 Tests

.1 Test and check electrical, instrumentation and control systems for correct operation and compliance with statutory and regulatory authority requirements.

.2 Perform tests in presence of Contract Administrator. Log, tabulate, sign and include testing and Commissioning results in the O & M manuals.

.3 Testing shall include, but not be limited to, the following:

.1 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.2 Communications, control and instrumentation.

.4 Supply instruments, meters, consumable parts (such as fuses) and equipment. Arrange for qualified personnel to conduct tests.

.5 In cooperation with mechanical trades, take clamp-on ammeter readings with motors operating at full load. Compare values against the equipment nameplate rating. Log, tabulate and include readings in Maintenance Data and Operating Instructions.

.6 Correct systems which fail any test, correct and re-do tests to ensure proper operation of the system.

.7 Refer to the City of Winnipeg Standards for supplementary tests that may be required.

3.2 Training

.1 Provide training of City personnel in all aspects of maintenance, operation, and functionality for all systems.

.2 Training shall be performed at the NEWPCC Facility in Winnipeg, Manitoba. Training shall involve both classroom style of training, as well as practical training with the equipment present.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section gives general requirements for Instrumentation and Control related items. It is supplemental to the requirements defined in other Specification Sections.

.2 Comply with latest edition of all applicable codes and standards whether referenced in this Section or not.

.3 In the event any inconsistency is discovered between the Specifications, codes or standards, the most stringent shall apply.

1.2 References

.1 The following is a list of codes and standards are applicable as required:

.1 Institute of Electrical and Electronics Engineers (IEEE):

.1 C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

.2 IEEE 802.3u, 100BASE-TX, 100BASE-FX Ethernet at 100 Mbit/s.

.3 IEEE 802.3z, 1000BASE-X Gbit/s Ethernet over Fibre Optic.

.4 IEEE 802,3ab, 1000BASE-T Gbit/s Ethernet over twisted pair.

.5 IEEE 802,3x, Flow Control.

.2 The International Society of Automation (ISA):

.1 S5.1, Instrumentation Symbols and Identification.

.2 S50.1, Compatibility of Analog Signals for Electronic Industrial Process Instruments.

.3 62443, Security for Industrial Automation and Control Systems.

.3 Canadian Standards Association (CSA):

.1 C22.1 Canadian Electrical Code.

.2 C22.2, Electrical Safety Code.

.4 National Electrical Manufacturers Association (NEMA).

.5 National Fire Code, National Fire Protection Association (NFPA):

.1 NFPA 820, Fire Protection in Wastewater Treatment Plants.

.2 Comply with the following City of Winnipeg Standards documents:

.1 Identification Standard 510276-0000-40ER-0002.

.2 Tag Name Identification Standard 612620-0014-40ER-0001.

.3 HMI Layout and Animation Plan 612620-0015-40ER-0001.

.4 Historical Data Retention Standard 612620-0016-40ER-0001.

.3 See the City of Winnipeg Automation Design Guide 612620-0013-40ER-0001, Sections 1 to 16 for general design philosophy. Sections 3 and 7 relate to control system network architecture.

1.3 Acronyms and Abbreviations

.1 CP: Control Panel.

.2 FAT: Factory Acceptance Test.

.3 I&C: Instrumentation and Control.

.4 I/O or IO: Input and Output.

.5 HMI: Human-Machine Interface, alias for Operator Interface.

.6 LCP: Local Control Panel.

.7 O&M: Operation and Maintenance.

.8 PCS: Process Control System comprising PLC's, and HMIs, communications systems and related hardware and software.

.9 PCS: Process Instrumentation and Control System.

.10 P&ID: Process and Instrument Diagram.

.11 PLC: Programmable Logic Controller.

.12 SAT: Site Acceptance Test.

.13 SIT: Site Integration Test.

.14 SIFT: System Integration Functional Test.

.15 UPS: Uninterruptible Power Supply.

.16 VFD: Variable Frequency Drive.

1.4 Submittals

.1 General: Refer to Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings and Product Data:

.1 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. 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.

.2 Provide a Shop Drawing identifying all inputs, outputs, internal states, and alarms available to be communicated to the PCS. The Contract Administrator will indicate which points to communicate to the PCS.

.3 Equipment identifiers shall be included on all Shop Drawings and product data submittals to clearly identify the equipment they apply to.

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

.3 Informational Submittals:

.1 Provide informational submittals in accordance with other Specification Sections including but not limited to the following:

.1 Training Plan: In accordance with other Specification Sections.

.2 Testing and Commissioning Forms: In accordance with other Specification Sections.

.3 Operation and Maintenance Data: In accordance with Section 01 91 31 - Commissioning Plan.

.4 As-Built Drawings: In accordance with Section 01 78 00 - Closeout Procedures.

.2 Extra Materials:

.1 List of proposed spares, expendables, and test equipment. include descriptive literature, quantities, unit prices, and total costs.

1.5 Drawings and Specifications

.1 The intent of the Drawings and Specifications is to indicate labor, products, and services necessary for a complete, installed, tested, commissioned and functional installation.

.2 The Electrical, Instrumentation, and Control Specifications and Drawings and the Specifications of all other Divisions shall be considered as an integral part of the Work. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified by the Drawings or Specifications of other Divisions, shall be considered as properly and sufficiently specified and shall be provided.

.3 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 a bid.

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

1.6 Care, Operation, and Startup

.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.

1.7 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 or cUL certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Minimum enclosure type to be used is NEMA 12 unless otherwise specified.

.4 Junction Boxes:

.1 All field wiring connections to be located in junction boxes with terminals. The design documents show the expected junction boxes to be required. However, the Contractor must provide all junction boxes required, whether or not the junction boxes are shown in the design documents.

1.8 Finishes

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel.

.1 Paint enclosures light grey to ANSI 61 grey enamel, unless otherwise specified.

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

1.9 Equipment Identification

.1 Identify equipment with nameplates.

.2 All identifiers shall be consistent with City of Winnipeg Water and Waste Department Identification Standard 510276-0000-40ER-0002 and as shown on drawings.

.3 Nameplates:

.1 Lamacoid, 3 mm thick plastic nameplates, mechanically attached with self tapping stainless steel screws, white face with black lettering. Note: “Sheet Metal Screws” or other sharp pointed screws are NOT acceptable.

.2 Sizes as follows:

Table 1.1: Nameplate Sizes

Size	Dimension	Lines of Text	Text Height
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	40 x 90 mm	2 lines	8 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	5 mm high letters
Size 8	35 x 100 mm	3 lines	5 mm high letters
Size 9	45 x 100 mm	4 lines	5 mm high letters
Size 10	75 x 160 mm	3 or 4 lines	8 mm high letters
Size 11	150 x 250 mm	3 or 4 lines	10 mm high letters

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

.4 Allow for average of fifty (50) letters per nameplate.

.5 Identification to be in English.

.4 Provide nameplates for the following, sizes as shown:

.1 Cabinets – Size 8.

.2 Small Junction Boxes (150 mm x 150 mm or smaller) – Size 1.

.3 Large Junction Boxes – Size 2.

.4 Control panels – Size 8.

.5 Field Devices (Instruments, Actuators, etc.) – Size 4.

1.10 Wiring Identification

.1 Identify wiring using heat shrink labels with mechanically printed black letters on white background. Label both ends of phase conductors of feeders and branch circuit wiring.

1.11 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 5 m intervals.

.3 Colours: 38 mm wide prime colour and 19 mm wide auxiliary colours.

Table 1.2: Conduit and Cable Colour Code

System	Prime Band	Aux. Band
120/208/240 V Power	Black	
UPS 120/208/240 V Power	Black	Green
Control Wiring (120 V)	Black	Orange
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring (<50 V)	Blue	Orange
Intrinsically Safe	Blue	White
Ground	Green	

.4 Cable Identification: Supply and install lamacoid type cable identification tags for all cables. Install identification tag at both ends.

1.12 As-Built Drawings and Documents

.1 Refer to Section 01 78 00 - Closeout Procedures - for additional requirements for As-Built Drawings and documents.

.2 The Contractor shall keep one (1) completed set of automation documents at the Site during the work, including all addenda, change orders, Site Instructions, clarifications, and revisions for the purpose of As-Built documents. This includes, but is not limited to the following:

.1 IO Lists.

.2 Instrument Lists.

.3 IP Address Lists.

.4 Functional Requirements Specifications.

.5 Automation Equipment List.

.6 PLC Module List.

.3 On completion of the work, minimum of four (4) weeks prior to final inspection, submit As-Built Drawings and documents to Contract Administrator for review. The Contractor shall certify, in writing signed and dated, that the As-Built Drawings are complete and that they accurately indicate all electrical services, including exposed as well as concealed items.

.4 Comply with all other City of Winnipeg standards and requirements.

1.13 Operation and Maintenance (O&M) Manuals

.1 Provide operation and maintenance manuals as specified herein and in accordance with the general conditions. Refer to Section 01 91 31 - Commissioning Plan.

.2 Include in the operations and maintenance manuals a minimum of:

.1 Stamped and signed Shop Drawings.

.2 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of portions or features of the installation.

.3 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature not acceptable.

.4 All test results performed. This includes, but is not limited to fibre optic tests; Control System network tests; Profibus Network Tests; FAT, SIFT, SIT and SAT tests.

