Division 01

General

Section #	Section Name	Pages
01000	GENERAL REQUIREMENTS	3
01300	SUBMITTALS	18
01430	OPERATION & MAINTENANCE DATA	10
01500	TEMPORARY FACILITIES	8
01501	CONSTRUCTION SEQUENCING	8
01505	MOBILIZATION & DEMOBILIZATION	2
01780	PROJECT CLOSEOUT PROCEDURES	4
01810	EQUIPMENT TESTING & FACILITY COMMISSIONING	14
01820	DEMONSTRATION & TRAINING	5

SECTION 01000
GENERAL REQUIREMENTS

PART 1 GENERAL.....1

1.1 DESCRIPTION.....1
1.2 BONDS AND INSURANCE.....1
1.3 MOBILIZATION AND DEMOBILIZATION.....1
1.4 MAINTENANCE SECURITY.....1
1.5 BASIS OF PAYMENT.....1
1.6 SUBSTANTIAL PERFORMANCE OF THE WORK.....2
1.7 REQUIREMENTS OF AUTHORITIES AND AGENCIES.....2
1.8 NATURE OF SITE.....2
1.9 DAMAGE TO EXISTING UTILITIES AND STRUCTURES.....2
1.10 OCCUPYING THE SITE.....3
1.11 SITE EXAMINATION.....3

SECTION 01000
GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

.1 This Section specifies the requirements for the Field Office, Bonds, Insurance, Mobilization, Demobilization and the Maintenance Holdback.

1.2 BONDS AND INSURANCE

.1 Provide a Performance Bond in an amount equal to 100% of the Contract Price, a Labour and Material Payment Bond in an amount equal to 100% of the Contract Price, and Insurance as outlined in the General Conditions and Supplemental General Terms and Conditions.

1.3 MOBILIZATION AND DEMOBILIZATION

.1 Refer to Section 01505 – Mobilization & Demobilization for requirements with respect to mobilization and demobilization.

.2 Supply and erect all signs, barricades, flashers, delineators, flag persons, and such other protection as may be required in order to protect the public during the performance of the Work.

.3 If required, move onto the Site and set up offices, storage facilities, sanitary facilities, temporary fencing, hydro and telephone.

.4 Remove and move off Site any offices, storage facilities, and all temporary facilities and leave the Site in a clean and tidy condition.

1.4 MAINTENANCE SECURITY

.1 Refer to the General Conditions and the Articles of Agreement for Warranty and Maintenance Security requirements.

1.5 BASIS OF PAYMENT

.1 Payment for Bonds and Insurance shall be included in the Monthly Payment Certificate after OCWA has received the required bonds and proof of insurance in a form satisfactory to OCWA, confirming that OCWA's bonding and insurance requirements have been met.

.2 Payment for the Mobilization/Demobilization requirements of this Section shall be made as follows:

.1 Sixty percent (60%) upon commencement of construction, i.e. full mobilization. The payment for mobilization shall be included in the first payment certificate issued for the Contract subject to the Consultant being satisfied that full mobilization has been carried out. If the Consultant is not satisfied, the Consultant shall allow a payment in an amount which, in the Consultant's opinion, reflects the degree of mobilization effected to date.

.2 Progressively from 60% at the commencement of construction to 85% at Substantial Performance of the Work.

.3 The remaining 15% is to be paid upon Total Performance of the Work.

.3 Payment for all costs associated with the monies withheld as maintenance holdback, including interest thereon, shall be made under this item. No other

compensation for the maintenance holdback will be considered except as provided for otherwise in the Contract Documents.

1.6 SUBSTANTIAL PERFORMANCE OF THE WORK

.1 Before OCWA takes over the Work from the Contractor or issues the Certificate of Substantial Performance, the requirements for Section 01810 - Equipment Testing & Facility Commissioning, Section 01820 - Demonstration & Training, and Section 01780 - Contract Closeout shall have been completed to the satisfaction of the Consultant and all certificates from equipment suppliers stating that their equipment has been satisfactorily installed, tested and is in proper working order shall have been received by the Consultant.

.2 The date of Substantial Performance of the Work as shown on the Certificate of Substantial Performance will be the date of satisfactory completion of Testing and Commissioning or Demonstration and Training, whichever is later, or a date thereafter, provided that all applicable requirements in the Contract Documents are satisfied.

1.7 REQUIREMENTS OF AUTHORITIES AND AGENCIES

.1 The Contractor shall be responsible for complying fully with the requirements of all authorities and agencies that govern any or all of the Work under this Contract. These requirements may affect installation and construction methods and may include a requirement to provide written notice to an authority or agency prior to the commencement of the Work. When written notice to an authority or agency is required, a copy of the notice shall be submitted to the Consultant by the Contractor.

1.8 NATURE OF SITE

.1 The Contractor shall make a careful examination of the Site and shall take all such steps as are necessary in order to ascertain the conditions under which the Work is to be carried out. No extra money shall be payable to the Contractor due to soil and/or groundwater conditions adversely affecting the Contractor's Work or any other matter affected by the Site or Site conditions.

1.9 DAMAGE TO EXISTING UTILITIES AND STRUCTURES

.1 The Contractor shall, at the Contractor's own expense, obtain the necessary drawings and perform any necessary subsurface investigations in order to determine the exact number and location of all existing utility services, structures, underground pipes, cables, and other similar items. The locations of existing structures and underground pipes, cables, utilities, and other similar items as shown on the Contract Drawings does not relieve the Contractor of its responsibility to determine the actual locations of all existing utility services, structures, underground pipes, cables and other similar items.

.2 The Contractor shall take all necessary steps to ensure that no damage is caused to existing structures, buildings, foundations, roads, sidewalks, property, utility services, and other similar items during the progress of the Work.

.3 If any damage is caused, the Contractor shall repair and make good such damage at the Contractor's own expense within a reasonable time and to the complete satisfaction of OCWA.

1.10 OCCUPYING THE SITE

.1 The Contractor must comply with the insurance and WSIB requirements of the Contract for the duration of the Contract. If the Contractor fails to meet the insurance and WSIB requirement, OCWA shall exercise its right in GC 23.4 or issue a Stop Work Order until the Contractor has met the insurance and WSIB requirements of the Contract.

.2 Only those areas designated by the Consultant for the Contractor's access shall be used for the execution of the Work and, in executing the Work, the Contractor shall not unnecessarily obstruct the normal flow of traffic, to, from, or about the Site; and shall not unreasonably allow any vehicles or materials to stand in front of, or near to, any buildings or building access areas on the Site.

.3 The Contractor shall confine its operations within the areas designated for construction, storage and access as shown on the Contract Drawings and/or as directed by the Consultant.

.4 The Contractor shall limit its access to and from the Site as instructed by the Consultant.

.5 The Contractor shall maintain safe access to all existing facilities for OCWA's operations staff at all times for the duration of the Contract.

.6 The Contractor's occupation or use of any areas of the Site occupied by operational plant (Restricted Areas) shall be limited to such times as are necessary for the execution of the Work in those areas. The Contractor shall clearly identify in its schedule when occupation of any Restricted Areas is required and shall notify the Consultant in writing when such possession is required a minimum of 10 Working Days in advance.

.7 The Contractor shall not occupy or use any of the Restricted Areas for a longer period than is necessary for the execution of any part of the Work to be undertaken in those areas, nor shall the Contractor occupy an area greater than the minimum required in order to complete that part of the Work.

1.11 SITE EXAMINATION

.1 The Contractor shall, during the time of tendering, visit the Site before submitting its tender and satisfy itself by personal examination as to the local conditions to be met during the construction and conduct of the Work. The Contractor shall make its own estimate of the facilities and difficulties to be encountered including the nature of the subsurface materials and conditions. The Contractor shall not claim, at any time after submission of its tender, that there was any misunderstanding of the terms and conditions of the Contract relating to Site conditions.

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL.....1

1.1 DEFINITIONS.....1
1.2 SUBMITTALS PROCEDURE.....1
1.3 SUBMITTAL REQUIREMENTS.....2
1.4 SUMMARY.....3
1.5 CONSTRUCTION AND SUBMITTALS SCHEDULES.....3
1.6 PROCEDURES.....4
1.7 ACTION SUBMITTALS.....6
1.8 SUPPLEMENTS.....16

PART 2 PRODUCTS (NOT USED).....16

PART 3 EXECUTION (NOT USED).....16

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.1 DEFINITIONS

.1 Action Submittal: Written and graphic information submitted by the Contractor, that requires the Consultant's review, comment and approval.

.2 Informational Submittal: Information submitted by the Contractor, that does not require the Consultant's review. Submittals not meeting the requirements of the Contract will be returned.

.3 Shop Drawings: Drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.4 Sample: A physical portion of a specified product.

1.2 SUBMITTALS PROCEDURE

.1 The Contractor shall direct submittals to the Consultant at the address specified in the Articles of Agreement, unless specified otherwise in the Contract Documents.

.2 The Contractor shall review all submittals promptly, and in orderly sequence, to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.3 The Contractor shall coordinate each submittal with requirements of work and Contract Documents. Individual submittals will not be reviewed until all related information is available.

.4 The Contractor shall allow 10 working days for Consultant review of each submittal.

.5 Adjustments made on shop drawings by the Consultant are not intended to change contract price. If adjustments affect value of Work, state such in writing to the Consultant immediately after receipt of approval of shop drawings. If value of work is to change a Change Order must be issued prior to proceeding with work.

.6 The Contractor shall submit an electronic copy in PDF format of shop drawings for each requirement requested in specification sections and as the Consultant may reasonably request.

.7 The Contractor shall submit electronic copy in PDF format of product data sheets or brochures for requirements requested in specification sections and as requested by the Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.8 If upon review by the Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned to the Contractor and fabrication and installation of work may proceed. If shop drawings are rejected, noted copy will be returned to the Contractor and resubmittal of corrected shop drawings, through same procedure indicated above, must be performed by the Contractor before fabrication and installation of work may proceed.

.9 After Consultant review, the Contractor shall distribute copies of the approved submittal. The Contractor shall not proceed with work until relevant submittals are reviewed by the Consultant

.10 The Contractor shall notify the Consultant, in writing at time of submittal, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.11 The Contractor shall verify field measurements and affected adjacent work are coordinated.

.12 The Contractor's responsibility for errors and omissions in submittal is not relieved by the Consultant's review of submittals.

.13 The Contractor's responsibility for deviations in submittal from requirements of Contract Documents is not relieved by the Consultant's review of submittal, unless the Consultant gives written acceptance of specific deviations.

.14 The Contractor shall make any changes in submittals which the Consultant may require consistent with Contract Documents and resubmit as directed by the Consultant. When resubmitting, the Contractor shall notify the Consultant in writing of revisions other than those requested by the Consultant.

.15 The Contractor shall keep one reviewed copy of each submittal on site.

1.3 SUBMITTAL REQUIREMENTS

.1 This section specifies general requirements and procedures for Contractor's submissions of shop drawings, product data, samples and mock-ups to the Consultant for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 The Contractor shall review submittals prior to submittal to the Consultant. This review represents that the necessary requirements of the Work have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned to the Contractor without being examined and shall be considered rejected.

.3 Submittals shall indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Information not applicable to the Work must be deleted prior to submittal.

.5 Supplement standard information to provide details applicable to the Work.

.6 Cross-reference product data information to applicable portions of Contract Documents.

.7 Samples include examples of materials, equipment, quality, finishes, workmanship. Label samples with origin and intended use.

.8 Notify the Consultant in writing, at the time of submittal of any deviations in the samples from the requirements of the Contract Documents.

.9 Where colour, pattern or texture is criterion, submit full range of samples. Make changes in samples, which the Consultant may require, consistent with Contract Documents. Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified

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

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

.12 Professional Engineer Design

.1 Where Specification Sections require design by a Professional Engineer, such engineer is required to be licensed in the related discipline in the Province of Ontario.

1.4 SUMMARY

.1 As a minimum, the Contractor shall submit the following submittals to the Consultant, or his designate, before, during and after construction:

.1 Construction schedule.
.2 Proposed location and details of temporary buildings (if any)
.3 Shop drawings for permanent and temporary works.
.4 Samples.
.5 Tests and reports.
.6 Maintenance data and operating instructions.
.7 Maintenance materials.
.8 Lump Sum breakdown of Tender price.
.9 Interference Drawings.
.10 Record Drawings.
.11 NSF 61 and NSF 372 certifications of materials and equipment.
.12 Permits/certificates from various regulatory agencies (such as TSSA, ESA etc.).
.13 Commissioning plans and schedules
.14 On-the-Job Training form (OJT)

.2 Facsimile transmissions will not be acceptable.

1.5 CONSTRUCTION AND SUBMITTALS SCHEDULES

.1 Within one week of receiving the order to commence the Work, the Contractor shall submit for review by Consultant, the proposed construction schedule and schedule of submittals. Update schedules as required with delineation of critical path.

.2 Show the proposed progress and dates for submittal acceptance of the main items, structures and Subcontractors of the Contract in a clear, graphical manner in weekly stages.

.3 Include the following items in the construction schedule as a minimum:

.1 Mobilization and other preliminary activities.
.2 Obtaining permits.
.3 Early procurement activities for long lead time items.

.4 Construction sequence, phases, constraints and milestones.
.5 Delineation of critical path and float days.
.6 Delivery dates for major equipment items.
.7 Civil, structural, architectural, process mechanical, building services, electrical, instrumentation and control work.
.8 Interfaces with work provided by OCWA/or and others.
.9 Start-up and testing activities for equipment and systems.
.10 Contract closeout activities.
.11 Demobilization and grounds restoration.
.12 Performance testing, FAT, SAT, training, shutdowns/tie-ins to existing structure.
.13 Commissioning plan and schedule

.4 Submit a revised construction schedule with each monthly payment application, for the duration of the Contract.

.5 Every week submit to the Consultant a summary showing the major construction activities planned for the following 2 weeks.

.6 Failure to submit schedules as specified may result in delayed progress payments at the discretion of OCWA.

1.6 PROCEDURES

.1 The Contractor shall:

.1 Review each submittal and check it for compliance with the Contract Documents.

.2 Stamp each submittal with a uniform approval stamp before submitting to the Consultant.

.3 The stamp shall include the Contract name, submittal number, Specification number, Contractor's reviewer name, date of Contractor's approval, and a statement certifying that the submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

.4 The Consultant will not review submittals that do not bear the Contractor's approval stamp and will return them without action.

.5 The Consultant will not review submittals received directly from a Subcontractor or supplier and will return them without action.

.6 Complete, sign, and transmit with each submittal package, one Transmittal of Contractor's Submittal form attached at the end of this Section.

.1 Identify each submittal with the following:

.1 Numbering and Tracking System:

.1 Sequentially number each submittal.

.2 Any resubmittals of a submittal shall have the original number with a sequential alphabetic suffix.

.3 Specification Section and subsection to which the submittal applies

.4 Contract title and the Consultant's project number.

.5 Date of transmittal.

.6 Names and addresses of the Contractor, Subcontractor or supplier, and manufacturer as appropriate

.2 Include a signed Transmittal of Contractor's Submittal included as a supplement to this Section in order to identify and describe each deviation or variation from the Contract Documents with each submittal. If no deviation is applicable, then the form must indicate 'no deviation from Contract'.

.3 Accompany submittals with transmittal letter, containing:

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

.2 Other pertinent data.

.2 Submittals shall include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

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

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

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

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.3 Format:

.1 Do not base submittals on reproductions of the Contract Documents.

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

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

.4 Include an index with labelled tab dividers in an orderly manner.

.4 Timeliness: Schedule and submit in accordance with the schedule of submittals, and the requirements of the individual Specification Sections.

.5 Processing Time:
  .1 The time for review shall commence upon the Consultant's receipt of the submittal.
  .2 The Consultant will act upon the Contractor's submittal and transmit a response to the Contractor no later than 10 Working Days after receipt, unless otherwise specified in the Specification Sections.
  .3 Resubmittals will be subject to the same review time.
  .4 No adjustment of Contract Time or Contract Price will be allowed due to delays in the progress of the Work caused by the rejection of submittals and subsequent resubmittals.
  .5 Allow for additional review time required for complex equipment and systems.

.6 Re-submittals: Clearly identify each correction or change made. Two submittals of each submittal (original submittal and one resubmittal) will be processed at no charge to the Contractor. The cost of any processing/review time incurred by the OCWA beyond the two submittals will be charged back to the Contractor and deducted from the next progress draw.

.7 Incomplete Submittals:
  .1 The Consultant will return the entire submittal for the Contractor's revision if the preliminary review deems it incomplete.
  .2 The submittal will be deemed incomplete when any of the following items are missing:
    .1 The Contractor's review stamp completed and signed.
    .2 Transmittal of the Contractor's Submittal Form completed and signed.
    .3 Deviation form completed and signed.
    .4 Deviations identified during the review which were not identified on the deviation form.
    .5 Insufficient number of copies.

.8 Submittals not required by the Contract Documents:
  .1 Will not be reviewed and will be returned stamped "Not Subject to Review."
  .2 The Consultant will keep one copy and return all remaining copies to the Contractor.

1.7 ACTION SUBMITTALS

.1 The Contractor shall prepare and submit a list of Action Submittals required by the individual Specification Sections.

.2 Shop Drawings:
  .1 Copies: Six (6).
  .2 The Contractor shall identify and indicate:
    .1 The applicable Contract Drawing and Detail number, Products, units and assemblies, and system or equipment identification or tag numbers.
    .2 The Equipment and Component Title: Identical to the title shown on the Contract Drawings.

.3 Critical field dimensions and relationships to other critical features of the Work. Note any dimensions established by field measurement.

.4 Project specific information drawn accurately to scale.

.3 Manufacturer's standard schematic drawings and diagrams:

.1 Modify to delete any information that is not applicable to the Work.

.2 Supplement standard information to provide information specifically applicable to the Work.

.4 Product Data: Provide as specified in the individual Specification Sections.

.5 Foreign Manufacturers: When proposed, include the following additional information:

.1 Names and addresses of at least two (2) companies that maintain technical service representatives close to the location of the Site.

.2 Complete list of spare parts and accessories for each piece of equipment and the address of the closest supplier.

.6 Units: Submit all Shop Drawings in SI metric units.

.3 Samples:

.1 Submit samples of materials to be used in the Work for review. Adhere to the requirements of the Specifications Sections. If no quantity of samples is specified, two samples will be required for architectural materials and one sample of metal and mechanical items.

.2 Do not use material in the work which is in any way inferior to the samples submitted and reviewed. Match accepted samples.

.3 Preparation: Mount, display, or package samples in the manner specified by the manufacturer to facilitate a review of their quality. Attach a label on the unexposed side that includes the following:

.1 Manufacturer's name

.2 Model number

.3 Material

.4 Sample source

.5 Manufacturer's Colour Chart: Units or sections of units showing the full range of colours, textures, and patterns available.

.6 Full size Samples:

.7 Size as indicated in the individual Specification Sections

.8 Prepared from the same materials to be used for the Work

.9 Cured and finished in a manner specified by the manufacturer

.10 Physically identical to the Product proposed for use.

.4 Review of samples notwithstanding, materials that are unsound or imperfect when delivered to site will be rejected.

.5 Identify samples by project name and number, date, name of Contractor and all other pertinent information.

.6 Retain reviewed samples on Site and make them available to the Consultant when required.

.7 Action Submittal Dispositions: The Consultant will review, mark, and stamp as appropriate, and distribute marked up copies as noted:

.1 No Exceptions Taken:

.1 The Contractor may incorporate the Product(s) or implement the Work covered by the submittal.

.2 Distribution:

.1 One copy furnished to OCWA.

.2 Once copy furnished to OCWA's project representative.

.3 One copy retained in the Consultant's file.

.4 Remaining copies returned to the Contractor with the appropriate annotations.

.2 Exceptions Noted:

.1 The Contractor may incorporate the Product(s) or implement the Work covered by the submittal, in accordance with the Consultant's notations.

.2 Distribution:

.1 One copy furnished to OCWA.

.2 One copy furnished to OCWA's project representative.

.3 One copy retained in the Consultant's file.

.4 Remaining copies returned to the Contractor with the appropriate annotations.

.3 Exceptions Noted, Resubmit:

.1 The Contractor may not incorporate the Product(s) or implement the Work covered by the submittal.

.2 Distribution:

.1 One copy furnished to OCWA's project representative.

.2 One copy retained in the Consultant's file.

.3 Remaining copies returned to the Contractor with the appropriate annotations.

.8 Informational Submittals.

.1 General:

.1 Copies:

.1 Submit three copies, unless otherwise indicated in the individual Specification Sections.

.2 Refer to the individual Specification Sections for specific submittal requirements.

.3 The Consultant will review each submittal for general conformance with the Contract Documents.

.4 The Consultant's review does not relieve the Contractor from its obligations to comply with the requirements of the Contract, nor shall it relieve the Contractor of its responsibility for any consequences which may arise out of errors in the shop drawings or in the Contractor's design.

.5 If the submittal meets the conditions of the Contract, the Consultant will retain one copy for record purposes, and forward the other copies to the appropriate parties.

.6 If the Consultant determines that the submittal does not meet the requirements of the Contract and is therefore considered unacceptable, the Consultant will retain one copy and return the remaining copies with review comments to the Contractor and will require that the submittal be corrected and resubmitted.

.7 Distribution:

.1 One copy furnished to the OCWA's project representative.

.2 One copy retained in the Consultant's file.

.3 One copy furnished to the OCWA

.9 Certificates:

.1 General:

.1 Provide a notarized statement that includes the signature of the entity responsible for preparing the certification.

.2 Signed by an officer or other individual authorized to sign documents on behalf of that entity.

.2 Welding: shall be in accordance with the individual Specification Sections.

.3 Installer: Prepare written statements on the manufacturer's letterhead certifying that the installer complies with the requirements as specified in the individual Specification Sections.

.4 Material Test: Prepared by a qualified testing agency, on the testing agency's standard form, indicating and interpreting the test results of the material for compliance with the requirements of the Contract.

.5 Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by any applicable laws and regulations or governing agencies or as specified in the individual Specification Sections.

.10 Contractor Design Data:

.1 Written and graphic information

.2 List of assumptions

.3 List of performance and design criteria

.4 Summary of loads or load diagram, if applicable
.5 Calculations
.6 List of applicable codes and regulations
.7 Name and version of software
.8 Information requested in individual the Specification Sections.
.9 Seal and signature of a professional engineer licensed in the Province of Ontario.

.11 Manufacturer's Instructions: Written or published information that documents the manufacturer's recommendations, guidelines, and procedures in accordance with the individual Specification Sections.

.12 Operation and Maintenance Data: As required in Section 01430 - Operation and Maintenance Data.

.13 Special Guarantee/Warranty: Supplier's written guarantee as required in the individual Specification Sections.

.14 Statement of Qualification: Evidence of qualification, certification, or registration as required in the Contract Documents to verify the qualifications of the professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, specialist, installer, and other professionals.

.15 Submittals required by applicable Laws, Regulations, and Governing Agencies:
.1 The Contractor shall promptly submit all notifications, reports, certifications, payrolls, and other documents as may be required, directly to the applicable federal, provincial, or local governing agency or their representative.
.2 Transmit to the Consultant for the OCWA's records one copy of all correspondence and transmittals (to include enclosures and attachments) between the Contractor and the governing agency.

.16 Test and Inspection Reports:
.1 General: Shall contain the signature of the person responsible for the test or report. Insofar as practical, test materials and equipment on site. Where shop test is necessary, give the Consultant two weeks' notice in writing of proposed shop test date.
.2 Factory: Include the following, at a minimum:
.1 Identification of the Product, Specification Section, and type of inspection or test with reference to the applicable standard or code.
.2 Date of test, contract title and number, and name and signature of an authorized representative of the manufacturer.
.3 Test results.
.4 If a test or inspection deems that the material or equipment is not in compliance with the Contract Documents, identify the corrective action necessary to bring the material or equipment into compliance.
.5 Provide an interpretation of the test results, when requested by the Consultant. Complete an equipment report prior to site testing each item of rotating mechanical equipment. During testing complete

the remainder of the equipment report. Submit the reports for inclusion in the Installation, Operation and Maintenance manual.

.6 Before operating equipment, engage the services of a qualified manufacturer's service representative to inspect, operate, test and adjust the equipment after installation.

.7 Submit the manufacturer's representative's signed report describing in detail the inspection, tests and adjustments made, quantitative results and suggestions for precautions to be taken for correct maintenance. Verify that the equipment and its installation conform to the requirements of the Contract for the service intended and is ready for permanent operation. Bind copies of report into the installation, operation and maintenance manuals.

.8 Inspection includes:

.1 Soundness (without cracked or otherwise damaged parts).

.2 Completeness of installation as specified and as recommended by the manufacturer.

.3 Correctness of setting, alignment and relative arrangement of various parts of system.

.9 Operate, test and adjust equipment to prove it is correctly installed to operate under the intended conditions.

.10 Equipment will only be accepted after receipt of the manufacturer's representative's report.

.11 Submit notice in writing at least 48 hours before the manufacturer's representative is scheduled to perform these services.

.12 Modify or replace equipment or materials failing required tests.

.13 Perform additional testing required due to changes of materials requested by the Contractor or due to failure of materials or construction in order to meet the specification requirements of the Contract at no additional cost to the OCWA.

.14 Other items as identified in the individual Specification Sections.

.3 Field: At a minimum, include the following:

.1 Contract title and number.

.2 Date and time.

.3 Record of temperature and weather conditions.

.4 Identification of the Product and Specification Section.

.5 Type and location of test, sample, or inspection, including the reference to the applicable standard or code.

.6 Date issued, testing laboratory name, address, and telephone number, and name and signature of the laboratory inspector.

.7 If a test or inspection deems that the material or equipment is not in compliance with the Contract Documents, identify the corrective action necessary to bring the material or equipment into compliance.

.8 Provide an interpretation of the test results, when requested by the Consultant.

.17 Testing and Start-up Data: In accordance with Section 01810 - Equipment Testing & Facility Commissioning.

.18 Training Data: In accordance with Section 01820 – Demonstration & Training.

.19 Interference Drawings:

.1 Before the installation of any structural, mechanical, or electrical systems, prepare an integrated set of interference drawings in cooperation with all Subcontractors and/or Other Contractors.

.2 Show the locations and relationships of all Subcontractors and/or Other Contractors in mechanical and electrical equipment rooms, pipe spaces, tunnels, galleries, and basements, and all electrical conduits and pipes to be cast into structural slabs, walls, and columns.

.3 Submit updated interference drawings as the Work progresses.

.4 Make all necessary relocations due to interference with Other Contractors, as a result of incomplete interference drawings, at no cost to the OCWA.

.20 Informational Submittal Dispositions: The Consultant will review, mark, and stamp as appropriate, and distribute marked up copies as noted:

.1 Received for Information:

.1 The Contractor may incorporate the Product(s) or implement the Work covered by the submittal.

.2 Distribution:

.1 One copy furnished to the OCWA.

.1 One copy furnished to the OCWA's project representative.

.2 One copy retained in the Consultant's file.

.3 Remaining copies returned to the Contractor with the appropriate annotations.

.2 Exceptions Noted, Resubmit:

.1 The Contractor may not incorporate Product(s) or implement the Work covered by submittal.

.2 Distribution:

1. One copy furnished to the OCWA's project representative.
2. One copy retained in the Consultant's file.
3. Remaining copies returned to the Contractor with the appropriate annotations.

.21 Progress Photographs

.1 Progress photograph shall be electronically formatted and labelled as to location and view.

.22 Tower Crane (as applicable)

.1 Comply with the requirements of the Occupational Health and Safety Act and Regulations for Construction Projects.

.2 Submit complete shop drawings for tower crane signed and sealed by a licensed professional engineer. Submit design loads, foundation details,

details showing interface with permanent structure, and construction sequence as affected by installation of the crane.

.3 Shop drawings will be reviewed by the Consultant for general conformance with the geometry of the structure and for interference with the work. The Consultant will not review structural adequacy of the crane system.

.4 Where crane foundation is located on pile foundation of the permanent work, verify that loads imposed by the crane are within the specified capacities.

.23 Shop Drawings

.1 The review of shop drawings by the Consultant is for the sole purpose of ascertaining conformance with the general concept. The Consultant's review does not constitute the Consultant's approval of the detail design inherent in the shop drawings nor does it relieve the Contractor of its responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents.

.2 Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the Site, for information that pertains to fabrication processes or to techniques of construction and installation and for coordination of the work of all Subcontractors.

.3 Drawing submittals shall include, but not necessarily be limited to:

.1 Catalogue Drawings include reprints of catalogue drawings of proprietary articles of standard fabrication and manufacture for the work.

.2 Shop Drawings include dimensioned line drawings and related specifications, information and literature for custom fabricated articles and equipment.

.3 Submit six copies of shop drawings for review.

.4 Submit four copies of catalogue drawings for information.

.5 Submit all drawings in SI metric units.

.6 Two stamped shop drawings will be returned to the Contractor after review.

.7 None of the catalogue drawings will be returned to the Contractor if the equipment depicted conforms to the Specifications.

.8 Submit shop drawings well in advance of the time when the equipment is required for installation or material is required for use.

.9 Coordinate submittal of shop drawings prepared by various trades so that all information is available to allow comprehensive review and sufficient review time is available where the work of one trade interfaces with or affects the work of another. Recognize extensive engineering review time required for certain complex equipment or systems.

.10 Clearly identify each submittal as to the Project description, Contract number, Specification Section, paragraph number, Equipment Schedule number, if applicable and component.

.11 The Consultant will stamp each submittal as “REVIEWED, REVIEWED AS NOTED, or REVISE AND RESUBMIT”. Do not change shop drawings after they have been reviewed and stamped.

.12 Identify changes on re-submittals and include revision dates.

.13 Payment will not be authorized for equipment and materials delivered to the site of the works before corresponding shop drawings have been reviewed and accepted.

.14 If the Consultant requests details or items on shop drawings which the Contractor believes require extra payment or extension of scheduled contract time, make any claims within one week and receive acceptance of extra work, before proceeding with fabrication.

.15 Final review of specific equipment and materials shop drawings is subject to witnessing or review by the Consultant, of testing, start-up, commissioning and operation of the equipment for the periods specified, or performance of the material(s) and after all guarantees have been fulfilled as specified.

.16 The Consultant will review the shop drawings or Contractor’s design only for conformance with the Contract’s design concept and general arrangement. The Consultant’s review does not relieve the Contractor from compliance with requirements of the Contract Documents nor relieve the Contractor of its responsibility for and the consequences arising out of errors in the shop drawings or the Contractor’s design.

.17 Where work is to be designed by the Contractor, comply with applicable codes and submit shop drawings signed and sealed by a licensed Professional Engineer registered in the Province of Ontario.

.18 Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform with the design intent. Provide record “as built” shop drawings together with comprehensive operations and maintenance manuals.

.19 No claims will be allowed for monetary compensation or extension of the Contract Time, arising from delays related to shop drawings which are incomplete, lack sufficient information and which for those inadequacies, or for any other reason, are returned to the Contractor for revision and re-submittal, thus requiring repeated review by the Consultant.

.20 Keep one copy of each stamped, reviewed shop drawing at the site of the work for reference during construction work progress.

.21 Within four weeks of receipt of the written notice to commence the Work, submit to the Consultant, three copies of an itemized list

indicating all shop drawings which the Contractor proposes to submit.

.22 Shop drawings will not be reviewed and will be returned and considered rejected, unless they have been previously checked and initialed by the Contractor.

.24 Shop Drawings for Temporary Works

.1 Submit for review shop drawings of temporary works which:

.1 Control the dimensions and locations of any part of the structures to be constructed under the contract.

.2 Impose loads on parts of the works which are still under construction or on existing structures.

.2 Submit six copies of shop drawings for review. Payment will not be made for any items of Work started or completed without the required drawing review. Submit shop drawings well in advance of the time when they are required for construction. Coordinate shop drawings prepared by different trades so that information is available to prevent conflict or errors where the work of one trade affects the work of another.

.3 Two copies of submitted shop drawings will be returned to the Contractor after review.

.4 Shop drawings will be reviewed for conformity with the required arrangement and dimensions of the permanent structures and for general conformity with the specifications.

