Contract No.: 2022-RFT-002

DEEP RIVER WATER TOWER REHABILITATION
Town of Deep River

CONTRACT SPECIFICATIONS

DIVISION 1
GENERAL REQUIREMENTS

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1 GENERAL

1.1 Intent

1.1.1 This Section identifies the general intent and requirements of the overall Contract to be followed by the Contractor, sub-contractors and all trades involved in completing the work.

1.1.2 The Contractor shall study the Contract Documents to determine the extent of work required by each Section and upon which work of other Sections depend and to co-ordinate scope and extent of Work to be performed by each trade.

1.1.3 The Contractor shall within forty-eight (48) hours of becoming aware of circumstances which may require a clarification or change in the Work, give written notice to the Engineer outlining such circumstances and requesting written directions.

1.1.4 As applicable, maintain in good condition and order on site one (1) copy of the Contract Documents approved for all finalized shop drawings (printed in colour on 11 inch x 17 inch paper), building permit, addenda, site instructions, proposed changes, change orders, test reports, manufacturer's installation and application instructions, progress photographs, redline drawings, approved progress schedules, minutes of site meetings, other modifications to the Contract Documents, and other documentations as required by the Ministry of Labour.

1.2 Specification Format

1.2.1 Specifications serve to indicate standards, materials and methods for completing the Work.

1.2.2 Where Contract Documents do not provide sufficient information for completing installations, comply with manufacturer's written instructions.

1.2.3 The following definitions apply:

.1 Construction – Complete construction of all new Works including demolition and removal of existing structures as indicated in the Contract Documents.

.2 Provide - To supply and install, complete and in place, including accessories, finishes, tests and services as required to render item so specified complete and ready for use.

.3 Commission - Start-up and initial operation of equipment as required to demonstrate satisfactory operation of components and entire system including calibration of any control instrumentation as required to maintain operations.

.4 Training – Delivery of demonstrations and instructions in the operation and maintenance of equipment and system to the Owner and Operational personnel.

.5 Closeout Submittals – Any actual revisions to the Project Record Documents, including red-lined contract drawings, specifications, and addenda, change orders, site instructions, requests and responses, shop drawings, product data, samples, surveying records, project record drawings, operation and maintenance manuals, training materials, commissioning documents, warranties, bonds, or any other written notices in their final edit to submit to the Owner prior to closing out the Contract.

.6 Drawings, Lists, or Schedules of Items are intended to show scope and arrangement of Work. For locations of items described refer to such Drawings, Lists or Schedules unless locations are stipulated in the Specifications.

.7 Wherever words "reviewed", "selected", "directed", "designated", "permitted", "inspected", "instructed", "required", "report", "submit", "obtain", "consult", or similar words or phrases are used in the Contract Documents, it shall be understood that "by/to/from/with the Engineer" shall follow.

1.2.4 If there is a discrepancy between the Specifications and Drawings or each section, the most stringent Drawings, clause or note shall take precedent as per the Engineer's interpretation.

1.3 Standards

1.3.1 Conform to the latest editions as amended and revised to date of Contract.

1.3.2 If requested provide copy on site of such standard(s).

1.3.3 Where standards designate authorities such as "Engineer" or "Consultant", these designations shall be taken to mean "CIMA Canada Inc." and / or "CIMA+". Where standards designate "Owner" or "Purchaser" or other such designation, these designations shall be taken to mean "The Corporation of the Town of Deep River".

1.4 Requirements of Authorities & Agencies

1.4.1 The Contractor shall be responsible for complying fully with the requirements of all Authorities and Agencies that govern any or all of the Works under this Contract. These requirements may affect installation and construction methods and may include a written notice to an Authority or Agency prior to the commencement of construction. When a written notice to an Authority or Agency is required, a copy of the notice shall be submitted to the Engineer by the Contractor.

1.4.2 Comply with *The Building Code Act* including the Building Code, as amended; and Regulations and by-laws of other authorities having jurisdiction including latest amendments thereto: all hereafter referred to as Code. Where Code or Contract Documents do not cover a particular requirement, conform to requirements of the National Building Code, as amended, including its related supplements. Where Drawings and/or Specifications exceed Code requirements satisfy such additional requirements.

1.5 Reference Information

1.5.1 The drawings governing alterations to existing works if required were prepared using the following assumptions:

.1 Existing facility documents used in preparing the documents for this contract include:

Contract or Project No.	Project Title	By	Date
Unknown	Elevated Tank Foundations, Valve Chambers & Pump House Alterations	Proctor & Redfern	March 1961
LM 4115	Rutherford Avenue Multi-Legged Tank Refurbishment	Landmark Municipal Services	August 7, 2014

And that the existing structure was built in accordance with the original contract documents, significant details of which have been reproduced on the drawings.

.2 The workmanship and materials employed on the existing structures were of good quality and the building has not deteriorated significantly.

.3 Bearing walls, structural steel and structural concrete is reasonably true and plumb.

1.5.2 Examine the site and buildings or structures on it. Establish conditions under which the work is to be done, and accept the premises as found upon taking possession of the property. Direct all inquiries to the Consultant.

1.5.3 Existing base horizontal and vertical control points will be provided by the Owner.

1.5.4 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

1.5.5 The Owner will replace control points in accordance with the original survey control. The cost of resetting or replacing control points disturbed by the Contractor shall be at the Contractor's expense.

1.5.6 All elevations indicated on the Contract Drawings or Specifications are referred to datum of Geodetic Survey of Canada and to a benchmark established at or near the site of the Works.

1.5.7 All general layout required by the Contractor for the purposes of construction shall be carried out by the Contractor. The Contractor shall provide such masts, scaffolds, batter boards, slope stakes, straight edges, templates and other devices as may be necessary to facilitate layout and inspection and construction of the Works within the contract price.

1.5.8 Survey Requirements by Contractor:

.1 Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out the works using appropriate instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation column locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.6 Sub-surface Conditions

1.6.1 Promptly notify the Engineer in writing if subsurface conditions, or any reasonable assumption of probable conditions, differs materially from those indicated in the Contract Documents.

1.6.2 The Engineer or other agents of the Owner will promptly investigate the conditions and the Engineer will advise the Contractor in writing of any necessary changes to the Works.

1.7 Protection & Safety

1.7.1 The Contractor shall undertake the role of the "Constructor" as defined in the *Occupational Health and Safety Act*.

1.7.2 Prior to the commencement of work, provide to the Engineer a list of those products which are controlled under WHMIS legislation and that are expected to be used in the performance of the work. Provide related Material Safety Data Sheets in accordance with the specified procedure for Submittals for information. Properly label all containers used in the application of products controlled under WHMIS product legislation. Notify the Engineer of changes to the list in writing and provide the relevant Material Safety Data Sheets. Ensure that those who handle, and/or are exposed to, or are likely to handle or be exposed to, hazardous materials are fully instructed and trained in accordance with WHMIS requirements.

1.7.3 Protect excavations, trenches and building from damage by rainwater, ground water, backing up of drains or sewers and other water, frost and other weather conditions. Provide sheeting, piling, shoring, pumps, equipment, temporary drainage, protective covering and enclosures. Provide necessary pumps including spare pump for keeping excavations free of water throughout construction period.

1.7.4 Protect active services. Cap inactive services and remove unwanted portions with approval of Engineer.

1.7.5 Protect finished Work. Damaged Work shall be restored or redone at the Contractor’s expense at the discretion of the Engineer.

1.7.6 Protect public and those employed on Work from injury. Mobile equipment when not in use shall have keys removed and locked up in secure location.

1.7.7 Ensure that working conditions for the Owner are not adversely affected by Work under this Contract. Contractor is responsible to maintaining the tidiness of the work area.

1.8 Manufacturer’s Instruction

1.8.1 Install or erect products in accordance with manufacturer's direct written instructions.

1.8.2 Handle and store materials in accordance with manufacturers' and suppliers' recommendations and to prevent damage to materials during storage and handling.

1.8.3 Notify the Engineer in writing, of conflicts between the specification and manufacturer's instructions, so that the Engineer may establish the course of action.

1.9 Equipment Pricing by Manufacturers, Distributors & Dealers

1.9.1 The Owner supports open, fair, and competitive pricing practices and expects that all equipment Resellers (Manufacturers, Distributors, and Dealers) adhere to such practices. Resellers must offer equipment individually priced as requested by Subcontractors.

1.9.2 In addition to individual pricing, equipment offered in a bundle quote to provide further quantity based discounts to Subcontractors is an acceptable practice; however, if the Owner determines that bundled pricing for a group of items is being offered to unfairly restrict competition for the individual equipment involved, the Owner reserves the right to delete that manufacturer from the list of pre-approved manufacturers listed in the tender specifications.

1.9.3 The Owner reserves the right to request that the Successful Bidder provide more detailed equipment price breakdowns for the establishment and recording of asset and depreciation values.

1.10 Progress Draw Cost Breakdowns

1.10.1 In accordance with Section 01025 Measurement and Payment.

1.11 Concealment of Services

1.11.1 Pipes, conduits, service lines and ducts shall be concealed in chases, behind furring or above ceilings, and such items shall not be exposed to view except where they are noted as being exposed to view or reviewed and approved by the Engineer.

1.11.2 Where no ceiling is provided, such items occurring in ceiling spaces may be exposed. In this case, workmanship must be of the highest quality, all lines etc. shall be run straight and true.

1.12 Mobilization and Demobilization

1.12.1 The Contractor must provide for the mobilization/demobilization of the site in accordance with these Contract Documents.

1.12.2 Comply with the Engineer's and Owner's instructions in regard to the allocation of the mobilization areas of the site; construction fencing, temporary signage, field offices and storage areas, access and parking. Failure to comply may result a deduction of payment.

1.12.3 Successful mobilization will generally consist of the following:

.1 Supply and erect all temporary signs, barricades, fences, flashers, and delineators, and provide flag persons and such other protection as may be required to protect the public during construction.

.2 Provide security protection for site offices, plant and stored materials.

.3 Move onto site and set up offices, storage facilities, plant, sanitary facilities, and temporary hydro, telephone and internet services.

.4 Provide all necessary access to the project including temporary access as required.

1.12.4 Successful demobilization will generally consist of the following:

.1 Removal of temporary signs, barricades/fences, flashers, delineators, flag persons, and such other protection that was installed at the beginning of the Contract.

.2 Removal of temporary access or work areas, and restoration of damaged surfaces to original condition or better.

.3 Move off site and remove offices, storage facilities, and all temporary or construction plant or facilities and leave the site clean and tidy.

1.12.5 The payment for mobilization up to a maximum of 60 percent shall be included in the first payment certificate issued for the Contract subject to the Owner or Consultant being satisfied that full mobilization has been carried out. If the Owner or Consultant is not so satisfied, then an adjustment to the payment certificate that reflects the degree of mobilization, in the opinion of the Owner or Consultant, will be made.

1.12.6 The payment for demobilization shall become due following Substantial Performance/Completion of the Works and subject to the Owner or Consultant being satisfied that full demobilization has been carried out. If the Owner or Consultant is not so satisfied, then an adjustment to the payment certificate that reflects the degree of demobilization, in the opinion of the Owner or Consultant, will be made.

1.13 Damage to Existing Utilities & Structures

1.13.1 Obtain the necessary drawings and perform any necessary sub-surface investigations in order to determine the exact location of all existing utility services, structures, underground pipes, cables, and other similar items. Notify Engineer immediately of any potential conflicts with proposal buried piping and utilities.

1.13.2 The location for existing structures and underground pipes, cables, utilities, and other similar items as shown on the Contract Drawings does not relieve the Contractor of this responsibility.

1.13.3 Take the 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.

1.13.4 If any damage is caused, inform the Engineer of the damage and proposed repair methodology, repair and make good such damage at no additional cost within a reasonable time and to the complete satisfaction of the Engineer.

1.14 Occupying the Site

1.14.1 Use only those areas designated by the Owner for the access, except in so far as is necessary for the execution of the Works, and in so doing, do not unnecessarily obstruct the normal traffic of, to, from or about the site; and do not unreasonably allow any vehicles or materials to stand in front of, or near to, any buildings on the site or any access thereto.

1.14.2 Areas shown as Contractor’s Limits are areas to be used by the Contractor for construction, parking lot, storage and temporary facilities.

1.14.3 All inquiries and deliveries related to the Contractor’s activities will be directed to the Contractor’s designated site supervisor.

1.14.4 Confine operations within areas designated for construction, storage and access as shown on the Contract Drawings and/or as directed by the Engineer.

1.14.5 Limit access to and from the site as instructed by the Engineer.

1.14.6 Maintain safe access to any existing facilities for the operations staff at all times.

1.14.7 Limit possession of any areas of the site occupied by operational plant (Restricted Areas) to such times as are necessary for the execution of the Works in those areas.

1.14.8 Clearly identify in the schedule when occupation of Restricted Areas or the main work area is required and notify the Engineer in writing when such possession is required at least ten (10) working days in advance.

1.14.9 Do not occupy or use any of the Restricted Areas for a longer period than is necessary for the execution of any part of the Works to be undertaken in those areas. Occupy an area not greater than the minimum required for that part of the Works.

1.15 Contractor Use of Premises

1.15.1 Arrange with the Owner and Engineer for storage areas and access to the Works.

1.15.2 Make arrangements with property owners if additional areas are required. Obtain written agreements and submit copies to the Engineer.

1.15.3 Confine operations within working limits for construction, storage and access.

1.15.4 Install and maintain temporary chain link fencing along working and storage areas and access routes.

1.15.5 Carry out the construction of the Works in such a manner that a minimum of inconvenience is caused to the Owner and occupants of properties adjacent to the Works.

1.15.6 Store materials separately on the site at locations agreed upon with the Engineer, suitably protected to prevent their deterioration or the intrusion of foreign matter. In the opinion of the Engineer, remove any material which has deteriorated or been damaged immediately from the site at no additional cost to the Owner.

1.15.7 Areas occupied by the Contractor and subcontractors are to be kept neat and tidy.

1.15.8 During construction of the facilities, liaise with the Engineer and Operations staff to schedule work to minimize impacts on operations.

1.15.9 Obtain written approval from the Engineer for tie-in work to the existing facilities. Operations staff will operate any valve, switch, or other controls on existing facilities.

1.15.10 The Contractor shall provide portable washroom facilities to be used by the Contractor’s personnel. They are to be maintained by the Contractor in neat and clean condition for the duration of the contract.

1.15.11 After Substantial Performance of the Contract, the Contractor shall not enter the facility without prior written authorization from the Owner and restrict activities to the work duly authorized by the Owner, including modifications and rectification of deficiencies. For completion of additional work other than the authorized work, obtain written approval from the Owner prior to proceeding with such additional work.

1.15.12 Meter the supply of water, electricity and chemicals for the construction and commissioning of the Works. Meter this supply and reimburse the Owner for all usages at the completion of the Contract.

1.16 Owner Occupancy

1.16.1 The Owner and Operations staff will occupy premises during entire construction period for execution of normal operations.

1.16.2 Cooperate with the Owner and Operations staff in scheduling operations to minimize conflict and to facilitate usage by the Owner and Operations staff.

1.16.3 The Contractor shall ensure that heavy construction equipment, amenities, offices or any potential obstruction in the Work area minimizes disruption and impact to operations.

1.16.4 Maintain free access and parking for the Owner, Engineer and Operations staff.

1.17 Partial Owner Occupancy

1.17.1 Schedule and substantially perform designated portions of Work for Owner's occupancy prior to Substantial Performance of entire Works.

1.17.2 Provide additional warranty for all equipment, materials and workmanship placed into service and used by the Owner to maintain operations in accordance with the sequence of construction until issuance of Substantial Performance for the entire Works.

1.17.3 The Owner and Operations staff will occupy designated areas for the purpose of operation to ensure operational compliance.

1.18 Payment

1.18.1 This is a lump sum Contract and payment will be made for work completed during the payment period on a percentage basis of the sum entered in the breakdown of the lump sum price, as approved by the Engineer.

1.18.2 Applications for payment may be made on a monthly basis as the work progresses. The applications should be dated the last day of the payment period and the amounts claimed should be proportionate to the amount of work performed and products delivered to the place of work as of that date.

1.18.3 Applications for payment must be made in accordance with legislation and statutory regulations, including proof of WSIB coverage during the work period and a Statutory Declaration that the previous payment was properly and fairly distributed.

1.18.4 There are no provisions for payment of this section in the Form of Tender. Costs for following the general requirements of the Contract shall be included in the overall Contract price.

1.18.5 Refer to the General Conditions of the Contract for further instructions related to payment.

2 PRODUCTS – NOT APPLICABLE

3 EXECUTION – NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 Intent

1.1.1 The intent of these specifications is to provide for the works herein enumerated to be fully completed in every detail for the purposes designated. It is hereby understood that the Contractor, in accepting the Contract, agrees to furnish any apparatus, appliance, material or labour not herein specifically mentioned or included, but which is found necessary to complete, perfect, and test every requirement written and implied in these specifications, without extra cost to the owner.

1.2 Work Covered by Contract Documents

1.2.1 The work to be done under this Contract, as specified and/or as shown on the Drawings includes the complete supply of all materials, labour and equipment for the construction of utilities and services required for the Orangeville Standpipe Rehabilitation project.

1.2.2 Work of this Contract generally comprises:

.1 Mobilization and installation of temporary construction facilities, equipment, and signage.

.2 Complete removal and replacement of the exterior coating system, including full lead abatement and construction of a temporary scaffolding structure.

.3 Interior lining spot repairs and minor interior steel repairs.

.4 Adjustments to the main access ladder installation.

.5 Construction of a new balcony platform for improved ladder access.

.6 Minor health and safety system upgrades including installation of tie-off columns and D-rings.

.7 Repainting of valve room valves and piping.

.8 Site clean-up and restoration.

.9 Testing, commissioning, and handing over of the completed system to system to the Town of Deep River.

.10 Site demobilization.

.11 Warranty period inspections.

1.2.3 This clause is not intended to define the scope of the contract. Use it only as a general guide to the extent of the work.

1.3 Location of Work

1.4 The Deep River Water Tower is located within the Town of Deep River, at 45 Rutherford Avenue.

1.5 Hours of Work

1.5.1 Normal working hours shall be Monday to Friday between 7 am and 5 pm.

1.5.2 The Contractor is advised that night, weekend or holiday work may be required in the Contract. The Owner or Engineer may, where they deem it necessary to speed up the work or deem it necessary or expedient in order to preserve and maintain traffic over or on any street or road, or to restore utility service, order any work to be carried out in whole or in part at night or on two or three shift basis, or on Sundays or holidays, and the Contractor shall have no claim for extra compensation in respect thereof.

1.5.3 The Contractor shall, as far as possible, refrain from work on days which are legal holidays for the Owner. If it is desired to work on any such holiday, the Contractor shall notify the Owner in writing at least four days in advance of such holiday of the Contractor's intention to work, stating the areas where the work will be conducted.

1.5.4 If the Contractor fails to give such notice in advance of any holiday, such failure shall be considered as an indication that no work requiring the presence of an authorized representative of the Owner is to be done by the Contractor on such a holiday.

1.6 Contract Method

1.6.1 Construct the Works under a single lump sum contract.

1.7 Work by Others

1.7.1 Other contractors expected to be on site during this Contract may include:

.1 No other contractors are expected to occupy the site.

1.7.2 The Contractor will coordinate all Contractors and all testing and commissioning work required by the other contractors and/or their agents.

1.7.3 The Contractor shall at all times cooperate with the Owner, Operations Staff and other contractors on site. The Contractor shall maintain time and space separation between the Contractor's forces and other Contractors and Operations Staff for the duration of the project.

2 PRODUCTS - NOT APPLICABLE

3 EXECUTION - NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 General Coordination

1.1.1 The Contractor shall develop and finalize the construction sequence so as to minimize impact on operations, subject to approval of the Engineer and the Owner.

1.1.2 Construct Work in stages to accommodate the Owner's use of the premises during construction, as necessary. Work shall be carried out expeditiously to minimize disruptions to existing operations.

1.1.3 The Contractor shall so arrange the timing of, and the method by which the works are carried out so as not to affect the operation of the existing facilities. The work will be carried out in stages to accommodate the Owner's continued access for operation and maintenance of all facilities during installation. The Contractor's detailed construction schedule shall be coordinated with the Owner, and the engineer and shall show the sequence including the data and duration of equipment or system shutdowns required for construction purposes. No deviation from this schedule shall be permitted without the Contractor having first obtained the Owner's written approval. Any permitted outages will be continuous without interruption.

1.1.4 Any shutdowns shall be in strict accordance with the sequence in the Contractor's schedule and shall be carefully coordinated with the Owner, Engineer and Operating personnel to avoid unplanned impacts to the water supply and distribution system.

1.1.5 Prior to shutdown of the standpipe the Contractor must request in writing at least ten working days in advance of the required shutdown. Depending on demand the Owner may require the shutdown to be done at other than normal working hours or postponed to a time more suitable to system operation. The Contractor shall reschedule his work to suit system operation at no additional cost to the Owner.

1.2 Submittals for Review

1.2.1 Provide detailed plans and schedules for all work activities which will create a disruption to or require the participation of Owner Operations.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION

3.1 General

3.1.1 The Contractor shall take responsibility for carefully coordinating all aspects of the work including all permanent and temporary connections whether identified on the Contract Drawings or not, to successfully complete the Works. Designate a fully qualified individual, as a General Superintendent, to be responsible for directing the progress of this Contract continuously, including the coordination and work of sub-contractors.

3.1.2 Coordinate Progress Schedule and coordinate with the Owner occupancy during construction.

3.1.3 Some equipment or supplies may require lengthy delivery times and as such must be ordered as soon as a notice to proceed is given by the Engineer. The Owner will not entertain extra claims or waive damages as a result of late delivery of such items.

3.1.4 Existing systems or individual equipment items will be isolated by the Owner. The Contractor is responsible for unwatering, de-commissioning, de-energizing and de-pressurizing as required. Perform all such work in accordance with the shutdown plan submitted by the Contractor and approved by the Engineer. The Owner will operate all valves and gates as required.

3.1.5 Provide details of works required to implement tie-ins, detailing what services, temporary facilities etc., if any, will be provided by Owner and/or its staff. All other services to be provided by the Contractor.

3.1.6 Provide all necessary temporary pumps, blinds, valves, piping, electrical wiring, controls, and labour incidental to complete the Work. Any temporary equipment must be continuously monitored by the Contractor during construction, and be replaced expeditiously upon failure so as to be able to continue with the Work.

3.1.7 Some shutdowns will have to take place outside normal working hours, i.e. nighttime and/or weekends in order to comply with shutdown limitations as described in this Section.

3.1.8 Coordinate scheduling, submittals, and work of the various Sections of the Project Specifications and other requirements of the Contract Documents to ensure efficient and orderly sequence of installation of interdependent construction elements.

3.1.9 Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such elements.

3.1.10 Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

3.2 Permitted Outages

3.2.1 All outages to be coordinated with Owner and the Operating Authority.

3.2.2 All outages shall be strictly coordinated with the Owner and the Operating Authority. All required shutdowns of the Orangeville Standpipe will be contingent upon prior coordination with the Owner and the Operating Authority.

3.3 Operation/Construction Constraints

3.3.1 The following operation/construction constraints to be considered in scheduling the work.

3.3.2 Construction Constraints:

.1 Working space at the Deep River Water Tower is limited. Careful construction staging planning will be required during construction.

3.4 Suggested Sequence of Construction

3.4.1 This Section is not intended to describe the full extent of the work to be done under this Contract. It is intended to outline the general construction sequence only. The Contractor will be responsible for scheduling the detailed construction of the works within the general sequence and permitted outages.

3.4.2 The Contractor shall schedule their work and conform with the intent of the following requirements, and ample allowance shall be made in the schedule to comply therewith. The following is not intended to imply the Contractor must carry out the work in the exact manner indicated but is intended to indicate the restrictions that shall be imposed on construction work sequence and to set out the time duration of shutdowns.

3.4.3 Upon award of the Contract, the Contractor shall begin work as described in the following sequence of construction. The following suggests the general chronological order in in which construction activities are proposed to take place. This list is not intended to be comprehensive in all activities required to complete the works, but is intended to identify the main constraints on the scheduling of construction activities. The construction of the works is proposed to proceed as follows:

.1 Submission of exterior scaffolding shop drawings, blasting and coating procedures and upgrade shop drawings.

.2 Mobilization and construction of temporary facilities and site preparation.

.3 Exterior scaffolding structure construction.

.4 Health and safety upgrades, including ladder, platform and appurtenances installation.

.5 Setup of blasting equipment and environmental controls at the standpipe site, including full lead abatement procedures.

.6 Interior lining touch-up repairs.

.7 Exterior coating replacement by abrasive blasting.

.8 Complete testing and disinfection of the standpipe and process piping.

.9 Complete commissioning and close out procedures.

3.4.4 Prior to work directly affecting operations of the existing water system, the Contractor shall provide a plan and schedule of activities to occur during the work at least 15 working days before the planned work, for review and approval by the Engineer. The plan by the Contractor shall identify the anticipated durations for the activities that will be required and a schedule of proposed shutdowns. The decision to terminate work will be made, if in the opinion of the Engineer that work is not progressing according to the Contractors timelines, and/or it is evident the work will not be completed in the allowable time.

3.4.5 The exact construction sequence must be developed by the Contractor based on their own work plan and projections of the required time required to complete the work. The Contractor may have to stage equipment shutdowns, to accomplish a task, in order to meet the constraints identified herein. The Contractors detailed schedule submitted after award of the Contract shall provide the number of shutdowns and the duration of each shutdown. The Owner and the Engineer reserve the right to adjust the suggested construction sequence based on the water demands in the system at no extra cost to the Contractor, unless the changes will cause undue hardship on the Contractor.

3.4.6 The Contractor is encouraged to combine activities during shutdowns to minimize impact on the existing water system. Following review of the construction schedule, the number of shutdowns may be limited, should in the opinion of the Engineer there are an excessive number.

3.4.7 The Contractor shall complete testing and commissioning of the new reservoirs in as short a time as reasonably possible to minimize any possible water supply disruptions.

3.5 Contractor Use of Premises and Restricted Areas

3.5.1 The Contractor shall arrange with the Owner for easements for construction, storage and access to all of the Works within the Owner's property line.

3.5.2 Make arrangements with property owners if additional areas are required. Obtain written agreements and submit copies to the Engineer.

3.5.3 Confine operations within easements for construction, storage and access.

3.5.4 Install and maintain adequate security or construction fencing and gates around storage areas or the construction site and maintain during the construction period.

3.5.5 Do not enter upon or occupy with workers, tools or materials any lands other than public streets, roadways, right-of-ways or easements shown on the Contract Drawings except after written consent has been received from the property owner.

3.5.6 The construction of the Works shall be carried out in such a manner that a minimum of inconvenience is caused to the Owner and occupants of properties adjacent to the Works.

3.5.7 Materials shall be stored separately on the Site at locations agreed upon with the Engineer and shall be suitably protected to prevent their deterioration or the intrusion of foreign matter. In the opinion of the Engineer, any material which has deteriorated or been damaged shall be removed immediately from the Site at the Contractor's expense.

3.5.8 The flow in existing drains and ditches shall be maintained by the Contractor at all times at no extra cost to the Owner. During construction of the facilities, the Contractor shall liaise with the Engineer to schedule work to ensure continual flow.

3.5.9 The Owner's Operating staff will operate any valve, switch, or other control on existing facilities.

END OF SECTION

1 GENERAL

1.1 General Requirements

1.1.1 Existing systems or individual equipment items will be isolated by the Owner. The Contractor is responsible for unwatering, de-commissioning, de-energizing and de-pressurizing as required. Perform all such work in accordance with the shutdown plan submitted by the Contractor and approved by the Engineer. The Owner will operate all valves and gates as required.

1.1.2 Provide details of works required to implement tie-ins, detailing what services, temporary facilities etc., if any, will be provided by Owner and/or its staff. All other services to be provided by the Contractor.

1.1.3 Provide all necessary temporary pumps, blinds, valves, piping, electrical wiring, controls, and labour incidental to completing the Work. Any pumps and water level must be continuously monitored by the Contractor during any tie-ins to make all provisions necessary to prevent flooding and bypassing during all diversion pumping operations or tie-ins.

1.1.4 Where piping under this Contract connects to the work of others, connect to the existing piping where it has already been installed or, if not installed, terminate and cap the pipe. Cap all of the abandoned pipes generated from this construction. During the removals, all abandoned pipes and spools shall be blocked by using either blind flanges or caps with couplings.

1.1.5 Coordinate tie-ins to allow staged construction by area. Supply and install additional temporary isolation valves to ensure only one shutdown is required for each commodity.

1.1.6 Do not leave any pipe open to process or storage areas where the flow of liquid or gas may be allowed into other areas, except as planned for and required for work to be done.

1.1.7 Provide temporary supports for all existing electrical conduits/cables.

1.1.8 The Contractor is responsible for the proper and adequate temporary venting of confined spaces. Provide full purging and monitoring of explosive conditions prior to welding or cutting of any piping. Monitor for explosive gases in all hazardous areas prior to and during any work related activities.

1.2 Coordination

1.2.1 Designate a fully qualified individual, as a General Superintendent, to be responsible for directing the progress of this Contract continuously, including the coordination and work of sub-contractors.

1.2.2 Coordinate scheduling, submittals, and work of the various Sections of the Project Specifications and other requirements of the Contract Documents to ensure efficient and orderly sequence of installation of interdependent construction elements.

1.2.3 Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such elements.

1.2.4 Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

1.2.5 In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

2 PRODUCTS

2.1.1 Not Used

3 EXECUTION

3.1 General

3.1.1 The Contractor shall take responsibility for the proper functionality of all devices in the scope, including existing modified devices, at the conclusion of his work. Prior to beginning work and upon the Contractor's request, with five working days' notice, the Owner will demonstrate the functionality of any piece of existing equipment.

3.1.2 Where existing active mechanical, electrical or other services, concealed or exposed, extend through or are within the area to be renovated, include for concealing existing services behind new finishes wherever they would be exposed in new finished areas.

3.1.3 Carefully remove existing fixtures, equipment, construction and finishes shown on the Drawings to be removed employing experienced tradesmen. Salvage, identify and store the Products that are to be reused or delivered to the Owner.

3.1.4 Where mechanical or electrical fixtures and equipment are removed, cut back obsolete piping, ductwork and conduit behind finishes, unless otherwise specified, and cap. Cap piping watertight. Remove obsolete wiring back to its source. Provide blank cover plates on obsolete outlet boxes.

3.1.5 Remove and dispose of the site products not designated for reuse or delivery to the Owner.

3.1.6 Be responsible for and enforce fire protection methods and procedures and adherence to local fire regulations, including requirement of the Occupational Health and Safety Act.

3.1.7 Maintain fire access/control at all times.

3.1.8 Whenever soldering, welding or any open-flame work is performed, ensure the area is suitable for such work, ensure the proper incombustible shields are provided to protect combustible products and materials and have an observer present at all times to ensure adjacent products and materials are not ignited and welding, soldering or open flame work does not produce a hazardous condition.

3.1.9 Ensure the existing fire protection and alarm systems are not obstructed, shutoff or made inactive at any time. Do not use any fire hydrant, standpipe, or hose system for other than fire protection purposes.

3.1.10 Open fires and burning of rubbish are not permitted on the site.

3.1.11 Smoking is not permitted in hazardous areas or any other buildings on the Plant Sites.

3.1.12 Comply with Chapter 321 of OHSA Regulations for Construction Projects.

3.1.13 Remove any potential designated substances and comply with the following:

.1 Light ballasts in accordance with Ontario Regulation 347.

3.2 Welding and Cutting

3.2.1 All welding and cutting within the existing works is to follow National Fire Protection Association (NFPA) Standard 51B “Fire Prevention in the Use of Cutting and Welding Processes”

3.3 Work In Confined Spaces

3.3.1 Make all Contractor staff including subcontractors aware of confined spaces and the requirements for entering such spaces.

3.3.2 Where work is to be done in confined space conditions, follow the requirements listed in Paragraph 4.4, below.

3.4 Work Procedures for Confined Spaces

3.4.1 All construction activities in confined spaces require entry procedures in accordance with Occupational Health and Safety Regulation 213/91 Sections 60 to 63 inclusive.

3.4.2 Surveillance: Provide a trained person to maintain continuous surveillance of work in confined spaces. This person is not permitted to assist in construction activities or gas monitoring as this person’s function is to maintain constant surveillance and initiate rescue procedures should an emergency arise. If work in two or more different confined spaced locations is required at the same time, provide additional trained persons for continuous surveillance per location at no additional cost.

3.5 Work in Hazardous Locations

3.5.1 In hazardous areas provide and use safe mechanical and electrical devices and equipment.

3.5.2 All construction activities that occur in hazardous locations require continuous combustible gas monitoring by the Contractor’s forces as specified herein.

3.5.3 Test for explosive or toxic gases, or oxygen deficiency before commencing the day’s work and continuously while working in areas which may contain an explosive, toxic or oxygen deficient atmosphere. If a hazardous condition is found, make the work area safe before commencing or continuing work.

3.5.4 Use non-sparking tools in Class 1, Division 1 areas or where an explosive atmosphere may exist hazard cannot be eliminated by Contractor.

3.5.5 The areas considered electrically classified by virtue of the possible presence of explosive gases are specified elsewhere. However, caution must be exercised everywhere in the Plant.

3.5.6 Conform to Ministry of Labour requirements for work in hazardous locations. Establish and implement written procedures to assure compliance. Construction activities, except wire pulling and cleaning, that occur in hazardous locations require continuous combustible gas monitoring, by the Contractor. Provide documentation of tests for gas and oxygen deficiency prior to starting work in hazardous locations.

3.5.7 Metering for Toxic Gas, Combustible Gas, Oxygen Deficiency: Monitor toxic gas, combustible gas, and oxygen deficiency at all levels in hazardous locations as per requirements of Ontario Occupational Health and Safety Act.

3.5.8 Gas Metering: Maintain a minimum of two portable gas detection meters. These meters continuously monitor for combustible gas, oxygen deficiency, carbon monoxide, metal oxide, and hydrogen sulphide in the surrounding atmosphere and alarms at a pre-set warning level. Recharge the meter's batteries after each 8 hours of use. Recharge as necessary in accordance with manufacturer's specifications. Recalibration will be completed every three weeks or more frequently if required. Update and provide records of calibration and re-calibration and provide this information upon request from the Engineer.

3.5.9 Meter Operator: Provide a trained person to operate and read the portable meter continuously while construction activities occur in the designated hazardous locations. This meter operator is not permitted to assist in the construction activity in any way since this person's function is to watch the combustible gas and oxygen deficiency dials at all times. The meter operator must be located in the immediate vicinity of the construction activity. If work in two or more different hazardous locations is required at the same time, provide the additional meter operator(s) and meter(s) a not additional cost to the Owner.

3.5.10 Training: Provide for the manufacturer's representative to supply site training to all designated meter operators. Provide as many training sessions as required so that every meter operator attended a session.

3.5.11 Hazardous Event Procedure: If a dial on the meter deflects to indicate 10% of the Lower Explosive Limit (LEL), 19.5% oxygen, 10 ppm hydrogen sulphide or 35 ppm carbon monoxide, then discontinue the construction activity, evacuate the area, and notify the Owner's site representative.

3.5.12 Log Book: maintain a log book that will contain the following information:

.1 Date

.2 Name of meter operator

.3 Explosive gas, oxygen deficiency, hydrogen sulphide and carbon monoxide readings every ½ hour

.4 Construction activity type

.5 Location of construction activity

3.5.13 Submit the logbook to the Engineer when construction is complete and make available for inspection by Owner when requested.

3.5.14 Firefighting Equipment: Provide and maintain suitable firefighting equipment when working in the designated hazardous locations. Train Contractor's personnel working in these areas in the use of firefighting equipment.

3.6 Holes in Existing Concrete

3.6.1 When it is required to make new holes in existing concrete for piping, conduit, cables, or equipment, using either method described below:

.1 Chip with an electric hammer with chisel point. If any impediment is encountered, advise the Engineer before proceeding further. Adjust the location of holes as necessary to avoid electrical conduits. Cut reinforcing steel after permission is received.

.2 For any openings which are to be saw cut into an existing structure pre-drill the corners using a 100 mm dia. core drill do not over core corners.

.3 Core-drill holes after radiograph procedures are followed.

3.6.2 Radiograph the existing concrete for 3 diameters around the centreline of the proposed penetration. If no structural steel, piping or electrical conduits are found, core the hole. If structural steel, piping or electrical conduits are found, select an alternative location and radiograph it. If structural steel, piping or electrical conduits are found, do not core unless written permission form the Engineer is received.

3.6.3 Prior to commencing work, submit to the Engineer a photocopy of the license issued under the Atomic Energy Control Board Regulations for radiography. Perform work in accordance with current Atomic Energy Control Board Regulations for radiography. Be responsible for boundary controls and signs that protect the personnel and others from hazards in the radiograph work area. Inform the Engineer in writing 48 hours prior to commencing any radiography.

3.7 Protection of, and Modification to Existing Work

3.7.1 All existing structures, mechanical and electrical systems to remain shall be protected in a manner satisfactory to the Engineer. The Contractor shall document existing conditions prior to completing any new works.

3.7.2 Should any parts of the existing structures or systems become heaved, cracked or otherwise damaged after commencement of the work by the Contractor, all such damaged portions of the work shall be completely repaired and made good by the Contractor at its own expense and to the satisfaction of the Engineer, notify the Engineer of any conditions that would not permit the required repairs to be affected. If, in the final inspection of the work any defects, faults or omission are found, the Contractor shall cause the same to be repaired or removed and replaced by proper material and workmanship without extra compensation for the labour and materials required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein for at least the guarantee period described in the General Conditions of the Contract.

3.8 Salvage of Existing Equipment

3.8.1 Where requested, any equipment removed under this contract shall be returned the Owner. The Contractor shall verify with the Engineer and the Owner whether any equipment removed under this contract is to be retained by the Owner prior to disposal.

END OF SECTION

1 GENERAL

1.1 General

1.1.1 After Contract Award, the Contractor may submit an alternate material or piece of equipment to the Engineer and Owner for review. An Alternate will only be evaluated and considered acceptable if it meets the intent of the original design and specifications, and where there is a credit or no additional cost to the Owner.

1.1.2 The Specification Sections contain pertinent performance criteria, quality, function and requirements for materials and methods to achieve work described.

1.1.3 Co-ordinate pertinent related work and modify surrounding work as required to complete project under each substitute designated at no additional cost to Owner.

1.2 Requests for Substitution

1.2.1 Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier or manufacturer, the naming of the item is regarded as the standard to establish the type, function and quality required.

1.2.2 Material or equipment of equal or better performance and quality may be offered in substitution for those specified. Requests for review of substitute items of material and equipment will not be accepted by the Engineer from anyone other than the Contractor.

1.2.3 All requests for substitution must be accompanied by a detailed listing of the expected cost savings to the Owner.

1.2.4 Substitutions will not be considered when they are indicated or implied on Shop Drawings or product data submittals without a separate written request.

1.2.5 Requests for substitution include any request for changes from the Contractor that require significant design changes, redesign or significant design reviews.

1.2.6 A request for substitution constitutes a representation that the Contractor:

.1 Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product.

.2 Will provide the same warranty for the substitution as for the specified product.

.3 Will coordinate the installation and make changes to other Work which may be required for the Work to be complete at the Contractor’s expense and at no additional cost to the Owner.

.4 Waives claims for additional costs or time extension which may subsequently become apparent.

.5 Will reimburse the Owner for review or redesign services.

1.2.7 Request for substitution to be made by written application to the Engineer and is to include sufficient data to enable the Engineer to assess the acceptability of requirements, including the following:

.1 All submittal information required for the specified equipment, including all deviations from the specified requirements and/or necessitated by the requested substitution.

.2 Materials of construction, including material specifications and references.

.3 Dimensional drawings, showing required access and clearances, including any changes to the work required to accommodate the proposed substitution.

.4 Drawings and details showing changes if the offered substitution necessitates changes to or coordination with other portions of the Work. Perform these changes as part of the substitution of material or equipment at no additional cost.

.5 Certification that the proposed substitute will adequately perform the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified with the same or better warranty.

.6 Information and performance characteristics for all system components and ancillary devices to be furnished as part of the proposed substitution.

.7 Certification that acceptance of the proposed substitute will not prejudice achievement of Substantial Completion.

.8 Itemization of all costs including any licenses fee or royalty that will result directly or indirectly from the acceptance of the proposed substitution. Include redesign and cost of claims of any other contract affected by the resulting change.

.9 Guaranteed credit or cost reduction offered if the proposed substitution is accepted and a waiver of claims for additional expenses which may subsequently become apparent.

.10 Recommended maintenance requirements and availability of spare parts and service.

.11 Written confirmation from subcontractors and suppliers on cost, schedule, and technical requirements if requested by the Engineer.

1.3 Engineer's Review

1.3.1 Engineer will evaluate each proposed substitution. Engineer will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without the Engineer's prior written acceptance by either a Change Order or a reviewed shop drawing. The burden of proof is on the Contractor.

1.3.2 Pay the Engineer's cost for evaluating the requested substitution even though the request may be denied, or for additional redesign work required as a result of any substitution. Costs will be charged on a time and expense basis and may be deducted from progress payments due the Contractor.

2 PRODUCTS - NOT APPLICABLE

3 EXECUTION - NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 Description

1.1.1 This section describes the minimum administrative requirements expected by the Contractor to coordinate the work, under the administration of the Engineer.

1.1.2 Involves coordination of project schedules, submittals, meetings, use of site, temporary utilities, construction facilities, construction progress of the work, required shut-downs and commissioning.

1.2 Responsibilities of Engineer

1.2.1 Schedule and administer pre-construction and construction progress (site) meetings, as well as responses to requests for information, and clarification of the scope of work.

1.2.2 Prepare the agenda with copies for all participants and preside at the meeting.

1.2.3 Record minutes and distribute copies of minutes within five (5) working days after each meeting and transmit to meeting participants, affected parties not in attendance, the Contractor and the Owner. The Engineer will include and identify significant proceedings, decisions or actions with 'Action By' in the minutes.

1.3 Responsibilities of Contractor

1.3.1 Provide physical space for meetings.

1.3.2 Comply with Engineer's allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities in accordance with Section 01510 – Temporary Utilities and 01520 – Construction Facilities.

1.3.3 Provide information required to the Engineer and be prepared to discuss all items on the agenda, such as schedule updates, two (2) week look-ahead schedules, responses to previous or outstanding action items.

1.3.4 Representatives of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of the party each represents.

1.3.5 Identify any errors in minutes to the Engineer in writing within three (3) days of receipt. Any conflicts shall be coordinated with the Engineer. Otherwise, it will be interpreted that the Contractor resolves the interference issues at his own responsibility.

1.3.6 During construction coordinate use of site and facilities through Engineer's procedures for intra-project communications, submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

1.4 Pre-Construction Kick-off Meeting

1.4.1 Within fifteen (15) days from award of the Contract, the Engineer will convene a pre-construction meeting to discuss and resolve administrative procedures and responsibilities from the start of the project.

1.4.2 Representatives of the Owner, the Engineer and the Contractor and major Sub-Contractors shall be in attendance.

1.4.3 The Engineer will establish a time and location for the meeting and notify concerned parties a minimum of five (5) working days before the meeting.

1.4.4 The meeting agenda will include such items for discussions as:

.1 Appointment of official representative of participants in Work.

.2 Schedule of Work, progress scheduling and delivery schedule of major equipment in accordance with Section 01320 – Construction Schedule.

.3 Schedule of submission of shop drawings, samples and colour chips in accordance with Section 01330 – Submittals.

.4 Requirements and location for temporary facilities, site signs, offices, storage sheds, utilities, and fencing in accordance with Section 01510 – Temporary Utilities.

.5 Site security in accordance with Section 01520 – Construction Facilities.

.6 Contemplated changes and change orders procedures, approvals required, mark-up percentages permitted, time extensions and administrative requirements.

.7 Owner supplied products.

.8 Record drawings in accordance with Section 01700 – Closeout Submittals.

.9 Maintenance materials and manuals in accordance with Section 01780 – Closeout Submittals.

.10 Take-over procedures, acceptance and warranties in accordance with Section 01760 – Warranty Work and 01780 - Closeout Submittals.

.11 Monthly progress claims, administrative procedures, progress photographs and holdbacks.

.12 Appointment of independent inspection and testing agencies or firms (i.e., concrete, materials, geotechnical, compaction, asphalt, etc.).

.13 Insurance.

.14 Safety issues.

.15 Environmental issues, including spills reporting.

.16 Other items of discussion

1.4.5 The Engineer will document the responsibilities and necessary activities of the participants during construction as discussed.

1.5 On-Site Documents

1.5.1 Maintain at job site, one copy each of the following:

.1 Contract drawings with red-line mark-up for changes.

.2 Specifications.

.3 Addenda.

.4 Reviewed shop drawings.

.5 Contract Change Directives.

.6 Site instructions.

.7 Other modifications to Contract.

.8 Field test reports.

.9 Copy of approved Work schedule.

.10 Manufacturers' installation and application instructions.

.11 Notice of Project.

.12 Building Permit

.13 Health and Safety Plan and any other documents required by the Ministry of Labour.

.14 Contract Close-out Documents, including Trainings, Commissioning Forms and Documents, and Operation & Maintenance Manuals.

1.5.2 The Owner will supply electronic copies of drawings and specifications in digital format to the Contractor. The Contractor shall reproduce additional copies for their use, if required.

1.6 Schedule Management

1.6.1 Submit to the Engineer within five (5) working days of award of the Contract, the preliminary construction progress schedule, based on the tender, and all required schedules, in accordance with Section 01320 – Construction Schedule.

1.6.2 After review by the Engineer, revise and resubmit all schedules to comply with revised project schedule.

1.6.3 Identify and track all critical items on all schedules and advise the Engineer of any changes to the schedules.

1.6.4 Actively manage and coordinate the work to avoid delays against reviewed schedules.

1.6.5 Revise schedules, reorganize and replace construction to minimize the impact of any identified delays.

1.7 Coordination of Construction

1.7.1 This is a lump sum contract to be completed in its entirety by the Contractor using the Contractor’s own forces or the forces of individual subcontractors and sub-trades.

1.7.2 All of the specifications and drawings shall be interpreted as one contract and the Contractor shall be wholly responsible for coordination of all work by the Contractor’s own forces, sub-trades or subcontractors to complete the work.

1.7.3 No Section or Division of these specifications shall be construed or interpreted as being the responsibility of any sub-trade, subcontractor or supplier.

1.7.4 The Contract Drawings provide general routing of piping and general location of equipment unless specific dimensions are indicated. Locate piping and equipment to avoid interference with walkways, other equipment and required headroom.

1.7.5 The Engineer may furnish supplementary drawings to assist in proper execution of the Works. Such drawings will be issued for clarification only and will have the same meaning and intent as if part of the plans referred to in the Contract Documents.

1.7.6 The Contractor shall examine the work of all trades and ensure that conditions are satisfactory for the completion of any subsequent work.

1.7.7 The Contractor shall notify the Engineer immediately of any adverse conditions which may affect subsequent work and shall not proceed with any subsequent work until such conditions are rectified.

1.8 Submittals

1.8.1 Make all necessary submittals to the Engineer for review and approval.

1.8.2 Submit preliminary shop drawings, product data and samples in accordance with Section 01330 – Submittals for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to the work of other contracts. After review, revise and resubmit by transmittal to the Engineer.

1.8.3 Submit all requests for payment to the Engineer.

1.8.4 Submit requests for interpretation of Contract Documents, requests for information or clarification of the scope of work to the Engineer.

1.8.5 Submit requests for use of Alternatives to the Engineer.

1.8.6 Submit requests for Contemplated Contract Changes to the Engineer.

1.8.7 Deliver all closeout submittals to the Engineer.

1.9 Construction Progress or Site Meetings

1.9.1 Site meeting frequency shall be bi-weekly, or more frequently as required, at no additional cost to the Contract, if performance and schedule are not to the satisfaction of the Engineer and the Owner, or for additional coordination as required.

1.9.2 The Owner, Engineer and Contractor will be in attendance. The purpose of these meetings is to discuss the progress of the Work and related matters including:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems and conflicts.

.4 Problems which may impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revisions to construction schedule.

.8 Progress, schedule, during succeeding work period.

.9 Review submittal schedules (shop drawing, RFI, etc.): expedite as required.

.10 Maintenance of quality standards.

.11 Pending changes and substitutions.

.12 Review proposed changes for effect on construction schedule and on completion date.

.13 Safety issues.

.14 Environmental issues.

.15 Other business.

1.10 Shut-Down Coordination Meetings

1.10.1 The Contractor shall request a meeting for any shut-down that may impact the flow of water through the facility and/or has a duration of greater than six hours.

1.10.2 Require attendance of all parties directly affecting, or affected by, work of the specific equipment or facility that must be shut-down.

1.10.3 Notify the Engineer, in writing, ten working days in advance of the meeting date so that the Engineer may coordinate with the Owner.

1.10.4 At least 10 working days in advance of the requested meeting the Contractor shall:

.1 Prepare and distribute a draft agenda

.2 Submit the proposed shut-down sequence and procedure

.3 Submit the proposed start date and time and duration of shut-down

.4 Provide the isolation and assistance requirements needed by operating staff

.5 Provide a contingency response approach in the event of problem or extended shut-down duration.

1.10.5 The Engineer will record minutes and distribute copies to participants and those affected by decisions made.

1.10.6 Identify errors in the minutes, if any, to the Engineer in writing within three days of receipt.

1.11 Pre-Commissioning Meeting(s)

1.11.1 A pre-commissioning meeting shall be held ten (10) working days prior to any commissioning activities to review the pre-commissioning and final commissioning plan and schedule.

Where work requires staggered commissioning of unit processes, hold a dedicated pre-commissioning meeting for each unit process.

1.11.2 Attendance at the pre-commissioning meeting shall include the Owner, Engineer, Operator, Contractor-appointed commissioning supervisor, and key Contractor personnel involved with the commissioning of the Work.

1.12 Contractor's Representative at Meetings

1.12.1 The Contractor shall attend all Construction Progress Meetings or other such coordination meetings as directed by the Engineer.

1.12.2 The Contractor's representative at these meetings shall be the Site Supervisor or Project Manager/Contract Administrator and/or a competent and reliable person who is familiar with the Work. The Contractor's representative shall have full authority to make decisions on the Contractor's behalf.

2 PRODUCTS – NOT APPLICABLE

3 EXECUTION – NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 Description

1.1.1 This section specifies requirements and procedures for preparing and updating construction schedules and reports for planning, coordinating, executing and monitoring the progress of the work. The construction work shall be scheduled using the Critical Path Method (CPM) of network analysis.

1.2 Scheduling

1.2.1 The CPM type construction schedule will be used to monitor job progress. The Contractor will be responsible for providing all information concerning sequencing, logic and duration of all activities as well as providing the initial CPM logic network diagram and tabular report data. Once the initial logic network diagram is accepted, the contractor will be responsible for providing regular schedule updates including information on logic, percent complete, actual start and finish dates and duration changes.

1.2.2 The Contractor shall dedicate the necessary resources for updating the Detailed Progress Schedule daily such that the schedule is always current and accurately reflects the activities occurring on site; furthermore, the Contractor shall store a live version of the schedule on a File Transfer Protocol (FTP) and provide viewing access to the Engineer - such that the Engineer, at any time, may view a current and accurate version of the Detailed Progress Schedule.

1.2.3 The Contractor shall retain a third-party scheduler if, in the opinion of the Engineer, the first submission of the Detailed Preliminary Baseline Schedule does not demonstrate that the Contractor has the technical resources to provide a schedule that meets the requirements of this Section.

1.2.4 There shall be sufficient cause for Default by the Contractor, should the Contractor fail to comply with the requirements of this Section.

1.2.5 Failure of the Contractor to comply with the requirements of this provision shall subject him to, at the Owner's Sole discretion, a withholding, in partial or in total of payments otherwise due to the Contractor for work performed under this Contract. The Contractor agrees that any withholding of money is not a penalty for noncompliance, but is an assurance for the Owner that funds will be available to implement these requirements should the Contractor fail to do so, since failure of the Contractor to comply with these requirements shall mean that the Contractor failed to execute the work with such diligence as to ensure its completion within the time for completion.

1.3 Schedule Preparation and Submittal Requirements

1.3.1 Baseline Schedules:

.1 Summary Level Preliminary baseline Schedule:

.1 Shall be submitted to the Engineer and the Owner by the Contractor a minimum of two (2) Working Days prior to the preconstruction meeting.

.2 Shall be submitted with an accompanying narrative report. The narrative shall detail, at a minimum, all planned equipment, crew sizes and quantities.

.2 Detailed Preliminary Baseline Schedule:

.1 Shall be submitted to the Engineer and the Owner by the Contractor within ten (10) Working Days after the date of the Order to Commence or prior to the first progress payment, whichever occurs first.

.2 To ensure that the schedule is being developed according to the requirements of the Contract Documents, the Contractor shall be required to attend an initial schedule planning meeting and may be required to attend weekly meetings at which it will present to the Engineer the then-current version of the schedule. The Contractor will provide both hard copy and electronic copies of the schedule as it is developed, and as required by the Engineer. If requested by the Engineer, the Contractor will require Subcontractors to attend these meetings.

.3 Shall be resource-loaded, CPM schedule using the latest commercially available version of MS Project.

.4 Shall be submitted with accompanying narrative report.

.5 Shall be submitted as a shop drawing in accordance with Section 01330 – Submittals.

.6 The Contractor shall provide the electronic copy of the schedule as both a MS Project file and PDF file.

.3 Detailed Final Baseline Schedule

.1 Shall be submitted to the Engineer and the Owner by the Contractor within thirty (30) Working Days after the date of the Order to Commence or prior to he first progress payment, whichever occurs first.

.2 Same requirements and format as specified above for Detailed Preliminary Baseline Schedule.

1.3.2 Progress Schedules:

.1 Detailed Progress Schedules:

.1 Shall be submitted to the Engineer and the Owner by the Contractor on a monthly basis or more frequently as required.

.2 Shall be subject to the same requirements and format as specified above for the Detailed Final Baseline Schedule.

.3 Shall be submitted with accompanying construction photographs.

.2 Look-Ahead Schedule:

.1 Shall be submitted to the Engineer and the Owner by the Contractor on a bi-weekly basis using simplified MS Excel spreadsheet format.

.2 The Contractor’s representative shall explain the two (2) week look-ahead schedule during the Construction progress meetings.

.3 Shall be submitted as a shop drawing in accordance with Section 01330 – Submittals.

.4 The Contractor shall provide the electronic copy of the schedule as both MS Excel file and PDF file.

1.4 Schedule Preparation

1.4.1 With the exception of the Summary Level Preliminary Baseline Schedule, the Contractor shall prepare schedules using the latest commercially available version of MS Project.

1.4.2 The scheduling software shall be used to produce a resource-loaded CPM schedule in the form of time-scaled diagrams with the critical path activities highlighted.

1.4.3 Schedules shall be submitted to the Engineer in both MS Project file and PDF file. The schedule shall be formatted as follows:

.1 Formatted to print on 279mm x 432mm sheet size.

.2 Title Block: Show the name of the project, project number, Contract number, Owner, Date, date submitted, revision or update number, and the name of the scheduler.

.3 The Detailed Baseline Schedule will be numbered ‘0.0’. Revisions, if required, will be numbered ‘0.1’, ‘0.2’, etc. Numbering for the Progress Schedule updates shall reflect the number of months elapsed since the Contract commenced: that is, the first update will be numbered ‘1.0’; second month ‘2.0’, etc.

.4 The Contractor shall identify horizontally, across the top of the schedule, the time frame by year, month and day.

.5 The Contractor shall identify each activity with a unique number and activity code and a brief description of the Work associated with that activity.

.6 The Contractor shall reflect sequences of the Work, restraints, delivery windows, review times, shutdowns, Contract Times and Project Milestones.

.7 The Contractor shall identify the duration of each activity and show early start, early finish, late start, late finish, and completion, and float for each activity and sub-activity.

.8 The Contractor shall identify the Work of separate stages and other logically grouped activities, and clearly identify critical path activities.

.9 Legend to describe standard and special symbols and bars.

1.4.4 Scheduling Software:

.1 File Transfer and Back-up: The Contractor, if required, shall provide a copy of all baselines and update files on USB.

.2 Settings: The Contractor shall provide the Engineer with all of the software settings it has used in the baseline schedules and updates. Examples of the information required include but are not limited to: Calendar Settings, User Preferences, Schedule Settings, etc.

.3 Export to Excel: If requested, the Contractor will provide the Engineer with an Excel spreadsheet containing report data exported from the schedule.

.4 The Contractor will produce schedule layouts and reports according to the Engineer's requirements and instructions. Reports such as the following will be required in the indicated file formats:

.1 Detailed Schedule Layout [.pdf and .mpp].

.2 Critical Path Layout [.pdf and .mpp].

.3 Early and Late Resource Curves [.pdf and .xls].

1.5 Summary Level Preliminary Baseline Schedule

1.5.1 The purpose of this schedule submission is to convey to the Owner at an early stage the Contractor's original plan to achieve overall and milestone(s) completion in accordance with the Contract Documents. Since this schedule is only expected to be developed to a summary level, it may be a bar chart, as opposed to a Critical Path Method schedule, and may be created using an MS Excel spreadsheet or other software application. The schedule should contain as much detail as is necessary to fully articulate the Contractor's plan up to and including Total Performance of the Work. The Contractor is also required to provide an accompanying narrative, describing in general terms how it intends to resource the project as well as assumed rates of production for major items of Work. The Contractor will provide any information requested by the Owner that the Owner considers necessary in order to understand the Contractor's original plan.

1.5.2 The Contractor must submit the Summary Level Preliminary Baseline Schedule a minimum of two (2) Working Days prior to the Pre-Construction meeting and be prepared to discuss the schedule at the same meeting.

1.6 Detailed Preliminary Baseline Schedule

1.6.1 The Detailed Preliminary Baseline Schedule must be submitted within ten (10) Working Days after the date of Order to Commence or prior to the first progress payment whichever occurs first.

1.6.2 The Detailed Preliminary Baseline Schedule shall cover all phases of the Work and shall represent the Contractor's practical original plan to complete the Work, considering restrictions of access and availability of Work areas, and availability and use of manpower, material and equipment. It is to be a fully resource-loaded schedule, with labour, material and equipment resources provided at an activity level or as required by the Engineer.

1.6.3 The Detailed Preliminary Baseline Schedule shall show the sequence and interdependencies of construction and commissioning activities, as well as project related activities reasonably required to complete the Work, and shall address the following, at a minimum:

.1 The issuance and the Contractor's receipt of the Order to Commence Work.

.2 Obtaining any applicable permits, design drawings, specifications and shop drawings for early product procurement, and long lead time items. Refer to Section 01330.

.3 Mobilization and other preliminary activities.

.4 Setup of Engineer's trailer.

.5 Site Access.

.6 Any initial Site Work as applicable.

.7 Specified Work sequences, constraints, and Milestones, including Substantial and Total Performance of the Work date(s).

.8 Type of Work to be performed by the Subcontractor(s) involved.

.9 Major equipment design, fabrication, factory testing, and delivery dates.

.10 Delivery dates for Owner-furnished pre-purchased equipment, if applicable.

.11 Submittals such as shop drawings that are critical or near critical to schedule completion.

.12 Major components of the Work and other relevant details, including at a minimum:

.1 Site Work.

.2 Concrete Work.

.3 Architectural and Coatings Work.

.4 Equipment Work.

.5 Mechanical Work.

.6 Electrical Work.

.7 Leakage testing of tanks, pipes and structures.

.8 Shutdowns and tie-ins:

.1 Work by Owner.

.2 Work by Contractor.

.9 Instrumentation, SCADA design and control Work.

.10 Any applicable interfaces with Owner pre-purchased equipment, if applicable.

.11 Other important Work for each major facility.

.12 Equipment and system start-up, training, and test activities. Refer to Section 01810.

.13 Project close-out and cleanup.

.14 Demobilization.

1.6.4 The Contractor shall break the work into activities with a duration of minimum five (5)/maximum twenty (20) working days each, except for non-construction activities (such as procurement of materials and delivery of equipment) and other activities which may require a longer duration and shutdowns, tie-ins and connections, which may require a shorter duration. To the extent feasible, activities related to a specific physical area of the project

shall be grouped on the network for ease of understanding and simplification. The selection and number of activities shall be subject to review by the Engineer and Owner.

1.6.5 The activities defined in the Detailed Preliminary Baseline Schedule shall represent the planned durations in anticipation of normal manpower and equipment utilization in durations of whole Working Days. The Engineer may require that the duration of major activities be calculated by the scheduling software on the basis of the planned rate of daily production. The Contractor will resource load the schedule using labour, and not crew, hours unless otherwise instructed by the Engineer.

1.6.6 In calculating activity durations, normally adverse weather conditions shall be considered. The Contractor shall include sufficient float in the schedule to account for normally adverse weather conditions.

1.6.7 The Contractor shall schedule the Work to minimize the effect of adverse weather, and to allow for protection of the Work from such effects.

1.6.8 Activity Descriptions

.1 Activity names shall: describe action; identify building elements; and specify location.

1.6.9 Activity Numbering

.1 Activity numbering shall be alphanumeric and conform to the Engineer's instructions.

1.6.10 Activity Coding

.1 The Contractor shall make extensive use of the activity coding capabilities of the scheduling software in order to satisfy the grouping, sorting, filtering and report generating requirements of the Owner.

1.6.11 Examples of the activity codes that will be required are: phase; area; location; responsibility; work type, etc.

1.6.12 The Detailed Final Baseline schedule shall be accompanied by a narrative that provides a detailed description of the labour, materials, plant, means and methods that the Contractor intends to use to carry out the Work and achieve the planned rate of production required to support the activity durations shown in the schedule. The narrative shall also provide explanations supporting the use of lead-lag relationships and constrained dates.

1.6.13 The Contractor shall submit all revisions and/or additional information requested by the Engineer pursuant to its review should the Engineer consider that these additions are necessary for the Detailed Preliminary Baseline Schedule in order to comply with the requirements of this Section.

1.6.14 Submission of the schedules (including Baseline and Progress Schedules) referred to in this Specification Section, and any subsequent updates to such schedules, shall constitute the Contractor's representation that:

.1 The Contractor and its Subcontractor(s) intend to execute the Work in the sequence indicated in such schedule.

.2 The Contractor has distributed the proposed schedule to Subcontractor(s) and Equipment Vendors for their review and comment and has obtained their concurrence.

.3 All elements of the Work required for the performance of the Contract are included. Failure to include any such element shall not excuse the Contractor from completing the Work within the milestone dates and Contract Time and other constraints specified in the Contract Documents.

.4 Seasonal weather conditions have been considered and included in the planning and scheduling of the Work influenced by high and low ambient temperatures and/or precipitation.

.5 The Contractor has thoroughly inspected the Site, considered the work of other Contractors and where necessary to complete the Work under this Contract, coordinated its plan with other Contractors retained by the Owner.

.6 The Contractor has incorporated any other special conditions in planning the Work such as specified or required Work restriction periods, etc.

.7 The express or implied acceptance by the Owner and/or the Engineer of the final baseline schedule and any progress schedules shall not constitute an approval or acceptance of the Contractor's construction means, methods, or sequencing or its ability to complete the Work in a timely manner, and shall not place any obligation or responsibility on the Owner or Engineer toward the Contractor nor shall it, in any way, limit or restrict the Contractor's obligations and responsibilities under the Contract.

1.7 Detailed Final Baseline Schedule

1.7.1 The required revisions must be made and the Detailed Preliminary Baseline Schedule finalized to the satisfaction of the Owner and Engineer, whereupon it will become the Detailed Final Baseline Schedule, against which progress will be measured.

1.7.2 The Detailed Final Baseline Schedule must be submitted within twenty (20) Working Days after the date of Order to Commence or prior to the first progress payment, whichever occurs first. The Owner shall withhold all or part of the monthly progress payment until the Detailed Final Baseline Schedule is acceptable by the Owner and Engineer.

1.7.3 The Contractor acknowledges and understands that time is of the essence of this Contract and therefore that Baseline Early dates for activities, and not the late dates, reflect the target dates for project planning and execution. The Contractor will plan for, and enlist, resources with the goal of achieving the early dates.

1.8 Detailed Progress Schedules

1.8.1 The Contractor shall submit a Detailed Progress Schedule to the Engineer at the end of each month, with each application for payment starting with the second monthly progress payment. The schedule, together with the related data and reports specified in this Section, shall be submitted along with the monthly progress payment application. The progress payment will not be reviewed until the schedule along with all the related data and reports specified in this Section are submitted. The Owner may withhold all or part of the monthly progress payment until the updated Detailed Progress Schedule is updated in a manner acceptable to the Engineer.

1.8.2 Each Detailed Progress Schedule shall record and report data and report actual completion and/or start dates for each completed or in-progress activity, activity percent complete for in-progress activities and forecast completion dates for all activities that are not yet complete. As-built logic will be adjusted as required to reflect the actual sequence of the Work. The Detailed Progress Schedule shall show the projected Completion Date of the Work based on the progress information inserted into it, without changes to the schedule logic or the original

duration of any activity. The Contractor shall use the retained logic option when executing schedule calculation. The Detailed Progress Schedule will be shown as a target schedule to indicate whether the current progress schedule remains on target, has slipped or is ahead of schedule.

1.8.3 The Contractor may then, in a second and subsequent update to the progress schedule, incorporate any logic and duration changes that represent its revised planning, provided all such changes are identified and documented in the schedule narrative and are agreed to by the Engineer.

1.8.4 If it appears that the progress schedule submitted by the Contractor no longer represents the actual sequencing and progress of the Work, the Engineer may instruct the Contractor to revise the Detailed Progress Schedule. The Owner may withhold all or part of the monthly progress payment until the Detailed Progress Schedule is updated in a manner acceptable to the Engineer.

1.8.5 A complete schedule update submission (to be submitted with each monthly progress payment application) must include the following schedule and progress reports:

.1 An updated Detailed Progress Schedule, comparing actual and target progress.

.2 A resource-loaded graph, comparing targeted to actual labour and material.

.3 A schedule narrative, including:

.1 Detailed description of progress, including comparison of planned to actual rates of production, key deliveries to the Site, construction, erection, testing and commissioning.

.2 A discussion of the basis for any Work sequencing, logic, interdependencies or original activity duration revisions incorporated into an updated schedule.

.3 Comparisons of actual and planned progress, with a brief commentary on any actual or forecast delays or problems that might have an impact on the completion date of the Work, and a discussion of the measures being (or to be) adopted to overcome these.

.4 Records of all Contractor and Subcontractor(s) personnel and construction equipment on Site.

.5 Progress photographs.

.6 Any other information specifically required by the Engineer.

.4 The Contractor shall provide the Engineer with a complete weekly list of personnel, plant and construction equipment as well as production rates actually achieved on all major activities, and labour hours for all major trades such as, for example, the formwork, mechanical, and electrical trades.

.5 The Contractor shall incorporate and logically connect approved Contract changes into the CPM schedule. Each change will be identified by number and description.

.6 In the case of a potentially critical delay occurring between the regular schedule updates, and if requested by the Engineer, the Contractor shall update the schedule at the beginning of the delay event and at the resolution of the delay issue. Activities will be added to the schedule as required to analyze the delay using the Time Impact Analysis method.

.7 In order to further define (beyond the level of detail shown in the Detailed Final Baseline Schedule) critical portions of the Work such as facility shutdowns, the Contractor shall, if requested, develop detailed schedule fragments.

1.9 Completion, Milestones and Constraints

1.9.1 The Owner has set out a Substantial Performance date for the Work based on the Time for Completion clauses in the Contract Documents. These dates shall be strictly adhered to; in this regard, the Contract provides for liquidated damages.

1.9.2 Float is defined as the amount of time between the earliest start date and the latest start date of an activity or chain of activities on the CPM schedule. Float shall not be for the exclusive use of either the Contractor or Owner.

1.9.3 Use of float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times, or imposed dates, other than as required by the Contract, shall be cause for the rejection of any schedule submitted by the Contractor.

1.9.4 In the event that the Contractor's progress schedule indicates completion prior to the stipulated overall completion (or other milestones) date, such float will not be for exclusive use of either the Contractor or Owner.

1.10 Compliance with Schedule

1.10.1 The Contractor shall comply with the latest schedule approved by the Owner and Engineer.

1.10.2 If the Contractor fails to complete a major activity, critical event or milestone by the date indicated in the latest update to the construction schedule and such failure is anticipated to extend the Contract Time or milestones, the Contractor shall, within seven (7) calendar days of such failure, submit an updated construction schedule with a narrative clearly indicating how the Contractor intends to correct the non-performance and return to the accepted construction schedule. Actions by the Contractor to complete the Work within the Contract Time (and milestones) shall not be justification for an adjustment to the Contract Time or Contract Price unless such failure is due to a delay in accordance with the provisions of Clause 3.1 below.

1.10.3 The Owner may, at no additional cost to the Owner, order the Contractor to increase Construction Equipment, labour force or working hours if the Contractor fails to:

.1 Complete a milestone activity by its scheduled completion date, or

.2 Satisfactorily perform the Work as necessary to prevent delay to the overall completion of the Work., but only to the extent required to return to the agreed upon construction schedule.

1.10.4 In the event of a conflict between the Contractor's performance of the Work and the Owner's requirements to operate an operational facility, the operation of the facility shall always take precedence.

1.11 Progress Photographs

1.11.1 The Contractor must photographically document all phases of the Contract including preconstruction, construction progress, and post-construction.

1.11.2 The Contractor must ensure that a digital camera is available at the Site for its own use and for the use of the Engineer. The Contractor shall take photographs of the various parts of the construction on a regular basis and when problems or matters of particular interest or importance arise.

1.11.3 Copies of such photographs shall be retained on Site until completion of the Work and should be identified with the following information:

.1 Date when photograph was taken and by whom.

.2 Contract number.

.3 Contractor's name.

.4 Location (e.g. – grid lines).

.5 Direction of view.

.6 Description.

.7 Contractor's photo file number (so that each photo and negative may be readily identified).

1.11.4 The Engineer shall have the right to select the subject matter and vantage point from which photographs are taken. Matters of importance or interest which are to be photographed include:

.1 After the effective date of the agreement and before the Work at the Site is started, and again upon issuance of Substantial Performance, take photographs of the construction Site as well as the property adjacent to the perimeter of the construction Site.

.2 Structures, both inside and outside the Site. The pre-construction records will be compared to the post-construction records to assess damage or displacement of existing structures.

.3 Faulty work.

.4 Type of excavation; width of trench, etc.

.5 Sheeting and shoring used.

.6 Dewatering methods, condition of bottom of excavation.

.7 Work on elements.

1.11.5 A complete set of photographs shall be prepared by the Contractor in accordance with the above requirements and submitted to the Engineer on USB. The photos shall demonstrate how the Work is actually progressing and the planned and detailed sequencing of the Work at the time of the report. The Engineer may direct the contractor to obtain additional

photographic records of structures and features within the site limit. The cut-off date for the monthly progress report shall be as instructed by the Engineer.

1.12 Two Week Look-Ahead Schedule

1.12.1 Provide by 4:00 pm EST on the first workday of each week a Weekly Progress and Planning Report including the following:

.1 An overview of the previous working week's progress including quantification where applicable.

.2 An updated schedule showing progress to date, critical path, and planned activities for the upcoming four weeks (on a rolling basis). All major upcoming items are to be highlighted, especially where coordination is required (e.g., shutdowns, inspections).

.3 General summary of staff utilization including downtimes for training, maintenance of equipment, waiting on others (such as Engineer, Owner or others), etc.

.4 Summary log of all Issues/Concerns, RFIs, RFCs, and their current status.

.5 Health and Safety summary including the names of all those who have received the Contractor's and the site-specific training and any incident reports.

.6 Summary of all external visitors to site including the Owner, the Engineer, regulatory authorities, the testing companies, the subcontractors and the suppliers.

2 PRODUCTS – NOT APPLICABLE

3 EXECUTION

3.1 Contract Completion time

3.1.1 Causes for Extension of Time:

.1 The contract completion time will be adjusted only for causes specified in the Contract Documents. In the event the Contractor requests an extension of any contract completion date, the Contractor shall furnish justification and supporting evidence. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to an extension of the Contract completion date under the provisions of the Contract, the Engineer's determination as to the total number of days' extension shall be based upon the current accepted and updated CPM schedule and on all data relevant to the extension. Such data shall be included in the next monthly updating of the schedule. The Contractor acknowledges and agrees that actual delays in activities which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network do not have any effect on the contract completion date or dates and therefore will not be the basis for a change in Contract Time.

.2 The Contractor shall submit to the Engineer a detailed account of the claim and the grounds upon which the claim is based. Such claim shall be submitted within a reasonable time, and in any event no later than Thirty (30) Calendar Days after completion of the specific Work affected by the situation. Oral arrangements will not be considered. The Contractor must produce written evidence in support of the claim and shall advance no claim in the absence of such written evidence. Claims submitted later

than thirty (30) Calendar Days after completion of the specific Work affected by the situation will not be considered.

.3 The Contractor is to account for fifteen (15) days per calendar year of abnormally adverse weather in their base contract. Only abnormally adverse weather exceeding fifteen (15) days per calendar year will be evaluated for an extension to the contract completion time.

.4 The term “abnormally adverse weather conditions” shall apply only where one of the following conditions has been demonstrated to the satisfaction of the Engineer:

.1 Rainfall exceeds 25mm in twenty four (24) hours. The majority of the rainfall either must have occurred during normal Working Hours as specified in the Contract Documents or must have commenced within three hours of the start of normal Working Hours.

.2 Snowfall exceeds 25cm in twenty four (24) hours. The majority of the snowfall either must have occurred during normal Working Hours as specified in the Contract Documents or must have commenced within three (3) hours of the start of normal Working Hours.

.3 Ambient outside air temperature exceeds 35°C for more than two (2) hours.

.4 Ambient outside air temperature is below -25°C for more than two (2) hours.

.5 Where the Contractor claims that a delay has occurred due to abnormally adverse weather conditions, the Contractor shall, on the date such delay has occurred, inform the Engineer of their intent to claim for such delay and indicate which work activities have been delayed. The Contractor shall submit to the Engineer their final claim for such delay within five (5) Working Days of the occurrence, complete with full supporting documentation from Environment Canada indicating what weather event caused the delay and the hours during which the event occurred.

.6 An extension to the Contract Time due to abnormally adverse weather conditions will only be granted if the work activity that has been delayed is part of the Work’s critical path according to the latest accepted schedule revision at the time of such weather event. The extension to the Contract Time shall be limited to the duration of the weather event.

.7 The Contractor shall monitor local weather forecasts and take reasonable measures to mitigate delays in the Work and damage to the Work due to weather conditions. The Contractor’s claim for delay may be denied or reduced if, in the opinion of the Engineer, the Contractor had failed to take reasonable measures to mitigate such delays.

END OF SECTION

1 GENERAL

1.1 Intent

1.1.1 Shop drawings and product data.

1.1.2 Samples.

1.1.3 Record drawings.

1.1.4 Tests and reports.

1.1.5 Certificates and transcripts.

1.2 Administrative

1.2.1 Submit all listed submittals to the Engineer for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Works. 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.

1.2.2 Work affected by submittals shall not proceed until the review and approval process is complete.

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

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

1.2.5 Review submittals prior to submission to the Engineer. This review confirms that each submittal has been checked and coordinated with requirements of the Works and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

1.2.6 Notify the Engineer in writing, at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations. Also refer to Section 01200 – Alternatives.

1.2.7 Verify that field measurements and affected adjacent work have been coordinated.

1.2.8 The Contractor’s responsibility for errors and omissions in submittals is not relieved by the Engineer's review of submittals. The review of shop drawings by the Engineer is for the sole purpose of ascertaining conformance with the general design concept on the Contract Drawings and documents. This review shall not mean that the Engineer approves detail design inherent in the manufacture of specific pieces of equipment, or those details required for construction, the responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and the Contract Documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub trades.

1.2.9 The Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by the Engineer's review.

1.2.10 The Engineer has allowed for up to two shop drawing submittals and reviews as part of the normal approval process. Any more than two shop drawing submittals will be considered a deviation for which the Engineer may seek compensation from the Contractor for the additional time and effort of shop drawing review. This does not include initial submittal data such as shop tests and field tests that are submitted after initial submittal.

1.2.11 Keep one reviewed copy of each submission on site.

1.3 Shop Drawings and Product Data

1.3.1 Refer to the specified named acceptable products as appropriate.

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

1.3.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Works. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of where they are specified or on which drawings the work appears. Indicate cross-references to Contract Drawings and Specifications.

1.3.4 Identify all shop drawings as agreed with the Engineer.

1.3.5 Allow 10 working days for the Engineer's review of each submission.

1.3.6 Adjustments made on shop drawings by the Engineer do not address the issue of Contract Price. If adjustments affect the value of the Works, state this in writing to the Engineer prior to proceeding with the work.

1.3.7 Make all changes to shop drawings as required by the Engineer and consistent with Contract Documents. When resubmitting, notify the Engineer in writing of any revisions other than those requested.

1.3.8 Submittals:

.1 Submittals may either be uploaded to the CIMA FTP (file transfer protocol) site and transmitted to the Engineer with a Submittal Transmittal Form in a form acceptable to Engineer for official submission, emailed with a Transmittal Form or submitted in hardcopy.

.2 The marked-up copies will be returned to the Contractor either via the CIMA FTP site, email or hardcopy by mail/courier.

.3 The final submittals will be retained by the Engineer and stored at the site office.

.4 The Contractor is responsible for producing hardcopies and sharing softcopies with Equipment Manufacturers and with subcontractors.

.5 Submittal Cover Page

.1 For each discrete submittal, type or print the appropriate information on a cover page to fully describe the submittals being sent for review. Include the cover page for each discrete submittal. The title page shall include the following:

.1 Project Title

.2 Project / Contract Number

.3 Submittal / Shop Drawing Title

.4 Contractor Reference Number (if applicable)

.5 Specification and Clause reference

.6 Revision Number

.7 Filename

1.3.9 Submissions shall include:

.1 Contractor’s name, contact phone no. and address.

.2 Date and revision dates.

.3 Project title and number.

.4 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

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

.5 Section of Contract where specified and location to be installed.

.6 Apply shop drawing stamp, signed by Contractor’s authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

.7 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 Complete piping drawings, including size and location of all sleeves and/or openings to be formed into structural works.

.9 Submit all equipment and instrument shop drawings in advance of MCC and control panel shop drawings to allow coordination and any vendor specific power, I/O or control wiring requirements.

.10 Wiring diagrams.

.11 Single line and schematic diagrams.

.12 Relationship to adjacent work.

.13 Enclosure ratings (NEMA or IEC) for electrical equipment

.14 Electrical supply requirements including:

.1 Acceptable voltage range for mains and control power

.2 Current draw at full load

.3 Maximum and/or minimum setting of upstream protection

.4 Withstand and interrupt ratings

1.3.10 Submit one copy of product data sheets or brochures for requirements requested in the specifications and as requested by the Engineer where shop drawings will not be prepared due to standardized manufacture of product.

1.3.11 Submit shop drawings for each requirement requested in specification Sections and as the Engineer may reasonably request.

1.3.12 Softcopy submittals

.1 All softcopy submittals shall be named using the following nomenclature: [5]-[3]-R[2]-[4]-[1].pdf, where the fields in the filename are defined as follows:

.1 [1] = Contractor specific unique reference number (if applicable)

.2 [2] = Revision number

.3 [3] = Specification and clause number

.4 [4] = Submittal/Shop Drawing title

.5 [5] = Project/Contract number

.2 Each discrete shop drawing submittal shall be a single complete PDF document complete with cover page as the first page.

.3 At the request of the engineer, the Contractor shall submit native files of certain submittals (MS Word, MS Excel, MS Project, Primavera, etc.) to help expedite the review process.

1.3.13 Submittals will be returned with one or of the following notations. Take action as noted:

.1 "REVIEWED WITH NO COMMENT" - Make and distribute additional copies promptly as required for execution of Work. Instruct parties to report promptly any inability to comply with provisions.

.2 "REVISE & RESUBMIT" - Make the necessary revisions and resubmit revised drawings for review. This procedure will not relieve the responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of Contract. Show the drawing number of the first such revised drawing and show the latest revision number applicable to the drawing by increasing the revision index – “R0”, “R1”, “R2”, etc. Refer to 01330 – Submittals – Supplement B: Submittal file naming Convention Instructions for instructions on how to apply revision numbers.

.3 “REVIEWED AS NOTED” – Make the necessary revisions prior to commencing with the execution of work. A resubmission for Engineer review is not required. Resubmit with all necessary revisions for record purposes.

.4 “REJECTED” – This notation indicates that the Engineer has received the submission and has deemed it incomplete or improper for review.

.5 "NOT REVIEWED" - This notation indicates when Engineer has acknowledged receipt of the shop drawing and that a review is not required.

1.3.14 Use only those shop drawings on the work that bear the "NO COMMENT" or “AS NOTED” notation.

1.3.15 Do not revise shop drawings marked "NO COMMENT" unless resubmitted to the Engineer for further review.

1.3.16 Ship one set of approved shop drawings, installation instructions, lubrication schedules, parts lists and other information along with each piece of equipment to the Site and clearly mark "DO NOT REMOVE FROM SITE".

1.3.17 Neither the Engineer nor the Owner will accept responsibility for the cost of changes necessary if any equipment is fabricated without prior review of shop drawings. Completion of the Engineer’s review will be designated by the presence of his initialed reviewed stamp on the returned drawings.

1.3.18 Where more than one type of shop drawing has been specified for one item, e.g., wiring diagrams, layout details, and dimensional drawings, the shop drawings will be submitted together, to enable Engineer to review the drawings as a package.

1.3.19 Catalogue pages or drawings applicable to an entire family or range of equipment will not be accepted as shop drawings unless they are clearly marked to show the pertinent data for the particular materials.

1.3.20 Manufacturers' catalogues, manuals, or price lists will not be accepted as shop drawings. Such materials may be used as supplemental information to the shop drawings.

1.3.21 Indicate the tag number of all instruments and valves and clearly show the features and details applicable to the equipment being supplied.

1.3.22 Determine which shop drawings have, in addition to those drawings specifically mentioned in the Contract, design elements requiring the seal of a Professional Engineer registered in the Province of Ontario, in accordance with the applicable provincial or federal engineering acts or other governing legislation. Seal such drawings before submitting them for review. Submit for review engineering calculations signed by the registered Professional Engineer responsible for the shop drawing design elements.

1.3.23 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, a copy will be returned denoted “Reviewed with Comments”, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned denoted “Revise and Resubmit”, and resubmission of corrected shop drawings, through the same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.3.24 The Owner may deduct, from payments due, costs of additional engineering design or review incurred if the Contractor does not submit correct shop drawings after two reviews.

1.3.25 The review of shop drawings by the Engineer is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Engineer approves detail design inherent in shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and the Contract Documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub trades.

1.3.26 As per Item 1.5, prepare and submit proposed sleeve location drawings showing the location and size of sleeves, openings and miscellaneous items to be formed in the work with the reinforcing steel drawings to allow full coordination. Any reinforcing steel modifications required as a result of failure of the Contractor to provide these drawings, will be at no cost to the Owner.

1.3.27 Submit all equipment and instrument shop drawings in advance of MCC and control panel shop drawings to allow coordination and any vendor specific power, I/O or control wiring requirements.

1.3.28 Delete information not applicable to project from all submittals.

1.3.29 Supplement standard information to provide details applicable to project as required.

1.3.30 When corrected copies are resubmitted, the Contractor shall direct specific attention to all revisions in writing and shall list separately any revisions made other than those called for by the Engineer on previous submittals. Requirements specified for initial submittals shall also apply to resubmittals.

1.3.31 When resubmittals are needed, resubmittals shall be made within 10 business days. The Contractor may submit an acceptable request for an extension of time, listing the reasons why the resubmittal cannot be completed within the stipulated time.

1.3.32 The need for more than two resubmittals, or any other delay in obtaining the Engineer review of submittals, will not entitle the Contractor to extension of the Contract Times unless delay of the Work is the direct result of a change in the Work authorized by a Change Order.

1.3.33 The maximum size of shop drawings shall be 600mm x 900mm to permit red line photocopy reproduction. Digital pdf copies of all drawings shall be printable such that the scale can be checked.

1.3.34 Shop drawings which require the approval of a legally constituted authority having jurisdiction shall be submitted by Contractor to such authority for approval. Such shop drawings shall receive final approval of authority having jurisdiction before Consultant's final review.

1.3.35 Drawings stamped “As Noted” must be revised for inclusion in the Operation and Maintenance Manuals.

1.3.36 Submit three hardcopy sets of final shop drawings and one pdf copy on an USB.

1.4 Samples

1.4.1 Submit samples in duplicate for review as requested in respective specification Sections. Submit samples with identifying labels bearing material or component description, manufacturer’s name and brand name, Contractor’s name, project name, location in which material or component is to be used, and date.

1.4.2 Deliver samples prepaid to the Engineer's business address, or as otherwise directed by the Engineer.

1.4.3 Notify the Engineer in writing, at time of submission of deviations in samples from requirements of the Contract Documents.

1.4.4 Where colour, pattern or texture is a selection criterion, submit the full range of samples.

1.4.5 Adjustments made on samples by the Engineer do not address the issue of Contract Price. If adjustments affect the value of the Works, state such in writing to the Engineer prior to proceeding with the work.

1.4.6 Make all changes to samples as required by the Engineer and consistent with Contract Documents.

1.4.7 Reviewed and accepted samples will become the standard of workmanship and material against which installed work will be verified.

1.5 Insert and Sleeve Location Drawings

1.5.1 Submit insert and sleeve location drawings showing the location and size of sleeves, anchor bolts, openings and miscellaneous items to be formed in the work. Submit these drawings with the reinforcing steel drawings to allow full coordination.

1.6 Site Progress Records

1.6.1 All site progress reports shall be provided as required to the Engineer and a copy shall also be kept for the Contractor’s records.

1.6.2 Provide by 10:00 am EST a Daily Progress Report including the following:

.1 The weather conditions with maximum and minimum temperatures

.2 The conditions encountered during excavation

.3 The commencement and the completion dates of the work of each trade in each area of the Contract.

.4 The erection and removal dates of formwork in each area of the Contract

.5 The dates, the quantities, and the particulars of each concrete pour

.6 The dates, the quantities, and the particulars of roofing installation

.7 The dates on which major items are installed.

.8 The numbers and classifications of the Contractor's and the Sub-contractor's trades people working at the site and the numbers and classifications of construction machinery and equipment and the number of hours each is operated.

.9 The visits to the site by the Owner, Engineer, the Regulatory Authorities, testing companies, the Sub-contractors and the suppliers.

1.7 Preconstruction and Progress Photographs

1.7.1 Provide preconstruction photographs in digital format, prior to commencement of work on the site. Deliver to the Owner/Engineer before starting any construction, two electronic copies by digital devices. The Owner/Engineer may direct the Contractor to obtain additional photographic records of structures and features within the site limits. The pre-construction records will be compared to the post-construction records to assess damage or displacement of existing structures.

1.7.2 Obtain pre-construction photos of the existing:

.1 Roads, sidewalks and curbs.

.2 Shoulder and grass areas.

.3 Building exterior.

.4 Interior views of rooms, tunnels, etc., where modifications are planned.

1.7.3 On commencement of work and at monthly intervals thereafter, provide two copies of six different view photographs to illustrate the progress of the work. Photographs are to be taken by a professional photographer from locations selected by the Engineer. Owner reserves the right to request hard copies of digital pictures as necessary, printed on photo quality media.

1.7.4 Photographs must be clearly identified with project name, date and location of exposure.

1.7.5 Submit progress photographs with monthly application for payment.

1.8 Operation and Maintenance Data

1.8.1 Submit per Section 01780 – Closeout Submittals.

1.1 Test and Reports

1.1.1 Insofar as practical, test materials and equipment on site. Where shop test is necessary, give Engineer two (2) weeks notice in writing of proposed shop test date.

1.1.2 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 and Operation and Maintenance (O&M) manuals.

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

1.1.4 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 and O&M manuals.

1.1.5 Inspection includes:

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

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

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

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

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

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

1.1.9 Modify or replace equipment or materials failing required tests.

1.1.10 Perform additional testing required due to changes of materials requested by Contractor or due to failure of materials or construction to meet specifications.

1.2 Record Drawings

1.2.1 Submit per Section 01780 – Closeout Submittals.

1.3 Equipment and Systems

1.3.1 Submit per Section 01780 – Closeout Submittals.

1.4 Spare Parts

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

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

1.4.3 Deliver to site location and place in storage as directed by the Owner.

1.4.4 Obtain receipt for all delivered products from the Owner or Engineer and submit these receipts prior to Substantial Performance.

1.5 Maintenance Materials

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

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

1.5.3 Deliver to site location and place in storage as directed by the Owner.

1.5.4 Obtain receipt for all delivered products from the Owner or Engineer and submit these receipts prior to Substantial Performance.

1.6 Special Tools

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

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

1.6.3 Deliver to site location and place in storage as directed by the Owner.

1.6.4 Obtain receipt for all delivered products from the Owner or Engineer and submit these receipts prior to Substantial Performance.

1.7 Warranties and Bonds

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

1.7.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.7.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers.

1.7.4 No warranty will commence until issuance of Substantial Performance on respective work components. The warranty on items used during construction, with the Owner's permission, for the safe and orderly completion of the works will not commence until Substantial Performance.

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

1.7.6 Co-execute submittals when required.

1.7.7 Retain warranties and bonds until time specified for submittal.

END OF SECTION

1 GENERAL

1.1 Construction Safety Measures

1.1.1 Contractor shall submit a site-specific Health and Safety Plan within 5 working days after the date of Notice to Proceed or prior to mobilization on site, whichever occurs first. The site-specific Health and Safety Plan must address the requirements of the Acts. As Constructor, the Contractor will be required to prepare a Site-Specific Health and Safety plan to be submitted for review by the Owner. The Contractor is to submit the draft plan at the Pre-Construction Meeting which shall be revised, if needed, before construction begins.

1.1.2 The contractor shall meet the requirements of the following:

.1 Occupational Health and Safety Act, Regulations for construction projects, O.Reg. 213/91 (as amended. by O.Reg. 631/94), Part II General Construction.

.2 Occupational Health and Safety Act, Industrial Establishments Regulation, R.R.O. 1990, Reg. 851 (as amended by O.Reg. 516/92; 630/94; 230/95; and 450/97), Part I Safety Requirements.

.3 Revised Statutes of Ontario 1980, Chapter 321, Revised Regulation of Ontario 1980, Regulation 691 as amended by O.Reg. 156/84 and O.Reg. 645/86, and Ontario Regulation 714/82.

.4 Workers Safety & Insurance Board (WSIB) and municipal statutes and authorities.

1.1.3 In event of conflict between any provisions of above authorities, the most stringent provision governs.

1.1.4 The Contractor is designated “Constructor” as defined by law.

1.2 Special Protection and Precautions

1.2.1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials and regarding labelling and the provision of material safety data sheets (MSDS) acceptable to Labour Canada.

1.2.2 Conform to the Ministry of Labour requirements for work in hazardous locations. Establish and implement written procedures to assure compliance.

1.2.3 Comply with the Owner’s and Plant Operations Health and Safety Procedures.

1.2.4 Provide site specific health and safety training to all Contractor and Sub-Contractor staff on-site. To ensure all staff on site have attended site orientation and are accounted for in case of emergency, the Contractor is required to provide to the Owner a daily attendance sheet, listing individual’s names.

1.2.5 Submit all required training certificates related to performing the Work to the Owner prior to undertaking the Work, e.g., confined space training, fall arrest training, asbestos awareness training.

1.2.6 Contractor to obtain CAD rating and WSIB clearance certificates from each sub-contractor and to provide to Owner upon request.

1.2.7 Smoking is not permitted in hazardous areas or other areas as designated by the Owner. Post "No Smoking" signs as required.

1.3 Safety and First Aid Facilities

1.3.1 Provide and maintain on Site, in a clean orderly condition, completely equipped First-Aid kit or facilities readily accessible at all times to Contractor's employees and, the Engineer and the Owner.

1.3.2 Facilities and staffing to be in accordance with the Industrial First Aid Regulations of the Workplace Safety and Insurance Board and OSHA regulations.

1.3.3 Provide fire extinguishers, smoke and CO monitors for trailers.

1.3.4 Supply three additional hardhats and safety vests for visitors to site.

1.3.5 Provide and maintain on the site a completely equipped first aid kit, which shall be readily accessible at all times to all employees and the Owner.

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

1.3.7 A telephone call list for summoning aid, such as doctors, ambulances, pulmotors and rescue squads from outside sources is to be conspicuously posted.

1.4 Safety Equipment and Hazardous Areas and Materials

1.4.1 Safety equipment such as gas detection equipment for explosive or toxic gases or oxygen deficiency, safety belts, ropes, etc., are to be made available to the Engineer as necessary for inspection.

1.4.2 Construction personnel requiring use of respiratory equipment are to be clean shaven.

1.4.3 Post warning signs at hazardous areas or where hazardous materials are stored, and install protective barriers. Instruct personnel in proper safety procedures. Inform the Owner of the location of these materials. The Contractor shall ensure that these materials are not kept stored or used on site without the Owner's prior consent or approval

1.4.4 Identify all areas considered to be hazardous locations and comply with all requirements of the Ministry of Labour.

1.4.5 Ensure compliance with CGA B149.6-11 and applicable safety codes when working on or in the area of natural and digester gas lines. Purge all gas lines with nitrogen prior to proceeding with work. Note that certain gas lines passing through the work area will continue in service during this construction. Take suitable safety precautions at all times.

1.5 Site Conditions

1.5.1 Work at site may involve contact with the following pre-existing materials:

.1 Sodium Hypochlorite

.2 Exterior lead-based paint system.

The above list does not include materials provided by the Contractor required to complete the Work.

END OF SECTION

1 GENERAL

1.1 Intent

1.1.1 This Section covers the work for the protection of the environment during construction.

1.1.2 The requirements of this Section are in addition to the requirements of any other Section of this specification and are not meant to limit in any way regulations, guidelines, laws or by-laws in effect at time of construction.

1.1.3 In all cases the most stringent requirements for environmental protection shall govern.

1.2 General Provisions

1.2.1 Be responsible for the protection of the natural environment of the site and surrounding areas, both land and water. Protection of the environment must start with avoidance and prevention, and then control/mitigation, compensation, or enhancement (in order of descending preference).

1.2.2 Prime consideration must be given to protecting the environment during all phases of construction. Co-operate fully with the Engineer, Owner, operating personnel and local authorities to protect the natural environment.

1.2.3 Obtain the Engineer's approval of planned work and storage areas and proposed access roads. Submit a written proposal prior to starting construction.

1.2.4 Project construction activities must be carried out in compliance with all applicable environmental laws and regulations.

1.2.5 All materials (hazardous and non-hazardous) shall be handled so as to protect human health and the environment.

1.2.6 Activities shall be planned and implemented, and equipment shall be managed and maintained in a manner that minimizes air emissions.

1.2.7 Prevent the accidental discharge of containments into soils, surface water and/or groundwater. Any accidental contamination shall be reported to the Ministry of Environment immediately and cleaned up as per provincial requirements.

1.2.8 Erosion control measures shall be designed, implemented and maintained to ensure that there is no increased sediment loading to surface waters leaving the Project site. The Contractor is responsible for ensuring that the erosion control measures are implemented and maintained throughout the duration of the Project.

1.3 Inspection

1.3.1 Be advised that inspectors from the Owner, MECP, MOL, Conservation Authority and other authorities having jurisdiction may make periodic visits to the Site during construction. They have the authority to order the Contractor to stop work if in their opinion the Work is not being completed so as to ensure compliance with the environmental objectives. Acceptance of the Work by the Engineer may be withheld until the Owner and other authorities have issued their approval.

1.4 Limits of the Site

1.4.1 The limits of the site working area are shown on the Contract Drawings and described in the specifications. Confine operations within these limits, unless written approval is obtained from the Engineer and from the property owners concerned.

1.4.2 Install snow fencing stakes or other barriers suitable to the Engineer and other authorities to clearly define the working limits of the Site, parking areas, storage areas, maintenance areas and haul routes within the site, and confine activities to these areas. Submit drawings of the Site showing areas outlined above for review by the Engineer.

1.5 Erosion and Sediment Control

1.5.1 Prior to the commencement of any work on this project which might cause erosion and/or sedimentation, the Contractor must receive approval from the Engineer for an erosion and sedimentation control program proposed by the Contractor. This program must be in accordance with Ontario Guidelines on Erosion and Sediment Control for Urban Construction Sites (latest revision).

1.5.2 Ensure adequate environmental protection and take precautions at times of inclement weather (i.e., ensure erosion and sedimentation control measures are functioning effectively and install additional measures as necessary).

1.5.3 All costs for developing and implementing an erosion and sediment control program shall be included in the price tendered.

1.6 Site Drainage and Unwatering Discharge

1.6.1 Direct the discharge of unwatering operations from any site excavation to an adequate sediment basin by pumping unless approved otherwise by the Engineer. The discharge pipe shall be fitted with a "Wetland" filter bag for removal of silt. Filter bags shall be inspected periodically and replaced once full.

1.6.2 Prevent soil and debris carried by site drainage from entering existing sewers; swales or draining on to adjacent property in the vicinity. At areas where discharge of unwatering will, of necessity, flow onto adjacent private property make arrangements with the property owners concerned. Take adequate precautions to prevent damage to adjacent property. Avoid point discharge of unwatering which will cause erosion.

1.6.3 Direct all run-off and overland flow from the site working and stockpiling area to an adequate sediment basin prior to discharge to a watercourse. The sediment basin shall incorporate straw bales, filter berms, sand bags, etc. as required to eliminate silt or debris from entering any watercourse.

1.6.4 Install check dams and silt control fencing in locations as shown on the drawings and other locations, as directed by the Engineer.

1.6.5 The inspection and cleaning as required, of siltation barriers shall be carried out weekly and after each rainfall. During prolonged rainfall, check daily. Clogged filter materials such as crushed stone or straw bales, etc., shall be replaced as required and as directed by the Engineer.

1.6.6 If the erosion and sediment control measures are damaged or fail the Contractor is responsible for rapid and effective response to such events to minimize the introduction of sediments to aquatic systems.

1.7 Noise Control

1.7.1 If machinery, motors, pumps and other similar equipment must be operated beyond the normal working hours, keep the noise below a level acceptable to the Engineer by housing the equipment at no additional cost to the Contract.

1.7.2 Establish and maintain site procedures such that noise levels from construction areas are minimized. Use vehicles and equipment equipped with efficient muffling devices. Provide and use devices that will minimize noise levels in the construction area. Adhere to all local noise bylaws.

1.8 Dust Control

1.8.1 Prevent dust nuisance resulting from construction operations at all locations on site. Provide water for dust control as directed by the Engineer.

1.8.2 Use appropriate covers on trucks hauling fine or dusty material.

1.8.3 Use watertight vehicles to haul wet materials.

1.8.4 Employ only wet type equipment for saw cutting or concrete grinding to control dust nuisance.

1.8.5 All trenches and areas disturbed by construction works that will produce dust shall be maintained dust free by an application of water.

1.8.6 Obtain Engineer's approval before chemicals are used for dust control. Under no circumstances is sodium chloride permitted for dust control.

1.8.7 Do not use calcium chloride on access roads.

1.9 Mud Control

1.9.1 Keep plant and public roadways clean and free from mud.

1.9.2 Provide mud mats and/or wash stations to prevent tracking of mud from any portion of the contract limits onto any paved roadway.

1.9.3 Obtain and pay for the services of clean outside roads into the site with a street sweeper vehicle as required; or as directed by the Engineer. The street sweeper should be capable of wet and dry cleaning. Ensure that dust is controlled during cleaning operations. Mud, dust and other debris from the construction site will not permitted on the main roads leaving the site. The Contractor will be responsible for street cleaning as required for the duration of construction until Substantial Performance.

1.10 Refuelling Areas

1.10.1 Carry out all refuelling, except the fuelling of backhoes and shovels at approved refuelling areas only.

1.10.2 Review in detail proposed route and sequencing of construction to plan access routes and fuelling areas. Establish suitable fuelling and maintenance areas and obtain approval from Engineer.

1.10.3 Do not refuel, clean or maintain equipment adjacent to or in any watercourses or drains leading to watercourses. Do not fuel equipment within 30 metres of any watercourse unless non-spill facilities are used. Emptying of fuel, lubricants, pesticides or construction materials into any watercourse is strictly forbidden.

1.11 Cleaning Equipment

1.11.1 Clean construction equipment prior to entering roadways. Do not clean equipment in locations where debris can gain access to sewers or watercourses.

1.12 Contingency and Emergency Response Plans

1.12.1 To fulfil its commitment to protecting public and worker health and safety, and the environment, the Contractor is required to adopt a preventive strategy. Through this strategy, the potential issues and emergency events that can be anticipated will be identified and procedures put in place to minimize their potential occurrence.

1.12.2 To address unanticipated events, the Contractor is required to develop Contingency and Emergency Response Plans and implement these plans as part of its contract with the Owner for undertaking the Project.

1.13 Spills

1.13.1 Submit procedures for interception, rapid clean up and disposal of spillages that may occur for Engineer's review prior to commencing work. Be prepared at all times to intercept, clean up and dispose of any spillage that may occur. Keep all materials required for clean-up of spillages readily accessible on site.

1.13.2 Report immediately any spills causing damage to environment to:

.1 Spills Action Centre of the Ministry of the Environment and Climate Change Tel. 1 (800) 268-6060 and (416) 325-3000.

.2 The Municipality in which the spill occurred and the operating authority of the supply system water plant.

.3 Any other authority having jurisdiction or an interest in the spill including any Conservation Authority, water supply authorities, drainage authority, road authority, fire department etc.

.4 The Owner of the pollutant, if known.

.5 The person having control over the pollutant if known.

.6 The Engineer.

1.13.3 Contact the manufacturer of the pollutant, if known, and ascertain the hazards involved, precautions required and best measures to be used in any clean up or mitigating action.

1.13.4 Take immediate action using any available resources to contain and mitigate the effects on the environment from any accidental spill.

1.14 Removal and Disposal

1.14.1 Remove surplus materials and temporary facilities and controls from the Site.

1.14.2 Dispose of all non-contaminated waste materials, litter, debris and rubbish off-Site.

1.14.3 Do not burn or bury rubbish and waste materials on the Site.

1.14.4 Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

1.14.5 Do not discharge wastes into streams or waterways.

1.14.6 Dispose of debris including excess construction material, non-contaminated litter and rubbish at an appropriate off-Site facility identified by Contractor and approved by Owner.

1.15 Environmental Awareness Training

1.15.1 The Contractor is responsible for developing and implementing environmental awareness training to ensure that all on-site personnel are aware of environmental sensitivities associated with their actions; their roles and responsibilities in protecting the environment; and the mechanisms available for them to carry out their environmental protection responsibilities. The training program must include specific environmental awareness programs for the Contingency and Emergency Response Plans developed for the project.

1.15.2 The Contractor is responsible for submitting the training program for the Engineer’s review and approval. The appropriate changes are to be made based on Engineer’s review comments

END OF SECTION

1 GENERAL

1.1 Requirements Included

1.1.1 Regulations affecting the Work imposed by the most recent editions of:

.1 Ontario Building Code (OBC).

.2 National Building Code (NBC).

.3 *Occupational Health and Safety Act* Regulations for Construction Projects, O.Reg. 231.

.4 *Environmental Protection Act*, Ontario Regulation 406/19 - On-Site and Excess Soil Management

.5 Ministry of the Environment, Conservation and Parks (MECP).

.6 Local Conservation Authority.

.7 Municipal by-Laws and Regulations.

.8 Municipal Servicing Standards.

.9 Municipal Utilities.

.10 Ontario Fire Code (OFC).

.11 Codes & Standards for National Fire Protection Association (NFPA).

.12 *Technical Standards and Safety Act* – O.Reg. 220/01 Boilers & Pressure Vessels.

.13 Technical Standards and Safety Authority (TSSA).

.14 Energy Act Ontario.

.15 Ontario Electrical Safety Code (OESC), ESA bulletins.

.16 *Environmental Protection Act*, O.Reg. 419/05: Air Pollution - Local Air Quality

.17 Ontario Ministry of the Environment Publication NPC-300 - Environmental Noise Guideline.

.18 Ontario Reduce, Reuse and Recycle Regulations O.Reg. 101/94-105/94

.19 CSA Certificate Standards and Electrical Bulletins

.20 OSHA Standards for equipment

.21 CSA-2462-08 Safety in Workplace for Arc Flash Hazard

1.2 Compliance with Regulations

1.2.1 Ascertain requirements and regulations of authorities listed above.

1.2.2 Comply with all such requirements and regulations as applicable to the Work.

1.2.3 Requirements set out in this Section are for guidance and information and are not necessarily complete.

1.3 Codes and Standards

1.3.1 The Contractor will:

.1 Perform work in accordance with the latest named published editions of codes and standards.

.2 Provide material and workmanship, which meet or exceed the specifically named code or standard.

.3 Execute Work in accordance with the applicable Federal, Provincial, Territorial and Municipal statutes, laws, regulations to the location of the Work to be performed.

.4 In the event of conflict of above statutes, laws, regulations and codes execute work in accordance with the requirements of the Authority having jurisdiction.

.5 Enforce all safety measures in accordance with the Ontario Occupational Health and Safety Act and applicable local Construction Safety.

.6 Enforce all safety measures in accordance with the Workplace Hazardous Materials Information System (WHMIS).

.7 For the purpose of the Occupational Health and Safety Act, the Contractor for the Works will be designated “Constructor” and will assume the responsibility of the Constructor as set out in the Act and its regulations. The Engineer will monitor the quality and quantity of work, undertake progress payment inspections and inspections for compliance with specifications and plans. The Owner will NOT be a “Constructor” by reason thereof.

.8 Provide the Director of Construction Health and Safety Branch of the Ministry of Labour with the information required under the Occupational Health and Safety Act prior to commencing work.

1.4 Permits

1.4.1 The Owner will apply for, obtain and pay for all permits required for the Works, including but not limited to:

.1 All utilities approvals.

.2 Ministry of Environment, Conservation and Parks

.3 Local Region Conservation Authority

1.4.2 The Contractor will arrange for and inform the Engineer of inspections required by building permits, Techincal Standards and Safety Authority (TSSA), Electrical Safety Authority (ESA) or any other Regulatory body requiring inspection.

1.4.3 The Contractor will arrange for and inform the Engineer of all other regular and final inspections required.

1.4.4 The Contractor will be responsible for all payments for the inspections as required for the permits.

1.4.5 The Contractor shall pay for all locates.

1.5 Work in Vicinity of Overhead Power Lines

1.5.1 Contractor to confirm the setback requirements for operation near power lines with local utility.

1.5.2 Request Power Company to relocate, de-energize or guard any energized conductor where construction equipment may operate within 3 m of conductor.

1.5.3 Obtain Power Company approval prior to operating any equipment within 3 m of energized conductor.

1.5.4 Where practical, avoid storage of metallic pipe sections under high voltage overhead power lines.

1.5.5 If pipe sections must be stored under power lines, protect personnel from effects of induced currents by grounding pipe sections at two locations with AWG #2 copper ground conductors and grounding rods.

1.5.6 Complete and submit applicable WSIB forms prior to commencement of work.

1.5.7 Provide appropriate signs where required as per OSHA Section 44, 3(e).

2 PRODUCTS - NOT APPLICABLE

3 EXECUTION - NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 Intent of Section

1.1.1 This section provides a list of references, standards and organizations that may be referred to throughout these documents by an abbreviation. The abbreviations and details on the organization and contact information are provided in this section.

1.2 References

1.2.1 AA - Aluminum Association, http://www.aluminum.org.

1.2.2 AASHTO - American Association of State Highway and Transportation Officials, http://www.aashto.org.

1.2.3 ACI - American Concrete Institute, http://www.aci-int.org.

1.2.4 AHA - American Hardboard Association, http://domensino.com/AHA.

1.2.5 AISC - American Institute of Steel Construction, https://www.aisc.org/

1.2.6 AISI - American Iron and Steel Institute, https://www.steel.org

1.2.7 AITC - American Institute of Timber Construction, http://www.aitc-glulam.org.

1.2.8 AMCA - http://www.amca.org.

1.2.9 ANSI - American National Standards Institute, http://www.ansi.org.

1.2.10 API - American Petroleum Institute, http://www.api.org.

1.2.11 ARI - Air Conditioning and Refrigeration Institute, 22209 http://www.ari.org.

1.2.12 ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers, http://www.ashrae.org.

1.2.13 ASME - American Society of Mechanical Engineers, United Engineering Centre, http://www.asme.org.

1.2.14 ASTM - American Society for Testing and Materials, http://www.astm.org.

1.2.15 AWCI - Association of the Wall and Ceiling Industries, http://www.awci.org.

1.2.16 AWMAC - Architectural Woodwork Manufacturers Association of Canada, http://www.awmac.com.

1.2.17 AWS - American Welding Society, http://www.amweld.org.

1.2.18 AWWA - American Water Works Association, U.S.A. 80235 http://www.awwa.org.

1.2.19 CFFM - Canadian Forces Fire Marshal, cmea-agmc.ca/new-canadian-forces-fire-marshal-cffm.

1.2.20 CGA - Canadian Gas Association, http://www.cga.ca.

1.2.21 CGSB - Canadian General Standards Board, www.tpsgc-pwgsc.gc.ca/ongc-cgsb.

1.2.22 CISC - Canadian Institute of Steel Construction, https://www.cisc-icca.ca.

1.2.23 COFI - Council of Forest Industries, http://www.cofi.org.

1.2.24 CRCA - Canadian Roofing Contractors Association, https://roofingcanada.com.

1.2.25 CSA - Canadian Standards Association, http://www.csa.ca.

1.2.26 CSC - Construction Specifications Canada, http://www.csc-dcc.ca.

1.2.27 CSDFMA - Canadian Steel Door and Frame Manufacturing Association https://csdma.org.

1.2.28 CSPI - Corrugated Steel Pipe Institute, http://www.cspi.ca.

1.2.29 CSSBI - Canadian Sheet Steel Building Institute, http://www.cssbi.ca.

1.2.30 CWC - Canadian Wood Council, http://www.cwc.ca.

1.2.31 EEMAC - Electrical and Electronic Manufacturers' Association of Canada, http://www.electro.ca.

1.2.32 FCC / CCFMFC - Fire Commissioner of Canada, http://www.ccfmfc.ca.

1.2.33 ICPI - Interlocking Concrete Pavement Institute, http://www.icpi.org/icpi.

1.2.34 IEEE - Institute of Electrical and Electronics Engineers, http://www.ieee.org.

1.2.35 ITC –Institute of Timber Construction, https://itc-sa.org.

1.2.36 MTO - Ministry of Transportation Ontario, www.mto.gov.on.ca.

1.2.37 MECP – Ministry of the Environment, Conservation and Parks, https://www.ontario.ca/page/ministry-environment-conservation-parks.

1.2.38 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry, http://msshq.org.

1.2.39 NAAMM - National Association of Architectural Metal Manufacturers, http://www.naamm.org.

1.2.40 NBC – National Building Code, https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-publications/national-building-code-canada-2015.

1.2.41 NFC – National Fire Code, https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-publications/national-fire-code-canada-2015.

1.2.42 NEMA - National Electrical Manufacturers Association, http://www.nema.org

1.2.43 NFPA - National Fire Protection Association, http://www.nfpa.org

1.2.44 NFSA - National Fire Sprinkler Association, Phttp://www.nfsa.org

1.2.45 NHLA - National Hardwood Lumber Association, http://www.natlhardwood.org

1.2.46 NLGA - National Lumber Grades Authority, nlga.org/en.

1.2.47 NRC - National Research Council, https://nrc.canada.ca/en.

1.2.48 NSF International, https://www.nsf.org.

1.2.49 OBC – Ontario Building Code, http://www.buildingcode.online.

1.2.50 PCI - Prestressed Concrete Institute, http://www.pci.org.

1.2.51 QPL - Qualification Program List, c/o Canadian General Standards Board, Place du Portage, http://w3.pwgsc.gc.ca/cgsb.

1.2.52 SAE - Society of Automotive Engineers, 400 Commonwealth Drive, http://www.sae.org.

1.2.53 SCC - Standards Council of Canada, http://www.scc.ca.

1.2.54 SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, http://www.smacna.org.

1.2.55 SSPC - Steel Structures Painting Council, http://www.sspc.org.

1.2.56 TTMAC - Terrazzo, Tile and Marble Association of Canada, http://www.ttmac.com.

1.2.57 UL - Underwriters' Laboratories, http://www.ul.com.

1.2.58 ULC - Underwriters' Laboratories of Canada, http://www.ulc.ca.

1.2.59 USACE - United States Army Corps Engineers, http://www.hnd.usace.army.mil.

2 PRODUCTS - NOT APPLICABLE

3 EXECUTION - NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1.1 Inspection and testing by the Owner, is not intended to relieve Contractor of responsibility but is a precaution against errors. Defective materials or workmanship, if found at any time prior to final acceptance of work, shall be rejected regardless of previous inspection.

1.2 Inspection

1.2.1 Allow the Engineer access to the Works at all times. If part of Work is prepared at locations other than the job site, allow access to such work whenever it is in progress.

1.2.2 Give timely notice requesting inspection if work is designated for special tests, inspections or approvals by the Engineer instructions.

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

1.2.4 The Engineer may order any part of the Works to be examined if work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such work and pay cost of examination and correction. If such work is found in accordance with Contract Documents, the Owner will pay the cost of examination.

1.3 Independent Inspection Agencies

1.3.1 The Owner and/or Engineer may engage a Testing Laboratory or Independent Inspection/Testing Agencies for the purpose of inspecting and/or testing portions of Work. The cost of such services will be borne by the Owner.

1.3.2 Provide equipment required for safe access to execute inspection and testing by appointed agencies.

1.3.3 Employment of inspection/testing agencies does not relieve the Contractor from responsibility to perform work in accordance with the Contract Documents.

1.3.4 If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Engineer at no cost to the Owner. The Contractor is to pay costs for retesting and re-inspection.

1.4 Liquid Leakage Tests

1.4.1 Before backfill has been placed against walls or any other activity that would prevent proper testing, test all liquid holding structures for leakage. Liquid retaining structures include:

.1 Reservoirs.

.2 Clearwells.

.3 Tanks.

.4 Channels.

.5 Wet wells.

1.4.2 The Works and leakage testing shall conform to all requirements of ACI 350.1-10 published by the American Concrete Institute, Farmington Hills, Michigan, except as modified by these Contract Documents.

1.4.3 The test method in Clause 1.4.2 shall also apply for testing of:

.1 Secondary containment structures.

.2 Precast concrete structures.

.3 Prefabricated structures made up of any material that are not governed by any other leakage test requirements.

1.4.4 Each cell of multi-cell containment structures shall be considered a single containment structure.

1.4.5 A leakage test is also required for any existing liquid holding structures that the Contractor has performed Work on, unless instructed otherwise by the Engineer.

1.4.6 Leakage test shall be conducted prior to installation of any coating or waterproofing.

1.4.7 Test all liquid holding structures for leakage by filling with water. The test water level shall be at the maximum liquid level indicated on the Contract Drawings.

1.4.8 Provide temporary plugs and barriers where necessary to facilitate the test. All containment structure penetrations and inlet/outlets shall be securely sealed to prevent the loss of water from the containment structure during the test.

1.4.9 If active dewatering is required to construct the liquid holding structure, the ground water level shall be kept at or below the base slab during the leakage test.

1.4.10 Repair all visible damage prior to filling the structure with water.

1.4.11 The Contractor shall be responsible for coordinating the supply of water for the leakage tests and for transferring water from one structure to the next for leakage test purposes. The Contractor shall also be responsible for final disposal of the water used for leakage testing.

1.4.12 Repeat test until leakage is less than the permitted amount.

1.4.13 Complete leakage tests and reduce leakage to the specified limit before applying waterproofing.

1.4.14 After installation of the connecting pipe work the Owner will supply sufficient water from the existing system to carry out the first test. Should any subsequent tests be required, water will be supplied, but at the Contractor’s expense.

1.5 Access to Work

1.5.1 Allow inspection/testing agencies access to the Works, off-site manufacturing and fabrication plants. Cooperate to provide reasonable facilities for such access.

1.5.2 Provide confined space access as required for inspection of the works.

1.6 Procedures

1.6.1 Notify appropriate agency and the Engineer in advance of requirement for tests, in order that attendance arrangements can be made.

1.6.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in work.

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

1.7 Rejected Work

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

1.7.2 Make good other contractor's work damaged by such removals or replacements promptly.

1.7.3 If it is the opinion of the Engineer that it is not expedient to correct defective work or work not performed in accordance with the Contract Documents, the Owner may deduct from Contract Price difference in value between work performed and that called for by Contract Documents, amount of which shall be determined by the Engineer.

1.8 Tests and Mix Designs

1.8.1 Furnish test results and mix designs as required by Specifications Sections or as requested by the Engineer. The cost of tests and mix designs beyond those called for in Contract Documents shall be appraised by the Engineer and may be authorized as recoverable.

1.9 Layout of Work

1.9.1 Where systems, piping and/or equipment are concentrated in a small work area, prepare interference drawings, per Section 01330, of the work to define potential conflicts or challenges in work sequencing, as requested by the Engineer.

1.9.2 Plan the total installation by preparing a minimum 1:50 scale reproducible interference drawing detailing the location and identifying each system to the Engineer for review. Include for work of all disciplines on drawing.

1.9.3 Install systems and products to provide the maximum headroom, clearances for access, specified floor to ceiling heights, and to minimize offsets in pipes, conduit, ducts and structural framing.

1.9.4 Run pipes, ducts, tubing and conduit plumb or level (except where specific slope is required for proper function) and parallel with building surfaces.

1.9.5 Notify the Engineer and request clarification if locations of fixtures, fittings, equipment and services to these items interfere with interior finishes and use of the work.

1.10 Mill Tests

1.10.1 Submit mill test certificates as required by Specifications Sections or as requested by the Engineer.

1.11 Equipment and Systems

1.11.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

1.12 Minimum Standard

1.12.1 The Specifications and the Contract Drawings define a minimum standard of Workmanship. The Contractor shall include in the Tender, the cost of any additional work or improvements in the quality of the Works that the Contractor considers necessary to unconditionally guarantee the performance of the completed work in conformity with the Contract through the Warranty Period.

1.13 Workmanship

1.13.1 The quality of the workmanship and finished product shall present a neat and attractive appearance when finished.

1.13.2 If ordered by the Engineer, the Contractor shall make enough openings in the Works and/or materials as are necessary to inspect the works.

1.13.3 Should the Engineer find the work and/or materials so opened up to be faulty in any respect, the Contractor shall remove and make good all defective work and/or materials and shall bear the expense of all such opening, inspecting, and making good.

1.13.4 Should the Engineer find the work and/or materials so opened up to be in acceptable condition, the expense of such opening and closing will be borne by the Owner.

2 PRODUCTS - NOT APPLICABLE

3 EXECUTION - NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 Section Includes

1.1.1 Temporary utilities for the work including power, water, heating, ventilation, telephone and internet communication to be used during construction.

1.1.2 The Contractor shall install and pay for all temporary utilities.

1.2 Installation and Removal

1.2.1 Provide temporary utilities and controls in order to execute work properly, safely and expeditiously.

1.2.2 Remove all temporary works from site after use, unless otherwise directed by the Engineer or specified in this specification. Work for the Engineer's site office will not be removed.

1.2.3 Make all necessary applications, obtain permits and pay for all hook-ups, fees, charges for service and use.

1.3 Localized Unwatering

1.3.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water. Unwatering pumps shall be electrical to keep the noise of running motors to a minimum.

1.3.2 Dispose of all groundwater and surface water runoff in a manner approved by the Engineer and Owner, as per Section 01400 – Environmental Protection.

1.4 Temporary Water Supply

1.4.1 The Contractor shall make arrangements with the Owner for a continuous supply of potable water for construction use, if required. The Contractor shall connect to water supply and meter this supply for record and billing purposes. The Contractor must employ all reasonable steps and precautions to conserve water supplied. The connection point and method of connection will be subject to the approval of the Engineer and the Owner. A backflow prevention device meeting applicable code requirements must be supplied and installed at the point of connection by the Contractor.

1.4.2 Enough water will be provided once only by the Owner for the purpose of filling and disinfecting the following facilities:

.1 Elevated tank.

.2 Process piping.

1.4.3 Should the initial attempt at disinfecting not pass all testing requirements as stipulated by the Contract Documents, additional water for disinfecting purposes will be provided by the Owner at the Contractor's sole expense.

1.5 Temporary Heating and Ventilation

1.5.1 Any construction heaters used inside a building must be vented to the outside or be flameless type. Solid fuel salamanders are not permitted.

1.5.2 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 safe working environment.

1.5.3 Maintain inside temperatures above a minimum of 13°C in areas and adjacent to areas where construction is in progress or ongoing.

1.5.4 Ventilating:

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

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

.3 Dispose of exhaust materials in 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 time after cessation of work process to assure removal of harmful contaminants.

1.5.5 The Contractor shall provide its own temporary heating and ventilation system to facilitate construction of the Works. If the permanent heating and ventilation system is used, then all maintenance requirements for the system shall be performed by the Contractor prior to substantial performance of the works. The Contractor shall perform maintenance as recommended by the system manufacturer and required by the Owner. All maintenance activities performed by the Contractor shall be documented and submitted to the Engineer and Owner.

1.5.6 Substantial Performance will not be issued until the entire system is as near original condition as possible and is certified by the Engineer.

1.5.7 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.

1.5.8 Be responsible for damage to the Works due to failure in providing adequate heat and protection during construction.

1.6 Temporary Power

1.6.1 The Contractor shall provide electric power distribution equipment, cabling and panels for both construction of the Work and to feed the temporary construction trailers. The Contractor shall determine the type and amount of power required and provide the necessary connections and metering equipment to connect to the existing Wallaceburg Elevated Water Tank power supply. The Contractor shall pay all costs for the electric power used during the Contract Time, except for the portions of the Work, if any, which have been designated in writing by the Engineer as being substantially performed and which have been assumed by the Owner.

1.6.2 The Contractor shall replace any blown fuses or damaged breakers and repair any other damage caused. The Contractor shall provide extension cords as required. The Contractor shall not overload circuits beyond their rated capacities.

1.6.3 The Contractor shall provide ground fault protection for all electrical equipment.

1.6.4 The Contractor shall notify and make arrangements with the Utility Company for the temporary connection and supply of electric power for construction of the Works.

1.6.5 The Contractor shall be responsible for payment of direct charges to the Utility Company for the provision of electric power for construction of the Works.

1.6.6 The Contractor may provide their own portable generators for power generation, inclusive of fuel, operation and maintenance, size appropriately for the intended work. The generator must be noise attenuated to 45dB units from at least 5 m distance under any operating condition.

1.7 Temporary Lighting

1.7.1 The Contractor shall provide temporary lighting to meet all applicable safety requirements to allow for erection, application, or installation of materials and equipment, and observation or inspection of the Work.

1.7.2 The existing lighting systems may be used at no cost and to the extent possible during construction. The Contractor shall provide additional lighting as required. When the Work is complete, the Contractor shall clean all permanent fixtures and lamps that have become soiled by the performance of the Work.

1.7.3 The Contractor shall secure all temporary lighting and wiring from damage, falling or tripping hazards.

1.8 Temporary Communication Facilities

1.8.1 The Contractor will provide and pay for a high-speed internet service and related equipment necessary for the Contractor’s and Engineer’s own uses and to facilitate on-line project collaboration.

1.9 Fire Protection

1.9.1 Provide and maintain temporary fire protection equipment during performance of the Works required by governing codes, regulations and bylaws.

1.9.2 Burning rubbish and construction waste materials is not permitted on site.

2 PRODUCTS - NOT APPLICABLE

3 EXECUTION - NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 Security

1.1.1 The Contractor shall assume overall responsibility for security of the site, during construction. Security deemed necessary for protection against loss or damage of any equipment on site in relation to the project shall be the sole responsibility of the Contractor.

1.1.2 Confine work and operations of employees as required by Contract Documents. Do not unreasonably encumber premises with products.

1.1.3 Prohibit the committing of nuisance on the site and any employee found violating such a provision shall be promptly discharged.

1.2 Sanitary Facilities

1.2.1 Provide sufficient sanitary facilities for all persons employed on the Contract subject to approval of type, size and location by the local health authorities and the Engineer.

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

1.2.3 Leave site in a clean sanitary condition.

1.3 Construction / Engineer Offices

1.3.1 Provide one construction office heated to 22°C, lighted to 750 Lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table, telephone and e-mail.

1.3.2 The office shall be provided with a floor 0.3 m above grade, complete with four 50% opening windows and two lockable doors. Include for building water, sewage, power and utility rental (phone, internet and fax) costs for duration of contract. The Contractor may provide a construction trailer with two rooms. One separate lockable office sized room for the Engineer with a separate door and/or entrance, and the other larger room as the construction office and kitchen.

1.3.3 Insulate building including floor and roof and provide electric heating system to maintain 22°C inside temperature at -20°C outside temperature.

1.3.4 Provide air conditioner for ventilation and to maintain maximum temperature of +22°C at +30°C outside temperature.

1.3.5 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.

1.3.6 Install electrical lighting system to provide min 750 Lx using surface mounted, shielded commercial fixtures with 10% upward light component.

1.3.7 Arrange and pay (including monthly rentals) for the duration of the contract and issuance of final certificate:

.1 High speed Internet connection or stick complete with required hardware, software, installation and setup for the Engineer's site representatives. Contractor to arrange and pay monthly costs for service.

.2 Plain paper facsimile / photocopier / printer / scanner with wi-fi capability and the following minimum features: (Single function or rental equipment is also acceptable.)

.1 Built-in Ethernet, 1 USB 2.0 Port with wireless router

.2 Colour function required for copy, print and scan

.3 Copy resolution (Black): up to 1200 dpi

.4 Print resolution (Colour): up to 600 x 600 dpi

.5 Scan resolution: up to 1200dpi

.6 Max scan size: 11" x 17"

1.3.8 Provide the following list of clean lightly used furniture and equipment to furnish the field office:

.1 Eight to ten conference chairs – Tube steel frame with high grade fabric padded seat & back. Chairs should be stackable with black vinyl arm rests.

.2 One conference table to accommodate 8 - 10 chairs.

.3 Standard double-pedestal desk with lockable drawers complete with two (2) sets of keys.

.4 Standard swivel-type adjustable office chair.

.5 One 750mm x 1500mm desk having three lockable drawers, typing table and guest chairs.

.6 One standard four drawer, legal size, lockable, steel filing cabinet with three sets of keys.

.7 One 1.0 m x 2.5 m sloping plan table with one drafting stool.

.8 Two wastepaper baskets.

.9 One lockable steel storage cabinet with adjustable shelves, 36" w x 16" d x 72" h.

.10 One coat rack & shelves.

.11 One 3' x 4' bulletin boards.

.12 One 4-tier heavy duty storage shelves.

.13 Sink with potable water, refrigerator and microwave.

.14 Touchless hand sanitizer dispenser c/w refills for duration of contract.

1.3.9 The Engineer will use all the office furnishings and equipment for Contract Administration of the project.

1.3.10 Maintain office equipment including installation, troubleshooting, repairs and toner.

1.3.11 Provide twice weekly broom clean both trailers and daily garbage removal.

1.3.12 Maintain documents and materials on-site, in the construction office, in accordance with these specifications.

1.3.13 Maintain documents in order and make available for viewing by Engineer and Ministry of Labour Inspector at all times.

1.4 Storage Sheds

1.4.1 Provide adequate weather tight sheds with raised floors, for storage of materials, tools and equipment, which are subject to damage by weather.

1.4.2 Provide heated storage structures.

1.4.3 Maintain storage sheds in a neat and clean condition.

1.5 Scaffolding and Supports

1.5.1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs required to complete the work.

1.5.2 Do not load or permit the loading of any part of the Works with a weight or force that will endanger the Works.

1.6 Construction Parking

1.6.1 Parking will be permitted in areas as approved by the Engineer, provided it does not disrupt plant maintenance vehicles nor the performance of operations staff.

1.6.2 Provide and maintain adequate access to project site.

1.6.3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.6.4 If existing access roads are maintained by the Owner including snow removal, do not store materials or modify the road that will affect snow clearing. Any damages resulting from the Contractors negligence will be the responsibility of the Contractor.

1.6.5 When site space is not adequate, arrange for and/or maintain additional off-site parking.

1.7 Hoisting

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

1.7.2 All hoists and cranes shall be operated by qualified operators.

1.8 Temporary Barriers and Enclosures

1.8.1 Provide temporary barriers to prevent unauthorized entry to construction, site office and on-site parking areas, and to protect existing facilities and adjacent properties from damage from the Contractor's operations.

1.8.2 Where appropriate, equipment barriers with vehicular and pedestrian gates with locks.

1.8.3 Provide security and facilities to protect the Work and the Site from unauthorized entry, vandalism and theft.

1.8.4 Maintain a log of workers and visitors and make the log available to the Engineer upon request. Include the date, name, address and company employed by, company/ person invited, time in and time out for each person, and record deliveries and security incidents.

1.9 Temporary Connections and Staging of Work

1.9.1 The Contractor is fully responsible for the installation, maintenance and eventual removal of all temporary connections required to complete the works.

1.9.2 A staging and shutdown plan for these connections must be prepared and submitted to the Engineer for approval at least 14 days in advance of this work.

1.10 Removal of Temporary Facilities and Controls

1.10.1 Remove temporary utilities, equipment, facilities, materials prior to the Substantial Performance inspection.

1.10.2 Remove underground installations to a minimum depth of 600 mm. Grade and restore the Site as indicated on the drawings or in the specifications.

1.10.3 Clean and repair damage caused by installation or use of temporary work. Restore existing facilities used during construction to their original and functional condition

END OF SECTION

1 GENERAL

1.1 Description

1.1.1 This section provides the general equipment stipulations that apply to all products, materials and equipment provided for this contract. These requirements are in addition to the detailed requirements that may be covered under individual equipment specification or manufacturer specific requirements.

1.2 Reference Standards

1.2.1 Conform to standards, in whole or in part as requested in each of the specifications.

1.2.2 If there is a question as to whether any product or system is in conformance with applicable standards, the Engineer reserves the right to have such products or systems tested to prove or disprove conformance.

1.2.3 The cost for such testing will be borne by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.

1.2.4 Conform to the latest date of issue of referenced standards in effect on date of submission of Tender, except where specific date or issue is specifically noted.

1.3 Quality

1.3.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in the Works shall be new, not damaged or defective, and of best quality (compatible with specifications) for purposes intended. If requested, furnish evidence as to type, source and quality of products provided.

1.3.2 Defective products identified prior to completion of the Work will be rejected regardless of previous inspections. Inspection by the Engineer or any agent of the Owner at no time relieves the Contractor from responsibility for the supply of acceptable quality products.

1.3.3 Remove and replace defective products at own expense and be responsible for delays and expenses caused by the rejection of defective products.

1.3.4 Should any dispute arise as to the quality or fitness of any products, the decision to accept the product(s) rests strictly with the Engineer based upon the requirements of the Contract Documents.

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

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

1.4 Availability

1.4.1 Immediately upon signing the Contract, review the product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify the Engineer of such, in order that substitutions or other remedial action may be considered and authorized in ample time to prevent delay in performance of the work.

1.4.2 In the event of failure to notify the Engineer at commencement of the Works and, should it subsequently appear that the Works may be delayed for such reason, the Engineer reserves the right to substitute more readily available products of similar character, at no increase in the Contract Price or at no change to the Contract Time.

1.5 Storage, Handling and Protection

1.5.1 Handle and store products in a manner so as to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions.

1.5.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until they are to be incorporated in the Works.

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

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

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

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

1.5.7 Store and mix paints in heated and ventilated areas. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

1.5.8 Remove and replace damaged products at own expense and to the satisfaction of the Engineer.

1.5.9 Touch-up damaged factory finished surfaces to the Engineer's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 Transportation

1.6.1 Pay the costs of transportation of products required in performance of the Works.

1.6.2 Transportation cost of products supplied by the Owner will be paid for by the Owner.

1.6.3 Unload, handle and store such products at the Works.

1.7 Manufacturer's Instructions

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

1.7.2 Notify the Engineer in writing of conflicts between Specifications and manufacturer's instructions. The Engineer will clarify or establish the most appropriate solution to the conflict.

1.7.3 Improper installation or erection of products, due to failure in complying with manufacturer's instructions, authorizes the Engineer to require removal and re-installation at no increase in the Contract Price or at no change to the Contract Time.

1.8 Coordination

1.8.1 Ensure the cooperation of all work in the layout of the Works. Maintain efficient and continuous supervision over the entire works.

1.8.2 Be responsible for construction and placement of openings, sleeves, accessories and any materials or work necessary to fully coordinate all of the Works outlined in the Specifications.

1.8.3 Before installation, inform the Engineer of all potential interferences and complete installation as directed by the Engineer.

1.9 Concealment

1.9.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings or as indicated on drawings and specifications.

1.10 Remedial Work

1.10.1 Perform remedial work required to repair or replace parts or portions of the Works identified as defective or unacceptable. Coordinate adjacent affected work as required.

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

1.11 Material Fasteners

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

1.11.2 Prevent electrolytic action between dissimilar metals and materials by providing isolation kits, gaskets or some other manner of isolation as directed by Engineer.

1.11.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other materials are specifically requested in the affected Specifications. This clause will only apply if fastener and anchor material is not identified elsewhere.

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

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

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

1.12 Equipment Anchorage

1.12.1 Use anchors of standard commercial sizes and patterns with material and finish suitable for service.

1.12.2 Use heavy hexagon head bolts, semi-finished unless otherwise specified or required by the vendor. Use No. 304 stainless steel as a minimum for all areas unless indicated otherwise on the Contract Drawings or affected specifications.

1.12.3 Anchor bolts shall not project more than one diameter beyond nuts.

1.12.4 Use No. 304 SS type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.13 Protection of Work In Progress

1.13.1 Adequately protect the work completed or in progress. Work damaged or defaced, due to a failure to provide protection, is to be removed and replaced, or repaired, as directed by the Engineer, at no increase in the Contract Price or at no change to the Contract Time.

1.13.2 Prevent overloading of any part of the building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated, without written approval of the Engineer.

END OF SECTION

1 GENERAL

1.1 Description

1.1.1 This section describes the cleaning requirements for existing facilities and the project site.

1.2 Cleaning of Existing Facilities

1.3 The Owner will arrange to drain the existing tank or conduits.

1.4 The Contractor will be responsible for cleaning the sludge or other debris on the interior of the existing elevated tank or conduits with a low-pressure water wash.

1.5 Thoroughly clean and make available to the Engineer for a complete inspection to document the condition of the steel and welds and any visible repair areas.

1.6 All wash water, sediment accumulation, and any other foreign matter shall be removed from the elevated tank prior to commencing interior paint removal.

1.7 The Contractor shall utilize a vacuum excavation (vac-ex) truck for the cleaning process. Water and sediment must be discarded at an approved location.

1.8 The Contractor is to provide a pre-cleaning plan to the Engineer for review and approval.

1.9 Project Cleanliness

1.9.1 Maintain the Works in tidy condition, free from accumulation of waste products and debris, other than that caused by the Owner or other contractors.

1.9.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Engineer. Do not burn waste materials on site.

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

1.9.4 Provide onsite drum containers for collection of waste materials and debris.

1.9.5 Provide and use clearly marked separate bins for recycling.

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

1.9.7 Dispose of waste materials and debris off site.

1.9.8 Clean interior areas prior to the start of finish work and maintain areas free of dust and other contaminants during finishing operations.

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

1.9.10 Provide adequate ventilation while using volatile or noxious substances. The use of building ventilation systems is not permitted for this purpose.

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

1.9.12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces and will not contaminate building systems or electrical or control panels.

1.10 Final Cleaning

1.10.1 Prior to Substantial Performance or Completion or the Works, remove surplus products, tools, construction machinery and equipment not required for performance of remaining work.

1.10.2 Remove waste products and debris other than that caused by others, and leave the Works clean and suitable for occupancy.

1.10.3 Remove waste products and debris other than that caused by the Owner or other contractors.

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

1.10.5 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

1.10.6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

1.10.7 Clean lighting reflectors, lenses, and other lighting surfaces.

1.10.8 Vacuum clean and dust building interiors, behind grilles, louvres, screens and electrical control panels.

1.10.9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

1.10.10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces or grounds.

1.10.11 Remove dirt and other disfiguration from exterior surfaces caused by construction.

1.10.12 Clean, sweep and wash all paved or concrete areas affected by construction.

1.10.13 Clean equipment and fixtures to a sanitary condition and clean or replace filters of mechanical equipment.

1.10.14 Ensure downspouts, and drainage systems have not become blocked by construction activities. Clean and remove blockages if required.

1.10.15 Remove debris and surplus materials from crawl areas and other accessible concealed spaces

END OF SECTION

1 GENERAL

1.1 Intent of Section

1.1.1 This section covers the flushing and disinfection of water retaining structures, and in-plant potable water process piping.

1.1.2 The Contractor shall be responsible to flush, test and sterilize all structures and pipework in such lengths or sections as the Engineer shall direct, and provide all labour, water, chemicals and chemical metering equipment, pumps, gauges, caps, stoppers, air release cocks, pipework and other apparatus required to complete the tests. The Contractor shall employ qualified specialists if necessary.

1.2 Acceptable Specialist Sub-contractor

1.2.1 The specialists shall be fully experienced in providing disinfection services of water retaining structures, and potable water process piping and shall provide references of disinfection work completed for other elevated water tower projects in Ontario if requested. Should the Contractor intend on completing the disinfection work themselves, they shall provide references of their experience to the Engineer for review and approval. The Engineer reserves the right to reject the Contractors experience and the Contractor shall use one of the acceptable specialist sub-contractors listed below at no extra cost to the Owner.

1.2.2 Acceptable Specialist Sub-contractors include:

.1 Corix Group of Companies

.2 Jackson-Tkach Inc.

.3 Canadian Pipeline Cleaning Inc.

2 PRODUCTS - NOT APPLICABLE

3 EXECUTION

3.1 Disinfection Standards

Infrastructure in continuous contact with potable water shall be disinfected in accordance with the requirements of the following ANSI/AWWA Standards.

ANSI/AWWA Standard	Standard Name
C651-14	Disinfecting Water Mains
C652-19	Disinfection of Water-Storage Facilities
C653-20	Disinfection of Water Treatment Plants

3.1.1 Should there be conflicts between the above-noted standards or with the specifications, the more stringent provisions shall apply between the two.

3.2 Disinfection of Water Retaining Structures

3.2.1 The Contractor shall submit a disinfection plan and methodology for all piping and water retaining structures for review by the Owner and the Engineer, at least fifteen (15) working days before disinfection is proposed to be carried out.

3.2.2 Prior to placing water retaining structures into service, the Contractor shall disinfect water retaining structures per this specification. All disinfection operations shall be supervised by the Engineer, Owner and Operating Authority.

3.2.3 Disinfection of water retaining structures shall be carried out in accordance with the requirements of the appropriate standard referenced in the table above.

3.2.4 Disinfection shall not commence until components have been cleaned and thoroughly flushed.

3.2.5 After the disinfection procedure is completed and before the facilities are placed in service, water shall be sampled and tested for chlorine residual and coliform organisms in accordance with the relevant standard.

3.3 Bacteriological Sampling and Testing

3.3.1 Before a water storage facility or treatment facility is placed in service, bacteriological sampling and testing shall be performed in accordance with the above-noted respective AWWA Standard, and the *Safe Drinking Water Act*, Ontario Regulation 170/03.

3.3.2 The water samples for bacteriological testing shall be taken by the Operating Authority for the existing water system only.

3.3.3 The Operating Authority shall be responsible for sending the samples to a registered laboratory for testing.

3.3.4 Analytical fees for the initial round of sampling will be absorbed by the Operating Authority. The Contractor will be responsible for fees related to additional samples submitted due to failed results plus any costs associated with providing additional water.

3.4 Discharge of Chlorinated Water

3.4.1 Safely dispose of all chlorinated water from draining operations or used for testing, flushing or disinfecting waterworks.

3.4.2 Do not discharge any untreated chlorinated water into any storm sewer, watercourse or sanitary sewer.

3.4.3 A reducing agent to neutralize residual chlorine shall be applied to the chlorinated water used for the disinfection of treatment facilities and water retaining structures and piping prior to discharge to the environment, in accordance with the requirements of the appropriate above-noted AWWA Standard or MECP regulation. The Contractor will bear all associated costs with the materials and labour required for dechlorination and discharge of chlorinated water.

3.4.4 Approved dechlorinating agents:

.1 Hydrogen Peroxide

.2 Sulphur Dioxide.

.3 Sodium Bisulphate.

.4 Sodium Metabisulphate.

3.4.5 In all cases, the wasted water must be neutralized to provide a total chlorine residual of less than 0.002 mg/L at the outfall where detrimental effects may be suffered by plants and/or animals in the natural environment. The Contractor is responsible for monitoring and testing the discharge of all wastewater in the presence of the Engineer. Should test results show a residual of greater than 0.002 mg/L, the discharge shall be ceased immediately, and the procedure modified to meet the requirement of less than 0.002 mg/L of total chlorine.

3.4.6 Notify the following authorities regarding the method to be used to dechlorinate potable water and obtain approval from the Engineer prior to discharge of any chlorinated water to the environment:

.1 For drainage ditches and storm sewers, notify the Owner.

END OF SECTION

1 GENERAL

1.1 Description

1.1.1 This Section specifies requirements for work during Warranty Period.

1.1.2 The duration of the Warranty Period shall be twenty four (24) months.

1.2 General

1.2.1 Provide all warranties outlined in the Contract Documents from the time of Substantial Performance or Completion of the Works.

1.2.2 Perform warranty work required during progress of the work and during the Warranty Period. Reference section 01770 Closeout Procedures, 01780 Closeout Submittals and the General Conditions.

1.2.3 Extend warranties on any piece of equipment or component of the Work that is required to be placed in operation prior to Substantial Performance for the purpose of complying with the sequence of construction.

1.3 Submittals

1.3.1 Inform the Engineer in writing of the arrangements made for carrying out warranty work during the Warranty Period.

1.3.2 Provide a telephone number, email address and mailing address for receipt of notices relating to matters requiring action by the Contractor during the Warranty Period.

1.4 Inspection and Declaration of Final Completion

1.4.1 Request inspection for Final Completion no later than 10 working days before the expiry of the Warranty Period.

1.4.2 Participate in a joint inspection of the Works for the purpose of establishing Final Completion. Arrange for, coordinate and pay for any special access required to inspect the Works, such as the draining of tanks.

1.4.3 Review the status of all Warranty items carried out during the Warranty Period with the Engineer.

1.4.4 Complete all outstanding deficiencies, repair noted defects, complete all outstanding warranty items and obtain the Engineer’s written agreement that all works are complete in accordance with the Contract Documents.

1.4.5 Apply for Final Completion.

1.5 Work during Warranty Period

1.5.1 Perform all warranty work required upon receipt of verbal or written notices from the Engineer.

1.5.2 Repair or make good settlements and defects on surfaces of backfilled trench or excavations.

1.5.3 Repair all damages to structures caused by settlement of ground adjacent to or over excavation.

1.5.4 Maintain all trees and shrubs either planted or relocated for the duration of the Warranty Period.

1.6 Repair by Owner

1.6.1 The Owner will, without giving notice to the Contractor, repair shrinkages or defects that are dangerous in nature, that constitute an extreme emergency or that affect the operation of the Works. The Contractor will be notified of less serious conditions prior to work being performed.

1.6.2 The Engineer will notify the Contractor of emergency work performed by the Owner.

1.6.3 The cost of labour, equipment and material to perform emergency work will be charged to the Contractor

END OF SECTION

1 GENERAL

1.1 Section Includes

1.1.1 Procedures for the purpose of issuance of Substantial Performance and Completion of the Works.

1.2 Final Cleaning

1.2.1 Execute final cleaning per Section 01740 – Cleaning prior to Substantial Performance of the Work.

1.2.2 Clean debris from drainage systems or swales.

1.2.3 Clean the Site; sweep paved areas and rake clean landscaped surfaces.

1.2.4 Maintain cleaning until acceptance by the Owner.

1.3 Restoration

1.3.1 As a minimum, restoration shall mean replacement, repairs, or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Work.

1.3.2 Except where specifically required otherwise by other Sections, restore areas of the Work and areas affected by the performance of the Work to conditions that existed prior to commencement of the Work and to match condition of similar adjacent, undisturbed areas.

1.3.3 Ensure that restored areas match existing grade and surface drainage characteristics, except as otherwise specified, and ensure a smooth transition from restored surfaces to existing surfaces.

1.3.4 Do not alter original conditions without prior written approval from the Engineer.

1.3.5 Without limiting the generality of the foregoing or other requirements of the Contract Documents, preserve and protect existing features encountered at the Site during performance of the Work including, but not limited to buildings, wells, yard hydrants, structures, fences, utilities, access roads, grassed areas, trees and other graded or improved areas.

1.3.6 Utilize construction methods and procedures during performance of the Work which keeps disturbance and damage of whatever nature to existing conditions to the practical minimum. Where work necessitates root or branch cutting, do not proceed without the Engineer's prior approval.

1.3.7 Ensure that quality, grades, elevations, and the extent of bedding, cover, and other backfill materials including subgrades, finish grades, and thickness of materials for roadways are properly documented during their removal to ensure reconstruction to at least their original and functional condition.

1.3.8 Restoration Material: New, except as otherwise specified, not damaged or defective, and of the best quality for the purpose intended. Furnish evidence as to type, source, and quality of materials or products furnished when requested by the Engineer or specified in other Sections.

1.3.9 Should any dispute arise as to the quality or fitness of materials, whether obtained on or off Site, whether previously inspected by the Engineer prior to use or not, the decision to use any material or product in the finished Works will rest solely with the Engineer.

1.3.10 Remove from the Site clean material not approved for reuse.

1.3.11 Handle and store products and materials in a manner to prevent damage, adulteration, deterioration, and soiling and in accordance with manufacturers' instructions when applicable.

1.3.12 Prior to commencement of restoration work, inform the Engineer of proposed material, methods, and procedures to repair, replace, or reconstruct disturbed, damaged, or suspected damage to the Work.

1.3.13 Perform cutting, fitting, remedial, and coordination work to make the several parts of the Work fit together.

1.3.14 Except as specified otherwise, dismantle and salvage materials for reuse where practicable.

1.3.15 Exercise due care when removing material for salvage. Repair or replace materials damaged through improper handling or through loss after removal.

1.3.16 Store and protect removed material approved for reuse in approved locations. Beginning of restoration work means acceptance of existing conditions.

1.3.17 Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.

1.4 Inspection and Declaration of Substantial Performance

1.4.1 Contractor's Inspection: The Contractor and all Subcontractors shall conduct an inspection of the Work, identify deficiencies and defects, and repair as required to conform to the Contract Documents.

1.4.2 Notify the Engineer in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made and request the Engineer's Inspection no later than ten (10) working days before the expected Substantial Performance date.

1.4.3 Owner and Operations staff to attend inspection with Engineer and Contractor.

1.4.4 Substantial Performance: Submit a written certificate that the following has been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed to a dollar value per the General Conditions of the Contract.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Electrical inspections and approvals are complete and submitted.

.5 All required documentation has been submitted per Section 01780 Closeout Submittals.

.6 Operation of systems has been demonstrated to the Owner and Operations staff.

.7 All required training has been delivered.

.8 Work is complete and ready to be used for the purposes intended.

1.4.5 Agree to a list of outstanding work and deficiencies that do not affect Substantial Performance with the Engineer.

1.4.6 Apply for Substantial Performance.

1.5 Total Completion

1.5.1 Complete all remaining outstanding work and deficiencies within the timeframe stipulated in the Bid Form or within the dollar value per the General Conditions of the Contract.

1.5.2 Final Inspection: When all the outstanding items and deficiencies that did not affect Substantial Performance have been completed, request final inspection of the Works by the Engineer and the Owner.

1.5.3 Complete any outstanding work or deficiencies arising out of the final inspection that are deemed to affect issuance of the Completion Payment Certificate.

2 PRODUCTS – NOT APPLICABLE

3 EXECUTION – NOT APPLICABLE

END OF SECTION

1 GENERAL

1.1 Section Includes

1.1.1 As-Recorded drawings, samples, and specifications.

1.1.2 Equipment and systems.

1.1.3 Product data, materials and finishes, and related information.

1.1.4 Operation and maintenance data.

1.1.5 Spare parts, special tools and maintenance materials.

1.1.6 Warranties and bonds.

1.1.7 Final site survey.

1.2 Submission

1.2.1 Prepare instructions and data by personnel experienced in the maintenance and operation of described products and submit two hardcopies for the Engineer's review.

1.2.2 One copy will be returned with comments and one copy will be retained to assist the Engineer and will be returned after delivery of the final copies.

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

1.2.4 Ensure spare parts, maintenance materials and special tools provided are new, undamaged and not defective, and of the same quality and manufacture as products provided in the Works.

1.2.5 If requested, furnish evidence as to type, source and quality of products provided.

1.2.6 Defective products will be rejected, regardless of any previous inspections by the Engineer or other agents of the Owner. Defective products to be replaced at the Contractor's expense.

1.2.7 Pay the costs of transportation related to replacement of defective products.

1.3 Operation and Maintenance Data

1.3.1 Manual

.1 An organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual Sections of Divisions 02 to 16.

1.3.2 General

.1 Provide three hardcopies of documentation including as-constructed shop drawings to instruct the Owner's operations and maintenance staff in the operation and associated maintenance of each piece of equipment and system as supplied and installed. The following description is provided to the Contractor to describe the general requirements of the Operation and Maintenance Manuals. All information may not apply in all cases. Similarly, the Contractor may be required to provide additional information to adequately describe the equipment.

.2 The Contractor will prepare a skeleton of the O&M Manual including table of contents, section tabs and scale mock-up of printing proposed. The Contractor will provide all the documentation required for the completed O&M Manuals before commencement of the start-up period. No payment for any work will be made over 90% of the Contract value until all documentation for the completed O&M Manuals are received and accepted as satisfactory. For the purpose of this Section, Contract Value will be equal to the Total Tender Price less applicable taxes and Contingency Allowance, plus approved Change Orders.

.3 In construction projects where work is carried out in distinct stages, the relevant portion of the manual will be required for that section of the work prior to equipment start-up. If completed documentation for this section of the work is not available, further payment will be withheld.

1.3.3 Contents

.1 Provide the material in volumes as described below. It is not necessary that each volume be in a separate binder. However, the arrangement must be approved by the Engineer. Where a binder is nearly full, the material of the next volume will be in a separate binder.

.1 Volume 1 – Operating Manual

.2 Volume 2 – Architectural/Structural Maintenance

.3 Volume 3 – Mechanical Operations and Maintenance

.4 Volume 4 – Electrical and Instrumentation Operations and Maintenance.

.1 Provide the following information for each system and major piece of equipment. Refer to each piece of equipment by its name and tag number. Where manufacturer's literature covers several models or options, highlight the applicable information and cross out redundant information.

.1 Index of information in that section in order of appearance.

.2 Description of system, components and technical data. Include interfaces, sequences, operations, characteristics changes for seasonal operation.

.3 Maintenance and operating instructions, including:

.1 Installation instructions

.2 Procedure for starting

.3 Proper adjustment

.4 Test procedures

.5 Procedure for operating

.6 Procedure for shutdown

.7 Safety precautions

.8 List of electrical relay settings and control and alarm contact settings.

.1 Troubleshooting data

.2 Preventative maintenance program complete with:

1. Suggested check list sheets
2. List of points to be greased or oiled
3. Recommended type, grade and temperature range of lubricants
4. List of wear points to be inspected and/or adjusted regularly
5. Suggested schedule of lubrication and inspection

.9 Schematic, single line and wiring diagrams

.10 Valve tag list

.11 Recommended spare parts list

.12 Certification, guarantee, warranty

.13 Service representatives – name, address and telephone number

.14 Suppliers for replacement parts – name, address and telephone numbers

.15 Test results; witness testing and commissioning, reports

.16 Test data for piping systems (degreasing, flushing, disinfection)

.17 Hydrostatic or air tests performance

.18 Equipment alignment certificates

.19 Balancing data for air and water systems

.20 Inspection approval certificates for all types of systems; plumbing and piping, hot air and ventilating, electrical supervisory, etc.

1.3.4 The material submitted in accordance with the contractual requirements for "As-Constructed Shop Drawings" is generally bulky and difficult to file in a binder. If requested by the Engineer, provide copies of all "As-Constructed Shop Drawing" material in a single drawer legal size cardboard file cabinet. Arrange in accordance with the Construction Specifications Institute. Identify any material located in the file cabinet as such in the appropriate location in the binders.

1.3.5 At the Engineer's discretion, provide the information in plastic map pockets in appropriate sections in the binders.

.1 Binders

.1 Binders shall be large capacity, expanding/catalogue type for 11 x 8-1/2 sheets with expanding, lockable posts, 2" to 4", or 3" to 5" capacity, having fully hinged (metal, piano type) hard covers bound in heavyweight black fabricord with custom embossed gold lettering. Allow minimum 1/4" empty space inside each binder. Binders: ACCO 50505 05426, 50505 05436, or equal.

.2 The custom embossed gold lettering on the front cover and spine must include: the name of the Owner, Contract No., Contract Title, Owner Logo, "Operation & Maintenance Manual" title, Volume x of y number, Divisions included, and Set x of y number. Template for spine and cover page attached.

.3 Binder accessories – Sections will be separated with the divider pages with labelled printed indexes (side tabs) and reinforces with a rip-proof, three hold punched strip, or similar protection. Drawings will be folded and inserted in labelled clear plastic binder type pockets/sleeves (page protectors). CDs, DVDs, and other electronic media will be placed in labelled, clear plastic, static free binder type holder sheets.

.2 Provide one electronic pdf copy on USB and three individually bound hardcopies of completed Operations and Maintenance Manuals in accordance with Section 01700– Contract Closeout.

1.4 Record Drawings and Samples

1.4.1 The Owner will supply a set of contract drawings. Mark thereon all revisions in red ink as the job progresses to produce a set of record drawings.

1.4.2 Dimension locations (vertically and horizontally) of buried or concealed work, especially piping and conduit, with reference to exposed structures. Dimension the installed locations of concealed service lines on the site or within the structure by reference from the centre line of the service to the structure column lines or other main finished faces or other structural point easily identified and located in the finished work.

1.4.3 Update these drawings and make available for monthly review. Payment against the Progress Payment line item for updated drawings will be withheld if drawings have not been maintained up-to-date.

1.4.4 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.

1.4.5 Submit record drawings in SI metric units.

1.4.6 Record on the white prints on a daily basis, work constructed differently than shown on the Contract Documents. Record all changes in the work caused by site conditions, or originated by the Owner, the Engineer, the Contractor, or a sub-contractor and by addenda, supplemental drawings, site instructions, supplementary instructions, change orders, correspondence, and directions of regulatory authorities. Accurately record the location of concealed mechanical services and electrical main feeders, junction boxes and pull boxes. Do not conceal critical work until its location has been recorded.

1.4.7 Do not use these drawings for daily working purposes and make the set available for periodic inspection by the Engineer.

1.4.8 Make records in a neat and legibly printed manner with non-smudging medium.

1.4.9 The Contractor shall scan the complete set of “record drawing” mark-ups to PDF (full resolution) and upload progress “record drawing” sets onto the CIMA FTP site and transmit to the Engineer at the end of the project.

1.4.10 Submit all marked up record drawings to the Engineer at the conclusion of the contract. Substantial Performance will not be issued until record drawings are complete and submitted.

1.5 Recording Actual Site Conditions

1.5.1 Record information on set of drawing prints provided by the Engineer.

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

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

1.5.4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:

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

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

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

.4 Field changes of dimensions and details.

.5 Changes made by Contract Change Directives.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

1.5.5 Specifications: legibly mark each item to record actual construction, including:

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

.2 Changes made by Addenda and Contract Change Directives.

1.5.6 Other Documents: maintain manufacturers' certifications, inspection certifications, field test records, required by individual specifications sections.

1.6 Final Survey

1.6.1 The Contractor will be responsible for providing as-built survey elevations for all new work on the record drawings.

1.6.2 The Owner will check the 'As-Recorded' survey elevations.

1.7 Equipment and Systems

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

1.7.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications, final as-constructed diagram.

1.7.3 Include as-constructed installed colour coded wiring diagrams in the manual and also provide an electronic copy in AutoCAD.

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

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

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

1.7.7 Include manufacturer's printed operation and maintenance instructions.

1.7.8 Include sequence of operation by controls manufacturer where appropriate.

1.7.9 Provide original manufacturers' parts list, illustrations, assembly drawings, and diagrams required for maintenance.

1.7.10 Provide installed control diagrams by controls manufacturer where appropriate. Include copies in the manuals and provide an electronic version in AutoCAD.

1.7.11 Provide coordination drawings, with installed colour coded piping diagrams.

1.7.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

1.7.13 Provide list of original manufacturers' spare parts, current prices, and recommended quantities to be maintained in storage.

1.7.14 Include test and balancing reports as specified in Section 01450 - Quality Control.

1.7.15 Additional requirements: As specified in individual specification sections.

1.8 Spare Parts

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

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

1.8.3 Deliver to site location and place in storage as directed by the Owner.

1.8.4 Obtain receipt for all delivered products from the Owner or Engineer and submit these receipts prior to Substantial Performance.

1.8.5 Where spare parts are not specified, provide the Engineer and Owner with a list of all spare parts recommended by the equipment manufacturer for all major pieces of equipment, valves, and instruments, including model or part numbers, and costs for individual items.

1.9 Maintenance Materials

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

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

1.9.3 Deliver to site location and place in storage as directed by the Owner.

1.9.4 Obtain receipt for all delivered products from the Owner or Engineer and submit these receipts prior to Substantial Performance.

1.10 Storage Handling and Protection

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

1.10.2 Store in original and undamaged condition with manufacturers' seal and labels intact.

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

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

1.10.5 Remove and replace damaged products at the Contractor's own expense and to the satisfaction of the Engineer.

1.10.6 Exercise all equipment in strict conformance with the equipment manufacturers written instructions during storage and following installation. Provide all equipment exercise logs to the Engineer for review.

1.11 Warranties and Bonds

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

1.11.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.11.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers.

1.11.4 No warranty will commence until issuance of Substantial Performance on respective work components. The warranty on items used during construction, with the Owner's permission, for the safe and orderly completion of the works will not commence until Substantial Performance.

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

1.11.6 Co-execute submittals when required.

1.11.7 Retain warranties and bonds until time specified for submittal.

2 PRODUCTS – NOT APPLICABLE

3 EXECUTION – NOT APPLICABLE

END OF SECTION

DIVISION 2 – SITE WORKS

Section No.	Title
02362	Dust Control
02611	Transportation and Disposal
02831	Lead-Based Paint Abatement
02911	Topsoil & Finish Grading
02933	Sodding

1 GENERAL

1.1 Scope of Work

1.1.1 This section covers dust control operations to be employed during applicable construction activities as specified in the contract.

1.2 References

1.2.1 CGSB 15-GP-1M-(92), Calcium Chloride.

1.2.2 OPSS 2501 – Calcium Chloride

1.3 Submittals

1.3.1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures.

1.4 Delivery, Storage and Handling

1.4.1 Supply and place calcium chloride or water in quantities and at times as required to mitigate the impact of dust.

1.4.2 Store bags of calcium chloride in weatherproof enclosures.

2 PRODUCTS

2.1 Materials

2.1.1 Calcium chloride solid, Type I: to CGSB 15.GP-1M-(92). Calcium chloride solution (35% aqueous solution) may be substituted for calcium chloride solid.

2.1.2 Water shall be free of contaminants that could adversely affect fill material or the environment. Water shall be free of foreign material that would alter the dust suppressant solution or cause blockage in the spray equipment.

3 EXECUTION

3.1 Application

3.1.1 Apply calcium chloride with equipment approved by the Engineer when directed by the Engineer.

3.1.2 Water shall be the only dust suppressant applied within two weeks before the placement of any asphaltic concrete materials or the application of surface treatments.

3.1.3 Steps shall be taken as necessary to control dust resulting from operations or by public traffic such that it does not:

.1 Affect traffic,

.2 Enter surface waters, or

.3 Escape beyond the right-of-way to cause a nuisance to residents, businesses, or utilities.

3.1.4 Dust suppressants shall be applied in a manner that avoids ponding, runoff, drifting, and tracking of the material beyond the area of application.

3.1.5 Dust suppressant application shall not proceed during periods of rain when the surface is in a saturated condition or on areas of ponded water.

3.1.6 Dust suppressants other than water shall not be applied when weather forecasts indicate a high probability of rainfall in order to minimize loss of the material from the intended area of application. Areas receiving rainfall within 6 hours after application may require reapplication of the material.

3.1.7 Dust suppressant solutions shall be applied by a pressure distributor. For the maintenance of existing roadways, dust suppressant solutions shall be applied to a prepared surface. Work shall commence within 3 Working Days of receiving notice from the Contract Administrator and shall proceed continuously until completed.

END OF SECTION

1 GENERAL

1.1 Summary

1.1.1 Section Includes:

1.1.2 Supply, operation, maintenance, and coordination of transport vehicles/ containers.

1.1.3 Preparing transport vehicles/containers for off-site transportation.

1.1.4 Loading and securing materials in transport vehicles/ containers.

1.1.5 Weighing transport vehicles/ containers.

1.1.6 Decontaminating vehicles/ containers prior to leaving the Site.

1.1.7 Transporting the following materials from the Site to approved off-Site disposal or storage facilities:

.1 Lead-contaminated debris.

.2 Lead-contaminated wastewater.

.3 Non-hazardous solid waste.

.4 Non-hazardous wastewater.

1.1.8 Off-Site transportation and recycling of scrap metal.

1.1.9 Preparation of shipping documents including waste profiles, manifests, and bills of lading.

1.1.10 Maintaining transportation records as required by the Dangerous Goods Transportation Act. -

1.1.11 Obtaining documents from disposal facilities.

1.2 References

1.2.1 Definitions:

1.2.2 Wastewater:

.1 Water collected from equipment decontamination facilities.

.2 Any other potentially contaminated water as determined by the Engineer.

1.2.3 Reference Standards:

.1 Section 01450- Quality Control: Requirements for references.

.2 Ministry of the Environment, Conservation and Parks

.3 MECP Guideline for Use at Contaminated Sites in Ontario.

1.2.4 Ontario Regulations:

.1 Revised Regulations of Ontario (R.R.O.) 1990, Reg. 261, Dangerous Goods Transportation Act.

.2 O. Reg. 347, General Waste Management.

1.2.5 Society for Protective Coatings:

.1 SSPC Guide 7, Guide to the Disposal of Lead-Contaminated Surface Preparation Debris.

1.3 Submittals

1.3.1 Section 01330 – Submittal Procedures: Requirements for submittals.

1.3.2 Letters of Commitment.

1.3.3 Include a copy of the letter of commitment from each proposed disposal facility prior to shipping material to the facility. State in each letter:

.1 That the facility is in compliance with its current and valid permit.

.2 That the facility can and will accept the materials contingent upon the acceptance of the waste profile proposed for disposal at the facility.

.3 Any disposal facility restrictions which may cause rejection of the transported materials.

.4 Any additional sampling and analysis of materials which are required prior to delivery to the facility.

.5 Any restrictions on delivery schedules.

1.3.4 Each facility shall disclose information concerning any existing corrective action programs which may impact the ability of the disposal facility to accept materials from the Site.

1.3.5 Operating Licenses and Permits:

.1 Include copies of valid operating licenses and permits for each proposed disposal facility three working days prior to commencing the transportation of materials from the Site.

.2 Include copies of valid operating licenses and permits from each transporter for each proposed transport vehicle/ container three working days prior to entry to the Site.

1.3.6 Disposal Facility Requirements:

1.3.7 For each disposal facility accepted by the Owner or specified by the Owner, the Contractor shall provide the disposal facility requirements to the Engineer and Owner including:

.1 Any disposal facility specific packaging requirements for shipments.

.2 Disposal facility restrictions by wastestream which may cause rejection of transported materials.

.3 Any wastestream specific pre approvals required by federal or provincial agencies prior to acceptance of wastestream by the disposal facility.

.4 Restrictions on delivery schedules.

.5 Type and frequency of routine additional sampling and analysis of materials by wastestream which are required during transport and disposal activities prior to delivery to the disposal facility.

.6 Additional sampling and analysis of materials that will be conducted by the disposal facility during receipt of shipments to verify waste profiles.

.7 Each disposal facility shall disclose the name and telephone number of the contact at the lead agency responsible for the disposal facility primary permits who has knowledge of, and can verify, the existence of existing corrective action programs which may impact the ability of the disposal facility to accept materials from the Site.

1.3.8 Agency Approvals: For any wastestream requiring agency pre-approval; provide letters of approval from the applicable federal and provincial agencies which approve the disposal of materials from the Site at each proposed disposal facility 14 working days prior to the off-Site transportation of materials.

1.3.9 Shipping and Disposal Documents: Include completed copies of shipping and disposal documents including manifests and/or bills of lading waste profiles on standard approved forms, including a copy of each form signed by the transporter prior to leaving the Site and a copy of each form signed by the disposal facility accepting the shipment.

1.3.10 Weigh Scale Documents.

1.3.11 Include copies of weigh scale tickets on approved forms signed by an authorized weigh scale operator including the following information:

.1 Location, date, and time of weighing.

.2 Measured weights.

.3 Vehicle and container identification.

.4 Shipment identification number.

1.4 Environmental Requirements

1.4.1 Do not spill, leak, or otherwise release materials from transport vehicles and containers during loading and unloading operations or while in transit from the Site to the disposal facility.

1.4.2 Do not generate dusting conditions when loading bulk solids.

1.4.3 Do not generate fume or misting conditions when loading bulk liquids.

1.4.4 Clean up any and all spills or leaks in transit.

1.5 Payment

1.5.1 This is a lump sum Contract and payment will be made for work completed during the payment period on a percentage basis of the sum entered in the breakdown of the lump sum price for 02611 – Transportation and Disposal, as approved by the Engineer.

1.5.2 The Contractor shall assume that payment will be for the transportation and disposal of non-hazardous waste. Transportation and disposal of hazardous waste shall be priced as a provisional item in the Form of Tender.

2 PRODUCTS

2.1 Polyethylene Sheeting

2.1.1 Continuous sheeting, minimum 1.5 mm thick, fabricated from a single ply of construction grade polyethylene plastic.

2.2 Tub Liner

2.2.1 Tub Liners for Bulk Solid Shipments: Pre-manufactured fitted polyethylene tub liner or continuous single sheet of polyethylene sheeting.

2.3 Containers, Packing Materials, and Labels

2.3.1 Comply with federal, provincial, and local regulations.

3 EXECUTION

3.1 Examination

3.1.1 Section 01720 – Preparation, and 13600 – Tank Rehabilitation: Verification of existing conditions before starting work.

3.1.2 Notify the Engineer sufficiently in advance of its intention to commence activities at the Site that require attendance by the Engineer as provided herein.

3.1.3 Activities requiring attendance by the Engineer include:

.1 Placement of tub liner in bulk solid transport vehicles/ containers.

.2 Final securement of loaded materials prior to transport from the Site.

.3 Decontamination of transport vehicles j containers prior to leaving the Site.

3.1.4 Do not cover up loaded material prior to the Engineer's inspection.

3.2 Waste Profiling

3.2.1 Conduct waste profile sampling and analysis in accordance with disposal facility requirements. The Engineer will perform CQA sampling and/ or analysis to confirm waste profile sampling and analysis. Such sampling and/ or analysis or failure to perform such sampling and/ or analysis by the Engineer shall not release or reduce Contractor's obligation to perform the Work in accordance with the requirements of Contract Documents. Do not remove materials from the Site which have been sampled and are awaiting analytical results. The Contractor shall provide copies of analytical results to the Engineer upon receipt of any results. The Engineer will review analytical results within seven working days of receipt from the Contractor.

3.2.2 Classify materials for off-Site disposal according to waste stream based on waste profile analytical results and other pertinent data/ information.

3.2.3 Select and submit proposals to the Engineer for the appropriate disposition of all determined waste streams to be removed from the Site in accordance with applicable regulations for each waste stream. The Contractor shall be responsible for disposition of materials to the Owner approved disposal facility.

3.2.4 Submit to the Engineer completed waste profile for each waste stream. Waste profiles will be signed-off by the Owner or the Engineer except for materials brought on the Site by the Contractor that are not incorporated in the Work or materials contaminated by performance of the Work.

3.2.5 Submit signed waste profiles to disposal facility accepted by the Owner.

3.3 Preparation and Securement Of Transport Vehicles

3.3.1 Do not load materials for transport for disposal without the Engineer's approval.

3.3.2 Comply with federal, provincial, and local regulations concerning shipping vehicles, containers, and materials.

3.3.3 Clean the receiving box of the transport vehicle/ container of any loose debris or foreign material. Line the receiving box or container with a minimum of one layer of 1.5 mm polyethylene sheeting continuous along the bottom and sides. Place the sheeting on the floor, run up the sides, and drape over the sideboards. Neatly push the polyethylene sheeting into corners to prevent tearing during loading and transport.

3.3.4 Visibly display the number for each transport vehicle/ container.

3.3.5 Secure materials in transport vehicles/ containers in accordance with regulations governing the transportation of these materials.

3.3.6 Load bulk materials into transport vehicles or containers in a manner which will not damage the placed polyethylene sheeting. Limit the freefall of bulk materials being loaded.

3.3.7 Replace damaged sheeting which is incapable of providing containment.

3.3.8 Following loading, fold the box liner over the loaded materials and place an overliner of polyethylene sheeting over the materials prior to securing with an approved tarpaulin in a manner to prevent the loss of materials or fugitive dust emissions.

3.3.9 The Engineer will approve the lining requirements where the Contractor can demonstrate, to the satisfaction of the Engineer, that all of the following conditions are met:

.1 The receiving box or container is of leakproof construction and capable of maintaining a leakproof condition.

.2 The cover to be placed over the receiving box or container is impermeable and will totally enclose the materials within.

.3 The cover to be placed over the receiving box or container will prevent fugitive dust emissions.

.4 The receiving box or container is constructed of materials which can be decontaminated.

3.4 Documentation for Off-Site Transportation

3.4.1 Document the transport and disposal of contaminated materials and wastewater, if required, to off-Site disposal facilities on appropriate bills of lading. Prepare and provide the Engineer and Owner with copies of bills of lading for each shipment of materials from the Site. Be responsible for maintaining bills of lading, from the time the materials leave the Site to the time of release to the disposal facility. All bills of lading for the transportation and disposal of materials shall be signed by the Contractor.

3.5 Notification

3.5.1 Notify applicable federal, provincial, and local representatives, or authorities having jurisdiction over the route and mode of transport, in advance of commencing transportation.

3.6 Transportation

3.6.1 Transport material removed from the Site directly to the disposal facility approved by the Engineer. Do not change either the route or mode of transport after commencing off-Site operations without the Engineer's prior written approval.

3.6.2 Where required, mark and placard shipments in accordance with R.R.O. 1990, Reg. 261.

3.6.3 Comply with the requirements of federal, provincial, and local regulations as applicable.

3.6.4 Employ transport vehicle operators trained in conformance with R.R.O. 1990, Reg. 261.

3.6.5 Materials shall be transported using vehicles licensed for the waste stream being transported.

3.7 Disposal

3.7.1 Make all arrangements with the disposal facility for the receipt and acceptance of materials removed from the Site.

3.7.2 Be responsible for, and do all work necessary to, ensure that materials removed from the Site are properly prepared and will be accepted by the disposal facility. Dispose of materials at the disposal facilities approved by the Engineer, which are in compliance with applicable regulations and are permitted to receive materials from the Site.

3.7.3 Weigh transport vehicles/ containers at the approved off-Site disposal facility weigh scales both before and after discharging their contents.

3.7.4 Such measurements will be used by the Engineer to verify proper delivery of materials which have been removed from the Site and for payment purposes.

3.7.5 Return to the Site any transported material delivered to a disposal facility which is rejected by the disposal facility.

3.8 Non-Hazardous Solid Waste

3.8.1 Dispose of non-hazardous solid wastes at a sanitary landfill approved by the Engineer.

3.8.2 The facility shall be appropriately licensed to receive solid wastes, other than hazardous wastes.

3.9 Hazardous Solid Waste

3.9.1 Store and dispose of hazardous solid wastes in appropriate storage bins and at a sanitary landfill approved by the Engineer. The Contractor shall collect, store and dispose of hazardous solids wastes per this specification, Section 02831 – Lead Based Paint Abatement and applicable provincial and federal guidelines.

3.9.2 The receiving facility shall be appropriately licensed to receive hazardous solid wastes.

END OF SECTION

1 GENERAL

1.1 Summary

1.1.1 Section Includes:

.1 Supply Removal and management of hazardous lead paint.

1.2 References

1.2.1 Abbreviations and Acronyms:

.1 HEPA: High efficiency particulate air.

1.2.2 Reference Standards:

1.2.3 Section 01450 - Quality Control: Requirements for references.

1.2.4 Occupational Health and Safety Act (OHSA).

.1 Revised Regulations of Ontario (R.R.O.) 1990, Regulation 213/91, as amended, Regulations for Construction Projects.

.2 R.R.O. 1990, Regulation 843, Designated Substance- Lead.

1.2.5 Environmental Protection Act (EPA):

.1 Reg. 347- General Waste Management, as amended.

1.2.6 Ontario Ministry of Labour Guideline: Lead on Construction Projects, September 2004.

1.2.7 Society for Protective Coatings:

.1 SSPC Guide 6 - Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations.

1.3 Coordination

1.3.1 Coordinate lead management activities with work being performed in adjacent areas. Coordination procedures shall be explained in the Contractor's Lead Paint Management Plan and describe how the Contractor will prevent lead exposure to other contractors and Owner personnel performing work unrelated to lead hazard abatement activities.

1.4 Sequencing

1.4.1 Section 01120 – Coordination with Existing Operations and Sequence of Construction: Requirements for sequencing.

1.4.2 Sequence activities to complete lead management in the following order:

.1 Implement health and safety plan.

.2 Implement control procedures.

.3 Conduct paint removals.

.4 Perform cleanup and inspection prior to application of primer coat when an area(s) has been abrasive blasted.

.5 Perform final cleanup and inspection when paint removal operations are completed for the interior and exterior stages of the work.

.6 Perform final cleanup and inspection when all paint removal activities are completed.

1.5 Scheduling

1.5.1 Section 01320 – Construction Progress Documentation: Requirements for scheduling.

1.6 Submittals

1.6.1 Section 01330 - Submittal Procedures: Requirements for submittals.

1.6.2 Temporary Control Submittals:

.1 Plan for decontamination of Site personnel

.2 Plan for decontamination of equipment

.3 Plan for disposal of waste materials and intended haul routes

1.6.3 Lead Paint Management Plan:

.1 The classification of lead-containing construction operations for this work is Type 3b Operation as outlined in MOL Guideline.

.2 Prior to mobilization to the Site, submit a Lead Paint Management Plan to the Engineer for review to ascertain compliance with the requirements specified.

.3 Include procedures, schedules, and Contractor's drawings, as applicable. Include health and safety procedures required for safe handling, storage, and disposal of all painted materials as a Type 3b Operation.

.4 Include measures to be implemented to prevent releases of lead paint to the environment during site cleanup after blasting activities.

.5 Include proposed scrap metal recycling and other disposal facilities and documentation that the facilities are permitted and will accept metal and other materials with lead paint.

.6 Provide required scrap metal or waste characterization sampling and analysis required by recycling and disposal facilities to obtain acceptance for receiving materials.

1.6.4 Contingency Plan: Prepare a contingency plan for emergencies including fire, accident, failure of power, and failure of dust collection system, failure of supplied air system or any other even that may require modification of standard operating procedures during lead removal. Include specific procedures to ensure safe egress and proper medical attention in the event of an emergency.

1.6.5 Containment System: Provide drawings showing the containment system for each of the system required and indicating the method(s) of supporting the working platforms and containment materials to each other to the standpipe structure. When the use of negative pressure and airflow inside containment is specified, provide all ventilation calculations and details on the equipment that will be used for achieving the specified airflow and dust collection. Design containment systems by a professional engineer licensed in the Province of Ontario. Affix professional seal and signature to shop drawings for such items.

1.6.6 Review with the Engineer on a weekly basis documented progress of lead management activities. Progress shall be documented in weekly project reports. Submit documentation to the Engineer upon completion of lead paint management activities.

1.6.7 Maintain a log of the analytical results from sampling conducted prior to, during or after demolition activities. The log of results shall be kept current with project activities and an updated log shall be provided to the Engineer as requested.

1.6.8 Qualifications and Organization Report:

.1 Describe the qualifications of the certified health and safety officer and management supervisor, including name and title, qualifications, and project specific responsibilities and authorities.

.2 The report shall be signed by the Contractor and the certified health and safety officer and management supervisor to indicate that all personnel comply with certification and experience requirements of this section and that project personnel have been given the authority to complete the tasks assigned to them.

1.7 Closeout Submittals

1.7.1 Section 01780 – Closeout Submittals: Requirements for closeout submittals.

1.7.2 Management Report:

1.7.3 Include the following information:

.1 Start and completion dates of lead hazard control activities.

.2 A detailed written description of the lead management activities, including control methods used health and safety procedures and equipment used inspection for loose flakes of paint, and final cleanup activities.

.3 The log of sampling and laboratory analysis results of paint or other material analysis, and personnel or other air monitoring and copies of the analytical laboratory reports.

.4 Scrap metal and waste disposal documentation.

.5 Certification of report by health and safety professional and management supervisor.

1.8 Quality Control

1.8.1 Perform initial Quality Control (QC) of all environmental control and waste handling aspects of the project to verify compliance with these specification requirements and the accepted

drawings and plans. Use the Environmental Daily Report form supplied by the Engineer to record the results of the inspections. Provide the completed reports to the Engineer before work resumes the following Day. QC inspections shall include, but not be limited to the following:

.1 Proper installation and continued performance of the containment system(s) in accordance with the approved drawings.

.2 Visual inspections of emissions into the air and verification that the cause(s) for any unacceptable emissions is corrected.

.3 Set up, calibration, operation, and maintenance of the regulated area and high volume ambient air monitoring equipment, including proper shipment of cassettes/filters to the laboratory for analysis. Included is verification that the Engineer receives the results within the time frames specified and that appropriate steps are taken to correct work practices or containment in the event of unacceptable results.

.4 Visual inspections of spills or deposits of contaminated materials into the water or onto the ground, pavement, soil, or slope protection. Included is verification that proper cleanup is undertaken and that the cause(s) of unacceptable releases is corrected.

.5 Proper implementation of the waste management plan including-laboratory analysis and providing the results to the Engineer within the time frames specified herein.

.6 Proper implementation of the contingency plans for emergencies.

1.9 Quality Assurance

1.9.1 Comply with federal, provincial, and local regulations, guidelines, and policies as specified in Section 01420 – References, and 01450 – Quality Control applying to the work of this Section.

1.9.2 Maintain current licenses as required by federal, provincial, and local regulations, guidelines, and policies applying to the work of this Section as specified in Section 01420 - References.

1.9.3 Post and keep a second copy of each document on file in the Contractor's field office.

1.9.4 Regulatory Requirements:

.1 Obtain any required permits from federal, provincial, and local authorities. The Contractor is responsible for all associated fees or costs incurred in obtaining the licenses, permits and notifications.

.2 Conform to procedures applicable when hazardous or contaminated materials are present, including but not limited to OHSA requirements.

1.10 Qualifications

1.10.1 Management Supervisor: Competent person trained in hazardous materials management by a qualified training company and minimum of ten years of experience with hazardous materials management, such as lead paint and asbestos containing materials. Responsible for development and implementation of the management plan, the management report and shall supervise lead management work activities. The management supervisor will be responsible for ensuring quality control procedures.

1.10.2 Quality Control Inspector: Third party inspection services will be coordinated by the Engineer. The Contractor will be required to implement any and all recommendations by the inspector at no cost to the Owner.

1.10.3 The laboratories selected to perform analysis on paint chip, air, waste and other samples shall be accredited by the Canadian Association for Laboratory Accreditation Inc. for environmental testing procedures.

1.11 Environmental Requirements

1.11.1 Undertake environmental requirements per this section in addition to those indicated in Section 13605.

1.11.2 Do not spill, leak, or otherwise release materials from work areas. Do not allow paint flakes to migrate from work areas.

1.11.3 All efforts shall be made to keep dust migration from the enclosed areas to a minimal level as possible. Migration shall be in accordance with the requirements specified herein.

1.11.4 Visible Emissions:

.1 Conduct observations of visible emissions and releases on an ongoing daily basis when dust-producing activities are underway, such as paint removal, clean up, waste handling, and containment dismantling or relocation. Note that visible emission observations do not apply to the fine mist that may escape through permeable containment materials when wet methods of preparation are used.

.2 Visible emissions in excess of SSPC Guide 6, Level (One percent of the Working Day) are unacceptable. In an Eight-hour Working Day, this equates to emissions of a cumulative duration of no greater than 4.8 minutes (288 seconds). This criterion applies to scattered, random emissions of short duration. Sustained emissions for a given duration (e.g., One minute or longer), regardless of the total length of emissions for the Working Day, are unacceptable and actions shall immediately be initiated to halt the emission.

.3 If unacceptable visible emissions or releases are observed, the Contractor shall immediately shut down the emission-producing operations, clean up the debris, and change work practices, modify the containment, or take other appropriate corrective action as needed to prevent similar releases from occurring in the future.

1.11.5 Ambient air monitoring shall be performed as a means of environmental monitoring.

1.12 Ambient Air Monitoring

1.12.1 Undertake air monitoring per this section in addition to those indicated in Section 13605.

1.12.2 Ambient Air Monitoring: Perform ambient air monitoring in accordance with the following in the event of a failure of the hoarding and containment system and/or equipment:

.1 Monitor Siting. Collect and analyze air samples to evaluate levels of TSP-lead if there are sensitive receptors within five times the height of the structure or within 1000 feet (305m) of the structure, whichever is greater. If sensitive receptors are not located within these limits, monitoring is not required. Sensitive receptors are

areas of public presence or access including, but not limited to, homes, schools, parks, playgrounds, shopping areas, livestock areas, and businesses. The motoring public is not considered to be a sensitive receptor for the purpose of ambient air monitoring.

.2 Locate the monitors according to SSPC TU-7, in areas of public exposure and in areas that will capture the maximum pollutant emissions resulting from the work. Identify the recommended monitoring sites in the Ambient Air Monitoring Plan, including a sketch identifying the above. As minimum provide a monitor at the bottom, middle and top of the containment system. Do not site the monitors until the Engineer accepts the proposed locations.

.3 Equipment Provided by the Contractor:

.1 The Contractor shall provide up to four monitors per work site and all necessary calibration and support equipment, power to operate them, security (or arrangements to remove and replace the monitors daily), filters, flow chart recorders and overnight envelopes for shipping the filters to the laboratory. The number of monitors required will be indicated in the Ambient Air Monitoring Plan Notes. Each monitor shall be tagged with the calibration date.

1.12.3 Duration of Monitoring: Monitoring shall be performed for the duration of dust-producing operations (e.g., paint removal, waste handling, containment cleanup and movement) for a minimum of eight hours each Working Day.

1.12.4 Monitoring Schedule:

.1 For dry abrasive blast cleaning monitoring shall be conducted full time during each day of dust-producing operations (e.g., paint removal, waste handling, and containment movement).

.2 For wet abrasive blast cleaning, water jetting, or power tool cleaning, conduct monitoring for the first five working days of dust producing operations. If the results after five working days are acceptable to the Engineer, monitoring may be discontinued. If the results are unacceptable to the Engineer, initiate corrective action to correct the cause of the emissions, and continue monitoring for an additional five working days. If the results are still unacceptable, the Engineer may direct that the monitoring continue full time.

.3 When monitoring is discontinued, if visible emissions are observed and/ or the Contractor's containment system changes during the course of the project, then air monitoring will again be required for a minimum of two consecutive working days until compliance is demonstrated to the satisfaction of the Engineer.

1.12.5 Background Monitoring: Collect background samples for two working days prior to the start of the Works while no dust producing operations are underway to provide a baseline. The background monitoring shall include one week, one weekday and one weekend day. The background monitoring shall coincide with the anticipated working hours for the paint removal operations but shall last for a minimum of eight hours each day.

1.12.6 Monitor Operations and Laboratory Analysis:

.1 Calibrate the monitors according to the manufacturer's written instructions upon mobilization to the Site and monthly. Tag each monitor with the calibration date and provide calibration information to the Engineer upon request.

.2 Perform all ambient air monitoring according to the accepted Ambient Air Monitoring Plan and according to EPA regulations 40 CFR Part 50 Appendix B, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method), and 40 CFR Part 50 Appendix G, Reference Method for the Determination of Lead in Suspended Particulate Matter Collected from Ambient Air.

.3 Place filters in monitors and operate monitors each Day prior to start of Dust-producing operations and remove the filters upon completion each Day. Advise the Engineer 24 hours in advance when the filters will be removed and replaced. The monitor operator shall record the following information, at a minimum, on field data and laboratory chain-of-custody forms (or equivalent):

.1 Monitor location and serial number.

.2 Flow rate, supported by flow charts.

.3 Start, stop time and duration of monitoring.

.4 Work activities and location of work during the monitoring period.

.5 Wind direction and speed.

.4 For the first five Days of monitoring, submit the filters, field data and laboratory chain-of-custody forms together with the flow chart recorders (i.e., monitor flow rate and the duration of monitoring) on a daily basis in an overnight envelope to the laboratory for analysis. The laboratory must provide the Engineer with written results no later than 72 hours after the completion of each Day's monitoring. At the discretion of the Engineer, if the initial Days of monitoring on full time monitoring projects are acceptable, the filters may be sent to the laboratory every three days rather than every day. Written results must be provided to the Engineer no later than five days after the completion of monitoring for the latest of the three days.

1.12.7 Ambient Air Monitoring Results. The laboratory shall provide the report directly to the Engineer with a copy to the Contractor. The report shall include:

.1 Monitor identification and location.

.2 Work location and activities performed during monitoring period.

.3 Monitor flow rate, duration, and volume of air sampled.

.4 Laboratory methods used for filter digestion/ analysis.

.5 Sample results for the actual duration of monitoring.

.6 Sample results expressed in terms of a 24-hour time weighted average. Assume zero for period not monitored.

.7 Comparison of the results with the acceptance criteria indicating whether the emissions are compliant.

.8 Field data and chain-of-custody records used to derive results.

.9 Should revised reports or any information regarding the analysis be issued by the laboratory directly to the Contractor at any time, the Contractor shall immediately provide a copy to the Engineer and advise the laboratory that the Engineer is to receive all information directly from the laboratory.

1.12.8 Acceptance Criteria:

1.12.9 TSP-lead results at each monitor location shall be less than 1.5 -tg/m3 per 90-Day period converted to a daily allowance using the formulas from SSPC Guide 6 as follows, except that the maximum 24-hour daily allowance shall be no greater than 6 -tgfm3.

1.12.10 The formula for determining a 24-hour daily value based on the actual number of paint disturbance days expected to occur during the 90-Day period is:

.1 DA = (90 /PD) x 1.5 -tg/m3, where

.2 DA is the daily allowance, and

.3 PD is the number of preparation days anticipated in the 90-Day period.

.4 If the DA calculation is >6.0 -tg/m3, use 6.0 -tg/m3.

1.13 Existing Work

1.13.1 Status of Existing Coatings:

1.13.2 The following information on existing coatings or substrate conditions is provided for information only, and is generally believed to be accurate, but is not guaranteed. Perform tests as required to verify applicability of this information to the Work. Inspection and assessment of the existing elevated tank has been performed. Details of the lead testing results are provided in:

.1 Appendix B – Water Tower Coating Lead Test Results

1.13.3 Any information and data furnished to bidders will form part of the Contract and is not intended as a representation or warranty but is furnished in order that bidders may have access to the same information which is available to the Owner. Neither the Owner nor the Engineer will be responsible for any deduction, interpretation, or conclusion drawn from any information and data furnished.

1.14 Payment

1.14.1 This is a lump sum Contract and payment will be made for work completed during the payment period on a percentage basis of the sum entered in the breakdown of the lump sum price for 02831 – Lead-Based Paint Abatement, as approved by the Engineer.

2 PRODUCTS

2.1 Materials and Equipment

2.1.1 Materials and equipment needed to complete the project shall be available and kept on the Site. Submit a description of the materials and equipment required; including Material Safety Data Sheets for material brought on Site to perform the Work.

2.1.2 Expendable Supplies: Submit a description of the expendable supplies required, including the following:

.1 Polyethylene Bags: Disposable bags shall be polyethylene plastic and shall be a minimum of 0.15 mm thick (0.1 mm thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance to the satisfaction of the Engineer; and shall be capable of being made leak-tight. Leak-tight means that solids, liquids or dust cannot escape or spill out.

.2 Polyethylene Leak-tight Wrapping: Wrapping used to wrap lead contaminated debris shall be polyethylene plastic that is a minimum of 0.15 mm thick or any other thick plastic material shown to demonstrate at least equivalent performance to the satisfaction of the Engineer.

.3 Polyethylene Sheeting: Sheeting shall be polyethylene plastic with a minimum thickness of 0.15 mm, or any other thick plastic material shown to demonstrate at least equivalent performance to the satisfaction of the Engineer; and shall be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, flame-resistant polyethylene sheets which conform to the requirements of NFPA 701 shall be provided.

.4 Tape and Adhesive Spray: Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water (water with surfactant). Tape shall be minimum 50 mm wide, industrial strength.

.5 Containers: Leak-tight and labeled in accordance with OHSA standards.

.6 Signage: Warning signs indicating lead hazard in work area and restricted access.

.7 Detergents and Cleaners: Detergents or cleaning agents shall not contain trisodium phosphate and shall have demonstrated effectiveness in lead control work using cleaning techniques implemented by the Contractor.

2.2 Containment Systems

2.2.1 Install and maintain containment systems specified herein to surround the work for the purpose of controlling emissions of dust and debris according to the requirements of this specification. Working platforms and containment materials that are used shall be firm and stable and platforms shall be designed to support the workers, inspectors, spent surface preparation media (e.g., abrasives), and equipment during all phases of surface preparation and painting. Platforms, cables, and other supporting structures shall be designed according to OHSA regulations. If the containment needs to be

attached to the structure, the containment shall be attached by bolting, clamping, or similar means. Welding or drilling into the structure is prohibited unless approved in advance and in writing by the Engineer.

2.3 Equipment (Only if Type 2 or 3 operations are to be conducted)

2.3.1 Abrasive Removal Equipment: The use of powered machine for vibrating, sanding, grinding, bristle blasting or abrasive blasting is prohibited unless the machine is equipped with local exhaust ventilation systems which are equipped with HEPA filters when performed in open areas or outside the containment systems.

2.3.2 Vacuum Systems: Suitably sized for the project, and filters shall be capable of trapping and retaining all mono-disperse particles as small as 0.3 micrometers (mean aerodynamic diameter) at a minimum efficiency of 99.97 percent. Used filters that are being replaced shall be disposed of at a licensed facility and in a manner to prevent release of particles.

2.3.3 Heat Blower Guns: Flameless, electrical, paint-softener type with controls to limit temperature to degrees Celsius. Heat blower shall be DI (non-grounded) 120 volts AC, and shall be equipped with cone, fan, glass protector and spoon reflector nozzles.

2.3.4 Ambient Air Monitoring: Air monitoring for lead based particular matter shall be performed within the Site location and results provided to the consultant on a daily basis or more frequently when requested. Three air monitor probes shall be provided and placed downwind of Site activities. Where possible an air monitor shall be placed on an adjacent property downwind of the Site activities.

2.3.5 Abrasive Recycling Equipment: Suitably sized for the project, and filters shall be capable of trapping and retaining all mono-disperse particles as small as 0.3 -tM (mean aerodynamic diameter) at a minimum efficiency of 99.97 percent. Used filters that are being replaced shall be disposed at a licenses facility and in a manner to prevent the release of particles. The equipment shall be enclosed if visible dust and debris are being emitted or the regulated areas or high-volume monitor lead levels are not in compliance.

2.4 Equipment Decontamination Facility:

2.4.1 Prior to commencing work involving equipment contact with potentially contaminated materials, construct an equipment decontamination pad in accordance with the details shown on the Drawings.

2.4.2 Provide, operate, and maintain suitable portable, high-pressure, low-volume decontamination wash unit(s) equipped with self-contained water storage tank and pressurizing system and capable of heating and maintaining wash waters to 80 degrees C and providing a nozzle pressure of 1,035 kPa.

2.4.3 Provide, operate, and maintain necessary equipment, pumps, and piping required to collect and contain equipment decontamination wastewater and sediment and transfer same to approved storage facilities.

2.5 Personnel Hygiene/Decontamination Facility:

2.5.1 Provide, operate, and maintain a Personnel Hygiene/Decontamination Facility, which contains, as a minimum, the following:

.1 Shower facilities with at least one shower for every six on-Site Contractor personnel.

.2 Locker room with one locker for each on-site Contractor personnel.

.3 A room where personal safety equipment and protective clothing can be stored.

.4 A room where personnel can eat or drink.

.5 Boot washing facility and boot rack for washed boots to drain.

.6 Toilet facilities with at least one toilet and one hand basin for every six on-site Contractor personnel.

.7 Tank(s) for sanitary waste and wastewater and necessary pumping and piping from the Personnel Hygiene/Decontamination Facility to the designated wastewater storage tanks.

.8 Potable water and wastewater pumping and piping.

.9 Containers for storage of spent disposable personal safety and protective equipment.

2.5.2 Connect necessary pumping and piping to convey:

.1 Wastewaters from hand basins, toilet facilities, and shower facilities to designated wastewater storage tanks.

.2 Potable water from the potable water tank to facilities requiring running water.

2.5.3 Provide a boot wash, glove wash, refuse containers, and other items required for initial personnel decontamination at the decontamination corridor established at each work area for initial personnel decontamination prior to entering the Personnel Hygiene/Decontamination Facility.

2.5.4 Provide separate storage for wastewaters generated from toilet facilities, hand basins, and shower facilities from wastewater generated from initial decontamination of personnel.

2.5.5 Sample and analyze containerized wastewater for disposal purposes; submit analytical results to the Engineer prior to off-Site disposal.

2.5.6 Post notices and take such precautions as required by local health authorities.

2.5.7 Maintain the Personnel Hygiene/Decontamination Facility and premises in a clean and sanitary condition.

2.6 Wastewater Storage Tanks:

2.6.1 Provide, operate, and maintain wastewater storage tanks to store wastewater.

2.6.2 Wastewater includes:

.1 Hand basin and shower wastewaters from the Personnel Hygiene/ Decontamination Facility.

.2 Water collected from the Equipment Decontamination Facility.

2.6.3 Store wastewaters from the Equipment Decontamination Facility in a separate tank from the wastewater from the Personnel Hygiene/Decontamination Facility.

2.6.4 If toilet facilities are provided in the Personnel Hygiene/Decontamination Facility, store wastewater from these toilets with the wastewater from the hand basins and showers for ultimate disposal off Site.

2.6.5 Provide pumps and piping to convey collected wastewaters to designated wastewater storage tanks.

2.6.6 Install wastewater storage tanks in locations shown on the Drawings.

2.6.7 Support tank(s) on temporary aboveground foundation(s) provided by the Contractor.

2.6.8 Connect pumps, piping, valves, miscellaneous items, and necessary utilities as required for operation of the facilities. Protect tanks, valves, pumps, piping, and miscellaneous items from freezing.

2.6.9 Do not operate wastewater storage tanks until inspected by the Engineer.

2.6.10 Notify the Engineer 72 hours in advance of when a wastewater storage tank is anticipated to be full. Do not discharge additional liquids to a filled tank following sampling by the Engineer. The Engineer will determine the appropriate disposition of the wastewaters based on sample analysis.

2.6.11 Transport and dispose of wastewaters in accordance with Section 02611.

3 EXECUTION

3.1 Examination

3.1.1 The Contractor shall visit the site and verify existing conditions before starting work.

3.1.2 Verify that the Site conditions are ready to receive work.

3.1.3 Examine each area prior to initiation of work to determine proper lead management controls are in place.

3.1.4 Verify that the temporary storage area is prepared to receive anticipated waste generated prior to disposal.

3.2 Soil Sampling at Tank Site

3.2.1 The Contractor, in the presence of the Engineer, shall remove one soil sample per 550 square metres within the limits of the tank Site, or as otherwise directed by the Engineer, prior to the start of the work at each tank site.

3.2.2 Identify the soil samples, place in separate containers, and deliver the soil samples to a testing laboratory certified by the Province of Ontario in order to have atomic absorption testing (total lead) performed on the individual soil samples.

3.2.3 The Contractor shall apply a temper-resistant seal to the soil container in the form of a stricker or other approved method, as directed by the laboratory testing company.

3.2.4 The tank site, as considered for soil sampling, shall consist of all land within the fenced tank site or property line and all areas within temporary construction fencing or as otherwise determined by the Engineer.

3.2.5 Each set of soil samples shall consist of five 20 mm diameter by 12 mm deep plugs taken from a 0.1 square metre. The location where soil samples were taken from shall be documented.

3.2.6 After Substantial Performance of the Work, the Contractor, in the presence of the Engineer, shall remove additional sets of soil samples from the site in the vicinity of the same locations as before, identify the soil samples, place them in separate containers, and deliver the soil samples to the same laboratory that tested the initial samples to have atomic absorption testing (total lead) performed on the soil samples.

3.2.7 All costs associated with testing the initial and final soil samples shall be the responsibility of the Contractor. The Contractor shall be responsible for ensuring that "Chain of Custody Forms" are used for the initial and final sampling of the soil. If the initial and final lead levels fall in a category which requires action by the Contractor, then the Contractor shall perform the required action as stipulated below.

Initial Total Lead Levels in Soil, "I" (mg/kg)	Final Total Lead Levels in Soil, "F" (mg/kg)	Action Required by Contractor
I < 400	F < 400	None
I < 400	400 ≤ F < 5,000	Interim Controls
400 ≤ I < 5,000	400 ≤ F < 5,000	None
400 ≤ I < 5,000	F ≥ 5,000	Abatement of Soil
I ≥ 5,000	F ≥ 5,000	None

3.2.8 After Interim Controls- Interim Controls, in accordance with EPA's guidance document "Guidance on Residential Lead-Based Paint, Lead Contaminated Dust, and Lead-EPA Contaminated Soil," include, but are not limited to the following:

.1 Establish barriers between children and soil by planting ground cover and shubbery, moving play equipment, restricting access through posting and fencing, and/or preventing further lead contamination of the area.

.2 Monitor the condition of interim controls.

.3 Post public notices of contaminated property.

3.2.9 Abatement of Soil - Abatement of Soil techniques include, but are not limited to the following:

.1 Remove and dispose of the contaminated soil in accordance with EPA's guidance document "Guidance on Residential Lead-Based Paint, Lead Contaminated Dust, and Lead-EPA Contaminated Soil", and place Chatham-Kent PUC approved topsoil and ground cover over the abated area, or pave the site with asphalt.

.2 Post public notices of contaminated property

3.3 Preparation

3.3.1 Establish work zones and install dust barriers.

3.3.2 Containment:

.1 The containment system for exterior coating removal shall comply with the SSPC Guide 6 Class 2A system classification.

3.3.3 Place 0.15 mm plastic sheeting in areas where lead paint flakes shall be generated such that all lead debris will be captured. Overlap all layers of plastic sheeting by a minimum of 300mm.

3.3.4 Establish a decontamination area outside of the exclusion zone, if required, in accordance with the Health and Safety Plan.

3.3.5 Remove all miscellaneous trash and general debris from inside the exclusion zone to prevent contamination with lead paint. Dispose of such waste with general municipal waste in approved containers.

3.3.6 Operate equipment within the lead management area in a manner that will minimize migration of lead paint flakes and dust beyond the lead management area boundaries.

3.4 Coating Removal - Exterior Containment System

3.4.1 The containment system for exterior coating removal by abrasive blast cleaning shall, at a minimum, meet the requirements defined under MOL Guideline: Lead on Construction Projects for a Full Enclosure and comply with the SSPC Guide 6 Class 2A system classification unless otherwise stated herein. The requirements for the containment system components are defined below:

.1 Containment Materials: Flexible. Comprised of screens, tarps, plastic sheeting or similar materials.

.2 Penetrability: Air Impenetrable. Comprised of materials that are impervious to dust or wind including but not limited to coated solid tarps or drapes and plastic sheeting. The materials shall be chemical and solvent resistant for the products to be used on Site. Use fire retardant materials.

.3 Support Structure: Rigid. Consisting of scaffolding and framing to which the containment materials are affixed and allow for no movement. The support structure shall be designed and sealed by a professional engineer licensed in the Province of Ontario.

.4 Joints: Fully Sealed. All mating joints between the containment materials and the structure and floor, ceiling, or ground are sealed. Sealing measure include tape, caulk, Velcro, clamps, or other similar material capable of forming a continuous impenetrable or impermeable seal. Overlapping is not permitted.

.5 Entryways: Resealable. Comprised of flexible or rigid doorways that are capable of being repeatedly opened and resealed. Sealing methods include the use of zippers, Velcro, clamps or similar fasteners. Sealing mechanism used shall be accessed by both directions. Overlapping door tarpaulins shall not be used.

.6 Air Supply (Intake) Points: Controlled. The use of baffles, louvers, flap seals, filters and ducts on supply air point to preclude inadvertent escape of abrasive and debris.

.7 Input Air Flow (Ventilation): Forced (Mechanical). Mechanical ventilation shall be provided to remove contaminated air from the containment system and filtered air shall be provided to replace the exhausted air. Design the system with proper exhaust ports or plenums, adequately sized ductwork, adequately sized discharge fans and air cleaning devices (dust collectors) and properly sized and distributed make-up air points to achieve a uniform air flow inside the containment system for the removal of airborne particles and visibility.

.8 Air Pressure: Achieve a minimum negative air pressure of 7.5 mm (0.03 inch) W.C. relative to ambient conditions. Confirm through visual assessment for the concave appearance of the containment enclosure.

.9 Air Movement: The design target for airflow shall be a minimum cross-draft velocity of 0.5 mjs (100 feet/minute) or down-draft velocity of 0.31 m/s (60 feet/minute).

.10 Exhaust Dust Filtration: Provide filtration of the exhausted air, to achieve a filtration efficiency of 99.9 percent at 0.5 microns (0.02 mils). Provide a dust collector rated at 40,000 cfm exhaust capacity.

3.4.2 Take steps to minimize dust generation during the transfer of all abrasive/ paint debris (expendable or recyclable abrasives) for recycling or disposal. Acceptable methods include, but are not limited to vacuuming, screw or belt conveyance systems, or manual conveyance. Manual conveyance is only permitted if the work is performed inside a containment that is equipped with an operating ventilation system capable of controlling the dust that is generated.

3.4.3 Reinforce the containment systems as necessary to ensure that no damage occurs to the tank. Any damage to the tank caused as a result of the installation of a containment system shall be repaired by the Contractor to the satisfaction of the Engineer and Owner at its own expense.

3.4.4 The containment system shall be designed with the minimum criteria:

.1 The hoarding shall be designed to be a minimum of 2.4 m above the sloped exterior tank roof and extend the full length of the tank.

.2 The containment system is to be designed to allow for access to the tank. Where required the scaffold support for the containment system is to be designed to be erected over Site features that will remain in place during construction.

.3 The Contractor is to identify and bring to the attention of the Engineer any potential conflicts with scaffold support and any other existing Site features prior to design of the support system.

3.5 Coating Removal – Tank Interior

3.5.1 The tank interior shall be considered a containment area and shall be modified, as necessary, to provide adequate ventilation, air supply, negative air pressure, air movement, and exhaust dust filtration. The temporary removal of existing vents and hatches along the top roof is permissible to provide the noted requirements. Removed accessories shall be salvaged and reinstalled at the completion of coating activities.

3.5.2 The containment system for this area shall be a modified SSPC Guide 6 Class 2A with existing component. It is considered modified since some of the components for this system are provided by the existing steel tank structure.

3.5.3 Open abrasive blast cleaning of the interior is acceptable method for coating removal and surface preparation. The minimum criteria shall be obtained for this containment area prior to performing blasting operations.

3.5.4 Containment Materials: Rigid. Existing steel tank is constructed of steel and acts as the containment material for the interior coating removal operations.

3.5.5 Penetrability: Air Impenetrable. Provided by existing steel tank structure.

3.5.6 Support Structure: Not required. Operation to be performed inside the existing steel tank.

3.5.7 Joints: Fully Sealed. All mating joints between the containment materials and the structure and floor, ceiling, or ground are sealed. Sealing measure include tape, caulk, Velcro, clamps, or other similar material capable of forming a continuous impenetrable or impermeable seal. Overlapping is not permitted.

3.5.8 Entryways: Re-sealable. Comprised of flexible or rigid doorways that are capable of being repeatedly opened and resealed. Sealing methods include the use of zippers, Velcro, clamps or similar fasteners. Sealing mechanism used shall be accessed by both directions. Overlapping door tarpaulins shall not be used.

3.5.9 Air Supply (Intake) Points: Controlled. The use of baffles, louvers, flap seals, filters and ducts on supply air point to preclude inadvertent escape of abrasive and debris.

3.5.10 Input Air Flow (Ventilation): Forced (Mechanical). Mechanical ventilation shall be provided to remove contaminated air from the containment system and filtered air shall be provided to replace the exhausted air. Design the system with proper exhaust ports or plenums, adequately sized ductwork, adequately sized discharge fans and air cleaning devices (dust collectors) and properly sized and distributed make-up air points to achieve a uniform air flow inside the containment system for visibility.

3.5.11 Air Pressure: Achieve a minimum negative air pressure of 7.5 mm (0.03 inch) W.C. relative to ambient conditions. Confirm through visual assessment for the concave appearance of the containment enclosure.

3.5.12 Air Movement: The design target for airflow shall be a minimum cross-draft velocity of 0.5 m/ s (100 feet/minute) or down-draft velocity of 0.31 m/ s (60 feet/ minute).

3.5.13 Exhaust Dust Filtration: Provide filtration of the exhausted air, to achieve a filtration efficiency of 99.9 percent at 0.5 microns (0.02 mils). Provide a dust collector rated at 30,000 cfm exhaust capacity.

3.5.14 The Contractor shall take every precaution reasonable to prevent the escape of dust and debris from the contained area into the pedestal interior and environment.

3.5.15 Steps shall be taken to minimize dust generation during the transfer of all abrasive/paint debris (expendable or recyclable abrasives) for recycling or disposal. Acceptable methods include, but not limited to vacuuming, screw or belt conveyance systems, or manual conveyance. Manual conveyance is only permitted if the work is performed inside a

containment that is equipped with an operating ventilation system capable of controlling the dust that is generated.

3.6 Coating Removal – Miscellaneous

3.6.1 Removal of existing exterior coatings at the site where tank recoating is taking place.

3.6.2 Obtain paints sample from all miscellaneous items and test for the presence of lead and other heavy metals. Should lead or other heavy metals be present then a containment structure shall be installed prior to paint removal. Vacuum Abrasive Blast Cleaning or Vacuum-Shrouded Power Tool Cleaning is an acceptable method of removing the existing paint.

3.6.3 The containment for Vacuum Abrasive Blast Cleaning shall, at a minimum, comply with the SSPC Guide 6 Class 4A system classification unless otherwise stated herein. The requirements for the containment system components are defined below:

.1 Containment Materials: Type A2- Flexible.

.2 Penetrability: Air penetrable, Type B2a - Tightly Woven.

.3 Support Structure: Type C3 - Minimal Support Structures.

.4 Joints: Type D2- Partially Sealed. The containment materials are mated together. The use of overlapping seams is recommended, complete sealing of joints is not required.

.5 Entryways: Type E4- Open Seam. Entry into the work area is made through unsealed seams in the containment area.

.6 Air Supply (Intake) Points: Type F2- Open Air Supply (Intake). Open air entry points without the use of ducts, valves, or baffles.

.7 Input Air Flow (Ventilation): Type G2- Natural. Fans or blowers are not used at supply air entry points.

.8 Air Pressure: Not required.

.9 Air Movement: The Contractor shall implement engineering controls to reduce airborne lead exposure and to prevent the escape of airborne lead particles from the containment.

.10 Exhaust Dust Filtration: Type J2- Air Filtration Not Required.

3.6.4 The containment for Vacuum-Shrouded Power Tool Cleaning and hand tool cleaning shall, at a minimum, comply with the SSPC Guide 6 Class 3P system classification unless otherwise stated herein. The requirements for the containment system components are defined below:

.1 Containment Materials: Type A2- Flexible.

.2 Penetrability: Air penetrable, Type B2a- Tightly Woven.

.3 Support Structure: Type C3 - Minimal Support Structures.

.4 Joints: Type D2- Partially Sealed. The containment materials are mated together. The use of overlapping seams is recommended, complete sealing of joints is not required.

.5 Entryways: Type E4- Open Seam. Entry into the work area is made through unsealed seams in the containment area.

.6 Air Supply (Intake) Points: Type F2- Open Air Supply (Intake). Open air entry points without the use of ducts, valves, or baffles.

.7 Input Air Flow (Ventilation): Type G2- Natural. Fans or blowers are not used at supply air entry points.

.8 Air Pressure: Not required.

.9 Air Movement: The Contractor shall implement engineering controls to reduce airborne lead exposure and to prevent the escape of airborne lead particles from the containment.

.10 Exhaust Dust Filtration: Type J2- Air Filtration Not Required.

3.7 Stop Work

3.7.1 Stop Work at any time when the conditions are not within the tolerance stipulated in the Specifications and take the appropriate corrective action. The stoppage will continue until conditions have been corrected. Standby time and cost required for corrective action is at the Contractor's expense. The occurrence of the following events shall be reported immediately to the Engineer and followed up in writing and shall require the Contractor to automatically stop lead paint removal and initiate cleanup activities.

3.7.2 Airborne lead levels at any of the high volume ambient air monitoring locations that exceed the limits stipulated in this Specification, or airborne lead in excess of the OSHA Action Level at the boundary of the regulated area.

3.7.3 Break in containment barriers.

3.7.4 Visible emissions in excess of the specification tolerances.

3.7.5 Loss of negative air pressure when negative air pressure is specified (e.g., for dry abrasive blast cleaning).

3.7.6 Serious injury within the containment area.

3.7.7 Fire or safety emergency.

3.7.8 Respiratory system failure.

3.7.9 Power failure.

3.8 Health and Safety Requirements

3.8.1 Follow health and safety procedures specified by OSHA and MOL per Section 01351 and contained in the Health and Safety Plan prepared by the Contractor for lead management activities.

3.9 Lead Paint Removal

3.9.1 Conduct lead paint removal activities described in this Contract and in the approved Lead Paint Management Plan.

3.9.2 Upon completion of paint removal activities at the end of each Day conduct HEPA vacuuming to collect loose paint flakes or paint dust in work area. No residues shall remain on the surfaces overnight, either inside or outside of containment.

3.10 Waste Management

3.10.1 Manage wastes generated consistent with the procedures set forth in the approved Lead Paint Management Plan.

3.10.2 Label all drums and containers in accordance with OHSA regulations.

3.10.3 Perform waste characterization analysis in accordance with applicable standards.

3.10.4 Should water accumulate in the work/exclusion zone(s), contain as wastewater in tanks for off-Site disposal to industrial wastewater treatment plant.

3.10.5 Transport and dispose of waste material per Section 02611.

3.11 Pollution Control

3.11.1 Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious toxic substances and pollutants produced by construction operations.

3.11.2 Be prepared to intercept, clean up, and dispose of spills or releases that may occur, whether on land or water. Maintain materials and equipment required for cleanup of spills or releases readily accessible on Site.

3.11.3 Promptly report spills and releases potentially causing damage to the environment to:

.1 Authority having jurisdiction or an interest in the spill or release including any conservation authority, water supply authorities, drainage authority, road authority, and fire department.

.2 The owner of the pollutant, if known.

.3 The person having control over the pollutant, if known.

.4 The Engineer.

3.11.4 Contact the manufacturer of the pollutant, if known, and ascertain the hazards involved, precautions required, and best measures to be used in any cleanup or mitigating action.

3.11.5 Take immediate action using available resources to contain and mitigate the effects on the environment and persons from any spill or release.

3.12 Equipment Decontamination

3.12.1 Do not commence work involving equipment contact with potentially contaminated material until the Equipment Decontamination Facility is operational.

3.12.2 Decontaminate equipment after working in potentially contaminated work areas and prior to subsequent work or travel on clean areas.

3.12.3 Perform equipment decontamination on the Contractor -constructed equipment decontamination pad.

3.12.4 As a minimum, perform the following steps during equipment decontamination:

.1 Mechanically remove packed dirt, grit, and debris by scraping and brushing without the use of steam or high-pressure water to reduce the amount of water needed and to reduce the amount of contaminated rinsate generated.

.2 Use high-pressure, low-volume, hot water or steam supplemented by detergents or solvents as appropriate and as approved by the Engineer.

.3 Pay particular attention to tire treads, equipment tracks, springs, joints, sprockets, and undercarriages.

.4 Scrub surfaces with long handle scrub brushes and a cleaning agent.

.5 Rinse off and collect cleaning agent.

.6 Air dry equipment in the Clean Zone before removing from the Site or travel on clean areas.

.7 Perform an assessment as directed by the Engineer to determine the effectiveness of the decontamination.

3.12.5 Maintain an inspection record on the Site which includes:

.1 Equipment descriptions with identification numbers or license plates.

.2 Time and date entering the decontamination facility.

.3 Time and date exiting the decontamination facility.

.4 Name of the inspector with comment stating that decontamination was performed and completed.

.5 Each piece of equipment will be inspected by the Engineer after decontamination and prior to removal from the Site and/ or travel on clean areas. The Engineer will have right to require additional decontamination to be completed if deemed necessary.

.6 Take appropriate measures necessary to minimize the drift of mist and spray during decontamination including the provision of wind screens.

.7 Collect decontamination wastewaters and sediments which accumulate on the equipment decontamination pad. Transfer wastewaters to designated wastewater storage tank.

.8 Transfer sediments to soil staging area.

.9 Furnish and equip personnel engaged in equipment decontamination with protective equipment including suitable disposable clothing, respiratory protection, and face shields.

3.12.6 Have on hand sufficient pumping equipment, of adequate pumping capacity and associated machinery and piping in good working condition for ordinary emergencies, including power outage, and competent workers for the operation of the pumping equipment. Maintain piping and connections in good condition and leak-free.

3.13 Quality Control

3.13.1 The Contractor's management supervisor shall perform a visual inspection to assure that lead hazard control activities have been properly completed. The management supervisor shall visually verify that the area is free of dust and paint chips generated by demolition and lead management activities.

3.13.2 The Engineer may collect waste samples, soil samples, or ambient or perimeter air samples for laboratory analysis to confirm satisfactory implementation of Contractor lead management plan activities.

END OF SECTION

1 GENERAL

1.1 Scope

1.1.1 This specification covers the requirements for stockpiling, supplying, and placing topsoil.

1.2 Related Sections

1.2.1 DIVISION 1 – GENERAL REQUIREMENTS

1.2.2 Section 02933 – Sodding

1.3 Submittals

1.3.1 Soil fertility test for topsoil placed in stockpile

1.3.2 Source of supplemental topsoil, including results of a Soil Fertility test

1.4 Measurement and Payment

1.4.1 Work outlined in this section is included in the lump sum tender price.

2 PRODUCTS

2.1 Topsoil

2.1.1 Topsoil shall be a fertile loam material that is free of roots, vegetation, or other debris of a size and quantity that prevents proper placement of the topsoil. The topsoil shall not contain material greater than 25 mm in size, such as stones and clods.

2.1.2 Imported topsoil shall not have contaminants that adversely affect plant growth.

2.1.3 Soil from swamps or muskeg areas may be used in place of topsoil, when approved by the Contract Administrator.

2.1.4 Topsoil for seeded areas, planting beds: mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.

2.1.5 Soil texture based on the Canadian System of Soil Classification, to consist of 20 to 70% sand, minimum 7% clay, and contain 2 to 10% organic matter by weight.

2.1.6 Contain no toxic elements or growth inhibiting materials.

2.1.7 Finished surface free from:

.1 Debris and stones over 50 mm diameter.

.2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.3 Consistency: friable when moist.

2.2 Soil Amendments

2.2.1 Fertilizer:

2.2.2 Fertility: major soil nutrients present in the 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, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.5 pH value: 6.5 to 8.0.

2.2.3 Sand: washed coarse silica sand, medium to course textured.

2.2.4 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and any other micro-nutrients suitable to the specific plant species or application or defined by the soil test.

2.2.5 Fertilizer requirements will be determined after obtaining results of soil fertility test.

2.3 Source Quality Control

2.3.1 Advise the Engineer of sources of topsoil and manufactured topsoil to be utilized with sufficient lead time for testing.

2.3.2 Contractor is responsible for amendments to supply topsoil as specified.

2.3.3 Provide soil testing results by recognized testing facility for pH, P and K, and organic matter.

3 EXECUTION

3.1 Stripping of Topsoil

3.1.1 Commence topsoil stripping of areas as indicated on the Contract Drawings, and as directed by the Engineer, after area has been cleared of brush, weeds and grasses and removed from site.

3.1.2 Strip topsoil to depths as indicated on the Contract Drawings, or as directed by the Engineer. Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

3.1.3 Stockpile in locations as directed by the Engineer. Stockpile height not to exceed 3 m.

3.1.4 Dispose of unused topsoil offsite.

3.1.5 Protect stockpiles from contamination and compaction.

3.2 Preparation for Topsoil

3.2.1 Verify that grades are correct. If discrepancies occur, notify the Engineer and do not commence work until instructed by the Engineer.

3.2.2 Areas where topsoil is to be placed shall be fine graded to a uniform surface. The surface shall be loosened to a depth of 50 mm. It shall be free of all vegetation, debris, and stones which would not be covered by the depth of topsoil specified.

3.2.3 Grade soil, eliminating uneven areas and low spots, and ensuring positive drainage.

3.2.4 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site.

3.2.5 Prepared areas shall be maintained in the condition described above until topsoil is placed.

3.3 Placing and Spreading of Topsoil/Planting Soil

3.3.1 Provide soil amendments to ensure topsoil meets quality objectives noted in sub-section 2.2.

3.3.2 Place topsoil after the Engineer has accepted the prepared subgrade.

3.3.3 Topsoil shall be placed to a uniform depth of 200 mm on areas specified in the Contract Documents.

3.3.4 Spread topsoil in uniform layers not exceeding 100 mm.

3.3.5 For sodded areas keep topsoil 15 mm below finished grade.

3.3.6 Spread topsoil as indicated to following minimum depths after settlement.

3.3.7 200 mm for seeded areas.

3.3.8 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.4 Finish Grading

3.4.1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.

3.4.2 Consolidate topsoil to required bulk density using equipment approved by the Engineer. Leave surfaces smooth, uniform and firm against deep foot printing.

3.5 Acceptance

3.5.1 The Engineer will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.6 Surplus Material

3.6.1 Dispose of surplus materials not required off site.

END OF SECTION

1 GENERAL

1.1 Scope of Work

1.1.1 This section covers sodding requirements for works specified in the contract.

1.2 References

1.2.1 Landscape Ontario Horticultural Trades Association, Landscape Standards Section #8.

1.2.2 Nursery Sod Growers Association of Ontario: “Classification and Use of Turf Grass for Ontario”.

1.2.3 Canada “Fertilizers Act” and “Fertilizer Regulations”.

1.3 Delivery, Storage and Handling

1.3.1 The Contractor shall provide, upon request by the Engineer, a label or statement certifying the quality grade, location of sod source and species of grass in the sod, and that the sod meets the specifications or requirements of the Standard for the stated grade.

1.3.2 Sod shall be protected during transportation for load security and reduction of wind exposure to prevent drying out and shall arrive at the site in a fresh and healthy condition.

1.3.3 Sod delivered to the site shall be stored to minimize drying out or overheating.

1.3.4 Small, irregular or broken pieces of sod shall not be accepted.

1.3.5 Sod shall be allowed to dry sufficiently from wet weather to prevent tearing during handling.

1.3.6 Sod shall be protected from drying out and watered as necessary to ensure its vitality.

1.3.7 Sod shall not be dropped or dumped from vehicles. Sod shall be delivered, stored, and unloaded on pallets.

1.3.8 Fertilizers and amendments shall be delivered and stored in waterproof containers showing weight, analysis and name of manufacturer.

1.4 Scheduling and Sequencing

1.4.1 Schedule sod to be delivered within 24 hours of being cut.

1.4.2 Schedule sod laying to coincide with preparation of the soil surface

1.4.3 Sod shall not be placed when soil is in a saturated or frozen condition

1.4.4 Sod shall be laid within 24 hours of delivery to the site.

1.5 Qualifications of the Contractor

1.5.1 Experienced, qualified personnel under the direction and supervision of a foreman with at least five years of horticultural and planting experience will carry out sodding and related Work.

1.5.2 The Work of this Section will be carried out while the Contractor's foreman is on Site and directly supervising the sodding operation.

1.6 Warranty

1.6.1 Warranty all sod until completion of minimum 2 mowings. Sod shall be mowed when turf has reached a height of 100-25mm, and mowing height shall be 75-85mm.

1.6.2 Repair any deterioration, bare spots, breaks or displacement of sod during warranty period. Contractor shall be responsible for all maintenance of sodded areas during the warranty period, including watering and initial two mowings.

1.6.3 Replacement of sod damaged due to circumstances beyond the Contractor's control after completion shall not be an obligation under this warranty. The Contractor is responsible for watering during severe drought.

1.6.4 At the conclusion of the warranty period, the sod shall be predominantly green and succulent, showing evidence of rooting into the underlying soil. Sod shall not have greater than 3% scattered dead patches and these patches shall not exceed 0.15m^2 on an individual basis. Any sod which fails to meet these requirements must be corrected by the Contractor to bring the sod within these criteria, including the warranty period for new, replacement sod.

1.7 Maintenance

1.7.1 Water sod immediately after laying and ensure that moisture penetration is obtained through sod and into top 100mm of topsoil.

1.7.2 Sod shall be watered sufficiently to maintain optimum growing conditions throughout the warranty period. Ensure adequate moisture in root zone at freeze up.

1.7.3 Any areas that are not in a healthy growing state or that have ruts or other damage at the end of the warranty period will not be accepted until repairs are made to the satisfaction of the Engineer. Repairs shall be made at the Contractor's expense. The site shall be restored to original conditions from any damage arising from replacement operations at no additional cost.

2 PRODUCTS

2.1 Sod

2.1.1 Sod shall be Ontario No. 1 Grade Kentucky Bluegrass / Fine Fescue nursery sod in vigorous growing condition, free from weeds and crabgrass, cut from well-established turf, soil permeated with roots and containing sufficient moisture to maintain vitality during transport and storage. Sod shall be grown from a seed mixture containing by weight, 90-95% Kentucky bluegrass cultivars and 5-10% Creeping Red, Chewings or Hard Fescue cultivars.

2.1.2 Sod shall be cut with a uniform soil thickness (excluding thatch and leaf growth) of 15mm minimum.

2.1.3 Sod shall be a minimum age of 12 months, and root development shall support weight without breaking.

2.1.4 All Sod provided shall have an average leaf blade height between 40-60mm.

2.1.5 All Sod shall be free from diseases, fungi, nematodes and soil-born insects.

2.1.6 All Sod shall have no more than 10mm of thatch (uncompressed).

2.1.7 Field turf grass sod shall not contain more than 10 weeds per $10m^2$.

2.2 Fertilizer

2.2.1 Complete commercial fertilizer with 50% of the elements derived from organic sources.

2.2.2 All Fertilizers shall be granular, pelletized or pill form, and shall be dry and free flowing, unless otherwise specified.

2.2.3 Fertilizers shall be packed in standard waterproof containers, clearly marked with the name of the manufacturer, weight and analysis.

2.2.4 The types, formulations, and rates of application for fertilizers shall be as recommended by the laboratory soil specialist, based on the test results of the growing medium, and as approved by the consultant.

2.3 Water

2.3.1 Water shall be potable and free of impurities and chlorine that could inhibit germination and growth.

2.3.2 Water temperature shall not be more than $10^{O}C$ below ambient air temperature.

2.3.3 The Contractor shall be responsible for obtaining water from its own sources. The Contractor will be responsible for obtaining any permits or certificates for water usage.

2.3.4 Water tanks used for the application of water will be clean and free of any contaminants that will be hazardous to the growth and development of plant material or to the general environment.

2.4 Sod Pegs

2.4.1 Wood, 17 x 17mm size, minimum 200mm in length, tapered end. Pegs shall be used as required on sloped areas to be sodded.

3 EXECUTION

3.1 Examination

3.1.1 The Contractor shall verify that existing site conditions are ready to receive work.

3.1.2 Commencement of work implies acceptance of existing conditions.

3.2 Preparation

3.2.1 The Contractor shall ensure that topsoil placed has been fertilized and amended as recommended by the soil testing agency, as covered under Section 02911.

3.2.2 The Contractor shall verify that all grades are correct prior to placement of sod.

3.3 Placement of Sod

3.3.1 Sod placement shall not commence until completion of topsoil placement and irrigation system installation.

3.3.2 Sod shall be placed immediately upon delivery or as soon as possible thereafter, but no later than 36 hours after cutting. Sod shall be watered immediately following placement, to a minimum penetration depth of 100mm below sod.

3.3.3 Sod shall be laid in smooth and even rows, with joints in adjacent rows staggered a minimum of 25cm. Pieces shall be closely knit, tight together in such a manner that there are no open joints visible and no pieces are stretched or overlapped.

3.3.4 Sod shall be laid perpendicular to slopes or the flow of water. On slope areas, sodding shall be started at the bottom of the slope. On slopes steeper than 2:1, every row shall be pegged with wooden lath pegs of sufficient length to ensure satisfactory anchorage of the sod, at intervals of not more than 0.5m metres. Pegs shall be driven flush with sod.

3.3.5 Countersink sod to the existing grade level at all edges. Sod shall be cut only where necessary, using a sharp knife or edging tool.

3.3.6 After sod is laid, tamp and roll the sodded area to a uniform surface. Blend all final sod grades smoothly to have a clean flush bond into adjacent surfaces. Do not use heavy power rollers. Maximum weight allowed: 450kg. Hand roller shall have a minimum weight of 90kg and a maximum weight of 135kg.

3.3.7 Initially water sod within 2 hours of placement. Apply sufficient quantity of water to penetrate the top 100mm surface of the top soil. Verify water penetration by lifting strips at random and examining the soil. Apply water uniformly and in a manner to prevent erosion.

3.4 Protection

3.4.1 Maintain and protect work until final acceptance. Newly sodded areas shall be protected from heavy foot traffic during laying. Planks shall be placed if necessary to prevent damage.

3.4.2 Before pedestrian traffic is permitted on the turf, and after the turf is well rooted into the growing medium, all pegs or stakes shall be removed or driven at least 50mm below the surface.

3.4.3 The work will only be accepted by the Engineer when the Work is properly established and the turf is free of eroded, bare and dead spots and is 98% free of weeds. On completion and approval by the Owner and Engineer, all necessary instructions shall be provided for proper maintenance to ensure the continuing establishment and vigour of the sod.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

Section No.	Title
13600	Elevated Tank Rehabilitation
13605	Exterior Coating

1 GENERAL

1.1 Intent

1.1.1 Under this Section, the Contractor shall supply all materials, equipment and labour necessary for the complete design, construction, and commissioning of the Deep River Water Tower Rehabilitation and all related accessories, as specified herein and identified on the Contract Drawings.

1.2 Related Sections

1.2.1 Division 1 – GENERAL REQUIREMENTS

1.2.2 Section 13605 – Exterior Coating of Steel Water Tanks

1.3 System Description

1.3.1 The existing Deep River Water Tower has a net working volume of 1,500 m^3 with approximate dimensions and elevations shown on the Contract Drawings and listed below:

.1 Overall water tower height: +/- 39.5 m

.2 Storage cell diameter: +/- 14.0 m

.3 Storage cell height: +/- 10.5 m

1.4 Definitions

1.4.1 The following technical definitions shall apply to this Specification:

.1 **Accessories:** Optional or additional equipment or components required by the project documents.

.2 **Appurtenances:** Piping, mechanical equipment, vents, ladders, platforms, brackets, fall arrest and safety equipment, doors, lighting, and related items necessary for operation of the tank.

.3 **Bottom Capacity Level (BCL):** The elevation above which the required working capacity is contained; not lower than top of silt stop, lip of the outlet pipe, or invert of the outlet check valve.

.4 **Elevated Water Tank:** The entire structure comprising: the foundation, support structure, steel tank, and appurtenances and accessories.

.5 **High Water Level (HWL)**: The maximum water level under normal tank operating conditions other than overflow.

.6 **Net Working Capacity:** The volume contained between the bottom capacity level (BCL) and the top water level (TWL).

.7 **Riser Piping:** Inlet/outlet and overflow pipes, fittings, and appurtenances above the termination point near grade. The termination point near grade in the inlet/outlet pipe shall be the bottom flange in the vertical run of pipe or the bottom of the expansion joint

when located near grade. The termination point near grade of the overflow will be the discharge point of the overflow.

.8 **Service Loads:** Unfactored design loads.

.9 **Top Water Level (TWL):** The elevation to the lip of the overflow.

.10 **Total Capacity:** The total volume contained between the bottom capacity level (BCL) and the top capacity level (TWL).

1.5 Reference Standards

1.5.1 The work undertaken, and products provided in this Specification shall conform in all respects to the latest published revisions of the following standards except where specified herein or on the Contract Drawings:

.1 Ontario Building Code

.2 National Building Code of Canada

.3 AWWA D100 - Standard for Welded Steel Tanks for Water Storage

.4 AWWA D102 - Standard for Coating Steel Water-Storage Tanks

.5 AWWA D107 – Standard for Composite Elevated Tanks for Water Storage

.6 ANSI/AWWA C210 Standard – Liquid Epoxy Coating and Lining Systems for the Interior and Exterior of Steel Water Pipelines (latest edition)

.7 ANSI/AWWA C222 Standard – Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings (latest edition)

.8 NACE SP0178 – National Association of Corrosion Engineers – Standard Recommended Practice - Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

.9 NACE SP0188 – Discontinuity (Holiday) Testing of Protective Coatings on Conductive Substrates

.10 ASTM D16-11a – Standard Terminology for Paint, Related Coatings, Materials and Applications

.11 AWWA D104 - Standard for Automatically Controlled, Impressed – Current Cathodic Protection for the Interior of Steel Water Tanks

.12 AWWA C652 - Standard for Disinfection of Water-Storage Facilities

.13 CSA S16.1 - Steel Structures for Buildings

.14 CSA W47 - Welder Qualifications

.15 CSA W59 - Welded Steel Construction

.16 SSPC-SP1 – Solvent Cleaning

.17 SSPC-SP2 – Hand Tool Cleaning

.18 SSPC-SP3 – Power Tool Cleaning

.19 SSPC-SP5/NACE No. 1 – White Metal Blast Cleaning

.20 SSPC-SP6/NACE No. 3 – Commercial Blast Cleaning

.21 SSPC-SP10/NACE No. 2 – Near-White Blast Cleaning

.22 SSPC-PA1 – Workmanship Standards

.23 SSPC-PA2 – Measurement of Dry Coating Thickness with Magnetic Gauges

.24 SSPC-PA3 – A Guide to Safety in Paint Application

.25 SSPC-TR3/NACE 6A192 - Dehumidification and Temperature Control During Surface Preparation, Application, and Curing for Coatings/Linings of Steel Tanks, Vessels, and Other Enclosed Spaces

.26 CSA A23 - Design of Concrete Structures

.27 Occupational Health and Safety Act, 1990 and Regulations for Construction Projects

.28 ANSI/NSF-61 - American National Sanitation Foundation Standard for Products in Contact with Potable Water

.29 ANSI Z117.1 - Safety Requirements for Working in Tanks and Other Confined Spaces

.30 NACE RPO 178-95 - National Association of Corrosion Engineers – Standard Recommended Practice - Fabrication Details, Surface Finish Requirements and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service

.31 ACI 371R - American Concrete Institute Guide for the Analysis, Design, and Construction of Concrete-Pedestal Water Towers

.32 Canadian General Standards Board

1.6 Submittals

1.6.1 General

1.6.2 The Contractor shall prepare and submit all required documentation and samples in accordance with Specification Section 01330 – Submittal Procedures. In addition, the Contractor shall submit all additional documentation as specified herein.

1.6.3 Submittals Required Following Award of Contract

.1 A Quality Assurance (QA) Plan shall be submitted that documents the key design and construction elements of the elevated water tank rehabilitation and improvements project including but not limited to protective coatings, shop welding and field welding. The intent of the Contractor's QA Plan is to ensure monitoring and checking of the work in progress, and verification that the construction conforms to the requirements of the Contract. The QA Plan shall include procedures for exercising control of the construction

work and the personnel exercising such control, detail method(s) for verifying that all construction tolerances are met, and detail remedial action plans to correct any work that does not meet the tolerances specified.

.2 All detailed design calculations and drawings for the elevated water tank appurtenances shall be prepared and sealed by a Professional Engineer licensed in the Province of Ontario and experienced in the design of composite elevated water tanks.

.3 The following documents which shall be prepared and sealed by the design engineer of record, within four weeks of contract award for review and approval of the Engineer:

.1 Interior and exterior coating systems.

.2 Shop Drawings of all the required appurtenances and accessories. All drawings shall show all features of the work, including the size and position of all structural components and reinforcement, location and details of reinforcement splices, special details, and the required strength or grade of all materials.

.3 Reinforcement details required to accommodate roof works specified under this contract.

.4 All remaining submittals shall be submitted as soon as reasonably possible after contract award and the necessary field measurements have been obtained. Field measurements shall be obtained before submitting shop drawings.

1.6.4 Submittals Required During Construction

.1 Certified welding procedures, names and qualifications of welders and listing of all welding equipment/electrodes to be utilized prior to the repair of all steel pits or welds and installation of accessories on the interior and exterior of the tank.

.2 Inspection reports detailing all quality assurance measurements taken throughout fabrication, erection and welding of all steel tank accessories and appurtenances. Reports to be received prior to commencing with the work.

.3 After commissioning of the rehabilitated water storage tank and prior to the issuance of Substantial Performance for the contract, affidavits prepared and sealed by the design engineer of record that:

.1 The Engineer has inspected the Work during construction and certifies that the design requirements have been fulfilled.

.2 The Engineer has reviewed field test results and certifies that the results satisfy the requirements of this Specification and the Reference Standards.

2 PRODUCTS

2.1 General Requirements

2.1.1 The general requirements specified herein, provide overall guidance and minimum requirements for the design, component supply, construction, commissioning and the performance of the elevated water tank.

2.2 Design

2.2.1 The elevated water tank rehabilitation shall be designed complete including all appurtenances, accessories and piping required for its proper operation and maintenance and shall comply with all applicable safety standards.

2.3 Steel Tank Rehabilitation, Appurtenances and Accessories:

2.3.1 Steel Tank

.1 All materials incorporated into the steel tank shall comply with AWWA D100 and shall be new, previously unused and in first-class condition.

.2 Detail all new welded connections, roof support members and connections to them, plate connections and all equipment connections, appurtenances and accessories, within the steel tank in accordance with NACE RPO 178-95, or latest revision.

.3 No dissimilar metals shall be allowed on the interior or exterior wherever possible. If dissimilar metals must be used, the dissimilar metals shall be electrically isolated from the steel tank surface to prevent corrosion, by an acceptable method approved by the Engineer.

.4 All members shall be designed to safely withstand the maximum stresses to which they may be subjected during fabrication, erection and operation.

.5 All steel shall be Grade 300W and conform to the current Specifications of the CAN3-G40 series, latest revision.

.6 All new openings in the tank shell, suspended floor, riser plating and other locations which are subject to hydrostatic pressure, shall be reinforced in accordance with AWWA D-100, Section 3.13.

2.3.2 Roof Reinforcement Installation and Upgrades

.1 The Contractor shall complete an analysis of the respective tank sections affected by installation of appurtenances and safety equipment outlined in the Contract. The analysis shall be used to determine reinforcement required to install items stipulated in the Contract. The analysis shall also be used to verify compliance with current OBC and NBC code requirements. The design shall be based on Post-Disaster importance.

.2 The Contractor shall consider all loading resulting from addition of new appurtenances completed as part of this Contract.

.3 Minimum reinforcement requirements, if any, are specified on the Contract Drawings. The Contractor shall review all reinforcement shown on the Contract Drawings and provide any additional reinforcement, as may be required to accommodate appurtenance and roof upgrade installations.

.4 The Contractor shall design and install all appurtenances specified under this Contract and provide all required reinforcement which may be required to accommodate installations specified in the Contract.

.5 Any additional reinforcement or modification required over and beyond those shown on the Contract Drawings shall be included in the base bid. No further payment will be made for additional reinforcement installation.

.6 All components shall be seal-welded.

.7 Submit analysis calculations, sealed by an Engineer licensed to practice in the Province of Ontario.

2.3.3 762mm Diameter Storage Cell and Wet Rise Access Hatches

.1 Remove and replace storage cell access hatch fasteners.

.2 Blast and recoat exterior hatch components in accordance with Specification Section 13610.

.3 Complete spot repairs of the interior liner at each hatch as per notes on Drawing G01.

.4 Supply and install new neoprene access hatch gaskets for each hatch.

.5 All fasteners are to be SS316L.

2.3.4 Main Access Ladder and Platform Extension

.1 Temporarily remove main access ladder, ladder support brackets, ladder gate and rest seats as indicated on Contract Drawings.

.2 Install new ladder support brackets at 3.0 m c/c on existing ladder to allow minimum ladder rung clearance of 150 mm from the edge of existing column leg.

.3 Design, supply and install main access platform at ladder.

.4 Reinstall existing ladder onto new ladder support brackets at completion of coating application work.

.5 Reinstall existing ladder gate and rest seats with ladder. Ladder seats to be spaced at equal intervals along the ladder.

.6 Install new extension ladder support bracket at bottom of main access ladder complete with end stops.

.7 Site verify all dimensions prior to fabrication.

.8 Approximate Ladder Length = 27 metres.

2.3.5 Ladder Fall Arrest System

.1 Remove existing TS Rail fall arrest system from the Main Access Ladder.

.2 Supply and install a Miller GlideLoc Vertical Height Access Ladder System Kit, complete with entry and exit gates and rail clamps on the Main Access ladder.

.3 All GlideLoc components to be hot-dipped galvanized.

.4 TS Rail system on roof access ladder to remain. Protect system during abrasive blasting operations.

2.3.6 Tie-Off Columns

.1 Design, supply and install tie-off columns as indicated on Contract Drawings.

.2 Maximum tie-off column height shall be 500mm.

.3 Each tie-off column shall be furnished with a SS316L D-ring anchor, fastened to the tie-off column with a min. 12mm dia. SS316L fastener.

.4 Confirm location of each tie-off column with the Engineer prior to installation. All effort is to be made to install each tie-off column directly above an existing interior roof stiffener, if applicable.

.5 Install all tie-off columns vertically plumb. For rooftop installations, slope of the roof, if any, is not shown on Contract Drawings.

.6 All components of the tie-off column to be seal-welded.

.7 Each tie-off column is to be designed for a load of 22kN applied in any direction at max. 400mm above the installation surface. All tie-off column components, including but not limited to roof reinforcement shall be designed and sealed by an Engineer licensed to practice in the Province of Ontario.

.8 Design, supply and install roof reinforcement to accommodate installation of each tie off column, as required.

.9 Topcoat color to be ‘Safety Yellow’, PMS 116, as per Specification 13605.

2.3.7 D-Ring Anchors

.1 Design, supply and install Stainless Steel D-ring anchors as indicated on Contract Drawings.

.2 Each D-ring is to be secured to a Stainless Steel HSS base via a min. 12mm dia. bolted connection. Size of the base section to be designed and selected by the vendor. At minimum, the size of the HSS section shall be adequate to allow removal and replacement of the D-ring anchor.

.3 For installations on steel, the HSS D-Ring anchor base is to be seal-welded to the steel substrate.

.4 Design and installation of each D-Ring anchor shall include all required reinforcement required to accept anchor point design load.

.5 Confirm location of each D-ring anchor with the Engineer prior to installation.

.6 All anchorage components, including but not limited to roof reinforcement shall be designed and sealed by an Engineer licensed to practice in the Province of Ontario.

.7 All fasteners to be SS316L.

.8 Design load = 22kN in any direction.

2.3.8 Rescue Davit Bases

.1 Design, supply and install rescue davit bases, as indicated on Contract Drawings. The rescue davit base shall be compatible with masts and accessories manufactured by DBI Sala only.

.2 Supply and install 75mm dia. test plug to ensure water tightness.

.3 All components of the davit base shall be seal-welded.

.4 Design and install all required roof/shell reinforcement at the davit base to accept davit base loads.

.5 Design load = 22kN in any direction.

.6 Topcoat color to be 'Safety Yellow', PMS 116, as per Specification 13605.

2.3.9 Existing Balcony Guardrail Modifications

.1 Design and modify existing guardrails to have minimum height of 1070 mm as indicated on Contract Drawings. Vendor to design member extensions and validate guardrail members to accommodate a 1.0 kN point load horizontally and 1.5 kN/m vertically along the top rail, as per O.B.C.

.2 Extend height of existing kickplate by installing 50mm high, 6mm thick flat bar approximately 15 mm above existing kick plate. Seal weld flat bar to vertical posts and diagonal braces.

.3 Design, supply and install any additional balcony reinforcement to accommodate guardrail vertical extension.

.4 All components of the guardrail system shall be fully seal-welded.

2.3.10 Interior Grab Bar Replacement

.1 Remove damage grab bars installed adjacent to the side access hatch. Grind attachment points smooth for each bar.

.2 Supply and install 18mm dia., 400mm wide deformed bars in existing bar locations.

.3 Repair weld damage and apply lining on damaged areas and bar as per interior lining repair notes stipulated on Contract Drawings.

2.3.11 Telecommunication Equipment Management & Coordination

.1 The Contractor shall coordinate with respective telecommunication companies and jointly develop a work plan for safe execution of the work while maintaining uninterrupted telecommunication service during construction. See Special Provisions for antenna management and coordination requirements.

.2 The Contractor shall temporarily remove all existing roof and balcony mounted antennas and related infrastructure to the exterior of the scaffolding, as indicated on Contract Drawings to facilitate blasting and coating application.

.3 All antennas and telecommunication equipment relocated to the scaffolding shall be protected for duration of construction.

.4 Relocate all antennas from the scaffolding to their original locations at completion of the coating application process.

.5 Relocate all telecommunication cables to Unistruts provided at completion of construction.

2.3.12 Telecommunication Cable Unistrut and Conduit Installation

.1 Remove existing Unistrut brackets and unistrut attachment brackets installed adjacent to the main access ladder from tower support column.

.2 Install Unistrut supports to suit existing Unistrut brackets along the main access ladder. Max Unistrut spacing to be 1800mm c/c.

.3 Reinstall existing unistruts on new brackets at completion of coating application work.

.4 Unistrut brackets to be coated as per Specification 13605.

.5 Install five (5), 200mm long, 50mm dia. cable conduits on balcony, adjacent to the main access ladder. Conduits to be coated as per Specification 13605.

.6 Supply and install roof-mounted unistrut brackets along roof access ladder and roof handrail at max 1400mm c/c spacing.

2.3.13 Non-Skid Walkway

.1 Install a non-skid walkway as indicated on Contract Drawings.

.2 Apply non-skid walkways as per Specification 13605.

2.3.14 Exterior Coating Repairs Due to Welding and / or Construction

.1 The Contractor shall repair any exterior and interior coating damage due to welding, repairs or any other work completed under this Contract.

.2 All coating repair costs shall be included in the overall bid submitted by the Contractor.

3 PRODUCTS – NOT APPLICABLE

4 EXECUTION – NOT APPLICABLE

4.1 General

4.1.1 All components forming part of the elevated tank structure including structural retrofits, repairs and all appurtenances and accessories shall be constructed in accordance with the approved shop drawings and all work shall be performed by qualified, experienced and, where necessary, licensed personnel.

4.1.2 The workmanship and finish shall be the best in modern shop practice.

4.1.3 The Contractor is solely responsible for all shipping, handling and storage of materials and equipment in accordance with Section 01610 – General Equipment Stipulations.

4.1.4 The Contractor shall ensure that all material is handled in accordance to the manufacturers recommended procedures and all aspects of appropriate acts and regulations.

4.2 Welding

4.2.1 All welding and surface finish requirements shall be conducted in conformance with CSA W59 and CSA-W47, using only Canadian Welding Bureau (CWB) approved welders, and NACE Standard RPO178-95.

4.2.2 Welding electrodes shall be of E70 (E480) series low hydrogen type. All open containers of the electrodes shall be stored in drying ovens.

4.2.3 Only thoroughly dry electrodes shall be used. Welders shall be equipped with only enough electrodes for two hours of welding at a time.

4.2.4 All loner plate seams shall be welded on the top side only with continuous fillet welds or continuous butt welds with backup bars. All other lap joints shall be welded both sides with continuous fillet welds.

4.2.5 All rough welds shall be ground to remove sharp edges, undercuts, pinholes and other such irregularities. All welds shall be smooth and even and sound throughout and shall have a minimum strength of 90 percent of that of the connecting plates. When requested by the Engineer, welding specimens shall be prepared by the Contractor and will be subjected to suitable tests to determine the quality and strength of the welds. Test welds shall be similar in every way to those made in the tank.

4.2.6 The Engineer will coordinate a certified independent Inspection Agency to inspect and test both shop and field welds in accordance with AWWA D-100, Section 11, “Inspection and Testing”, to monitor the progress of the steel and welding work and ensure conformance to all specifications and Reference Standards. The Engineer shall make arrangements for inspection and testing by the Inspection Agency. Payment for the visual inspections and testing carried out by the Inspection Agency will be made by the Owner. The Contractor shall cooperate fully with the Inspection Agency, provide access to its facilities and submit all required information. It shall be the Contractor’s responsibility to submit credentials of welders and approved welding procedures and coordinate the times when inspections and testing are to be carried out.

4.2.7 Testing of welded joints shall be carried out prior to application of any protective coatings by the independent Testing Agency selected by the Owner. Testing of welded joints shall include:

.1 Radiographic Testing

.2 Vacuum Testing

.3 Ultrasonic Testing

4.2.8 When a section of weld is shown by radiograph to be unacceptable, the Contractor shall repair the defective weld. All costs to re-inspect and re-test the repaired section shall be back-charged to the Contractor under the Contract by the Owner.

4.2.9 Should the quality of completed welds in the tank be in doubt, the Contractor shall, if and where ordered by the Engineer, cut out test pieces and shall patch the openings made in the plates. The number of such test pieces, excluding those which fail to show the specified strength, shall not exceed ten.

4.2.10 Any additional inspections costs incurred for re-inspections and/or re-testing due to welding deficiencies or scheduling delays, shall be back-charged to the Contractor under the Contract by the Owner.

4.2.11 Upon completion of the steel tank, the Inspection Agency will prepare a written report summarizing all inspections and testing, and submit one copy of the complete report to the Engineer together with all of the Radiograph Negatives. Payment for the report prepared by the Testing Agency, will be made by the Owner.

4.3 Protective Tank Coatings

4.3.1 The Contractor shall apply all protective tank coatings in accordance to Section 13605 – Exterior Coating of Steel Water Tanks, and Section 13610 – Interior Lining of Steel Water Tanks, as applicable.

4.3.2 The Engineer will coordinate a certified independent Inspection Agency to verify surface finish requirements, monitor the progress of the work and ensure conformance to all specifications and Reference Standards during shop priming, if applicable, and field application of the coating systems on behalf of the Owner and Engineer. The Engineer shall make arrangements for inspection by the Inspection Agency. Payment for the inspections carried out by the Inspection Agency, will be made by the Owner. The Contractor shall cooperate fully with the Inspection Agency, provide access to its facilities and submit all required information requested by the Engineer or the Inspection Agency. It shall be the Contractor's responsibility to conduct their own Quality Control of the surface finish and coating requirements and submit all required documents per the coating specifications.

4.3.3 Any additional inspections costs incurred for re-inspections and/or re-testing due to deficient work or scheduling delays, shall be back-charged to the Contractor under the Contract by the Owner.

4.3.4 Upon completion of the interior and exterior protective coating systems, the Inspection Agency will prepare a written report summarizing all inspections and tests, and submit one copy of the complete report to the Engineer. Payment for the report prepared by the Testing Agency will be made by the Owner.

4.4 Testing

4.4.1 The Contractor shall test all watermains, pipework, pipelines and water storage facilities constructed under this Contract in accordance to Division 1 and all other relevant Divisions and Sections where work is to be tested.

4.4.2 Water for filling and disinfecting the elevated tank to the Overflow Level, will be provided once at no cost to the Contractor. Any additional volume of water required to satisfy the disinfection and/or testing requirements, shall be metered and paid for by the Contractor at the applicable water rate(s) in effect.

4.5 Disinfection

4.5.1 The Contractor shall disinfect all watermains, pipework, pipelines and water storage facilities constructed under this Contract in accordance with Ontario Regulation B13-3 "Chlorination of Potable Water Suppliers in Ontario", and AWWA C652-19 – Disinfection of Water Storage Facilities. The exact method is to be agreed with the Engineer prior to commencing the work.

4.5.2 All chlorinated water discharged from the elevated tank and/or piping shall be dechlorinated by the Contractor to provide a total chlorine residual of zero mg/L. The Contractor is responsible for monitoring the discharge of water from the elevated tank or process piping in the presence of the Engineer. Should tests show a residual greater than zero mg/L, the discharge shall be ceased immediately, and the procedure modified to meet less than the zero mg/L objective.

4.6 Chlorine Residual and Bacteriological Testing

4.6.1 Procedure

.1 Prior to substantial performance, two consecutive rounds of water samples, taken at least 24 hours apart by the Owner's qualified personnel licensed in accordance with Ontario Regulation 170/03, shall pass both the chlorine residual and bacteriological standards outlined herein for coincident samples. Prior to chlorine residual and bacteriological testing, flushing or washing, pressure testing, and disinfection shall be completed by the Contractor, and any super-chlorinated water shall be removed from all portions of the piping system prior to being placed into service.

.2 Chlorine residual and bacteriological sampling shall be undertaken by the Owner's qualified personnel licensed in accordance with Ontario Regulation 170/03.

.3 The contents of the elevated tank and pipework being tested must not be disturbed or flushed during the period between the 1st and 2nd sampling rounds, except to obtain a water sample.

4.6.2 Chlorine Residual Requirements

.1 At each sampling location, the total and free chlorine residuals in the sample must be at least equal to or greater than the source water residual at the end of the test for the Owner to approve putting the tank on line.

.2 A single failed chlorine residual parameter will constitute a failure of that entire sampling round, both, chlorine residual and bacteriological. The Contractor may elect to have the Owner's qualified personnel re-sample (chlorine and bacteriological) or take other corrective action to achieve two consecutive rounds of acceptable chlorine residual and bacteriological results.

.3 Chlorine readings shall be taken by the Owner's qualified personnel at the same time as water samples for bacteriological testing are collected.

4.6.3 Bacteriological Requirements

4.6.4 At each sampling location, the water must satisfy the bacteriological requirements as follows:

.1	E.Coli:	A (Presence/Absence Test)
.2	Total Coliform	A (Presence/Absence Test)
.3	Background	<25 (Membrane Filtration)

4.6.5 Analytical fees for the initial round of sampling will be paid by the Owner. The Contractor will be responsible for fees related to additional samples submitted due to failed results plus any costs associated with providing additional water.

4.6.6 A single failed bacteriological parameter will constitute a failure of the entire sampling round. The Contractor may elect to have the Owner's qualified personnel re-sample (chlorine and bacteriological) or take other corrective action to achieve two consecutive rounds of acceptable chlorine residual and bacteriological results.

4.7 Start-Up and Commissioning

4.7.1 Start-up and Commissioning of the Elevated Water Storage Facility shall be in accordance to Division 1 and all other relevant Divisions and Sections where work is to be commissioned.

4.8 Final (Warranty) Inspection

4.8.1 Prior to the expiry of the Warranty Period, a joint inspection of the elevated water storage tank shall be completed by the Engineer, Contractor and Owner at a time convenient to the Owner.

4.8.2 Draining the elevated tank will be coordinated by the Owner.

4.8.3 The Owner has the right to delay the final inspection by up to four months beyond the Warranty Period if reasonable operational requirements dictate.

4.8.4 The Engineer will make arrangements for an inspection of the interior and exterior protective coating systems by a certified independent Inspection Agency on behalf of the Owner. Payment for the inspections carried out by the Inspection Agency will be made by the Owner.

4.8.5 After all the noted defects are repaired, the Contractor shall be responsible for disinfecting the elevated tank in accordance with Ontario Regulation B13 3 “Chlorination of Potable Water Suppliers in Ontario”, and AWWA C652-11 – Disinfection of Water Storage Facilities. The exact method is to be agreed with the Engineer prior to commencing the work. All water samples will be taken by the Owner.

4.8.6 Water for re-filling the elevated tank to the Overflow Level will be provided once at no cost to the Contractor. Any additional volume of water required to satisfy the disinfection requirements, shall be metered and paid for by the Contractor at the applicable water rate(s) in effect.

4.8.7 If repairs are required to the tank that cannot be completed immediately, the maintenance holdback will be withheld until all outstanding deficiencies are rectified. The Contractor shall assume responsibility for additional repairs if there is a progressive deterioration of the defect between the date of the inspection and when repairs are affected.

END OF SECTION

1 GENERAL

1.1 Description

1.1.1 This section specifies the requirements for the supply of all labour, equipment and materials for coating and recoating the exterior (outside), weather exposed surfaces of steel water tanks and accessories on the tank.

1.1.2 Coating materials, surface preparation, application, inspection, and testing of the steel water storage tank coatings shall comply with the latest edition of AWWA D102 – Coating Steel Water Storage Tanks, with the exceptions as noted in this Specification regarding named performance requirements.

1.2 References

1.2.1 AWWA - American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235, USA (www.awwa.org).

1.2.2 ASTM - American Society for Testing and Materials, PO Box C700, 100 Bar Harbor Dr., West Conshohocken, Pennsylvania 19428, USA (www.astm.org).

1.2.3 NACE International – The Corrosion Society, P.O. Box 218340, Houston, Texas 77218, USA (www.nace.org).

1.2.4 SSPC – The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh, Pennsylvania 15222, USA (www.sspc.org).

1.2.5 NSF International, P.O. Box 130140, 789 Dixboro Road, Ann Arbour, Michigan 48113-0410, USA (www.nsf.org).

1.3 Definitions

1.3.1 The following definitions shall apply to this Specification:

.1 **Abrasive:** Small particles of material that are propelled at high velocity to impact a surface during abrasive blast cleaning.

.2 **Abrasive Blast Cleaning:** Cleaning and roughening of a surface produced by the high velocity impact of an abrasive that is propelled by the discharge of pressurized fluid from a blast nozzle or by a mechanical device such as a centrifugal blasting wheel (Also referred to as Abrasive Blasting).

.3 **Airless Spraying:** Process of spraying coating liquids using hydraulic pressure, not air pressure, to atomize.

.4 **Coat:** One layer of a coating applied to a surface in a single continuous application to form a uniform film when dry.

.5 **Coating:** A liquid, liquefiable, or mastic composition that, after application to a surface, is converted into a solid, protective, decorative, or functional adherent film.

.6 **Coating System:** The complete number and types of coats applied to a substrate in a predetermined order (When used in a broader sense, surface preparation, pre-treatments, dry film thickness, and manner of application are included).

.7 **Commercial Blast Cleaned Surface:** A commercial blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter. Random staining shall be limited to no more than 33 percent of each unit area (approximately 58 cm2) of surface and may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coating (See NACE No. 3/SSPC-SP6).

.8 **Corrosion:** The deterioration of a material usually a metal, that results from a reaction with its environment.

.9 **Cracking (of Coating):** Breaks in a coating that extends through to the substrate.

.10 **Curing:** Chemical process of developing the intended properties of a coating or other material (e.g., resin) over a period of time.

.11 **DFT:** Dry Film Thickness.

.12 **Discontinuity:** A void, crack, thin spot, foreign inclusion, or contamination in the coating film that significantly lowers the dielectric strength of the coating. It may also be identified as a pinhole or holiday.

.13 **Environment:** The surroundings or conditions (physical, chemical, mechanical) in which a material exists.

.14 **Film:** A thin, not necessarily visible layer of material.

.15 **High-Pressure Water Cleaning:** Water cleaning performed at pressures from 34 to 70 MPa.

.16 **Holiday:** A discontinuity in a protective coating that exposes unprotected surface to the environment.

.17 **Lining:** A coating or layer of sheet material adhered to or in intimate contact with the interior surface or a container used to protect the container against corrosion by its contents and/or to protect the contents of the container from contamination by the container material.

.18 **Low-Pressure Water Cleaning:** Water cleaning performed at pressures less than 34 MPa.

.19 **Measurement:** An average of three readings in a 37.5 mm diameter circle.

.20 **Microns:** 1 mil = 25 microns.

.21 **Near-White Blast Cleaned Surface:** A near-white blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter. Random staining shall be limited to not more than 5% of each unit area of surface (approximately 58 cm2 [9.0 in2]), and may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coating (See NACE No. 2/SSPC-SP10).

.22 **Paint:** A pigmented liquid or resin applied to a substrate as a thin layer that is converted to an opaque solid film after application. It is commonly used as a decorative or protective coating.

.23 **Paint System:** See Coating System.

.24 **Pitting:** Localized corrosion of a metal surface that is confined to a small area and takes the form of cavities called pits.

.25 **Primer:** A coating material intended to the applied as the first coat on an uncoated surface. The coating is specifically formulated to adhere to and protect the surface as well as to produce a suitable surface for subsequent coats (Also referred to as Prime Coat).

.26 **Profile:** Anchor pattern on a surface produced by abrasive blasting.

.27 **Protective Coating:** A coating applied to a surface to protect the substrate from corrosion.

.28 **Readings:** A single film thickness gauge determination.

.29 **Rust:** Corrosion product consisting of various iron oxides and hydrated iron oxides. (This term properly applies only to iron and ferrous alloys).

.30 **Solvent Cleaning:** Removal of oil, grease, dirt, soil, salts, and contaminants by cleaning with solvent, vapour, alkali, emulsion, or stream. (See SSPC-SP1).

.31 **Spalling:** The spontaneous chipping, fragmentation, or separation of a surface or surface coating.

.32 **Tack Coat:** A thin wet coat applied to the surface that is allowed to dry just until it is tacky before application of a thicker wet coat (Use of a tack coat allows application of thicker coats without sagging or runs).

.33 **Topcoat:** The final coat of a coating system (Also referred to as Finish Coat).

.34 **Void:** (1) A holiday, hole, or skip in a coating. (2) A hole in a casting or weld deposit usually resulting from shrinkage during cooling.

.35 **Water Cleaning:** Use of pressurized water discharged from a nozzle to remove unwanted matter (e.g. dirt, scale, rust, coatings) from a surface.

.36 **White Metal Blast Cleaned Surface:** A white metal blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter (See NACE No. 1/SSPC-SP 5).

.37 **Wet Film Gauge:** Device for measuring wet film thickness of a coating.

1.4 Reference Standards

1.4.1 The work undertaken and products provided in this Specification shall conform in all respects to the latest published revisions of the following standards except where specified herein:

.1 ANSI/AWWA D100 Standard – Welded Carbon Steel Tanks for Water Storage (latest edition)

.2 ANSI/AWWA D102 Standard – Coating Steel Water Storage Tanks (latest edition)

.3 ASTM D16-11a – Standard Terminology for Paint, Related Coatings, Materials and Applications

.4 SSPC AB2 – Cleanliness of Recycled Ferrous Metallic Abrasives

.5 SSPC – Guide 6 0 Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations

.6 SSPC – Guide 7 – Guide to the Disposal of Lead-Contaminated Surface Preparation Debris

.7 SSPC-PA Guide 11 Protecting Edges, Crevices and Irregular Steel Surfaced by Stipe Coating

.8 SSPC-SP1 – Solvent Cleaning

.9 SSPC-SP2 – Hand Tool Cleaning

.10 SSPC-SP3 – Power Tool Cleaning

.11 SSPC-SP6/NACE No. 3 – Commercial Blast Cleaning

.12 SSPC-SP10/NACE No. 2 – Near-White Blast Cleaning

.13 SSPC-Paint 20-Zinc-Rich Coating (Type I, Inorganic, and Type II, Organic)

.14 SSPC Paint 22 – Epoxy-Polyamide Paints (Primer, Intermediate and Topcoat)

.15 SSPC-Paint 36-Two-Component Weatherable Aliphatic Polyurethane Topcoat, Performance-Based

.16 AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

.17 EMMAQUA (Equatorial Mount with Mirrors for Acceleration with Water) Outdoor Accelerated Weathering Test Method.

.18 SSPC-PA1 – Shop, Field, and Maintenance Painting of Steel

.19 SSPC-PA2 – Measurement of Dry Coating Thickness with Magnetic Gauges (latest edition)

.20 SSPC-PA3 – A Guide to Safety in Paint Application (latest edition)

.21 ASTM D4417 – Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel (latest edition)

.22 Occupational Health and Safety Act, 1990 and Regulations for Construction Projects

1.5 Related Sections

1.5.1 Division 1 – GENERAL REQUIREMENTS

1.5.2 Section 13600 – Standpipe Rehabilitation

1.6 Intent

1.6.1 It is the intent of this specification that the exterior surface of the steel water tank and all accessories on the tank, be cleaned, properly prepared, repaired or upgraded and a new exterior coatings system applied so that a sound, continuous coating system exists in all areas.

1.7 Equipment, Labour and Services

1.7.1 The Contractor shall furnish all labour, material and equipment necessary to complete the items of work outlined, including cleaning, surface preparation and protective coating application, unless otherwise specifically directed.

1.7.2 The Contractor shall, during the course of the work, provide for the services required in the form of electrical supply, compressed air, crane or other transport, and other commodities that he may require. The use of specialized equipment will not be permitted without written authorization by the Engineer.

1.7.3 It shall be the responsibility of the Contractor to adequately protect, shield or cover all structure, stores, machinery, equipment and openings, as required by the Engineer, to prevent damage or contamination from the work procedures involved.

1.7.4 In the case of the Owner's machinery, equipment or services being used by the Contractor for any purpose whatsoever, the Contractor shall be responsible for their reconditioning, if necessary, and shall make good any damage resulting from such use.

1.7.5 Electrical Supply

1.7.6 The Contractor shall pay all fees, obtain necessary permits, and have meters installed for power and lights as may be required for the prosecution of this Work. The Contractor shall furnish and install all necessary temporary service drops, wiring, connections, etc. necessary for temporary service required by the Contractor.

1.7.7 All costs associated with any temporary electric service required by the Contractor shall be included in the Base Bid.

1.7.8 All electrical devices and wiring used shall be explosion proof and carry the appropriate C.S.A. approval. All lighting and wiring shall be made secure from damage or falling. All

electrical installation and equipment shall be subject to approval by a certified electrician at the discretion of the Engineer

1.8 Containment & Protection of Adjacent Areas

1.8.1 The Contractor shall supply and install a scaffolding and hoarding (containment) system to shroud the steel portion of the tank for safe access for blasting, inspection and coating applications. All containment systems and scaffolding shall be designed by a professional engineer licensed to practice in Ontario. Installation, use, and maintenance of the containment systems is the entire responsibility of the Contractor.

1.8.2 The Contractor shall submit detailed shop drawings of the containment system and the attachment details, stamped, and signed by a Professional Engineer of Ontario to the Engineer for review prior to the supply and installation of the containment system around the tank.

1.8.3 If a complete containment system of the tank is utilized, the Contractor shall retain the design Engineer of Record to complete a full inspection of the containment system prior to use for construction purposes at no additional cost to the Owner. Upon completion of the inspection of the containment system, the Engineer of Record shall provide a letter to the Owner summarizing the results of the inspection noting any comments made to the Contractor or repairs required.

1.8.4 If complete containment of the tank is utilized to contain all cleaning dust, emissions, debris, paint overspray, and paint droplets, the complete containment shall include a full roof bonnet.

1.8.5 The design of all containment systems shall account for the loadings imposed on the existing tank structure. If the containment system will place additional loads on the tank which the tank was not originally designed for, the Contractor shall reinforce the existing tank as necessary to assure no damage or permanent deformation occurs to the existing tank. Any damage done to the tank as a direct or indirect result of the containment system shall be repaired or sections replaced by the Contractor at no additional cost to the Owner. Neither the Engineer nor the Owner assume any responsibility for the structural ability of the tank to support the containment system.

1.8.6 If tarps are used as part of the containment system, the tarps shall be an impervious, solid, flame-resistant material, reinforced with a fiber mesh and shall allow as much light as possible to pass through the material.

1.8.7 The containment system shall be designed to withstand a minimum of 56 km/hr winds. The Contractor shall identify the necessary safety measures and remedial actions for the site, including the containment system, in their Quality Assurance and Health and Safety Plans, for situations when wind speeds exceed 56 km/hr.

1.8.8 The containment enclosure shall not be welded to the tank or structure without the approval of the Engineer.

1.8.9 The use of robotic or creeper-type cleaning devices are prohibited.

1.8.10 The Owner reserves the right to stop work or to require the Contractor to provide additional or different containment methods if the Contractors operations create a nuisance beyond the site property line in the sole opinion of the Owner, the Engineer, the Owner’s designated representative(s), any regulatory agency, or neighbour. All costs of providing an adequate containment system shall be included by the Contractor in the Base Bid.

1.8.11 Review of the containment system for containing the spent cleaning dust, emissions, debris, overspray, and coating droplets shall not warrant the structural integrity of the containment system and shall not warrant the structural integrity of the tank to support the containment system. Nor shall review of the containment system warrant the ability of the system to contain spent cleaning dust, emissions, debris, overspray, and coating droplets.

1.9 Cleaning

1.9.1 Refer to Section 01740 – Cleaning

1.9.2 The work area shall be kept clean at all times by the Contractor, consistent with the type of work being done. Garbage disposal containers adequate to handle all wastes shall be provided by the Contractor.

1.10 Fire Prevention

1.10.1 The Contractor shall take precautions against fire in the working areas and provide adequate fire-fighting equipment.

1.11 Safety

1.11.1 Refer to Section 01351 – Health and Safety.

1.11.2 The Contractor shall comply with all regulations established by the Ministry of Labour under the Occupational Health and Safety Act and Regulations for construction projects and other government authorities, including those pertaining to the handling of waste materials.

1.11.3 The Contractor shall comply with the requirements of the Environmental Protection Act, Revised Statues of Ontario, 1980, Chapter 141, and the various Regulations under the Act with regard to abrasive blast cleaning and painting procedures.

1.12 Supervision

1.12.1 The Contractor, or an experienced foreman or superintendent authorized to act on behalf of the Contractor, shall be continually in charge of the work. Information given by the Engineer to a foreman or superintendent shall be as binding as though given to the Contractor in person. No workers, foreman or superintendent shall be continued on the work who, in the judgment of the Engineer, is negligent or incompetent.

1.13 Colour

1.13.1 The colour on the exterior of the tank shall be as follows:

.1 The entire standpipe colour shall be standard gloss white.

.2 All safety equipment shall be painted ‘Safety Yellow’, PMS 116, as indicated on the Contract Drawings.

1.13.2 The words ‘Orangeville’, ‘Historic Charm’, ‘Dynamic Future’ and <LOGO> shall be installed on the shell of the storage cell in two separate locations, approximately 180 degrees apart. Tank lettering to be located in the field and approved by the Engineer and Owner. Font and colours shall meet the requirements of the Town of Orangeville branding standards. Refer to the Contract Drawings and Appendix 4 for details.

1.14 Workmanship

1.14.1 All work performed by the Contractor shall be of the best quality throughout and in accordance with the requirements of SSPC-PA1, unless otherwise specified. Any dispute or difference of opinion as to the interpretation of these specifications or regarding the quality of material or workmanship shall be left to the decision of the Engineer, whose decision shall be final and binding on both parties.

1.14.2 Destructive Testing of Coatings

1.14.3 If disputes arise concerning the quality of the applied coatings, adhesion tests, Tooke Gage analysis, or some other form of destructive testing as directed by the Engineer, may be used to resolve the dispute.

1.14.4 If it is found that such Work is defective, the Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs), arising out of or relating to such uncovering, exposure, observation, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price.

1.14.5 If, however, such Work is not found to be defective, the Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to the delays caused by such uncovering, exposure, observation, testing, replacement, and reconstruction.

1.15 Access

1.15.1 The Contractor shall provide free and safe access to the work area, including the cone, shell and roof areas at all times for the benefit of the Engineer and the Coating Inspection Agency.

1.16 Details of Work

1.16.1 Any particulars of the work provided herewith are given only for the guidance of the Contractor who will be held responsible for securing all necessary dimensions and details; the intent of these specifications being to effect a quality coating system in the area specified.

1.17 Manufacturer’s Instructions

1.17.1 The coating manufacturer’s published instructions are a part of this specification and shall be acquired by the Contractor. In case of conflict, the decision of the Engineer shall prevail.

1.18 Exceptions

1.18.1 There shall be no departure from these specifications unless directed by the Engineer. The Engineer has the right during the performance of the work to make alterations, providing such alterations are instituted before the particular work requiring changing is commenced, and also that such alterations will not increase the Contractor’s cost. Any exceptions required by the Contractor must be presented in writing to the Owner as part of the tender documents.

1.19 Submittals

1.19.1 Submit blasting material information and MSDS sheets, coating material and MSDS sheets and colour samples per Section 01330.

1.19.2 The Contractor shall submit their exterior coating methodology, procedures and proposed equipment to the Engineer for review prior to commencing any coating application work.

1.19.3 Product Data:

.1 For each coating system, provide three copies of the coating manufacturer's technical data sheets, and the coating colours available (where applicable) for each Product used in the coating system that demonstrates compliance with the Specification.

.2 Submit the required information on a system-by-system basis.

.3 Provide copies of coating system submittals to the coating applicator.

.4 Indiscriminate submittal of the manufacturer's literature only is not acceptable.

.5 Product and safety data sheets: Submit three copies for each Product.

1.19.4 Colour Samples – Submit manufacturer's colour swatches for the colours specified.

.1 Submit a coloured stencil shop drawing of the exterior lettering including all dimensions, radii, and colour references. The details indicated on the Contract drawings are for bidding purposes only.

1.19.5 Manufacturer's Quality Assurance – Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.

1.19.6 Applicator's Quality Assurance.

1.19.7 Submit list of a minimum of five completed projects of similar size and complexity to this Work. Include for each project:

.1 Project name and location.

.2 Name of owner.

.3 Name of contractor.

.4 Name of engineer/consultant.

.5 Name of coating manufacturer.

.6 Approximate area of coatings applied.

.7 Date of completion.

1.19.8 Warranty – Submit manufacturer's standard warranty.

1.19.9 Provide certification from the coating manufacturer certifying that all coatings will not contain more than 0.06 percent by weight of lead (or any lead compounds) in the cured coating for each coat applied.

1.19.10 Provide a written proposal outlining the method for protection of adjacent areas to prevent damage or contamination from the Work procedures involved.

1.20 Quality Assurance

1.20.1 Coating Manufacturer's Qualifications

1.20.2 Specialized in manufacture of coatings with a minimum of five (5) years successful experience in application of the specified Product.

1.20.3 Applicator's Qualifications

1.20.4 Experienced in the application of specified coatings for a minimum of five (5) years on projects of similar size and complexity to this Work.

1.20.5 Pre-application Meeting

1.20.6 A pre-application meeting shall be held at prior to the start of the coating system application work.

1.20.7 Attendance of parties directly affecting the Work of this Section, include the Contractor, Engineer, Owners Representative, applicator and manufacturer's representative. The following items shall be reviewed at the pre-application meeting:

.1 Health and safety

.2 Environmental requirements

.3 Protection of surfaces not scheduled to be coated

.4 Surface preparation

.5 Application and Application Equipment

.6 Repair

.7 Field quality control

.8 Cleaning

.9 Disinfection

.10 Protection of coating systems

.11 Inspection Milestones and Reports

.12 Coordination with other Work

1.20.8 Environmental Requirements

1.20.9 Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the coating Product manufacturer.

1.20.10 Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by coating Product manufacturer.

1.20.11 The Contractor shall supply, install and maintain two humidity and two temperature monitoring sensors each at the top, middle and bottom of the containment system to monitor the ambient humidity and temperature conditions respectively, during coating applications.

1.20.12 Minimum application temperatures shall be as required by manufacturer's instructions.

1.20.13 Provide lighting level equivalent to 80 foot-candles measured mid-height at substrate surface.

1.20.14 Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the coating manufacturer during application and drying periods.

1.20.15 Painting shall be suspended when wind velocities exceed that which will allow for a quality application of exterior coatings and where coating could be carried off Site by the wind.

1.20.16 In addition to any air monitoring requirements of the Ministry of the Environment and the OHSA required for the Work under this Contract, the Engineer, at any time, may determine that additional air monitoring is required to ensure that air quality in other parts of the structure or containment system is within acceptable levels. At the Engineer's request, the Contractor shall provide additional air monitoring equipment and services as necessary, and at its own expense, to verify acceptability of the air quality within the exterior containment system.

1.20.17 Negative pressure shall be maintained in the enclosure while any coating removal Work is in progress. The negative pressure shall be maintained through an appropriately sized self-cleaning dust collection unit suited for abrasive blasting operations. All air removed from the contained area shall be filtered through the dust collection equipment so as to not release any debris into the external atmosphere.

1.20.18 All waste materials resulting from abrasive blast cleaning and coating removal operations shall be cleaned up by vacuuming. Sweeping, shoveling, or other mechanical means to remove the waste materials will not be allowed.

1.20.19 It is the responsibility of the Contractor to ensure that the containment, collection and storage of waste materials is done in strict accordance with all current federal, provincial, and local regulations with respect to waste handling and disposal.

1.20.20 When abrasive blast cleaning is used, the Contractor shall consider all areas which are subject to any abrasive blast cleaning to be of a containment nature, and which shall be subject to all health and safety standards and practices set forth by any and all federal, provincial, and local agencies, authorities, departments, or governing body involved

1.20.21 All waste materials shall be recovered and removed from the Site, and disposed of in accordance with all applicable local, provincial, and federal laws, regulations, and codes. Removed coating, cleaning debris, and abrasive blast cleaning materials shall be cleaned up daily and stored in leak-proof covered containers for disposal. Tank interior blast residue shall be stored separately from exterior blast residue and containers labelled as such. Containers shall be designed to keep water from entering the containers. Collection, handling, and disposal of these materials shall be in conformance with the OHSA, the EPA, and all other governing laws, rules, and regulations. The cost of all disposals under this Contract shall be the responsibility of the Contractor.

1.20.22 For the purposes of the base bid, the Contractor shall consider all waste coating materials as non-hazardous until proven otherwise by testing. Prior to mobilizing equipment to site, the Contractor shall take a minimum of three samples of sufficient quantity of the exterior coating system and primer and send the samples to a laboratory to analyze for the concentration of

any lead. The Contractor shall make all arrangements and pay all associated laboratory costs necessary to determine if the materials are classified as a hazardous waste and shall make necessary arrangements, based upon these results, for proper disposal of materials and lead based paint abatement protocols. Copies of all testing results shall be sent to the Engineer prior to mobilizing equipment to site.

1.20.23 The Contractor is required to furnish copies of all manifests, chain of custody forms, testing results, etc. to the Engineer for materials removed from the Site and disposed of prior to Substantial Performance of the Work.

1.20.24 The Contractor shall provide the name of the treatment or disposal facility to the Engineer for approval prior to removal of any materials from the Site.

1.20.25 All materials removed from the Site shall be transported to a treatment or disposal facility as outlined above. The transporter shall obtain the necessary insurances and permits required for transportation of the materials which shall be submitted to the Engineer for approval prior to removal and transporting of materials from the Site.

1.20.26 All waste materials that remain on the collector system shall be removed at least once a day or more frequently if directed by the Engineer.

2 PRODUCTS

2.1 Exterior Coating Systems (OCS-4)

2.1.1 The tank exterior and all new appurtenances and accessories (unless otherwise stated) shall be coated with a zinc / polyurethane / fluorourethane coating system to the dry film thicknesses as specified below:

2.1.2 Primer of organic zinc in accordance with AWWA D102 OCS-4 and SSPC-Paint 20, Type II, at a minimum thickness of 2.5 to 3.5 mils DFT when measured in accordance with SSPC PA2.

2.1.3 Intermediate (mid) coat of polyurethane in accordance with AWWA D102 OCS-4 and SSPC-Paint 36 Level 1 at a minimum thickness of 2.0 to 3.0 mils DFT when measured in accordance with SSPC PA2.

2.1.4 Top (finish) coat of fluorourethane in accordance with AWWA D102 OCS 4 at a minimum thickness of 2.0 to 3.0 mils DFT when measured in accordance with SSPC PA2.

2.1.5 Non-slip surface coat where indicated on Contract Drawings comprising of fluorourethane in accordance with AWWA D102 OCS 4 at a thickness of 2.0 to 3.0 mils DFT and glass bead (50-80 mesh coarse bead) when measured in accordance with SSPC PA2. Use 3 ounces of 50-80 mesh coarse beads per gallon of fluorourethane.

2.1.6 The DFT of the primer, intermediate and topcoat shall not exceed the maximum recommended thickness of the supplier.

2.1.7 The exterior coating materials shall be a system of Products from a single manufacturer.

2.1.8 All primer, intermediate and top coating materials shall be supplied in different colour shades and shall be clearly marked on each container as to the material function and colour.

2.1.9 The coating system with a white finish must meet all the performance criteria as listed below.

.1 Adhesion to Steel: ASTM D4541 over SSPC SP10/NACE 2 prepared surface - 1,200 psi minimum value, Method E, Type 5

.2 Gloss Retention: ASTM D4141 Method C (EMMAQUA) - 95 percent gloss retention minimum after a 1,260 MJ/m2 exposure.

.3 Colour Retention: ASTM D4141 - 0.2 DED Hunter Scale maximum change with a 1,252 MJ/m2 exposure.

.4 Salt Spray: ASTM B117 - Maximum 1/16 inch rust creep after 10,000 hours exposure.

.5 QUV Exposure: ASTM D4587 - 60 percent gloss retention minimum, UVA 340 Bulbs 8 hour UV 4 hour condensation with 25,000 hours exposure.

.6 QUV Exposure: ASTM D4587 - 2.0 DED FMCII (Friele-MacAdam-Chickering Colour Differential Scale) (MacAdam units) maximum change, UVA 340 Bulbs 8 hour UV 4 hour condensation with 25,000 hours exposure.

2.1.10 Different lots of material shall be kept to a minimum consistent with the manufacturer's production facilities for the product.

2.1.11 Paint shall be supplied at the site in new, unopened containers. Materials older than the manufacturer's published shelf life shall not be accepted. Damaged containers will not be accepted.

2.1.12 If requested, the Contractor shall provide the Engineer, with a one litre sample of each different lot of material proposed for the work. On demand, the Contractor shall provide the Engineer, with certified copies of the manufacturer's quality control testing records.

2.2 Approved Product Suppliers

2.2.1 TNEMEC Inc.

2.2.2 Sherwin Williams Protective & Marine

3 EXECUTION

3.1 General Requirements

3.1.1 The exterior surface finish of the Wallaceburg elevated steel tank and accessories shall be in strict conformance to AWWA D100 and NACE SP0178 (latest editions).

3.1.2 The Contractor shall provide sufficient lights and intensity to allow proper abrasive blasting, coating application, inspection and worker safety.

3.1.3 The Contractor shall measure and maintain a daily log of ambient and substrate conditions that directly affect the application of protective coatings. Ambient condition readings shall be taken immediately prior to commencement and during coating application. At a minimum, the Contractor shall measure dry bulb temperature, relative humidity, surface temperature, dew point and record general weather conditions. In addition, the reports shall indicate type of coating and batch numbers of kits used during the application process. The Contractor shall submit daily condition log / report to the Owner and Engineer at the end of each week. Failure to submit daily inspection reports on a weekly basis will result in holdback of payment for the billing period.

3.2 Inspection

3.2.1 All material and equipment furnished, and work done, shall be subject to rigid inspection by the Engineer or the appointed Inspection Agency. Such inspection shall not relieve the Contractor of the responsibility for furnishing the qualified labour, or their own quality assurance checks necessary to meet the requirements of the specification and the referenced standards. The Contractor shall ask for the Engineer's approval only after the Contractor's own thorough inspection and after the Contractor is satisfied that all the requirements of the specification have been met.

3.2.2 Specified milestone hold-point inspections are required for each work stage as follows:

.1 Prior to preliminary blast, where applicable.

.2 Prior to surface upgrading and/or repairs.

.3 After surface preparation/upgrading.

.4 Prior to each phase of final blast.

.5 Prior to each prime coat application.

.6 Prior to each intermediate coat application.

.7 Prior to each final coat application.

.8 After each final coat phase.

.9 After deficiency repairs

3.2.3 The Contractor shall NOT proceed beyond the stage requiring inspection until the Engineer or approved Inspection Agency has made or waived inspection. The Contractor and Engineer or approved Inspection Agency shall sign a milestone completion form before further coating application is performed by the Contractor. Inspection may be waived only by written notice to the Contractor.

3.2.4 The Contractor shall notify the Engineer and approved Inspection Agency a minimum of 36 hours before a milestone inspection is to be completed. The Contractor shall allow for milestone inspection in their construction schedule. No schedule delays due to required milestone inspections will be considered.

3.2.5 The Contractor shall provide the Engineer with a two week look-ahead schedule detailing each work stage and provide at least 48 hours notice during the course of the project when delays in the schedule are expected.

3.2.6 The Contractor shall arrange for a qualified representative of the paint manufacturer to visit the site a minimum of two times during the period while the coating is being applied. The manufacturer's representative shall examine surfaces to be coated, materials to be used, and methods of application, and shall submit a report of each visit in writing to the Engineer.

3.2.7 Any defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause resulting from the Contractor's actions or omissions, found to exist prior to final acceptance of the work, shall be repaired or removed immediately when ordered by the Engineer. In the case of repair, the procedures shall be in an acceptable manner as authorized by the Engineer. In the case of removal, the work shall

be replaced by work and materials which shall conform to the specification. This clause shall have full effect regardless of the fact that the defective work may have been previously overlooked by the Engineer.

3.2.8 Contractor's Quality Control Requirements:

.1 Quality control shall be completed by the Contractor on an ongoing basis before, during and after the blasting, coating application process to ensure that the contract specifications and coating manufacturer's requirements are adhered to at all time.

.2 The Contractor shall perform all required quality control checks and submit respective quality control reports prior to requesting a hold point inspection. Coating application work completed without documented quality control inspection will not be accepted.

.3 The Contractor shall submit all quality control reports to the engineer at the time of inspection request, or as soon as quality control checks are performed prior to the scheduled milestone inspection. Milestone inspections will not be held without submission of the Contractor's quality control reports and Contractor's assurance that the coating application work has been completed according to specifications and manufacturer's recommendations.

.4 Surface preparation requirements, coating products and final DFT readings shall be noted on the red-line mark-up drawings and shall be submitted at the end of construction activities. All quality control documents shall be submitted at the end of the coating application process for the Owner's records.

3.2.9 Inspection Instruments:

.1 Blast Profile – Shall be measured by the use of replica tape in accordance with ASTM Standard Test Method D 4417

.2 Blast Air Pressure – Shall be measured at the nozzle, using a Clemtex NPG-100 Needle Gauge or an equivalent instrument approved by the Engineer.

.3 Metal Temperature – Shall be measured with an Atkins Technical Inc. Thermocouple/digital thermometer, model No. 39658-K, or an equivalent instrument approved by the Engineer.

.4 Relative Humidity – Shall be measured with a sling psychrometer such as Bacharach model 12-9015, or an equivalent instrument approved by the Engineer.

.5 Dew Point – Shall be determined by calculation/graph comparing relative humidity with air temperature.

.6 Wet Film Thickness – Shall be made measured with a Nordson wet film thickness gauge, a KTA wet film thickness gauge, or an equivalent instrument approved by the Engineer.

.7 Dry Film Thickness – Shall be made using a Type 1 or Type 2 magnetic gauge according to the requirements of SSPC-PA2.

.8 Cure Tests – Shall be as recommended by the manufacturer.

3.3 Surface Preparation

3.3.1 Irregular Surfaces

3.3.2 Any burrs, weld spatter, rough welds, weld overlap, bolts, sharp edges, or corners or any areas disturbed or installed by the Contractor's operations which would cause difficulty in achieving a defect-free coating shall be chipped and/or ground smooth.

3.3.3 Any pinholes or voids in exterior welds (such as the overflow brackets, etc.) shall be filled with an epoxy seam sealer. It is not the intent to have these irregular surfaces chipped and/or ground flush.

3.3.4 The objective of the chipping, grinding and/or seam sealing is to eliminate irregular surfaces to provide a surface that is sufficiently smooth for the application of a uniform thickness coating without voids. This chipping, grinding and/or seam sealing is considered incidental to the exterior painting and is to be included in the Base Bid.

3.3.5 All welded joints shall be cleaned and all weld slag and weld splatter removed by grinding, sanding or wire brushing prior to surface preparation by blast cleaning. All welds shall be continuous.

3.3.6 Oil and Grease

3.3.7 All oil grease contamination shall be removed according to the requirements of SSPC-SP1 – Solvent Cleaning, prior to blast cleaning.

3.3.8 Blast Cleaning

3.3.9 All exterior steel surfaces shall be blast cleaned in accordance with the requirements of SSPC-SP6/NACE 3 - Commercial Blast Cleaning, to a Sa2 appearance (SSPC-Vis I), using clean dry abrasive. Blast cleaned surfaces shall have sufficient profile that is appropriate for the specific primer and coating system as recommended by the coating manufacturer.

3.3.10 A 150 mm wide strip of uncoated, blasted steel shall be left between primed and non-blasted surfaces at the finish of any primer application.

3.3.11 Areas where Blast Cleaning is not Permitted

3.3.12 Where abrasive blasting is not permitted, rusted areas shall be prepared in accordance with SSPC-SP11-Power Tool Cleaning to Bare Metal. For all other areas, surfaces shall be prepared in accordance with the requirements of SSPC-SP3 - Power Tool Cleaning, to a St3 appearance (SSPC-Vis I). If permitted, high pressure water cleaning shall be carried out to remove all soil and deteriorated paint before proceeding with SSPC-SP3 cleaning.

3.3.13 Contamination

3.3.14 Care shall be exercised to prevent contamination of cleaned or coated surfaces prior to overcoating.

3.3.15 Final Cleaning

3.3.16 Compressed air blowdown of all areas before coating application shall be carried out. Cleaning by low pressure wash will also be permitted for the primer coats.

3.3.17 The appropriate specified degree of surface preparation shall exist as each coat of paint is being applied. The ambient conditions will dictate the interval between blasting and painting.

3.3.18 Dew Point

3.3.19 Cleaning operations for final surface preparation shall not be continued if steel temperatures are less than 3°C above the dew point.

3.4 Application

3.4.1 General Requirements:

.1 Coating materials shall be applied after surface preparation and before any rusting occurs, or any dust or soils has accumulated.

.2 Coating materials shall be applied in successive coats as to attain the required film thickness specified.

.3 After prime coat has cured sufficiently, and before the second coat application, all welds, sharp edges and protrusions shall be striped with a topcoat material of a colour contrasting with both the primer and second coat colours. Apply by brush and work in well on all rough areas using a scrubbing motion and a short bristled brush.

.4 After second coat has cured sufficiently, and before the third coat application, all welds, sharp edges and protrusions shall be striped with a topcoat material of a colour contrasting with both the second and third coat colours. Apply by brush and work in well on all rough areas using a scrubbing motion and a short bristled brush.

.5 The Contractor shall endeavor to maintain the manufacturer's published curing and recoat windows at all times, and provide sufficient notice to the Engineer to complete milestone hold-point inspections. The Engineer will not be held responsible if the curing or recoat windows are not met as a result of poor coordination or workmanship by the Contractor and no claims will be considered by the Owner.

3.4.2 Coating Uniformity

.1 All coatings shall be uniformly applied without sags, foreign materials contamination, or other blemishes. Such defects shall be removed and repaired before proceeding with another coat, at the discretion of the Engineer.

.2 All ingredients in any container shall be thoroughly mixed prior to use and agitated often enough during application to keep the pigment in suspension.

3.4.3 Application Method

.1 Prime coats for exterior surfaces may be applied by any method recommended by the coating manufacturer that attains an acceptable coating.

.2 Intermediate and finish coats for exterior surfaces shall be applied by roller, unless otherwise approved by the Engineer.

.3 Touch-up and repair coats for exterior surfaces may be applied by any method recommended by the coating manufacturer that attains an acceptable coating.

3.4.4 Spray Pressure

.1 Pressures on the spray gun shall be regulated to achieve optimum atomization of the paint at the lowest possible pressure.

.2 Excessive dry spray, or overspray, will not be accepted.

3.4.5 Spray Technique

.1 Overlapping (50 percent) vertical passes followed by overlapping (50 percent) horizontal passes (or vice versa) shall be made with each spray coat to obtain uniform film thickness.

.2 A complete wet coat shall be applied in each operation. If sagging is a problem, a mist coat/full coat application shall be used to obtain the desired wet film thickness per coat.

.3 All brackets, nozzles, irregular surfaces, etc. shall be coated first and the surrounding regular surfaces blended into these areas.

3.4.6 Dew Point

.1 No coating materials shall be applied when the surface to be coated is less than 3°C above the Dew Point.

.2 A surface temperature thermometer in intimate contact with the steel shall be used for monitoring purposes.

.3 Application conditions shall be as published by the coating manufacturer, but no coating shall be applied above 85 percent Relative Humidity (R.H.) except for inorganic zinc. No coating shall be applied above 59°C steel temperature.

3.4.7 Curing

.1 The manufacturer's published curing schedule shall be strictly followed and steel temperatures rather than ambient, are to be maintained.

3.5 Warranty and Repair

3.5.1 Warranty

3.5.2 A written warranty shall be supplied to the Owner by the Contractor. The Contractor shall warrant that the surface preparation and coating system application be free from defects caused by faulty workmanship, or failure to follow the specifications and/or the manufacturer's instructions (set forth in the Manufacturer's data sheets), for the 24-month warranty period. The warranty period shall commence from the date of issuance of the Completion Certificate.

3.5.3 A written warranty shall be supplied to the Owner by the coating supplier. The coating supplier shall warrant that the coating system be free from deterioration due to blistering, uneven fading or colour change, excessive surface erosion or weathering or other forms of coating failure which can be directly attributed to an abnormal coating system breakdown, for a period of 15 years. The warranty shall indicate that; the loss of gloss be less than 24 units as measured by a gloss meter in accordance with ASTM 523 with 60 degree geometry; the coating system shall not chaulk in excess of a rating of 8 as measured in accordance with ASTM D4214, Method A; the colour shall not change more than 5 DE Hunter units as determined in accordance with ASTM D2244 by comparing a coating area exposed with clean water and a soft cloth, with an unexposed area.

3.5.4 The written warranties from the Contractor and the coating supplier shall not be pro-rated or qualified in any way deemed inappropriate or unfair to the Owner.

3.5.5 Warranty Inspection

3.5.6 Prior to the expiry of the Warranty Period, a joint inspection of the exterior surfaces of the steel tank shall be completed by the Engineer, Contractor and Owner at a time convenient to the Owner.

3.5.7 The Contractor shall perform the following duties at the Warranty Inspection:

.1 The Contractor shall perform the inspection, and shall furnish an experienced foreman, laborer, and rigging or swing stages for the inspection.

.2 The Contractor shall be prepared to perform minor touch-up operations, and provide all material, equipment and labour to complete the minor repairs and clean-up.

.3 The Contractor shall have at least one gallon of each of the exterior primer, intermediate coating, and finish coating at the time of the inspection along with power cleaning tools and “Scotch-Brite” abrasive disks for spot cleaning.

.4 Repairs – Spot repairs shall be made by the Contractor before returning the tank to service. Repairs requiring extensive Work and rigging may be delayed until a time mutually agreeable to the Owner and Contractor.

3.5.8 Repairs

3.5.9 Any location where layers of coating have peeled off, bubbled or cracked, and any location where rusting is evident, shall be considered a failure of the coating system.

3.5.10 Repairs shall be made by the Contractor at all points where failures are observed by removing the deteriorated coating, cleaning the surface, and recoating with the same coating system.

3.5.11 Repairs of greater than 15 percent of the entire exterior surface area of the steel portion of the tank shall require that the entire system be removed from the structure with reapplication of the specified system by the Contractor including all labour, materials and equipment at no cost to the Owner.

END OF SECTION