.5 PLC and HMI Programs on USB memory stick.

.6 As-Built drawings.

.7 Signed and dated warranty certificate.

.8 Signed and dated approval by the local Electrical Inspections Department.

.9 All other requirements outlined in the Specifications.

.3 Submit draft document prior to the start of commissioning.

1.14 Environmental Conditions

.1 Equipment and systems are to be rated to correctly operate in the environment in which they are to be installed.

.2 Exterior devices shall be rated to operate in an exterior environment with temperature range of minus 40°C to plus 40°C.

1.15 Quality Assurance

.1 Qualifications: Refer to Section 01 61 00 - Common Product Requirements.

2. PRODUCTS

2.1 General

.1 The design is based upon the manufacturers and model numbers shown on the Drawings and in the Specifications. If a manufacturer chosen after project award is different from that

on which the design is based, the design must be modified by the Contractor based on the chosen manufacturer. If additional engineering work is required, the Contractor must provide an Engineer's seal for the change to the design.

.2 Substitutes:

.1 Provide all additional and modified wiring, raceway, enclosures, intrinsically safe barriers, and accessories at no additional cost associated with approved substitutes.

.3 Like equipment items:

.1 Use products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's services.

.2 Implement all same or similar functions in same or similar manner. For example, control logic, sequence controls, and display layouts.

3. EXECUTION

.1 Post engraved warning signs to meet requirements of local bylaws, Inspection Authority and Contract Administrator.

.2 Permanently identify with lamacoid nameplate, equipment energized from multiple power sources, noting voltages, power source locations, supply disconnect designations and grounding electrode location.

3.2 Warning Signs

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

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

3.3 IP Addresses

.1 IP Addresses will be provided to the Contractor for all network devices after project award. The Contractor will be required to sign a Non-disclosure Agreement and confidentiality agreement in relation to the IP Addresses.

END OF SECTION

POLYMER FEED SKID

1. GENERAL

1.1 Scope of Work

.1 Supply, testing, training and Performance Verification of skid-mounted, pre piped, prewired and pressure tested polymer feeding equipment shown and specified, complete with metering pumps, control panels, piping, valves, calibration columns, frames and accessories to feed polymer, complete and operable, in accordance with the requirements of the Specifications.

.2 It is the responsibility of the Supply Contractor to assess and evaluate information provided, including Specifications, Drawings, design rationale and process control description to appropriately select, supply, and install the peristaltic pumps. Together with Shop Drawing submittal, the Supply Contractor shall provide appropriate justification (i.e. process calculation) for the selection and configuration.

.3 Coordinate all process equipment power requirements and revisions to electrical distribution system. Electrical distribution system shall include, but is not limited to, equipment dimensions, circuit breakers, cabling, working space, and clearance requirements at no additional cost to the project.

.4 Coordinate all process equipment control and monitoring requirements and revisions to Plant Control System. Plant Control System shall include, but is not limited to, cabling, PLC cards, network switches, and communication at no additional cost to the project.

.5 Liquid Polymer Dosing Skid shall be supplied by the Rotary Press manufacturer.

.6 The footprint of the polymer feed skid shall suit the proposed Dewatering Building available floor space including access for service and maintenance as shown on Drawings.

.7 Coordinate delivery, installation, training, start-up and commissioning with the Construction Contractor.

1.2 References

.1 The following is a list of standards which may be referenced in this Section:

.1 ABMA.

.2 NEMA: MG 1, Motors and Generators.

.2 Canadian Standards Association (CSA):

.1 CSA C22.1 – Canadian Electrical Code.

.2 CSA C22.2 No. 100 – Motors and Generators.

1.3 Definitions

.1 Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

1.4 Construction Contractor Submittals

.1 Shop Drawings:

.1 Make, model, weight, horsepower, and cross-sectional details and colour brochures of each equipment assembly.

.2 Complete catalogue information, descriptive literature, Specifications, and identification of materials of construction.

.3 Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.

.4 Detailed Drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.

.5 Power and control wiring diagrams, including terminals and numbers.

.6 Complete motor nameplate data, as defined by NEMA, motor Manufacturer, and including any motor modifications.

.7 Factory finish system.

.8 Size, length and spacing of anchor bolts or attachment to the foundations or supports.

.9 External utility requirements air, water, power, etc. for each component.

.10 Control Panel external face layout and inter layout drawings and electrical wiring diagrams.

.2 Quality Control Submittals:

.1 Factory Functional and Performance Test Reports.

.2 Manufacturer's certification of compliance that the factory finish system is identical to the requirements specified herein.

.3 Special shipping, storage and protection, and handling instructions.

.4 Manufacturer's printed installation instructions.

.5 Suggested spare parts list to maintain the equipment in service for a period of five (5) years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.

.6 List special tools, materials, and supplies furnished with equipment for use prior to and during start-up and for future maintenance.

.7 O&M manual.

1.5 Shipment, Protection and Storage

.1 Ship pre-assembled to the degree possible.

.2 Provide storage instructions indicating specific requirements to ensure there is no uneven wear, distortion or weathering of components.

.3 Identify all other special storage requirements.

1.6 Responsibility of the Pump Manufacturer

.1 The pump manufacturer is responsible for the selection, co-ordination and performance of the metering pumps, motors, and control stations which will be capable of meeting the head, pressure, accuracy and flow requirements specified herein. The pump manufacturer is responsible for the selection, co-ordination and performance of the appurtenances.

.2 All major components (pumps and accessories) shall be supplied as a Vendor Package unless specified otherwise.

2. PRODUCTS

2.1 General

.1 The supply of liquid polymer dosing skid under this Section shall come from the Rotary Press Manufacturer.

2.2 Pumping Requirements

.1 Take into account the specific gravity, viscosity, corrosivity and temperature of the fluid being pumped.

.2 Minimum turn-down ratio: 1:100.

.3 Supply a minimum pumping accuracy of plus/minus 2% of the full range for each pump package.

2.3 Pump Skids

.1 General:

.1 The pumps shall come with factory fabricated pump skids as shown in the P&IDs and as described herein. Pump skids to be pre-tested in factory complete with certification. The pumping skids includes metering pumps, controls, calibration column, pressure relief valves, ball valves, pressure gauges, and all associated piping and fittings, in accordance with the Drawings.

.2 Construct the pump parts in contact with the commodity being pumped from materials suitable for the application.

.3 Peristaltic pumping action shall be created by the compression of the flexible tube between the pump head rollers and track, inducing forward fluid displacement within the tube by the rotation of the pump rotor, and subsequent vacuum-creating restitution of the tube. Process fluid shall be contained within pump tubing and shall not directly

contact any rotary or metallic components. Pumps shall be dry self-priming, capable of being run dry without damaging effect to pump or tube.

.4 Pump head shall consist of a fixed track, a hinged guard door, two spring-loaded tube clamp mechanisms, and spring-loaded roller rotor assembly. Pump tubing shall be in contact with the inside diameter of the track through an angle of 180 degrees and be held in place on the suction and discharge by a spring loaded self-adjusting clamp mechanism. At all times, one roller shall be fully engaged with the tubing providing complete compression and preventing back flow or siphoning. Supply and Install two spring-loaded adjustable tube retainer mechanism to secure the tubing at the entry and exit points of the pump head.

.5 The pump skid shall consist of a proportional pneumatic valve for continuous polymer dilution and a static mixing chamber.

.6 Supply and Install type 316L SST clamps for each tube connection.

.7 All components of the chemical feed pump skids including pump, speed controller, motor, and related appurtenances unit shall be pre-plumbed and pre-wired.

.2 Accessories:

.1 Each pump shall be supplied with pre-piped calibration column and pressure relief valve. The calibration column shall be constructed of material which is compatible with the chemical and shall be complete with a vented top cap and shall be graduated in millilitres.

.2 Drive System: Shall be self-supporting and shall not require anchoring. Capable of operating on 120 VAC, 60 Hertz single phase supply.

.1 Motor: Brushless DC motor with integral gearbox and tachometer feedback. Circuitry shall be complete with temperature and load compensation and protection.

.2 Enclosure:

.1 Rated IP65 or better.

.2 Drives and operator interface will be integral with pumphead with a pressure cast aluminum housing with Alocrom pre-treatment and exterior grade corrosion resistant polyester powder coat.

.3 Provide nine-foot length mains power cord with NEMA 5-15P 115 VAC attachment plug.

.3 Supply and Install a floor-mounted support frame for the skid assembly. Fabricate support frame of chemically resistant stainless steel. Provide sufficient strength to allow the support frame to carry the full weight of all of the skid components when full of chemical.

.4 Supply chemical resistant tubing.

.5 Each pump shall be supplied with a built-in flowmeter with signal going back to the control panel.

2.4 Piping and Valves

.1 Supply and Install valves and appurtenances of material suitable for the specified chemicals.

2.5 Pump Skid Operation

.1 The pump Manufacturer shall Supply and Install all wiring and conduit within a skid package.

2.6 Spare Parts and Maintenance Materials

.1 Comply with the requirements specified in Section 01 61 00.

.2 Supply all spare parts for each pump skid system for the recommended general overhaul after five (5) years of operation, including but not limited to:

.1 Spare pump head assemblies and rotors.

.2 Continuous rolls of specified tubing size per pump.

.3 Spare sets of tubing quick disconnects per pump.

.3 Supply a list of spare parts and sorted into Kits with recommended frequency intervals for the expected maintenance work over a period of five (5) years under normal conditions.

2.7 Classification

.1 As per Section 26 05 00 and as indicated on Drawings.

2.8 Acceptable Manufacturers:

.1 Watson-Marlow.

.2 Prominent.

.3 Or approved equal.

.4 The polymer pump skid shall be supplied by the manufacturer of the dewatering rotary press.

3. EXECUTION

3.1 Manufacturer's Representative

.1 Manufacturer's Representative shall be required to attend the site to train staff, and to witness installation and testing to ensure the equipment is installed and operated as intended.

.2 The minimum periods shall be as follows:

.1 Installation and testing: one (1) day.

.2 Staff Training: one (1) day.

3.2 Installation Training

.1 Instruct the Construction Contractor in the methods and precautions to be followed in the installation of the pump.

.2 Attest to the Construction Contractor's understanding by required Form 101 appended to these Construction Contract Documents.

3.3 Installation

.1 Verify satisfactory delivery of the equipment by completing Form 100.

.2 Manufacturer's Representative shall ensure that the pump is installed as required to provide satisfactory service.

.3 Manufacturer's Representative shall cooperate with the Construction Contractor as documented by Form 102.

3.4 Testing

.1 Ensure that the pump, including all component parts, operates as intended.

.2 Cooperate with Construction Contractor to fulfill the requirements for satisfactory performance of the equipment as documented by Form 103 and 104.

.1 The Manufacturer's Representative shall provide the services of factory trained instructors for the purpose of training the City's personnel in the proper operation and maintenance of the equipment as documented by Form T1 and T2.

3.5 Commissioning

.1 Attend during commissioning of the process system which includes the pump specified in this section to ensure that the pump functions as intended in the process system.

3.6 Factory Acceptance Testing

.1 Prior to shipping, conduct factory performance testing.

.2 Testing will include the complete pump assembly, including pump, variable speed drive.

END OF SECTION

EQUIPMENT DATA SHEET

Description:	Polymer Dosing Pump 1 & 2
	P-P3411 & P-P3412
Number:	2
Design Conditions:	
Liquid:	Polymer
Liquid temperature:	8-30ºC
Solids content:	0.1-0.5%
Pump Location	Scum Dewatering Building – Polymer Room
Classification:	Unclassified
Rating Point:	
Rated Flow:	120 L/h
Rated TDH:	30 m
Construction:	
Suction Connection:	25 mm
Discharge Connection:	25 mm
Input Power:	
Phases/Voltage/Frequency:	1/120/60
Classification:	As per Section 26 05 00
Accessories:	Pressure relief valves
	Check valves
	Pressure gauge
	Pressure switch
	Pressure transmitter
	Isolation ball valves
	Water pressure regulator
	Pneumatic Proportional Valve
	Static Mixing chamber
	Strainer
	Junction Box
	SS316 Skid
Acceptable Manufacturers:	Watson-Marlow
	Prominent
	Or Approved Equal

END OF SECTION

1. GENERAL

1.1 Description

.1 Supply two (2) rotary press systems in a duty/standby configuration with all necessary appurtenances.

.2 The footprint of the rotary press system shall suit the proposed Dewatering Building available floor space including access for service and maintenance as shown on Drawings.

.3 The Rotary Press shall be supplied with three (3) dewatering channels and shall accommodate one future dewatering channel. Each channel shall have a diameter of 900 mm (36 inches). Flocculated sludge will be fed at a low, constant pressure not exceeding 48 kPa (7 PSI) into the channel where it is dewatered.

.4 The required number of operating channels is determined by the flow conditions, quality of the sludge, the dryness of the cake, the filtrate quality and economic, dimensional and maintenance considerations.

.1 A Rotary Press comprises at least the following components:

.1 Drive System.

.2 Dewatering channels.

.3 Rotary Press base.

.4 Cake outlet chutes.

.5 Coordinate delivery, installation, training, and commissioning with the Construction Contractor.

1.2 References

.1 American Bearing Manufacturers' Association (ABMA):

.1 15: Ball Bearings. Local Bearings and Fatigue Life.

.2 American Gear Manufacturers Association (AGMA).

.3 American National Standards Institute (ANSI):

.1 B16.1: Standard for Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.

.2 S1.11: Standard Octave-Band and Fractional-Octave-Band and Digital Filters.

.4 American Society of Mechanical Engineers (ASME):

.1 Pressure Vessels Code (Section IX).

.5 American Society for Testing and Materials (ASTM):

.1 A36: Standard Specification for Carbon Structural Steel.

.2 A48: Specification for Gray Iron Castings.

.3 A480: Specification for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet and Strip.

.4 A500: Specification for Cold-Formed Welded and Seamless Steel tubing in Rounds and Shapes.

.5 G65: Standard Practice for Conducting Dry Sand/Rubber Wheel Abrasion Tests (Procedure A).

.6 American Welding Society (AWS). ASME (SOK).

.7 Institute of Electrical and Electronics Engineers (IEEE):

.1 85: Test Procedures for Airborne Sound Measurements on Rotating Electric Machinery.

.8 Instrument Society of America (ISA).

.9 National Electrical Code (NEC).

.10 National Electrical Manufacturers' Association (NEMA):

.1 MG1: Motors and Generators.

.11 Steel Structures Painting Council (SSPC):

.1 SP10 Near White Blast Cleaning.

.12 Underwriters Laboratories Inc. (UL).

.13 Standard Methods for Examination of Water and Wastewater.

.14 Canadian Standards Association (CSA):

.1 CSA C22.1 – Canadian Electrical Code

.2 CSA C22.2 No. 100 – Motors and Generators

1.3 Submittals

.1 Submit the following Shop Drawings in accordance with Section 01 33 00:

.1 Mechanical:

.1 Mechanical submittals shall include at least the following:

.1 Certified shop and erection drawings showing all important details of construction, sludge feed, wash water, high pressure air, and drainage connections, wiring diagrams, itemized motor horsepower, dimensions and anchor bolts.

.2 Descriptive literature, bulletins, and/or catalogs of the equipment.

.3 Data on the characteristics, features, and performance of the equipment.

.4 The total weight of the equipment including the weight and dimensions of the single largest item.

.5 Identification of lifting hooks or methods for each large component.

.6 A complete total bill of materials for all equipment.

.7 List of recommended spare parts.

.2 Electrical:

.1 Electrical submittals shall include at least the following:

.1 Electrical schematics, panel layouts, point-to-point I/O (input/output) wiring diagrams, control panel network diagram, instrumentation sheets, and product data sheets for electrical equipment being supplied by the Rotary Press manufacturer.

.2 Control narratives with tags, minimum/maximum/initial setpoints, timer values, system alarms.

.3 List of all input and output signals.

.4 List of all internally-derived values.

.5 A complete total bill of materials for all equipment.

.2 Operation and maintenance manual (O&M manual):

.1 O&M Manuals will thoroughly address all items of equipment, components, options, accessories, and ancillary devices provided with equipment components.

.2 O&M Manuals will include the following minimum information in addition to that normally provided or required by the manufacturer; and in addition to the specific requirements identified in equipment specification sections.

.1 Title Page:

.1 Project Name, Equipment model.

.2 Manufacturer Information.

.2 Table of Contents.

.3 Equipment introduction, description of each item of equipment and system addressed in O&M Manual. Use project specific equipment name plate, tag numbers, manufacturing date.

.4 Rotary Press installation Procedure:

.1 Lifting instruction.

.2 Storage and installation recommendations.

.5 Rotary Press individual operating Instructions:

.1 Principe of operation of the rotary press:

.1 Process overview.

.2 Zones description.

.3 Effect of parameters.

.6 Flocculator individual operating instructions:

.1 Flocculator Operation Instruction.

.2 Sludge sample operation.

.3 Jar testing procedure.

.7 Equipment automatic operating instructions:

.1 Recirculation Cycle.

.2 Dewatering Cycle.

.3 Wash Cycle.

.4 Shutdown sequence.

.5 Safety instruction.

.6 Recommended daily check list.

.7 Trouble shooting information (Problem, causes and solutions chart).

.8 Polymer preparation.

.9 Filtrate sampling procedure.

.8 Maintenance instructions:

.1 Introduction and safety instructions for maintenance.

.2 Rotary Press:

.1 Preventive maintenance.

.2 Cleaning Exterior/Interior.

.3 Lubrication chart and mechanical check list.

.4 Recommended Preventive maintenance with schedule.

.5 Adjustment and Maintenance: Seals, deflector and inlet spacer.

.6 Assembly Procedures.

.7 Disassembly procedures.

.9 Flocculator:

.1 Recommended Preventive maintenance with schedule.

.2 Cleaning.

.3 Lubrication chart and mechanical check list.

.4 Replacement of the seals.

.5 Assembly Procedures.

.6 Disassembly procedures.

.10 Main maintenance operation:

.1 For each item or product provided.

.2 Identifying only provided options and accessories.

.3 Listing complete model number as needed to order an exact duplicate.

.11 Product Data as follows:

.1 Complete technical data sheets for each item or product provided.

.2 Identifying only provided options and accessories.

.3 Listing complete model number as needed to order an exact duplicate.

.12 General drawings as follows:

.1 Showing all parts, assemblies, and sub-assemblies.

.2 Showing arrangement and inter-relationship of all parts and equipment.

.3 Showing controls and direction of flows.

.13 Electrical drawings as follows:

.1 Complete and accurate control schematics.

.2 Control panel layouts.

.3 Show all control devices and prefabricated wiring and conduit.

.4 Identify all terminations and terminal strips.

.5 Include settings for all configuration dip switches.

.6 Include list of all fuses and breakers and their ratings.

.7 Identify each different source of power. Identification to follow the City of Winnipeg Water & Waste Identification Standard.

.14 A description of the functions including:

.1 A description of the automatic cycles.

.2 A list of all the alarms.

.3 A description of all the screens in the operator interface.

.4 A list of set points for all adjustable devices. Include minimum and maximum values for setpoints.

.5 A list of timer values.

.6 A list of all input and output signals.

.7 A list of all internally-derived values.

.15 List of recommended spare parts.

.16 List of recommended and alternate consumables and expendable such as lubricants and filters.

.17 Clear and concise written instructions, with illustrations as required, for the following:

.1 Normal operating procedures.

.2 Long term storage procedures.

.3 Adjusting and troubleshooting procedures.

.18 Copies of all information provided as part of the approved Product Data or Shop Drawing submittals.

.19 A professionally prepared DVD, covering all aspects of press operation and maintenance, including:

.1 Press and component disassembly and re-assembly, including channels, speed reducer drive, flocculator mixer, system piping, field instruments, pneumatic controls, control valves, seals, etc.

.2 Maintenance of all dewatering system components, including flocculation system, pneumatic system, dewatering channels, control valves and control elements, such as meters, pressure regulators, pressure sensors, etc., mixers, drives and variable speed controllers.

.3 Operational controls including pressure adjustments, press speed, sludge and polymer feed, as they relate to control and response to operator variation.

1.4 Spare Parts

.1 Comply with the requirements specified in Section 01 61 00.

.2 Supply all spare parts for each press system for the recommended general overhaul after five (5) years of operation including but not limited to bearings, seals, gaskets, rings, clamps, hardware, etc.

.3 Supply a list of spare parts and sorted into Kits with recommended frequency intervals for the expected maintenance work over a period of five (5) years under normal conditions.

1.5 Quality Assurance

.1 Rotary Presses shall be the product of one manufacturer.

.2 Rotary Presses shall be manufacturer's standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.

.3 Welding: In accordance with latest applicable American Welding Society Code or equivalent.

.4 Shop tests as specified.

.5 The Contractor shall obtain the presses, main drive, back drive, motors, gear reducers, sludge conditioning devices, valves, variable frequency motor controllers, controls and control panels and appurtenances from the press manufacturer, as a complete and integrated package to insure proper coordination and compatibility and operation of the system.

.6 Electrical Equipment Labeling Requirements:

.1 Provide equipment labeled by a nationally recognized testing company where standards have been established. Where equipment is not available with label, provide service of a nationally testing company to examine the equipment and certify in writing that it complies with its safety standards. Tests and inspections of equipment shall be at no additional cost to City.

.7 Provide all components made of stainless steel passivated by full submergence in a pickling bath for perfect surface finishing. No stainless steel components may be fabricated or assembled in a factory where carbon steel products are also fabricated, in order to prevent contamination by rust.

.1 Fully submerge all stainless steel parts in a pickling bath for at least eight (8) hours to remove welding spots and to protect the stainless steel against corrosion. Sand or glass bead blasted or brushed or otherwise not equivalently treated stainless steel is not acceptable.

.8 Provide fabrication in compliance with all applicable ASTM standards or equivalent international standards.

.9 Welding: In accordance with section IX of ASME Pressure Vessel Code:

.1 Qualifications for welders: Provide certification that welders to be employed in work have satisfactorily passed qualifications tests. If recertification of welders is required, retesting is the contractor’s responsibility at no additional cost to the City. Manufacturer shall submit welder’s qualifications with drawings.

.2 Visually inspect welding while the operators are making the welds and again after the work is completed. After the welding is completed, hand or power wire brush welds and clean them before the inspector makes the check inspection. Inspect welds under light for surface cracking, porosity, and slag inclusions: excessive roughness: unfilled craters: gas pockets: undercuts: overlaps: size: and insufficient throat and concavity.

.10 Services of Manufacturer's Representative as stated in Section 01 91 31 and as specified herein.

.11 Provide services of factory-trained Service Technician, specifically trained on type of equipment specified:

.1 Service Technician must be present on Site for all items listed below. Person-day requirements listed are exclusive of travel time, and do not relieve Contractor of the obligation to place equipment in operation as specified.

.2 Installation: Inspect grouting, location of anchor bolts; setting, leveling, alignment, field erection; coordination of piping, electrical and miscellaneous utility connection:

.1 1 person-days.

.3 Demonstration and Running Tests: Calibrate, check alignment and perform a functional test. Tests to include all items specified.

.1 1 person-days.

.4 Performance Testing: Field performance test equipment specified.

.1 1 person-days.

.5 Vendor Training: Provide classroom and field operation and maintenance instruction including all materials, slides, videos, handouts and preparation to lead and teach classroom sessions.

.1 4 person-days.

.6 Service inspections during first two (2) years of operation, for use at City's request, and exclusive of repair, malfunction or other troubleshooting service calls.

.1 1 person-days, 2 trips.

.7 Credit to the City, all unused service person-days specified above, at the manufacturer's published field service rate.

.8 Any additional time required of the factory trained service technician to assist in placing the equipment in operation, or testing or to correct deficiencies in installation, equipment or material shall be provided at no additional cost to the City.

.12 Manufacturer of presses shall have a minimum of ten (10) operating installations with equipment of the size specified and in the same service as specified operating for not less than five (5) years.

.13 If equipment proposed is heavier, longer, wider or taller, or different discharge arrangement than specified and indicated; provide all structural, architectural, mechanical, electrical and plumbing revisions at no additional cost to the City.

.1 If equipment is heavier than specified, the Contractor shall provide all hoisting equipment sized to maintain the minimum safety factor between the specified maximum equipment weight and the lifting capacity of the hoisting equipment indicated and specified.

1.6 Delivery, Storage and Handling

.1 Comply with the requirements specified in Section 01 61 00.

2. PRODUCTS

2.1 System Description

.1 Equipment Limitations:

.1 Press Assembly:

.1 Maximum Total Weight:

.1 Press (complete assembled): 4700 kg dry.

.2 Flocculator: 400 kg dry.

.2 Maximum weight for largest item:

.1 Gear box: 2000 kg.

.3 Maximum Assembly Overall Length x Width 4000 x 2700 mm.

.4 Maximum Assembly Overall Height: 2000 mm.

.2 Manufacturer shall coordinate the installation of the equipment with the installer.

2.2 Manufacturers

.1 Rotary Press:

.1 Fournier Industries Inc.

.2 Or approved equal.

2.3 Seismic Design Requirements

.1 The Contractor shall conform to the seismic design requirements for this project and for the Work of this specification section.

.2 Provide all equipment bases, anchorage, supports and foundations designed in accordance with the seismic requirements indicated and specified.

.3 Additionally, provide with the Certificate of Unit Responsibility, certification for all equipment signed by a registered structural engineer stating that computations were performed and that all components have been sized for the seismic forces specified and indicated.

2.4 Press Construction

.1 Drive System:

.1 Speed Reducer:

.1 The speed reducer shall be foot mounted type with spiral bevel and helical gears. The speed reducer shall be fabricated according to ANSI/AGMA 6010 standard with a robust cast iron housing . The bevel gears will have a minimum of AGMA quality of 9 and the helical gears a minimum of AGMA 11. Output shaft shall be made of steel with a minimum yield of 59000 PSI (300 MPa). Output shaft will have a minimum diameter of 158 mm (6-3/16”). The speed reducer shall be mounted on a steel base epoxy painted (see section 2.9.1 for painting). No parts of the speed reducer, including gearbox seals shall be in direct contact with either the sludge filtrate or cake. The output seal shall be an integral part of the speed reducer housing; there shall be no bolt-on output cover to cause leakage, shaft or gear misalignment.

.2 Motor:

.1 The electric motor shall be 600 V, 60 Hz, 3 PH, 1800 RPM totally enclosed, TEFC, 11.2 KW (15 HP), "C" flange, high efficiency, service factor 1.15, insulation "F" class, design "B". The electrical motor is directly coupled to the speed reducer.

2.5 Dewatering Channels

.1 The dewatering channel of the Rotary Press shall be mounted on the gear reducer output shaft. Each channel shall be an independent self-contained modular unit which can be interchanged with other Rotary Presses of the same model. The low-speed shaft seal of the speed reducer will, in no way, act as a filtrate seal for the dewatering channel. All material in direct contact with the flocculate sludge or with the cake shall be in stainless steel or plastic made.

.2 Each channel will consist of:

.1 Filtration elements:

.1 The filtration elements shall be made of stainless steel and be hard chrome plated for wear resistance. The filtration elements shall be a non-clogging design which does not require wash water during operation. Filtering element shall be manufactured from thin Stainless steel plate. Filtering element made from wire or wedge wire are not acceptable.

.2 Scrapers:

.1 To clean the filtration elements, each channel shall be equipped with two (2) stainless steel scrapers.

.3 Filtration wheels:

.1 The wheels shall be made of cast stainless steel ASTM A 743 Gr CF-8 or equal. The casting will have wall sections with a minimum thickness of 12 mm (1/2”), so designed to withstand internal pressures of up to 2069 kPa (300 PSI). The surface preparation and painting shall be as defined in section 2. Contact surfaces for the seals shall be made from polished stainless steel 316L and have a surface finish from 16 to 32 RMS.

.4 Deflector:

.1 Deflector shall be fabricated from a molybdenum disulphide-filled nylon (Nylatron).

.5 Gland covers, bearings and seals:

.1 Each gland cover shall be identical, and will act as gland to maintain the seal in proper position. The gland covers shall be made from 6 mm (1/4”) thick 316 stainless steel plates. The gland cover will also include in the lower part piping outlet to drain the filtrate.

.2 An additional opening is made for the outside wheel wash water system connection and air bleeding device. For inspection or maintenance, an opening port is located at the rear portion of the cover to permit easy access.

.3 For maintenance purposes, each gland cover shall be equipped with three (3) lifting ears equally spaced. Each cover is supplied with supplementary tapped holes to allow screws to be used as pullers during dismantling steps.

.4 Sealing between the gland cover and filtration wheel shall be assured by one (1) Outside Lip Seal in the UHMW bushing and Three (3) "O-ring": one (1) ‘’O-ring’’ between the bushing and the cover hub and two (2) ‘’O-ring’’ between the bushing and the filtration wheel hub.

.6 Housing:

.1 Each housing is made from 16 mm (5/8”) thick stainless steel 316. The surface in direct contact with the cake shall be stainless steel lined. Housing is supported by the filtration wheel through a set of bushing. Rotating of the housing is restricted by a torque arm, connecting the channel housing to the gear reducer base support. Each housing is interchangeable with other Rotary Presses of the same series.

.7 Wash system:

.1 The wash system shall be provided for use as a daily cleaning of the inside of the channel(s) and the outside of the filtration wheel(s).

.2 One (1) wash manifold is located inside the channel at the sludge inlet. This manifold is made of a stainless steel tubing assembly, equipped with twenty-eight (28) flush type stainless steel sprinklers.

.3 One (1) set of two (2) manifolds (one set for each filtration wheel) consisting of four (4) sprinklers shall be located in between the filtration wheels and the gland covers. Each manifold is made of stainless steel fittings and brass flat jet sprinklers.

.4 For maintenance purposes, the manifold assembly is assembled to a mounting plate bolted and sealed to the gland cover. All sets of nozzles detach from the water supply using a quick disconnect system for easier maintenance. The system is easily removable from an outside access.

.5 The system shall be equipped with a check valve to prevent the back flow of sludge into the wash system.

.6 Please only provide the washing system with clean water only.

.8 Filtrate Collector:

.1 Each channel shall be equipped with a removable filtrate collector. Filtrate collector shall be made of low linear density polyethylene (LLDPE). Filtrate outlet connection shall be 190.5 mm (7.5") dia. Each filtrate collector will include two (2) sampling ports to sample filtrate. Sampling port shall be closed by a removable plug.

.9 Filtrate collector manifold:

.1 Each filtrate collector shall be piped to a manifold. Manifold shall be made with Sch. 80, 153 mm (6") dia. PVC piping. Manifold outlet shall be equipped with a 90° elbow.

2.6 Rotary Press Base

.1 The base shall be fabricated from bend 9.5 mm (3/8") thick epoxy painted steel plate. Base shall be a close shape to optimize rigidity and spread the load evenly to the supporting floor. Anti rotation device fixations are integrated to the base to facilitate the installation.

2.7 Cake Outlet Chutes

.1 Every cake outlet will have a chute with an inspection door. The chute shall be made in low linear density polyethylene (LLDPE). A hole for mounting of a cake sensor is provided for this purpose.

2.8 Flocculator and Feed Manifold

.1 The Flocculator:

.1 Mechanical agitation using a pressurized vessel is required before the Rotary Press to assure a proper flocculation. Static mixing device or piping used as static mixer is not authorized.

.2 The flocculator model 05-300-900 shall be designed with a tank capacity of 64.3 liters (17 gallons) and for 690 kPa (100 PSI) pressure and a maximum temperature of 60°C (140°F). The body and bolted cover shall be fabricated of epoxy painted carbon steel. The thickness of the body shall be 9.5 mm (3/8"). Top cover plate shall be fabricated from 31.8 mm (1-1/4") epoxy painted carbon steel. Three (3) lifting lugs shall be supplied to facilitate handling.

.3 The agitator shall be variable speed and driven by a gear motor, helical type, hollow shaft, Nord Gear model SK0282. Hollow shaft shall be 30.2 mm (1-3/16") dia., 4.03 to 1 ratio, 0.75 kw (1 HP) high efficiency motor, 1750 RPM, 3 PH, 600 V, 60 Hz, continuous duty, Insulation class F, CSA, CE & UL approved.

.4 The seal at the agitator shaft and the flocculator cover will consist of two (2) lip seal contacts with grease cavity in between. A grease fitting will allow the cavity to be lubricated. The shaft seal wear sleeve shall be fabricated from stainless steel. The wear sleeve shall be polished to a surface finish of 16 rms and shall be hardened by nitriding.

.5 The flocculator will have the following connections:

.1 Sludge inlet.

.2 Sludge outlet.

.3 Pressure sensor fitting (Ref.: Press inlet pressure).

.4 Wash water connection.

.5 Polymer connection.

.6 Air purge.

.7 Spare inlet 19 mm (3/4").

.6 The sludge inlet and outlet connections shall be 75 mm (3") diameter with machine groove to adapt type 77 Victaulic coupling or equivalent.

.7 Threaded connections for service and instrumentation shall be located on the inlet manifold of the flocculator.

.8 The flocculator shall be equipped with an air breather. The air breather shall be located at the top of the flocculator and hook up to the potable water line for occasional back wash and to the drain line to collect any sludge leak. Breather shall be made of PVC.

.2 Feed Manifold:

.1 Piping for flocculated sludge:

.1 The piping between the flocculator and the Rotary Press shall be made of schedule 10, 316 stainless steel.

.2 The feed manifold and other accessories shall be tested in the shop at 690 kPa (100 PSI) hydrostatic pressure.

.2 Pipe fittings:

.1 The pipe fittings shall be grooved end type as described below:

On lines less than 3 m (10 ft) long	Style 77 Victaulic joints or equivalent
On lines more than 3 m (10 ft) long	Style 07 "Zero Flex" Victaulic joints or equivalent
Flange-to-flange joints	Style 741 "Vic-flange" or equivalent
For butt or field adjust joint coupling	Victaulic style 99 "Roust-A-Bout" or equivalent

.3 Valves and Accessories:

.1 All valve(s) shall be compatible with the nominal operating pressures of the different systems and shall be designed to resist the operating temperatures and the contained fluids. The valves shall be of equal diameter as the piping except where indicated otherwise.

.2 Automatic Sludge feeding and recirculation valve.

.1 Two pneumatically-actuated valves shall be installed on the sludge line between the rotary press and the flocculator. The valve shall meet the following characteristics:

Valve	
Type	Two-way ball type Full port
Size diameter	76, 2 mm (3'') dia.
End connection	ANSI 125# Flanged
Body material and facing	Painted cast iron
Ball material	Ductile iron / Teflon fuse ball

Shaft	Stainless steel
Seat type	RPTFE
Manufacturer	Quality Certified Valve, American Valve, Sure Flow or equivalent
Actuator	
Type	Pneumatic double acting (2-pistons design on geared shaft)
Nominal torque at 81 PSI (560 kPa)	2390 lbs in (270 Nm)
Manufacturer	FESTO or equivalent
Position indicator	
Type	Visual Position switches
Switches	SPDT
Protection	Watertight IP67
Manufacturer	FESTO or equivalent

.2 Sludge feed and recirculation valves shall be piloted by solenoid valve located in the Rotary Press Junction Box (ref. section 2.19.7). The valve body shall be made of anodized die cast aluminium and will have an insulation rated IP65. The working pressure shall be in the range of 248 to 800 kPa (36 to 116 PSI). The solenoid valve with manual override shall be 24 VDC. Solenoid valve shall be Festo model no. VMPA1-M1H-M-PI or equivalent.

.3 Channel Isolating valve:

.1 At the inlet of each channel, a shut-off valve shall be supplied. The valve shall meet the following characteristics:

Valve	
Type	Ball type Full port
Size diameter	76.2 mm (3 inches) dia.
End connection	ANSI 125# Flanged
Body material and facing	Painted cast iron
Ball material	Ductile iron / Teflon fuse ball
Shaft	Stainless steel
Seat type	RPTFE
Manufacturers	Quality Certified Valve, American Valve, Sure Flow or equivalent
Actuator	
Type	Lever

.4 Channel Wash water valve:

.1 For automatic control purposes, a pneumatic actuator shall be installed to control the wash water valve to each individual channel. The valve shall meet the following characteristics:

Valve	
Type	Ball type Full port
Size diameter	25.4 mm (1 inch) dia.
Body material and facing	Type 316 stainless steel
Maximum pressure	1000 PSI (6.9 MPa)
Manufacturer	C.F.F. model no. SS-3DM or equivalent
Actuator	
Type	Pneumatic spring return type Aluminium anodized body
Manufacturer	Festo model no. VMPA1-M1H-M-PI or equivalent.

.2 Wash water valve shall be piloted by solenoid valve located in the Rotary Press Junction Box (Ref. Section 2.19.7). The valve body shall be made of anodized die cast aluminium and will have an insulation rated IP65. The working pressure shall be in the range of 248 to 800 kPa (36 to 116 PSI). The solenoid valve with manual override shall be 24 VDC. Solenoid valve shall be Festo model no. VMPA1-M1H-M-PI or equivalent.

.5 Other valves:

.1 All other valves other than the one above shall meet the following characteristics:

Valve	
Type	Ball type Full port
Size diameter	As required
Body material and facing	Type 316 stainless steel
Seat material	PTFE
Manufacturers	Quality Certified Valve, American Valve, C.F.F., Trueline, H&P or equivalent
Actuator	
Type	Lever

.3 Polymer check valve:

.1 A stainless steel 25.4 mm (1") NPT check valve shall be installed on the polymer line to prevent sludge from entering the polymer feed line. The check valve will start to open at 3.4 kPa (0.5 psig) and shall be fully opened at 6.8 kPa (1.0 psig). The valve shall be spring assisted for silent closing and minimizing the effect of water hammer. The valve temperature limit shall be -29 to 204°C (-20 to 400°F). The model shall be IFC model no. SC600TSSSSM.

.4 Flocculated sludge sampler:

.1 A flocculated sludge sampler shall be supplied. The device shall consist of a transparent PVC tube to inspect the texture of the flocculated sludge. A 19 mm (3/4") vent and 50 mm (2") sludge inlet and sludge draining valves will allow filling and draining the sampler

without dismantling or adding any pipes, tubes or plugs. A 19 mm (3/4") vent shall also be installed for wash purpose. The sampler shall be easily removable for maintenance.

.5 Wash water pressure gauge:

.1 A pressure gauge shall be installed at the flocculator on the wash water line. The pressure gauge shall be a 63.5 mm (2-1/2"), liquid filled. The scale shall be 0 to 1.1 MPa (0 to 160 PSI).

2.9 Miscellaneous

.1 Painting and protection:

.1 Painting and protection for equipment and steel piping:

.1 Surface preparation:

.1 Near white blast cleaning according to SSPC-SP10 for the equipment.

.2 Pickling SSPC-SP8 for the piping.

.2 Primer:

.1 Type: Epoxy Resin (high build) Carboguard 893.

.2 Note: According to the ONGC-1 GP165A Standard (US equivalent Standard SSPC Paint No. 22).

.3 Dry thickness: 152 µm (6 mils) minimum.

.3 Finish coat:

.1 Type: Polyurethane.

.2 Color: Glass Shield Blue # 2862044 Carbothane 134HG blue.

.3 Dry thickness: 38 µm (1.5 mils) by layer (2 layers) = 76 µm (3 mils) minimum.

.4 Total system thickness: 229 µm (9 mils) min.

.2 Painting and protection for all wetted parts:

.1 Surface preparation:

.1 Near white blast cleaning according to SSPC-SP10.

.2 Primer:

.1 Type: Epoxy Resin (high build) Plasite # 7122.

.2 Note: According to the ONGC-1 GP165A Standard (US equivalent Standard SSPC-Paint No. 22).

.3 Dry thickness: 229 µm (9 mils) min.

.4 The surfaces in contact with feed sludge, filtrates and cake will also be painted except when those surfaces are made out of stainless steel or polymer based product.

.2 Materials:

.1 The steel used in the construction will meet the following standards:

.1	Tubing:	CSA G40.21 - 44W (US equivalent ASTM A-500)
.2	Structural shape:	CSA G40.21 - 44W (US equivalent ASTM A-572)
.3	Plate:	CSA G40.21 - 44W (US equivalent ASTM A-36)
.4	Sheet:	ASTM A569
.5	Shaft:	ANSI-1045
.6	Stainless steel:	ANSI 304, ANSI 316

.3 Special Tools:

.1 Special maintenance tools shall be supplied. Those will include a shaft torque wrench and lifting bolt for wheel and housing. The special maintenance tools shall be delivered into a tool box.

2.10 Fasteners

.1 All fasteners to be used shall be made according the ANSI/ASME B18 standards.

.2 Except if otherwise noted, ASTM F738M stainless steel bolts and ASTM F836M stainless steel nuts (property class A1-50 for both, or equal) shall be used for all assemblies:

.1 Channel housings.

.2 Gland covers to channel housing.

.3 Filtrate collector to channel housing.

.4 Channel sludge inlet to the channel housing.

.5 Anti-rotation plate to the channel housing.

.6 Channel housings to outer spacers.

.7 Filtration wheels to the inner spacer.

.8 Scraper blades to outer spacer.

.9 Actuator support to the channel assembly.

.10 Lifting devices to the channels.

.11 Interior bushing to the gland cover hub.

.12 Wash water system support to gland cover.

.13 Speed reducer to reducer base.

.14 Deflector.

.15 Actuator support.

.16 Speed reducer output shaft to its cap plate.

.17 Identification plates.

.18 Motor bell housing to the speed reducer input.

.19 Input and output flocculator piping.

.20 Flocculator.

2.11 Welding

.1 All the welding shall be performed under the AWS Standard, CSA Standard, or equivalent.

2.12 Noise level

.1 The noise level of each of the equipment shall not exceed 75 dBA measured at 1 m (3 ft) from the source.

2.13 Interchangeability

.1 All parts from press or from channel shall be interchangeable with another.

2.14 Design Criteria

.1 Residuals Dewatering:

.1 The material to be dewatered will be approximately 1-20% scum solids from Primary Clarifiers.

.2 Available Polymer: NSF approved polymer will be made available at a range of 1.5-3.0 kg/tone.

.3 Maximum Design Feed:

.1 Feed Rate: 6.7 m^3/hr.

.2 Residuals Solids: 335 kg/hr of dry solids.

.3 Feed Concentration: 1-20% TSS.

2.15 Required Performance

.1 Rotary Press shall achieve the minimum following performance with the feed residuals characteristics listed under "Design Criteria" at the following rates:

.1 Feed Rate: 6.7 m^3/hr.

.2 Feed Concentration: 5% TSS.

.3 Residuals Dewatering:

.1 Dewatered Residuals Concentration (Minimum): 50% TS and to pass the concrete slump test.

.2 Minimum Rotary Press Solids Capture: 95%.

.1 Capture shall be defined as:

.1 Percent Capture = (F-C)/F x 100

Where: F = Feed residuals total suspended solids concentration (mg/L).

C = Filtrate total suspended solids concentration (mg/L).

.2 The above performance requirements are the minimum acceptable limits at the specified feed residuals characteristics. The addition of conditioning chemicals for the Dewatering Rotary Press will be allowed, up to the maximum stated in the “Design Criteria” Section above, to achieve the performance requirements.

.3 Failure to meet the specified performance requirements shall constitute the basis for equipment rejection, unless otherwise noted.

2.16 Warranty

.1 The Contractor shall warrant and shall obtain from the manufacturer its warranty that the Rotary Presses with all their backdrives, appurtenances and control systems will be free from defects in design, materials, and workmanship for a period of one year from the date of successful completion of Performance Testing or Beneficial Use whichever comes first. The manufacturer’s warranty shall be in a form acceptable to and for the benefit of the City and shall be submitted by the Contractor. The Contractor shall repair or replace any work found to be defective within said warranty period. For the purposes used in the above paragraph Beneficial Use shall be defined as the use of provided equipment for its intended purpose. In the event that the equipment does not meet the specified performance through no fault of the Contractor/City, use of the equipment during the period of time beginning on the date of Operational Testing until the machine either performs as specified or the manufacturer states that they will not be able to perform as specified shall not be considered Beneficial Use.

.2 The Rotary Press manufacturer shall provide a warranty for all components of the Rotary Press system furnished under this specification, whether manufactured by the Rotary Press manufacturer or purchased from another manufacturer to be provided as a part of the Rotary Press system.

.3 The warranty period is fixed and precise, as it is for the shortest of the following described period:

.1 Twelve (12) months from the installation date; or

.2 Eighteen (18) months from the delivery date.

2.17 Instrumentation and Controls

.1 Basic principle of operation:

.1 The dewatering unit will consist of one (1) rotary press with its flocculator, along with control devices necessary to maintain an adequate proportion of flow and pressure, resulting in an uniform feed of sludge and diluted polymer to the press.

.2 The feed sludge is pumped to the flocculator as to maintain a constant pressure at the flocculator inlet. To accomplish this, the rotating speed of the feed sludge pump will be adjusted according to the internal pressure of the flocculator as to maintain the pressure close to the set value.

.3 The diluted polymer is pumped to the flocculator in such a way as to obtain a specified polymer-sludge dosage. The dosage is controlled by adjusting the speed of the diluted-polymer pump and is a function of the speed of the sludge pump, and a set value entered by the operator. From the flocculator, the flocculated sludge is fed into each of the channels of the Rotary Press.

.4 The channel outlet pressure is controlled by modulating a restrictor device at the cake outlet. The applied air pressure of the restrictor's actuator is controlled to maintain a constant outlet pressure.

.5 A local control cabinet is used to operate the system and to change the basic parameters.

.6 The control panel shall be CSA certified. All dewatering equipment and peripheral shall be controlled by the Rotary Press Control Panel for better integration.

2.18 Instrumentation

.1 Flowmeters:

.1 Sludge flowmeter:

.1 The sludge flowmeter shall be installed before the flocculator inlet.

.2 The instrument shall meet the following specifications:

Type	Electromagnetic
Linearity error	±0.5%
Diameter/measuring range	100 mm (3") / 1 – 10 m^3/h
Process temperature	-20°C to 80°C (-4°F to 176°F)
Electrical connection	1/2" NPT
Process connection	Flange type

Display/operation	Remote transmitter with two line display with backlit / push button
Output signal	4-20 mA, pulsed totalizer
CSA/FM approval class	Class 1 division 2
Liner material	Hastelloy C
Electrode material	316L SS
Protection	IP67/Nema 4X, IP68/Nema 6P

.3 Approved manufacturers:

.1 Endress & Hauser.

.2 Seimens.

.3 ABB.

.4 Rosemount.

.5 Or approved equal.

.2 Polymer flowmeter:

.1 The polymer flowmeter shall be installed at the flocculator inlet.

.2 The instrument shall meet the following specifications:

Type	Electromagnetic
Linearity error	±0.5%
Diameter/measuring range	24 mm (1”) / 100 – 2000 L/d
Process temperature	-20°C to 80°C (-4°F to 176°F)
Electrical connection	1/2" NPT
Process connection	Flange type
Display/operation	Remote transmitter with two line display with backlit / push button
Output signal	4-20 mA, pulsed totalizer
CSA/FM approval class	Class 1 division 2
Liner material	PTFE
Electrode material	316L SS
Protection	IP67/Nema 4X, IP68/Nema 6P

.3 Approved manufacturers:

.1 Endress & Hauser.

.2 Seimens.

.3 ABB.

.4 Rosemount.

.5 Or approved equal.

.3 Inlet pressure gauge and transmitter:

.1 The inlet pressure gauge and transmitter shall be installed at the flocculator inlet.

.2 The instrument will meet the following specifications:

Type	Digital pressure transducer, capacitive, ceramic
Linearity error	± 0.075 %
Process temperature	4°C to 125°C (39 to 257°F)
Operating pressure range	0-207 kPa (0-30 PSI)
Proof pressure (Without any damage to the transducer)	1.8 MPa (270 PSI)
Electrical connection	1/2" NPT
Calibration	0-207 kPa (0-30 PSI)
Output	4-20 mA, with Hart Communication, 2 lines LCD display
Process connection	1/2" NPT
Protection	Division 1
Diaphragm material	Ceramic

.3 Approved manufacturers:

.1 Endress & Hauser.

.2 Seimens.

.3 ABB.

.4 Rosemount.

.5 Or approved equal.

.4 Outlet pressure control:

.1 Cake outlet pressure shall be controlled by air pressure on the bellows actuating the vertical restrictor.

.2 Adjustable airline pressure regulator shall be used to control the outlet pressure. Each channel will have its own in line air regulator. Regulator shall be relieving type, pressure range 0 to 690 kPa (0 to 100 PSIG), 1/4 inch port, with 1 MPa (150 PSIG) pressure gage. Regulator shall be Festo Model no. MS4N-LR-1/4-D6-AS or equivalent.

.3 For automation purposes, Electro-pneumatic transducer shall be supplied with the control system and shall be Festo Model no. VPPE-3-1-1/8-6-420-E1 or equivalent.

.5 Cake sensing:

.1 Each channel shall have a cake sensor mounted on the outlet chute cover. For easy maintenance, the sensor shall be equipped with a quick connector. Sensor shall be Schneider Electric Model no. XT218A1PCM12 or equivalent.

.6 Wash water pressure switch:

.1 A pressure switch shall be installed on the wash water line at the flocculator. The pressure switch shall be 1/4" NPT, SPST/NO. The switch shall cover an adjustable range of 207 to 827 kPa (30 to 120 PSI). The switch shall be shop calibrated at 414 kPa (60 PSI) and sealed. The dry contact of the switch shall be used to produce a low pressure alarm on the operator interface.

2.19 Process Control Cabinets

.1 The City has standardized on Schneider Electric M580 PLCs. The vendor shall use the standardized controllers and quote the discount pricing the City receives. The Process Control Cabinet PLC will be required to be connected to the City M580 network. No other alternates or substitutes will be allowed.

.2 The supply voltage for the rotary press system controls cabinet shall be limited to 120 VAC. Devices requiring 600 VAC shall be kept in a separate cabinet.

.3 Provide a cabinet for the Rotary Press and Flocculator variable frequency drives.

.1 Supply voltage: 600 VAC, 3 phase.

.2 Back-panel mounted components and devices consisting of (but not limited to) the following:

.1 Main fused disconnect switch.

.2 Variable frequency drives (VFD) for the rotary press and flocculator.

.3 Line reactors for VFDs.

.3 Door mounted components consisting of (but not limited to) the following:

.1 Power warning alert indicator.

.2 Operating handle for main fused disconnect switch.

.3 Emergency stop push button.

.4 VFD keypads.

.5 Green LED run status pilot light, Amber LED VFD fault pilot light and Hand-Off-Auto selector switch for each VFD.

.4 Variable frequency drive (VFD):

.1 Variable frequency drives shall be used to control the speed of the rotary press and the flocculator.

.2 VFDs will have overload protection and ramp regulation capability. Configuration and programming shall be done via a keypad. Run command, status and speed control shall be handle using communication network (VFD Ethernet/IP).

.3 The VFD will have the following specifications:

Voltage/phase/frequency input	600V/3/60
Maximum output voltage	600V
Input frequency variation	47 to 63 Hz
Communication	Modbus TCP, Ethernet/IP, Modbus Serial
Operating temperature	-15 to 50°C (5 to 122°F)
Certification	CE, cULus Listed
Protection	IP20 Nema/Open
Rotary press rating	As per motor requirement
Flocculator rating	0.75 KW (1 HP)

.4 Each VFD shall include a Hand-Off-Auto selector switch along with a speed potentiometer for manual speed adjustment when in Hand mode. The VFDs will need to be run manually by Operators should the auto controls fail.

.5 Air conditioning system shall be supplied. The air conditioning system shall be Hoffman Proair Harsh Environment CR23 Series or equivalent.

.6 The City has standardized on Schneider Electric Altivar VFDs. No other alternates or substitutes will be allowed.

.4 Provide a pre-wired control cabinet for the Rotary Press System.

.1 Supply voltage: 120 VAC.

.2 Control voltage: 24 VDC.

.3 Pre-terminate connections to field devices and field wiring using DIN rail terminal blocks.

.1 Manufacturer: Phoenix Contact or approved equal.

.4 The control cabinet shall include the following:

.1 120 VAC UPS, rated for 120 minutes.

.2 Internally mounted laptop shelf.

.3 Back-panel mounted components and devices consisting of (but not limited to) the following:

.1 Programmable logic controller (PLC).

.2 Circuit breakers for main power, PLC, HMI and other control devices.

.3 Filter and surge protective device for control voltage.

.4 120 VAC to 24 VDC power supply.

.5 NEMA 5-15R duplex GFCI.

.5 Door mounted components consisting of (but not limited to) the following:

.1 Human machine interface (HMI).

.2 Programming port.

.3 Permanent metal data pocket attached to the inside of the enclosure. If space permits, the pocket shall be at least 250 mm wide and of depth and thickness to accommodate electrical diagrams.

.4 Amber LED Equipment fault pilot light and Red LED Preventative Maintenance Warning pilot light.

.6 Air conditioning system shall be supplied. The air conditioning system shall be Hoffman Proair Harsh Environment CR23 Series or equivalent.

.5 Programmable logic controller (PLC):

.1 A programmable logic controller shall be used to control the Rotary press and the related equipment. PLC shall have Ethernet/IP communication to communicate with the VFD, HMI and the plant network.

.2 The PLC will have the following specifications:

Communication ports	2 Ethernet/IP, 1 USB
Integrated connection type	Modbus TCP
Memory card type	SD
Nominal input power	24 VDC
Operating temperature	0 to 60°C (32 to 140°F)
Certification	cULus Listed Cl 1 Div 2

.1 Accepted Manufacturers: Schneider Electric Modicon M580 series or approved equal.

.3 IO Modules will have the following specifications:

.1 Operating temperature: 0 to 60°C (32 to 140°F).

.2 Certification: cULus Listed Cl 1 Div 2.

.3 Analog inputs:

Input type	Current: 0...20 mA, 4...20 mA, Voltage: +/- 10 V, 0...10 V, 0...5 V, 1...5 V
Resolution	16 bits
Measurement error	0.3% Full scale @ 25°C (77°F)

.1 Accepted Manufacturers: Schneider Electric Modicon X80 series or approved equal.

.4 Analog outputs:

Output type	Current: 0...20 mA, 4...20 mA
Resolution	16 bits
Measurement error	0.25% Full scale @ 25°C (77°F)

.1 Accepted Manufacturers: Schneider Electric Modicon X80 series or approved equal.

.5 Discrete inputs:

Input type	Current sink (logic positive) Current state 1 guaranteed : >= 2 mA Current state 0 guaranteed : <= 0.5 mA
Resolution	32 bits
Sensor power supply	19...30 V

.1 Accepted Manufacturers: Schneider Electric Modicon X80 series or approved equal.

.6 Discrete outputs:

Output type	24V DC discrete source
Field power voltage	Nominal: 24 VDC Range: 10 to 30 VDC
Resolution	16 bits
Output current rating	0.5A per output

.1 Accepted Manufacturers: Schneider Electric Modicon X80 series or approved equal.

.6 Human machine interface (HMI):

.1 A human machine interface shall be used to operate the Rotary press and the related equipment.

.1 Touchscreen operator interface:

.1 The touchscreen operator interface will have the following specifications:

Display type and size	TFT Color LCD (10.4" - 26.4 cm)
Graphic display resolution	800 x 600 (VGA)
Display colors	18-bit Colors
Touch screen	Analog resistive
Operating temperature	0 to 55°C (32 to 131°F)
Communication ports	Ethernet, USB
Programming memory	512 MB Flash EPROM

Memory card type	SD
Input voltage (power consumption)	24 VDC (35 W or less)
Certification	CE, cULus Listed Cl 1 Div 2
Protection	IP54, IP66, NEMA 12/13/4X indoor use only

.2 Manufacturers: Schneider Electric or approved equal.

.7 Rotary Press Junction Box:

.1 A pre-wired Nema 4X FRP enclosure junction box shall be installed on the rear of the rotary press gearbox. Wash valves and cake detection sensor shall be routed to this junction box and connected to terminal blocks. The Rotary press junction box shall include, but not limited to, the following components:

.1 I/P converter.

.2 Air filter and regulator.

.3 Solenoid valve for pneumatic control of sludge feeding and recirculation valve.

.4 Solenoid valve for pneumatic control of wash water valve.

.2 To insure proper air quality and inlet pressure control to system, an air regulator and an air filter are furnished and installed on the air inlet supply of the Rotary press junction cabinet. The air regulator and air filter shall be rated for air purity class 3.7 per DIN ISO 8573-1, high efficiency general purpose protection for a particle removal down to 5 microns, including water and oil aerosols. 1/4" NPT type connection, fully automated drain, maximum pressure 175 PSI, operating temperature between 2°C & 60°C (35°F & 140°F), an integrated air regulator shall include a manometer, range 0-175 PSI with lockable rotary knob. Air regulator shall be Festo Model no. MS4N-LFR-1/4-D7-CRV-AS or equivalent.

.8 Emergency stop push button:

.1 An emergency stop push button shall be installed in front of the rotary press and wired to the junction box. Emergency stop push button shall be powered by 120 V or less and connect directly into VFD controls. Powering the Emergency stop push button by greater than 120 V will not be acceptable.

2.20 Programming

.1 Control:

.1 Process parameters and control shall be accessible to the pre-program PLC via operator interface. The operator will have access to the following:

.1 Sludge inlet pressure.

.2 Outlet pressure control.

.3 Polymer/Sludge ratio.

.4 Rotary press rotating speed.

.5 Flocculator agitator speed.

.6 Manual control of each equipment.

.2 Protection and alarms:

.1 Programming will include the following protection/alarm:

.1 High inlet pressure, stop the dewatering system.

.2 Zero flow on sludge input flow, stop the dewatering system.

.3 Cake flush, stop the dewatering system.

.4 Preventive maintenance notice, alarm only.

.5 Low wash water, alarm only.

.6 Low air pressure, stop the dewatering system.

.7 Any motor did not start, stop the dewatering system.

.2 Programming will include at the minimum the following alarms:

.1 Rotary press faulted.

.2 Rotary press did not start.

.3 Flocculator faulted.

.4 Flocculator did not start.

.5 Sludge pump faulted.

.6 Sludge pump did not start.

.7 Sludge pump low flow.

.8 Polymer pump faulted.

.9 Polymer pump did not start.

.10 High inlet pressure.

.11 Cake flush.

.12 Low air pressure.

.13 Low wash water pressure.

.14 Preventive maintenance warning.

.3 Operator interface screens:

.1 The operator interface shall be built to give friendly usage to the operator. The following screen page shall be available to the operator:

.1 Menu page.

.2 Cycle start-stop page.

.3 Parameter page.

.4 Sludge pump control loop page.

.5 Rotary press manual operation page.

.6 Preventive maintenance advise page

.4 Standard features:

.1 System programming to incorporate the following features as standard control:

.1 Individual or grouped channel wash selection (for optimal wash depending on the water supply).

.2 Automatic system start at selected time of the day.

.3 Automatic adjustable delayed system stop.

3. EXECUTION

3.1 Installation

.1 It shall be possible to install the Rotary Presses in pieces if required.

3.2 Start-up and Commissioning

.1 Comply with the requirements specified in Section 01 65 00 and as specified herein.

.2 Comply with the requirements specified in Section 01 91 31 and as specified herein.

.3 Polymer Selection:

.1 For start-up the Rotary Press manufacturer shall recommend and provide six (6) months supply of polymer based upon similar applications.

.4 Test piping connections to prove the equipment nozzles are installed with the pipe in a free supported state and without need to apply vertical or horizontal pressure to align piping with equipment nozzles. This must be performed and the piping acceptable prior to any field performance testing.

.5 Field testing will not be conducted without an accepted procedure, calibration certificates for all testing equipment, gauges and flow meters and a completed and signed pretesting check list.

.6 After installation of equipment, and after inspection, operation, testing and adjustment have been completed by the manufacturer's field service technician, conduct running test for each Rotary Press in presence of the Contract Administrator to determine its ability to operate within the specified parameters and deliver its rated capacity under specified conditions.

.7 The tests shall be run for at the proposed operating speeds, together with the polymer system, residuals feed system, washwater system, and associated instrumentation and controls. All defects or defective equipment revealed by or noted during the tests shall promptly be corrected or replaced at no additional compensation.

.8 Following the initial demonstration tests and when scum feed is made available, Rotary Presses shall undergo the running and performance tests.

.1 Rotary Press shall be operated continuously to demonstrate conformance with the requirements specified in clause 2.15.

.2 Notify Contract Administrator fifteen (15) days written notice prior to conducting the tests so that the Contract Administrator can be present to witness the tests.

.3 Test procedures shall be submitted to the Contract Administrator for review. A qualified representative of the manufacturer shall supervise each test and certify the performance during the tests. Provide qualified person to aid in adjustments needed during the test period.

.4 The units shall be run at essentially steady-state conditions during the tests and at the design hydraulic loading related to the residuals volume index of the residuals being supplied.

.5 Collection of test data will be temporarily suspended during periods when the feed residuals concentration is outside its specified range.

.6 Samples will be collected at mutually agreed upon intervals during each test for the purpose of determining the following:

.1 Feed residuals concentration.

.2 Cake solids concentration.

.3 Filtrate solids concentration.

.4 Concrete slump test.

.5 The laboratory analysis of the samples shall be performed by a competent laboratory, accepted by the Contract Administrator, and in accordance with the applicable standard methods. Provide written analytical results.

.7 Continuously monitor energy use and residuals feed rate during the test interval. The residuals feed rate together with the solids concentration tests shall be used to develop

a complete solids balance. The calculation shall be used to verify the accuracy of the measured quantities. Test equipment used for power measurements to be calibrated before and after testing, with certified reports submitted to the Contract Administrator.

.8 The Manufacturer shall prepare a formal written test report including laboratory analysis reports, measured power usage and residuals feed flow data and the mass balance calculations. Six (6) copies of the certified report shall be submitted to the Contract Administrator within ten (10) days after completion of the test.

.9 The Contract Administrator shall review the test report to determine if the acceptance tests meet the performance requirements specified herein. Acceptance shall be based on the following criteria:

.1 Power draw by the main drive motor has not exceeded the required performance limits.

.2 A minimum of 90% of the samples collected and analyzed comply simultaneously with both the residuals concentration and solids capture rate performance requirements while the residuals feed rate was at the design condition.

.3 The Contract Administrator shall notify the City and Contractor in writing of the non-acceptable performance of any of the installed Rotary Press systems.

.10 In the case of non-acceptable performance, make corrections within the thirty (30) days and retest the system.

.11 If an acceptance retest is successful and meets the requirements specified herein, the Contract Administrator will recommend to the City, in writing, the acceptance of the respective Rotary Presses.

.12 If retesting is unsuccessful remove and replace the Rotary Press to meet the specified requirements at no additional cost to the City.

.13 Repeat tests until specified results are obtained.

.14 Construction Contractor to provide all labor, piping, testing equipment, flow meters and test gauges for conducting tests.

.1 Construction Contractor shall provide calibrated test gauges for all permanently installed gauges and portable calibrated flow meters for all pumping systems even in those cases where permanent flow meters are installed.

.2 All calibrations must be within thirty (30) days of the field testing.

.3 The testing will not be started and will not be accepted until the calibrated testing equipment stated above is operational and all certifications have been submitted.

.9 Make all adjustments necessary to place equipment in specified working order at time of above tests.

.10 Test on product only.

.11 Remove all replace equipment at no additional cost to the City with equipment that will meet all requirements specified and indicated if unable to demonstrate to the satisfaction of the Contract Administrator that equipment will perform the service specified, indicated and as submitted and accepted.

3.3 Contract Closeout

.1 Provide in accordance with Section 01 78 00.

END OF SECTION