.5 If resubmittal is requested, discuss the comments made and resolve all issues raised by them, then resubmit the shop drawings amended accordingly.

.6 Do not begin construction of temporary works before review of the shop drawings is completed.

.7 Review of the Contractor's drawings does not relieve the Contractor of its responsibility for the results arising from errors or omissions of design or from the use or abuse of the temporary works.

.8 Keep one copy of each stamped, reviewed drawing at the site of the work for reference for the duration of the Work.

.9 Make no changes to shop drawings after they have been reviewed.

.10 Submit shop drawings in SI metric units.

.25 Temporary Buildings

.1 Submit to the Consultant for review, three copies of drawings showing details of construction and proposed location of temporary buildings including site trailers, prior to mobilization on site. One copy will be returned to the Contractor.

.26 Record Drawings

.1 The Consultant will supply a set of Contract Drawings. Mark thereon all revisions as the Work progresses to produce a set of Record Drawings.

.2 Note changes made during construction by any of Contractor's forces or those of its Subcontractors.

.3 Dimension locations of buried or concealed work, especially piping and conduit, with reference to exposed structures.

.4 The Certificate of Substantial Performance will not be issued until record drawings are complete and submitted.

.5 Update the record drawings and make available for monthly review. Drawings not maintained up to date will be considered as stipulated deductions for the purposes of progress payment certificates.

.6 Attach sketches and revisions issued by the Consultant to the pertinent record drawings.

.7 Submit record drawings for electrical schematic and instrument control diagrams. Submit operation and maintenance instruction manuals with updated control diagrams, revised to show construction revisions.

.8 The record drawings shall show the reference plan number.

.9 Submit record drawings in SI metric units.

1.8 SUPPLEMENTS

.1 The supplement listed below, following "End of Section", forms part of this Specification.

.1 Form: Transmittal of Contractor's Submittal

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

TRANSMITTAL OF CONTRACTOR'S SUBMITTAL

(ATTACH TO EACH SUBMITTAL)

DATE: _____

TO:_____

_____

_____

_____

_____

Submittal No.:_____

☐ New Submittal ☐ Resubmittal

Project:_____

Project No.:_____

Specification Section No.:_____

(Cover only one section with each transmittal)

Schedule Date of Submittal:

_____

FROM:_____

Contractor

_____

_____

_____

SUBMITTAL TYPE: ☐ Shop Drawing ☐ Sample ☐ Informational

The following items are hereby submitted:

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Spec. and Para. No.	Drawing or Brochure Number	Contains Variation to Contract	
				No	Yes

THE CONTRACTOR hereby certifies that (i) THE CONTRACTOR has complied with the requirements of the Contract Documents in the preparation, review, and submission of the designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and the requirements of laws and regulations and governing agencies.

By:_____

CONTRACTOR (Authorized Signature)

SECTION 01430
OPERATION & MAINTENANCE DATA

PART 1 GENERAL....1

1.1 SECTION INCLUDES....1
1.2 DEFINITIONS....1
1.3 MEASUREMENT AND PAYMENT....1
1.4 QUALITY ASSURANCE....1
1.5 SEQUENCING AND SCHEDULING....1
1.6 DATA FORMAT....2
1.7 SUBMITTALS....3
1.8 DATA FOR EQUIPMENT AND SYSTEMS....4
1.9 DATA FOR MATERIALS AND FINISHES....6
1.10 SUPPLEMENTS....7

PART 2 PRODUCTS (NOT USED)....7

PART 3 EXECUTION....7

3.1 SUBMISSIONS....7

SECTION 01430
OPERATION & MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 DEFINITIONS

.1 Preliminary Data: Initial and subsequent submissions for the Consultant's review.

.2 Final Data: Consultant-accepted data, submitted as specified in this Section.

.3 Maintenance Operation: As used on the Maintenance Summary Form, "maintenance operation" is defined to mean any routine operation required to ensure the satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

.4 Equipment Data: basic equipment information in electronic format.

1.3 MEASUREMENT AND PAYMENT

.1 The work outlined in this Section shall not be measured separately for payment. The work outlined in this Section shall be included in the lump sum price of the Contract.

1.4 QUALITY ASSURANCE

.1 Manuals for equipment and systems shall be prepared by equipment manufacturer or system supplier.

1.5 SEQUENCING AND SCHEDULING

.1 Equipment and System Data:

.1 Preliminary Data:

.1 Do not submit until the Shop Drawing for the equipment or system has been reviewed and accepted by the Consultant.

.2 Submit prior to the shipment date.

.2 Final Data:

.1 Submit instructional manual formatted data a minimum of 30 Days prior to equipment or system field functional testing.

.2 Submit compilation formatted and electronic media formatted data prior to Substantial Performance of the Work.

.2 Materials and Finishes Data:

.1 Preliminary Data:

.1 Submit a minimum of 15 Days prior to the request for final inspection.

.2 Final Data:

.1 Submit within 10 Days after final inspection.

1.6 DATA FORMAT

.1 Prepare preliminary data in the form of an instructional manual. Prepare final data in a data compilation format (subsection 1.6.1.2) and provide a copy of the same on electronic media.

.2 Instructional Manual Format:

.1 Binders: Commercial quality, permanent, three ring or three post binders with durable plastic covers.

.2 Size: letter size, minimum.

.3 Cover: Identify the manual with the typed or printed title "Operation and Maintenance Data" and list:

.1 Contract title.

.2 Designate applicable system, equipment, material, or finish.

.3 Identity of separate structure, as applicable.

.4 Identity of general subject matter covered in the manual.

.5 Identity of equipment number and Specification Section.

.4 Title Page:

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

.2 Subcontractor, supplier, installer, or maintenance subcontractor's name, address, and telephone number, as appropriate.

.1 Identify the area of responsibility of each.

.2 Provide the name and telephone number of the local source of supply for parts and replacement.

.5 Table of Contents:

.1 Neatly typewritten and arranged in systematic order with consecutive page numbers.

.2 Identify each Product by Product name and other identifying numbers or symbols as set forth in the Contract Documents.

.6 Paper: 10 kg minimum, white for typed pages.

.7 Text: Manufacturer's printed data, or neatly typewritten.

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

.9 Material shall be suitable for reproduction, with quality equal to the original. Photocopying of material will be acceptable, except for any material containing photographs.

.3 Data Compilation Format:

.1 Compile all Consultant-accepted preliminary O&M data into a hard copy, hard bound set.

.2 Each set shall consist of the following:

.1 Binder: ACCO binder P5436E.

.2 Cover: Identify each volume with the typed or printed title "Operation and Maintenance Data, Volume No. ___ of ___", and list:

1. Contract title.
2. Contractor's name, address, and telephone number.
3. If the entire volume covers equipment or system(s) provided by one supplier, include the following:

1. Identity of the general subject matter covered in the manual.
2. Identity of the equipment number and Specification Section.

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

.4 The table of contents shall be neatly typewritten, arranged in a systematic order:

1. Include a list of each Product, indexed to the content of each volume.
2. Designate the system or equipment for which it is intended.
3. Identify each Product by Product name and any other identifying numbers or symbols as set forth in the Contract Documents.

.5 Section Dividers:

1. Heavy, 40 kg cover weight, tabbed with numbered plastic index tabs.
2. Fly Leaf:
    1. For each separate Product, or each piece of operating equipment, with a typed description of the Product and any major component parts of equipment.
    2. List with each Product:
        1. Name, address, and telephone number of the Subcontractor, supplier, installer, and maintenance subcontractor, as appropriate.
        2. Identify the area of responsibility of each.
        3. Provide the local source of supply for parts and replacement.
    3. Identity of separate structure, as applicable.
    4. Store drawings folded into individual pockets.

.6 Assemble and bind material, as much as possible, in the same order as specified in the Contract Documents.

.4 Electronic Media Format:

.1 Portable Document Format (PDF):

.1 After all preliminary data has been found to be acceptable to the Consultant, submit O&M data in PDF format.

.2 Files are to be exact duplicates of the Consultant accepted preliminary data. Arrange by Specification number and name.

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

1.7 SUBMITTALS

.1 Informational:

.1 Data Outline: Submit four copies of a detailed outline of the proposed organization and contents of the final data prior to preparation of the preliminary data.

.2 Preliminary Data:

.1 Submit four copies for the Consultant's review.

.2 If the data meets the conditions of the Contract:

1. One copy will be returned to the Contractor.
2. One copy will be forwarded to the Consultant.

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

1. All copies will be returned to the Contractor with the Consultant's comments (on a separate document) for revision.
2. The Consultant's comments will be retained in the Consultant's file.
3. Resubmit copies revised in accordance with the Consultant's comments. If the resubmitted copies are approved, the Contractor will be notified but no copies will be returned.

.3 Final Data: Submit four copies if different from the preliminary data in the format specified in this Section.

1.8 DATA FOR EQUIPMENT AND SYSTEMS

.1 Content for Each Unit (or Common Units) and System:

.1 Product Data:

.1 Include only those sheets that are pertinent to the specific Product.

.2 Clearly annotate each sheet to:

1. Identify the specific Product or part installed.
2. Identify any data applicable to the installation.
3. Delete all references to inapplicable information.

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

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

.5 Complete nomenclature and the commercial number of replaceable parts.

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

.7 Spare parts ordering instructions.

.8 Where applicable, identify installed spares and other provisions for future work (for example, reserved panel space, unused components, wiring, terminals, etc.).

.2 As installed, colour coded piping diagrams.

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

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

.1 Relations of the component parts of the equipment and systems.

.2 Control and flow diagrams.

.3 Coordinate drawings with Contract record documents to ensure the correct illustration of the completed installation.

.5 Format:

1. Provide reinforced, punched, binder tab; bind in with text.
2. Reduced to letter size, or twice letter size folded to letter size.
3. Where reduction is impractical, fold and place in a pouch which is bound in with the text.
4. Identify the Specification Section and Product on the Drawings and envelopes.

.6 Instructions and Procedures: Within the text, as required to supplement the Product data.

.1 Format:

1. Organize in a consistent format under a separate heading for each different procedure.
2. Provide a logical sequence of instructions for each procedure.
3. Provide an information sheet for OCWA's personnel, including:
    1. Proper procedures in the event of a failure.
    2. Instances that might affect the validity of the warranty or Bond.

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

.3 Operating Procedures:

1. Startup, break in, routine, and normal operating instructions.
2. Test procedures and results of factory tests where required.
3. Regulation, control, stopping, and emergency instructions.
4. Description of the operation sequence by the control manufacturer.
5. Shutdown instructions for both short and long durations.
6. Summer and winter operating instructions, as applicable.
7. Safety precautions.
8. Special operating instructions.

.4 Maintenance and Overhaul Procedures:

1. Routine maintenance.
2. Guide to troubleshooting.
3. Disassembly, removal, repair, reinstallation, and re-assembly.

.7 Warranty, Bond, and Service Agreement: In accordance with Section 01780 - Contract Closeout.

.2 Content for each electric or electronic item or system:

.1 Description of unit and component parts:

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

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

.3 Complete nomenclature and the commercial number of replaceable parts.
.4 Interconnection wiring diagrams, including control and lighting systems.

.2 Circuit Directories of Panelboards:
.1 Electrical service.
.2 Controls.
.3 Communications.

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

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

.5 As installed control diagrams by the control manufacturer.

.6 Operating Procedures:
.1 Routine and normal operating instructions.
.2 Sequences required.
.3 Safety precautions.
.4 Special operating instructions.

.7 Maintenance Procedures:
.1 Routine maintenance.
.2 Guide to troubleshooting.
.3 Adjustment and checking.
.4 List of relay settings, control and alarm contact settings.

.8 Manufacturer's printed operating and maintenance instructions.

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

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

.2 Format:
.1 Use a copy of the Maintenance Summary Form bound with this Section or an electronic facsimile of such.
.2 Each Maintenance Summary may take as many pages as required.
.3 Use only 8 1/2 inches by 11 inches sized paper.
.4 Complete using a typewriter or electronic printing.

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

.4 Recommended Spare Parts:
.1 Data is to be consistent with the manufacturer's bill of materials/parts list furnished in the O&M manuals.
.2 "Unit" is the unit of measure for ordering the part.
.3 "Quantity" is the number of units recommended.
.4 "Unit Cost" is the current purchase price.

1.9 DATA FOR MATERIALS AND FINISHES

.1 Content for Architectural Products, Applied Materials, and Finishes:
.1 Manufacturer's data, giving full information on Products:
.1 Catalogue number, size, and composition.
.2 Colour and texture designations.
.3 Information required for reordering special-manufactured Products.
.2 Instructions for Care and Maintenance:
.1 Manufacturer's recommendation for types of cleaning agents and methods.
.2 Cautions against cleaning agents and methods that are detrimental to the Product.
.3 Recommended schedule for cleaning and maintenance.
.2 Content for Moisture Protection and Weather Exposed Products:
.1 Manufacturer's data, giving full information on Products:
.1 Applicable standards.
.2 Chemical composition.
.3 Details of installation.
.2 Instructions for inspection, maintenance, and repair.

1.10 SUPPLEMENTS
.1 The supplements listed below, attached following "END OF SECTION", form part of this Section.
.1 Forms: Maintenance Summary Form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SUBMISSIONS
.1 Consultant to develop this section.

END OF SECTION

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO.:_____

1. EQUIPMENT ITEM_____

2. MANUFACTURER _____

3. EQUIPMENT/TAG NUMBER(S) _____

4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 45 KG)_____

5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____

6. MANUFACTURER'S LOCAL REPRESENTATIVE _____

   a. Name_____ Telephone No. _____

   b. Address _____

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in the manufacturer's standard maintenance manual, if applicable. (Reference to the manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

8. LUBRICANT LIST

Reference Symbol	Shell	Standard Oil	Gulf	Arco	Or Equal
List symbols used in No. 7. above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OCWA'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

SECTION 01500
TEMPORARY FACILITIES

PART 1 GENERAL....1

1.1 GENERAL REQUIREMENTS....1
1.2 CONSTRUCTION PARKING AND ROADWAYS....2
1.3 SANITARY FACILITIES....2
1.4 SECURITY AND CONSTRUCTION FENCING....2
1.5 PROJECT SIGN BOARDS....3
1.6 TEMPORARY BUILDINGS....4
1.7 TEMPORARY UTILITIES....4
1.8 FIRST AID FACILITIES....8
1.9 SUBMITTALS....8
1.10 BASIS OF PAYMENT....9
1.11 MEASUREMENT OF PAYMENT....9

PART 2 PRODUCTS (NOT USED)....9

PART 3 EXECUTION (NOT USED)....9

SECTION 01500
TEMPORARY FACILITIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Each Section of the Specifications is not necessarily complete in itself and all Sections of the Specifications are related. Contractor shall read each Section in conjunction with all other Tender Documents. Contractor shall also ensure that all Subcontractors read the relevant Documents and comply with the requirements.

.2 Generate and submit for review by the Engineer a Temporary Facilities Plan **five (5) business days** prior to the scheduled pre-construction meeting. The plan shall include but shall not be limited to the following:

.1 Identify temporary construction facilities such as: site access / egress; storage area for materials and equipment; temporary buildings; temporary water and sanitary facilities; construction roads; parking; temporary power and utilities; etc.

.2 Identify security fencing and access gates for compound and construction area;

.3 The temporary facilities plan shall be kept within the designated construction compound area agreed to by OCWA and the Engineer;

.4 Provide physical dimensions and layout for all temporary facilities;

.3 The temporary facilities shall be furnished as required by the Workers Compensation Act, the Ministry of Labour (MOL), and Occupational Health and Safety Act (OHSA).

.4 Maintain temporary buildings clean and free from nuisances so as to avoid danger to the OCWA's personnel, property or structures, prevent complaints from the Engineer and prohibit interference with the operation of the existing plant. The Contractor shall make themselves aware of, and adhere to, all Provincial regulations, regional by-laws, and local by-laws regarding workplace smoking.

.5 All temporary storage buildings / facilities must meet, at a minimum, all manufacturers' storage recommendations for all project related materials and equipment as well as all materials and equipment storage recommendations specified in the Contract Documents.

.6 When temporary buildings / facilities are no longer required, promptly dismantle and remove from the site, unless otherwise specified or directed. Restore areas damaged to original or better conditions to the satisfaction of the Engineer.

.7 Furnish and maintain all apparatus and equipment, such as ladders, scaffolds, ramps, runways, temporary stairs, derricks, hoists, elevators, chutes, etc., as required for the proper execution and progress of the Works. Such facilities shall be strong and substantial and safe for the purpose for which they are intended, and shall meet all applicable requirements of governing regulations and authorities.

.8 The Contractor shall provide all temporary equipment necessary to complete the Works. The Contractor shall not be permitted to use / operate any existing OCWA equipment for the duration of the Contract.

.9 Contractor shall not use any existing regional water, sanitary, power, and lunch room facilities available onsite. Contractor shall rely entirely on its own temporary facilities provided onsite.

1.2 CONSTRUCTION PARKING AND ROADWAYS

.1 Build and maintain temporary roads within the contract limits agreed to by the OCWA and the Engineer,

.2 Provide snow removal and salting on all temporary roads, parking, and work area(s) for the entire duration of the Contract.

.3 The Contractor is responsible to repair damages made during construction to any existing roads and parking lots used during construction, to existing or better condition without any cost to the OCWA.

.4 Do not store materials on, or otherwise modify, roads such that maintenance or snow removal is adversely affected. Any costs or damages incurred on existing roadways as a result of the Contractor's activities shall be the responsibility of the Contractor.

1.3 SANITARY FACILITIES

.1 Provide sufficient sanitary facilities in accordance with the MOL requirements for all persons employed on Contract subject to approval of type, size and location by the local Public Health authorities, the Ontario MECP and the Engineer.

.2 Maintain facilities with all required toilet room supplies in a clean and sanitary condition and disinfect frequently.

.3 Remove any contaminated soil and replace with fresh clean material. Leave site in a clean sanitary condition.

1.4 SECURITY AND CONSTRUCTION FENCING

.1 Provide construction fencing around the perimeter of the Contract and working limits as shown on the Drawings.

.2 The Contractor must remove and dispose offsite of all construction fences at the end of the construction.

.3 Security deemed necessary for protection against loss of or damage to any equipment, temporary materials, tools or permanent materials on site, in relation to the Contract, shall be the sole responsibility of the Contractor. Provide and maintain security gate at entrance to this Contract as shown on the Drawings.

.4 Maintain content and liability insurance on materials and equipment.

.5 If latches, doors, fencing or other openings leading into the construction site are not secure, Contractor is responsible for maintaining continuously manned site security at no additional cost to OCWA.

.6 Visual identification shall be worn at all times and be monitored by the Engineer. Any person without valid identification will be removed from the site. No additional cost shall be incurred by OCWA for persons removed from site.

.7 Where the Contractor utilizes the existing facility fencing and gate they shall provide their own lock to be "daisy chained" to OCWA's lock. Any lock not found to be "daisy chained" will be removed, and it will be the Contractor's responsibility to reinstall a lock as per these requirements.

.8 The Contractor shall not cut or remove OCWA's lock, or any portion of the security chain, in order to gain access to the site. The cost of replacing OCWA's lock or security chain damaged as a result of the Contractor's actions will be deducted from any future payment due to the Contractor.

.9 The Contractor shall be responsible for maintenance of all fences surrounding the work area, and the surveillance of the Works, in order to provide security at all times against vandalism of the Works, theft, and injury to persons not involved with construction. Any repairs due to vandalism will be the responsibility of the Contractor.

1.5 PROJECT SIGN BOARDS

.1 OCWA will produce and install project signboards for the site.

.2 No other signs, other than warning signs and notices required by law, may be erected on site without the approval of the Engineer and OCWA.

.3 On attainment of "Substantial Performance", or at such earlier time as may be approved by the Engineer, the Contractor shall remove the construction project signboards and support structures and reinstate any damaged area to existing or better condition.

1.6 TEMPORARY BUILDINGS

.1 Provide temporary buildings for staff and construction purposes at locations approved by the Engineer before erection work commences, meeting requirements of Ontario Reg. 659, latest amendment.

.2 Keep temporary buildings clean and free from nuisance so as not to become a danger to adjoining facilities or to form grounds for complaints from adjacent property owners.

.3 Furnish and maintain satisfactory weathertight structures with raised floors as may be required to adequately protect those materials stored on Site which may otherwise be damaged by the weather.

.4 Relocate as necessary or as directed by the Engineer.

1.7 TEMPORARY UTILITIES

.1 Installation / Removal:

.1 Provide construction facilities and temporary controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

.2 Safety and Security Fencing:

.1 All Contract activity areas must be designated with temporary barriers, safety fences and warning signs as required by applicable codes, regulations and by-laws.

.2 Maintain and relocate protection until all Works is complete.

.3 Water Supply:

.1 OCWA will supply temporary potable water and /or effluent water supply at no charge. Make arrangements with the Engineer for temporary connections.

.2 Contractor to measure and provide OCWA with records of all potable water and effluent water usage. OCWA to pay for potable water and / or effluent water charges to fill structures for leakage tests.

.3 Make temporary connections to existing services with backflow preventers. All the cost to establish for temporary connections and backflow prevention is borne by the Contractor.

.4 Maintain temporary connections throughout construction period.

.5 Remove temporary connections when work is complete.

.6 OCWA does not guarantee continuous supply of potable water and / or effluent water.

.4 Temporary Heating and Ventilation:

.1 Any construction heaters used inside building(s) must be vented to the outside or be the flameless type. Solid fuel salamanders are not permitted.

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

.1 Facilitate progress of the Works.

.2 Protect the Works and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for a safe working environment.

.3 Maintain inside temperatures above a minimum of 10°C in areas where construction is in progress.

.4 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapors or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in a manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for some time after the cessation of all work processes to assure removal of harmful contaminants.

.5 The permanent heating system of the building may be used when available. The Contractor will be responsible for damage to the heating system if use is permitted.

.6 Date of Substantial Performance and Warranties for heating system will not commence until the entire system is in as near original condition as possible and is certified by the Engineer.

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

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to the Works due to failure to provide adequate heat and protection during construction.

.5 Temporary Power:

.1 Provide temporary electrical wiring meeting requirements of Section 76 of Ontario Electrical Safety Code.

.2 Properly install and maintain wiring for temporary electric light and power.

.3 Install temporary hydro meter and pay costs for electrical system installation. Contractor to monitor and provide OCWA with monthly hydro usage. OCWA to pay usage charges associated with work operations.

.4 Temporary connections to existing hydro services are subject to approval from the Engineer and power company representative. Contractor shall remove all temporary connections prior to final acceptance of work by the OCWA.

.5 Provide weatherproof, grounded, temporary power distribution system sufficient to accommodate performance of work, including but not limited to:

.1 Temporary electrical heating.

.2 Operation of test equipment and test operation of building equipment and systems that cannot be delayed until permanent power connections are operable.

.3 Temporary operation of other temporary facilities, including permanent equipment and systems that must be placed in operation prior to use of permanent power connections (pumps, HVAC equipment, and other similar equipment).

.4 Power for temporary operation of existing facilities (if applicable) at site during change over to new permanent power system.

.5 Provide circuits of adequate size and proper power characteristics for each use.

.6 Whenever possible run circuit wiring overhead, and rise vertically in locations where it will be least exposed to possible damage from construction operations and result in least interference with work.

.7 Provide rigid steel conduit or equivalent raceways for wiring, exposed on grade, floor, decks or other recognized exposures to damage or abuse.

.6 Provide temporary power outlets with transformers, branch wiring and distribution boxes located safely and conveniently for construction activities. Provide flexible power cords as required.

.7 Do not use permanent convenience receptacles during construction unless approved by the Engineer.

.6 Temporary Lighting:

.1 Provide suitable lighting for work conducted at night where permitted by the Engineer or under conditions of deficient daylight to ensure proper work and to provide adequate facilities for inspection and safe working conditions.

.2 Provide general, weatherproof, grounded temporary lighting systems in construction areas, as soon as is practically feasible.

.3 Provide sufficient illumination for safe work and traffic conditions.

.4 Run temporary circuit wiring generally overhead and rise vertically in locations where it will be least exposed to damage from construction operations on grade, floors, decks, or other recognized areas of possible damage or abuse.

.5 Provide temporary branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

.6 Maintain lighting and provide routine repairs.

.7 Temporary Telephone:

.1 Provide and pay for temporary telephones necessary for own use.

.8 Equipment / Tool / Materials Storage:

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

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

.9 Project Cleanliness:

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

.2 Remove waste material and debris from site and deposit in waste container at end of each working day.

.3 Burning of refuse on site shall not be permitted.

1.8 FIRST AID FACILITIES

.1 Provide and maintain on-site completely equipped first-aid facilities in a clean and orderly condition, and readily accessible to all staff at all times.

.2 Designate certain employees who are properly instructed to be in charge of first-aid. At least one such employee will always be available on the site while work is being carried on.

.3 Conspicuously post telephone call lists for summoning aid, such as doctors, ambulances, rescue squads, etc.

1.9 SUBMITTALS

.1 The Contractor shall submit the following information in accordance to this Section and Section - 01300 Submittals:

.1 Temporary Facilities Plan to be submitted to the Engineer for review within **ten (10) business days** from Contract Award.

1.10 BASIS OF PAYMENT

.1 The contract price for this Divisional Specification shall be compensation in full for all labour, material, equipment and workmanship associated with the content of the Temporary Facilities Specification.

1.11 MEASUREMENT OF PAYMENT

.1 The measurement of payment is a lump sum for all Works required under this Divisional Specification.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01501
CONSTRUCTION SEQUENCING

PART 1 GENERAL....1

1.1 DEFINITIONS....1
1.2 SUBMITTALS....1
1.3 INTENT....1
1.4 COORDINATION....2
1.5 COORDINATING CONSTRUCTION WITH OPERATION OF EXISTING FACILITIES....2
1.6 SERVICES PROVIDED BY THE CONTRACTOR....3
1.7 SUGGESTED SEQUENCE OF CONSTRUCTION....3
1.8 ORGANIZATION OF WORK....4
1.9 MONITORING AND EMERGENCY RESPONSE....5
1.10 ELECTRICAL AND TEMPORARY POWER....5
1.11 FIRE PROTECTION....6

PART 2 PRODUCTS....6

2.1 GENERAL....6

PART 3 EXECUTION....6

3.1 CONSTRAINTS....6
3.2 SUGGESTED SEQUENCE OF CONSTRUCTION....7

SECTION 01501
CONSTRUCTION SEQUENCING

PART 1 GENERAL

1.1 DEFINITIONS

.1 Clean or Cleaning: The removal and disposal of material remaining in a pipe, or other structure by the Contractor after its removal from service. This includes emptying, to the greatest extent possible, using existing installed process pumping equipment, by such methods and to such level of cleanliness as required in order to execute the Work in accordance with the terms of the Contract; and to ensure the protection of the health and safety of the personnel of the Contractor, OCWA, and the Consultant.

.2 Place into Service: Complete in all respects, including all ancillary Work, successfully test and demonstrate to the satisfaction of the Consultant, and place into satisfactory operation, all in accordance with the requirements of the Contract, including the submittal of maintenance manuals.

1.2 SUBMITTALS

.1 Administrative Submittals: Proposed sequence of construction.

.2 An approved construction sequence must be approved by OCWA and the Consultant prior to commencing construction.

.3 Include for multiple construction sequence coordination meetings with OCWA and the Consultant.

1.3 INTENT

.1 This Section includes mandatory construction sequencing constraints and a suggested sequence of construction that will satisfy the mandatory constraints required in the execution of the Work.

.2 The suggested sequence of construction described herein is general in nature and illustrates the design intent with respect to the execution of the Work. Prepare and submit a proposed sequence of construction for review by OCWA and the Consultant. This review will serve to satisfy OCWA and the Consultant that all mandatory construction sequencing constraints have been properly addressed by the Contractor in the proposed sequence of construction but shall in no way absolve the Contractor of complete responsibility for the execution of the Work in accordance with the requirements of the Contract Documents.

.3 The suggested sequence of construction described herein outlines the intent of the design with respect to the general progress of Work. The descriptions of construction activities as outlined in this Section are not intended to be comprehensive or all-inclusive. Many other construction activities and Work components, although not specifically noted in this Section, are integral parts of the Work and shall be scheduled and completed by the Contractor in accordance with the Contract Documents.

.4 The broad grouping of parts of the Work under phases, stages, or similar divisions in the suggested sequence of construction is intended to illustrate the general sequence for the execution of the Work as envisioned by the Consultant. Such grouping shall in no way absolve the Contractor of complete responsibility for the construction means, methods, techniques, sequences, and procedures of construction, or the safety precautions and programs incidental thereto.

1.4 COORDINATION

.1 The Contractor shall coordinate the requirements of this Section with the other requirements of the Contract Documents.

.2 The facility will be maintained in continuous operation without interruption throughout the duration of the Contract. Cooperate with OCWA and do not interfere unnecessarily with the day-to-day operations of the facility. At all times provide OCWA with unhindered access to all portions of the facility that are in operation

1.5 COORDINATING CONSTRUCTION WITH OPERATION OF EXISTING FACILITIES

.1 The Longlac Water Pollution Control Plant will be in operation throughout the duration of the project. The operation of the Plant is paramount. The Contractor shall fully cooperate and co-ordinate with OCWA’s operations staff and the Consultant throughout the project.

.2 The existing facility operates 24 hours per day, 7 days per week. In the event of conflict between construction operations and routine station operations, Plant operations shall have priority. The Contractor shall take every precaution to avoid interfering with routine station operation and maintenance. Re-schedule construction operations, if required, without change to the contract price and time for completion.

.3 The Contractor shall provide ten (10) working days written advance notice, including proposed construction method, procedure and contingency plans, where the construction schedule requires that a portion of the existing works be taken out of service to facilitate construction. OCWA and the Consultant will review the proposed timing for impact on station operations.

.4 Operations staff prefer that all station shutdowns be scheduled to occur during the day between 10 a.m. and 4 p.m., to avoid peak hour demand periods.

.5 The maximum allowable Plant shutdown period is 6 hours. All work planned to be completed during the Plant shutdown period shall be completed within this timeframe.

.6 Tie-ins to existing piping and services shall be completed at night or at OWCA's discretion.

1.6 SERVICES PROVIDED BY THE CONTRACTOR

.1 The Contractor shall provide all required temporary pumping equipment and appurtenances including all facilities required in order to bypass process flows when necessary and approved by the Consultant and clean all tanks, channels, and structures as necessary in order to execute the Work in a safe manner as specified in the Contract Documents.

.2 The Contractor shall provide all necessary temporary power, pumping facilities, pipes, valves, fittings, diversions, and temporary bulkhead systems as may be required during the course of construction and the changeover of process flows from one tank, channel, pipe, or sewer to another.

.3 In general, OCWA will remove from service and empty process units, tanks, sewers, channels, pipelines, and similar facilities only once, unless otherwise specified in the Contract Documents. The Contractor shall be responsible for cleaning any facilities taken out of service.

.4 In general, place into service all new tankage, pumping facilities, piping, sewers, channels, and similar facilities before removing any existing parallel facilities from service.

.5 The Contractor shall fulfill all Commissioning requirements and activities on a timely basis and allocate sufficient time in the construction schedule to fully comply with all Commissioning requirements and provision of documentation and training. Refer to Section 01810 – Equipment Testing and Facility Commissioning.

1.7 SUGGESTED SEQUENCE OF CONSTRUCTION

.1 The suggested sequence of construction described herein is based on the Consultant's knowledge of the design components of the Contract and not on experience in the construction of such Work. The Consultant assumes no responsibility for the time required to construct the Work following the suggested sequence of construction.

.2 The Contractor may, on its own initiative, submit an alternate proposed sequence of construction to the Consultant for review. Such review shall in no way make the Consultant responsible for the time or costs required to construct the Work following the Contractor's alternate sequence of construction.

.3 The Contractor shall incorporate the construction constraints and the sequence of construction in the Progress Schedules.

.4 The suggested sequence of construction describes, in general, the sequence of installation and commissioning of major structures, processes, and equipment items. The Contractor shall be responsible for determining which ancillary services, such as electrical, drainage, heating, and ventilation are also required to be completed in order to permit the commissioning of the structures and equipment as described in the Contract Documents.

