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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | September 22,2009 | Review/update of the document “Related Sections” |
| 3 | May 11, 2011 | Inserted the approved suppliers in Part 2 |
| 4 | April 15, 2013 | Final Draft – Consolidated Comments Spec Update Project |
| 5 | June 17, 2013 | Finalized for Legal Review. Incorporation of new Commissioning and Computerized Maintenance Management System Data Requirements Specification cross references. |
| 6 | May 28, 2014 | Incorporation of Legal Comments (AV) |
| 7 | July 15, 2014 | Amended to reflect changes related to commissioning specification and name change (AV) |
| 8 | September 24, 2014 | Updated, Finalized Specification – Reference eDOCS #1029453-v6 (AV) |
| 9 | February 18, 2015 | Updated standards (AV) |
| 10 | March 2, 2015 | Updated, Finalized Specification – Legal Reference eDOCS #5043364 v12 (AV) |
| 11 | November 11, 2016 | Updated NEMA MG-1 reference to 2016 new version (AV) |
| 12 | January 15, 2017 | Updated standards references. Updated the Acceptable Manufacturers list by adding ABS Group. (CPD PMO, OMM) (AV) |
| 13 | January 12, 2022 | Updated for pump testing project (Q-18-300) (BM) |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GENERAL

## Scope of Work

### The work of this Section consists of supplying, testing, delivering and commissioning the installation of submersible sewage pumps in accordance with these specifications, designed for continuous/intermittent operation as described herein.

### Unit Responsibility: The work requires that the submersible sewage pump, complete with all accessories, be the end Product of one system manufacturer or system supplier. Unless otherwise indicated in the Contract Documents, the Contractor shall obtain each system from the supplier of the equipment, which supplier shall furnish all components and accessories of the system to enhance compatibility, ease of operation and maintenance, and as necessary to place the equipment into operation in conformance with the specified performance requirements, features and functions without altering or modifying the Contractor’s responsibilities under the Contract Documents. The Contractor is responsible to the Region for providing the equipment systems as specified in this Section.

## Related Sections

### *[Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.*

### *Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.*

### *This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]*

### *[List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]*

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### *[List Sections specifying products installed but not supplied under this Section and indicate specific items.]*

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### *[List Sections specifying related requirements.]*

#### Section 01250 – Substitutions

#### Section 01300 – Submittals

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

#### Section 01430 – Operation and Maintenance Data

#### Section 01810 – Equipment Testing and Facility Commissioning

#### Section 01820 – Demonstration and Training

#### Section 11010 – Equipment General Requirements

### [Division 13 SCADA and Instrumentation– insert applicable specifications]

### [Division 16 Electrical – insert applicable specifications]

### [Product requirements for [item]... for installation under this Section.]

## References

### Comply with the latest edition of the following codes and standards, and where no codes and standards are listed under a standards authority, all applicable codes and standards of that standards authority, and all amendments thereto:

#### Ministry of the Environment, Conservation and Parks (MECP)

##### Design Guidelines for Sewage Works (2008)

#### Canadian Electrical Code

#### National Electrical Manufacturer’s Association (NEMA)

##### NEMA MG 1-2016

#### Canadian Standards Association (CSA)

#### American National Standards Institute (ANSI)

##### ASME/ANSI B16.1-2015 Gray iron Pipe Flanges and Flanged Fittings, Classes 25, 125 and 250

#### Hydraulic Institute (HI)

##### ANSI/HI11.6-2016, American National Standard for Rotodynamic Submersible Pumps for Hydraulic Performance, Hydrostatic Pressure, Mechanical, and Electrical Acceptance Tests

##### ANSI/HI 14.6-2016, Rotodynamic Pumps for Hydraulic Performance Acceptance Tests

#### Ministry of Labour (MOL) – Class 1, Group D, Division 1 (environmental compatibility).

#### [EEMAC – MG 1, Class F insulation. EEMAC standards are outdated but may be considered if there are no current equivalent applicable standards available. If EEMAC standards are to be applied, the Consultant will review the standards and approve any references to EEMAC standards in order to meet the Region’s energy efficiency objectives.] *[Consultant to replace with NEMA MG-1 2016 equivalent standard]*

#### *[Additional standards to be proposed by the Consultant and approved by the Region]*

## Pump Requirements

### The pump units and associated equipment shall conform in general to the requirements specified in this Section and the MECP’s Design Guidelines for Sewage Works (2008) and suitable for installation at the locations shown on the Contract Drawings.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pump Tag Number | Location | Capacity L/S | TDM | Minimum Efficiency | Discharge |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

## Submittals

### Shop Drawings:

#### Submit Shop Drawings in accordance with Section 01300 – Submittals.

#### Make, model, weight, and kilowatts of each equipment assembly.

#### Dimensional drawings showing the proposed layout and sections together with motor and anchor bolt base plans.

#### Pump curves illustrated in metric units including NPSHR, efficiency, RPM and brake horsepower data for all pumps.

#### A graphical plot showing speed torque curves for each motor at 70%, 80% 90% and 100% rated voltage, together with the respective pump load curve.

#### A precise list of all electrical requirements for the equipment including controls, monitoring equipment and instruments shall be given, including all power characteristics and materials of construction. A schematic of wiring of the listed electrical equipment assembled together must also be included in the submittal.

### Informational Submittals:

#### Factory Functional Test Report. Test Reports shall be submitted to the Consultant and the Region for approval and shall be in an electronic format suitable for upload to the Region’s CMMS (Maximo).

#### Manufacturer’s Certification of Compliance that the factory finish system is identical to the requirements specified in the Contract Documents.

#### Factory Acceptance Test (FAT) Report.

#### Site Acceptance Test (SAT) Report.

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

#### Manufacturer’s printed installation instructions.

#### Manufacturer’s Certificate of Proper Installation.

#### List of suggested spare parts required to maintain the equipment in service for a period of five years. Include a list of any special tools required for checking, testing, parts replacement, and maintenance with current price information.

#### Characteristic curves for variable speed pumps for maximum pump speed and for speeds required to obtain minimum pump flow and head conditions specified and indicated. Identify curves by speed and provide all curves on one sheet. Provide NPSHr curve for each speed.

#### Shop and field testing procedures, pump and piping set up, equipment to be used and ANSI/HI testing tolerances to be followed.

#### The Contractor shall provide complete list of the above requirements in an electronic format suitable for uploading to the Region’s CMMS (Maximo). Refer to Section 01425 – Computerized Maintenance Management System Data Requirements.

#### Operation and Maintenance Data: As specified in Section 01430 – Operation and Maintenance Data, Refer to Section 01425 – Computerized Maintenance Management System Data Requirements for additional requirements.

#### List any special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.

#### All submittals shall be approved by the Consultant and signed-off by the Region.

## Warranty

### The Contractor warrants that all equipment covered by or supplied under this Contract shall:

#### Comply with the Specification Sections for the said equipment.

#### Be free from defects in design, manufacture, workmanship or materials.

#### Perform efficiently and without unwanted interruption for a period of 24 months after the date of the Total Performance of the Work. The date of Total Performance of the Work shall be established by the Consultant and is as defined in the General Conditions of the Contract.

#### Repair, at the Contractor’s own expense, any breakage, damage, defects or deterioration that is reported to the Contractor during the warranty period.

## Data Forms

### The following two data forms are attached as supplements to this Specification Section:

#### Table 1 - "Data Form for Submersible Sewage Pumps". This form has been completed by the Consultant for use by the relevant suppliers.

#### Table 2 - "Data Form for Submersible Sewage Pumps”. This form shall be completed by the Contractor as required by this Section.

## Quality Assurance

### Pumps shall be the product of one manufacturer.

### Pumps shall be manufacturer’s standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.

### The Contractor shall obtain the pumps, motors, discharge columns, discharge heads, suction cans and appurtenances from the pump manufacturer, as a complete and integrated package to insure proper coordination and compatibility and operation of the system.

### Variable frequency motor controllers can be supplied by the Contractor or the pump manufacturer at the Contractor’s option. The pumping system shall be a complete and integrated package to insure proper coordination and compatibility and operation of the system.

#### The Contractor shall coordinate the variable frequency motor controllers with the pump and motor manufacturer and submit as part of the shop drawings a written statement signed by the Contractor, pump manufacturer, motor manufacturer and variable frequency motor controller manufacturer that the variable frequency motor controller manufacturer has received the required information from the pump and motor manufacturers and that all parties have reviewed the system and coordinated the equipment selection. Also include all motor data and information that has been used for the coordination.

### Guide cables or rails and hatches can be supplied by the Contractor or the pump manufacturer at the Contractor’s option. The pumping system must be a complete and integrated package to insure proper coordination and compatibility and operation of the system.

### If equipment proposed is heavier or taller, than specified and indicated; provide all structural, architectural, mechanical, electrical and plumbing revisions at no additional cost to the Region.

### If equipment is heavier than specified, the Contractor shall provide all hoisting equipment sized to maintain the minimum safety factor between the specified maximum equipment weight and the lifting capacity of the hoisting equipment indicated and specified.

### For variable speed pump systems the pump manufacturer must perform an analysis of the combined motor and pump assembly for resonant frequency or their harmonics independent of a structure.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

.1 The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

.1 All costs associated with the work of this Section shall be included in the price(s) for Item No(s). in the Bid Form.

*If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.*]

# PRODUCTS

## Equipment

### In the event that the Contractor places an order for the equipment, the order shall refer to the equipment specified in this Section and the information in the accompanying Table 1 and 2 Data Forms, or as modified by the Consultant.

### The pump shall be or have:

#### Volute made of cast iron, close coupled to the motor and with duck feet to be mounted on cast-in-place concrete base as shown on the Contract Drawings.

#### Impeller made of cast iron, of the enclosed type and shall be in static and dynamic balance. The shaft shall be made of stainless steel and suitable for the motor.

#### The pump unit shall be fitted with a bail or two eye bolts for attachment to the lifting chain so as to provide a direct pull over the centre of gravity.

#### Each pump shall have, as an integral part, sliding guide brackets suitable to slide along guide rails for lowering or raising the unit for servicing.

#### Equip each pump with a heavy cast iron combination type discharge connection and elbow to lock the pump to the discharge piping. Design the arrangement so that when the pump is lowered along the rails, it connects automatically to the discharge piping with a positive sealing action. Provide an elbow discharge flange faced and drilled according to ASME/ANSI B16.1-2015 125 Class for standard flanged fitting with two bolt holes straddling the horizontal axis.

#### A suitable base or cradle shall be provided for each pump.

#### Each pump shall be furnished with temperature and leakage detection sensors complete with leakage and flow monitoring required for integration into the electrical control system. The leakage detection will consist of a sensor in the sealed chamber to detect leakage through the lower sealing surfaces. Provide sensors capable of initiating an alarm signal before leakage can progress into the motor housing. Provide all electrical appurtenances required for the sensors.

#### Provide lifting chains and pump cable in lengths as required on the Contract Drawings.

#### Electrical requirements shall be as required on the Contract Drawings and in this Section. The pumps shall be supplied with continuous kW (horsepower) rated cables for power and controls (sensors).

#### The motor shall be capable of operating the pump continuously at any point of the selected impeller curve without exceeding the nominal motor rating. The duty point shall lie within the envelope encompassing 50% to 150% of the best efficiency point.

#### Electrical sub-metering at the sewage pump level will be installed and mounted in the corresponding MCC, telemetered to the SCADA system and incorporated in SCADA graphics displays in instantaneous kW demand and accumulated kWh.

#### Provide motors that are explosion proof where required, that are watertight, air or oil-filled, submersible and with Class F insulation. Provide motors that are CSA approved. NEMA standard MG-1-2016 may be utilized where no such other standard exists and as approved by the Consultant. *[Consultant to replace with NEMA equivalent standard]* Provide motors and pumps suitable for continuous operation without overheating when the pump is installed in a dry well.

#### Seal the shaft against leakage between the motor housing and pump casing with a self-aligning double mechanical seal. Provide sealing faces of tungsten carbide on tungsten carbide for the lower seal and tungsten carbide on carbon for the upper seal.

#### Anti-friction bearings shall be suitable for a minimum B10 bearing life of 50,000 hours life under operating conditions.

#### The pump shall be capable of passing solids that are 75 mm in diameter.

#### The pump and motor shall be suitable for installation in areas designated by the Ministry of Labour as Class I, Group D, Division I (refer to the Canadian Electrical Code, North American Hazardous Area Classification).

#### All necessary appurtenances and accessories required for the operation, installation, and removal of the pumps as described in the Contract Documents shall be provided.

#### Electrical requirements, including power and external controls, as defined by the Division 16 – Electrical Specification Sections.

## Acceptable Manufacturers

### KSB Pumps Inc.

### Xylem (Flygt), for wet pits only.

### WILO Canada Inc. (EMU)

### Sulzer (ABS)

### Or Equivalent.

# EXECUTION

## General

### The Contractor shall fully coordinate the delivery, installation and testing of all equipment.

### The Contractor shall be responsible for coordinating the location of the hatch cover for the removal of the pump.

## Shop Testing

### Conduct motor efficiency and power factor tests at full load 100 and 50, 75 percent load.

### Provide the following motor tests in accordance with ANSI/HI 11.6

#### Test motor integrity in a submerged condition.

#### Dry run no load test.

#### Motor electrical integrity test.

#### Moisture and temperature sensors integrity test.

### Test pump casings under a hydrostatic head of at least 75 psi (500 kPa) or 150 percent of rated shutoff head, whichever is greater. Test casing with pump assembled.

### Test pumps at the conditions specified and indicated and take not less than seven operating points between shut-off and run out. Test points must be at the conditions specified and indicated.

### Take readings to determine flow, differential pressure, rpm, horsepower, and wire to water efficiency.

### Operate each pump for not less than one hour and take readings to determine that the pump will operate as specified and indicated without cavitation at the specified minimum head condition with not more than the specified NPSH available.

### Run all tests in accordance with the latest standards of the Hydraulic Institute and as specified.

### Variable speed tests:

#### Conduct tests as specified above for full speed at reduced speeds except that tests for cavitation at run out are not required.

#### Run one speed test at speed required to discharge the minimum rating point specified and indicated with one point of test at the minimum rating point.

#### Run a second test at a speed approximately midway between full and minimum speed.

#### Run addition tests for each reduced speed operating condition specified and indicated.

### Testing Acceptance Grade and Tolerances:

#### ANSI/HI 14.6 Acceptance Grade: 1U.

#### Efficiency Tolerance: -0 percent.

#### If pumps do not meet the tolerances specified, trim the impeller and retest until the specified results are obtained.

## Field Testing

### Test piping connections to prove the discharge nozzle are installed with the pipe in a free supported state and without need to apply vertical or horizontal pressure to align piping with pump nozzles. This shall be performed and the piping acceptable prior to any field performance testing.

### Field testing will not be conducted without an accepted procedure, calibration certificates for all testing equipment, gauges and flow meters and a completed and signed pretesting check list.

### After installation of pumping equipment, and after inspection, operation, testing and adjustment have been completed by the manufacturer’s field service technician, conduct running test for each pump in presence of the Consultant to determine its ability to operate within the vibration and temperature limits specified, and to deliver its rated capacity under specified conditions.

### During tests, observe and record head, capacity, and motor inputs.

### Test Duration: Determined by the Consultant, but not less than three hours of continuous operation at each condition specified and indicated.

### Contractor to provide all water labor, piping, testing equipment, equipment, flow meters and test gauges for conducting tests.

## Installation

### Install pumps and all related accessories in accordance with the manufacturer’s instructions and to the satisfaction of the Consultant.

### Make all necessary piping and cable connections.

### Employ skilled mechanics to supervise the installation.

## Testing and Commissioning

### Perform testing and commissioning in accordance with Section 01810 – Equipment Testing and Facility Commissioning.

### Commission the system in accordance with Section 01810 – Equipment Testing and Facility Commissioning.

### Arrange and pay for the services of qualified technical representatives of the pump supplier to commission the installation.

### Arrange for the Consultant and the Region’s representative to be present at the time of commissioning.

### Obtain a certificate from the supplier stating that his qualified representative has found the installation to be to his satisfaction.

## Demonstration and Training

### Perform training in accordance with Section 01820 – Demonstration and Training.

## Supplements

### The supplements listed below, attached following “End of Section”, form part of this Section:

#### Table 1 Data Form for Submersible Sewage Pumps.

#### Table 2 Data Form for Submersible Sewage Pumps.

**END OF SECTION**

**YORK REGION ENVIRONMENTAL SERVICES**

**TABLE 1 DATA FORM**

**for**

**SUBMERSIBLE SEWAGE PUMPS**

York Region Project Contract No.

Location

Notes:

1. Prepare quotations in accordance with MOECC Design Guidelines for Sewage Works, as supplemented by this Table.
2. Complete Table 2 fully and submit prior to shop drawing submittal.

**PUMPS - GENERAL**

No. of pumps required:

Pump Type:

Pump Application:

Liquid Pumped:

**PUMP MECHANICAL FEATURES**

Maximum Speed (synch):

Service (continuous/intermittent):

Line shaft (carbon/stainless steel):

**PUMP OPERATING CONDITIONS**

Design Point Capacity (each pump):

Design Point Total Dynamic Head (m):

System Head Curve Included (Yes/No):

**SPECIAL REQUIREMENTS**

*[Consultant to detail special requirements for the pumps].*

Each pump shall be equipped with a [ ] mm Class 125 C.I. flange discharge and one pump set in each wet well shall be equipped with mix flush valves on the volute. Each pump motor shall also be equipped with leakage detection sensors and thermal overload protection (thermistors).

**All data shall be in an electronic format suitable for upload to Region’s CMMS (Maximo). Refer to Section 01425 – Computerized Maintenance Management System Data Requirements.**

**YORK REGION ENVIRONMENTAL SERVICES**

**TABLE 2 DATA FORM**

**for**

**SUBMERSIBLE SEWAGE PUMPS**

York Project No. Contract No.

Location:

**CONTRACTOR’S REFERENCE**

Contractor’s name, address and phone number:

Contractor’s reference number and date:

**PUMP DATA**

Number of pumps: Pump Manufacturer:

Place of Manufacture:

Model Number and Type:

Speed: rpm Performance Curve Attached:

Performance for each pump at or near design point:

L/s at m TDH

kW (HP) % Efficiency

Suction Diameter: mm Discharge Diameter: mm

Size of Impeller: mm Maximum Impeller Size: mm

Maximum Diameter of Solids: mm

Weight of Pump/Motor: kg

**PUMP MOTOR DATA**

Motor Manufacturer:

Place of Manufacture:

Model Number and Type:

Type of Motor Cooling System:

Nominal Rating of Motor: kW

Starting Inrush: A Maximum Inrush: A

Voltage/Phase/Frequency:

Full Load Speed: rpm

Temperature Rise at Full Load:  C

Permissible Number of Starts per hour:

**All data shall be in an electronic format suitable for upload to Region’s CMMS (Maximo). Refer to Section 01425 – Computerized Maintenance Management System Data Requirements**

**PUMP MOTOR DATA (continued... 2)**

Cable(s) to Motor for Power (and Sensor) - Type, length, conductor number and size:

Bearing Type at: Pump End:

Other End:

Average Bearing Life:

Nominal Bearing Operating Pressure: kPa (psi)

Painting Finish:

**DEVIATIONS**

List all exceptions to the Specification. Use a separate sheet if necessary. If none, state

“NO DEVIATIONS”:

**ALTERNATIVES**

State “See Separate Letter” / Sheet OR “None Proposed”, whichever applies:

Submitted by: Signature:

Date: