

This document contains the following specification sections:

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| 281301 | Electronic Security Rough In Requirements |

PART 1 - GENERAL

1.1 Section Includes

- .1 Field engineering survey services to measure and stake the site for construction and record purposes.
- .2 Survey services to establish and confirm invert measurements for construction of the Work and for record purposes.

1.2 Qualifications of Surveyor

- .1 The Contractor is to provide a qualified surveyor to conduct survey services during construction, with qualifications subject to review and acceptance of the Contract Administrator. Acceptable qualifications include a registered land surveyor, professional engineer (P.Eng.), or certified engineering technologist (C.E.T.) being a member in good standing with his/her association. Contractor to submit qualifications for review.

1.3 Survey Reference Points

- .1 The plans indicate horizontal coordinates and geodetic datum for a benchmark. Contract Administrator will provide AutoCadd format plans to allow the Contractor to determine co ordinates as may be required including the following:
 - .1 Coordinates to locate building corners, spay pad, walkways and related surficial features..
- .2 Confirm co-ordinates by survey quality GPS equipment.
- .3 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference point during construction.
- .4 Make no changes or relocations without prior written notice to Contract Administrator.

1.4 Survey Requirements

- .1 Establish lines and levels, locate and lay out, by instrumentation that is co ordinate based.
- .2 Stake for rough grading, finish grading, landscaping, and [alignment](#).
- .3 Stake slopes at stations not exceeding 5 m.
- .4 Establish lines and levels spray pad and access walkways and related surficial features not exceeding 5 m.
- .5 Establish pipe invert elevations, and keep record of same.
- .6 Establish lines and levels for mechanical and electrical work.

1.5 Records

- .1 Qualified surveyor shall conduct necessary horizontal and vertical measurements to depict all improvements on the site, and prepare plan(s) depicting all improvements and report on whether these improvements are within horizontal and vertical tolerances as set forth in the Contract.
- .2 Acceptable tolerances in relation to known bench marks:
 - .1 Horizontal location of major site improvements: 25 mm
 - .2 Vertical height: 15 mm.
- .3 Qualified Surveyor shall maintain a complete, accurate log of control and survey work as it progresses.

- .4 During progress of the Work the qualified surveyor to conduct surveys and record “as built” information on plotted layout drawings and provide excel data files at the following stages of the work:
 - .1 Rough grading prior to pouring concrete or completing paving.
 - .2 Prior to finish surface material being installed.
 - .2 Completion of major site work.
 - .3 Completion of each layer of granular works.
- .5 Qualified surveyor to provide alignment and grade throughout construction.
- .6 On completion of the project the qualified Surveyor will conduct surveys and record information on drawings.

1.6 Submittals

- .1 Prior to start of Work, submit name and address of qualified surveyor, intended instrumentation to complete co ordinate based surveys and proof of qualifications.
- .2 On request of Contract Administrator, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by Surveyor certifying that elevations and locations of completed Work are in conformance, or non- conformance with Contract Documents.
- .4 Supply all data in excel format with columns that show (a) date of survey, (b) point numbers, (c) northerly, (d) easterly, (e) elevation, (f) description.
 - .1 Supply data on a regular basis throughout project and on a schedule as determined by Contract Administrator.

PART 1 - GENERAL

1. General

- .1 The term "shop drawings" means plans, drawings, diagrams, illustrations, schedules, performance charts, brochures and other data, including site erection plans or drawings which are to be provided by the Contractor to illustrate details of a portion of the work.
- .2 Submit to Contract Administrator for review shop drawings, product data and samples specified.
 - .1 Initial submission to be labeled - Not for Construction". Drawings to include a water treatment skid layout of equipment, dimensioned plan, piping schematic, Process & Instrumentation Diagram (P&ID), electrical power requirements, wiring schematics for a complete skid-mounted water treatment system and detailed on location and features.
 - .2 Upon approval from Contract Administrator of initial submission provide all shop drawings.
- .3 Until submittal is reviewed, work involving relevant product may not proceed.
- .4 Where articles or equipment from any subtrade or specification section or plan attach to connect to other articles or equipment under any other subtrade or specification section or plan, be responsible and clearly indicate that all such attachments and connections (including electrical) have been properly coordinated, regardless of the trade, specification section or plan grouping under which the adjacent articles or equipment will be supplied or installed. Notify the Contract Administrator in writing if there are any deviations in the shop drawings from the requirements of the contract documents and any obvious or implied conflicts or errors between the various trades, specification sections and plans.
- .5 The shop drawing review process is for the sole purpose of conformance with the general design concept. The shop drawing review shall not mean that the Contract Administrator approves the detail design inherent in the shop drawing. The responsibility the shop drawings shall remain with the Contractor submitting the shop drawings. The shop drawing review shall not relieve the Contractor of their responsibility for errors or omissions in the shop drawings or of their responsibility for meeting all requirements of the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site for information that pertains solely to fabrication process or to techniques for construction and installation and for co-ordination of the work of all subtrades.

2. Shop Drawings

- .1 Plans or drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work showing fabrication, layout, setting or erection details as specified in appropriate sections.
- .2 Prior to submitting shop drawings for the Contract Administrator 's review, the Contractor shall review all shop drawings to confirm their meeting all requirements of the project and mark and sign his/her approval on the plans or drawings which shall certify review of submission, verification of field dimensions and compliance with contract documents.
 - .1 Indicate specification section and item number on all documents submitted. For each submission package provide a letter of transmittal indicating specifications sections and item numbers submitted for approval in submission package.
- .3 Each shop drawing must be certified by manufacturer and as such, shall indicate that all product engineering has been performed to ensure the product will meet the requirements of the intended installation.
- .4 Include all electrical wiring diagrams and installation plans or drawings for electrically powered equipment.

- .5 Wherever documents are provided in S.I. units, all performance and dimensional data shall be submitted in S.I. units.
- .6 *Submit either:*
 - .1 *Blackline prints; or*
 - .2 *AutoCAD (AutoCAD 2008 or newer) format drawings*
- .7 *Submit:*
 - .1 *Three copies, of which two will be retained by Contract Administrator.*
- .8 Submissions as a minimum shall include:
 - .1 Delete information which is not applicable to the project.
 - .2 Supplement standard information to provide additional information applicable to project.
 - .3 Clearly indicated product or material, complete with model number and make.
 - .4 Show dimensions and clearances required.
 - .5 Show performance characteristics and capacities.
 - .6 Show wiring diagrams (where requested) and controls.
 - .7 Include overall specification and item numbers.
- .9 Shop drawings for the following shall be sealed by a Professional Engineer registered to practice in the Province of Manitoba:
 - .1 Components of a building that are load bearing. A partial listing is:
 - .1 Roof or other ceiling members.
 - .2 All structural components of building.
 - .2 Foundation and mounting for all spray fixtures.

3. Product Data

- .1 Certain specification sections specify that manufacturer's standard schematic plans or drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings, provided that the product concerned is clearly identified.
- .2 Submit in sets, not as individual submissions.
- .3 Above will only be accepted if they conform to the following:
 - .1 Delete information which is not applicable to the project.
 - .2 Supplement standard information to provide additional information applicable to project.
 - .3 Clearly indicated product or material, complete with model number and make.
 - .4 Show dimensions and clearances required.
 - .5 Show performance characteristics and capacities.
 - .6 Show wiring diagrams (where requested) and controls.
 - .7 Include overall specification and item numbers.

4. Contractor's
Responsibility

- .1 Contractors responsibilities (as applicable to the General and Sub contractors):
 - .1 Design project and review shop drawings, product data and samples prior to submission to Contract Administrator.
 - .2 Verify:
 - .1 Field measurements
 - .2 Field construction criteria
 - .3 Catalogue numbers and similar data
 - .4 Conformance with the specification – compare specification numbers and item numbers to all required shop drawings.
 - .3 Co-ordinate each submittal with the requirements of the work of all trades and contract documents. The Contractor is responsible to ensure and confirm that applicable trades have reviewed and accepted the submission and made any and all required changes to construct a finished and operating project as required by the contract documents.
 - .4 Clearly identify any variations in the shop drawings from the contract requirements. If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submissions. If the Contract Administrator approves any such variation, the Contract Administrator shall issue an appropriate contact modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued. In all cases the Contractor is responsible for coordination of any and all changes with all applicable sub contractors.
 - .5 Responsibility for deviations in submittals from requirements of Contract documents and errors and omissions is not relieved by Contract Administrator 's review of submittals, unless Contract Administrator gives written acceptance of specified deviations.
 - .6 Notify Contract Administrator, in writing at time of submission, of deviations in submittals from requirements of Contract documents.
 - .7 After Contract Administrator 's review, distribute copies, maintain one copy on site.

5. Submission
Requirements

- .1 Allow for a 14 day period for review by the Contract Administrator for each individual submission.
- .2 Accompany submissions with transmittal letter which lists shop drawings included for review, complete with specification and item numbers.
- .3 No claims will be allowed that may arise because of delays in submissions, re-submissions and review of shop drawings.
- .4 Obtain final review prior to ordering, fabricating or completing installation work.
- .5 Initial submission - Provide three copies of shop drawings and product data to be reviewed by Contract Administrator (one copy to be returned upon completion of review). Each subsequent re-submission (until acceptance) also to include only three copies of the plans or drawings and data for review.
- .6 After final acceptance produce 6 copies of product data and distribute as follows:
 - .1 Contractor - operating manual 3

- .2 Contractor - file 1
- .3 Contractor - site 2 (provide 1 field set to Contract Administrator).

6. Items for
Submission

- .1 In general supply shop drawings for all materials being incorporated into the works. The following is a partial listing of items of work to be submitted on the shop drawings:
 - .1 Mechanical and Electrical
 - .1 Lights (all types).
 - .2 Panels and breakers.
 - .3 Water Treatment and pumping skid details.
 - .4 Spray pad features.
 - .5 Filtration rates.
 - .6 Chemical feed systems and controls.
 - .7 Holding tank including anchoring system.
 - .8 Doors and door hardware.
 - .9 Hose and hose reel.
 - .10 Drain diverter assembly.
 - .11 Actuated valves.
 - .12 Controls.
 - .13 Underground piping and conduit alignment.
 - .14 Overall layout and configuration drawings with co-ordinates.
 - .2 The listing above does not supersede other items that may be requested on the plans or the specifications or other items requested by the Contract Administrator.

7. Record
Drawings

- .1 During construction revise all plans (and/or shop drawings) to indicate all changes that occurred during construction and revise plans to “record” copy. Indicate on the plans (and/or shop drawings) that such revisions have been completed. Provide two copies of record plans to Contract Administrator for review.
 - .1 Provide Contract Administrator monthly progress updates of as-builts and applicable copies as project proceeds.
- .2 After Contract Administrator has reviewed initial record plans and drawings and deemed them to be “satisfactory” provide copies of all plans and drawings.
- .3 Final record drawings are to be provided a minimum of 2 weeks prior to request for Substantial Performance.

8. Contract Administrator’s
Review

- .1 The Contract Administrator 's review pertains to general design only. Errors in dimensions, quantity or interference will be noted, if noticed, but this will not in any way relieve the Contractor from his/her responsibility for errors or omissions.

- .2 Contract Administrator's review may result in a request for revisions to shop drawings, product data or samples. Complete revisions ensuring all request for revision items have been addressed and resubmit for Contract Administrator's review. If the second submission does not address all revisions requested in the first review the City retains the right to hold the Contractor responsible for Contract Administrator's costs of additional reviews at. Such additional costs may be deducted from the overall payments due.

End Section 01340

PART 1 - INSPECTION AND TESTING OF WORK

1.1 Laboratories/Agencies

- .1 Engage and pay for independent Inspection/Testing Agencies for the purpose of inspecting and/or testing portions of the Work. Obtain Contract Administrator's approval for firms to be engaged.
- .2 Provide all equipment required for carrying out inspection and/or testing.
- .3 Employment of Inspection/Testing Agencies in no way relieves the Contractor of responsibility to perform the Work in accordance with the Contract Documents.
- .4 Allow the Inspection/Testing Agencies access to all portions of the Work on site and manufacturing or fabrication plants, as may be necessary. Provide facilities for such access.

1.2 Contractor's Consulting Engineer

- .1 Submit qualifications of Contractor's Testing Agency to Contract Administrator for approval.
- .2 Provide quality control inspection on concrete production. Submit qualifications of Contractor's quality control personnel to Contract Administrator for approval.
- .3 Engage a Testing Agency to provide quality control inspection on concrete works.
- .4 Reporting – Contractor's testing agency to be authorized and directed by Contractor to copy Contract Administrator directly with results of all testing completed.
- .5 Ensure all sample results are promptly reported with copies to the Contract Administrator.

1.3 Related Requirements Specified Elsewhere

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory are specified under various sections.

1.4 Design Standards Code Requirements

- .1 Inspection and/or testing will be performed in accordance with the following:
 - .1 Compacted fill materials to ASTM D698 for Standard Proctor Density.
 - .2 Concrete to CSA - A23.2 and mix designs to CSA - A23.1, Part 2.

1.5 Appointment and Payment

- .1 Contractor will appoint and pay for following services of testing laboratory:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing related to tankage construction.
 - .3 Inspection and testing performed exclusively for Contractor's convenience.
 - .4 Testing, adjustment and balancing of treatment and pumping systems, mechanical and electrical equipment and systems.

- .5 Tests specified to be carried out by Contractor under the supervision of Contract Administrator.
- .6 Concrete mix design.
- .7 Additional tests as specified elsewhere.
- .8 Re-inspection and/or testing of rejected work.

1.6 Contractor's Responsibilities

- .1 Furnish labour and equipment to:
 - .1 Provide access to work to be inspected and tested.
 - .2 Facilitate inspections and conduct tests.
 - .3 Make good work disturbed by inspection and test.

1.7 Procedures

- .1 Notify the respective Inspection/Testing Agencies and Engineer(s) well in advance of the requirements for tests in order that necessary arrangements can be made.
- .2 Schedule and submit samples and/or materials required for testing so as to cause no delay in the Work.
- .3 Provide facilities to allow inspection and/or testing and make available space for storage and curing of the test samples. Deliver concrete cylinders to testing laboratory.
- .4 If defects are revealed during inspection and/or testing the Contractor's or Contract Administrator may issue instructions for removal or correcting defective work and irregularities. The Contractor shall notify the Contractor's and Contract Administrator within two (2) working days if such instructions are in error or at variance with the Contract Documents.
- .5 If any material, in whole or in part, does not conform to the Specifications or is found to be defective then such material shall be rejected by the Contractor's or Contract Administrator and replaced.

1.8 Reference Standards

- .1 Within the text of the specifications reference may be made to the following standards:
 - .1 ACI American Concrete Institute
 - .2 AISC American Institute of Steel Construction
 - .3 ANSI American National Standards Institute
 - .4 ASTM American Society for Testing and Materials
 - .5 AWWA American Water Works Association
 - .6 CCA Canadian Construction Association
 - .7 CEC Canadian electrical Code (published by CSA)
 - .8 CEMA Canadian Electrical Manufacturers Association
 - .9 CGSB Canadian Government Specification Board
 - .10 CISC Canadian Institute of Steel Construction

- .11 CLA Canadian Lumberman's Association
- .12 CPCA Canadian Painting Contractors Association
- .13 CSA Canadian Standards Association
- .14 FM Factory Mutual Engineering Corporation
- .15 IEEE Institute of Electrical and Electronic Engineers
- .16 IPCEA Insulated Power Cable Engineers Association
- .17 NAAMM National Association of Architectural Metal Manufacturers
- .18 NBC National Building Code
- .19 NEMA National Electrical Manufacturers Association
- .20 TTMAC Terrazzo, Tile and Marble Association of Canada
- .21 ULC Underwriters Laboratories of Canada
- .22 Conform such standards, in whole or in part, as specified.

1.9 Concrete Inspection
and Testing

- .1 Notify Contract Administrator at least two working days before complete formwork and concrete reinforcement will be ready for inspection.
- .2 Allow ample time for inspection and corrective work, if required, before scheduling concrete placement.
- .3 Provide free access to all portions of work and co-operate with appointed firm.
- .4 Submit proposed concrete mix design of each class of concrete to Contract Administrator for review prior to commencement of work.
- .5 Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.
- .6 One test will be taken for each individual placing operation which exceeds 7.5 cubic metres or at least one test for each 50 cubic metres of concrete placed or day of operation.
- .7 One "test" consists of a slump test, air content test (for air entrained concrete) and compressive strength tests on three lab cured cylinders.
- .8 Two additional site cured cylinders will be taken during cold weather concreting and be cured on job site under the same conditions as concrete it represents
- .9 Take slump tests of each truck as necessary to verify quality of concrete.
- .10 Contractor to deliver test cylinders to testing company offices in Winnipeg as directed by the Engineer.
- .11 The method of storage, curing, testing and reporting shall be in accordance with CAN3-23.2-M90.
- .12 Re-test to Contract Administrator's approval any workmanship or materials which do not meet specifications. Repair or replace all work found to be faulty unless an alternative solution is accepted by Contract Administrator.
- .13 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve Contractor of Contractor's contractual responsibility.

1.10 Conformance

- .1 If there are questions as to whether any product or system is in conformance with applicable standards, the Contract Administrator reserves the right to have such products or systems tested to prove or disprove conformance. The cost for such testing will be borne by the City in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.
- .2 Where specified standards are not dated, conform to latest issue of specified standards as amended and revised to the tender closing date.

End Section 01401

PART 1 - GENERAL

1.1 Clean Up and Final
Cleaning of Work

- .1 Maintain work in a tidy condition and free from accumulation of waste products and debris at all times.
- .2 Remove all waste materials and debris from the site or dispose of as otherwise directed by the Contract Administrator. Do not burn waste material onsite.
- .3 In addition to the requirements of the General Conditions, perform the following prior to application for Certificate of Substantial Performance:
 - .1 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, ceilings, walls and floors
 - .2 Make a thorough inspection of all finishes, fitments and equipment and ensure proper workmanship and operation
 - .3 Broom clean walks, steps, floors and platforms.
 - .4 Remove all dirt and other disfigurations from interior and exterior surfaces.
 - .5 Clean and remove all debris and surplus materials.
- .4 When work is substantially completed, remove all surplus materials, tools, construction machinery and equipment not required for the performance of the remaining work. Leave the work area clean, swept and washed down suitable for occupancy.
- .5 When the Contract Administrator determines that the work completed is to his/her satisfaction, remove all surplus materials, tools, construction machinery and equipment. Also remove any waste products and debris.

1.2 Removal of
Temporary Facilities

- .1 Prior to application for Certificate of Substantial Performance, remove all temporary items used to aid the performance of work. Restore area to original (pre-construction) state.

1.3 Inspection/Takeover
Procedures

- .1 Prior to application for Certificate of Substantial Performance, carefully inspect all work and ensure that it is complete, that all processes and related equipment is fully operational, that all major and minor construction deficiencies are complete and/or corrected, that clean up works have been completed, and the building is in proper conditions for occupancy. Notify the Contract Administrator in writing, of satisfactory completion of inspection and request a Contract Administrator's inspection.
- .2 During the Contract Administrator's inspection, a list of apparent deficiencies will be drawn up and signed by the Contract Administrator. This deficiency list may be amended if additional deficiencies are found during future inspections.
- .3 Complete all works requested in the listing of deficiencies and request a subsequent inspection. If the second inspection determines that deficiencies previously identified have not been addressed the City retains the right to hold the Contractor responsible for

subsequent inspections, such additional costs shall be deemed liquidated damages and shall be deducted from the overall payments due.

- .4 Training and winterizing will be considered an integral part of overall works in respect to completion.
- .5 When it is considered that all deficiencies have been corrected, make application for certificate of final payment.

1.4 Performance Assurance

- .1 Upon application for Certificate of Substantial Performance, forward to the Contract Administrator all inspection and approval certificates, test reports, warranties, maintenance manuals, operating instruction, record drawings and other requirements as specifically required by the contract documents.

1.5 Cleaning and Clean Up

- .1 Upon completion and before final acceptance of work remove waste, surplus and useless excavated materials and rubbish resulting from works (as determined by Contract Administrator), to be removed and cleaned up to the satisfaction of the Contract Administrator.
- .2 Haul any excavation and useless material from the site and dispose of in a manner acceptable to the Contract Administrator.
- .3 Complete all clean up works within allotted construction days.

1.6 Deficiencies Inspection

- .1 After clean up works have been completed request an inspection of the construction area to assess cleanup works and derive a deficiency list. This deficiency list may be amended if additional deficiencies are found during future inspections.
- .2 Complete all works requested in the listing of deficiencies and request a subsequent inspection. If the second inspection determines that deficiencies previously identified have not been addressed the City retains the right to hold the Contractor responsible for subsequent inspections, such additional costs shall be deemed liquidated damages and shall be deducted from the overall payments due.

1.7 Start-up Tests

- .1 Test all equipment and circuits installed in the presence of the Contract Administrator and co-operate with the suppliers of equipment to ensure equipment will operate in the manner intended, for turnover to the City.

End Section 01700

1. Record Drawings

- .1 Maintain project record drawings and record accurately deviations from Contract documents.
- .2 Record changes in red on paper copy and provide Autocadd file of record plans.
- .3 Record following information:
 - .1 Depths and location of various elements of foundation in relation to survey datum.
 - .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - .4 Field changes of dimension and detail.
 - .5 Final location of spray pad features and overall layout.
 - .6 Changes made by Change Order or Field Order.

End Section 01720

PART 1 - GENERAL

**1.1 Operating and
Maintenance Manuals**

- .1 Other specification sections indicate O&M information, training and record drawings that are to be provided in hard copy and pdf. Incorporate all O&M data, training information and record drawings as requested into one overall submission. Provide index of entire submission.
- .2 Prior to substantial completion of project submit to the Contract Administrator 2 final copies of Operations Data and Maintenance manual in English. Substantial Performance will not be considered until final manuals have been completed to the satisfaction of the Contract Administrator.
 - .1 Provide three final hard copies and three DVD-ROM version of final hard copy submitted.
- .3 At least 25 days prior to the anticipated date for substantial performance submit to the Contract Administrator for review one draft copy of the operating and maintenance manuals.
- .4 Submission to be made up as follows:
 - .1 Bind data in vinyl hard covered, 3 ring loose leaf binder for 215 x 280 mm size paper. Do not "overfill" binder, fill binders to a maximum of 85% of it's intended capacity.
 - .1 Acceptable binder is Cardinal FreeStand EasyOpen D-Ring ClearVue presentation binder, normal non-locking or alternate binders (such as Avery) not acceptable.
 - .2 When multiple binders are used, correlate data into related consistent groupings.
 - .3 Assign a number and letter to each section in the manual. The number is to correspond to the specification numbering system and items shall be provided in the order that they appear in the specifications.
 - .4 Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of project; identify subject matter of contents.
 - .5 Prepare a table of contents for each volume, with each product or system description identified, in three parts as follows:
 - .1 Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
 - .2 Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section for each category, identify names, addresses, and telephone numbers of subcontractors and suppliers.
 - .1 Significant design criteria.
 - .2 Operating instructions.
 - .3 List of equipment and parts list for each component.

- .4 Maintenance instructions for equipment and systems.
- .5 Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents - where applicable.
- .3 Part 3: Project documents and certificates, including the following:
 - .1 Shop drawings and product data.
 - .2 Water quality and water balance reports.
 - .3 Certificates and originals of warranties.
- .6 Contents each volume.
 - .1 Provide a table of contents with title of project; names, addresses, and telephone numbers of Sub-consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
 - .2 For each product or system 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 clearly identify specific products and component parts, and data applicable to installation, delete inapplicable information.
 - .4 Drawings supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - .5 Warranties bind in copy of each as specified.
- .5 Manuals for Equipment and Systems.
 - .1 For each item of equipment and each system include description of unit or system, and component parts identifying function, normal operating characteristics, and limiting conditions.
 - .1 Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
 - .2 Operating procedures include:
 - .1 Startup, break-in, and routine normal operating instructions and sequences.
 - .2 Regulation, control, stopping, shut-down, and emergency instructions.
 - .3 Summer, winter (winterizing), and any special operating instructions.
 - .3 Maintenance Requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - .4 Include manufacturer's printed operation and maintenance instructions.
 - .5 Include sequence of operation by controls manufacturer.

- .6 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .7 Provide control diagrams by controls manufacturer as installed.
- .8 Provide Contractor's coordination drawings, with color-coded piping diagrams as installed.
- .9 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .10 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .11 Additional Requirements as specified in individual product specification sections.
- .12 Provide a listing in table of contents for design data, with tabbed dividers and space for insertion of data.
- .13 Neatly type list and notes. Use clear drawings, diagrams or manufacturer's literature. Bind in copies of all guarantees.
- .14 Utilize a separate pouch for drawings larger than 210 mm x 431 mm, one pouch per drawing.
- .6 Include following information plus data specified:
 - .1 Description, operations and maintenance instructions for equipment and parts list. Indicate nameplate information such as make, size, capacity, serial number.
 - .2 Additional material used in project listed under various sections showing name of manufacturer and source of supply.
 - .3 List of suppliers names and addresses for each piece of equipment.
 - .4 Bind in copies of all guarantees.
 - .5 Refer to Mechanical and Electrical Divisions for specific details of Mechanical and Electrical data.
 - .6 Detailed operating instructions for all mechanical and electrical equipment.
 - .7 Service manuals outlining complete maintenance procedures and safety measures for all equipment.
 - .8 Illustrated parts list for all equipment, with local suppliers' names and addresses. In all cases the closest local distributor or authorized repair depot must be listed regardless of the initial purchase outlet.
 - .9 Final corrected and reviewed shop drawings for all equipment.
 - .10 Final corrected installation drawings for all equipment and equipment operation curves.
 - .11 Start-up test reports.
 - .12 Listing of maintenance material including stand by equipment.
- .7 Organize contents into applicable sections of work to parallel project specification breakdown. Mark each section by colored labeled tabs protected with celluloid covers fastened to hard paper dividing sheets.

- .8 Group contents and sections according to equipment function (i.e. distribution pumps, raw water pumps, transfer pumps, fire pumps, etc...) complete with related components (i.e. fire pump controller information together with vertical turbine information).
- .9 Include with each copy of Operations data and maintenance manual, a complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.
- .10 Update manuals as required to include commissioning data. Commissioning data to include a written copy of all program values entered into all equipment supplied.
- .11 Do not include unnecessary information, advertising and theoretical data not directly related to equipment being supplied.

1.2 Instruction of
Operating Staff

- .1 See Section 01820.

End Section 01730

PART 1 - GENERAL

1.1 Section Includes

- .1 Procedures for demonstration and instruction of equipment and systems to Contract Administrator and City's personnel.

1.2 Description

- .1 Demonstrate operation and maintenance of equipment and systems prior to Substantial Performance. See Section 01700 – Project Closeout and Section 01730 – Operation and Maintenance Requirements.
- .2 Provide 7 day notice to Contract Administrator on operation and maintenance instruction to be given. Contract Administrator will provide list of City's personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.3 Quality Control

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

1.4 Submittals

- .1 Commissioning: Submit schedule of time and date for commissioning of each item of equipment and each system a minimum of 2 weeks prior to submitting request for commissioning, for Contract Administrator 's approval.
- .2 Demonstration/training: Submit schedule of time and date for of each item of equipment and each system prior to submitting request for Substantial Performance, for Contract Administrator 's approval.

1.5 Conditions for
Training/Demonstrations

- .1 Equipment has been inspected and put into operation in accordance with applicable Section.
- .2 Testing, adjusting, and balancing has been performed and equipment and systems are fully operational.
- .3 Provide copies of completed (after Contract Administrator's review) operation and maintenance manuals for use in demonstrations and instructions.

1.6 Preparations

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

1.7 Demonstrations
and Instructions

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

- .2 Produce a detailed, written plan for the start-up and initial operation, under design conditions, of the equipment and systems installed and constructed under the contract. The document, after review and approval by the Contract Administrator, will serve as the guidance manual for the commissioning process. The document shall be prepared and submitted to the Contract Administrator for review.
- .3 When the installation work has been completed and before any equipment is operated, carry out the start-up of the equipment in coordination with the suppliers and carry out the following work
 - .1 Service all equipment in accordance with the manufacturer's instructions as required for initial operation of the equipment.
 - .2 Check the installation as to its workmanship.
 - .3 Check the controls including the supply voltage, heater overload settings and wiring connections.
 - .4 Perform further tests as directed by the Contract Administrator to confirm that the equipment is in accordance with the intent of the specifications.
- .4 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .5 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .6 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
- .7 Include digital photos on CD and in paper form that demonstrates and describes various aspects and equipment instruction.
- .8 Upon completion of start-up, submit to the Contract Administrator the suppliers' certificates stating that
 - .1 The equipment has been installed in accordance with the supplier's recommendations.
 - .2 The equipment was commissioned in the presence of the supplier and is now ready for permanent operation.
 - .3 The equipment has been properly lubricated, primed or serviced.
 - .4 Plant personnel have been instructed in the operation and maintenance of the equipment.
 - .5 Manufacturers' data have been provided to the Contractor for inclusion in Operating and Maintenance Manual.
- .9 Once systems have been started up and accepted complete winterizing. Ensure O&M manual contains all information required for winterizing, follow instructions and update as required to ensure final instructions as printed are clear and concise.

1.8 Start-up

- .1 Initial start up (expected to occur in fall of 2013) completed as part of commissioning applies to:
 - .1 Water treatment process equipment (manufacturer).
 - .2 Chemical feed systems including calibrations and calculating feed rates.

- .3 Control and automation systems (manufacturer).
- .4 Instrumentation and meters (manufacturer).
- .5 Pumping systems.
- .6 Winterizing- fully winterize systems.
- .2 Final start up (expected to occur in spring of 2014) completed as part of final start up applies to:
 - .1 Water treatment process equipment (manufacturer).
 - .2 Chemical feed systems including calibrations and calculating feed rates.
 - .3 Control and automation systems (manufacturer).
 - .4 Instrumentation and meters (manufacturer).
 - .5 Pumping systems.
 - .6 Winterizing.

1.9 Training

- .1 Initial training completed after commissioning applies to:
 - .1 Water treatment process equipment (manufacturer).
 - .2 Chemical feed systems including calibrations and calculating feed rates.
 - .3 Control and automation systems (manufacturer).
 - .4 Instrumentation and meters (manufacturer).
 - .5 Pumping systems.
 - .6 Winterizing.
- .2 Final training completed after final start up applies to:
 - .1 Water treatment process equipment (manufacturer).
 - .2 Chemical feed systems including calibrations and calculating feed rates.
 - .3 Control and automation systems (manufacturer).
 - .4 Instrumentation and meters (manufacturer).
 - .5 Pumping systems.

1.10 Time Allocated
For Instructions

- .1 Ensure amount of time required for instruction of each item of equipment is as required, provide a minimum 2 hours of instruction for each item.

End Section 01820

PART 1 – GENERAL

**1.1 Description
of Work**

- .1 The work described herein shall consist of the design, supply and installation of a 2 chamber water holding tank, the connection of the various inlet and outlet piping and appurtenant works, supply of the electrical conduit material, liquid level control, the testing of completed works and associated landscaping and restoration of disturbed areas from construction.
- .2 The work described herein shall consist of the design, supply and installation of the diverter and strainer chamber.
- .3 The work described herein shall consist of the design, supply and installation of underground piping.

**1.2 Classification
of Work**

- .1 Water Holding Tank - shall be classified on the basis of nominal holding capacity and shall include all appurtenances required to connect the tanks to inlet and outlet piping, venting, manholes c/w covers, lines, controls and testing.

1.3 Standards

- .1 The following organizations publish Standards which have been referred to in this Section:
AWWA - American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado
CSA - Canadian Standards Association, Ottawa, Ontario
ASTM - American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania

The Standards referred to shall be the most recent edition.
- .2 Underground works to applicable City of Winnipeg standards for specifications and standard details including.
 - .1 CW 2030-R7 EXCAVATION BEDDING AND BACKFILL
 - .2 CW 2125-R4 FLUSHING, HYDROSTATIC LEAKAGE TESTING AND DISINFECTION OF WATERMAINS AND WATER SERVICES
 - .3 CW 2160-R7 CONCRETE UNDERGROUND STRUCTURES AND WORKS

1.4 Quality

- .1 Hydrostatically test the completed works under the direct supervision of the Contract Administrator.

1.5 Shop Drawings

- .1 Provide as a minimum the following detailed information on the shop drawings.
 - .1 Backflow preventors and air gaps on fill and drain piping.
 - .2 Holding tank c/w hold down system.

- .3 Diverter and strainer assembly.
- .4 Proposed piping and fittings to be used.
- .5 Level controls.
- .6 Hose reel assembly.
- .7 Proposed piping and conduit locations and burial depths.

1.6 Storage
and Handling

- .1 Store and handle tanks, pipe and other appurtenances associated with the construction of the storage tank in accordance with the recommendations of the respective manufacturer and to the satisfaction of the Contract Administrator.

1.7 Holding tank

- .1 When calculating the usable tank capacity and to assure continuous operation of the filtration system, use the calculated tank volume between 150 mm above the uppermost pump inlet to the bottom of the overflow waste outlet.
- .2 Construct tank of materials which are inert, corrosion resistant, nontoxic, and watertight such as concrete, fiberglass or polyethylene, which can withstand all anticipated loadings under full and empty conditions.
- .3 Provide an actuated valve and level control switch to maintain water level automatically.
- .4 Introduce the makeup water into the tank through an air gap and backflow preventor which will prevent back flow and back-siphonage.
- .5 Provide at least one baffle and locate baffle for complete mixing and circulation of treated water.
- .6 Water treatment system and tank design must ensure 100% of water for spray ground use has undergone a minimum 7.5 minute contact time @ 2 mg/L free chlorine concentration at required pH level before use.
- .7 Provide factory installed and appropriately sized pipe connections (Sch 80 socket) which have been clearly labeled and detailed on shop drawings.
 - .1 Main drain return.
 - .2 Play features product pump suction outlet.
 - .3 Bypass return.
 - .4 Filter pump suction outlet.
 - .5 Filter return.
 - .6 Fresh water inlet.
 - .7 Overflow outlet (consider each chamber).
 - .8 Vent.
- .8 Provide standard City of Winnipeg manhole frame and solid cover over each manhole riser.
- .9 Provide level control switches suitable for turning on make up water supply and providing pump shut down on low level. Consider low level that may be caused from a plugged screen on the line between the tank and spray pad.

1.8 Tank Hold Down System

- .1 Hold Down System – Design and provide assembly consisting of straps and anchoring materials designed to prevent a holding tank from floating under high water table conditions. Overall assembly in accordance with tank manufacturer’s instructions.

PART 2 - PRODUCTS

2.1 Pipe

- .1 Pipe and fittings are to be PVC CSA certified for potable water use. Joint: solvent weld.
 - .1 Pressure: Sch 40 for above grade use.
 - .2 Pressure: Sch 80 for below grade use.
 - .3 Drain: Sch 40 for below grade use.
 - .4 On water treatment skid; Sch 80 PVC.
- .2 Water supply piping inside a building: Hard copper type L tubing.
 - .1 Fittings: Wrot copper fittings per ASTM Specification B75 Alloy C12200. Cast fitting to ASTM Copper alloy C84400.
 - .2 Joint: silver brazing.
 - .3 Supports: copper hangers, plated rods and plated supports.

2.2 Clamps

- .1 Clamps as used for ID sized PE shall be all stainless steel with stainless steel nuts and bolts. Murray Gold Seal HDL series or approved equal.

2.3 Fittings

- .1 All buried connections PVC Sch 80 construction unless otherwise specified on the plans or approved by the Contract Administrator. Use Teflon tape or appropriate pipe joint compound on all threaded connections whether above or below ground.

2.4 Holding Tank Drain Backwater Valve

- .1 Mainline Adapt-A-Valve, Model # ML-4XA, normally open.

2.5 Diverter and Strainer system

- .1 Provide a below grade tank containing a diverter and strainer system which allows for easy access without confined entry considerations by maintenance personnel. Operate the diverter valve automatically by the spray park controller based on park operating hours and park inactivity.
- .2 Diverter valve;
 - .1 Use an electrically actuated valve with electrical supply from the controller.
 - .2 Two input terminals to signal and display “diverter valve open status” and “diverter valve closed status”. Use valve open/closed limit switches to show the diverter valve status as either “Diverter Valve Open to Waste” or “Diverter Valve Closed

- .3 The valve is normally closed during park operating hours and during the purge cycle and is open after park closing. Provide a 5 minute delay in opening the valve after park closing to allow the water to drain into the holding tank.
 - .1 Valve open; water diverted to sewer.
 - .2 Valve closed: water diverted to tank.
- .4 Open valve after 30 minutes of park inactivity, which assumes the potential for rain. Immediately close the diverter valve after the park is reactivated.
- .5 Diverter valve must be in the closed position for the water to tank fill solenoid valve to operate to prevent the park from diverting all the water in the tank to the sewer. If the diverter valve is not in the closed position when the park is activated, an alarm on the HMI shall read “DIVERTER VALVE ERROR. CHECK POSITION OF VALVE
- .3 Debris screen.
 - .1 Size screen area so that the total clear area of all openings shall be at least four times the area of the connecting pipe. Provide screen area on shop drawings.
 - .2 Debris screen: a stainless steel screen basket with no greater than 3 mm perforated holes.
 - .3 Quick-opening cover.
 - .4 Provide a replacement basket.
- .4 Tank.
 - .1 Minimum 750 mm diameter.
 - .2 Aluminum, hinged lockable lid.
 - .3 Provide ballast and tie down anchors as required to prevent floatation.
 - .4 Drain with a pipe connection on the bottom.

2.6 Holding Tank

- .1 Holding Tank to be two chamber and to:
 - .1 Conform to CSA Standard B66-10 and be certified for potable water use.
 - .2 Be suitable for minimum 600 mm burial.
 - .3 Have a minimum holding capacity to provide an overall capacity that is a minimum of 10 times the maximum park flow rate and a minimum size of 13,600 litres (3,600 US gal). Use a 1.8 diameter tank or larger.
 - .4 Be manufactured from concrete, fiberglass or polyethylene, unless otherwise specified by the Contract Administrator or shown on drawings.
 - .5 Any bolts or screws used to be stainless steel.
 - .6 Provide a gooseneck vent (minimum size 50 mm galvanized pipe) if deemed required.
 - .7 Include copy of tank manufacturer’s installation instructions including recommended anchoring with shop drawing dimensional drawings, manhole risers, watertight tank and manhole connection details and child resistant lid details.

- .1 Standard of acceptance for childproof lids is a City of Winnipeg manhole frame and cover.
- .2 Manholes.
 - .1 Have an access manhole over each chamber extending minimum 100 mm above ground surface. Manhole connection to tank to be watertight with covers that are child-resistant.
 - .2 Fiberglass tanks:
 - .1 The manhole and all risers are to be one unit, totally bonded and sealed to the tank. Simple gasket is not acceptable.
 - .1 Shop drawings to indicate factory or field fiberglass bonding of manhole to tank.
 - .3 Polyethylene tanks:
 - .1 Manhole: connection to tank to be integral to and permanently bonded to the tank; additional manhole risers shall be bolted and gasketed to provide a waterproof seal. Use only stainless steel bolts.
 - .2 Shop drawings to indicate methods and materials to provide a watertight seal.
 - .4 Concrete tanks:
 - .1 Manhole: gasket or mastic sealed joints to be watertight.
 - .2 Shop drawings to indicate methods to provide a watertight seal.
 - .5 Manhole length to be as required to extend 100 mm above finished grade.
 - .6 For conduit connections through manholes: use a bulkhead or other type fitting to provide a waterproof seal.
- .3 Provide anchoring for preventing tank flotation for tanks that are not constructed of concrete.
 - .1 Straps shall be standard as supplied by tank manufacturer.
 - .2 Provide glass fiber reinforced plastic anchor straps for each tank shown. Include galvanized turnbuckle assembly for tightening.
 - .3 Number and location of straps shall be as specified by manufacturer. Provide minimum of 2.
 - .4 Provide stainless steel straps and stainless steel hooks on straps.
 - .5 Deadman anchor to be concrete, minimum full length of tank and minimum of 300 mm x 300 mm.
 - .1 Provide 2-10M rebar evenly spaced.
 - .2 Provide stainless steel anchor hooks cast in concrete.
 - .6 Provide shop drawings for anchoring system to prevent tank flotation,

2.7 Liquid Level Control

- .1 Be CSA approved complete with 15 m of electrical cable. Electrical cable shall not be constructed with any materials or fibres which conduct or absorb water

- .2 Switch activate fill valve at low level and close fill valve at approximately 100 mm above fill start level.
- .3 Be omnidirectional in operation ie. no "up" side.
- .4 Acceptable type "Super Single", "Pil", "GSW 560516", "Tulsar S10-10" or approved equal if controls meet the above requirements.

2.8 Electrical Material

- .1 Electrical materials to bear CSA approval labels.

2.9 Plumbing Material

- .1 PVC fittings: PVC Schedule 80 or as specified in the plans.

2.10 Hose Reel

- .1 Hose reel with 30 m length of 16 mm 100% rubber garden hose complete with threaded adapter ends, insulated nozzle and wall mounting rack (plastic wind up type with method of wrapping hose on reel without physically handling hose- (Suncast hose handler TWM200 or approved equal). Provide mounting hardware required for installation.
 - .1 Provide "Gardenia" type spray nozzle and threaded adapter ends with hose reel.
 - .2 Pipe with hot and cold water with manual valves.

PART 3 - EXECUTION

3.1 Installation of Holding Tank Assembly

- .1 Instructions: Ensure manufacturer's installation instructions are onsite. Complete installation in accordance with manufacturer's recommendations. If manufacturer's installation instructions are more stringent than that below follow most stringent.
 - .1 Install tank according to the required location and depth.
 - .2 Install the top of tank manhole 50-100 mm existing ground surface and slope soil away from the tank manhole cover.
 - .3 Place tanks at the required depth to service proposed depth of drains.
- .2 Install electrical conduit for level control switches between building and tank
- .3 Excavation: excavate to allow 610 of fill on sides and end of tank. Overall depth to allow for bedding depth, do to exceed rated tank burial depth.
 - .1 Haul away extra dirt from installation.
- .4 Bedding depth: Depth 200 mm to 300 below tank bottom, ensure bottom of excavation and top of bedding is level.
- .5 Tanks with internal support posts: inspect after placing on bedding to ensure that all posts are secure in their appropriate locations.
- .6 Backfill surround material: Use well graded clean sand or pea gravel. Backfill material must not contain any sticks, rocks, lumps or other such contaminants. Use backfill surround

material for bedding under tank and from top of bedding to 300 mm above tank. Compacted common backfill can be used above backfill surround material to finished elevation. Mound backfilled area to minimize the effects of settlement.

- .1 Some manufacturer's of fiberglass or HDPE tanks recommend only pea gravel or crushed stone to be used as backfill around tanks. Follow manufacturer's instructions in such circumstances unless these specifications are more stringent.
- .7 Compacted common backfill can be used above top level of backfill surround material to finished elevation. Mound backfilled area to minimize the effects of settlement.
- .8 Placing backfill surround material:
 - .1 Prior to backfill, fill tank to 10% with water (or greater if recommended by manufacturer) for a ballast. After backfill has reached over 75% full height fill tank with water and ensure it remains level during backfilling.
 - .2 Begin backfill at ends first. Continue to backfill around the perimeter of the tank in maximum 300 mm layers.
 - .3 Compact each layer. Always compact ends first. **NEVER BACKFILL ON ONE SIDE ONLY. BACKFILL ALL OF THE OUTLINE OF THE TANK UNIFORMLY.**
 - .4 Completely fill around all voids around tank, No voids or air pockets may exist under the tank. Use a probe tool consisting of a 20 mm metal pipe about 1.2 m long with tee handle and flattened tip for easy penetration deep into the backfill under the tank. Probe thoroughly from 4 o'clock around to 8 o'clock along both sides.
 - .5 Ensure tank remains completely level in the horizontal direction ensuring all joints are watertight during backfill operations.
 - .6 For concrete tanks only:
 - .1 Place tank on minimum 150 mm sand bedding and extend sand to 200 mm above base of tank. Remaining backfill to be compacted common unless otherwise recommended by Manufacturer.
- .9 Manhole risers:
 - .1 Install manhole in a plumb vertical or horizontal manner ensuring all joints are watertight.
 - .2 Hand backfill with sand around manhole risers.
 - .3 Ensure manhole joints or through pipe connections are sealed watertight.
- .10 Pipe connections: Backfill connections to the tank with sand (150 mm below pipe and 150 mm above pipe).
- .11 Bolted tanks: If tanks have bolted together flange pieces torque and tighten bolts in accordance to manufacturer's recommendations. In "cold" weather take precautions as required to ensure gasket is in contact with both flange pieces and squeezes out of flange after tightening, complete assembly in a "warm" area if gasket is not pliable. In cold weather gasket material is not to contact threads as this may interfere with ability to tighten bolt/nut assembly.
- .12 Anchoring (Fiberglass or HDPE tanks): Complete anchoring as required to prevent floatation when the tank is empty and assuming the water table is equal to the top of the ground. Be responsible for tank floatation for warranty period.

.1 Anchoring.

- .1 Place anchors parallel with tank and located 300 mm from tank.
 - .2 Place poly sleeves over anchor straps at edges of tank.
 - .3 Place deadman anchor 300 mm from tank and level with tank bottom.
 - .4 Secure anchor straps to deadman anchor ensuring tank is level. Snug the turnbuckles only enough to straighten straps and provide slight resistance.
- .13 Provide a guide or support mechanism to secure all liquid level controls in one area of the tank. Ensure guide assembly allows removal of the control servicing. Provide shop drawings of assembly.
- .14 Ensure tank is completely clean after installation i.e. no pebbles, stones, debris, etc.

3.2 Insert and Threaded
Fitting Connections

- .1 Make all connections to insert sized polyethylene pipe with stainless steel or brass insert fittings and double clamps. Ensure clamps are installed with screw heads in opposite directions.
- .2 Tighten clamps to a torque of 6-7 Nm (50 - 60 inch lbs.). Supply and use a torque wrench for tightening clamps.
- .3 Warm polyethylene pipe to between 20-60° C immediately prior to tightening clamps; no open flame is permitted for warming.
- .4 Coat all male threaded fittings with pipe joint compound approved for use with type of material fittings are made of.
- .5 Do not use couplers to join two pipe ends, use continuous pipe lengths.

3.3 Installation of
Piping into Building

- .1 Place all piping points of entry into buildings below footings.
- .2 Cast in place all piping through building slab..

3.4 Installation of
Level Control Switches

- .1 Pass cable through conduit between building and tank. Conduit is to be one continuous length and connect to manhole.
- .2 Seal watertight all connections to manhole, utilize a bulkhead or other similar fitting.
- .3 Fasten float cable to allow movement in an area. Provide shop drawings of assembly.
 - .1 Ensure liquid level control can be removed for servicing.

3.5 Electrical

- .1 Complete all works in accordance with the Canadian Electrical Code and Manitoba Hydro requirements.

3.6 Chlorination

- .1 Chlorinate tank in accordance to applicable standards after installation is complete. This is expected to be in the fall of 2013.
- .2 Empty chlorinated water utilized for disinfection of the tank and fill with potable water. Flush chlorinated water from pump system and winterize in fall 2013.
- .3 In spring of 2014 be responsible to re-chlorinate tank, dechlorinate as required and start up system to operational conditions.

3.7 Holding Tank Testing

- .1 Fill the tank with water and ensure the proper operation of the pumps and level control switches.
- .2 Fill tank with water to top of the manhole. Record water level and check after 24 hours. If water level drops more than 10 mm, find leak and repeat testing.
- .3 Ensure the proper operation of the liquid level control.

End Section 02716

PART 1 - GENERAL

1.1 Description of Work

- .1 Complete all design and construction work for a concrete block masonry building for walls and partitions with a metal roof (slope from east to West). Building is to be insulated to have minimum RSI 3.52 (R-20) walls and minimum RSI 8.81 roof (R-50). Provide all materials, equipment, tools, labour and services to install including the installation of concrete floor, masonry accessories and parging.
- .2 The plans depict an architectural style which was selected to be compatible with the intended use of the building and with the environment adjacent to the building site. All bids should propose buildings of a style which is similar to that depicted in the plans, or which the bidder deems to be suitable and compatible with the intentions of the Contract Administrator that the building be aesthetically harmonious with its environment.
 - .1 Consider reinforcing steel size and spacing, building dimensions and concrete thickness as a minimum. Increase where required.

1.2 Design
Criteria

- .1 The plans indicate a block wall building on a spread footing with a clear span steel roof. Provide sealed (by Professional Engineer registered in Manitoba) plans and specifications for the entire building. Building is to be watertight and insulated.
Plans (including shop drawings) to include:
 - .1 Specify loads, forces and other effects used in the building design.
 - .2 Details of methods proposed to support masonry works and applicable loading calculations on support spacings.
 - .3 Exposed interior purlins under roof panels to be galvanized.
 - .4 Provide materials, assembly and erection techniques to ensure the finished building liner panels are without ripples, dents, crinkles or other such imperfections.
 - .5 Drawing of wall to ceiling connection and related trims/flushing used
 - .6 Building side views.
 - .7 Type of ventilating fans and air inlet screens quoted.
 - .8 Eavestrough location.
 - .9 Doors and hardware.
 - .10 Lintels as required.
 - .11 Flashings used.
 - .12 Doors, frames and hardware.
 - .13 Painting.
 - .14 Masonry accessories such as mortar, caulking, sealants, ties and anchors, etc.
 - .15 Published manufacturer's installation instructions for all components
- .2 Provide specifications including Part 2 Products and Part 3 Execution for all roof and other components that are not provided in this specification section.

1.3 Building Dimensions

- .1 The plans indicate a minimum building size and clear span interior height based on an assumed skid area, be responsible to provide a building size to allow 900 mm clearance from the water treatment assembly skid to the building walls or equipment hung from the walls.

1.4 Standards

- .1 Work to conform to most recent editions of all standards.
- .2 Perform masonry work to CSA CAN3-S304-M except where specified otherwise.
- .3 Conform to the National Building Code of Canada.
- .4 Concrete and rebar to applicable City of Winnipeg standards including.
 - .1 CW 3170-R3 EARTHWORK AND GRADING
 - .2 CW 3310-R14 PORTLAND CEMENT CONCRETE PAVEMENT WORKS
- .5 Conform to CGSB - Canadian Government Specification Board.

1.5 Protection

- .1 Protect work from too rapid drying. Cover tops of completed and partially completed walls with waterproof coverings at end of each working day. Drape covers over walls and extend 600 mm down both sides. Anchor cover securely in position.
- .2 Protect adjacent finished surfaces from marking or damage due to masonry work.
- .3 Provide temporary bracing of masonry work during erection to prevent damage due to winds or other lateral loads until permanent structure provides adequate bracing.

1.6 Storage, Handling

- .1 Store materials onsite in a manner to prevent damage. Store masonry units off the ground.
- .2 Protect all materials from damage due to weather conditions.
- .3 Handle materials carefully to prevent chipping and breaking.

1.7 Coordination

- .1 Coordinate exhaust fan and intake opening work.
- .2 Coordinate door openings and installed hardware.

1.8 Interior Wall

- .1 Interior walls: metal studs with drywall, primed and painted with two coats – color chosen by City. Inside of outside walls to be insulated with vapour barrier.

PART 2 - PRODUCTS

2.1 Materials

- .1 Concrete Blocks: to CSA A165.1-M, normal weight type H/15/A/M, lightweight type H/15/C/M, modular size.

2.2 Expansion and Control Joints

- .1 Install expansion and control joints as per manufacturer recommendations and CSA Standards.
- .2 Provide shop drawing showing location and layout of expansion and control joints.

2.3 Components Roof

- .1 Exterior: Use interlocking ribs of prepainted or galvalume steel not less than 0.50 mm (24 ga) thick. The panels shall be one piece from eave to ridge and applied with ribs upstanding and parallel to the roof slope.

2.4 Exhaust Fan

- .1 Wall outlet fan to be wall mount equal to Zephyr Z8 to deliver 115 L/sec @ 12 mm S.P. and maximum 2.6 sones sound level c/w automatic backdraft damper .
 - .1 If code requires additional air changes alter fan type accordingly.
- .2 Unit to be complete with a exterior discharge hood fabricated of galvanized metal.
- .3 Exhaust fan to start on switch and a timer.
- .4 All openings through wall be neat and complete with flashings and caulking.

2.5 Air Intake

- .1 Air intake to be 300 x 300 mm with #20 bird screen and insect screen.
- .2 Unit to be complete with a exterior intake hood fabricated of galvanized metal.
- .3 Provide a removable winter insulated “plug” for opening.
- .4 All openings through wall be neat and complete with flashings and caulking.

2.6 Floor Drain

- .1 Adjustable floor cleanout with lacquered cast iron body and anchor flange, secondary “O” ring Test Seal, 4” diameter cleanout opening and scoriated combined cover and plug top.
- .2 Provide P-trap.
- .3 Standard of acceptance: Mifab Seies C1100 or approved equal.

2.7 Insulation

- .1 Insulate building to have minimum RSI 3.52 (R-20) walls and minimum RSI 8.81 roof (R-50).
- .2 Walls: Use metal studs and track as required, maximum 400 mm spacing.

- .3 Ceiling: As required to provide insulation and drywall interior finish.

2.8 Sealer

- .1 Standard of Acceptance: Professional® Water Sealant by Professional Products of Kansas Inc or approved equal.
- .1 First coat: PWS-15 super.
- .2 Second coat: PWS-8 Extra.

2.9 Doors

- .2 Exterior doors - reinforced metal honey comb core construction insulated with polyurethane insulation and fabricated of steel not less than 0.80 mm (20 ga) thick (to ASTM A526). Provide doors with a raised metal threshold of not less than 20 mm (13/16 in.) in height and with two stainless steel kick plates per door. Fabricate frames of steel not less than 1.25 mm (16 ga) thick.
- .3 All doors and frames - factory applied primed and painted two coats with 2 part 100% solids epoxy with factory recommended primer.
- .4 Closer and Stop: Each door shall have a heavy duty closer and bracket.
- .1 Exterior: LCN 4020 Series Smoothee, Sargent 351 Series, Hager 5100 Series, Yale 4400 Series.
- .2 Interior: LCN Series 1460 , Sargent series 1431.
- .5 Weather-stripping Exterior doors: Provide weather-stripping for door jam, sides of frame and top of frame such that there is no visible light when door is closed. Weather-stripping material to be grey silicone with mill finish aluminum with pan head zinc plated screws.
- .6 Lock guard plate: Provide stainless steel lock guard plate with security frame pin for exterior doors.
- .7 Weather astragal: Provide a 28 mm wide anodized clear aluminum astragal.
- .8 Door sweep (all doors): Provide a 25 mm vinyl brush type sweep in extruded anodized aluminum holder c/w slotted holes for height adjustment.
- .9 Kick plates: Provide an aluminum kick plate 1.3 mm X 203 mm X door width less 50 mm for single door width and less 25 mm for double door width, countersunk holes for screws and screws. Finish: anodized aluminum.
- .10 Over-head rain drip (exterior doors): Provide 63 mm wide clear anodized aluminum rain drip with slotted holes and zinc plated screws.
- .11 Keying and locks: As per City standards.
- .12 Each exterior door unit (two required) to be 762 mm x 2,032 mm (30" x 80"); shall swing outward with spring door checks and provide a minimum 1,725 mm x 1,980 mm (56" x 78") clear opening. Exterior door to be complete with a cylinder lock and suitable opening hardware to code. Non active door is to have a head and foot bolt.
- .1 Provide a panic style surface vertical rod mounting exit with horizontal heavy duty push rail bar and mortised lock on active exterior door slab. Standard of acceptance: Sargent 8900, Von Duprin X99 or Yale 7130.

- .13 Interior door - reinforced metal honey comb core construction and fabricated of steel not less than 0.80 mm (20 ga) thick (to ASTM A526). Door unit to be 762 mm x 2,032 mm (30" x 80") and shall swing outward. Fabricate frames of steel not less than 1.25 mm (16 ga) thick. Supply a passage assembly.

PART 3 - Execution

3.1 Workmanship

- .1 Build masonry work true-to-line, plumb, square and level, with vertical joints in proper alignment.
- .2 Tolerances for exposed masonry work shall be:
- .1 Variation from mean plane: 3 mm under 2.5 m straight edge.
 - .2 Variation in masonry openings: 6 mm maximum.
 - .3 Variation from plumb: 6 mm in 3 m, 9 mm in 6 m, 12 mm in 12 m or more.
- .3 Assume complete responsibility for dimensions, plumbs and levels of this work and constantly check same with graduated rod.
- .4 Masonry courses to be of uniform height, and both vertical and horizontal joints to be of equal and uniform thickness.
- .5 Extend non-load-bearing partitions to bottom surface roof construction above. Provide lateral support anchors attached to roof above to requirements of CSA CAN3-S304-M. Fill topmost joint with mortar.
- .6 Keep cavity airspace and weep holes clean or mortar, clean out promptly if mortar falls into cavity airspace or plugs weep holes.
- .7 Buttering corners of units, throwing mortar into joints, deep or excessive furrowing of bed joints will not be permitted. Do not shift or tap units after mortar has taken initial set. Where adjustments must be made after mortar has started to set, remove mortar and replace with fresh supply.
- .8 Confirm winter plug for intake fits neatly and provides a fully insulated plug.
- .9 Install weatherstripping, sweeps and thresholds in accordance with manufacturer's instructions to ensure entire door perimeter is sealed (no visible light), including spacing between double doors.

3.2 Blockwork

- .1 Lay concrete block in running bond, with thicker end of face shell upward. Coursing to be modular 200 mm for one block and one joint.
- .2 Use lightweight concrete blocks for exposed interior surfaces of walls and partitions. Regular concrete blocks may be used for concealed and plastered surfaces.
- .3 Use specially shaped units where indicated, specified or required. Exposed open cells not permitted.
- .4 Stagger joints- stacked joints not permitted.

3.3 Expansion Joints

- .1 Construct expansion joints with fillers as required, installed in accordance with manufacturer's recommendations. Joints shall be caulked.

3.4 Through-Wall Flashings

- .1 Install flashings on tops of foundation walls supporting masonry in first bed course, over all openings in exterior masonry walls and elsewhere as shown on drawings.
- .2 Carry through-wall flashings minimum 150 mm up backing material and turn top edge into joint or anchor top edge continuously. Keep flashing 12 mm from exterior exposed face. Lap joints minimum 150 mm.
- .3 Lap and completely seal joints with adhesive to manufacturer's instructions. Bond flashing to vertical surfaces over whole area using flashing material manufacturer's recommended adhesive.
- .4 All flashing installed shall be made to exclude moisture or divert it outside.

3.5 Cutting Masonry

- .1 Cutting of masonry units exposed in finished work is to be done with approved type power saw.
- .2 Patching of masonry is not permitted.

3.6 Lintels

- .1 As Contractor's design engineer requirements.

3.7 Reinforcing

- .1 As per Contractor's design engineer requirements.

3.8 Bracing

- .1 Design and Installation: Design, provide and install bracing for walls, lintels, and other masonry work that will assure stability of masonry during construction.
- .2 Duration: Maintain bracing in place until roof or other structural elements are complete and provide permanent support.

3.9 Parging

- .1 Apply parging in a uniform coat, approximately 10 mm thick, where shown. Use sufficient pressure to ensure bonding.

3.10 Provisions for Other Trades

- .1 Provide openings in masonry walls where required or indicated. As work progresses build in metal doorframes, fabricated metal frames,

3.11 Pipes Through Wall

- .1 Complete through wall piping prior to masonry works.

- .2 Cut masonry /brick as required to make a neat round opening.
- .3 Seal space between masonry /brick with grout and flashing as required for a watertight seal.

3.12 Cleaning and Protection

- .1 Use good workmanship and job housekeeping practices to minimize the need for cleaning the masonry.
- .2 Dry brush masonry walls at end of each days work and also after final pointing. Maintain clean and free from mortar droppings.
- .3 Protect the wall by setting scaffolds so that mortar is not deflected onto the wall and at the end of each day set the scaffolding boards so that they do not deflect rainfall onto newly laid masonry.
- .4 Use a masonry laying technique shall be such that mortar does not run down the face of the wall, or smear the masonry face. After the joints are tooled, cut off mortar tailings with the trowel and brush excess mortar burrs and dust from the face of the masonry.
- .5 On completion, remove any excess mortar and smears that may remain, using wood paddles or scrapers.
- .6 If after using the above outlined techniques and additional cleaning of masonry is necessary:
 - .1 Wet masonry wall thoroughly with garden hose, apply cleaner with brush and scrub, rinse masonry wall thoroughly with garden hose. Clean the masonry only with an approved cleaning solution.
 - .2 Scrub surfaces to be cleaned using non-acid cleaning solution of type which will not harm constructed masonry. Check masonry unit manufacturer for acceptable solution. Clean trial test area and obtain approval to proceed.
 - .3 Use large amounts of water and do cleaning in accordance with solution manufacturer's instructions. Take care to prevent cleaning waste water from coming in contact with potable water in reservoirs. Direct all water to floor drains.
 - .4 Repeat cleaning operations as often as necessary until work is satisfactory.
 - .5 DO NOT CLEAN WITH MURIATIC ACID, SANDBLAST OR HIGH PRESSURE WASHERS.
- .7 Point or replace defective mortar to match existing, as required or directed.

3.13 Sealing (anti-graffiti coating)

- .1 Seal exterior walls as required to provide an anti-graffiti coating.
 - .1 After all cleaning procedures have been followed seal with an evenly applied coat of approved sealer.
 - .2 Allow cleaned surfaces to dry completely. For surfaces that have been power-washed, allow a minimum of 72 hours drying time. Allow a minimum of 48 hours drying time after it has rained. Concrete and masonry should cure for 28 days before application.
 - .3 Product application must not be initiated during inclement weather, when precipitation appears imminent, or when frozen moisture is present in substrate. Application should be completed at least twelve hours before onset of precipitation.

Optimum surface and air temperature ranges for application are between 5° and 30° C.

- .4 Apply material using a high-volume, low pressure, pump-up sprayer (between 40-50 psi), with a fan tip and solvent resistant fittings. Roller, brush of natural bristle, or foam may be used in areas where spray application is not appropriate. Do not use Airless spray equipment.
- .5 First Coat: Apply in a flood coat, from top to bottom, being sure to obtain a 4 to 6 inch rundown of product from the point where the spray makes contact with the surface. Work all the way down the building covering the rundown as you go. Avoid excessive overlapping.
 - .1 Some substrates may require back rolling after product is applied to smooth out any rundown lines.
 - .2 Brush any excess product that may accumulate on ledges and other areas that may hold excess material.
- .6 Second coat: Allow the surface to dry to the touch before applying a second coat (approx. 2 hours). Repeat application as described for first coat.
- .7 Follow instructions for application by the sealer manufacturer for correct results without forming runs or drops.

End Section 04200

PART 1 - GENERAL

1.1 Description of Work

- .1 The work shall consist of the design, supply and installation of all labour, materials, consumable and equipment necessary for the installation of a double loop water treatment and control system. Include everything requisite and necessary to properly complete the entire system, notwithstanding that every item may not be specifically mentioned.
 - .1 The water treatment system (WTS) shall have all equipment mounted on a powder coated steel skid and be wired, plumbed and tested prior to shipping.
 - .2 A holding tank along with a debris screen and diverter valve assembly shall also be included with the skid mounted equipment. See Section 02716 for details on holding tank and diverter valve requirements.
 - .3 For water conservation provide a dual loop system that treats the water with one loop and uses a separate re-circulating water system to the spray features.
 - .4 The Filter and recirculation system shall be a self contained dual loop design which shall contain all pumps, filters, pipe, valves, fittings, electrical panels, wiring and chemical control equipment as required for a complete functional system in accordance to all codes and these specifications and plans, whichever is the most stringent. See Section 02716 for details on holding tank requirements.
 - .5 Complete design and installation of an automatic disinfection system using chlorine and UV.
 - .6 Complete design and installation of an automatic pH control system using CO₂.
 - .7 Complete design of all plumbing, mechanical and electrical systems between the WTS, holding tank, diverter & strainer, and the spray features.
 - .8 Submit plans as required for building permits and related City approvals.

1.2 Work Included

- .1 The following list generally describes the scope of provide and install work under this section:
 - .1 Water Treatment Assembly.
 - .2 Chemical feed assembly.
 - .3 Chemical feed controllers.
 - .4 All connecting piping, valves and fittings.
 - .5 Distribution header and valves.
 - .6 UV disinfection system.
 - .7 Pumping Equipment.

1.3 General

- .1 Incorporate automatic and remote shutdown arrangements in the event required water chemistry levels is not being achieved.
- .2 Interloc operation of spray feature pumps into the filtration/treatment pumps so they will not operate when filtration /treatment pump is not operating.

- .1 Interloc UV disinfection system, provide a manual method to release interlock upon malfunctioning UV system.
- .3 The ratio of the flow rate of water supplied to the spray features directly from the treatment tank must not exceed 3 times the filtration/treatment system flow rate.
- .4 Maintain system operating water volumes/levels continuously by automatic top-up control and overflow systems.
- .5 Provide at least one sign “WARNING RECYCLED WATER IN USE - DO NOT DRINK”. Provide minimum lettering size of 100 mm and locate in a prominent position of view to all users.
- .6 Provide timers and control features to allow filtration and treatment equipment as a minimum be kept operating/circulating at all times a water spray/play grounds is open for use and it shall commence operating a minimum of 2 hours (time shall be field settable) before the first use and continue operating 2 hours (time shall be field settable) after the last use.
 - .1 Also allow 24 hour operation of the filtration system.
 - .2 Provide clear means and methods for filter backwashing.
 - .3 Size filtration/treatment systems to achieve complete water system turnover at least once every 30minutes.
- .7 Provide manual water chemistry test kit for daily water chemistry testing.
- .8 Provide operations and maintenance manuals.
- .9 Provide means and method to clean and drain water treatment tanks at a frequency necessary to maintain water quality without entering the tank. The use of portable pumps and hose is acceptable providing suitable hose, electrical cable and electrical plugs are provided.
- .10 Design and fabricate all equipment and piping to drain completely by use of drain plugs, drain valves or other means. Clearly label and tag all drain locations and parts that are to be removed or manipulated for winterizing on the plans. Slope pipe in one direction wherever possible, slope applicable piping to holding tank. Wherever possible use valves and unions to facilitate draining.
- .11 Design chemical feed systems to clarify, chemically balance and disinfect the spray pad water.
- .12 Flow measurement. A means of continuously measuring rate of flow shall be provided in the recirculation system and to the features. For sand filters, the flow-measuring equipment shall be located where the backwash flow rate can also be determined. The indicator shall be capable of measuring at least 1-1/2 times the design flow rate and shall be accurate within 10 percent of true flow. The indicator shall have a range of readings appropriate for the anticipated flow rates, and be installed where it is readily accessible for reading and maintenance, and with straight pipe upstream and downstream of any fitting or restriction in accordance with the manufacturer's recommendation.
- .13 Sand filters. Design the filtration rate of high-rate sand filters (pressure or vacuum) to not exceed a filtration rate of 15 gallons per minute per square foot of filter area. Equip the sand filter system to backwash each filter at a rate of 12 to 15 gallons per minute per square foot of filter bed area, or as recommended by the manufacturer. Discharge the backwash water to waste through a suitable air gap.
- .14 Disinfection with UV

- .15 Disinfection with chlorine. Provide a controller and related system to feed chlorine for disinfection using calcium hypochlorite at a sufficient dosage to maintain a concentration of at least 2.0 mg/L free chlorine throughout the system including the treatment tank and water emanating from the spray features. Do not exceed a free chlorine residual of 10.0 mg/L in any spray pad treatment tank during use. Add chlorine solutions to the spray pad water by automatic chemical feed and control equipment.
 - .1 Provide an automatic controller for continuously monitoring of ORP and adjusting the level of free residual disinfectant in the spray pad treatment tank.
 - .1 Use calcium hypochlorite tablets.
- .16 pH control: Provide a pH monitoring and control system to maintain a pH of 7.0-7.8 throughout the system including the treatment tank and water emanating from the spray features. Do not exceed a pH of 8.5 in any spray pad treatment tank during use. Add pH control solutions to the spray pad water by automatic chemical feed equipment.
 - .1 Provide an automatic controller and pH probe assembly for continuously monitoring and adjusting the pH level in the spray pad treatment tank.
 - .2 Use CO₂ feed system.
- .17 Size the pipes, fittings and valves of the system so that velocities do not exceed 1.8 m per second under suction, 3 m per second under pressure and 1 m per second in gravity flow. The velocities may be exceeded when hydraulic computations indicate higher velocities will not adversely affect the spray pad treatment system.
- .18 Design the grades and provide inverts of holding tank, tank connections, gravity piping and pressure piping.
- .19 Design the pipe sizes using the sizes shown as a minimum.
- .20 The plans indicate an assumed building size based on an assumed water treatment skid assembly with a minimum of 1 m free area around the skid to a building wall or equipment placed on the wall. Be responsible for skid sizes and make building larger is required to maintain space as indicated around the skid to adjacent wall or equipment.

1.4 Qualifications

- .1 Use qualified workmen who are fully familiar with this work and have a working knowledge of the system components.
- .2 Be thoroughly familiar with governing regulations applicable to this project.
- .3 The manufacturer shall have a minimum 3 years experience manufacturing spray park water treatment systems including water distribution manifolds. The manufacturer shall have in-house Water Quality Specialists in their employment. Utilize a qualified and experienced technician for installation, start-up and on-site system training and commissioning.

1.5 Compliances

- .1 Complete works in compliance with local regulations & codes, national and international standards, applicable health codes, and authorities having jurisdiction.
- .2 Manufacture components in accordance with CSA or CUL certified and bear the appropriate approval stamp in a visible location.

- .3 Provide National Sanitation Foundation (NSF) 50 or equivalent approvals of equipment supplied, where applicable.

1.6 Warranty

- .1 5 year warranty on the structural steel skid and frame and powder coated paint finish.
- .2 2 year warranty on fiberglass holding tank, electrical controllers, controller, transformers, electrical wiring and connections, water circulation piping and fittings, pumps, chemical feed systems, valves and gauges.

1.7 Labels

- .1 Identify all potential hazards on the equipment with clearly visible stickers or markings. Safety information shall be included in the WTS Operation & Maintenance Manual.
- .2 Provide permanent, waterproof labels with flow direction.

1.8 Record Drawings

- .1 Obtain separate set of drawings and mark the variations as the work progresses in order to complete a record of equipment and services installed at variance with locations and methods shown on original drawings.

1.9 Existing Conditions

- .1 Examine specifications and drawings relating to work of other trades which may affect installation of this work.
- .2 Where contradictions in specifications and drawings are implied, obtain ruling from Contract Administrator. Where ruling is not obtained, include the item or arrangement of better quality, greater quantity, or higher cost.
- .3 Work or expenses arising by default of not having examined existing conditions prior to submitting bid shall be borne under this contract at no additional cost to the City.

1.10 Accessibility

- .1 Install equipment and piping with adequate clearances for head room, passage, operation and service. Cast vertical piping in building floor to directly service water treatment skid requirements without horizontal run between water treatment skid and building wall.

1.11 Tests

- .1 Provide tests on equipment, systems and materials as may be requested by the Contract Administrator.
- .2 Factory test all skid mounted components and equipment.
- .3 Carry out tests for such lengths of time and at such a time as determined by Engineer before final completion and acceptance of work to verify performance requirements.
- .4 Completion of tests is not evidence of acceptance of tested part of contract.
- .5 No claim for damage will be made for injury or breakage of parts due to tests.

1.12 Electrical

- .1 Electrical equipment supplied under this section shall be CSA approved and bear CSA labels. Motors shall be tested to NEMA MG.1 standards or CSA C22.2 #52 and shall conform to insulation and dielectric strength.
- .2 Motors shall have conduit terminal boxes and adequate starting protective equipment as defined by the local power utility and as outlined in the Manitoba Electrical Code.

1.13 System Start Up

- .1 Be responsible to review Section 01730 and include training requirements as outlined in Section 01730 in scope of work.
- .2 Retain fully qualified operators to start up all systems.
- .3 Cycle all components of the complete system to duplicate normal operating conditions and test all level control system components.
- .4 Start up to include minimum 2 days for initial plant start up, commissioning and training. .

1.14 Training

- .1 Be responsible to review Section 01730 and include training requirements as outlined in Section 01730 in scope of work.
- .2 Training shall include spring start-up, weekly maintenance and operation, and winterization duties.

1.15 Electrical
Supply

- .1 Electrical supply to the skid shall be single phase, 120/240 VAC, 60Hz

1.16 Approved
Equals

- .1 Provide request for approved alternative equal in accordance with B6 for any specific product listed below products

PART 2 - PRODUCTS

2.1 Controller

- .1 Controller(s)
 - .1 Provide a Human Machine Interface (HMI) touch pad with the capability of modifying the park sequencing and testing sequences. The screen shall display all water treatment system alarms and direct the operator to the applicable equipment requiring attention.
 - .2 Shall operate the 24VAC solenoid valves on the manifold
 - .3 Include a 24 hour, 7 day a week clock that allows the operator to control park and water treatment system operations

- .4 Shall interface with the chemical controller, UV system controller (future input) and turbidimeter controller (future input) and disable water flow to the features should water chemistry alarm or UV disinfection alarm be activated.
- .5 Shall have the ability to purge the water lines prior to park opening.
- .6 Shall have a dry contact capable of controlling the operation of the diverter valve located in the drain line upstream from the holding tank. After park hours or after 30 minutes of park inactivity, the diverter valve shall send rain water from the spray pad to the sewer.
- .7 Shall allow for the operation of the pumps and UV system (UV is future) and include pump Hand/Off/Auto switches, motor starter protectors, contactors and an electrical disconnect.

2.2 Water Treatment
Skid

- .1 Skid constructed of powder coated mild steel or aluminum.
- .2 Skid deck: diamond plated.
- .3 Filtration and Feature Pump:
 - .1 Self priming.
 - .2 NSF listed with integral strainer.
 - .3 Size feature pump to suit the maximum flow requirements of the features at 60' total dynamic head (TDH).
 - .4 Variable Frequency Drive to interface and control the pump through a 4-20mA signal and allow the operator to manage the VFD entirely from the water chemistry controller, by providing the following capabilities.
 - .1 Programmable setpoint specified as either flow rate, effluent filter pressure, or fixed setting.
 - .2 Four programmable operator triggered alternate profiles ("Manual Turndowns").
 - .3 Four programmable scheduled alternate profiles ("Scheduled Turndowns").
 - .4 Override setting for backwash, which can be activated manually or automatically by controller.
 - .5 Ramp up and ramp down settings.
 - .6 Minimum output setting.
 - .5 Standard of Acceptance.
 - .1 Pentair EQ Series.
 - .2 Pentair Whisperflo.
 - .3 Pentair Challenger.
 - .4 Sta-rite Max-E-Pro.
 - .5 Sta-rite Series C.
- .4 Pressure and Vacuum Gauges:

- .1 Pressure gauges: 63mm, 316 stainless steel case, glycerin filled with a range of 0-160 PSI and +/- 1.6% accuracy. Pressure gauges shall be installed on the discharge end of the pumps or on the manifold.
- .2 Vacuum gauges: 63mm, 316 stainless steel case, glycerin filled with a range of 30-0" Hg and +/- 2% accuracy. Vacuum gauges shall be installed on the suction ends of the pumps.
- .3 Standard of Acceptance:
 - .1 ENFM, 7211 or 7214 Series.
 - .2 Marshall Instruments Inc., Severe Service.
- .5 Pressure Switch:
 - .1 Install a pressure switch on the discharge side of the pump. When low pressure is detected in the discharge line, the pumps shall automatically shut off.
 - .2 Standard of Acceptance:
 - .1 Hubbell Industrial Controls.
 - .2 Furnas Brand Class 69W
- .6 Sand Filters:
 - .1 Provide NSF listed high rate sand filters sized for a filter service rate of maximum 15 US GPM/ft² and come complete with filter air release valves and pressure gauges to display pressure drop across the filter. Sand filters shall be sized to accommodate a minimum holding tank turnover of once every 30 minutes.
 - .1 Provide 2 filter units.
 - .2 Multi-Port Valve: to provide backwash, rinse and filter-to-waste functions and a sight glass. Provide PVC unions to allow easy removal of multi port valve to access tank.
 - .3 Standard of acceptance:
 - .1 Pentair Triton II, TR-100C or TR-140C.
 - .2 Hayward Pro Series, S310T2 & S360T2
 - .3 Whitten BiFlow Filter, HPSB 36-14 & HPSB-48-25
- .7 Flow meter.
 - .1 On discharge side of pumps.
 - .2 Paddle wheel type insertion sensor and a 6 digit LCD digital display which is mounted directly on the sensor.
 - .3 Accuracy: +/- 10%.
 - .4 Standard of Acceptance: Blue White F-300 or F-1000.
- .8 Test kit. Provide colorimetric test kits for the determination of free disinfectant residual, and pH of the water. Provide a 3 month supply of appropriate reagents for making each type of test.

- .1 Standards. A DPD (Diethyl-P-Phenylene Diamine) test kit with the following increments: 0.2, 0.4, 0.6, 0.8, 1.0, 1.5, 2.0, 3.0, 5.0, 10 ppm as a minimum, shall be provided to measure the chlorine residual.
- .2 A pH test kit with a range from 6.8 to 8.2, accurate to the nearest 0.2 pH unit.

2.3 Disinfection and
pH Control

- .1 Chemical Controller.
 - .1 Supply a programmable chemical automation system for continuous monitoring and automatic control of pH and sanitizer ORP (oxidation-reduction potential). The controller shall also display the Langelier saturation index.
 - .2 The controller shall automatically activate the appropriate chemical feeders in order to maintain the sanitizer activity level within +/- 10 mV (millivolts) of ORP and the pH within +/- 0.1 pH unit of the set-points selected by the operator. ORP function shall include a seven-day, level-based chemical saver program. All set-point and calibration levels shall be adjustable with a numeric keypad mounted on the front panel of the unit.
 - .3 Use a NEMA 4X rated (IP66) lockable fiberglass cabinet to house the controller. Use NEMA 4X connectors to maintain rating.
 - .4 Control to display ORP, pH, descriptive alarm messages, ppm indicator lights, which track with the ORP and a constant pH of 7.5, vVisual pH and disinfectant feed pump indicator lights, which are activated as chemicals, are being fed and blink during pause mode of proportional feed and Flashing red LED alarm indicator for Hi/ Lo pH, ORP, current values, , control mode and operational status for ORP and pH. LCD graphic display screen and sample stream low or no flow failsafe condition
 - .5 To be NEMA 4x rated.
 - .6 The controller shall have the capability to calibrate all sensor inputs, depending on the accuracy needed, using either 1, 2, or 3-point calibration to determine respectively the origin, slope and curvature of the calibration curve.
 - .7 The controller shall include programmable high and low alarm levels for pH and ORP with operator-selectable feed lockout and alarm buzzer options. A Remote Alarm relay shall be included in parallel with alarm buzzer for operator-selectable voltage or dry contact output. The remote alarm shall notify the main spray park controller and spray park operations should cease when pH or ORP readings are unacceptable.
 - .8 The controller shall continuously monitor and alert for failure of ORP and pH probes using dynamic probe testing before the water chemistry gets out of range. Failure alarms based on safety timers or out-of-range alarms will not be considered equal.
 - .9 Monitor chemical feed tank low level approaching and low level level switches and activate alarms and shut downs accordingly.
 - .10 Alarms:
 - .1 The controller shall also have programmable alarms for pH, ORP, sample stream low flow & no flow and chemical overfeed. All alarm conditions shall activate a master alarm signal..

- .11 Probes:
 - .1 Probes shall be easily removable for cleaning and calibration and shall include calibration solution for a minimum of 12 calibration checks after start up is complete.
- .12 Password:
 - .1 The controller shall have two security password levels with one for operators and one for the distributor.
- .13 Flowcell:
 - .1 Flowcell: Utilize a flowcell with ports for potentiometric probes, ports for acid wash injection, and a clear acrylic front viewing window. The flowcell design shall provide precise sample flow rate and water velocity regulation
- .14 Standard of Acceptance:
 - .1 Santa Barbara Control Systems, Chemtrol PC2000.
 - .2 BECS Technology BECSys3 or BECSys5.
- .2 Chemical feed system- pH.
 - .1 Chemical feed system: CO₂ type feed system. Provide flow control unit c/w diffuser/injector fitting with integral check valve housed in a FRP enclosure.
 - .1 Provide 3 CO₂ cylinders (.)
 - .2 Feed diffuser/injector fitting.
 - .1 The Diffuser/Injector fitting shall be NPT PVC body complete with polyethylene diffuser and polyethylene check valve.
 - .2 The diffuser shall cause CO₂ to totally dissolve into solution without evidence of CO₂ bubbling in the pool basin.
 - .3 The diffuser/ injector fitting shall have a ¼” (6 mm) OD tube to ¼” (6 mm) NPT polyethylene check valve with a 1½ lb spring to prevent the flow of water into the feed unit.
 - .3 Provide a method to advise operator of the need to change feed tanks.
 - .4 Feed flow control unit:
 - .1 Include a brass solenoid valve rated for 120 VAC and 8 watts with a pressure rating of 100 PSIG (690 kPa).
 - .2 Control the CO₂ feed rate by a rate adjusting flow meter scaled from 0-30 Standard Cubic Feet Per Hour.
 - .3 The solenoid valve shall provide on/ off control of CO₂ feed gas through electrical activation by a water chemistry controller to maintain the desired pH set point.
 - .4 The solenoid valve, flow meter and connecting tubing/ fittings shall mounted in an FRP enclosure.
- .3 Chemical feed system- chlorine.
 - .1 Chemical feeder: calcium hypochlorite tablet type feed system.

- .2 System design to draw a sidestream from the main water flow via a chlorination skid introducing a portion of this to the chlorinator where the tablets are eroded at a controlled rate. The chlorination skid injection pump returns the resulting chlorinated solution back into the main water line or holding tank.
- .3 Injection rate to be automatically controlled based upon ORP monitoring and a controller.
- .4 System to be skid mounted with the appropriate mechanical, electrical, instrumentation and connections to the systems controller..
- .5 Provide a flow meter., injection pump, float valve, chlorine tablet hopper, solution tank, and check valve on a skid..
- .6 Provide booster pump if required.
- .7 Provide 30 kg of tablets upon spring start up.
- .8 Standard of Acceptance: Accu-Tab or approved equal.

2.4 UV Disinfection

.1 General

- .1 Provide a UV unit designed to produce only the dose necessary to provide the proper amount of intensity to destroy chloramines and inactivate pathogens like cryptosporidium and legionella.
- .2 Design system to operate in an environment with ambient relative humidity of 5-90% and ambient air temperature of 0-40°C.
- .3 Overall assembly to consist of a stainless steel reactor, in-line strainer (to capture any glass should the quartz tube surrounding a light bulb break), control panel, transformer and circuit breaker.
- .4 Plumb as required to allow isolation for service.
- .5 Size and plumb as required to treat entire flowrate to splash pad features
- .6 Design UV minimum dosage at design flow rate at end of lamp life: 40 mJ/cm². End of lamp life to be minimum 98% of specified new lamp output.
 - .1 Be responsible to choose UVT and design flowrate as required to obtain a dosage suitable for potable water or as above whichever is more stringent. Provide such data as related to system sizing with shop drawing submission.
- .7 UV reactor to consist of a minimum of 1 UV intensity monitor and one Control Panel.
- .8 All metal components in contact with the feed water shall be Type 316L stainless steel.
- .9 All material exposed to UV light shall be Type 316L stainless steel, Type 214/219 quartz or a suitable UV resistant material.
- .10 Design breaker and transformers as required. Ensure wire between control panel and reactor is not across an "open" floor area. If the control panel is on the wall and the reactor is on the skid place wire in conduit in the floor.

- .2 Cleaning (Wiper) System
 - .1 Equip UV reactor with a automatic on-line sleeve wiping system. The wiping system to be automatically initiated by the Control Panel, and will operate while the UV system is in operation.
 - .2 Be able to continue providing disinfection while the automatic cleaning system is in operation.
 - .3 Operate the automatic wiping system on a timed cycle. The frequency of wiping cycles shall be field adjustable via the operator interface. Manual wiping system control shall also be through the operator interface.
- .3 Control Panel
 - .1 The operator interface shall be a monitor that is menu driven, and shall display the following system information when prompted: reactor status, individual lamp status, failure of a specific lamp, lamp bank operating hours, dose either above or below minimum value, UV Intensity, power level, alarms, alarm history.
 - .2 Design the sensor to measure only the germicidal portion of the light emitted by a UV lamp. The detection system shall be factory calibrated., sensors that can be field calibrated will not be permitted.
- .4 UV Intensity Sensor
 - .1 Provide one (1) side-mounted UV intensity sensor.
 - .2 Design the sensor to measure only the germicidal portion of the light emitted by a UV lamp. The detection system shall be factory calibrated., sensors that can be field calibrated will not be permitted.
- .5 Temperature Switch
 - .1 Fit a temperature switch to reactor for protection against heat build-up under no flow or drained chamber conditions
 - .2 The temperature switch shall cause the UV system to shut down and alarm in event of higher than recommended water temperature (or air temperature if the lamps are operated in a dewatered situation).
- .6 Drain Valve
 - .1 Furnish reactor with a drain valve connection and drain valve so the reactor can be dewatered for inspection or cleaning or winterizing after the inlet and outlet valves are closed.
- .7 Spare Parts
 - .1 Provide 2 bulbs, 2 quartz sleeves, 4 quartz sleeve seals, 2 end cap seals, UV monitor seal, 2 wiper blades, 2 wiper shaft seals, 1 wiper drive belt, 2 Face Shield(s), able to block UV light wavelengths between 200 and 400 mm, wiper cloths and solution for 6 manual cleanings..
- .8 Guarantee
 - .1 Equipment: The equipment furnished under this section (excluding UV lamps) shall be free of defects in materials and workmanship, including damages that may be incurred during shipping for a period of one (1) year from start-up.
 - .2 Ballasts: The ballasts shall be warranted for 5 years, prorated after 1 year.

.3 UV lamps: Provide a UV lamp warranty for a minimum of 12,000 hours, pro rated after 9,000 hours and assuming 4 on/off cycles per 24 hours. UV dose at end of lamp life to be minimum 40 mJ/cm².

.9 Validation.

.1 Provide documentation (as part of shop drawing submission) that unit is fully approved by UL/MET, ANSI/NSF50 2010, and validated to the USEPA Disinfection Guidance Manual 3rd edition, August 2012.

.1

2.5 Distribution Manifold

.1 Provide a minimum 75mm diameter, 304 Stainless Steel header complete with 75mm threaded inlet coupling or flange with minimum 38mm union outlet couplings to spray features. Include a hose bib and a pressure gauge off the header. Size depending on aquatic play pad components and flow requirements.

2.6 Pressure Sustaining Valve

.1 Install an automatic pressure sustaining valve in the bypass line to maintain a consistent pressure at the distribution manifold. The valve shall be a hydraulically operated, pilot controlled, modulating valve. The valve shall be quick opening and slow closing to prevent surges.

.2 Standard of Acceptance; Cla-val, 50-13 Pressure Relief & Pressure Sustaining Valve or Netafim PVC Valve, with mining pilot.

2.7 Electric Solenoid Valves

.1 Use electronic solenoid valves on each line to a spray component. The manifold solenoid valves shall be a normally closed 24 VAC 60 Hz solenoid actuated globe pattern design. The valve pressure rating shall not be less than 1,000 kpa.

.2 Valve body: constructed of heavy-duty glass-filled UV-resistant nylon and have stainless steel studs and flange nuts.

.3 Diaphragm; nylon reinforced nitrile rubber.

.4 Have both internal and external manual open/close control (internal and external bleed) to manually open and close the valve without electrically energizing the solenoid.

.5 Have a brass flow control stem for accurate manual regulation and/or shut-off of outlet flow..

.6 Standard of acceptance: Rainbird PEB or PESB Series Solenoid Valve

2.8 Hangers and Supports

.1 All pipe hangers, supports and brackets to be galvanized steel or stainless steel.

.2 Hangers for piping off walls and ceilings to be Anvil-Strut or Uni-Strut type.

.3 Submit shop drawings for approval on all hangers and supports for piping.

2.9 Eye Wash Assembly

- .1 Provide pedestal mounted eye/face wash - hand and foot operated c/w hot and cold throttling valves and check valves on each line – Speakman 480, Guardian G1704 HFC, Bradley S19-210X or equivalent.
- .2 Thermostatic mixing valve to meet ANSI Z358.1. Leonard model TA 300, Powers ES150RB or equivalent.
- .3 Provide a 75 L hot water tank. Include an easy method to drain tank.

2.10 Safety Signage

- .1 Provide safety signs in 0.040 aluminum with a baked enamel finish 10"x7" in size
- .2 Individual sign messages as per OSHA standards are available from "REVERE - SETON" (toll free 1-800-263-1635), Brady (as distributed by Acklands), North Safety Products or approved equal as follows.
 - .1 Danger - Chemical Storage (# S0043)
 - .2 Notice – No Smoking (# S0604)
 - .3 Safety First - Eyewash Station (#S0549)

2.11 Portable Dewatering Pump

- .1 15 m of AWG 14/4 cable.
- .2 Submersible 1 phase motor NEMA design B with class F insulation- to CSA C22.2 and UL standard 778.
- .3 Aluminum alloy pump housing with stainless steel shaft and upper and lower single row ball bearing and independent double face seals.
- .4 Strainer – Hot dipped galvanized with minimum 100 – slotted holes 6 mm x 20 mm.
- .5 Controls – manual control- magnetic starter in a EEMAC 3 enclosure.
- .6 12.6 L/sec @ 6 m head.
- .7 Flygt Bibo BS-2066.171 imp 236 or approved equal.
- .8 Provide 30 m of 75 mm lay flat hose and suitable quick couplings to connect to pump.

2.12 Spill Containment Kit

- .1 Provide a \$200 cash allowance for a spill containment kit to be determined at a later date.

PART 3 - EXECUTION

3.1 Treatment Skid

- .1 Provide concrete or corrosion resistant fabricated bases to raise all skid mounted mechanical equipment approximately 50 mm above the floor. Do not install any mechanical skid equipment directly on floor.

- .2 If utilizing concrete bases ensure new concrete is “tied” to existing concrete with drilled in place anchors.
- .3 Provide shop drawings and obtain Contract Administrator approval.

3.2 Chemical Feed Skid- Chlorine

- .1 Assembly and position the chlorine chemical feed system in convenient positions, following manufacturer's instructions. Install chemical per locations specified.
- .2 Provide all connections and appurtenances necessary for a complete operating system.
- .3 Plug into a 120 V receptacle.

3.3 Chemical Feed System- CO₂

- .1 Provide bases and stands as required support and restrain cylinders. Raise cylinders off the floor.
- .2 Install and secure all systems as required.

3.4 Hangers & Brackets

- .1 Install hangers, brackets and brackets to support all piping and equipment.
- .2 Use sufficient hangers to restrain all piping and equipment from movement.
- .3 Shall be secured to the wall, floor and ceiling in a firm manner.
- .4 Ensure all brackets and hangers used are constructed of rust proof materials.

3.5 Eye Wash

- .1 Run hot and cold water to unit. Core copper pipes under floor as required.
- .2 Install check valves on all piping interconnecting hot and cold water.
- .3 Install hot water tank on a rust proof stand or concrete base to raise it 150 mm above the floor.
- .4 Install thermostatic mixing valve in an accessible location as per manufacturer's instructions.

3.6 UV System

- .1 Securely mount reactor unit in an accessible location considering space requirement for servicing of bulbs.
- .2 Consider sensor removal distance for service in placement of reactor and any appurtenances.
- .3 Install bypass.
- .4 Install vent at top of unit.
- .5 Provide a manual 12 mm ball valve on piping/fittings above unit to allow air into assembly to facilitate draining operations
- .6 Install strainer for possible sleeve glass breakage.
- .7 Secure control panel to an accessible wall.
- .8 Install breaker and transformer as required.
- .9 Complete all connections as required to the reactor and control panel.

3.7 Piping, Valves and Fittings

- .1 Install all piping, making all piping connections.
- .2 Remove all scale, dirt and other foreign material from piping and equipment.

3.8 Works in Existing
Building

- .1 Connect to existing water supply piping.
- .2 Make connections watertight and neat.

3.9 Testing

- .1 Test pumps, filters and equipment.
- .2 Test pressure shall be 150% of the operating pressure as determined by the Engineer. Test pressure shall be maintained without loss for a period of one hour. Isolate all low pressure equipment and instruments prior to testing. Operate all valves and other devices during the test period.

End Section 15200

PART 1 GENERAL

1.1 GENERAL

- .1 Design and supply of various electrical components are included in Divisions other than Division 16. Be responsible to review all specifications sections and all related shop drawings as prepared by the various project sub-contractors as related to required electrical works. Be responsible to make all electrical components operational as required by the contract documents. Supply materials and complete works as required to fully integrate and make work operational and integrated if not specifically itemized in other Divisions.
- .2 Install new service entrance in the new building and feed the existing building electrical services from the new building.
- .3 Complete electrical works as required for new building, controls, panels and related works.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1-except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1987 except where specified otherwise.

1.3 CARE, OPERATION AND START-UP

- .1 Instruct City's representative in the operation, care and maintenance of systems, system equipment and components.
- .2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 PERMITS, FEES AND INSPECTION

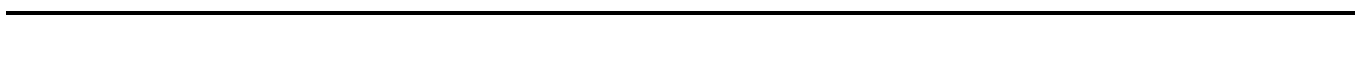
- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work.

1.5 MATERIALS AND EQUIPMENT

- .1 Equipment and materials to carry CSA, ULC or cUL approval and conform with applicable standards, no exceptions or alternatives.
- .2 Factory assemble control panels and component assemblies.

1.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
- .2 Nameplates:
 - .1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self-tapping screws.



- .3 Labels:
 - .1 Embossed plastic labels with [6] mm high letters unless specified otherwise.

1.7 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: [1400] mm.
 - .2 Wall receptacles:
 - .1 In mechanical rooms: [1400] mm.
 - .3 Panelboards: as required by Code or as indicated.

1.8 CONDUIT AND CABLE INSTALLATION

- .1 Provide shop drawings showing proposed embedded or below floor conduit locations.
- .2 Provide below floor conduit for future UV system.
- .3 Install conduit and sleeves prior to pouring of concrete.

1.9 FIELD QUALITY CONTROL

- .1 Conduct and pay for following tests:
 - .1 Insulation resistance testing.
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Check resistance to ground before energizing.

1.10 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

1.11 LIGHTING FIXTURES

- .1 Supply and install as shown on the drawings.

1.12 WIRING DEVICES

- .1 Wall Switches:
 - .1 Single pole toggle, ivory coloured, rated as indicated on the drawings. Standard of acceptance; Leviton or approved equal.
- .2 Receptacles:

- .1 Specification grade, 15 or ampere as stated on the plans, 120 AC rated - Leviton BR series or approved equal; ivory coloured.

1.13 MAST AND SERVICE ENTRANCE

- .1 Co-ordinate building mast with building contractor.
- .2 Provide meter socket and service entrance wiring. Make all arrangements to provide connections to Manitoba Hydro distribution system.

1.14 RECORD DRAWINGS

- .1 Before commencing work, obtain a set of white prints of all drawings pertinent to the work. Keep drawings on site and continuously update drawings to accurately record in colored pencil, all items such as alterations or additions, runs of conduit, numbers and locations or outlets, motors, panels and luminaires that may occur during progress of the work. Transpose this information onto a set of the latest Autocad drawings. All conduit runs must be shown on the record drawings, complete with size and wire count. Dimension buried conduit and cables from permanent datum points such as buildings.
- .2 Before requesting substantial performance certificate, make necessary final corrections, sign and date each print as certification of accuracy and deliver electronic copy to the Contract Administrator.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION 260501

PART 1 GENERAL

1.1 GENERAL

- .1 Provide complete grounding system as indicated on drawings.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as indicated.
- .2 Rod electrodes: copper clad steel 20 mm dia by 3 m long.
- .3 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Connect building structural steel and metal siding to ground.
- .8 Make grounding connections in radial configuration only, with connections terminating. Avoid loop connections unless otherwise indicated.

3.2 ELECTRODES

- .1 Install rod electrodes and make grounding connections.
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- .2 Bond separate, multiple electrodes together.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 260501 - Common Work Results - Electrical.

3.4 POOL AND SPLASH PAD SYSTEM

- .1 Install bonding and grounding connections for pool structures, metal parts of the pools, and other non-electrical equipment associated with the pool such as pipings, pool reinforcing steel, ladders, diving board support etc. as per Canadian Electrical code C22.1-2012 rule 68-058.

3.5 TESTS

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions. A report shall be submitted from the testing agency.
- .2 Provide continuity measurement test for the followings, which includes but not limited to:
 - .1 Between each structural Splashpad reinforced metal structure wall and ground loop system.
 - .2 Between the electrodes.
 - .3 Between all associated metal parts of the splash pad and ground loop system.
 - .4 Between all bonding points and ground loop system.
 - .5 Between main ground grid and splash pad ground loop.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator, if provided, during tests.
- .5 A ground electrode with an unsatisfactory resistance test result shall be altered as necessary until the required resistance reading is achieved.

END OF SECTION 260528

PART 1 GENERAL1.1 REFERENCES

- .1 Canadian Standards Association, (CSA International)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

PART 2 PRODUCTS2.1 CABLE PROTECTION

- .1 38 x 140 mm planks treated copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

PART 3 EXECUTION3.1 DIRECT BURIAL OF CABLES

- .1 After sand bed specified is in place, lay cables. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
 - .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.
- .4 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .5 After sand protective cover is in place, install continuous row of overlapping treated planks as indicated to cover length of run.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .2 Check phase rotation and identify each phase conductor of each feeder.
- .3 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .4 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .5 Acceptance Tests

- .1 Ensure that terminations and accessory equipment are disconnected.
- .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .3 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing in accordance with manufacturer's recommendations.
- .4 Leakage Current Testing.
 - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
 - .2 Record leakage current at each step.
- .6 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test.
- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION 260544

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, and enclosure dimensions.

PART 2 PRODUCTS

2.1 PANELBOARDS

- .1 Panelboards: product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .3 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .4 Two keys for each panelboard and key panelboards alike.
- .5 Copper bus with neutral of same ampere rating as mains.
- .6 Mains: suitable for bolt-on breakers.
- .7 Trim with concealed front bolts and hinges.
- .8 Trim and door finish: baked grey enamel.
- .9 Acceptable manufacturer's: Square D, Cutler-Hammer, or approved equal.

2.2 MAIN SERVICE ENTRANCE BREAKER

- .1 Provide main breaker.

2.3 BREAKERS

- .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .2 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .3 Breakers for motors which are not in direct line of sight to be "lockable" for servicing of motors. Provide one lock for each four or less lockable type breakers.

- .4 Common trip breakers: with single handle for multi-pole applications.
- .5 RMS symmetrical current interrupting capacity to match panel.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards
- .3 Wiring in panel boards shall be neat and set in as if laced.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus.
- .6 Label panelboards and breakers as per Section 260501.

END OF SECTION 262417

PART 1 GENERAL

1.1 GENERAL

- .1 Furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings and modifications as specified herein and as shown on the contract drawings. Integrate the AC surge protection into AC Power Service Entry, as shown on the plans.
- .2 The specified system shall provide effective TVSS in all ANSI/IEEE C62.41 - 1991 environments connected on the load side of the facilities meter

1.2 STANDARDS/REFERENCES

- .1 All referenced SPD's and their respective components shall be designed, manufactured, assembled, and tested in accordance with the latest applicable ANSI/UL Standard 1449, 3rd Edition.
- .2 Systems shall be designed, manufactured, tested and installed in accordance with the following standards:
 - .1 ANSI/IEEE C62.41.1 - IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits
 - .2 ANSI/IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low Voltage (1000V and under) AC Power Circuits
 - .3 ANSI/IEEE C62.45 - IEEE Guide for Surge Testing on Equipment in Low Voltage AC Power Circuits.
 - .4 FIPS Pub 94 (1983) – USDC Guide for Installation Techniques on Electrical Power Environments
 - .5 CSA.
 - .6 Canadian Electrical Code.– Article 250, 280 & 285
 - .7 National Fire Protection Association - NFPA-20, NFPA-70, NFPA-75, and NFPA-780
 - .8 IEEE Emerald Book –Manual for operation of electronic loads, including grounding techniques
 - .9 American National Standards Institute.

1.3 DEFINITIONS

- .1 **Single Element:** the safety tested implementation of industrial-grade, 'extra-large block' MOV's close-coupled/connected to each surge-path Using minimum 45kA rated Single Element per surge-path architecture that provides single voltage and 'response time' thresholds to virtually eliminate inherent and random SPD degradation.
- .2 **Zoned and Cascading Protection/Isolation System:** the safety tested implementation of 'Zoned' Primary and Secondary levels of industrial-grade, 'extra-large block' MOV's close-coupled/connected to each surge-path.
- .3 **SCCR –Short Circuit Current Rating:** the proven suitability of an SPD for use on an AC power circuit that is capable of safely delivering not more than a declared symmetrical or available current at a declared voltage during a 'short circuit condition'

1.4 EXCLUSIONS

- .1 No User accessible, integral or external, disconnect switch intended for easy removal of the SPD from power source is permitted.
- .2 SPD designs with “User Replaceable Surge Current Diversion Modules”, or ‘plug-in’ replaceable SPD modules shall not be permitted.
- .3 “Balanced Suppression Platform”, conventional multi-element arrays, or “Computer-matched MOV Array” technology shall not be permitted as a substitute for safety-fused single element technology.
- .4 No mixing of SPD/TVSS brands will be permitted within the same facility.

1.5 PRODUCT DATA

- .1 Submit shop drawings.
- .2 Provide verification of the SPD Systems’ compliance with the required ANSI/UL 1449, 3rd Edition Listing by Underwriters Laboratories (UL) or other valid Nationally Recognized Testing Laboratory (NRTL), such as “c ETL us Listed”, “c UL us Listed”, “c CSA us Listed”, “Intertek/ETL LISTED”.
- .3 Compliance data, including Agency Listing or Agency Control Identification No.; Manufacturer’s Model numbers; SPD Type; System Voltage Type; Wiring Diagrams; Voltage Protection Ratings; applicable Technical Specifications and/or mechanical drawings; and Installation Sheets.
- .4 Where applicable, additional product information sheets and bulletins shall be provided to further clarify design, performance, application, and installation qualifying details.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- .1 Labeled as Type 1 or 2, intended for Load or Line side of over-current protection.
 - .1 Type 1; line-side SPD”, no breaker or disconnect into the primary level Main Distribution Panel, Motor Control Center, or Main
 - .2 Type 2: ‘close-coupled’ to a dedicated circuit breaker or disconnect within power panel or switchgear.
- .2 UL 1449, 3rd Ed. All SPD’s shall bear either the ‘c ETL us Listed’, ‘c UL us Listed’, or ‘c CSA us Listed’ labels.
- .3 Provide Non-degrading, Single Element Protection.
- .4 Full manufacturer’s replacement warranty (parts): minimum 10 years.

2.2 DISTRIBUTION PANEL

- .1 Provide one Type 2 rated unit for the service entrance panel:
 - .1 ENEMA 12 enclosure.
 - .2 Rated for up to 100 kW per phase.

- .3 Single element or parallel multi-element protection mode.
- .4 Standard of acceptance: SurgePure MACH 1 series, Eaton SPD 100 standard series or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Supply and install, wire and connect to SDP in accordance with manufacturer's recommendations and installation instructions.
- .2 Fully comply with the provider's installation requirements, precautions, on-site testing and application verifications to validate User Warranty and to achieve maximum SPD System integrity and performance.
- .3 Provide breaker in panel as required.

END OF SECTION 264313

PART 1 GENERAL1.1 INTRUSION ALARM

- .1 System partitioning: System should be logically separated (partitioned) to effectively protect the building's perimeter.
 - .1 Perimeter partition, which can be armed as "Stay" or "Away".
 - .2 Partition should have dedicated output points for Arm, Burg, System Trouble, Zone Fault, and Zone Tamper.
 - .3 Partition should have an audible notification device (e.g. siren, bell, horn, etc). The audible notification devices signal should not lose more than 40% of SPL at the most distant point due to attenuation, refraction, reverberation, etc.
 - .4 Perimeter partition should have external weather resistant audible and visual notification devices (e.g. sirens, light strobes, etc).
 - .2 Head end: The system's head end should meet the following requirements:
 - .1 Hardware type used is DSC Maxsys PC4020 Series.
 - .2 Cables from all field devices should be home-run to the head end location.
 - .3 Only ULC listed and Department of Labour approved enclosures should be used.
 - .4 All enclosures (including card access, power supply, and auxiliary interface enclosures) should have tamper switches and locks. No padlocks are accepted. Locks on all enclosures should be keyed identically.
 - .5 All enclosures (including card access, power supply, and auxiliary interface enclosures) should be installed at serviceable heights (min 3ft – max 6ft).
 - .6 All enclosures (including card access, power supply, and auxiliary interface enclosures) should be interconnected with electrical conduits. The size of conduits should allow for 40% future expansion.
 - .7 All power supplies (including card access power supplies) loads should not exceed 70% of nominal.
 - .8 All power supply transformers for any type of DSC controllers should be installed in a separate dedicated enclosures located in the same room as the controller or expander panels.
 - .9 All security equipment (including card access and auxiliary interface equipment) power supplies should be fed from a separate building power circuit connected to an emergency power source.
 - .10 PC4020 is not allowed to be a power source for anything other than the ComBus (Communication Bus) (exclusive for the primary keypad).
 - .11 PC4204CX modules should be used to power up sirens, motion detection devices, keypads and other remote ComBus devices. PC4204CX load should not exceed 70% of nominal.
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- .12 A dedicated PC4204CX should be used to power up all audible notification devices. PC4204CX load should not exceed 70% of nominal.
 - .13 Each PC4020 should communicate back to the central monitoring location an AC Fail condition.
 - .14 Battery backup should be installed for every controller supplied with battery backup terminals.
 - .3 Field devices and cabling
 - .1 General cable and field device requirements:
 - 1. Use premium quality (e.g. Belden) stranded cables.
 - 2. All cables should be run in conduit.
 - 3. No cable splices are accepted.
 - 4. All status changing field devices should have DEOL (Double End of Line) supervision.
 - 5. All field device terminations and connections must be soldered.
 - 6. All cables should be uniquely and clearly labelled on both sides of the run. Labels should be permanent and not be susceptible to disconnection from the cable if exposed to thermal or mechanical influence.
 - 7. All cables should be labelled in ascending order in clockwise direction relative to the floor plan. The labelling sequence starts at the device installed by the primary entrance to the building or partition.
 - 8. An as-built indicating all cable runs and identifying the cables should be submitted as well as the system layout diagram created with accordance to DSC design specifications.
 - .2 Arming Stations
 - .1 An arming station consists of a card access card reader, an LCD4501 intrusion alarm keypad enclosed inside a universal Honeywell guard TG511A1000.
 - .2 Arming stations should always be installed on the secure side of partitions.
 - .3 An arming station should provide for a "Stay" and "Away" indication if applicable to a partition.
 - .4 A 7/8" hole must be made in the front cover of TG511A1000 aligned with a 1/2" hole made in the front cover of LCD4501 to allow users access to the right scroll button of LCD4501.
 - .5 Arming station devices should be installed 48" from the floor level to centre to meet the accessibility requirement, and not more than 6" apart.
 - .6 22AWG-6c cable should be used for an LCD4501 connection.
 - .3 Doors
 - .1 Normal or narrow gap GE Security 1076 series recessed type 1" door contacts should be used on all protected doors.
 - .2 If a door monitored by both intrusion alarm and card access system door position switches, a DPDT contact should be used.
 - .3 All monitored doors should comply with a "double hit" by-law. In other words, a door should always be monitored by a secondary detection device (e.g. a motion detector, a set of optical beams, etc) in addition to a door contact.
 - .4 Any door contact cabling should be recessed at any transition point from the wall, ceiling, basement, etc.
 - .5 22AWG-4c cable should be used for each door switch connection.
 - .4 Motion detection
 - .1 All interior spaces with windows, glass walls, or other possible points of entry should be protected by motion detection devices.
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- .2 Motion detection devices should be selected to address potential issues with detection obstructions and serviceability, and provide for maximum coverage and efficiency (e.g. motion sensors designed to provide a 90 degrees coverage of a space should be installed precisely in the corner without any offsets).
- .3 No swivel mounts are allowed for motion sensors installation.
- .4 Approved motion sensing devices are:
 - .1 Linear and angular detection: Honeywell DT7550C model (up to 50'), Optex CX-702 (50' and more).
 - .2 Photo-electric beams: Optex AX-70/130/200TN, Optex RN4 10-25/25-75/75-150 (for higher sensitivity and security areas).
- .5 22AWG-6c cable should be used for each motion sensor connection.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used

END OF SECTION 281301