.5 The Contractor shall carefully examine the existing utility services at the Site in order to determine the difficulty of the Work and the number and type of pipelines and cables required to be re-routed or protected from damage, during the performance of the Work.

.6 Prior to making major tie-ins to existing process units and structures, the Contractor shall demonstrate that the equipment installed in all new structures is fully functional. Connections to existing works will not be permitted until all equipment in the new adjacent Work operates to the satisfaction of the Consultant. No claim for delay will be entertained due to unsatisfactory operation of any equipment.

1.8 ORGANIZATION OF WORK

.1 The work shall be carried out in a logical sequence. All efforts shall be made to safeguard the operation of the WPCP and remain in compliance with regulatory requirements. Coordinate all construction activities through the Consultant with OCWA staff and verify that these activities do not interfere with the existing operation of the WPCP. The facility/system operation shall have priority over all construction activities.

.2 The work is to be completed in the time stated in the Form of Tender. In this regard the Contractor is responsible for scheduling and the sequence of work.

.3 When shutdowns and/or switch-overs of any system process or electrical systems are required, the Contractor shall coordinate all trades involved. Coordination with OCWA operating staff shall be through the Consultant. Detailed written sequences are required to be submitted to the Consultant to permit such coordination.

.4 For tie-ins shown on the Contract Drawings, the Contractor will submit the request in writing to the Consultant thirty (30) working days prior to the intended connection.

.5 The Contractor shall maintain access for OCWA staff, facility deliveries (as applicable) and other OCWA contractors at all times.

1.9 MONITORING AND EMERGENCY RESPONSE

.1 The Contractor shall have the necessary resources, materials, personnel, and equipment readily available to provide continuous 24 hours per Day, 7 Days per week monitoring and emergency repair of sheeting, shoring, stop log installations, bypass pumping operations, and any other temporary systems that are used to control process flows where, in the opinion of OCWA or the Consultant, the failure of such temporary systems could adversely impact upon plant operations.

.2 The Contractor shall provide and operate all temporary systems as required in order to contain and remove leakage through gates, valves, stop logs, and any other isolation devices that are used to accommodate the scheduled construction activities.

.3 Upon the unexpected discovery of designated substances in existing structures, materials, conduits and similar works, the Contractor shall immediately notify the Consultant and provide an action plan to deal with such substances with minimal impact to the construction schedule.

1.10 ELECTRICAL AND TEMPORARY POWER

.1 In order to minimize the duration of shutdowns and keep the facility in continuous operation, the Contractor shall maintain, to the maximum extent possible, facility electrical systems in operation while the new electrical components are installed, or the existing systems are modified or replaced as required for the final electrical system configuration. Where this is not possible, the Contractor shall provide temporary power in the form of overhead lines or portable generators at no additional cost to OCWA.

.2 Prior to commencement of the Work, provide and check all necessary temporary services required to ensure that the existing facility will operate in an uninterrupted fashion during the construction period. Provide overhead pole lines as required to the vicinity of existing equipment and make connections on an individual, rather than group, basis in order to minimize shutdowns. Prior to proceeding, provide a schedule with a written description of each operation for the Consultant.

1.11 FIRE PROTECTION

.1 Do not introduce combustibles into any facility until full fire protection is in service.

.2 The Contractor shall place new fire protection systems into service as soon as possible and notify the Consultant upon completion of the new fire protection services.

.3 The Contractor shall provide adequate supplementary fire protection facilities including, but not limited to, ample hand-operated 7 kg to 15 kg multipurpose dry chemical extinguishers in each facility. Provide temporary hose lines in areas where construction is in progress until the permanent fire protection is placed into service. Do not block any hydrant hose connections and any other firefighting equipment with any materials or equipment and ensure that hydrant hose connections and firefighting equipment is readily accessible at all times for the duration of the Contract.

.4 The Contractor shall dispose of all combustible rubbish promptly and safely. Prompt disposal is particularly needed for any material which may be subject to spontaneous ignition such as oily waste and paint rags.

.5 The Contractor shall monitor and control any probable ignition sources as necessary in order to prevent the threat of fire.

.6 The Contractor shall minimize hot work including, but not limited to, operations involving open flames, heat, or sparks such as brazing, cutting, grinding, soldering, and torching. If there is a practical and safer way to carry out the Work without hot work, the alternative method shall be used.

PART 2 PRODUCTS

2.1 GENERAL

.1 Unless specifically stated otherwise, provide all labour, materials, and equipment necessary to accomplish the Work of this Section.

PART 3 EXECUTION

3.1 CONSTRAINTS

.1 The Site limits for this Contract and adjoining contracts are shown on the Contract Drawings. The Site limits are time dependent and may change during the course of the Contract and as other contracts start and finish.

.2 Safe site conditions shall be maintained at all times.

.3 The Contractor is required to execute the Work within the space constraints shown and within the time constraints indicated in the Contract Documents. The Contractor's Schedule of Work shall identify these constraints and any critical path scheduling concerns.

.4 The Contractor shall work with OCWA and any adjacent Other Contractors to coordinate the interface between the Work and the work of any other contracts.

.5 The Contractor shall at all times maintain access to the site for OCWA operations at all times.

.6 OWCA reserves the right to alter the sequencing of the work if it is deemed in the opinion of OCWA or the Consultant that the different sequencing would result in a lower estimated risk, at no additional cost to OCWA.

.7 The work shall be carried out in a logical sequence in order to accommodate continuous operation of the Longlac WPCP. A construction sequence consisting of several shutdowns is required.

.8 Existing valves and gates may not be watertight.

.9 The access to plant site and plant facilities is restricted and site space is limited. Stage the work so that access to plant facilities is maintained at all times. Coordinate all construction activities, through the Consultant, with OCWA staff.

.10 Plant Shutdown's shall only be permitted for the tie-in's detailed below in the Suggested Sequence of Construction.

.11 The maximum allowable Plant Shutdown period is 6 hours commencing from 10:00 a.m.

.12 At least one (1) qualified Plant operator must be present during all shutdowns and tie-ins into existing services. Adequate planning, contingencies and notice must be provided.

.13 The Contractor shall give a minimum of ten (10) working days written notice to the Consultant where the construction schedule requires that a portion of the existing works be taken out of service to facilitate construction.

3.2 SUGGESTED SEQUENCE OF CONSTRUCTION

.1 The suggested sequence of construction for the Site is as follows:

.2 Suggested Construction Sequence:

.1 Install new dechlorination equipment inside the service building and run conduit outside.

.2 Install new contact chamber outlet pipe, baffles and riprap. Install stubs for both the 10” and 12” diversion inlet pipes.

.3 Run new 10” diversion pipe to tie in and run conduit from the service building to the dechlorination contact chamber. Pull chemical tubing and do tie in for 10” diversion pipe.

.4 Temporarily plug 12” line at the new chamber and commission 10” line, chamber, dosing lines and mixer.

.5 Remove section of now redundant existing 10” line to facilitate installation of new 12” diversion pipe. Complete tie-ins at existing 12” line and new chamber.

.6 Remove temporary plug in 12” line at the chamber and commission 12” line.

.7 Remove the remainder of the old 10” and 12” outfall pipe and complete all landscaping.

END OF SECTION

SECTION 01505
MOBILIZATION & DEMOBILIZATION

PART 1 GENERAL....1

1.1 GENERAL REQUIREMENTS....1
1.2 MOBILIZATION....1
1.3 DEMOBILIZATION....1
1.4 BASIS OF PAYMENT....2
1.1 MEASUREMENT OF PAYMENT....2

PART 2 PRODUCTS (NOT USED)....2

PART 3 EXECUTION (NOT USED)....2

SECTION 01505
MOBILIZATION & DEMOBILIZATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Each Section of the Specifications is not necessarily complete in itself and all Sections of the Specifications are related. Contractor shall read each Section in conjunction with all other Tender Documents. Contractor shall also ensure that all Subcontractors read the relevant Documents and comply with the requirements.

1.2 MOBILIZATION

.1 Mobilization shall include all work that must be performed upon Contract award and prior to construction commencement. This shall include but is not limited to the following:

.1 Pickup and erection of project signboards.

.2 Installation of tree and facility protection.

.3 Erection of temporary traffic signs, delineators, barricades and other warning signs.

.4 Proof of insurance and bonds including proof of 100% payment for such.

.5 Delivery to site of equipment, materials, and machinery necessary to undertake the construction of the works.

.6 Delivery to site of all specified components as per Specification 1500 – Temporary Facilities.

.7 All other requirements for proper performance of work.

1.3 DEMOBILIZATION

.1 Demobilization covers the work near the end or after completion of the construction. This includes but is not limited to:

.1 Removal and return of project signboards.

.2 Removal of tree and facility protection.

.3 Removal offsite of temporary traffic signs, delineators, barricades and other warning signs.

.4 Removal offsite of equipment, excess materials, and machinery.

.5 Removal offsite of temporary sanitary and potable water facilities.

.6 Reinstate all disturbed areas during construction to original or better condition.

1.4 BASIS OF PAYMENT

.1 The Mobilization and Demobilization item shall not exceed **5%** of the total bid price. If this item exceeds **5%** of the total bid price, this may be considered ground for tender disqualification.

.2 Payment for mobilization will be made in full in the first payment certificate, if mobilization is considered entirely completed in the opinion of the Engineer. The Engineer may allow only a partial payment to reflect the degree to which mobilization has been carried out.

.3 Payment for demobilization will be made in full upon construction completion, if demobilization is considered entirely completed in the opinion of the Engineer. The Engineer may allow only a partial payment to reflect the degree to which demobilization has been carried out

1.1 MEASUREMENT OF PAYMENT

.1 **Fifty per cent (50%)** of the bid price for this item will be allowed for mobilization with the balance to demobilization.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01780
PROJECT CLOSEOUT PROCEDURES

PART 1 GENERAL....1

1.1 GENERAL REQUIREMENTS....1
1.2 SUBSTANTIAL PERFORMANCE....1
1.3 CLOSEOUT PROCEDURES....1
1.4 SUBMITTALS....2
1.5 PROJECT AND PRODUCTS WARRANTY....3
1.6 REPAIRS BY OCWA....3
1.7 RELEASES FROM AGREEMENTS....4
1.8 FINAL CLEANING....4

PART 2 PRODUCTS (NOT USED)....5

PART 3 EXECUTION (NOT USED)....5

SECTION 01780
PROJECT CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Each Section of the Specifications is not necessarily complete in itself, and all Sections of the Specifications are related. Contractor shall read each Section in conjunction with all other Tender Documents. Contractor shall also ensure that all Subcontractors read the relevant documents and comply with the requirements.

.2 The sequence of events and description in this Section represent a suggested order of activities as the Contract proceeds from construction, through to testing, substantial completion, and completion. Not all work may proceed in this exact order.

.3 Project closeout procedure adjustments may be made after acceptance by the Engineer for the mutual benefit of the Contractor and OCWA if the situation warrants. Any changes made in the sequence of events, to accommodate the Contractor shall be at no additional cost to OCWA.

1.2 SUBSTANTIAL PERFORMANCE

.1 Prior to the Substantial Completion award, The Contractor shall provide a Certified Survey Site Plan to confirm measurements and elevations of the new construction. The plan shall include but shall not be limited to the following:

.1 Outlines of paved areas, curbs, and gutter.

.2 Final finished grades throughout the site and location of buried services.

.3 Final footprint of buildings(s) or structure(s).

.4 Outlines of property lines, fence lines, etc.

.2 Substantial Completion shall only be awarded if the Certified Survey Site Plan is accepted by the Engineer.

1.3 CLOSEOUT PROCEDURES

.1 The Contractor shall conduct a pre-final inspection of the work to identify significant defects or deficiencies, and repair as required, to conform with the Contract documents.

.2 The Contractor shall frame and mount, in the main electrical room, Electrical Safety Authority (ESA) and Technical Standards and Safety Authority (TSSA) Certificates of Inspection.

.1 Frames are to be plastic molded polystyrene.

.2 Frame glass shall be Plastic Acrylic provided with an anti-glare/anti-reflective finish.

.3 The Contractor shall mount the Single Line Electrical Diagrams in the main Electrical Room(s) as follows:

.1 Drawings: 600 mm (H) x 900 mm (W) minimum size.

.2 Diagrams shall be mounted on 10 mm Gator Board under non-light sensitive Plexiglass; matt laminated finish.

.4 The Contractor shall notify the Engineer in writing of the satisfactory completion of the Contractor's inspection and list of significant deficiencies and shall request for the Engineer and OCWA to conduct a final inspection.

.5 In the event the Engineer identifies significant deficiencies during the final inspection, Substantial Completion will not be granted until such deficiencies will be repaired to the satisfaction of the Engineer. The Contractor will have to cover all costs associated with service interruptions caused by such deficiency repairs as well as additional final inspections by the Engineer and the OCWA.

.6 Submit an application for review to the Engineer for final payment upon acceptance of the warranty period by the Engineer and the OCWA.

.7 Provide the Contract closeout deliverables listed under Section 1.4 - Submittals below.

1.4 SUBMITTALS

.1 The Contractor shall submit two (2) document packages of project closeout application in accordance to this Section and Section 01300 – Submittals to the OCWA for final payment acceptance. The Contract closeout package shall include but not be limited to the following:

.1 Complete pre-condition assessment report including photos.

.2 Written warranties and service agreements.

.3 Final as-built red line drawings.

.4 Final as-constructed survey.

.5 All construction progress photographs.

.6 Certificates of inspection and acceptance by local governing agencies, Ministries, and agencies having authority (i.e. building occupancy permit, etc.).

.7 Releases or Waivers of Liens and Claims.

.8 Releases from Agreements.

.9 Application for Final Payment.

.10 Provide Spare Parts, Special Tools, and Maintenance Materials record list as required by individual Specification Sections.

.11 Confirmation that the Single Line Diagram, the ESA Certificate of Inspection, and the TSSA Certificate of Inspection have been mounted per the specifications.

1.5 PROJECT AND PRODUCTS WARRANTY

.1 Project maintenance period commences at the completion of the entire project.

.2 All equipment warranties commence at the completion of the entire project. The Contractor shall make all necessary arrangements with the manufacturer / supplier to meet this requirement at no additional cost to OCWA.

.3 The Contractor shall be responsible for providing extended warranty periods as required by the Contract Documents at no additional cost to OCWA.

.4 The Contractor must submit the required product warranty certificates and / or written documentations from the manufacturers as specified in the Contract Documents.

.5 The Contractor must correct all deficiency works immediately after receipt of repair notices from the Engineer during the maintenance period. If the Contractor fails to correct all noted deficiencies to the Engineer's satisfaction, OCWA has right to have any or all outstanding repairs completed by a third party at the Contractor's expense.

1.6 REPAIRS BY OCWA

.1 During the warranty period and in the event of any emergency repair situations to the warranted work, OCWA has the right to conduct repair works and back charge the Contractor for all associated costs of such repairs. The Engineer will notify the Contractor of emergency work performed by OCWA and will provide the Contractor with proof of such work for payment purposes.

1.7 RELEASES FROM AGREEMENTS

.1 Furnish written releases from property, OCWA's or public agencies where side Agreements have been made, or special easements established, or where Contractor's operations have not been kept within OCWA's construction right-of-way.

.2 When the Contractor is unable to secure Written Releases from Agreements, the Contractor shall inform OCWA of the reasons:

.1 OCWA or its representatives will examine the site, and OCWA will direct Contractor to complete all work necessary to satisfy terms of the side Agreement or special easement.

.2 Should Contractor refuse to perform this work, OCWA reserves the right to have it done by separate contract and deduct the cost of same from the maintenance holdback.

.3 Works shall mean the total construction and related services required by these Contract Documents or terms of any side Agreements or special easements.

1.8 FINAL CLEANING

.1 Leave the work and adjacent affected areas in clean condition to the satisfaction of OCWA and the Engineer.

.2 Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.

.3 Clean all windows.

.4 Clean and wax wood, vinyl, or painted floors.

.5 Broom clean exterior paved driveways and parking areas.

.6 Hose clean sidewalks, loading areas, and others contiguous areas with major structures.

.7 Rake clean all other surfaces.

.8 Remove snow and ice from access to buildings.

.9 Replace air-handling filters, and clean ducts, blowers, and coils of ventilation units operated during construction.

.10 Leave water courses, gutters, and ditches open and clean.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01810
EQUIPMENT TESTING AND FACILITY COMMISSIONING

PART 1 GENERAL....1

1.1 INTENT....1
1.2 DEFINITIONS....1
1.3 MEASUREMENT AND PAYMENT....2
1.4 QUALITY ASSURANCE....2
1.5 CONTRACTOR'S RESPONSIBILITIES....2
1.6 TESTING AND COMMISSIONING GROUP....5
1.7 ADMINISTRATIVE SUBMITTALS:....5
1.8 QUALITY CONTROL SUBMITTALS:....5
1.9 TESTING AND COMMISSIONING SCHEDULE AND PLAN....6
1.10 COMMISSIONING BINDER....7
1.11 COMMISSIONING CHECKLIST AND SIGN-OFF FORM....7

PART 2 PRODUCTS (NOT USED)....7

PART 3 EXECUTION....7

3.1 PRE-COMMISSIONING DOCUMENTATION SUBMITTAL....7
3.2 FUNCTIONAL TESTING....7
3.3 FIVE DAY WATER TESTING....9
3.4 TRAINING....12
3.5 14-DAY PERFORMANCE TESTING....13
3.6 POST-COMMISSIONING DOCUMENTATION SUBMITTAL....15

SECTION 01810
EQUIPMENT TESTING AND FACILITY COMMISSIONING

PART 1 GENERAL

1.1 INTENT

.1 This Section covers equipment and systems inspection, functional tests, five day water testing, performance testing, and facility commissioning that shall be completed prior to consideration for Substantial Performance of the Work.

1.2 DEFINITIONS

.1 Contingency Plan: Describes the Contractor's back-up plan should equipment and/or systems malfunction as they are brought online, and during shutdowns in an operating facility to ensure continued safe operation.

.2 Facility Commissioning or Commissioning: Test or tests performed in the presence of the Consultant, OCWA after any required successful performance test, to demonstrate and confirm that the facility meets the specified operational performance requirements, while simulating actual operating conditions to the greatest extent possible, with wastewater and/or sludge as required by the facility.

.3 Facility: Entire project, or an agreed-upon (by OCWA) acceptable portion, including its entire unit processes.

.4 Factory Acceptance Test (FAT): The term, as used in the individual Specification Sections, which refers to specified testing performed on specified equipment at the manufacturer's facility prior to shipment. No equipment can be shipped without FAT approval by the Consultant.

.5 Field Quality Control: Term, as used in the individual Specification Sections, which refers to specified on-Site functional and performance testing of equipment.

.6 Five Day Water Test: Test or tests performed in the presence of the Consultant, OCWA after any required functional test, to demonstrate and confirm that the equipment and/or system meets the operational requirements specified in the Contract Documents, while simulating actual operating scenarios using effluent, air or potable water.

.7 Functional Test: Test or tests performed in the presence of the Consultant, OCWA to demonstrate that installed equipment and/or systems meet the manufacturer's installation, calibration, and adjustment requirements and other requirements specified in the Contract Documents including, but not limited to, noise, vibration, alignment, speed, proper electrical, instrumentation and control, mechanical connections, thrust restraint, proper rotation, initial servicing, and instrumentation calibration.

.8 Performance Test: Test or tests performed in the presence of the Consultant, OCWA after any required successful five day water test, to demonstrate and confirm that the equipment and/or system meets the specified operational

performance requirements, while simulating actual operating conditions to the greatest extent possible, with wastewater and/or sludge as required by the equipment and/or system, including but not limited to, noise, vibration, alignment, speed, proper electrical, instrumentation and control, mechanical connections, thrust restraint, proper rotation, initial servicing, and instrumentation calibration.

.9 Pre-purchased Equipment Vendor: The party under separate contract with the Owner to furnish products or special services.

.10 Site Acceptance Test (SAT): The term, as used in the individual Specification Sections, which refers to specified testing performed on specified equipment at OCWA's designated Site following shipment and installation to replicate the FAT tests performed at the manufacturer's facility.

.11 Source Quality Control: Term, as used in the individual Specification Sections, which refers to specified testing performed on specified equipment at the manufacturer's facility prior to shipment.

.12 System: The overall process, or a portion thereof, that performs a specified function. A system may consist of two or more subsystems as well as two or more types of equipment.

.13 Transition Plan: Description which details the progression of installation tasks, bringing new equipment online, and de-commissioning old equipment such that the impact on operations is minimized and the continued safe operation of the facility is assured

.14 Unit Process: As used in this Section, a unit process is a portion of the facility that performs a specific process function, such as HVAC, plumbing, filtration, (component of the water treatment process) or pump station.

1.3 MEASUREMENT AND PAYMENT

.1 All costs associated with the work of this Section shall be included in the lump sum price of the contract.

1.4 QUALITY ASSURANCE

.1 The Contractor shall provide authorized and qualified manufacturer-approved representatives to inspect equipment installation prior to functional tests and to supervise the placing of equipment into operation as required through-out the phases of commissioning described within this Contract Document.

.2 The Contractor's checkout, functional tests, Five Day water test, Performance Testing, and Facility Commissioning (Operational Testing) shall be witnessed by OCWA's Project Manager, the Consultant, and OCWA's Operation Maintenance and Monitoring Staff.

1.5 CONTRACTOR'S RESPONSIBILITIES

.1 The Contractor shall attend all testing and commissioning meetings.

.2 The Contractor shall coordinate and ensure that all applicable regulatory agency inspections to be conducted by the Technical Standards and Safety Authority, Electrical Safety Authority, Canadian Gas Association, are completed and that

reports from these agencies are submitted to the Consultant a minimum of five Working Days prior to functional testing.

.3 The Contractor may not progress to an advanced phase of testing and commissioning prior to the satisfactory completion and close-out of the previous phase of testing and commissioning as deemed by the Consultant, including delivery and acceptance of all submittals listed below under each phase of testing and commissioning unless otherwise directed by the Consultant and OCWA.

.4 The Contractor shall complete the installation of each unit and related processes before testing, including all related manufacturer's representative services.

.1 Provide the services of a senior mechanical engineer or technician for testing and commissioning of all mechanical equipment.

.2 Provide the services of a senior electrical/instrumentation engineer, or technician, or programmer for testing and commissioning of all electrical equipment and manufacturer's control panels with an integrated PLC program that controls the manufacturer's equipment.

.5 The Contractor shall coordinate the testing and commissioning of equipment and systems with the Consultant, equipment supplier, Subcontractors, Other Contractor(s), OCWA's Project Manager and OCWA's Operations Maintenance and Monitoring Staff.

.6 The Contractor shall provide the services of qualified manufacturer's representatives to assist in testing.

.7 The Contractor shall assist the equipment supplier to repair each system, equipment, and device as required throughout the testing and commissioning process.

.8 The Contractor shall cooperate with all parties involved and provide access to equipment and systems. The Contractor shall operate systems only at designated times and under the required conditions.

.9 Under no circumstance shall the Contractor operate a live system which is collecting water in a wastewater application.

.10 The Contractor shall provide written notification to the Consultant a minimum of 30 Working Days in advance of start-up, testing, and reliability demonstration activities.

.11 The Contractor shall designate and furnish one or more members of the Contractor's personnel to coordinate and expedite testing and facility commissioning. Such person(s) shall be present during the equipment testing and facility commissioning meetings and shall be available at all times during functional testing, five-day water testing, performance testing, and the facility commissioning period. The Consultant will also designate a person to interface with the Contractor's designated person. The Contractor shall coordinate all testing and commissioning activities with the Consultant's designate. OCWA's Project Manager will also designate a person to interface with the Consultant's and Contractor's designates.

.12 The Contractor shall provide temporary valves, gauges, test equipment and other materials and equipment required to conduct testing. Unless otherwise indicated

in the Contract Documents, the Contractor shall provide water, air, inert gases and chemicals as required for testing and facility commissioning.

.13 The Contractor shall provide related operating and equipment maintenance manuals, and spare parts and special tools as specified in the Contract Documents before testing any unit or system.

.14 The Contractor shall provide a minimum of two members of the Contractor's staff who are trained and certified for confined space entry for activities in confined space locations. The Contractor shall provide all necessary confined space entry equipment and certification documentation prior to entry of confined space. The Contractor shall also conform to OCWA's confined space requirements.

.15 The Contractor shall furnish a listing of recommended lubricants with their designated application used in installation testing, a minimum of 21 Working Days prior to the scheduled startup and testing. All lubricants shall be compatible with the lubricants presently used in OCWA's maintenance operations.

.16 The Contractor shall complete the following pre-requisite tasks prior to any start-up of any piece of equipment or system: Functional Checkout, calibration, and training on instrumentation and control equipment; instruction of OCWA's operations staff on operation and maintenance, in accordance with Section 01820 – Demonstration & Training; and receive approval from the Consultant for start-up.

.17 Through-out the testing and commissioning periods, the Contractor shall provide local on-call staff during all shifts to supervise, troubleshoot, and/or repair the equipment. OCWA will provide one operator per shift to work with the Contractor during operation of facilities. OCWA's Operations, Maintenance and Monitoring staff will meet all applicable licensing requirements for operating the facility. Prior to initiation of the start-up and commissioning period, the Contractor shall instruct OCWA's operations staff on operating procedures for equipment and systems supplied by the Contract as part of the training required by Section 01820 – Demonstration & Training. The Contractor shall provide a day-by-day schedule of all commissioning activities a minimum of 40 Days prior to any equipment start up to allow OCWA to allocate staff for the commissioning process.

.18 The Contractor shall supply grease, oil, fuel and power, as required for the initial operation of the equipment.

.19 The Contractor shall rectify deficiencies discovered during pre-start health and safety reviews at no change to the Contract Price or Contract Time. The pre-start health and safety review will be done in accordance with the requirements of the Ontario Health and Safety Act. The Contractor shall obtain a pre-start health and safety review certificate stating that the installation of the equipment has been inspected and that the equipment is safe for operation in accordance with the Ontario Health and Safety Act. If additional pre-start health and safety reviews of the system or equipment are required as a result of the Contractor's Work being incomplete or deficient, the Contractor shall pay for the cost of additional reviews.

1.6 TESTING AND COMMISSIONING GROUP

.1 A Testing and Commissioning Group including the following members shall be formed:
  .1 Consultant Project Manager and Technical Staff;
  .2 OCWA's Project Manager and Construction Staff;
  .3 OCWA's Operations, Maintenance and Monitoring Representatives including SCADA/PCS representatives;
  .4 Contractor's Representative(s), including Contractor's Project Manager and/or Field Superintendent;
  .5 Sub-contractor's Representatives as appropriate; and
  .6 Others as requested by the Consultant.

.2 The Testing and Commissioning Group shall be responsible for the planning and the implementation of the start-up process, including but not limited to, the following tasks:
  .1 Clarification of individual systems subject to start-up and the components that make-up each system;
  .2 Review the sequence of testing and commissioning of new/modified systems and decommissioning of any existing equipment and systems within the requirements of the Contract Documents;
  .3 Review the Contractor's initial testing and commissioning schedule, plan, and subsequent revisions;
  .4 Clarification of the Consultant's and the Contractor's responsibilities as defined within the Contract Documents and as they pertain to system and equipment testing and commissioning;
  .5 Coordination of testing and commissioning with existing operations;
  .6 Responding to problems in the start-up of systems or equipment by investigating the cause and symptoms, determining responsibility, making recommendations for action, and overseeing the implementation of action;
  .7 Determining acceptance of systems and equipment; and
  .8 Other testing and commissioning issues as identified by the Consultant.

1.7 ADMINISTRATIVE SUBMITTALS:

.1 The Contractor shall prepare and submit to the Consultant for approval all administrative submittals prior to the commencement of any start-up or commissioning activity. All items shall be submitted in a format acceptable to the Consultant and the OCWA.

1.8 QUALITY CONTROL SUBMITTALS:

.1 The Contractor shall prepare and submit to the Consultant for approval all Quality Control submittals prior to any start-up or commissioning activity. All items shall be submitted in a format acceptable to the Consultant and OCWA.

.2 In addition to the submittals listed below, the Contractor shall submit to the Consultant all documentation, test reports, affidavits and other documentation

cited in the AWWA Standards referenced in the relevant Specification Sections pertaining to the equipment.

1.9 TESTING AND COMMISSIONING SCHEDULE AND PLAN

.1 The Contractor shall prepare and submit to the Consultant and OCWA for approval all Testing, and Commissioning Schedule and Plan submittals prior to initiation of any start-up or commissioning activity. All items shall be submitted in a format acceptable to the Consultant.

.2 The Contractor shall prepare and submit five copies to the Consultant the testing and commissioning plan a minimum of 20 Days prior to the start of related testing for approval by the Consultant. The Contractor shall revise the schedule based on the Consultant's review and resubmit five copies of the approved schedule a minimum of 10 Working Days prior to the start of testing. The testing and commissioning plan shall describe, in detail, the proposed testing and commissioning procedures for each piece of equipment and each system during Functional Testing, the Five Day Water Test, Performance Testing, and Operational Testing (including expected performance, operation range of each tested equipment as specified in individual specification sections). The Contractor shall include all supporting documentation as appendices to the commissioning.

.3 The Contractor shall provide five copies of the proposed Factory Acceptance (FAT), and Site Acceptance (SAT) Test schedules and plans a minimum of 20 Working Days prior to the start of related testing for approval by the Consultant, including co-ordination with and acknowledgement of the Contractor's schedule, showing Factory (FAT), Site (SAT) and Test schedules, test plans, procedures and log format. Revise schedule and plan based on Consultant's review and re-submit five copies of the approved schedule and plan along with the commissioning plan.

.4 The Contractor shall include all supporting documentation as appendices to the commissioning plan. The Contractor shall prepare and submit to the Consultant a testing and commissioning schedule showing the sequence of testing and commissioning. At a minimum, the Contractor shall include the following in the schedule:

- .1 Each system and major piece of equipment to be started up;
- .2 For each system, the Contractor shall include a detailed description, date and time of testing and commissioning activities for the following work items in daily stages: Functional Testing, Five-Day Water Testing, Performance Testing, Operational Testing, Constraints, equipment to be decommissioned, temporary systems, and any other factors that may impact upon testing and commissioning;
- .3 Schedule of operator training (training to be completed prior to commencement of Performance Testing); and
- .4 The Contractor shall provide the names of the Contractor's personnel, Sub-contractor(s), manufacturer(s), or organization(s) proposed to perform the services, and documentation to confirm their qualifications.

1.10 COMMISSIONING BINDER

.1 The Contractor shall maintain an organized and up-to-date commissioning binder on-Site inclusive of all documentation related to commissioning. At a minimum, the binder shall contain the commissioning plan, schedule, and all supporting documentation.

1.11 COMMISSIONING CHECKLIST AND SIGN-OFF FORM

.1 The Commissioning Sign-off Form (to be provided by Consultant prior) will track the status of deliverables of each phase of commissioning, and approve progression through phases of the commissioning process. The Consultant shall keep the checklist up-to-date throughout the duration of the project. Sign-off is required from the Consultant, the OCWA Project Manager, and the OCWA Team Lead to close out any commissioning phase. Review of the Commissioning Sign-off Form shall be an agenda item on each project meeting. Prior to the commencement of any testing or commissioning activities, submit the Commissioning Sign-off Form to the OCWA for review and demonstrate that all required documentation has been submitted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PRE-COMMISSIONING DOCUMENTATION SUBMITTAL

.1 The Contractor shall prepare and submit to the Consultant for review and approval all items listed below before proceeding with any testing or commissioning activity. The Consultant will review and approve the submittals and provide recommendations to OCWA.

.2 The items below shall form the Commissioning Plan:

.1 List of systems to be commissioned

.2 Detailed list of installed equipment (including manufacturer and model number)

3.2 FUNCTIONAL TESTING

.1 Following review and approval of all documentation by the Consultant, the Consultant will direct the Contractor to advance to the Functional Testing phase.

.2 The Contractor shall complete the tasks below under the Consultant's supervision. The Consultant will not allow the Contractor to start equipment prior to the completion of the tasks stipulated below.

.1 Inspect and clean all equipment, instruments, devices, connected piping, structures, and the facility to ensure that they are free of dirt and debris.

.2 Exercise all valves by hand, and operate all other devices to check for binding, interference, or improper functioning.

.3 Inspect valves, adjust as necessary. Clean bonnets and stems. Tighten packing glands to ensure no leakage while permitting valve stem to function without galling.

.4 Test piping for leaks throughout the facility.

.5 Ensure bases of all equipment are true and level.

.6 Inspect all equipment for cracks or damaged parts. Inspect the correctness of the equipment settings and the relative arrangement of all components of the system.

.7 Inspect bearings and verify alignment. Clean and remove all foreign matter.

.8 Lubricate all equipment according to the manufacturer's instructions.

.9 Where possible, turn rotating equipment by hand to verify that the equipment is not seized.

.10 Retain and calibrate testing equipment in accordance with the manufacturer's instructions.

.11 Adjust all equipment clearances and torque settings according to manufacturer's instructions.

.12 Adjust tension, alignment, and equipment speed on belt and variable pitch sheaves drives according to manufacturer's instructions.

.13 Ensure drive rotation, equipment speed, control sequence, and all other conditions comply with manufacturer's specifications and will not cause damage.

.14 Inspect, adjust, calibrate, and balance equipment and systems to ensure that they are fully operational. Retain and utilize all instruments required to do so.

.15 Test electrical equipment to verify that meter readings and specific electrical characteristics, including motor amperage, comply with the manufacturer's specifications.

.16 Verify that monitoring, interlocks and manual control operate via the Operator Interface workstations throughout the facility.

.17 Test and verify that controls are operational in both automatic and manual modes, and that all local and remote-control points are fully functional.

.18 Confirm that all programming and setup installation of Process Control Systems are complete. Provide the services of a senior electrical/instrumentation engineer or programmer from the equipment manufacturer for this testing and confirmation of programming.

.19 Confirm that the wiring and support systems for equipment installed under separate contracts have been inspected and are completely operational.

.3 The Contractor shall complete Installation and Start-Up Check-out/Verification/Test Report forms for each piece of equipment. Project specific forms will be issued by the Consultant to the Contractor prior to start-up. All parties are to complete and sign the respective forms. The Contractor shall provide five copies of each completed form to the Consultant for review and approval. The forms are a minimum and additional forms are to be provided as required by the Consultant to cover all equipment included under the contract. The Contractor, with assistance from the equipment supplier, shall provide written documentation of all tests not covered by the forms listed below to the Consultant for review.

.4 Reporting Requirements

.1 The Contractor shall submit all reporting requirements listed below to the Consultant for review and approval.

.2 In addition to the test reports specified above, the Contractor shall submit the signed report prepared by the supplier's representative describing, in detail, the findings of the pre-startup inspection, tests and adjustments made, quantitative results and suggestions for precautions to be taken for correct maintenance, if any.

.3 Manufacturer's certificate of proper installation, stating that the installation of the equipment has been inspected, is installed in accordance with the instructions, has been started and adjusted as necessary, is ready for operation, and is in warranty condition.

.4 Completed copies of manufacturer's start-up log sheets

.5 Completed copies of checkout/verification/test report forms for all equipment

.6 Written documentation of all tests not covered by forms.

3.3 FIVE DAY WATER TESTING

.1 Ready-to-test determination will be reviewed and approved by the Consultant, and based on full compliance with the following:

.1 Submission of all reporting requirements described above to close out the Functional Testing phase.

.2 Notification by the Contractor of equipment readiness for testing.

.3 Adequate completion of Work adjacent to, or interfacing with, the equipment to be tested.

.4 Availability and acceptability of a manufacturer's representative, when specified in the Contract Documents, to assist in testing of respective equipment.

.5 Fulfillment of all other specified manufacturer's responsibilities.

.2 General

.1 The Contractor shall complete the tasks listed below under the Consultant's supervision. The Consultant will not allow the Contractor to advance to the 14-Day Performance Testing phase prior to successful completion of the tasks stipulated below and submission of all reporting requirements.

.2 The Five Day water testing shall not be initiated until the equipment, system or facility meets the functional test requirements specified in the Contract Documents.

.3 The Contractor shall provide testing that simulates the actual (or expected) operating conditions with the use of water, inert gas, air, etc., to simulate flows, operating pressure and other control parameters.

.4 The Contractor shall provide all necessary equipment, devices, temporary systems, test medium and all other components (as required) to perform the five Day simulated testing.

.5 The Contractor shall supply all special tools and accessories required for the repair and adjustment of each piece of equipment. All tools and accessories shall be turned over to OCWA.

.6 The Contractor shall have the Contract Documents, approved shop drawings, Product data, and operation and maintenance data on hand throughout the entire start-up and testing period.

.7 The Contractor shall place equipment into operation in the appropriate sequence.

.8 The Contractor shall check-out and start-up each piece of equipment (or system) only under the direct supervision of a responsible, qualified and approved manufacturer's representative.

.9 The Contractor shall correct or replace any equipment or materials failing the tests/simulation conducted.

.10 In the event the materials supplied and/or Work fails to meet the requirements of the Specification Sections, the Contractor shall perform additional testing at no expense to OCWA. The Contractor shall also provide additional services for inspection and start-up to meet the requirements of the Contract Documents at its own cost.

.11 If, in the opinion of the Consultant and OCWA, the facility (or system) meets the Five Day water testing requirements specified in the Contract Documents, the facility (or system) shall be accepted as compliant and the Contractor will be permitted to advance to the performance testing phase. If, in the sole opinion of the Consultant and/or OCWA, the Five Day water testing results do not meet the requirements specified in the Contract Documents, the systems shall be considered as non-compliant.

.12 In the instance of any significant interruption of operation during the Five Day test (as defined below), the testing will be stopped immediately. The Contractor shall correct the deficiencies encountered and restart the simulated test for another five Days of continuous uninterrupted operation.

.3 Five Day Water Test

.1 Following the demonstration of all systems and subsystems as specified above under the functional testing phase, the Contractor shall fill each system with the intended process fluids, except for wastewater, sludge and other wastewater systems.

.2 All potable water, oil, air, and chemical systems shall be filled with the specified fluid.

.3 Wastewater process systems shall be filled with potable water for testing purposes.

.4 The Contractor shall install temporary connections, bulkheads and make other provisions to re-circulate process fluids or otherwise simulate anticipated operating conditions for a continuous five Day period.

.5 All tests shall commence only on a Monday.

.6 During the water testing period, the Contractor's representatives shall monitor the characteristics of each machine according to manufacturer

information and specifications and report any unusual conditions to the Consultant.

.7 Water Tightness Testing. The water tightness of the completed tank shall be tested in Accordance with ACI 350.1-10/AWWA 400 standard to criteria HST-100. The tank shall be saturated in accordance with the standard and covered during the testing. Daily water level readings shall be recorded and sent to the consultant daily.

.8 The Contractor shall provide temporary pumps to complete the tasks.

.9 If the demonstration is not successful, reschedule a new five day test to start on a Monday.

.10 The Contractor shall obtain all necessary permits from the applicable regulating bodies to allow for the temporary withdrawal and discharge of water if this demonstration procedure requires the withdrawal and discharge of water.

.11 Submit operational test results to the Consultant within 15 Days from the end date of the successful test.

.12 The Contractor shall place all items of equipment installed under the Contract into operation, along with related piping and metering systems.

.13 Without exception, all rotating equipment shall be checked, witnessed by the Consultant and OCWA Operations, Maintenance and Monitoring staff, and tested for (submit all test results to OCWA):

.1 Vibration level:

.1 **Vibration level shall be within the specified limit.**

.2 The peak vibration velocity shall not exceed 1mm/sec (0.04 inches/sec) measured in the filter-in mode.

.3 The vibration level is to be measured and reported for both filter-in and filter-out modes.

.4 The Contractor shall provide a hardcopy of the Vibration Signature Spectrum showing vibration velocities over a frequency range of 0 to 2000 Hz, measured in filter-in and filter-out modes.

.5 Include this in each set of the Maintenance Manuals.

.2 Noise level: Noise level shall be within the specified limit indicated in the Specification Sections for each item of equipment.

.3 Initial winding analysis report

.14 For Control Loop Checkout/Verification, arrange with the electrical, instrumentation and control Subcontractors for the testing of loop wiring between instrument and field devices. Coordinate with the Consultant for the Consultant's attendance during control loop tests.

.15 Perform the testing of instrumentation loops for each loop in sequence and in groups. Instrument and loop testing will be graded on a pass/fail basis. Should more than two instrument loops within a group fail the loop

checkout, then the entire group of loops will be deemed to have failed the checkout. The failed loops shall be repaired and the entire group must be retested.

.16 All operational features and controls shall be demonstrated to function in both manual and automatic modes, where applicable. All local and remote control points shall be demonstrated to be functional.

.17 Five Day water testing of the system, the entire facility, or any portion thereof shall be considered complete when, in opinion of the Consultant, the system, facility or designated portion has operated in the manner intended for five continuous Days without significant interruption. Significant interruption shall include any of the following events:

.1 Failure of the system, facility, or any portion thereof to meet the specified performance criteria for more than two consecutive hours.

.2 Failure of any critical equipment or unit process that is not satisfactorily corrected within five hours from the initial time of failure.

.3 Failure of any non-critical equipment or unit process that is not satisfactorily corrected within eight hours from the initial time of failure.

.4 Any event deemed by the Consultant, at its sole discretion, to be a significant failure.

.5 Failure of the Contractor to provide and maintain qualified on-site start-up personnel as scheduled.

.18 Refer to Division 11 for additional information and requirements related to process instrumentation and control systems.

.4 Reporting Requirements

.1 The Contractor shall submit all reporting requirements listed here to the Consultant for review and approval. Forms are included as a supplement at the end of this Section.

.2 The Contractor shall complete the Consultant's Standard Installation/Start-up Checkout Forms.

.3 Vibration signature spectrums from rotating equipment.

.4 Initial winding analysis report.

.5 Water testing report (inclusive of any deficiencies noted during water testing).

.6 Post-water test inspection results.

3.4 TRAINING

.1 The Contractor shall provide equipment specific training in the field for OCWA Operations, Maintenance and Monitoring Staff prior to the equipment being placed into service by OCWA (that is, prior to 14-Day Performance Testing).

.2 Reporting Requirements

.1 The Contractor shall submit all reporting requirements listed here to the Consultant for review and approval. Forms are included as a supplement at the end of this Section.

.2 Completed Contractor/Supplier Training Sign-Off forms.

3.5 14-DAY PERFORMANCE TESTING

.1 General

.1 The Contractor shall complete the tasks listed below under the Consultant's supervision.

.2 During performance testing, each system shall be operated continuously for 14 Days as a complete facility. In the instance that the operation is halted for any reason related to the facilities constructed or the equipment furnished, the performance testing program must be restarted and repeated until the fourteen-day continuous period has been reached without interruption.

.3 All defects encountered during the performance testing period must be corrected or the specific component or entire piece of equipment shall be replaced by the Contractor to the complete satisfaction of the OCWA at no added cost to the OCWA.

.4 Performance testing shall not commence until the equipment, system or facility has been accepted by the Consultant and OCWA as having satisfied the Five Day water test requirements as specified in the Contract Documents.

.5 The Contractor shall arrange for and provide classroom and field training by the equipment Supplier(s) prior to commencing the performance testing period.

.6 The Contractor shall follow the approved performance testing plan and detailed procedures specified in the Contract Documents.

.7 The Contractor shall provide all labor, materials, and supplies for conducting the performance testing and taking all samples and performance measurements.

.8 The OCWA (at their discretion) may conduct independent testing to verify test results. If through the independent testing, the testing fails, the Contractor shall correct all deficiencies and retest at their own cost.

.9 Routine sampling and analytical laboratory work required during performance testing will be performed by the OCWA Operations, Maintenance and Monitoring Staff.

.10 Performance testing of the system, the entire facility, or any portion thereof shall be considered complete when, in the sole opinion of the Consultant, the system, facility or designated portion has operated in the manner intended for fourteen continuous days without significant interruption. Significant interruption shall include any of the following events:

.1 Failure of the system, facility, or any portion thereof to meet the specified performance criteria for more than two consecutive hours.

.2 Failure of any critical equipment or unit process that is not satisfactorily corrected within five hours from the initial time of failure.

.3 Failure of any non-critical equipment or unit process that is not satisfactorily corrected within eight hours from the initial time of failure.

.4 Any event deemed by the Consultant, at its sole discretion, to be a significant failure.

.5 Failure of the Contractor to provide and maintain qualified on-site start-up personnel as scheduled.

.2 Performance Testing

.1 Following successful completion of the Five Day water test and submission of all reporting requirements to close out the five Day water testing phase, the Contractor shall place the new, refurbished and/or reconstructed Work into operation starting on a designated Monday under supervision of the Consultant. For a 14 continuous Day period, OCWA will operate the facility. The Contractor shall have supervisory personnel, mechanics, electricians, instrument technicians and other workmen on Site during the normal working day and as required at other times to ensure the safe continuous operation of the facility (as specified by the Consultant). During other times, the Contractor shall have the above personnel on call to perform any adjustments and/or corrections required. In the event the facility, system, or any portion thereof does not perform satisfactory for 14 continuous Days, continue with the program until the operation of the work is satisfactory or reschedule a new 14-Day performance testing program.

.2 Equipment shall be operated using initially simulated interlock and alarm signals, where necessary, to check functionality.

.3 Loop checks shall be completed from field instruments by simulated or quantifiable process inputs to terminals in the local control panel for interface with the remote PLC. The Contractor shall provide further calibration of field instruments, as required.

.4 The performance testing shall demonstrate that all operational features and controls function in both manual and automatic modes, where applicable, and that all local and remote-control points are functional.

.5 The performance testing shall include verification of the following performance criteria:

.1 Acceptable operation of the equipment/system including control devices and safety systems for the available control modes of operation.

.2 Trending of monitored process variables and equipment parameters, as appropriate.

.3 Adequate system responses to simulated abnormal/emergency conditions, including, but not limited to, localized power failure and specific hardware failure.

.3 Reporting Requirements

.1 The Contractor shall submit all reporting requirements listed below to the Consultant for review and approval:

.2 Upon satisfactory completion of performance testing for each piece of equipment, submit to the Consultant, the Manufacturer's certificate of successful operation for each piece of equipment stating that the equipment is installed correctly, is in full operating condition, is operating in accordance with its design rating, and is in warranty condition. Submit the original certificates to the Consultant;

.3 Completed performance testing forms;

.4 Performance testing report (inclusive of any deficiencies noted during performance testing); and

.5 Post-performance test inspection results.

3.6 POST-COMMISSIONING DOCUMENTATION SUBMITTAL

.1 14 Day Performance testing results

.2 Pressure testing results

.3 Copies of manufacturer's certificates of proper installation (records)

.4 Copies of manufacturer's certificates of successful operation (records)

.5 Copies of manufacturer's start-up log sheets (records)

.1 Copies of checkout / verification / test report forms for all equipment types (records)

.2 Sample forms for documenting results of 5-day water test (records)

.3 Shutdown request form

.4 Shutdown permit to work

END OF SECTION

SECTION 01820
DEMONSTRATION AND TRAINING

PART 1 GENERAL....1

1.1 DEFINITIONS:....1
1.2 GENERAL....2
1.3 TRAINING REQUIREMENTS....3
1.4 TRAINING SCHEDULE....3

PART 2 TRAINING....4

1.5 THE CONTRACTOR SHALL SUBMIT A DETAILED SUMMARY OF TRAINING AND DEMONSTRATION ACTIVITIES BY UPDATING THE TRAINING SCHEDULE ADDRESSING ALL REQUIRED TRAINING TO THE CONSULTANT FOR APPROVAL BASED ON THE FOLLOWING:....4
1.6 TRAINING MATERIALS....5
1.7 SUBMITTALS....6

SECTION 01820
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 DEFINITIONS:

.1 Demonstration:
Demonstration is defined as a skilled performance of a task or technique showing precisely how it should and could be properly done on the job. Demonstration results in observational learning that allows for skill acquisition which includes "hands-on" task performance and repetition to confirm skills have been acquired.

.2 Trainee:
A Trainee is defined as OCWA personnel selected for operating and maintaining the facility including, but not limited to, managerial and supervisory staff, operators, maintenance staff, technical specialists, capital delivery staff and other OCWA employees as required.

.3 Training Coordinator:
A Training Coordinator is an OCWA employee responsible for internal management of training administration. The position is cited on the OJT Form.

.4 Training:
Training is planned and organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill. Training is a process of bringing an individual to an agreed standard of proficiency by practice and instruction and fulfilling the established learning objectives. Training allows performance to be improved by helping learners to master a new or established technology. The technology may be a piece of equipment, a complex system of devices, or a procedure for a defined operational or maintenance process.

.5 On-the-Job Training (OJT) Form
This is an OCWA-based form that allows training duration to be credited toward licensed water operator annual training requirements as accepted by OWWCO/MOECC. Sections A, B, and D of the form are to be completed by the training provider. Completed forms are to be submitted to the Consultant for all OJT cited sessions within two (2) Working Days after the training.

.6 Lesson Plan:
A Lesson Plan is the instructor's road map of what trainees need to learn and how it will be effectively delivered during the allocated time. A Lesson Plan requires identification of the learning objectives for the topic being covered. Lesson Plans detail the learning activities and developed strategies to obtain feedback on student learning. Lesson Plans address and integrate these four key components:
.1 Objectives for trainee learning;

.2 List of Personal Protective Equipment (PPE) required by trainees prior to training sessions;
.3 Teaching/learning activities;
.4 Method of confirming trainee understanding of the course materials (by survey, test etc.).

1.2 GENERAL

.1 Contractor is responsible for coordination of the Work related to training and demonstration activities in collaboration with the Consultant.

.2 Contractor shall bear all costs associated with demonstration and training except where otherwise noted in this specification.

.3 OCWA operates water and wastewater systems on a continuous 24/7 basis, and as such, considers training and demonstration to all shift operations and maintenance staff a key responsibility of the Contractor in arranging the delivery of quality training as defined by this section.

.4 A portion of the training sessions will be conducted during non-business hours in order to provide coverage to shift operations staff.

.5 Demonstration and training may be classroom based, on-site based (facility) or off-site based as appropriate.

.6 The Contractor shall provide knowledgeable, authorized representatives to demonstrate and/or train on equipment and systems. All representatives must be suitably qualified and experienced in the respective types and models of equipment or systems being used as well as the intent of this specification. Contractor and Manufacturer's Representatives who provide training shall be familiar with the specific facility operations and maintenance requirements as well as with the specified equipment.

.7 Training is to be of sufficient detail, duration, and quality to provide trainees with the knowledge and skills to meet the following objectives:

.1 Safe, reliable, cost effective, energy efficient operation of the facility, meeting regulatory requirements at all times, including under emergency modes of operation and under all design conditions (full range of device/system functional design as defined in the Contract Documents);

.2 Proper preventative maintenance, diagnosis, trouble-shooting and maintenance of the facility;

.3 Understanding of spare parts requirements, use of specialized equipment, tools and consumables replenishment including calibrations, calibration checks and adjustments;

.4 Understanding of health and safety procedures, hazards associated with operation/maintenance of the equipment/systems in accordance with OHSA.

.8 OCWA will not accept equipment or systems for operation by OCWA personnel unless all scheduled trainees have been trained.

.9 Contractor is not responsible for OCWA staff missing scheduled training sessions.

.10 The OCWA reserves the right to deduct the cost of any cancellations or repeat sessions necessary as a result of any actions or omissions of the Contractor or substandard quality of training and demonstration from any monies due to the Contractor under this Contract.

.11 The OCWA reserves the right to digitally record any or all training provided by the Contractor and any Subcontractors for exclusive use by the OCWA for any training sessions and will inform the Contractor prior to delivery which sessions will be recorded.

.12 Where appropriate, all demonstration and training shall be delivered on equipment and instruments that are capable of operating as intended. Any exceptions to such must be approved by OCWA.

.13 Lesson Plans deemed unacceptable shall be returned to the Contractor for correction and resubmission. No delays to the training schedule are permitted due to rejected Lesson Plans.

.14 In the event Contractor provided training is repeated and remains unsatisfactory (as deemed by the OCWA), such training will be provided by a third party selected by the OCWA at the expense of the Contractor.

1.3 TRAINING REQUIREMENTS

.1 Training activities are to be suitable based on existing knowledge and complexity of equipment systems and sub-systems.

1.4 TRAINING SCHEDULE

.1 The Contractor shall submit a detailed schedule of training and demonstration activities to the Consultant for approval.

.2 An approved Training Schedule allows all parties to view all established training dates for the duration of the project and allows OCWA to ensure trainees are available for the defined dates in the schedule.

.3 The Contractor shall provide sufficient time in the overall construction schedule to complete all required training and demonstration activities prior to commissioning.

.4 The OCWA shall provide a list of trainees which are required to receive training and instruction including dates and times of shift worker availabilities. Contractor shall incorporate this information into the Training Schedule on an ongoing basis.

.5 Where the same personnel are used for testing and commissioning and for demonstration and training, ensure that the testing and commissioning Work is completed to the satisfaction of OCWA before the demonstration and training commences for OCWA staff not involved in testing and commissioning, and that sufficient time is set aside to complete the demonstration and training.

.6 All factory training programs, if required, shall be completed prior to the start of testing and commissioning and shall use equipment similar to that being supplied.

.7 Contractor to provide all defined training on sub-systems to trainees following Functional Testing and prior to the start of overall Facility commissioning activities on related equipment and/or systems.

.8 All training shall be completed prior to commissioning activities as defined by Section 01810 – Equipment Testing & Facility Commissioning.

.9 Demonstration and training delivery shall be within a reasonable time frame following completion of Functional Testing (refer to Section 01810 – Equipment Testing & Facility Commissioning.). Contractor submission of Training Schedule must align with the providing training following Functional Testing and be approved by the Consultant. Any undue delay between Functional Testing completion and training will not be accepted.

.10 The Contractor shall coordinate the attendance of the demonstration and training specialists and/or instructors with the Consultant and OCWA to ensure availability of the trainees.

.11 The Contractor shall provide the Consultant with a Training Schedule, draft course outlines, Lesson Plans, and Agendas for review and acceptance at least forty (40) Working Days prior to the first training session. Schedule training only after approval by Consultant.

.12 All classroom training programs, if required, shall be completed prior to the start of any testing and commissioning.

PART 2 TRAINING

1.5 DETAILED SUMMARY OF TRAINING & DEMONSTRATION ACTIVITIES

.1 The Contractor shall submit a detailed summary of training and demonstration activities by updating the Training Schedule addressing all required training to the Consultant for approval based on the following:

.1 Detailed System and Equipment Training

.1 Contractor shall provide Lesson Plans to Consultant for approval 20 Working Days prior to scheduled delivery.

.2 Training sessions shall include a training evaluation form to be filled out by each trainee. Training evaluation forms shall be provided to the Consultant immediately upon completion of the individual session. Training shall be considered adequate if the instruction fulfilled all aspects of the Lesson Plan and the training evaluation forms indicate satisfactory training delivery. Training sessions not in accordance with the Lesson Plan shall be repeated at the Contractor's expense.

.3 Contractor shall ensure equipment and systems are in an operational state to the satisfaction of the OCWA prior to training by the Contractor.

.4 Contractor shall provide certified, trained, articulate representatives to coordinate and deliver training. Training shall align with operations and maintenance manual as specified in Section 01430 – Operation & Maintenance Data.

.5 Contractor shall provide properly completed OJT form (On the Job Training Form) to the Consultant within two (2) Working Days after the training.

1.6 TRAINING MATERIALS

.1 Course Materials for training sessions:

.1 Provide sufficient written materials to support all demonstration and training sessions while addressing each approved Lesson Plan for training (delivered by Contractor).

.2 All materials provided for training shall conform to the following:

.1 Size: 8.5 x 11 inches.

.2 Paper: 20-lb minimum, white, for typed pages.

.3 Text: Manufacturer's printed data, or neatly word processed, and designed specifically for learning. Ample space for note-taking shall be provided.

.4 Double-sided.

.5 Drawings and Sketches:

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

.2 Reduce larger drawings to not larger than 11 x 17 inches and fold to the size of the text pages.

.3 Use colour prints to highlight key elements.

.6 Cover to include:

.1 Contract number

.2 Title of project

.3 Identity of the separate equipment or system as applicable.
.4 Identity of the general subject matter covered in the manual.
.5 Locations or facility names.
.6 Publication date.
.7 Revision number.

.3 Binders shall be:

.1 Commercial quality D-ring binders with durable and cleanable plastic covers.

.2 Maximum post width: 2 inches.

.3 When multiple binders are used, the Contractor shall correlate the information into related consistent groupings and clearly number all volumes.

.4 Digitally Recorded Training Modules:

.1 The use of digitally recorded materials for an entire training module or part of a training module provided by the Contractor will be considered as long as it is professionally produced, reviewed and approved by the Consultant and OCWA prior to its use. Digitally recorded training materials shall be in DVD or other digital format approved by OCWA and shall become the property of OCWA for its exclusive use.

.2 The use of this material shall be viewed as an enhancement to the required face-to-face training and not as a substitute.

.3 The OCWA reserves the right to record and re-broadcast all training and/or demonstration sessions.

1.7 SUBMITTALS

.1 The Contractor shall develop, maintain and provide properly completed Summary of Training Requirements to the Consultant for approval on an ongoing basis that summarizes all training modules delivery details (date, time, location, title, number of participants, etc.) over the life of the Project.

.2 All training sessions shall be documented with respect to course title, date/time, instructor's name, duration, attendees (including signed attendance records), location and any other relevant information required by OCWA.

.3 A digital storage device (portable storage device) containing the training session Lesson Plan and Agenda including prepared instructional material.

.4 Draft training related submissions (Lesson Plans, agendas, training materials etc.) shall be submitted during the shop drawing submittal stage. Final approved training modules shall be submitted forty (40) Working Days prior to the scheduled date for training.

.5 The Contractor shall furnish complete training materials including operation and maintenance requirements and other data, to be retained by

each trainee plus one master copy and two additional copies to be provided to OCWA.

.6 Training material shall be submitted in digital format as PDFs created in the latest edition of Adobe Acrobat and include all drawings as PDFs and original AutoCAD (latest version) files.

.7 The Contractor shall submit properly completed OJT form(s) for all training cited in Summary of Training Requirements as required.

.8 Training session evaluation forms shall be provided to each trainee and completed forms to be provided to the Consultant. Contractor shall provide all such documentation to the Consultant within 2 Working Days of completing the individual training session for all training categories. Course evaluation forms provided for training shall be reviewed by the Consultant and OCWA and if deemed inadequate shall direct the Contractor to repeat the training session(s) at no additional cost to OCWA until delivery is considered satisfactory by the Consultant.

END OF SECTION

Division 02

General

Section #	Section Name	Pages
02231	CLEARING AND GRUBBING	5
02260	EXCAVATION SHORING SYSTEMS	8
02270	EROSION CONTROL	2
02315	EXCAVATING, TRENCHING AND BACKFILLING	8
02530	YARD PIPING	8
02701	AGGREGATES – GENERAL	2
02820.01	ASBESTOS ABATEMENT – MINIMUM PRECAUTIONS	6
02821	CHAIN LINK FENCES AND GATES	5
02921	TOPSOIL AND FINE GRADING	6
02938	SODDING	5

Section 02231
CLEARING AND GRUBBING

PART 1 GENERAL 1

1.1 RELATED REQUIREMENTS 1
1.2 MEASUREMENT PROCEDURES 1
1.3 REFERENCE STANDARDS 1
1.4 DEFINITIONS 1
1.5 ACTION AND INFORMATIONAL SUBMITTALS 2
1.6 QUALITY ASSURANCE 2
1.7 STORAGE AND PROTECTION 2
1.8 WASTE MANAGEMENT AND DISPOSAL 2

PART 2 PRODUCTS 2

2.1 MATERIALS 2

PART 3 EXECUTION 3

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL 3
3.2 PREPARATION 3
3.3 APPLICATION 3
3.4 CLEARING 4
3.5 UNDERBRUSH CLEARING 4
3.6 GRUBBING 4
3.7 REMOVAL AND DISPOSAL 4
3.8 FINISHED SURFACE 4
3.9 CLEANING 4

Section 02231
CLEARING AND GRUBBING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 None.

1.2 MEASUREMENT PROCEDURES

.1 Fixed price payments will be made for:

.1 Clearing.

.2 Close cut clearing.

.3 Grubbing.

1.3 REFERENCE STANDARDS

.1 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

.6 EAB refers to Emerald Ash Borer a non-native, invasive beetle that is highly destructive to ash trees where it occurs.

.1 Woodchips in the context of EAB consist of untreated, raw bark and wood fragments broken or shredded from logs or branches. Woodchips are to be less than 2.5 cm in at least any two dimensions.

.2 Firewood in the context of EAB consists of non-manufactured, solid wood material, with or without bark, cut into sizes less than 1.2 metres long and less than 25 cm in diameter which may be handled manually.

.3 Logs in the context of EAB consist of untreated, raw wood greater than 1.2 metres in length and greater than 25 cm diameter.

.4 Enclosed vehicle in the context of EAB consist of any vehicle transporting regulated wood material that is equipped to prelude the loss of materials or the escape of EAB while in transit.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

.2 Safety Requirements: worker protection.

.1 Workers must wear respirators gloves long sleeved clothing eye protection protective clothing when applying herbicide materials.

.2 Workers must wear dust masks gloves eye protection long sleeved clothing protective clothing safety boots, safety vests when clearing and grubbing.

.3 Workers must not eat, drink or smoke while applying herbicide material.

.4 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.7 STORAGE AND PROTECTION

.1 Prevent damage to utility lines site appurtenances root systems of trees fencing trees water courses which are to remain.

.1 Repair damaged items to approval of Consultant.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Ash wood mixed with the wood of other species is to all be managed and disposed of as ash wood.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

.2 Herbicide: effective for killing annual and perennial weeds, and bamboo grass, by being absorbed through roots and foliage.

.1 Spray applied on non-crop land areas.

.3 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reuse.

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

.1 Inspect site and verify with Consultant, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Consultant immediately of damage to or when unknown existing utility lines are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify Consultant in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing.

.4 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

.1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.4 CLEARING

.1 Clearing includes felling, trimming, cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, rubbish snags, brush, occurring within cleared areas.

.2 Clear as indicated, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches overhanging area cleared.

3.5 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated to ground level.

3.6 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^3.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.7 REMOVAL AND DISPOSAL

.1 Remove grubbed cleared materials off site.

.2 Remove diseased trees off site.

.3 Any ash wood materials or firewood which is removed from the site is to be transported in an enclosed vehicle and disposed of at an authorized disposal facility.

.4 The Contractor is responsible for monitoring all cut ash wood and firewood until it is properly disposed of.

3.8 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate grading operations.

3.9 CLEANING

.1 Proceed in accordance with Section 01780.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, flagging tape, tools and equipment.

END OF SECTION

Section 02260
EXCAVATION SHORING SYSTEMS

PART 1 GENERAL....1

1.1 SUMMARY....1
1.2 REFERENCES....1
1.3 DEFINITIONS....2
1.4 SYSTEM DESCRIPTION....2
1.5 SUBMITTALS....3
1.6 QUALITY ASSURANCE....4

PART 2 PRODUCTS....4

2.1 MATERIALS....4

PART 3 EXECUTION....5

3.1 INSTALLATION....5
3.2 FIELD QUALITY CONTROL....7

Section 02260
EXCAVATION SHORING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

.1 Comply with Division 1 – General Requirements and all other Specification Divisions.

.2 Section Includes:

.1 This section includes the design of temporary structures, shoring systems, excavation support, protection of existing structures, services and utilities required to execute the construction of the Works in all areas.

.2 Design, installation and maintenance of struts, walers, rakers, braces and other components required for an internal lateral support system.

.3 Design and installation for a cantilever support system.

.4 Design all temporary structures required for execution of the Works.

.5 Supply, place, brace and remove temporary shoring of sides of excavations. Include shoring systems that need to be left in place to ensure safe execution of construction.

.6 Underpinning and temporary supports for existing utilities not specifically mentioned but which may be necessary in order to execute construction of Works.

.7 Excavation shoring for yard piping.

1.2 REFERENCES

.1 CAN/CSA-G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel.

.2 CAN/CSA-G40.21-M Structural Quality Steels.

.3 CAN/CSA-S16.1-91 Design of Steel Structures.

.4 CSA W47.1 Certification of Companies for Fusion Welding of Steel Structures.

.5 CSA W59-13 Welded Steel Construction (Metal Arc Welding).

.6 ASTM A29/A29M-20 Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought.

.7 ASTM A322-13 Standard Specification for Steel Bars, Alloy, Standard Grades.

1.3 DEFINITIONS

.1 Temporary structures: Structures of a short-term nature, such as: excavation shoring systems, vertical or lateral shoring of existing structures or utilities, bracing, scaffolding and similar systems which will be required in order to execute construction of permanent Works.

.2 Excavation shoring system: A temporary structure, such as steel liner plates, steel-sheet piling, steel rib and lagging, or similar system required to retain earth and water in order to facilitate construction of permanent Works.

.3 Underpinning: Installation of temporary or permanent supports below structures or utilities that become undermined as a result of execution of constructing the permanent Works.

1.4 SYSTEM DESCRIPTION

.1 Installation of temporary structures, shoring systems, excavation support, protection of structures, services and utilities required to execute the construction of the Works.

.2 Installation of temporary structures, shoring systems and excavation support required to protect the existing structures which are adjacent to the construction of the Works.

.3 Installation of steel sheeting or other suitable excavation shoring systems to facilitate installation of new pipelines or utilities and/or modifications to existing utilities.

.4 Design Requirements

.1 Design temporary structures based on recognized geotechnical principles and structural theories for conditions present.

.2 Consider applicable loads and load combinations, including lateral pressures from groundwater, soil, existing foundation surcharge, unsymmetrical surcharge loads from construction operations and frost action on retained soil.

.3 Limit deflections of excavation shoring systems:

.1 Generally, limit deflections of foundation material supporting foundations at a higher elevation, to prevent settlement damage or displacement of structures and utilities. Ensure that retained foundation material is not disturbed and/or weakened.

.2 Lateral support systems for trench-shoring systems shall be designed to meet specified performance deflection and settlement criteria for various existing structures and water conduits.

.4 Bracing to remain fully effective during construction. Pre-stress bracing, if required, to control deflection within limits specified.

.5 Coordinate design of excavation shoring system and dewatering system to meet performance requirements specified.

.6 Base section properties of steel-sheet piling on complete slippage at interlocks unless interlocks are welded prior to load application.

.7 Design splices in walers and bracing in accordance with requirements of CAN/CSA-S16.1.

.5 Responsibility for Design of Shoring Systems and Temporary Structures

.1 Contractor is responsible for the design of all temporary structures, shoring and underpinning required to execute construction.

.2 Engage and pay for the services of a professional engineer with the required skills, licensed to practice in the province of Ontario, to carry out the necessary design and supervise the preparation of shop drawings.

.6 Performance Requirements

.1 Construct temporary structures and systems in compliance with the design.

.2 Ensure continuous protection of new and existing structures, piles, services, utilities, roads, and embankments from disturbance, displacement, settlement, or damage during construction.

.3 Prevent disturbance, destabilization, or failure of sides and bottom of excavation.

.4 Lateral support of the walls shall remain fully effective during construction. Pre-stress, struts, bracing and tiebacks, etc., as required, to control deflection and displacement and to ensure that minimum specified performance criteria are met.

1.5 SUBMITTALS

.1 Shop Drawings

.1 Submit shop drawings of excavation shoring and bracing systems for record purposes.

.2 Submit shop drawings of any underpinning system required to execute construction of the works.

.3 Shop drawings to bear seal and signature of the Professional Engineer who is the designer of the system.

.4 Excavation shoring and bracing systems drawings will not be reviewed for structural adequacy. Full responsibility for the design, installation, and maintenance of excavation shoring and bracing systems rests with the Contractor.

.5 Indicate:

.1 General arrangement of temporary structures.

.2 Design loadings.

.3 Dimensions and elevations of shoring.

.4 Installation and deflection tolerances.

.5 Material sizes, designations, and grades.

.6 Relationship of temporary structures to new and existing structures, services, and utilities.

.7 Method and details of installation of temporary structures.

.8 Location of temporary struts and walers relative to permanent structure.

.9 Schedule for removal of temporary struts and walers.

1.6 QUALITY ASSURANCE

.1 The professional engineer responsible for the design of the system shall be retained by the Contractor to supervise installation.

.2 Engage personnel with demonstrated competence and experience to install temporary structures and related systems.

.3 Welder: CSA W47.1 certified.

.4 Monitoring:

.1 Vibration Monitoring: When installing steel sheet piling and/or undertaking other vibration inducing construction activities carry out vibration monitoring.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Steel-sheet Piling:

.1 CAN/CSA-G40.20-M; hot-rolled, interlocking type.

.2 Structural steel: CAN/CSA-G40.21-M; GRADE 350W. Structural steel for wales, bearing plates, wales splices, capping channels, support angles and miscellaneous steel: CAN/CSA-G40.21-M; Grade 300W.

.3 Welding: CSA W59-M.

.4 Tie-backs and Anchor Bars: ASTM A29/A29M and ASTM A322; proof stressed to minimum yield stress; Dywidag bars.

.5 Lumber:

.1 Graded lumber, sound, straight, free from cracks, shakes, and large or loose knots.

.2 Planks for sheeting: Tongued and grooved, or grooved and splined.

.6 Concrete:

.1 Drypack concrete fill behind lagging.

.2 Lean mix concrete to support toes of piles for typical wood lagging excavation.

.7 Grout:

.1 Mix: Sand and Type 10 Cement in a 1:1 weight ratio.

.2 Compressive strength: 25 MPa minimum at 7 days and 35 MPa at 28 days.

PART 3 EXECUTION

3.1 INSTALLATION

.1 General:

.1 Install excavation shoring and bracing systems, as required by the soil conditions, to prevent cave-ins of banks and sides of excavation.

.2 Excavation shoring is mandatory in areas where excavation will potentially cause settlement and/or lateral movement of existing structures, pipelines and/or utilities or where the excavation will potentially undermine such existing structures, pipes, services, utilities, or roads.

.3 Excavation shoring is mandatory around:

.1 Structures where adjacent structures are constructed at a higher level.

.2 Where indicated on the plans and where open-cut is not noted as an acceptable alternative.

.3 In areas where excavation will potentially undermine existing structures, pipes, services, utilities, or roads.

.4 For driven excavation shoring systems, install within a tolerance of 75 mm. Meet specified vibration tolerances during installation and removal, as applicable.

.5 Where shoring is used as formwork for concrete structures, verify that shoring in its deflected position does not reduce thickness of structural concrete. If excavation shoring system as installed reduces the thickness of structural concrete, alter shoring at no additional cost to the Owner until shoring installation meets above requirements.

.6 Do not encase any part of the shoring in permanent concrete structure without written permission from Engineer.

.7 Schedule removal of bracing members and walers so that permanent structures, excavation shoring system, or bracing members are not overstressed and so that deflection performance criteria are not exceeded.

.8 For the left in placing shoring systems, the top shall be cut off 1.2 m below grade of as directed by the Engineer.

.9 For walls that are cast directly against shoring system which consist of solider piles/wooden lagging or liner plates, waterproofing membrane and drainage layer shall be supplied and installed.

.2 Steel-sheet Piling:

.1 Provide temporary guide frames and bracing to maintain alignment of sheet piles during setting and driving.

.2 Install piling to required dimensions and elevations.

.3 Install walers and bracings so as not to interfere with installation or placement of reinforcing bars or other parts of permanent structure.

.4 Clean inside face of sheeting system of dirt and loose material to make it suitable for use as an outside form for concrete wall.

.5 Do not excavate adjacent to retaining wall sheeting until bracing, anchoring, and testing have been completed.

.3 Soldier Piles and Lagging:

.1 Install soldier piles to required dimensions and elevations in pre-drilled holes. Fill void with lean concrete.

.2 As excavation proceeds, wedge lagging tightly against firm undisturbed ground.

.3 Remove any loose soil from between lagging and firm undisturbed ground.

.4 Fill voids between lagging and firm undisturbed ground with dry-pack concrete rammed tightly in place.

.5 Do not leave sides of excavation exposed without lagging.

.6 Install walers, struts, and bracings at required elevations as excavation proceeds.

.4 Underpinning:

.1 Execute installation in conformance with submitted shop drawings.

.2 Do not remove existing supports or foundation materials to cause settlement and /or damage to existing structures and utilities.

.3 Temporary underpinning to remain in place until permanent supports are constructed in accordance with the construction documents.

.4 Leave underpinning in place where indicated or where it cannot be safely removed without the risk of settlement, displacement and/or damage to the supported structure.

.5 Steel Liner Plates:

.1 Excavate to a depth of one ring and install first liner plate. Verify that first ring is true to circle and plumb.

.2 Excavate for next ring and place liner plates. Do not excavate further than width of one ring at any time.

.3 Pump grout into voids between liner plates and firm undisturbed ground.

.4 Grout after placing every second ring, or more frequently, as required. Do not leave rings without grout overnight.

.5 Do not leave sides of excavation exposed below liner plates at end of day's work.

.6 Clean inside face of liner plates of dirt and loose material to make it suitable for use as an outside form for concrete wall.

.7 Reinforce openings as required by design

.6 Temporary Supports and Bracing for yard piping and utilities:

.1 Install in conformance with submitted shop drawings.

.2 Temporary supports and bracing to remain in place until permanent supports are constructed in accordance with the construction documents.

3.2 FIELD QUALITY CONTROL

.1 Monitor and keep a written record of deflections of the excavation shoring system and of any settlement of adjacent structures resulting from the work under this section. Cease work and report to Engineer for any movement detected.

END OF SECTION

Section 02270
EROSION CONTROL

PART 1 GENERAL....1

1.1 DESCRIPTION....1
1.2 MEASUREMENT AND PAYMENT....1
1.3 GENERAL....1

PART 2 PRODUCTS (NOT USED)....2

PART 3 EXECUTION (NOT USED)....2

SECTION 02270
EROSION CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

.1 This Section specifies the requirements for temporary erosion control measures.

1.2 MEASUREMENT AND PAYMENT

.1 The Work outlined in this Section is included in the lump sum price in the Bid Form.

.2 No additional payment will be made for compliance with the erosion and sediment control requirements with all costs deemed to be included in the Bid Form.

1.3 GENERAL

.1 It is intended that the Works proposed be executed in such a manner that will, to the fullest extent possible, minimize any adverse effects on the natural environment of the overall project area.

.2 It is the responsibility of the Contractor that all personnel be sufficiently instructed so that the work is carried out in a manner consistent with minimizing environmental damage.

.3 The Contractor is required meet the requirements of all environmental legislation and regulations related to erosion and sediment control.

.4 Geotextile used for sediment fence shall conform with Ontario Provincial Standard Specification (OPSS) 1860**.**

.5 All control measures shall be in place prior to any land disturbance on site. These measures will be maintained by the Contractor during the construction in a manner satisfactory to the Engineer to ensure compliance with the requirements of the contract documents and to prevent damage occurring as a result of erosion, sedimentation and flooding.

.6 Any water pumped from excavations or trenches on the site shall be treated with appropriate controls (filter bags) before discharge on or off-site to ensure compliance with applicable guidelines and regulations.

.7 The Contractor shall ensure compliance via frequent monitoring of operations.

.8 Existing storm drainage systems, or any other inlets and outlets, are to be protected prior to construction start and at all times with appropriate erosion control measures.

.9 The Contractor shall maintain all road drainage systems, stormwater drainage systems, control measures, mud tracking prevention and cleaning features and other facilities as required.

.10 Any stockpile containing more than 100 cubic meters of material shall not be located less than 10 meters away from a roadway or drainage channel. If such a pile is intended to remain in place for more than thirty (30) days, it shall be adequately stabilized subject to Engineer's approval. Erosion from stockpiles which are intended to remain in place for less than thirty (30) days shall be controlled with appropriate measures as approved by the Engineer.

.11 A mud tracking prevention program and regular access/road cleaning will be required to be completed by the Contractor to ensure materials are not deposited on adjacent public roads.

.12 The Contractor shall maintain all road drainage systems, control measures and other facilities as required.

.13 The Contractor shall repair any siltation or erosion damage to adjoining surfaces and drainage facilities resulting from project activities.

.14 The Contractor will inspect the sediment control measures at least once per week and after each precipitation event and make necessary repairs and/or cleaning, as required.

.15 Site restoration must be complete and stable prior to the removal of erosion and sediment control measures.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

Section 02315
EXCAVATING, TRENCHING, AND BACKFILING

PART 1 GENERAL....1

1.1 RELATED SECTIONS....1
1.2 RELATED ONTARIO PROVINCIAL STANDARDS SPECIFICATIONS....1
1.3 REFERENCES....1
1.4 DEFINITIONS....2
1.5 SAMPLES....2
1.6 PROTECTION OF EXISTING FEATURES....2
1.7 SHORING, BRACING AND UNDERPINNING....3
1.8 DISPOSAL OF MATERIAL....3
1.9 COLD WEATHER WORK....3

PART 2 PRODUCTS....4

2.1 MATERIALS....4

PART 3 EXECUTION....4

3.1 SITE PREPARATION....4
3.2 SHORING, BRACING AND UNDERPINNING....4
3.3 DEWATERING AND HEAVE PREVENTION....5
3.4 EXCAVATION....5
3.5 FILL TYPES AND COMPACTION....6
3.6 COMPACTION TESTING....6
3.7 BEDDING AND SURROUNDING OF UNDERGROUND SERVICES....6
3.8 BACKFILLING....6
3.9 RESTORATION....7
3.10 TEST PITS....7

Section 02315
EXCAVATING, TRENCHING, AND BACKFILING

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Division 1 – General Requirements

.2 Section 02260 – Excavation Shoring Systems

.3 Section 02270 – Erosion Control

.4 Section 02530 – Yard Piping

.5 Section 02701 – Aggregates – General

.6 Section 02921 – Topsoil and Fine Grading

1.2 RELATED ONTARIO PROVINCIAL STANDARDS SPECIFICATIONS

.1 OPSS 180 – Management and Disposal of Excess Material.

.2 OPSS 517 – Dewatering of Pipeline, Utility and Associated Structure Excavation.

.3 OPSS 418 – Construction Specification for the Control of water from Dewatering Operations.

.4 OPSS 577 – Temporary Erosion and Sediment Control Measures.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C 117 04, Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-05, Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 422 63(2002), Test Method for Particle Size Analysis of Soils.

.4 ASTM D 698 00ae1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft^3) (600 kN m/m^3).

.5 ASTM D 1557 02e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft lbf/ft^3) (2,700 kN m/m^3).

.6 ASTM D 4318 05, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 8.1 88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB 8.2 M88, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA).

.4 CAN/CSA A23.1 14, Concrete Materials and Methods of Concrete Construction.

1.4 DEFINITIONS

.1 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Waste material: excavated material unsuitable for use in the Work or surplus to requirements.

.3 Borrow material: material obtained from locations outside the area to be graded, and required for construction of fill areas or for other portions of the Work. The source is to be approved by the Engineer.

.4 Unsuitable materials: the following may be classified as unsuitable:

.1 Weak and compressible materials under excavated areas.

.2 Frost susceptible materials under excavated areas.

.3 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB 8.1.

.5 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.5 SAMPLES

.1 Submit samples in accordance with Section 01300 – Submittals.

.2 Inform the Contract Administrator at least 10 Working Days prior to commencing Work, of proposed source of fill materials and provide access for sampling.

1.6 PROTECTION OF EXISTING FEATURES

.1 Existing buried utilities and structures:

.1 The indicated size, depth and location of existing utilities and structures are for guidance only. Completeness and accuracy are not guaranteed. The Contractor must complete their own utility locates prior to starting excavation.

.2 Prior to commencing excavation work, notify the City and/or applicable operating authorities having jurisdiction, establish location and state of use of buried utilities and structures. The City, or operating authorities having jurisdiction, are to clearly mark locations to prevent disturbance during the Work.

.3 Confirm locations of buried utilities by careful test excavations utilizing hydro-vac excavation or by hand.

.4 Maintain and protect from damage all water, sewer, gas, electric, telephone, and other utilities and structures encountered as indicated on the Contract Drawings.

.5 Temporarily relocate or support utilities, including poles that cannot be sufficiently protected from the excavation.

.6 Record location of maintained, re-routed and abandoned underground lines.

.2 Existing buildings and surface features:

.1 Conduct with the Engineer, a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by the Work.

.2 Protect existing buildings and surface features from damage while the Work is in progress. In event of damage, immediately make repair to approval of the Engineer.

.3 Where required for excavation, cut roots or branches as approved by the Engineer.

1.7 SHORING, BRACING AND UNDERPINNING

.1 Protect existing features in accordance with applicable local regulations.

1.8 DISPOSAL OF MATERIAL

.1 The Contractor shall arrange for the disposal off site of surplus excavated materials.

.2 Obtain a written agreement from property owner where excavation material is to be disposed setting out terms, conditions and ultimate responsibility for materials as placed.

.3 Comply with requirements of OPSS 180.

1.9 COLD WEATHER WORK

.1 Obtain written permission from the Engineer before starting excavation in frozen ground. Written authorization from the Engineer must be obtained for methods to be used to carry out such work.

.2 All excavations shall be protected to prevent frost from penetrating the ground below the foundations. Any footing or structure laid on frost which, in the opinion of the Engineer, has been injured through neglect of this clause of the Specifications shall be removed and made good by the Contractor at the Contractor’s expense.

.3 Backfilling shall not be done with frozen material and no fill shall be placed over material which is already frozen.

.4 Replace any excavated frozen material with suitable backfill material at no additional cost. Frozen material may be stockpiled off site for use after thawing.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Type 1 and Type 2 fill: properties to Section 02701 – Aggregates - General and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB 8.1.

.1 Granular A to OPSS 1010.

.2 Granular B to OPSS 1010.

.3 19 mm crushed rock to OPSS 1004.

.4 Sand to OPSS form 1004.05.05.

.3 Type 3 fill: selected material from excavation or other sources, approved by the Engineer for use intended, unfrozen and free from rocks larger than 150 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 EXECUTION

3.1 SITE PREPARATION

.1 Blank.

3.2 SHORING, BRACING AND UNDERPINNING

.1 Construct temporary works to depths, heights and locations as approved by the Contractor’s design engineer.

.2 During backfill operation:

.1 Unless otherwise indicated or as directed by the Engineer, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.

.3 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.4 Upon completion of substructure construction:

.1 Remove shoring and bracing.

.2 Remove excess materials from the Place of the Work and restore to the satisfaction of the Engineer.

3.3 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while the Work is in progress.

.2 Submit, for the Engineer's review, details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut offs, or other means.

.4 Provide appropriate filter screens so no soil or foundation material is removed, and a solids concentration of less than 500 parts per million in the discharge water is achieved.

.5 Protect open excavations against flooding and damage due to surface run off.

.6 Discharge water into existing drainage outlet(s)/swale(s). Prevent erosion of existing banks through use of energy absorption devices, such as rock check dams. Ensure discharge is not detrimental to public and private property, or any portion of the Work completed or under construction.

.7 Ensure dewatering for project does not exceed 50,000 l/day.

3.4 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated on the Contract Drawings.

.2 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.3 For trench excavation, unless otherwise authorized by the Engineer in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.4 Dispose of surplus and unsuitable excavated material off site at an approved location.

.5 Do not obstruct flow of surface drainage or natural watercourses.

.6 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.7 Notify the Engineer when the bottom of the excavation is reached.

.8 Obtain Engineer approval of completed excavation.

.9 Remove unsuitable material from trench bottom to extent and depth as directed by the Engineer.

.10 Correct unauthorized over excavation as follows:

.1 Fill under bearing surfaces and footings with fill concrete.

.2 Fill under other areas with Type 2 fill compacted to not less than 98% of Standard Proctor Maximum Dry Density (SPMDD).

.11 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to the approval of the Engineer.

3.5 FILL TYPES AND COMPACTION

.1 Use fill of types as indicated on the Contract Drawings. Compaction densities are percentages of maximum densities obtained from ASTM D 698.

.1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 98% SPMDD.

.2 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100% SPMDD.

.3 Place unshrinkable fill in areas as indicated on the Contract Drawings.

3.6 COMPACTION TESTING

.1 Testing of all compacted bedding and backfill for materials and compression will be done by testing agencies retained and paid for by the OWCA.

.2 Payment for any additional testing required because of changes in the material or the mix proportions, as well as any extra testing of the materials occasioned by their failure to meet the Specification requirements shall be borne by the contractor.

.3 The use of testing services does not relieve the Contractor of his responsibility to provide the materials and construction in compliance with the Contract Drawings and Specifications.

3.7 BEDDING AND SURROUNDING OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surrounding of underground services as indicated on the Contract Drawings. Conform to applicable City's Standard Drawings.

.2 Place bedding and surround material in unfrozen condition.

.3 Do not proceed with backfilling operations until the Engineer has accepted bedding installation.

3.8 BACKFILLING

.1 Do not proceed with backfilling operations until the Engineer has accepted installations.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material as indicated on the Contract Drawings in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer to not less than 95% of Standard Proctor Maximum Dry Density (SPMDD) before placing succeeding layer.

3.9 RESTORATION

.1 Upon completion of the Work, remove waste materials and debris, trim slopes, and correct defects as directed by the Engineer.

.2 Replace topsoil to all disturbed area or as indicated on the Contract Drawings.

.3 Clean and reinstate areas affected by the Work to the satisfaction of the Engineer.

3.10 TEST PITS

.1 This section specifies requirements for the excavation of test pits for the purpose of verifying elevations of utilities or any other investigative exercise.

.2 The Engineer will determine the utilities to be excavated and the method of excavation to be used.

.3 Non-destructive test pits are to be excavated using a vacuum truck excavator.

.4 Open excavation to be excavated using an appropriately sized backhoe and hand shovels.

END OF SECTION

SECTION 02530
YARD PIPING

PART 1 GENERAL

1.1 GENERAL CONDITIONS

.1 All sections of Division 1 form a part of this Specification. Read and fully adhere to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these documents to determine their effect upon the work of this section.

.3 All sections of Divisions 1 to 16 inclusive form part of the Contract Documents.

1.2 RELATED SECTIONS

.1 Section 02230 – Site Preparation for Pipelines, Utility and Associated Structures

.2 Section 02260 – Excavation Support Systems

.3 Section 02315 – Excavating, Trenching and Backfilling

.4 Section 16857 – Heat Tracing Systems

1.3 SCOPE

.1 Furnish all labour, materials, supervision, equipment and services specified, indicated or requested to supply and install the yard piping.

PART 2 PRODUCTS

2.1 COILED PRE-INSULATED PIPE

.1 General

.1 Pipe to be a flexible product, sold as a coil and not straight length. The pipe shall be capable of being run from one point to the other without break, fitting or joints.

.2 The pipe is being used as a conduit for smaller tubes.

.3 Product should be suitable for direct burial.

.2 Carrier Pipe

.1 PEX or another plastic pipe, capable of maintaining pressure.

.3 Insulation

.1 Complete with Heat Trace Channel

.2 Material: polyurethane foam.

.3 Closed cell content: 90%, minimum.

.4 Water absorption: maximum 10% by volume.

.5 K factor: 0.029 W/m °C (0.2 Btu • in/ft² • hr •°F).

.6 Thickness: minimum 50.8 mm (2 in)

.4 Outer Jacket

.1 HDPE or other durable material.

.2 Must be UV resistant for at least 2 years.

.3 Separate 22 Ga Stainless Steel Jacket applied over above-grade portions of pipe for UV protection.

.5 Example product Rehau MUNICIPEX Pre-insulated Pipe

2.2 SEWER PIPE

.1 General

.1 PVC Gasketed Type PSM Sewer Pipe to CSA B182.2, ASTM D3034, SDR 35.

.2 Gasketed fabricated fittings to CSA B182.2 and ASTM F1336 by same manufacturer of pipe.

PART 3 EXECUTION

3.1 GENERAL

.1 Complete excavation, trenching and bedding in accordance with the drawings and other specification sections.

.2 Lay pre-insulated conduit without kinking or bending tighter than permissible bend radius.

.3 Install pre-insulated conduit with heat trace conduit in 12 o'clock position. Ensure heat trace conduit is undamaged and aligned through length of conduit.

.4 Install separate stainless-steel jacket on above-grade portions of pre-insulated conduit for UV protection.

.5 Terminate pre-insulated PEX conduit inside building wall and inside Chlorine Chamber. On building end ensure that heat trace cable is only applied to PEX piping, not PVC piping used inside building.

.6 Supply and install approved transition coupling between yard PEX pipe and PVC pipe used inside building.

.7 Supply and install metallic tracer wire above all non-metallic buried pipes and conduits.

3.2 PRE-INSULATED PIPE DIRECT BURIED

.1 Flexible pipe for direct burial shall be of the type approved for direct burial.

.2 Ensure that the trench bottom is of undisturbed soil or soil compacted to a density of 95% of the maximum dry density, free of stones and uniformly graded to give continuous support to the pipe throughout their entire length.

.3 Provide sand bedding below and around pipe as indicated on drawings.

.4 No joints shall be allowed from the start to the end of the pipe. Only one termination at each end is allowed.

.5 Install pull cord in pipe with 3 m spare cord at each end and cap until ready for use.

.6 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling-in the PTFE pipe.

3.3 INSPECTIONS

.1 Advise Engineer so that they may inspect pipe and insulation prior to backfill.

3.4 PTFE DOSING PIPE INSTALLATION IN PIPING

.1 Install PTFE dosing pipe as indicated in ducts.

.2 Use CSA approved lubricants of type compatible with PTFE pipe jacket to reduce pulling tension.

3.5 GASKETTED PVC SEWER PIPE

.1 Ensure that the trench bottom is of undisturbed soil or soil compacted to a density of 95% of the maximum dry density, free of stones and uniformly graded to give continuous support to the pipe throughout their entire length.

.2 Provide sand bedding 300 mm below and around pipe.

.3 Ensure no foreign materials enter pipes during handling and installation. Remove any foreign materials from pipes before joining.

.4 Clean fittings and gaskets and lubricate with manufacturer approved lubricant before assembly.

.5 Mark joints before assembling for easy visual indication that pipe is fully seated in joint.

.6 Hydrostatically test piping before covering with bedding material. Provide temporary fittings, supports and restraints required for testing.

.7 Provide permanent thrust restraints or mechanical ties if adequate restraint will not be provided for joints through piping/trench layout and compaction of backfilling.

END OF SECTION

Section 02701
AGGREGATES - GENERAL

PART 1 GENERAL....1

1.1 RELATED SECTIONS....1
1.2 REFERENCES....1
1.3 SAMPLES....1

PART 2 PRODUCTS....1

2.1 MATERIALS....1
2.2 SOURCE QUALITY CONTROL....1

PART 3 EXECUTION (NOT USED)....2

Section 02701
AGGREGATES - GENERAL

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Division 1 – General Requirements.

1.2 REFERENCES

.1 ASTM D4791 10, Test Method for Flat or Elongated Particles in Coarse Aggregate.

1.3 SAMPLES

.1 Deliver and stockpile aggregates only in designated areas indicated on the Contract Drawings. Deliver aggregates as required.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular A per OPSS 1010.

.2 Granular B per OPSS 1010.

.3 Granular O per OPSS 1010.

.4 50 mm Clear Stone per OPSS 1004.

.5 19 mm Clear Stone per OPSS 1004

.6 Class 1 Aggregate per OPSS 1006.

2.2 SOURCE QUALITY CONTROL

.1 Inform the Engineer of proposed source of aggregates and provide access for sampling at least ten (10) Working Days prior to commencing production.

.2 If, in the opinion of the Engineer, materials from the proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Advise the Engineer ten (10) Working Days in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to the requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02820.01
ASBESTOS ABATEMENT - MINIMUM PRECAUTIONS

PART 1 GENERAL....1

1.1 SUMMARY....1
1.2 REFERENCE STANDARDS....1
1.3 DEFINITIONS....1
1.4 ACTION AND INFORMATIONAL SUBMITTALS....2
1.5 QUALITY ASSURANCE....2
1.6 WASTE MANAGEMENT AND DISPOSAL....3
1.7 EXISTING CONDITIONS....4
1.8 SCHEDULING....4
1.9 PERSONNEL TRAINING....4

PART 2 PRODUCTS....4

2.1 MATERIALS....4

PART 3 EXECUTION....5

3.1 PROCEDURES....5

SECTION 02820.01
ASBESTOS ABATEMENT - MINIMUM PRECAUTIONS

PART 1 GENERAL

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following work:

.1 Removing non-friable asbestos-containing materials, other than ceiling tiles, if the material is installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated at locations indicated on drawings.

.2 Break, cut, grind, sand, drill, scrape, vibrate or abrade non-friable asbestos containing materials using non-powered hand-held tools, and the material is wetted to control the spread of dust or fibres.

1.2 REFERENCE STANDARDS

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, most current (CEPA).

.2 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, most current (TDGA).

1.3 DEFINITIONS

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

.2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.

.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.

.4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.

.5 Authorized Visitors: Engineers, Consultants or designated representatives, and representatives of regulatory agencies.

.6 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the work.

.2 Is familiar with the provincial laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.7 Friable material: means material that:

.1 When dry, can be crumbled, pulverized or powdered by hand pressure, or

.2 is crumbled, pulverized or powdered.

.8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.9 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.

.10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit proof satisfactory to Consultant that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.3 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

.4 Submit proof of Contractor's Asbestos Liability Insurance.

.5 Submit to Consultant necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

.6 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.7 Submit proof satisfactory to Consultant that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.5 QUALITY ASSURANCE

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

.2 Health and Safety:

.1 Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned,

disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

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

.3 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area.

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

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Place materials defined as hazardous or toxic in designated containers.

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

.3 Fold up metal banding, flatten and place in designated area for recycling.

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

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

1.7 EXISTING CONDITIONS

.1 The DSS pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are attached.

.2 Notify Consultant of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Consultant.

1.8 SCHEDULING

.1 Hours of Work: schedule work involving ACM disturbance with on-site personnel. Include in Contract Sum if additional costs are required.

1.9 PERSONNEL TRAINING

.1 Before beginning Work, provide Consultant satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

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

.1 Fitting of equipment.

.2 Inspection and maintenance of equipment.

.3 Disinfecting of equipment.

.4 Limitations of equipment.

.3 Instruction and training must be provided by a competent, qualified person.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Drop Sheets:

.1 Polyethylene: 0.15 mm thick.

.2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

.3 Waste Containers: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene waste bag.

.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.

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

.5 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

PART 3 EXECUTION

3.1 PROCEDURES

.1 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.

.1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.

.2 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.

.3 Do not use compressed air to clean up or remove dust from any surface.

.2 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained. Drop sheets are not to be reused.

.3 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.

.1 Use garden reservoir type low - velocity fine - mist sprayer.

.2 Perform Work to reduce dust creation to lowest levels practicable.

.3 Work will be subject to visual inspection and air monitoring.

.4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.4 Frequently and at regular intervals during Work and immediately on completion of work:

.1 Dust and waste to be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste container, and

.2 Drop sheets to be wetted and placed in a waste container as soon as practicable.

.5 Cleanup:

.1 Place dust and asbestos containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.

.2 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.

.3 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that the appropriate guidelines and regulations for asbestos disposal are followed.

.4 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

END OF SECTION

Section 02821
CHAIN LINK FENCES AND GATES

PART 1 GENERAL 1

1.1 RELATED REQUIREMENTS 1
1.2 REFERENCE STANDARDS 1
1.3 ACTION AND INFORMATIONAL SUBMITTALS 2
1.4 DELIVERY, STORAGE AND HANDLING 2

PART 2 PRODUCTS 2

2.1 MATERIALS 2
2.2 FINISHES 3

PART 3 EXECUTION 3

3.1 EXAMINATION 3
3.2 PREPARATION 4
3.3 ERECTION OF FENCE 4
3.4 INSTALLATION OF GATES 5
3.5 TOUCH UP 5
3.6 CLEANING 5

Section 02821
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 None.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A90/A90M-09, Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.3 ASTM A121-07, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.

.4 A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.5 ASTM A123/A123M-09, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.

.2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.

.3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.

.4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.

.5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 CSA Group (CSA)

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

.2 CAN/CSA-A3000-08, Cementitious Materials Compendium.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01300.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for fences, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect fence and gate materials from damage.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with CSA A23.1.

.1 Nominal coarse aggregate size: 20-5.

.2 Compressive strength: 20 MPa minimum at 28 days.

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

.1 Type 1, Class A, heavy style, Grade 3.

.2 Height of fabric: 1.8 m.

.3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated.

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

.5 Tie wire fasteners, aluminum alloy wire.

.6 Gates: to CAN/CGSB-138.4.

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

.1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding.

.2 Fasten fence fabric to gate with twisted selvage at top.

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

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

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

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

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

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

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

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

.6 Turnbuckles to be drop forged.

.9 Organic zinc rich coating: to CAN/CGSB-1.181.

.10 Barbed wire: to ASTM A121 mm diameter galvanized steel wire 4 point barbs 125 mm spacing.

.11 Barbed wire: to CAN/CGSB-138.2, 2.5 mm diameter.

2.2 FINISHES

.1 Galvanizing:

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

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

.3 For barbed wire: to CAN/CGSB-138.2 ASTM A121, Class 2.

.4 For other fittings: to ASTM A123/A123M.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Grading:

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

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

3.3 ERECTION OF FENCE

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

.2 Space line posts 3 m apart, measured parallel to ground surface.

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

.4 Install additional straining posts at sharp changes in grade.

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

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

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

.7 Place concrete in post holes then embed posts into concrete to minimum 1067 mm depth

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

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

.8 Install fence fabric after concrete has cured, minimum of 5 days.

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

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

.10 Install overhang tops and caps.

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

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

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

.1 Knuckled selvedge at bottom.

.2 Twisted selvedge at top.

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

.1 Give tie wires minimum two twists.

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

.16 Tie into existing grounding system.

3.4 INSTALLATION OF GATES

.1 Install gates in locations as indicated.

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

3.5 TOUCH UP

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

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

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01780.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01780.

END OF SECTION

Section 02921
TOPSOIL AND FINE GRADING

PART 1 GENERAL....1

1.1 PAYMENT PROCEDURES....1
1.2 REFERENCES....1
1.3 DEFINITIONS....1
1.4 SUBMITTALS....1
1.5 QUALITY ASSURANCE....2
1.6 WASTE MANAGEMENT AND DISPOSAL....2

PART 2 MATERIALS....2

2.1 TOPSOIL....2
2.2 SOIL AMENDMENTS....2
2.3 SOURCE QUALITY CONTROL....3

PART 3 EXECUTION....3

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL....3
3.2 STRIPPING OF TOPSOIL (IF REQUIRED BY CONTRACT DOCUMENTS)....4
3.3 PREPARATION OF EXISTING GRADE....4
3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL -....4
3.5 SOIL AMENDMENTS....5
3.6 FINISH GRADING....5
3.7 ACCEPTANCE....5
3.8 SURPLUS MATERIAL....5
3.9 CLEANING....5

Section 02921
TOPSOIL AND FINE GRADING

PART 1 GENERAL

1.1 PAYMENT PROCEDURES

.1 Testing of topsoil: Contractor will pay for cost of topsoil tests and tests of other products in this section.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada.

.1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment.

.1 PN1340-2005, Guidelines for Compost Quality.

.3 Canadian Green Building Council (CaGBC).

.1 LEED Canada-NC Version 1.0-December 2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.

1.3 DEFINITIONS

.1 Compost:

.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.

.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.

.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminates.

.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A).

1.4 SUBMITTALS

.1 Quality control submittals:

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

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

1.5 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused soil amendments from landfill to official hazardous material collections site established by Contractor and approved by Engineer.

.2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 MATERIALS

2.1 TOPSOIL

.1 Topsoil for seeded areas and planting beds: mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 40 to 50% sand, 10-20% clay, 30-40% silt, and contain 4 to 10% organic matter by weight.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Finished surface free from:

.1 Debris and stones over 50 mm diameter.

.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:

.1 Fertility: major soil nutrients present in following amounts:

.1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.2 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.3 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.4 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.5 pH value: 6.5 to 7.0.

.2 Sand: washed coarse silica sand, medium to course textured.

.3 Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.4 Use composts meeting Category A requirements for land fill reclamation and large scale industrial applications.

.5 Limestone:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

2.3 SOURCE QUALITY CONTROL

.1 Advise Engineer of sources of topsoil and manufactured topsoil to be utilized with sufficient lead time for testing.

.2 Contractor is responsible for amendments to supply topsoil as specified.

.3 Topsoil testing by recognized testing facility for PH, P and K, and organic matter.

.4 Testing of topsoil will be carried out by testing laboratory designated by Engineer.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction sediment and erosion control drawings.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL (IF REQUIRED BY CONTRACT DOCUMENTS)

.1 Begin topsoil stripping of areas after area has been cleared of brush weeds and grasses and removed from site.

.2 Strip topsoil to depths as directed by Engineer.

.1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Stockpile in locations as directed by Engineer as indicated.

.1 Stockpile height not to exceed 2.5 m.

.4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill.

.5 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify Engineer and do not commence work until instructed by Engineer.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage and matching existing elevations.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 150 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL -

.1 Place topsoil/planting soil after Engineer has accepted subgrade.

.2 Spread topsoil/planting soil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil/planting soil to following minimum depths after settlement unless otherwise directed on drawings.

.1 300 mm for seeded areas.

.2 150 mm for sodded areas.

.3 450 mm for flower beds.

.4 450 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

.1 For planting beds: apply and thoroughly mix soil amendments into full specified depth of topsoil rates as required on drawings.

3.6 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Engineer.

.1 Leave surfaces smooth, uniform and firm against 1 cm deep footprinting.

3.7 ACCEPTANCE

.1 Engineer will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.8 SURPLUS MATERIAL

.1 Dispose of materials not required off site.

3.9 CLEANING

.1 Proceed in accordance with Section 01710 - Cleaning.

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

END OF SECTION

SECTION 02938
SODDING

PART 1 GENERAL....1

1.1 RELATED SECTIONS....1
1.2 REFERENCES....1
1.3 SCHEDULING:....1

PART 2 PRODUCTS....1

2.1 MATERIALS....1

PART 3 EXECUTION....2

3.1 EXAMINATION....2
3.2 PREPARATION....2
3.3 SOD PLACEMENT....3
3.4 SOD PLACEMENT ON SLOPES AND PEGGING....3
3.5 FERTILIZING PROGRAM....4
3.6 PROTECTION BARRIERS....4
3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD....4
3.8 ACCEPTANCE....4

SECTION 02938
SODDING

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 02921 – Topsoil and Fine Grading

1.2 REFERENCES

.1 Canadian Society of Landscape Architects (CSLA) / Canadian Nursery Landscape Association (CNLA)

.2 Canadian Landscape Standard 2016, First Edition

.3 Canadian Nursery Stock Standard 2017, Ninth Edition

.4 OPSS.MUNI 803

1.3 SCHEDULING:

.1 Schedule sod laying and/or seeding to coincide with preparation of soil surface.

.2 Schedule sod/seed installation when frost is not present in ground.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Commercial Grade Turf Grass Nursery:

.1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.

.2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.

.3 Number One Named Cultivars: Nursery Sod grown from certified seed.

.2 Sod Quality:

.1 Not more than 5 broadleaf weed and up to 20% native grasses per 40 m^2.

.2 Density of sod sufficient so that no soil is visible.

.3 Mowing height limit: 30 to 70 mm.

.4 Soil portion of sod: 10 to 15 mm in thickness.

.2 Sod establishment support:

.1 Stakes for fastening sod to the earth grade shall be a minimum 150 mm in length.

.3 Water:

.1 Water shall not have contaminants or impurities that would adversely affect the germination and growth of vegetation.

.4 Fertilizer:

.1 Fertilizer shall be according to the Canada Fertilizers Act. Fertilizer shall be supplied in bags bearing the manufacturer's label indicating net weight and guaranteed analysis.

.2 Fertilizer shall be in granular form, dry, free flowing without lumps. Fertilizer shall be supplied with a minimum analysis of 16% nitrogen, 3% phosphorus, and 15% potash. The guaranteed analysis ratio shall be 3-1-2.

.3 The total nitrogen component of the fertilizer shall be a minimum 30% water insoluble nitrogen (controlled, slow release nitrogen) by weight.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sod installation in accordance with manufacturer's written instructions.

3.2 PREPARATION

.1 Sodding shall not commence until the surface preparation has been approved in writing by the Consultant.

.2 Sodding shall commence within 7 Days of surface preparation.

.3 The Contractor shall maintain the surface and control erosion until the sod is in place.

.4 Sod shall not be placed when in a frozen condition, under adverse field conditions such as high wind, frozen soil or soil covered with snow, ice, or standing water.

.5 At the time of sodding, all surface areas designated for sodding shall be free of erosion and shall have a fine graded uniform surface.

.6 The surface shall be uniformly cultivated to a minimum depth of 50 mm and shall not have surface materials greater than 25 mm in size, such as stones and clods and weeds or other unwanted vegetation.

.7 Surface litter and debris shall be removed immediately prior to sod placement.

3.3 SOD PLACEMENT

.1 Lay sod during active growing season for type of sod. Laying sod during dry, freezing, or over frozen soil is unacceptable.

.2 If growing medium surface is dry, it shall be lightly moistened immediately before laying sod.

.3 Lay sod flush with adjoining grass areas, paving and top surface of curbs, unless shown otherwise on the drawings.

.4 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.5 Lay sod sections in rows, joints staggered (a minimum of [25] cm). Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

3.4 SOD PLACEMENT ON SLOPES AND PEGGING

.1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.

.2 Erosion control mesh/netting shall be installed in sodded areas where required, and secured with stakes or staples set to a minimum depth of [15] cm.

.3 Start laying sod at bottom of slopes.

.4 Peg sod on slopes steeper than three (3) horizontal to one (1) vertical, within one (1) m of catch basins and within one (1) m of drainage channels and ditches to following pattern:

.1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.

.2 Not less than 4 pegs per square metre.

.3 Not less than 8 pegs per square metre in drainage structures.

.5 Drive pegs to 20 mm above soil surface of sod sections.

3.5 FERTILIZING PROGRAM

.1 Fertilizer shall be applied uniformly to the surface area designated for sodding, a maximum of 48 hours prior to sod placement, at the rate specified on its bag by the manufacturer.

3.6 PROTECTION BARRIERS

.1 Protect newly sodded areas from deterioration with snow fence on rigid frame.

.2 Remove protection two (2) weeks after installation.

.3 Maintain protective measures in good conditions until acceptance by Consultant.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Sod shall be maintained for 30 Days following completion of placement.

.2 During this period, the placed sod shall be kept healthy, actively growing, and green in leaf colour.

.3 This requirement shall be suspended during the winter dormant period of Oct 15 to May 15 inclusive.

3.8 ACCEPTANCE

.1 Sodded areas will be accepted by Consultant provided that:

.1 The sod shall be in the same location as originally placed and shall not have moved, eroded, slipped, or sloughed.

.2 Sod shall show evidence of rooting into the underlying soil. The sod shall be of sufficient density that no surface soil is visible and there shall be no competitive growth, beyond that specified in the Sod subsection, emerging from the sod or from between the sod joints.

.3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.

.2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

.3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

END OF SECTION

Division 03

Concrete

Section #	Section Name	Pages
03100	CONCRETE FORMING AND ACCESSORIES	6
03101	CONCRETE TANK COVERS	3
03200	CONCRETE REINFORCING	5
03300	CAST-IN-PLACE CONCRETE	9

Section 03100
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL 1

1.1 RELATED REQUIREMENTS 1
1.2 REFERENCE STANDARDS 1
1.3 ACTION AND INFORMATIONAL SUBMITTALS 1
1.4 QUALITY ASSURANCE 2
1.5 DELIVERY, STORAGE AND HANDLING 3

PART 2 PRODUCTS 3

2.1 MATERIALS 3

PART 3 EXECUTION 4

3.1 FABRICATION AND ERECTION 4
3.2 REMOVAL AND RESHORING 4
3.3 CLEANING 5

Section 03100
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03300

.2 Section 03200

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA)

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

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

.3 CSA O151-09 (2014), Canadian Softwood Plywood.

.4 CSA O153-13, Poplar Plywood.

.5 CAN/CSA O325.0-16, Construction Sheathing.

.6 CSA O437 Series-93 (R2011), Standards for OSB and Waferboard.

.7 CSA S269.1-16, Falsework and Formwork.

.8 CAN/CSA S269.3-M92 (R2003), Concrete Formwork.

.2 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01300.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in coatings and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit 2 copies of WHMIS SDS

.3 Submit shop drawings for formwork and falsework.

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.2 Prepare Shop Drawings in accordance with CSA S269.1 for formwork and falsework.

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

.4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.

.5 Include the following information on falsework Shop Drawings:

.1 Longitudinal, lateral, vertical, dead, live and impact loads used in design.

.2 Safe bearing capacity of soil underneath mud sills.

.3 Maximum column, post and support loads.

.4 Deflection diagrams for beams with deflection of 10 mm or more.

.5 Deflection diagrams indicating initial and final elevation of deck surfaces, roofs and soffits.

.6 Grade of structural steel.

.7 Indicate steel posts, girders, beams, connections, bracing and welding, providing sufficient detail for safe performance of falsework.

.8 Fully detailed steel frame shoring.

.9 Species, grades and sizes of wood.

.10 Type and weight of equipment (moving or stationary) supported by falsework.

.11 Sequence, methods and rate of concrete placement.

.12 Proprietary equipment adequately identified for checking purposes.

.13 Full details and locations of splices.

1.4 QUALITY ASSURANCE

.1 Retain a professional engineer registered or licensed in Ontario, Canada, with experience in formwork and falsework design of comparable complexity and scope, to perform following services as part of Work of this Section:

.1 Design of formwork and falsework.

.2 Review, stamp, and sign fabrication and erection Shop Drawings, design calculations and amendments.

.3 Conduct on-site inspections and prepare and submit inspection reports verifying this part of Work is in accordance with Contract Documents and reviewed Shop Drawings. Perform inspections a minimum of once per month.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect formwork from damages.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

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

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

.2 Pan forms: steel reinforced plastic aluminum free of bends, dents, and residual concrete; having a high potential for reuse as indicated.

.3 Form ties:

.1 For concrete; snap ties must have integral waterstops and be complete with plastic cones and light grey concrete plugs.

.4 Form release agent: Proprietary, non volatile material not to stain concrete or impair subsequent application of finishes or coatings to surface of concrete, derived from agricultural sources, non petroleum containing, non-toxic, low VOC.

.5 Falsework materials: to CSA S269.1.

PART 3 EXECUTION

3.1 FABRICATION AND ERECTION

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

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

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

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

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

.6 Align form joints and make watertight.

.1 Keep form joints to minimum.

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

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

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

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

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

3.2 REMOVAL AND RESHORING

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

.1 7 days for walls and sides of beams.

.2 2 days for footings and abutments.

.2 Remove formwork when concrete has reached 70 % of its 28-day design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

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

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

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

3.3 CLEANING

.1 Progress Cleaning:

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01780.

END OF SECTION

Section 03101
CONCRETE TANK COVERS

PART 1 GENERAL 1

1.1 DESCRIPTION OF WORK 1

PART 2 PRODUCTS 1

2.1 MATERIALS AND FINISHES 1
2.2 STRUCTURAL PARAMETERS 2

PART 3 EXECUTION 3

3.1 HANDLING AND STORAGE 3
3.2 INSTALLATION OF FRP PRO'DECK 3

Section 03101
CONCRETE TANK COVERS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

.1 The scope of this specification is intended to describe all tank cover units and required accessories shown on the drawings. This includes but is not limited to following:

.1 Fiberglass Reinforced Plastic (FRP) tank covers,

.2 FRP trim and flashing,

.3 Fasteners required to secure the panels and flashing,

.4 Closures required for a complete installation.

PART 2 PRODUCTS

2.1 MATERIALS AND FINISHES

.1 Tank cover units shall be Pro'Deck or an approved equal that conforms to these specifications.

.2 Resin Type: Resin shall be premium grade, chemically resistant (choose one of the following):

.1 Isophthalic Polyester

.2 Vinyl Ester

.3 Glass Reinforcement: Reinforcement shall be straight rovings and continuous strand mat. Glass content shall be a minimum of 45% by weight.

.4 UV Resistance: Panel material shall be made from a UV stabilized resin system. Additional UV resistance shall come from surfacing mats.

.5 Anti-skid surfaces:

.1 Anti-skid surface is molded into the product for covers that experience occasional foot traffic.

.2 Anti-skid grit top is applied post production for heavy foot traffic.

.6 Color: Gray

.7 Lengths: Use lengths as long as practical to minimize end laps. Lengths shall be as shown on drawings, maximum 50 ft. long or manufacturer's limitations.

.8 FRP Flashing and Trim: Accessories shall be of thickness, dimensions, and profile required for a complete installation of tank covers as shown on the drawings.

.9 Structural Fasteners with Sealing Washers: Fasteners shall be stainless steel (304 series or Owner directed), spaced and installed per manufacturer's recommendations or the drawings.

.10 Recommended sealants:

.1 Sealant tape for side and end laps: 3/32 in. thick non-shrinking non-hardening butyl tape.

.2 Hatches: EPDM.

.3 Sealant: GE "Silpruf" silicon sealant or equivalent.

2.2 Structural Parameters

.1 Performance Criteria

.1 Tank covers shall meet the performance criteria described below for the spans indicated on the drawings. This is based on an 8 foot span, different spans to meet proportional requirement.

.2 Tank Cover Loads:

.1 10 lbs/ft2 wind

.2 20 lbs/ft2 snow

.3 250 lbs Point load (Live Load)

.3 Tank Cover Allowable Deflections

.1 L/D = 100

.4 Factors of Safety

.1 Live loads: FOS = 2.5

.2 Uniform loads: FOS = 2.5

PART 3 EXECUTION

3.1 HANDLING AND STORAGE

.1 Protect the surface of FRP cladding units from cuts, scratches, gouges, abrasions, and impacts. Do not use wire slings unless material is fully protected. Use spreader bars when lifting FRP.

.2 Store panels under cover. Keep panels dry. Stack panels off ground with one end elevated to permit draining of incidental water which can permanently stain panels.

3.2 INSTALLATION OF FRP PRO'DECK

.1 Installer must follow manufacturer's installation instructions and the shop drawings.

.2 Pilot holes must be drilled in panels for all fasteners. Drill holes with a sharp carbide tipped bit. Pilot holes in panels should be sized so that the fastener threads just clear the edges of the hole.

.3 Pilot holes in supports should be sized as recommended by the panel or fastener manufacturer.

.4 End laps for roofing panels shall be 4 inches minimum.

END OF SECTION

SECTION 03200
CONCRETE REINFORCING

PART 1 GENERAL 2

1.1 RELATED REQUIREMENTS 2
1.2 PRICE AND PAYMENT PROCEDURES 2
1.3 REFERENCE STANDARDS 2
1.4 ACTION AND INFORMATIONAL SUBMITTALS 2
1.5 DELIVERY, STORAGE AND HANDLING 3

PART 2 PRODUCTS 4

2.1 MATERIALS 4
2.2 FABRICATION 4
2.3 SOURCE QUALITY CONTROL 4

PART 3 EXECUTION 5

3.1 FIELD BENDING 5
3.2 PLACING REINFORCEMENT 5
3.3 FIELD QUALITY CONTROL 5

SECTION 03200
CONCRETE REINFORCING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03300 Cast in Place Concrete.

1.2 PRICE AND PAYMENT PROCEDURES

.1 Measurement and Payment:

.1 No measurement made under this Section.

.1 Include reinforcement costs in items of concrete work in Section 03300 - Cast-In-Place Concrete.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM A641/A641M-09a(2014), Standard Specification for Zinc–Coated (Galvanized) Carbon Steel Wire.

.2 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 CSA Group (CSA)

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

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

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

.4 CSA G40.20/G40.21-13 (R2014), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 Reinforcing Steel Institute of Canada (RSIC)

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01300- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit 2 copies of WHMIS Safety Data Sheet (SDS)

.3 Shop Drawings:

.1 Submit drawings.

.1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.

.2 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

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

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

.3 Detail lap lengths and bar development lengths to CAN/CSA A23.3,

.1 Provide type B lap splice.

.4 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.

.4 Quality Assurance Submittals:

.1 Submit as described in PART 2 - SOURCE QUALITY CONTROL.

.2 Mill Test Report: upon request, submit to Consultant certified copy of mill test report of reinforcing steel, minimum 1 week prior to beginning reinforcing work.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section.

PART 2 PRODUCTS

2.1 MATERIALS

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

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

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

.4 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.

.5 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M.

.6 Welded steel wire fabric:

.1 deformed in accordance ASTM A1064/A1064M, fabricated from as drawn steel wire into flat sheets; sizes as indicated on Drawings.

.2 Provide in flat sheets only.

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

.8 Tie wire: 1.5 mm diameter annealed wire.

.9 Mechanical splices: subject to approval of Consultant.

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

2.2 FABRICATION

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

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

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

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

2.3 SOURCE QUALITY CONTROL

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

PART 3 EXECUTION

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Consultant.

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

.3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder before placing concrete.

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

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

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

.2 Apply thick even film of mineral lubricating grease when paint is dry.

.4 Prior to placing concrete, obtain Consultant's approval of reinforcing material and placement.

.5 Maintain cover to reinforcement during concrete pour.

3.3 FIELD QUALITY CONTROL

.1 Inspection and testing of reinforcing and reinforcing materials may be carried out by testing laboratory designated by Consultant for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory certified to CSA A283.

.2 Inspection or testing by Consultant not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL 1

1.1 RELATED REQUIREMENTS 1
1.2 PRICE AND PAYMENT PROCEDURES 1
1.3 REFERENCE STANDARDS 1
1.4 ABBREVIATIONS AND ACRONYMS 2
1.5 ADMINISTRATIVE REQUIREMENTS 2
1.6 ACTION AND INFORMATIONAL SUBMITTALS 2
1.7 QUALITY ASSURANCE 2
1.8 DELIVERY, STORAGE AND HANDLING 3
1.9 SITE CONDITIONS 3

PART 2 PRODUCTS 4

2.1 DESIGN CRITERIA 4
2.2 PERFORMANCE CRITERIA 4
2.3 MATERIALS 4
2.4 MIXES 5

PART 3 EXECUTION 5

3.1 PREPARATION 5
3.2 INSTALLATION/APPLICATION 6
3.3 SURFACE TOLERANCE 7
3.4 FIELD QUALITY CONTROL 7

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03100 Concrete Forming and Accessories

.2 Section 03200 Concrete Reinforcing

1.2 PRICE AND PAYMENT PROCEDURES

.1 Measurement and Payment:

.1 Cast-in-place concrete in superstructure not measured but paid for as fixed price item.

.2 Supply and installation of anchor bolts, nuts and washers and bolt grouting not measured but considered incidental to work.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.

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

.3 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.

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

.5 ASTM C C1059/C1059M-13, Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.

.6 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.7 ASTM D624-2012, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.2 CSA Group (CSA)

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

.2 CSA A283-06-R2016, Qualification Code for Concrete Testing Laboratories.

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

1.4 ABBREVIATIONS AND ACRONYMS

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

.1 GU, GUb and GUL – General use cement.

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

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure key personnel, site supervisor, Consultant & OCWA attend.

.1 Verify project requirements.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01300.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS.

.3 Site Quality Control Submittals:

.1 Provide testing results for review by Consultant and do not proceed without written approval when deviations from mix design or parameters found.

.2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

.3 Concrete hauling time: provide for review by Consultant deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.

1.7 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01300-Submittals.

.2 Provide Consultant, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

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

.3 Minimum 1 weeks prior to starting concrete work, provide proposed quality control procedures for review by Consultant on following items:

.1 Hot weather concrete.

.2 Cold weather concrete.

.3 Curing.

.4 Finishes.

.5 Formwork removal.

.6 Joints.

.4 Quality Control Plan: provide written report to Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 – PRODUCTS.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.2 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Modifying maximum time limit without receipt of prior written agreement from Consultant and concrete producer as described in CSA A23.1/A23.2. is prohibited.

.2 Deviations submitted for review by Consultant.

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

1.9 SITE CONDITIONS

.1 Placing concrete during rain or weather events that could damage concrete is prohibited.

.2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.

.3 Cold weather protection:

.1 Maintain protection equipment, in readiness on Site.

.2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.

.3 Placing concrete upon or against surface at temperature below 5°C is prohibited.

.4 Hot weather protection:

.1 Protect concrete from direct sunlight when ambient temperature above 27°C.

.2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.

.5 Protect from drying.

PART 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Consultant and provide verification of compliance as described in PART 1 – QUALITY ASSURANCE.

2.3 MATERIALS

.1 Portland Cement: GU Normal.

.2 Blended hydraulic cement: Type GUb to CSA A3001.

.3 Portland-limestone cement: Type GUL to CSA A3001.

.4 Water: to CSA A23.1.

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

.6 Admixtures:

.1 Air entraining admixture: to ASTM C260.

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

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

.1 Compressive strength: 40 MPa at 28 days.

.8 Curing compound: to ASTM C309, or CSA A23.1/A23.2.

.9 Xypex Concentrate waterproofing coating (or approved equal) applied to the inside of the tank surfaces.

.10 Waterstops: flat ribbed extruded PVC Arctic Grade of sizes indicated with shop welded corner and intersecting pieces with legs minimum 150 mm long

.1 Tensile strength: to ASTM D638, minimum 13.8 MPa.

.2 Elongation: to ASTM D638, 250 %.

.3 Tear resistance: to ASTM D624, minimum 52 kN/m.

.11 Premoulded joint fillers:

.1 Bituminous impregnated fibre board: to ASTM D1751.

.2 Sponge rubber: to ASTM D1752, Type I, firm grade.

.12 Damp-proofing:

.1 Emulsified asphalt, mineral colloid type, unfilled.

.13 Concrete Bonding Agents: Epoxy to ASTM C881/C881M, Type V or Latex to ASTM C1059/C1059M.

2.4 MIXES

.1 Performance Method for specifying concrete: to meet Consultant performance criteria to CSA A23.1/A23.2.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

.2 Provide concrete mix to meet following plastic state requirements:

.1 Workability: free of colour variations loss of mortar segregation.

.3 Provide concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: C-1.

.2 Compressive strength at 56 age: 35 MPa minimum.

.3 Intended application: Waste Water Treatment chamber.

.4 Aggregate size 20 mm maximum.

.5 Other special requirements: w/c ratio = 0.40.

PART 3 EXECUTION

3.1 PREPARATION

.1 Obtain Consultant's written approval before placing concrete.

.1 Provide 48 hours minimum notice prior to placing of concrete. Complete a concrete pour form and submit to the Consultant for review at least 48 hours before a concrete pour

.2 Place concrete reinforcing in accordance with Section 03200.

.3 During concreting operations:

.1 Development of cold joints not allowed.

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

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

.5 Disturbing reinforcement and inserts during concrete placement is prohibited.

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

.7 Protect previous Work from staining.

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

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

.10 In locations where new concrete dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels or deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.11 Do not place load upon new concrete until authorized by Consultant.

3.2 INSTALLATION/APPLICATION

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

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.

.2 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.3 Sleeves and openings greater than 100 x 100 mm not indicated reviewed by Consultant.

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

.5 Confirm locations and sizes of sleeves and openings shown on drawings.

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

.3 Anchor bolts:

.1 Set anchor bolts to templates in coordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Consultant.

.1 Formed holes: 100 mm minimum diameter.

.2 Drilled holes: to manufacturers' recommendations.

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

.4 Set bolts and fill holes with epoxy grout.

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

.4 Drainage holes and weep holes:

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

.2 Install weep hole tubes and drains as indicated.

.5 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.6 Finishing and curing:

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

.1 Initial finishing followed by final finishing - Floating.

.2 Use procedures as reviewed by or those noted in CSA A23.1/A23.2 Consultant to remove excess bleed water. Ensure surface not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration of compatibility of compounds used.

.7 Waterproofing: Apply Xypex Concentrate waterproofing to the interior surfaces of the tank. Prepare the concrete surface in accordance with manufacturers instructions prior to application. Protect the surfaces during the product curing period.

.8 Waterstops:

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

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

.7 Use factory welded corners and intersections unless otherwise approved by Consultant.

3.3 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1 Straightedge Method.

3.4 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with CSA A23.2-14 Methods of Test for Concrete.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength.

.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials carried out by third party testing laboratory for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory certified to CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Consultant.

.4 Consultant will require testing laboratory to take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.5 Inspection or testing by Consultant not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

END OF SECTION

Division 05

Metals

Section #	Section Name	Pages
05500	METAL FABRICATIONS	9

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL....1

1.1 RELATED REQUIREMENTS....1
1.2 REFERENCE STANDARDS....1
1.3 ACTION AND INFORMATIONAL SUBMITTALS....1
1.4 QUALITY ASSURANCE....2
1.5 DELIVERY, STORAGE AND HANDLING....2

PART 2 PRODUCTS....2

2.1 MATERIALS....2
2.2 FABRICATION....2
2.3 FINISHES....3
2.4 SHOP PAINTING....3
2.5 PIPE RAILINGS....3
2.6 ACCESS LADDERS....3
2.7 CHANNEL FRAMES....3
2.8 BAFFLE PLATES AND MIXER SUPPORT....3

PART 3 EXECUTION....3

3.1 EXAMINATION....3
3.2 ERECTION - GENERAL....4
3.3 PIPE RAILINGS....4
3.4 ACCESS LADDERS....4
3.5 CHANNEL FRAMES....4
3.6 BAFFLE PLATES AND MIXER SUPPORT....4
3.7 CLEANING....4
3.8 PROTECTION....5

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 None.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.4 ASTM A240/A240M-19, Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Application.

.5 ASTM A312/A312M-19, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

.6 ASTM A554-16, Standard Specification for Welded Stainless Steel Mechanical Tubing.

.7 ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.2 CSA Group (CSA)

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

.2 CSA S16-14, Design of Steel Structures.

.3 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.4 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01300.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for bolts tubing pipe sections plates and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

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

1.4 QUALITY ASSURANCE

.1 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates (excluding stainless steel): to CSA G40.20/G40.21, Grade 300W.

.2 Steel pipe (excluding stainless steel): to ASTM A53/A53M, black finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts (excluding stainless steel): to ASTM A307.

.6 Stainless steel plate: to ASTM A240 grade 316L.

.7 Stainless steel tubing: to ASTM A554 grade 316L.

.8 Stainless steel bolts: to ASTM F593.

.9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

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

.2 Where possible, fit and shop assemble work, ready for erection.

.3 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Zinc primer: zinc rich, ready mix.

2.4 SHOP PAINTING

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

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Paint when temperature minimum 7 degrees C.

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

2.5 PIPE RAILINGS

.1 Steel pipe: 38 mm nominal outside diameter, formed to shapes and sizes as indicated.

.2 Galvanize exterior pipe railings after fabrication.

2.6 ACCESS LADDERS

.1 Stringers: 75 x 75 x 8 mm thick, angle.

.2 Steel Rungs: 20 mm diameter, bearing in stringers at 300 mm on centre.

.3 Galvanize exterior ladders after fabrication.

2.7 CHANNEL FRAMES

.1 Fabricate frames from steel, sizes of channel and opening as indicated.

.2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.

.3 Finish: prime coat painted.

2.8 BAFFLE PLATES AND MIXER SUPPORT

.1 Fabricate from stainless steel, grade 316L.

.2 All framing, connections, anchors to be from stainless steel

.3 Sizes as indicated on Contract Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Consultant.

3.2 ERECTION - GENERAL

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

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

.3 Provide suitable means of anchorage such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

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

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Make field connections with bolts.

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

.1 Primer: maximum VOC limit 250 g/L.

3.3 PIPE RAILINGS

.1 Install pipe railings.

.2 Set railing standards in concrete. Grout to fill hole. Trowel surface smooth and flush with adjacent surfaces.

3.4 ACCESS LADDERS

.1 Install access ladders in locations as indicated.

.2 Erect ladders 200 mm clear of wall on bracket supports.

3.5 CHANNEL FRAMES

.1 Install steel channel frames to openings as indicated.

3.6 BAFFLE PLATES AND MIXER SUPPORT

.1 Provide anchorage as indicated on Contract Drawings.

3.7 CLEANING

.1 Progress Cleaning:

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01780.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

Division 11

Process

Section #	Section Name	Pages
11010	EQUIPMENT GENERAL REQUIREMENTS	10
11540	LIQUID CHEMICAL FEED SYSTEMS	5
11630	MIXER	10

SECTION 11010
EQUIPMENT GENERAL REQUIREMENTS

PART 1. GENERAL....1

1.1 SCOPE OF WORK....1
1.2 SUBMITTALS....1
1.3 STANDARDS....2
1.4 FACTORY ACCEPTANCE TESTING....2
1.5 SPARE PARTS....3
1.6 AS-BUILT INFORMATION....3
1.7 WARRANTIES AND BONDS....3

PART 2. PRODUCTS (NOT USED)....3

PART 3. EXECUTION....3

3.1 DELIVERY, RECEIVING AND STORAGE EQUIPMENT....3
3.2 INSTALLATION OF EQUIPMENT....3
3.3 TIME OF COMPLETION....4
3.4 MANUFACTURERS SERVICES AND CERTIFICATION OF INSTALLATION....4
3.5 ACQUAINTANCE WITH WORK....5
3.6 MATERIAL AND WORKMANSHIP....5
3.7 SPECIAL TOOLS AND ACCESSORIES....6
3.8 TEMPORARY SUPPORTS....6
3.9 SMALL PIPING....6
3.10 ANCHOR BOLTS....7
3.11 FIELD WELDING AND FABRICATION....7
3.12 PROTECTION OF EQUIPMENT....7
3.13 ALIGNMENT....7
3.14 VIBRATION MONITORING....8
3.15 TESTING AND COMMISSIONING....8
3.16 TRAINING....8

SECTION 11010
EQUIPMENT GENERAL REQUIREMENTS

PART 1. GENERAL

1.1 SCOPE OF WORK

.1 The work of this Section covers the general clauses for the supply and installation of all process equipment and other works as specified and/or described in the contract drawings.

.2 Provide all labour and materials, obtain all necessary regulatory approvals, inspection reports, certificates, permits and any other documentation required to install and operate all equipment as designed and pay all related fees as may be required.

.3 Fully coordinate the work of all related Specification Sections. Use equipment specifications together with all Site Work specifications, concrete, building, electrical, controls and process control Specifications as necessary in order to produce a fully functional, performing (as designed) and coordinated Product and/or system that meets all the requirements of the Contract Documents.

.4 Fully coordinate all equipment and related components to function and perform as a complete working system, including all electrical sub-metering, process control programming, automation (as required), data management and network communication requirements.

.5 Fully coordinate and provide services, documentation and other requirements for commissioning individual elements and entire integrated systems as defined by Section 01810 – Equipment Testing and Facility Commissioning.

1.2 SUBMITTALS

.1 Shop Drawings:

.1 Refer to Section 01300 – Submittals.

.2 Submit Shop Drawings for all equipment in this Division, including all relevant installation and fabrication details.

.2 Informational Submittals:

.1 Factory Functional Test Report.

.2 Factory Acceptance Test (FAT) Report

.3 Report confirming compliance with performance requirements cited in the Specifications.

.4 Manufacturer’s Certification of Compliance that the factory finish system is identical to the requirements specified in the Contract Documents.

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

.6 Manufacturer’s printed installation instructions.

.7 Manufacturer’s Certificate of Proper Installation.

.8 Operating and Maintenance Data for all equipment in this Section as detailed in the equipment information template in electronic format.

.9 Suggested spare parts list to maintain the equipment in service for a period of five years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information. The list shall be in an electronic format.

.10 List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.

.11 For all energy consuming equipment under 50 kW, provide a list of power sub-metering for the aggregate number of devices provided.

.12 Equipment Tag list.

1.3 STANDARDS

.1 The materials and workmanship employed in the manufacture of all equipment shall conform to the applicable standards established by the ASTM, AWWA, CEC and CSA. Canadian Standards shall take precedence over American Standards in the event of duplication or conflicting requirements.

.2 The Contractor shall be familiar with the appropriate sections of applicable standards pertaining to the Work and confirm compliance of such to the Consultant.

.3 All electrical motors and equipment shall be built incorporating the latest Canadian standards for energy efficient motors and/or US Department of Energy: Energy Efficiency and Renewable Energy - Hydraulic Institute. EEMAC (Electrical and Electronic Manufacturers' Association of Canada) standards are outdated but may be considered if there are no current equivalent applicable standards available. All motorized and electrical equipment shall be CSA approved or supplied in accordance with ESA rules and regulations and subject to its approval.

1.4 FACTORY ACCEPTANCE TESTING

.1 Where the Contract specifies that Factory Acceptance Tests (FAT) must be witnessed by the Consultant or Consultant’s representative, the Contractor shall give notice to the Consultant and OCWA a minimum of 10 Working Days prior to the proposed testing date. Confirmation of the test date and time shall be provided to the Consultant and OCWA three Working Days prior to the testing date. Equipment shall not be delivered to the Site until Factory Acceptance Testing has been satisfactorily completed, witnessed, approved, and signed off by the Consultant and the OCWA. The Contractor shall provide a comprehensive summary of all FATs to the Consultant and the OCWA for final review prior to equipment acceptance.

.2 When certified FATs of the equipment or any component is specified, the Contractor shall ensure that the Supplier will provide the Consultant with two copies of required certified test reports showing that the equipment complies with the applicable Specification Section before the equipment is delivered to Site. The Contractor shall provide additional copies and electronic copies of the certified test reports as required for the Maintenance Data Manuals.

1.5 SPARE PARTS

.1 Provide a list of spare parts for all equipment.

1.6 AS-BUILT INFORMATION

.1 Submit as-built information in accordance with Section 01780 – Contract Closeout.

1.7 WARRANTIES AND BONDS

.1 Guarantee all equipment in accordance with Section 01780 – Contract Closeout and the General Conditions and Supplementary Conditions of the Contract.

PART 2. PRODUCTS (NOT USED)

PART 3. EXECUTION

3.1 DELIVERY, RECEIVING AND STORAGE EQUIPMENT

.1 The Contractor shall be responsible for all aspects of delivery, receiving and storage of equipment. In the event that the OCWA's facilities are to be used to store equipment, such areas must be pre-approved by the Consultant and OCWA prior to receiving the equipment. The Contractor shall arrange for the delivery of all items of equipment to the Site as required to meet and maintain the project schedule.

.2 The Contractor is responsible for maintaining equipment over long storage periods in accordance with the manufacturer's recommendations.

.3 Arrange for the delivery of all anchor bolts, templates, embedded metals, and other materials required during the concrete placement and assembly of equipment.

.4 Receive equipment at the Site. Unload and examine the equipment upon arrival for damage or defects and be responsible for its safekeeping, storage and installation. Immediately notify the Consultant and the supplier if any of the delivered equipment does not appear new or shows signs of damage or defects.

.5 Special measures shall be taken to ensure that electrical motors do not suffer from moisture, dust, dirt or mechanical damage if stored or installed and inactive.

.6 Equipment storage, safekeeping and relocation of equipment from one area of the Site to another, for whatever reason, shall be the sole responsibility of the Contractor from the time of initial off-loading at the Site until the date of Substantial Performance of the Work and acceptance by OCWA.

3.2 INSTALLATION OF EQUIPMENT

.1 Provide any appurtenant fittings and materials which are not specified in the Contract Documents but are necessary for the proper installation and operation of the equipment without additional payment.

.2 Provide all materials, labour and equipment required for the full installation and operation of the equipment at the performance levels required by the Contract Documents.

.3 Install the equipment in strict accordance with the manufacturer's instructions and to the satisfaction of the Consultant.

.4 Install all instruments in accordance with manufacturer's requirements. In the absence of detailed installation requirements, the Contractor shall install instruments with an in-line isolating valve and a tee and valve on their sample line to allow easy isolation from the process for maintenance and to allow air or moisture removal.

.5 Be fully acquainted with all work required for the complete installation of all equipment. Misunderstandings in regard to the nature or amount of work to be performed shall not constitute grounds for extra payment under this Contract.

.6 Ensure that no unnecessary strain is introduced into the equipment due to connections with piping or other appurtenances.

3.3 TIME OF COMPLETION

.1 Any delay in the delivery of the equipment or installation materials (including theft, damage, wrong equipment etc.) does not relieve the Contractor of its responsibility to complete the Contract in accordance with the Contract Documents and the Contract Time.

3.4 MANUFACTURERS SERVICES AND CERTIFICATION OF INSTALLATION

.1 Provide for all necessary services and expenses of any trained personnel representing the manufacturers of various pieces of specified equipment, in order to ensure the correctness of installation. The expenses to be provided shall also include any start-up costs required by suppliers which may be necessary to ensure the satisfactory installation, testing and commissioning of the equipment.

.2 Complete all equipment testing in accordance with Section 01810 – Equipment Testing and Facility Commissioning.

.3 Complete all commissioning in accordance with Section 01810 – Equipment Testing and Facility Commissioning and provide all documentation in a timely manner in order to commission process elements and entire systems as required by the construction schedule.

.4 Provide all materials, labour and equipment necessary to make any adjustments to the installation as required by the manufacturer or the Consultant until the equipment is fully tested and commissioned.

.5 Upon the completion of installation and testing, obtain from the suppliers or the manufacturers certification that the equipment is installed correctly, is in full operational condition, and is operating in accordance with its design rating. Submit the original certificate to the Consultant and all copies necessary to comply with other submittal requirements. Certification documentation shall include a statement to the effect that any adjoining pipe is properly and independently supported and does not cause undue stress that would be detrimental to the equipment performance.

.6 The Contractor shall coordinate the work of all equipment suppliers, fully commission all equipment and ensure that representatives from the various manufacturers are present during plant testing and commissioning as required by the Consultant.

.7 The Contractor shall coordinate the work of all equipment suppliers with respect to performing warranty work on equipment during the warranty period from storage to installation to Substantial Performance of the Work and the defined warranty period following Substantial Performance of the Work. The Contractor shall provide a complete list of equipment under warranty, the date the warranty commences, and details of all warranty work done on such equipment. The list shall be provided in an electronic format.

3.5 ACQUAINTANCE WITH WORK

.1 The Contractor shall be fully acquainted with all of the work required for the complete installation of all equipment. At no time shall the Contractor make any claim that any misunderstanding existed in regard to the nature or amount of work to be done in relation to the installation, testing and commissioning of all specified equipment.

.2 The Contractor shall be fully acquainted with all cross-referenced Specification Sections contained in the Contract Documents.

.3 Obtain all necessary details from equipment suppliers, including dimensions and other information pertinent to the Work.

3.6 MATERIAL AND WORKMANSHIP

.1 All materials and equipment are to conform to the latest edition of applicable standards in force at the time of tendering. In the event of a conflict between the Specifications and any standard, the more stringent of the two shall apply.

.2 Provide all materials and equipment in conformance with the following:

.1 Materials and equipment are in new condition, not refurbished, used, damaged, sub-standard or outdated and shall be first class in every respect.

.2 Constructed and finished in a workmanlike manner.

.3 Fully suitable for the service intended.

.4 Selected and fabricated in accordance with best engineering practices.

.3 Furnish safety devices, including shear pins, flexible coupling guards, belt guards and other pertinent items with the equipment.

.4 Design machinery such that working parts are readily accessible for inspection and repair, and each part is suitable for the service required.

.5 Carefully pack and crate equipment for shipment. Protect polished and machined metal surfaces from corrosion and damage during shipment. Specially pack electrical equipment to prevent damage by moisture. Cover any equipment having exposed bearings and glands in order to exclude foreign matter.

.6 Design equipment shall have adequate strength, power and capacity for both continuous and intermittent service and have motors and other parts capable of starting and operating under any conditions or loading likely to occur under normal plant operating conditions.

.7 Design the general mechanical and electrical equipment and particularly gearings, contacts and other wearing parts to satisfy the need for long periods of operation without frequent maintenance or attention.

.8 Provide adequate and, as far as practicable, authentic means of lubrication for working parts. Arrange lubrication grease nipples, grease boxes and other lubrication devices so that they are readily accessible for routine greasing.

.9 Indicate on the working drawings submitted, the type of lubricants to be used (must be readily available in Ontario). Use grease nipples of a consistent type (Alemite button head type or an approved equivalent). All MSDS related to lubricants including NSF certification(s) (if applicable) shall be listed and provided to the Consultant.

.10 Make all lubrication points readily accessible using grease nipples and Type 316 stainless steel or copper tubing extensions where required. Secure the nipples and tubing to the equipment at the appropriate locations.

.11 Design all equipment to be installed outdoors for service under climatic conditions typical for the area. Give particular attention to winter operating conditions.

.12 Design the equipment or provide equipment that accounts for the historic facility power quality provided by the local distribution company so that the equipment will not be susceptible to damage or operational outages due to sags and swells on the power supply to the facility. Provide appropriate protection for sensitive electronic equipment and components from historic power quality conditions.

.13 The equipment provided shall be suitable under the anticipated operating conditions and expected/normal duty cycles.

3.7 SPECIAL TOOLS AND ACCESSORIES

.1 Furnish a set of any special tools, wrenches, and accessories required for removing worn parts, for carrying out maintenance and for making adjustments. Special tools are tools which, because of their limited use or purpose-made design, are not normally readily available but are necessary for maintaining the equipment. Provide a list of special tools required to the Consultant with details for use or cross-referenced to O&M manuals.

3.8 TEMPORARY SUPPORTS

.1 Provide all necessary temporary supports and bracing to prevent the overloading of all floors and walls, while equipment is being installed. Ascertain the weights of all pieces of equipment from the manufacturer and move equipment into position in a manner and at a time approved by the Consultant.

.2 Provide eye bolts or hooks engineered for the safe handling of the equipment during installation. Eye bolts shall be left in place.

3.9 SMALL PIPING

.1 Supply and install all small connecting pipework, fittings and valves whether shown on the Contracts Drawings or not. Defining small piping for such purposes shall be by the Consultant. Perform all such work strictly in accordance with the instructions of the manufacturer whose equipment is being installed or connected. Coupling types shall be based on ease of maintenance requirements and shall be submitted to the Consultant for approval.

3.10 ANCHOR BOLTS

.1 Unless otherwise specified, supply all stainless steel anchor bolts, such anchor bolts being of a diameter and size as recommended by the manufacturers of the equipment and machinery being installed. Generally, use expansive type anchorages in setting small equipment. Set large pumps by means of bolts with sleeves cast into the concrete to a minimum depth of 150 mm. Elsewhere, cast in place anchor bolts may be used subject to the approval of the Consultant; these anchor bolts shall be properly positioned by means of plates appropriately placed.

3.11 FIELD WELDING AND FABRICATION

.1 Ascertain details of field welding and fabrication to be carried out for the erection and installation of the various items of equipment.

.2 Tungsten Inert Gas (TIG) welding shall be employed as a standard method of welding. Any other method of welding (such as metal inert gas (MIG) welding) must be approved by the Consultant and the OCWA prior to the commencement of any welding work.

.3 Fabricate the equipment in accordance with CAN/CSA Standard S16-14, Design of Steel Structures and the manufacturer's instructions.

.4 Shield the welding shielded in accordance with CSA Standard CAN/CSA W59-13 Welded Steel Construction (metal arc welding).

.5 Provide all welding inspection reports to the Consultant.

3.12 PROTECTION OF EQUIPMENT

.1 After the equipment has been installed and prior to actual use by OCWA, protect the equipment from damage. Ensure that the utilized protection measures are to the satisfaction of the manufacturer and the Consultant.

3.13 ALIGNMENT

.1 All rotating equipment shall be set and aligned in accordance with the more stringent requirements of either the equipment manufacturer’s instructions or the following:

.1 Level base, use machinists level on all machined surfaces.

.2 Base shall be true and leveled.

.3 Alignment of shafts, soft foot or motor and couplings shall be performed by reverse dial, rim to rim and face to face. Soft foot will be rim to rim vertical and horizontal mode.

.1 Soft foot of motor shall be checked to be within a tolerance of 0.03 m.

.2 Shaft to be aligned within a tolerance of ± 0.025 mm to 0.070 mm.

.3 Piping strains to pump shall be within a tolerance of ± 0.025 mm to 0.070 mm

.4 Laser alignment devices are permissible.

.5 Alignment tests to be done on equipment prior to operation and after a three hour “hot test”.

.4 Provide the Consultant with an alignment report confirming that the above-noted requirements have been met.

3.14 VIBRATION MONITORING

.1 Without exception, all rotating equipment shall be checked, analyzed and tested for vibration.

.1 The vibration level shall be within the specified limit in accordance with the manufacturer's recommendations. Generally, the peak vibration velocity shall not exceed 1 mm / sec measured in the filter-in mode. Measurement shall be carried out with a real time analyzer. Provide a hard copy of the vibration signature spectrum showing vibration velocities over a frequency range of 0 to 2000 Hz, measured in a filter-in mode.

.2 Provide the Consultant with the original vibration monitoring reports.

3.15 TESTING AND COMMISSIONING

.1 Unless otherwise specified, provide commissioning and startup in accordance with Section 01810 – Equipment Testing and Facility Commissioning.

.2 Unless otherwise specified, furnish a certificate of final inspection and approvals from the ESA to the Consultant.

.3 Provide defined commissioning activities in accordance with Section 01810 – Equipment Testing and Facility Commissioning.

3.16 TRAINING

.1 Unless otherwise specified, provide demonstration and training in accordance with Section 01820 – Demonstration and Training.

END OF SECTION

SECTION 11540
LIQUID CHEMICAL FEED SYSTEMS

PART 1. GENERAL....1

1.1 DESCRIPTION....1
1.2 SUBMITTALS....1
1.3 STANDARDS....2
1.4 QUALIFICATIONS....2
1.5 DELIVERY, STORAGE, AND HANDLING....2
1.6 EXTRA MATERIALS....2
1.7 PROTECTION OF OPENINGS....3
1.8 AS-BUILT INFORMATION....3
1.9 WARRANTY....3
1.10 TIME OF COMPLETION....3
1.11 ACQUAINTANCE WITH WORK....3
1.12 MATERIALS AND WORKMANSHIP....3
1.13 COORDINATION....4
1.14 EQUIPMENT AND PIPING IDENTIFICATION....4

PART 2. PROVIDE PIPING SYSTEM IDENTIFICATION OF CONTENTS AND DIRECTION OF FLOW AT VALVES AND FITTINGSPRODUCTS....4

2.1 PACKAGED LIQUID CHEMICAL FEED SYSTEM....4
2.2 EQUIPMENT IDENTIFICATION....6
2.3 PIPING IDENTIFICATION LABELS....6

PART 3. EXECUTION....6

3.1 EXAMINATION....6
3.2 INSTALLATION....6
3.3 DELIVERY AND STORAGE....7
3.4 COMMISSIONING AND TESTING....8
3.5 TRAINING....8

SECTION 11540
LIQUID CHEMICAL FEED SYSTEMS

PART 1. GENERAL

1.1 DESCRIPTION

1.1.1 This section specifies the design, shop drawing submission, supply, installation, testing, commissioning and training for the package calcium thiosulfate chemical dosing system and ORP analyzer.

1.2 SUBMITTALS

1.2.1 The following requirements for submittals are:

.1 Submit Shop Drawings for all equipment in this Section.

.2 Shop Drawings for different components of the package chemical dosing system to be submitted separately for individual review.

.3 Include relevant installation and fabrication details.

.4 An overall drawing of the complete package system assembly showing dimensions, orientation, equipment sizes etc. is also to be provided.

.5 Shop Drawings to include:

.1 Construction details for each component and piece of equipment, as applicable, including:

.1 All components listed in Section 2 Products below including but not limited to:

.2 All process equipment

.3 All product ancillary equipment such as tubing, containment piping, pipe supports, valves, fittings etc.

.4 All associated electrical control systems, wiring and cables, wiring and schematic diagrams

.5 All associated mechanical equipment

.6 Any other details required to demonstrate that the system has been coordinated and will properly function in its entirety as a complete unit.

.2 Product Data Test Reports

.1 Acceptance Testing.

.2 Factory Tests.

.3 Certificates

.1 Materials and Equipment

.4 Operation and Maintenance Data for all equipment in this Section

.1 Operating and Maintenance Manual

.2 Field Training

.5 Identification labelling for all equipment and piping as specified

1.3 STANDARDS

1.3.1 The materials and workmanship employed in the manufacture of all equipment shall conform to the applicable standards established by the ASTM, ANSI, CEC, COSB and CSA. Canadian Standards shall take precedence over American Standards in the case of duplication or conflicting requirements.

1.3.2 In case of conflicting specification requirements, the more stringent provisions shall apply.

1.4 QUALIFICATIONS

1.4.1 Submit qualifications of the installer for review.

1.4.2 A representative of the equipment manufacturer or Vendor, who is familiar with the design and is experienced in the installation, adjustment, and operation of the equipment specified shall be present at the job site during installation of the equipment, lead the commissioning and testing and provide training to OCWA staff.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect from the weather, excessive humidity, excessive temperature variation, and dirt, dust, or other contaminants equipment delivered and placed at a suitable location on site (to be coordinated with the Consultant and OCWA staff).

1.6 EXTRA MATERIALS

1.6.1 Two full loads of Calcium Thiosulfate solution shall be provided by the Vendor. One load shall be used for start-up, testing and commissioning of the package system. The second load shall be so that a fully functioning system loaded with chemical is handed over to OCWA upon completion of the project.

1.6.2 Submit spare parts data for each different item of material and equipment specified. Include in the data a complete list of parts and supplies, with current unit prices and source of supply.

1.6.3 Provide spare parts as recommended by the manufacturer for the warranty period.

1.7 PROTECTION OF OPENINGS

Protect equipment and systems openings from dirt, dust and other foreign materials with materials appropriate to system.

1.8 AS-BUILT INFORMATION

Submit as-built red line drawings and updated shop drawings.

1.9 WARRANTY

1.9.1 All components are to be individually warranted for a minimum period of two years.

1.9.2 Equipment supplier is also to warrant the entire unit and functionality for a period of two years.

1.10 TIME OF COMPLETION

1.10.1 Delay in delivery of equipment or installation materials does not relieve the Vendor of the responsibility to complete the Contract within the agreed date for contract completion.

1.11 ACQUAINTANCE WITH WORK

1.11.1 The Vendor shall be fully acquainted with all work involved in the complete installation of all equipment so that no misunderstandings arise with regards to the nature, scope or amount of work required.

1.11.2 Obtain all necessary details from Equipment suppliers including dimensions and other information pertinent to the Work of this Contract.

1.12 MATERIALS AND WORKMANSHIP

1.12.1 Material and equipment is to conform to the latest edition of applicable standards in force at the time of tendering. In the case of any conflict between the Specifications with any standards, the more stringent of the two applies.

1.12.2 Provide materials and equipment in conformance with the following:

- Constructed and finished in a workmanlike manner.

- Fully suitable for the service intended.
- Selected and fabricated to best engineering practice.

1.13 COORDINATION

Coordinate with various suppliers and sub-trades the installation of equipment specified in other Sections/Divisions of these Contract Specifications including but not limited to structural and electrical sub-trades.

1.14 EQUIPMENT AND PIPING IDENTIFICATION

1.14.1 Perform identification work in accordance with CAN/CGSB 24.3-92 except where specified otherwise.

1.14.2 Provide ULC and CSA registration plates, as required by respective agency.

1.14.3 Supply the equipment complete in all respects in accordance with Codes, ANSI and the *Occupational Health and Safety Act*.

1.14.4 All piping shall be labelled to conform to the Ministry of Labour's WHMIS policy.

PART 2. PROVIDE PIPING SYSTEM IDENTIFICATION OF CONTENTS AND DIRECTION OF FLOW AT VALVES AND FITTINGSPRODUCTS

2.1 PACKAGED LIQUID CHEMICAL FEED SYSTEM

.1 The chemical being stored and dosed is calcium thiosulphate (CaS_2O_3):

.1 Specific Gravity = 1.245

.2 Concentration = 30 w/v%

.3 pH = 6.5-7.5

.4 Clear colourless solution completely soluble in water

.1 A packaged system comprising the following components shall be supplied and installed in the area as highlighted in the Site Layout drawing:

.1 Liquid chemical feed system comprising two diaphragm pumps (rated for up to 7.6 L/hr and turndown capability to at least 0.2 L/hr) mounted on a pump panel (FRP Construction) and complete with all required isolation valves, pulsation damper, pressure relief valve, pressure gauge, calibration column, strainer, drip tray piped back to the containment area, and PTFE dosing line (assume 50m distance to dosing point).

.2 Suction Lance with 2-stage Level Switch sized for standard 200L chemical delivery/storage drum. Lights to be provided on Terminal Box indicating level alarms (two levels). Level switch to be wired up to the Terminal Box and panel lights provided on the front of panel. Acceptable Manufacturer: ProMinent or equivalent

.3 An injection valve with a PVC body and a PTFE mounting insert shall also be installed at the dosing point and be sized to match the dosing line size. Appropriate mounting and supports to be provided for the valve. Acceptable Manufacturer: Prominent or Equivalent

.2 The contractor shall be responsible for bringing all power and communication cables and signals to the packaged system.

.3 Provide pump, motors and control panel in one package by pump manufacturer. Both pumps will be powered via the control panel.

.4 Pump control panel:

.1 4-20 mA analog input and output

.2 The local control panel shall have a NEMA 4X enclosure and shall be wall-mounted adjacent to pumping units. Provide all mounting hardware as required to suit application

.3 Control panel will be equipped with a main breaker and overcurrent protection devices as well as motor starters for each pump. Wiring from the control panel to each dosage pump will be provided by the pump supplier. Contractor to coordinate with the pump supplier and provide conduits as required.

.4 Control panel door shall have at minimum:

.1 Run and Fault status indicator lights

.1 Hand/Off/Auto Selector Switch

.2 Emergency Stop Push Button

.3 Refer to contract drawings for I/O signals required from each pump.

.5 Acceptable Chemical Feed System Package Suppliers:

.1 Metcon

.2 SPD

.3 Equivalent to be approved

2.2 ORP ANALYZER

.1 Insulated and heated (electrical heater: 120V, 100W, 10°C setpoint) enclosure, Model Multibox 25, IP68 rated for outdoors

.2 Integral cable length: ensure it is long enough for the distance from the ORP sensor at the outlet of the new contact chamber to the transmitter (refer to drawing E-001 for exact location of transmitter)

.3 Dual-channel transmitter with PID control

.4 Display: (LCD) with built-in backlight and brightness/contrast adjustment

.5 Power Supply: 120 VAC

.6 Sensor input: digital EZLink
.7 Relay Outputs: 4 standard single-pole, fully programmable
.8 Data Logging capability via SD card.
.9 Transmitter to be installed in an outdoor-resistant enclosure just upstream of the chemical dosing point in the contact chamber (refer to I&C drawings for exact location of transmitter)
.10 The contractor shall be responsible for bringing all power and communication cables and signals to the packaged system.
.11 Acceptable Manufacturer: ABB or Equivalent

2.1 EQUIPMENT IDENTIFICATION

2.1.1 Securely fit, in an easily read location, corrosion-resistant metal nameplates with impressed type lettering on equipment.

2.2 PIPING IDENTIFICATION LABELS

2.2.1 Identification labels listing containment pipe contents and flow direction arrows custom pre-printed on pre-curved Polyvinyl Chloride (PVC) wrap around type label carriers to suit varying piping sizes. Labels designed to suit indoor and outdoor use, rated for -40°C to 82°C temperature range with built in ultraviolet inhibitors.

2.2.2 Provide a character height of 25mm, symbol line width of 8mm and character line width of 4mm.

2.2.3 Adhesive tapes directly on the piping are not acceptable.

2.2.4 Provide label to indicate direction of flow.

PART 3. EXECUTION

3.1 EXAMINATION

3.1.1 After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Consultant of any discrepancy before performing the work.

3.2 INSTALLATION

3.2.1 Install the equipment in strict accordance with the manufacturer's instructions and to the satisfaction of the Consultant.

3.2.2 Installation work shall include provision and installation of the entire chemical dosing system including but not limited to:

.1 Installation of all process equipment.

.2 Suction tubing with respect to the chemical dosing skid is to be contained within a Schedule 40 2” PVC pipe from the chemical storage drum outlet to the dosing skid inlet.

.3 Discharge tubing with respect to the chemical dosing skid is to be contained within a Schedule 40 2” PVC pipe indoors.

.4 See Section 02530-Yard Piping for discharge tubing containment outdoors. This section is to be insulated and heat traced.

.5 Installation of interconnecting piping, piping connections, pipe supports and all related appurtenances to ensure a fully functioning system.

.6 Tying in electrical power from the service connection (to be terminated at a junction box close to the process equipment location) to all equipment.

3.2.3 The Vendor shall provide the services of an engineering representative to inspect the equipment after erection, make adjustments in placing the equipment in operation, and shall be present during the final inspection, start-up, and acceptance test.

.1 The representative shall provide training on use of the equipment to facility staff.

3.2.4 Piping

.1 Piping shall be installed to true alignment and rigidly supported.

.2 Screwed joints shall be made up tight with a stiff mixture of graphite and oil, inert filler and oil, or an approved graphite compound, applied to the male threads only. Threads shall be full cut; not more than three threads on the pipe shall remain exposed.

3.2.5 Supports

.1 Supports are to be spaced evenly along a pipe run, one support at every direction change and at both sides of the direction change.

.2 At every connection, apply torque as per the support supplier requirements.

.3 All nuts and bolts are to include washers of the same material. Once tied, 3 threads should be seen.

3.3 DELIVERY AND STORAGE

3.3.1 All equipment and parts shall be packaged for shipment to prevent breakage, damage or cause out-of-adjustment calibration, readings, or controls.

3.3.2 Materials delivered to the site shall be inspected for damage and shall be unloaded and stored with a minimum of handling.

3.3.3 All equipment shipped separately and not mounted on the package unit assembly shall be stored indoors, off the floor. The area shall be dry with adequate ventilation, free from dust or water, and shall permit easy access for inspection and handling.

3.3.4 During inclement weather, the Vendor shall cover the equipment until such time that an inspection can be made of the equipment delivered to assess any damage if any has occurred in transit.

3.3.5 The Vendor shall be responsible for material delivered and stored at the site or other location.

3.3.6 Vendor shall take measures for the security of the equipment and it will be his sole responsibility up to the time of acceptance of the plant.

3.4 COMMISSIONING AND TESTING

3.4.1 The startup and commissioning will be carried out with actual product in the chemical storage drum according to Section 01810.

3.4.2 A 5-day run test is required following the commissioning when the equipment shall be managed and operated by the Vendor and shall demonstrate to be fully operational and meeting the intent of the design. During this period, the Vendor shall be responsible to resolve any issues arising from the equipment and ensuring that all performance criteria as outlined by the Consultant are met.

3.5 TRAINING

3.5.1 A field training course shall be provided for designated operating and maintenance staff members. Training shall be provided by the manufacturer's representative Field training shall cover all of the items contained in the operating and maintenance manuals.

3.5.2 One training session of 3 hours should be accounted for.

END OF SECTION

SECTION 11630
MIXER

PART 1. GENERAL....1

1.1 DESCRIPTION....1
1.2 RELATED SECTIONS....1
1.3 GENERAL....1
1.4 SUBMITTALS....2
1.5 APPLICABLE CODES AND STANDARDS....2

PART 2. PRODUCTS....3

2.1 SERVICE CONDITIONS....3
2.2 DESIGN REQUIREMENTS....3
2.3 ACCEPTABLE MANUFACTURERS....4
2.4 MATERIALS....4
2.5 MANUFACTURE AND FABRICATION....4
2.6 MIXER CONSTRUCTION....5
2.7 CONTROLS....6
2.8 ACCESSORIES....6
2.9 MOTOR....6
2.10 SHOP TESTING....7

PART 3. EXECUTION....7

3.1 INSTALLATION AND INSPECTION....7
3.2 MAINTENANCE....9
3.3 TRAINING....9
3.4 TESTING....9
3.5 WARRANTY....9

SECTION 11630
MIXER

PART 1. GENERAL

1.1 DESCRIPTION

.1 This section covers the supply, delivery, supervision of installation and commissioning of one (1) overhead mixer with anti-ragging impeller as specified herein for the open channel of the contact chamber, downstream of the chemical dosing point.

.2 The overhead mixer with anti-ragging impeller assembly shall be complete with electric motor, impeller, power cables, supports, flexible element motor coupling and guard, speed reducer, upper and lower shaft and all other appurtenances specified or otherwise required for proper operation.

.3 The Vendor is responsible for overall coordination of the equipment package to ensure compatibility of overhead mixer with chemical and outdoors conditions.

1.2 RELATED SECTIONS

.1 Section 01300 – Submittals

.2 Section 01810 – Equipment Testing & Facility Commissioning

.3 Section 01820 – Demonstration & Training

.4 Section 11540 – Liquid Chemical Feed Systems

1.3 GENERAL

.1 Equipment furnished under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with contract drawings, specifications, engineering data, instructions and recommendations of the mixer manufacturer, unless exceptions are noted by the Consultant.

.2 Coordination:

.1 The mixer supplier shall verify that each component of the system is compatible with all other components of the system; and that all devices for a properly functioning system have been provided. The Vendor is responsible for overall coordination of the equipment package to ensure compatibility of the mixer unit with their respective motors and accessories, and with the proposed works.

.3 Equipment Schedule:

.1 Manufacturer's field services, operation and maintenance manuals, and certificates of compliance shall be provided for all items of equipment furnished under this contract.

.4 Specific requirements for manufacturer's field services are covered in the quality control section. Specific requirements for operation and maintenance manuals and certificates of compliance are covered in the submittals section.

.5 Power Supply:

.1 Power supply to equipment will be 115/230 V, 60Hz, 1 phase.

1.4 SUBMITTALS

.1 Submit the Shop Drawings for review in accordance with Section 01300 – Submittals.

.2 The shop drawing submission shall include, but not be limited to, the following:

.1 Dimensional drawings showing proposed mixer layout and sections together with motor and anchor bolt base plans and details, data on shop painting, performance curves, weight, efficiency, and mast assembly.

.2 A precise list of all electrical requirements for the equipment including all controls, monitoring equipment and instruments shall be given including all power characteristics and materials of construction. A wiring schematic and single line diagram of the control panel(s) must be included.

.3 The supplier shall indicate a list of spare parts, which he/she would recommend be purchased and individual prices for each item.

.4 All ancillary equipment to be provided by the supplier shall be listed.

.5 Special accessories or tools for the adjustment or removal of parts required for any piece of equipment shall be listed and furnished as part of the supply.

1.5 APPLICABLE CODES AND STANDARDS

.1 The following minimum applicable codes, standards and regulations must be adhered to in the design, installation and services provided by the Vendor. In the case of conflicting information among these codes, it is the Vendor's responsibility to inform and obtain written approval from the Purchaser of any exceptions hereby taken.

.2 Requirements from the following organizations shall be considered as a minimum:

.1 OSHA - Occupational Safety and Health Act

.2 AISI - American Iron and Steel Institute

.3 NEMA - National Electrical Manufacturers Association

.4 AFBMA - Anti-Friction Bearing Manufacturers Association

.5 ASTM - American Society for Testing and Materials

.6 ANSI - American National Standards Institute

.7 CSA - Canadian Standards Association

.8 Municipality, OCWA, Provincial Codes

PART 2. PRODUCTS

2.1 SERVICE CONDITIONS

.1 The overhead mixer with anti-ragging impeller shall be installed as shown on Contract Drawings to provide an effective mixing at its location in the open channel.

.2 The mixer shall be designed for continuous service, meaning operation under load without interruption except for service and repair. The mixer shall also contain a timer to allow timed operation.

.3 Liquid requiring mixing is secondary treated effluent with an assumed specific gravity of 1.00.

.4 The entire weight of the mixer shall be supported by a frame to be provided and installed by the Vendor or Contractor.

.5 Mixer will be located outdoors and shall be suitable for climatic conditions typical of Longlac, Ontario.

2.2 DESIGN REQUIREMENTS

.1 Mixer shall be designed for the following design conditions:

.1 Open Channel Hydraulic Cross-Section Dimensions: 1.5m W x 1.5m H (from contact chamber floor to water level)

.2 Overall Height of Open Channel Cross-Section: 127” or 3226 mm (from contact chamber floor to baffle wall top)

.3 Water temperature: 2-30^{0}C.

.4 The mixer shall have a dry installed motor with a hood overhead for protection from the weather elements.

2.3 ACCEPTABLE MANUFACTURERS

.1 The following suppliers are deemed acceptable, and are listed in order of preference:

.1 Lightnin

.2 Hayward-Gordon

.3 Revolmix

2.4 MATERIALS

.1 All materials shall be compatible with specified liquid. Each mixer shall be of the integral design and close coupled.

.2 Material of the overhead mixer shall be 316 SS.

2.5 MANUFACTURE AND FABRICATION

.1 Corrosion Protection.

.1 All metal surfaces coming into contact with the mixed liquid, other than stainless steel or brass shall be protected by an approved, corrosion resistant coating.

.2 Welding.

.1 All structural butt welds shall be of full penetration. Equipment shall be free of any damages such as indentations and cracks. All welded joints shall be of similar chemistry, corrosion resistance and physical properties to the base metal being welded.

.3 Edge Grinding.

.1 Sharp projections of cut or sheared edges of metals, which will be submerged in operation, shall be ground to a radius.

.4 Paint and Coating.

.1 The exterior of the mixer, including all metal surfaces coming into contact with the treated effluent shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer and finished with a polyester, epoxidized resin paint. Prior to the final paint finish being applied, the mixer components shall be primed and washed. The components shall be coated with a two component epoxy finish. The coatings shall be non-toxic and approved. The finish paint or topcoat shall be applied externally to a minimum dry film thickness of not less than 100 microns. The film thickness shall be consistent with ISO 2808, method No. 6.

2.6 MIXER CONSTRUCTION

.1 Impeller

.1 The design of the impeller shall be of axial flow type with a closed impeller mixer design to prevent ragging. The impeller hub shall be of cast material, with the blades bolted to the hub.

.2 The impeller shall be of such design and operate at such rotational speed that dynamic balancing is not required to prevent damaging vibration.

.3 Minimum number of impellers blades shall be one (1).

.4 One impeller with a diameter of at least 350mm to be included on the shaft.

.5 Impeller to be able to rotate anywhere in the 100-300 rpm range.

.2 Mixer Shaft

.1 The impeller shaft shall be supported on two adapter type anti-friction bearings mounted independent of the speed reducer so as to isolate the gearing from bending loads caused by varying direction of fluid reaction forces.

.2 The bearings shall carry only the impeller shaft loads and shall include a thrust bearing capable of supporting the entire weight of the vertical impeller shaft and impellers. Systems requiring the alignment of three bearing are not acceptable.

.3 The output shaft shall be totally overhung; the use of submerged or steady bearings is not permitted.

.4 Separation of the shaft supporting the turbine from the speed reducer shall not require disassembly or other disturbance of the speed reducer internal gearing. Flanged connection for impeller assembly is an acceptable alternate.

.5 Mixer shaft length to be determined by the supplier such as the impeller stands 25” or 635 mm from the bottom of the contact chamber floor.

.3 Bearings

.1 The bearings shall be of anti- friction type of ball, roller or tapered roller design. Pressed- on type or sliding, journal type bearings are not acceptable.

.2 Bearings shall not require pre-loading and shall be maintenance free with a minimum L-10 bearing life of 100,000 hours minimum at design

conditions. Other bearings shall be of a type appropriate to the nature and size of the torsional, thrust and lateral loads encountered. In addition to the design torsional and thrust loads created by the gearing, bearing life calculations shall include the bending loads caused by the forces acting at the mixing/aeration impeller.

.3 The output shaft bearings shall be grease-lubricated with grease inlet and relief accessible from the mounting surface. Grease fittings serving the mixer and output shaft bearings are to be plainly marked and each grease fitting shall be protected with a removable cover.

.4 Lubrication

.1 The speed reducer oil shall have a splash lubrication system suitable for all weather starting and operation. Splash lubrication by means of an oil slinger or by gears running in an oil bath is preferred.

.2 Grease lubrication of some working parts is permissible, providing adequate separation is made of these parts from the oil lubricated parts.

.3 A single extended oil drain shall be provided, positioned for easy access, and located to leave not more than 6.35mm (1/4") of residual oil within the drive housing. Following the initial run in period, oil changes shall not be required at less than 2,500 hour intervals when operated continuously at ambient conditions above freezing. Instruction manuals shall include a list of acceptable lubricants, and recommended change intervals for low temperature operation.

2.7 CONTROLS

.1 Local control panel with ON/OFF control and a soft starter shall be provided as per contract drawings. Control panel enclosure to be suitable for outdoors. For the supply voltage, provide 100 VA Control transformer 208:120 V complete with fusing. See Structural drawings for mounting details.

2.8 ACCESSORIES

.1 Equipment Identification Plate: 1.6mm thick stainless steel identification plate with 6mm die-stamped tag number securely mounted on the equipment in a readily visible location.

.2 Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer.

.3 Lifting Lugs: If equipment weighing over 45kg.

2.9 MOTOR

.1 The motor shall be a totally enclosed, fan cooled, high efficiency, severe duty, electric induction motor with insulation meeting Class B, a weather tight junction box and a 1.15 service factor. The insulation shall be non- hygroscopic.

.2 A flexible coupling and coupling guard shall be provided between the electric motor driver and gearbox- input shaft.

2.10 SHOP TESTING

.1 The mixer manufacturer shall assemble and test run the mixer prior to shipment.

.2 The following inspections shall be performed as a routine quality check on each mixer prior to shipment from the factory:

.1 Propeller size, motor rating, voltage, phase and frequency will be checked for compliance with customer purchase order and specifications.

.2 Motor and power cable shall be checked before submergence for insulation defects and moisture content.

.3 Pressurize the motor with dry air and check for leaks at all joints and seals.

.4 Before operation run the mixer to check for correct rotation and ensure mechanical integrity.

.3 A quality control check sheet showing that the above has been accomplished shall be supplied with each mixer.

PART 3. EXECUTION

3.1 INSTALLATION AND INSPECTION

.1 Installation Check

.1 The Vendor shall provide the services of a qualified field representative according to the quality control section to assist during installation of the equipment.

.2 The representative shall be present when the equipment is placed in operation in accordance with Section 01810 Testing and Commissioning and shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Consultant.

.3 The Vendor shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

.2 Mixer Tests

.1 The mixer manufacturer shall perform the following inspections and tests on the mixer before shipment from factory:

.1 Propeller, motor rating, and electrical connections were checked for compliance to the spec.

.2 Motor and cable insulation test for moisture content or insulation defects shall be made.

.3 Prior to shipment, the mixer shall run dry to establish the correct rotation, the mechanical and electrical integrity.

.4 Inspections and tests performed shall confirm the mixer listed met all established quality assurance standards set for similar materials. Mixer shall be warranted against defects in design, workmanship and materials.

.2 Performance Tests

.1 A performance test shall be run on the mixer after the installation check is completed, to ensure that the unit is operating properly as determined by the representative, and after acceptance of the Field System Operation Tests. The performance tests shall be conducted by a capable representative and accepted by Consultant.

.2 OCWA's operating personnel will assist the Vendor in the performance test. A designated representative of OCWA and/or the Consultant will observe the performance tests.

.3 The test results will be used to prove compliance with the performance requirements prior to acceptance of the equipment. Consistent compliance with design conditions shall be defined as the average of sample values meeting or exceeding the specified design conditions.

.4 The Vendor shall detail the proposed performance testing procedure and analyses, subject to approval by Consultant. If more than one day of testing is required, the testing shall be done on consecutive days.

.3 Test Reports

.1 The equipment manufacturer shall prepare a formal test report, including all installation checks and performance tests and other recorded data and observations. Six copies of the report shall be submitted to Consultant within 30 days after completion of the specified tests.

3.2 MAINTENANCE

.1 Since the mixer shall be located on top of the open channel, access should be provided and/or defined to ensure safe maintenance of the equipment can be undertaken.

3.3 TRAINING

.1 In addition to the installation and operation checks required for the mixer, the Vendor shall provide training to OCWA's operating personnel in the proper operation and maintenance of the equipment. Training shall be provided as specified in Section 01820 – Demonstration and Training.

3.4 TESTING

.1 As part of the overall package chemical dosing system, the mixer shall undergo a 5-day test during which its performance in continuous operation of the system is demonstrated.

3.5 WARRANTY

.1 Each unit shall be new and shall carry the full manufacturer's warranty on parts, service, and performance. Warranty shall begin at substantial completion. The warranty shall include replacement of all defective equipment and shall extend two (2) years beyond substantial completion.

.2 Corrective Work.

.1 Any location where corrosion is evident shall be considered a failure of the material or the protection system. Before starting corrective work, the Manufacturer shall submit to the Consultant for review any analysis of the cause of the failure and details of the proposed corrective work. The manufacturer shall make repairs acceptable to the Consultant at all points where failures are observed within the warranty period.

.3 Inspection.

.1 Each unit shall be inspected at the end of the warranty period by representatives of OCWA, the Consultant, and the Manufacturer to identify any failures that may have occurred. The Manufacturer shall establish the date of each inspection and shall notify OCWA at least 30 days in advance. The scheduled inspection shall not relieve the Manufacturer from the obligation to perform corrective work whenever needed.

.4 The Vendor shall prepare and deliver on behalf of the manufacturer, to the Consultant an inspection report covering each inspection, indicating the number and type of failures observed, material and part where materials have failed, the percentage of the surface area where corrosion protection system failure has

occurred, and the names of the persons making the inspection. Colour photographs illustrating each type of failure shall be included in the report.

END OF SECTION

Division 15

HVAC and Mechanical

Section #	Section Name	Pages
15895	PASSIVE VENT	1

SECTION 15895
PASSIVE VENT DUCT

PART 1 GENERAL

1.1 GENERAL CONDITIONS

.1 All sections of Division 1 form a part of this Specification. Read and fully adhere to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these documents to determine their effect upon the work of this section.

.3 All sections of Divisions 1 to 16 inclusive form part of the Contract Documents.

1.2 SCOPE

.1 Furnish all labour, materials, supervision, equipment and services specified, indicated or requested to clean and verify existing Passive Ventilation.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 INSTALLATION

.1 Existing passive vent to be cleaned and inspected is located over the entrance door. Clean passive vent grilles (interior and exterior) and ensure air pathway through wall is free and clear of debris and obstructions.

.2 Existing passive vent located low in the room will remain blocked off with insulation as per existing conditions. Cleaning and inspection of this vent is not required.

END OF SECTION

Division 26 ELECTRICAL
TABLE OF CONTENTS

Section #	Section Name	Pages
26 05 00	COMMON WORK RESULTS FOR ELECTRICAL	6
26 05 20	WIRE AND BOX CONNECTORS (0-1000V)	2
26 05 21	WIRES AND CABLES (0-1000V)	2
26 05 28	GROUNDING - SECONDARY	2
26 05 29	HANGERS & SUPPORTS FOR ELECTRICAL SYSTEMS	2
26 05 31	SPLITTERS, JUNCTION, PULL BOXES & CABINETS	1
26 05 32	OUTLET BOXES, CONDUIT BOXES & FITTINGS	2
26 05 34	CONDUITS, CONDUIT FASTENINGS & CONDUIT FITTINGS	3
26 05 80	FRACTIONAL HORSEPOWER MOTORS	2
261216.01	DRY TYPE TRANSFORMERS UP TO 600V	2
262416.01	PANELBOARDS BREAKER TYPE	2
26 27 26	WIRING DEVICES	2
262816.02	MOULDED CASE CIRCUIT BREAKERS	1
26 50 00	LIGHTING	2

Section 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 DEFINITIONS 1
1.3 ACTION AND INFORMATIONAL SUBMITTALS 1
1.4 CLOSEOUT SUBMITTALS 2
1.5 DELIVERY, STORAGE AND HANDLING 2

PART 2 PRODUCTS 3

2.1 DESIGN REQUIREMENTS 3
2.2 MATERIALS AND EQUIPMENT 3
2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS 3
2.4 WARNING SIGNS 3
2.5 WIRING TERMINATIONS 3
2.6 EQUIPMENT IDENTIFICATION 3
2.7 WIRING IDENTIFICATION 4
2.8 CONDUIT AND CABLE IDENTIFICATION 4
2.9 FINISHES 4

PART 3 EXECUTION 5

3.1 EXAMINATION 5
3.2 INSTALLATION 5
3.3 NAMEPLATES AND LABELS 5
3.4 CONDUIT AND CABLE INSTALLATION 5
3.5 LOCATION OF OUTLETS 5
3.6 MOUNTING HEIGHTS 5
3.7 CO-ORDINATION OF PROTECTIVE DEVICES 6
3.8 FIELD QUALITY CONTROL 6
3.9 SYSTEM STARTUP 6
3.10 CLEANING 7

Section 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 CSA Group

.1 CSA C22.1-, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installation & Ontario Amendments to the code.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for all equipment & material to be used throughout the project.

.3 Shop drawings:

.1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

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

.4 If changes are required, notify Consultant of these changes before they are made.

.4 Certificates:

.1 Provide CSA certified material & equipment.

.2 Submit test results of installed electrical systems and instrumentation.

.3 Permits and fees: in accordance with General Conditions of contract.

.4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.

.5 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 – FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for all equipment & material used throughout.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates, labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Provide equipment & material in accordance with Common Product Requirements.

.2 Material & equipment to be CSA certified. Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: in accordance with Section 26 29 03 – Control Devices.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates/labels as follows:

.1 Nameplates: lamacoid 3 mm thick plastic engraving sheet , matt white finish face, black core, mechanically attached with self tapping screws

.2 Sizes as follows:

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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates & labels to be approved by Consultant to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate & label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes and/or numbered, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

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

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 5m intervals.

.3 Colours: 25mm wide prime colour and 20mm wide auxiliary colour.

Type	**Prime**	**Auxiliary**
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 FINISHES

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

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.

3.2 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

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

3.3 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe sized for free passage of conduit, and protruding 50mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32- Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

3.6 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: 1100 mm.

.2 Wall receptacles:

.1 General: 300mm.

.2 Above top of counters or counter splash backs: 150mm.

.3 In mechanical rooms: 1000mm.

.3 Panelboards: as required by Code or as indicated.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.8 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Quality Control.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

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

.5 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.9 SYSTEM STARTUP

.1 Instruct operating personnel/Consultant in 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 aspects of its care and operation.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Cleaning.

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

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

END OF SECTION

Section 26 05 20
WIRE AND BOX CONNECTORS (0-1000 V)

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1
1.3 CLOSEOUT SUBMITTALS 1
1.4 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 2

2.1 MATERIALS 2

PART 3 EXECUTION 2

3.1 INSTALLATION 2
3.2 CLEANING 2

Section 26 05 20
WIRE AND BOX CONNECTORS (0-1000 V)

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.

.2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

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

.1 EEMAC 1Y-2 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for TECK cable, flexible conduit, armoured cable, as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors/ cables and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.

.2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance as specified.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance a specified.

END OF SECTION

Section 26 05 21
WIRES AND CABLES (0-1000 V)

PART 1 GENERAL 1

1.1 PRODUCT DATA 1

PART 2 PRODUCTS 1

2.1 BUILDING WIRES 1
2.2 TECK 90 CABLE 1
2.3 CONTROL CABLES 1

PART 3 EXECUTION 2

3.1 FIELD QUALITY CONTROL 2
3.2 GENERAL CABLE INSTALLATION 2
3.3 INSTALLATION OF BUILDING WIRES 2
3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V) 2
3.5 INSTALLATION OF CONTROL CABLES 2

Section 26 05 21
WIRES AND CABLES (0-1000 V)

PART 1 GENERAL

1.1 PRODUCT DATA

.1 Provide product data in accordance with Submittal Procedures.

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12AWG.

.2 Copper conductors: sized as indicated & required with 600V insulation for 120/208V voltage with RWU90 for above ground application & RWU90 conductors for below grade application.

.3 Copper conductors: sized as indicated & required with 1000V insulation for 347/600V voltage with RWU90 for above ground application & RWU90 conductors for below grade application.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Conductors:

- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper size as indicated.

.3 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.

.4 Fastenings:

- .1 One-hole zinc straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables.
- .3 Threaded rods: 6 mm diameter to support suspended channels.

.5 Connectors:

- .1 Watertight approved for TECK cable.

2.3 CONTROL CABLES

.1 As specified.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00- Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed securely supported by straps.

3.5 INSTALLATION OF CONTROL CABLES

.1 As specified.

END OF SECTION

Section 26 05 28
GROUNDING – SECONDARY

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1
1.3 CLOSEOUT SUBMITTALS 1
1.4 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 1

2.1 EQUIPMENT 1

PART 3 EXECUTION 2

3.1 INSTALLATION GENERAL 2
3.2 EQUIPMENT GROUNDING 2
3.3 FIELD QUALITY CONTROL 2
3.4 CLEANING 2

Section 26 05 28
GROUNDING – SECONDARY

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Grounding conductors: bare stranded copper, size as required.

.2 Insulated grounding conductors: green, copper conductors, size as required.

.3 Non-corroding accessories necessary for grounding system, type, size, material as required , including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT or equal is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator during tests.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Cleaning Specification.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Section 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL 1

1.1 ACTION AND INFORMATIONAL SUBMITTALS 1
1.2 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 1

2.1 SUPPORT CHANNELS 1

PART 3 EXECUTION 1

3.1 INSTALLATION 1
3.2 CLEANING 2

Section 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41mm, 2.5mm thick, suspended/surface mounted.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to poured concrete with expandable inserts.

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

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

.4 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.5 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.6 For surface mounting of two or more conduits use channels.

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

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

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

.10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

.11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Cleaning Specification.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Cleaning Specification.

END OF SECTION

Section 26 05 31
SPLITTERS, JUNCTION, PULL BOXES AND CABINETS

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1

PART 2 PRODUCTS 1

2.1 JUNCTION AND PULL BOXES 1

PART 3 EXECUTION 1

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION 1
3.2 IDENTIFICATION 1

Section 26 05 31
SPLITTERS, JUNCTION, PULL BOXES AND CABINETS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Submittal Procedures.

.2 Product Data:

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

PART 2 PRODUCTS

2.1 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Surface Mounted: screw-on turned edge covers.

PART 3 EXECUTION

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

Section 26 05 32
OUTLET BOXES, CONDUIT BOXES AND FITTINGS

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1

PART 2 PRODUCTS 1

2.1 OUTLET AND CONDUIT BOXES GENERAL 1
2.2 CONDUIT / DEVICE BOXES 1
2.3 FITTINGS - GENERAL 1

PART 3 EXECUTION 1

3.1 INSTALLATION 1

PART 4 PROVIDE CORRECT SIZE OF OPENINGS IN BOXES FOR CONDUIT, MINERAL INSULATED AND ARMOURED CABLE CONNECTIONS. DO NOT INSTALL REDUCING WASHERS 2

Section 26 05 32
OUTLET BOXES, CONDUIT BOXES AND FITTINGS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01300 – Submittals.

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

2.2 CONDUIT / DEVICE BOXES

.1 Cast FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

PART 4 PROVIDE CORRECT SIZE OF OPENINGS IN BOXES FOR CONDUIT, MINERAL INSULATED AND ARMOURED CABLE CONNECTIONS. DO NOT INSTALL REDUCING WASHERS

.1 Vacuum clean interior of outlet boxes before installation of wiring devices.

.2 Identify systems for outlet boxes as required.

END OF SECTION

Section 26 05 34
DECHLORINATION PROJECT CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1

PART 2 PRODUCTS 1

2.1 CABLES AND REELS 1
2.2 CONDUITS 1
2.3 CONDUIT FASTENINGS 2
2.4 CONDUIT FITTINGS 2
2.5 EXPANSION FITTINGS FOR RIGID CONDUIT 2
2.6 FISH CORD 2

PART 3 EXECUTION 2

3.1 MANUFACTURER'S INSTRUCTIONS 2
3.2 INSTALLATION 2
3.3 SURFACE CONDUITS 3
3.4 CONDUITS UNDERGROUND 3
3.5 CLEANING 3

Section 26 05 34
DECHLORINATION PROJECT CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 45, Rigid Metal Conduit.

.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83, Electrical Metallic Tubing.

.5 CSA C22.2 No. 211.2 Rigid PVC (Unplasticized) Conduit.

.6 CAN/CSA C22.2 No. 227.3, Non-metallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

PART 2 PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

.1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, dipped galvanized steel

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings

.4 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum.

.6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3

2.3 CONDUIT FASTENINGS

.1 One-hole malleable iron straps to secure surface conduits 50 mm and smaller.

.1 Two-hole steel straps for conduits larger than 50 mm

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

.3 Channel type supports for two or more conduits.

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

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18 manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Setscrews are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

.1 Polypropylene.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

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

.2 Surface mount conduits throughout.

.3 Use electrical metallic tubing (EMT) throughout interior except in cast concrete, above 2.4 m and where not subject to mechanical injury.

.4 Use rigid pvc conduit in corrosive area/underground.

.5 Use flexible metal conduit for work in movable metal partitions, connection to motors in dry areas, connection to surface or recessed fluorescent fixtures, etc.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.7 Minimum conduit size for lighting and power circuits: 19 mm

.8 Bend conduit cold:

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

.9 Mechanically bend steel conduit over 19 mm diameter.

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

.11 Install fish cord in empty conduits.

.12 Run 1-25 mm spare conduits up to ceiling space from each new lighting/power panel.

.1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.

.13 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.14 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended/surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

3.5 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Section 26 05 80
FRACTIONAL HORSEPOWER MOTORS

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1

PART 2 PRODUCTS 1

2.1 FRACTIONAL HORSEPOWER MOTOR 1

PART 3 EXECUTION 1

3.1 MANUFACTURER'S INSTRUCTIONS 1
3.2 INSTALLATION 2
3.3 CLEANING 2

Section 26 05 80
FRACTIONAL HORSEPOWER MOTORS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No. 100-, Motors and Generators.

.2 CSA C22.2 No. 145-Motors and Generators for Use in Hazardous Locations.

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

.1 EEMAC M1-7-, Standard for Motors and Generators.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Submittal Procedures.

.2 Shop drawings:

.1 Indicate dimensions, recommended installation procedure, wiring diagrams, sizes and location of mounting bolt holes and recommended support method.

.3 Quality Assurance Submittals:

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Manufacturer's Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data for fractional horsepower motors for incorporation into manual specified in Closeout Submittals specification.

PART 2 PRODUCTS

2.1 FRACTIONAL HORSEPOWER MOTOR

.1 Non-hazardous locations: to CSA C22.2 No. 100, EEMAC M1-7.

.2 Motor with inherent overheating protectors.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install wiring, flexible connections and grounding.

.2 Check rotation before coupling to driven equipment.

3.3 CLEANING

.1 Proceed in accordance with Cleaning Specification.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Section 26 12 16.01
DRY TYPE TRANSFORMERS UP TO 600 V PRIMARY

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1
1.3 CLOSEOUT SUBMITTALS 1
1.4 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 1

2.1 DESIGN DESCRIPTION 1
2.2 EQUIPMENT IDENTIFICATION 2

PART 3 EXECUTION 2

3.1 INSTALLATION 2
3.2 CLEANING 2
3.3 PROTECTION 2

Section 26 12 16.01
DRY TYPE TRANSFORMERS UP TO 600 V PRIMARY

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CAN/CSA-C22.2 No. 47 Air-Cooled Transformers (Dry Type).

.2 CSA C9 Dry-Type Transformers.

.3 CAN/CSA-C802.2, Minimum Efficiency Values for Dry Type Transformers.

.2 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for dry type transformers and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for dry type transformers for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 DESIGN DESCRIPTION

.1 As specified.

.1 3 phase

.2 Voltage taps: standard

.3 Basic Impulse Level (BIL): standard

.4 Average sound level: standard

.5 Impedance at 17 degrees C: standard

.6 Enclosure: NEMA, removable metal front panel.

.7 Mounting: wall.

.8 Finish: in accordance with Section 26 05 00- Common Work Results for Electrical.

.9 Aluminum windings.

.10 Winding configuration to be as noted on drawings.

.11 Harmonic Mitigating Phase Shifting transformers as indicated on drawings.

.12 KL-Rated Transformers as indicated on drawings.

.13 Voltage Regulation to be 4% or better.

2.2 EQUIPMENT IDENTIFICATION

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

.2 Label size: 7.

.3 Nameplate wording: As specified.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Mount dry type transformers up to 75 kVA wall mount.

.2 Ensure adequate clearance around transformer for ventilation.

.3 Install transformers in level upright position.

.4 Remove shipping supports only after transformer is installed and just before putting into service.

.5 Loosen isolation pad bolts until no compression is visible.

.6 Make primary and secondary connections in accordance with wiring diagram.

.7 Energize transformers after installation is complete.

.8 Make conduit entry into bottom 1/3 of transformer enclosure.

3.2 CLEANING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Cleaning specification.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by dry type transformers installation.

END OF SECTION

Section 26 24 16.01
PANELBOARDS BREAKER TYPE

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1
1.3 CLOSEOUT SUBMITTALS 1
1.4 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 1

2.1 PANELBOARDS 1
2.2 BREAKERS 2
2.3 EQUIPMENT IDENTIFICATION 2

PART 3 EXECUTION 2

3.1 EXAMINATION 2
3.2 INSTALLATION 2
3.3 CLEANING 2
3.4 PROTECTION 3

Section 26 24 16.01
PANELBOARDS BREAKER TYPE

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.29, Panelboards and Enclosed Panelboards.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Include on drawings:

.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250/600V panelboards: bus and breakers rated for as specified.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panel board and key panelboards alike.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02- Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for all device's circuits.

2.3 EQUIPMENT IDENTIFICATION

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

.2 Nameplate for each panelboards size 4 engraved.

.3 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

PART 3 EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Section 26 05 00- Common Work Results for Electrical.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Cleaning Specification.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Cleaning Specification.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

Section 26 27 26
WIRING DEVICES

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1
1.3 CLOSEOUT SUBMITTALS 1
1.4 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 1

2.1 RECEPTACLES 1
2.2 COVER PLATES 2
2.3 SOURCE QUALITY CONTROL 2

PART 3 EXECUTION 2

3.1 INSTALLATION 2
3.2 CLEANING 2
3.3 PROTECTION 2

Section 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 20 A, U ground, to: CSA C22.2 No.42 with following features:

.1 Yellow urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Other receptacles with ampacity and voltage as indicated.

.3 Receptacles of one manufacturer throughout project.

2.2 COVER PLATES

.1 Cover plates for wiring devices to CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.4 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.5 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.3 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Cover plates:

.1 Install suitable common cover plates where wiring devices are grouped.

.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Cleaning Specification

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Cleaning Specification.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

Section 26 28 16.02
MOULDED CASE CIRCUIT BREAKERS

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1
1.3 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 1

2.1 BREAKERS GENERAL 1

PART 3 EXECUTION 1

3.1 INSTALLATION 1
3.2 CLEANING 2

Section 26 28 16.02
MOULDED CASE CIRCUIT BREAKERS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

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

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Cleaning Specification.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Cleaning Specification.

END OF SECTION

Section 26 50 00
LIGHTING

PART 1 GENERAL 1

1.1 REFERENCE STANDARDS 1
1.2 ACTION AND INFORMATIONAL SUBMITTALS 1
1.3 DELIVERY, STORAGE AND HANDLING 1

PART 2 PRODUCTS 1

2.1 FINISHES 1
2.2 OPTICAL CONTROL DEVICES 1
2.3 LUMINAIRES 1

PART 3 EXECUTION 1

3.1 INSTALLATION 1
3.2 WIRING 2
3.3 CLEANING 2

Section 26 50 00
LIGHTING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.2 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Submittal Procedures.

.2 Product Data:

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Common Product Requirements.

PART 2 PRODUCTS

2.1 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.2 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.3 LUMINAIRES

.1 As indicated in luminaire schedule.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 CLEANING

.1 Clean in accordance with Cleaning Specification.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION