# General

## Related Sections

### Section 01250 – Substitutions

### Section 01425 – Computerized Maintenance Management System Data Requirements

### Section 01430 – Operation and Maintenance Data

### Section 01505 – Mobilization and Demobilization

### Section 01520 – Field Office

### Section 01780 – Contract Closeout

### Section 09900 – Painting

### Division 13 specifications as applicable

### Division 16 specifications as applicable

#### References

### The following is a list of standards which may be referenced:

#### American Bearing Manufacturers Association (ABMA)

##### ABMA B10

#### Manufacturers Standardization Society

##### MSS SP-6-2012

#### Health Canada Reference Manual for the WHMIS Requirements of the Hazardous Products Act (HPA) and the Controlled Products Regulations (CPR).

##### Material Safety Data Sheet (MSDS) requirements of the Workplace Hazardous Materials Information System (WHMIS).

#### National Institute of Standards and Technology (NIST).

#### Canadian Standards Association (CSA)

##### CSA C22.1-12 Canadian Electrical Code, Part I

##### CSA C22.2 No. 0-10 (R2015) - Canadian Electrical Code, Part II

##### CSA No. 11

##### CSA No. 54

##### CSA No. 77

#### Occupational Health and Safety Act (OH&SA)

#### Underwriters laboratory Canada (ULC)

#### NSF International (NSF)

##### NSF/ANSI 60 Drinking Water Treatment Chemicals

##### NSF/ANSI 61 Drinking Water system Components

##### NSF 372-2011: Drinking Water System Components – Lead Content

#### ASTM

##### ASTM A105/A105M-14, Standard Specification for Carbon Steel Forgings for Pipe Applications or

##### ASTM A181/A181M-14, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.

##### ASTM A183-14, Standard Specification for Carbon Steel Track Bolts and Nuts.

#### ANSI/ASME

##### ASME B16.1/ASME B16.5-2015, Pipe Flanges and Fittings Package

## Definitions

### Products:

#### All Products, unless otherwise identified in the Contract, shall be new, unused and specifically purchased for incorporation into the Work.

#### Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and other terms of similar intent and is not intended to change the meaning of such other terms used in the Contract Documents, as those terms are self-explanatory and have well recognized meanings in the construction industry.

#### Items identified by the manufacturer’s product name, including the make or model designation as indicated in the manufacturer’s published product literature that is current as of the date of the tender closing.

## Measurement and Payment

### The work outlined in this Section will not be measured separately for payment. The work outlined in this Section shall be included in the Contract Price.

## Design Requirements

### Provide systems, equipment, and components, including supports and anchorages, in accordance with the relevant provisions of latest edition of the Ontario Building Code.

### Construct and finish work in a workmanlike manner. Provide materials suitable for the service intended, selected and fabricated in accordance with the best engineering and manufacturing practices.

### Design machinery with working parts easily accessible for inspection and repair, easily duplicated and suitable for service intended. Give special attention to durability of machine working parts and to design of stuffing boxes, glands, mechanical seals and bearings.

## Availability

### Immediately upon signing Contract, the Contractor shall review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of any products are foreseeable, notify the Consultant of such, in order that substitutions or other remedial action may be authorized to prevent any delay of the Work.

### If the Contractor fails to notify the Consultant and the Work becomes delayed in relation to product delivery, the Region and Consultant reserves the right to substitute the specified products with more readily available products of similar character, at no increase in Contract Price or Contract Time.

## Preparation for Shipment

### When practical, Products should be assembled at the factory by factory trained staff. Mark or tag all separate parts and assemblies in order to facilitate field assembly of the Products. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.

### Package Products in order to facilitate their handling and to protect them from any damage during shipping, handling, and storage. Mark or tag the outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of project and Contractor, equipment number and approximate weight. Include a complete packing list and bill of materials with each shipment.

### Extra Materials, Special Tools, Test Equipment, and Expendables:

#### Supply as required by any individual Specification Sections.

#### Schedule:

##### Ensure that shipment and delivery occurs concurrently with the shipment of any associated equipment.

##### Transfer of title to the Region shall occur immediately subsequent to the Contractor’s acceptance of the equipment from the supplier. However, the risk of and responsibility for any damage shall remain with the Contractor until the completion of the Contract Work.

#### Packaging and Shipment:

##### Package and ship extra materials and special tools in their original cartons insofar as possible, or in appropriately sized, hinged cover, wood, plastic, or metal boxes in order to avoid damage during long term storage.

##### Prominently display the following on each package:

###### Manufacturer’s part nomenclature and number, consistent with the Operation and Maintenance Manual identification system.

###### Description of applicable equipment.

###### Quantity of parts in the package.

###### Equipment manufacturer.

#### Deliver materials to the Site.

#### Notify the Consultant upon arrival for the transfer of materials.

#### Replace extra materials and special tools found by the Region to be damaged or otherwise inoperable at the time of their transfer to the Region.

### The Contractor shall request a minimum of 7 Days advance notice of any shipment from the manufacturer. Upon receipt of the manufacturer’s advance notice of a shipment, the Contractor shall promptly notify the Consultant of the anticipated date and place of the equipment arrival.

### Factory Test Results: Must be reviewed and accepted by the Consultant before the shipment of any Products, and as required in the individual Specification Sections.

## Delivery and Inspection

### Deliver Products in accordance with the accepted current progress schedule and coordinate in order to avoid conflict with the performance of the Work and the conditions at the Site. Deliver anchor bolts and templates sufficiently early in order to permit their setting prior to the placement of structural concrete.

### Deliver Products in an undamaged condition, in the manufacturer’s original container or packaging, with all identifying labels intact and legible. Include on the label, the date of manufacture and the shelf life, where applicable. Include ULC labels on any Products so specified.

### Provide equipment and labour to unload, move and place units in final position.

### For Products with MSDS associated with them, the Contractor shall provide the Consultant with all up to date product MSDS’s prior to delivery to Site.

### For Products having an expiration date, confirm the Product will not exceed expiration date on date of installation or application.

### Unload Products in accordance with the manufacturer’s instructions for unloading or as specified otherwise in the Contract Documents. Record the receipt of all Products at the Site. Inspect the Products for completeness and for any evidence of damage during shipment.

### Remove any damaged Products from the Site and expedite the delivery of identical new undamaged Products, and any incomplete or lost Products, in order to provide those specified in the Contract Documents, and so as not to delay the progress of the Work.

## Handling, Storage, and Protection

### Handle and store Products in accordance with the manufacturer’s written instructions and in a manner which prevents damage. Store Products in approved storage yards or sheds. Provide the manufacturer’s recommended maintenance during storage, installation, and until the Products are accepted for use by the Region.

### Arrange for storage in a manner which provides easy access for the inspection of Products. Conduct periodic inspections of stored Products in order to ensure that the Products are maintained under the specified conditions, and are free from damage or deterioration. Keep a running account of all of the Products in storage in order to facilitate their inspection and estimate progress payments for any Products delivered, but not installed, in the Work.

### Store electrical, instrumentation, and control Products, and equipment with bearings in weather tight structures maintained at a temperature above 15 degrees Celsius. Protect electrical, instrumentation, and control Products, and insulation against moisture, water, and dust damage. Connect and operate continuously all space heaters furnished in electrical equipment.

### Store fabricated Products above ground on blocking or skids and prevent them from soiling or staining. Store loose granular materials in a well-drained area on a solid surface in order to prevent them from mixing with foreign matter. Cover Products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation in order to avoid condensation.

### Store finished Products that are ready for installation in dry and well ventilated areas. Do not subject Products to extreme changes in temperature or humidity.

* + 1. Hazardous Materials: Prevent the contamination of any personnel, storage building, or the Site. Meet the requirements of the Product Specifications, applicable codes and regulations, and the manufacturer’s instructions , and Contract requirements. Ensure proper identification is completed for hazardous materials and that all necessary precautions are taken to prevent contamination.
    2. Store liquids in spill containment areas or structures that ensure protection of the environment form container failures and/or transfers. No liquid is to be stored over underground process structures under any circumstances.

### Arrange for delivery to the site, protection and storage of materials and equipment as per manufacturer’s recommendations.

### Schedule delivery of equipment only when building is far enough advanced to protect units from weather and construction dust and debris.

### Specification Sections may contain additional requirements for delivery, storage and handling.

### Handle and store Products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with the manufacturer's instructions when applicable.

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

### The Contractor shall remove and replace damaged or defective products at its own expense and to the satisfaction of the Consultant. Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve the Contractor of any of its responsibilities under the Contract, but is a precaution against oversight or error. The Contractor shall be responsible for any delays and expenses caused by rejection of damaged or defective products.

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

# PRODUCTS

## General

### Provide the manufacturer’s standard materials suitable for the service conditions to be encountered, unless otherwise specified in the individual Specification Sections.

### All materials, chemicals and equipment coming in contact with the process and/or water must be NSF 60/61/372 certified (as applicable).

### All equipment and all parts and materials comprising same shall be free of asbestos, lead and mercury.

### Where the Product Specifications include a named manufacturer, with or without a model number, and also include performance requirements, the named manufacturer’s Products must meet the performance specifications of the Contract.

### Similar items of Products furnished and installed in the Work shall be the end Products of one manufacturer and of the same series or family of models in order to achieve standardization for appearance, operation and maintenance, spare parts and replacement, manufacturer’s services, and in order to implement the same or similar process instrumentation and control functions in the same or a similar manner.

### Do not use materials and equipment removed from the existing premises, except as specifically permitted by the Contract Documents.

### Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified in the Contract Documents.

### Equipment, Components, Systems, Subsystems: Design and manufacture with due regard for the health and safety of operation, maintenance, accessibility, durability of parts, and in order to comply with all applicable OHSA, provincial, and local health and safety regulations.

### Regulatory Requirement: Coating of materials shall meet all applicable federal, provincial, and local requirements limiting the emission of volatile organic compounds and for worker exposure.

### Safety Guards: Provide safety guards for all belt or chain drives, fan blades, couplings, or other moving or rotary parts. Cover rotating parts on all sides. Design for easy installation and removal. Use 16 gauge or heavier, galvanized steel, aluminum coated steel, stainless steel, or hot-dip galvanized or aluminum coated 12 mm mesh expanded steel, reinforced as needed in order to eliminate excessive vibration. Provide hot-dip galvanized or stainless steel accessories and supports, including bolts. For outdoor applications, prevent the entrance of rain and dripping water. Eliminate sharp edges with suitable borders neatly welded.

### Provide materials and equipment listed by the ULC wherever standards have been established by that agency.

### Equipment Finish:

#### Provide the manufacturer’s standard finish and colour, except where a specific colour is indicated in the Contract Documents.

#### If the manufacturer has no standard colour, provide equipment with the finish as approved by the Consultant.

### Special Tools and Accessories: Furnish to the Region, upon acceptance of equipment, all accessories required to place each item of equipment into full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for the first lubrication of the equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, hand-wheels, chain operators, special tools, and other spare parts as required for maintenance.

### Lubricants:

#### Provide the initial lubricant recommended by the equipment manufacturer in a sufficient quantity to fill the lubricant reservoirs and to replace any consumption during testing, start-up, and operation until final acceptance by the Region.

#### Provide lubricants which are readily available in Canada. To the extent possible, provide lubricants that are compatible with products currently used in the Region’s maintenance operations.

#### Furnish lubricants in their original sealed containers, correctly identified as to brand and grade.

### Nameplates:

#### Supply equipment and motors with corrosion resistant metal nameplates fitted securely in an easily read location complete with impressed type inscriptions giving the following information as applicable:

##### For electric motors, nameplate marking which meets the requirements of CSA 22.2, No. 0, No. 11, No. 54 and No. 77.

##### For pumps, fans, blowers, cranes, valves, valve operators, instruments, etc.:

##### Model number

##### Serial number

##### Capacity

##### Head

##### Impeller diameter

##### Efficiency

##### Performance rating

##### Other information required to uniquely identify the equipment

#### Performance data in SI metric units

#### Operate supplied mechanical equipment satisfactorily without excessive wear, excessive lubrication and without requiring undue attention by operating staff. Make rotating parts in true dynamic balance and operate without vibration caused by mechanical defects, faulty design or misalignment of parts. In general, the limit of vibration velocity is 1 mm/sec. for equipment. A more stringent requirement may be specified in the detailed equipment specifications and supersedes this one.

#### Furnish gauges and gauge cocks, indicators, lubricating and safety devices necessary for the proper operation of equipment whether or not such accessories are specified under other Sections.

### Electric Motors

#### The specifications for electric motors appear in Division 16. The motor enclosure is specified in the detailed equipment specification.

### Chain Drives

#### Where chain drives are provided for equipment, provide readily adjustable, idling type chain tighteners.

### Ceiling and wall openings

#### Locate wall and ceiling openings to suit the pattern of masonry and ceiling tile or slab work. Make necessary adjustments in systems to allow openings to coincide with wall and ceiling or slab patterns.

### Bolted Connections:

#### Project bolt ends a minimum of 3 mm, but not more than one bolt diameter, beyond the nut faces. Use U.S. standard hexagonal nuts and bolts for bolted connections.

#### Use cadmium plated bolts and nuts on stainless steel flanges; provide stainless steel washers under bolt head and nut; use cadmium plated steel bolts and nuts on black steel and cast flanges.

### Flanges:

#### Arrange with bolt holes straddling the vertical centreline. Provide flanges finished in accordance with MSS SP-6-2012.

#### For equipment, valves, and devices with integrally cast flanges, provide flanges to the dimensions and drilling of ANSI B16.1-2015 with bolt holes straddling the vertical centre-line.

#### For fabricated equipment and vessels, provide forged flanges of the same material as the equipment or vessel.

#### Provide plain steel vessels and equipment with plain steel flanges; stainless steel equipment and vessels with stainless steel flanges.

#### Stainless steel lap joint flanges with plain steel backing rings are not acceptable.

#### Neither lap joint nor “Van Stone” flanges are acceptable on gas systems. Arrange flanges with bolt holes straddling the vertical centre-line.

#### Provide mild steel and stainless steel flanges to meet the requirements of ASTM A105/A105M-14 or ASTM A181/A181M-14 and ASTM A183-14 respectively. Provide flanges to the dimensions and drilling requirements of ANSI B16.5-2015.

#### Provide flanges finished in accordance with MSS standard of practice SP 6. Provide flat face and raised face flanges as stated in the detailed Specifications Sections.

#### Refer to the detailed equipment and piping specifications for working pressures and class.

### Bearings:

#### Unless otherwise specified in the Contract Documents, provide bearings for rotating equipment suitable for ABMA B 10 with a life expectancy of a minimum of 100,000 working hours at the rated conditions of service.

#### Provide alemite type or button-head grease fittings for bearing lubrication.

#### Construct bearings for electric motors so that no oil or grease can escape from them.

## Fabrication and Manufacture

### General:

#### Manufacture parts to North American standard sizes and gauges.

#### Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.

#### Design structural members for the anticipated shock and vibratory loads.

#### Use a minimum thickness of 6 mm for any steel that will be submerged, wholly or partially, during normal operation.

#### Modify standard Products as necessary in order to meet the performance Specifications.

### Lubrication System:

#### Shall require no more than weekly attention during continuous operation.

#### The Contractor shall ensure that the lubrication system is convenient and accessible. Provide oil drains with bronze or stainless steel valves and fill plugs which are easily accessible from the normal operating area or platform. Locate drains in order to allow for the convenient collection of oil during oil changes without removing the equipment from its installed position.

#### Provide constant-level oilers or oil level indicators for all oil lubrication systems.

#### For grease type bearings which are not easily accessible, provide and install stainless steel tubing; protect and extend the tubing to a convenient location with suitable grease fittings.

### Equipment Base Plates:

#### Common base plate for equipment and driver, fabricated from heavy cast iron or a welded structural steel section a minimum of 13 mm thick.

#### Provide with mounting plates a minimum of 19 mm thick for equipment and drivers with mounting surfaces machined to an average arithmetical roughness height of 3.0 microns maximum.

#### Provide with grout holes, vent holes and anchor bolt holes.

#### For equipment where leakage or condensation may occur, equip with a drip lip or gutter, a 25 mm NPT bossed drain connection at the low point, and drain piping to the building drainage system.

## Source Quality Control

### Where the Specification Sections call for factory testing to be witnessed by the Consultant, notify the Consultant a minimum of 14 Days prior to the scheduled test date, unless otherwise specified in the Contract Documents.

### Calibration Instruments: Must bear the seal of a reputable laboratory, acceptable to the Consultant, certifying that the instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).

### Factory Tests: Perform testing in accordance with accepted test procedures satisfactory to the Consultant, and document the successful completion of all factory tests.

### Evidence of conforming to standard:

#### Where materials are specified to conform to a standard, provide mill reports, invoices or other statements etc. which certify that materials are in fact to the specified standard.

#### Where the Contractor proposes to use materials not manufactured to a standard, provide test reports to the Consultant for approval, which show that the proposed material meets the requirements of the specified standard. Refer to Section 01250 – Substitutions.

#### Where materials are referred to in the Specification Sections or on the Drawings by a catalogue number or the model name of a manufacturer, such reference is used to indicate the quality and type of such materials. Materials of equivalent manufacture by another accepted manufacturer may be used, provided that detailed or referenced requirements of the specifications are met and written approval is obtained from the Consultant. Refer to Section 01250 – Substitutions.

### Should any dispute arise as to quality or fitness of products, the decision rests strictly with the Consultant based upon requirements of Contract Documents.

### Within seven days of written request by the Consultant, submit the following information for material and equipment proposed for supply:

#### Name and address of manufacturer.

#### Trade name, model and catalogue number,

#### Performance, descriptive and test data,

#### Manufacturer’s installation or application instructions,

#### Evidence of arrangements to procure.

### Use the products of one manufacturer for material and equipment of same type or classification unless otherwise specified in the Contract Documents.

# EXECUTION

## Inspection

### Inspect all materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install material or equipment showing such effects. Remove damaged material or equipment from the Site and expedite the delivery of identical new material or equipment. Delays to the Work resulting from material or equipment damage that necessitates the procurement of new Products will be considered delays within the Contractor’s control.

## Quality of Work

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

### Do not employ anyone unskilled in their required duties. The Region and the Consultant reserve the right to require the dismissal of workers deemed incompetent or careless from the Site.

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

## Installation

### Examine site conditions and report unacceptable conditions in writing. The commencement of the Work will imply acceptance of site conditions.

### Promptly remove rejected products from the site and replace with new products.

### Provide calibration reports for each piece of equipment, as applicable, in a format acceptable to the Consultant.

### Equipment Drawings are intended to show the general locations of equipment, devices, and raceway, unless specifically dimensioned.

### No shimming between machined surfaces is allowed.

### Prevent overloading of any part of building.

### Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of the Consultant.

### Repaint painted surfaces that are damaged prior to acceptance of the equipment.

### Handle, install, connect, clean, condition, and adjust all Products in accordance with the manufacturer’s instructions, and as may be specified in the Contract Documents. Retain a copy of the manufacturers’ instructions at the Site, available for review at all times.

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

### Notify the Consultant in writing, of conflicts between the Contract Documents and the manufacturer's instructions, so that the Consultant may establish a course of action.

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

### For material and equipment specifically indicated or specified to be reused in the Work:

#### Use special care in the removal, handling, storage, and reinstallation in order to ensure its proper function in the completed Work.

#### Arrange for the transportation, storage, and handling of any Products that require off Site storage, restoration, or renovation. Include the costs for such Work in the Contract Price.

### Install, calibrate and test equipment in accordance with the manufacturer’s written instructions and when specified, under supervision of competent experts provided by the equipment manufacturer.

### Erect equipment on foundations complete with suitably sized anchor bolts and take special care to ensure true alignment of all parts, especially pumps and electrical drives. Have qualified millwrights align the units after their sole plates have been shimmed at the anchor bolts. Re-check alignment after securing equipment to its foundation before grouting sole plates in place.

### Erect equipment level and plumb. The use of “pipe springing” and Dutchmen to correct misalignment and miss-fitting is not allowed. In general, install equipment directly on machined bases without shims; provide at least 1.5 mm of brass shim stock under all driver mounting feet.

### Provide all materials necessary to install equipment. Install piping and miscellaneous items supplied as part of the equipment including lubrication piping, pressure gauge tubing, thermocouple sensors and wiring, bubbler tubing, orifice meter tubing, pneumatic valve operator tubing and flexible tubing for pressure switches.

### The manufacturer’s instructions are the minimum standard for the installation.

## Field Finishing

### Perform field finishing In accordance with Section 09900 – Painting and Protective Coatings for applicable protective coating system with regard to type of substrate and service use/environment and the individual Specification Sections.

### Before application of prime coat, clean and prepare surface to requirements specified in the applicable protective coating system.

### Special factory applied coatings required (for example, for corrosion resistance) are specified in the equipment specifications.

### All interior coating/painting of equipment coming in contact with the process and/or water must be NSF 61 and NSF 372 certified.

## Remedial Work

### Perform remedial work required to repair or replace parts or portions of the Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

### Perform remedial work by specialists familiar with the materials affected. Perform in a manner that will neither damage nor put at risk any portion of the Work.

## Adjustment and Cleaning

### Perform all required adjustments, tests, operation checks, and other startup activities.

### Keep Site and work neat and orderly. Contain all waste, rubbish and debris in secured waste containers. Remove from Site all waste, rubbish and debris weekly. Remove equipment, temporary facilities and excess materials from the Site when they are no longer needed for progress of the work. After completing the work leave the Site neat and orderly.

### After testing leave structures and equipment thoroughly cleaned of debris and foreign matter. Leave pipe systems thoroughly clean and ready for operation.

### Clean installed units and items after adjacent work has been completed.

## Existing Utilities

### When breaking into or connecting to existing services or utilities, execute the Work at times directed by local governing authorities, with minimum of disturbance to work.

### Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

### Submit the schedule to and obtain approval from Consultant for any shut-down or closure of active services or facility. Adhere to the approved schedule and provide notice to affected parties.

### Where unknown services are encountered, immediately advise the Consultant and confirm findings in writing.

### Remove abandoned services lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Consultant.

## Lubricants

### Fill all lubricant reservoirs and replace any consumption during testing, startup, and operation prior to the acceptance of the equipment by the Region.

## Warranty

### All equipment warranties shall commence upon the date of Substantial Performance or Total Performance of the Work, as applicable.

**END OF SECTION**