2.2 Manufacturers

.1 Existing screw screens are made by ML Engineering (model # SCS-50) and supplied by Pro Aqua Engineering in Ontario. Contact is Geoff Coate at telephone # (905) 513-0222.

.2 Existing sodium hypochlorite dosing pumps are supplied by Prominent (model # G/4B0806NP3000D20001).

.3 Existing submersible pumps are supplied by Flygt (model # 31271804180).

.4 Existing progressing cavity pump is supplied by Moyno (model # A1GCSQ3AAA).

.5 Existing Mixers are supplied by Flygt (model # 46304101318)

.6 Existing fine bubble diffusers are supplied by Sanitaire. (Job #99-4258S)

.7 Existing Aeration Blowers are supplied by Aerzen (Model # GM-15L and GM-35S)

.8 Existing Air Compressors are supplied by DevilBiss (Model #447)

.9 Existing Refrigerated Air Dryer are supplied by DevilBiss (Model # PD25)

2.3 Capacities and Performance

.1 Identify equipment by the "New" equipment number.

.2 Relocate the screw screens to the new Headworks building and install them as per the drawings

.3 Relocate the sodium hypochlorite dosing pumps and install in the new clarifier building with the effluent water pumping system as per the drawings.

.4 A VFD will be added to each submersible NMLQ pump to satisfy the current application. The pumps, piping and the valves will remain where they are currently installed.

.5 The tanks will remain where currently installed and an interconnecting pipe will be added between the two tanks so they serve as one tank.

.6 A VFD will be added to the progressive cavity TWAS pump to satisfy the current application. Relocate the progressive cavity TWAS pump to the Clarifier Building and install as per the drawings.

.7 Install the mixers as shown on the drawings.

.8 Install the fine bubble diffusers as shown on the drawings and as per the requirements in Section 11531.

.9 The existing four (4) aeration blowers will equipped with new VFDs as per the drawings and will remain as installed currently.

.10 Leave the air compressors in their current location.

.11 Leave the refrigerated air dryer in the current location.

.12 Provide any parts and procedures required for the modifcation or relocation of the equipment in accordance with manufacturers' recommendations.

.13 Refer to the drawings for further details on the modifications to each piece of existing equipment.

2.4 Protective Coating

.1 Repair damage to coating in accordance with Section 09905.

3. EXECUTION

3.1 Installation

.1 For all equipment requiring relocation or modification, connect and install all equipment in accordance with the manufacturers' written instructions.

.2 Refer to Division 1.

3.2 Testing

.1 Refer to Division 1.

.2 After completion of installation of equipment requiring relocation, provide testing to demonstrate compliance with operating requirements as specified in Section 01650.

.3 For existing equipment, which does not require relocation or modification, provide testing to demonstrate compliance with operating requirements as specified in Section 01650.

3.3 Commissioning

.1 Refer to Division 1.

.2 Commission equipment in accordance with Section 01735.

MODIFICATION, RELOCATION AND REUSE OF EXISTING EQUIPMENT

END OF SECTION

CHANNEL FLOW CONTROL

1. GENERAL

1.1 Work Included

.1 This Section specifies the supply and supervision of the installation, testing and commissioning of slide gates, stop logs and weirs, complete with slides, frames, operating stems, operators, seals and other appurtenances. Gate construction will be as specified in this Section.

1.2 Definitions

.1 Slide Gate: stainless steel or aluminum gate used for lower head applications, up to 6.1 m. Gates may require sealing along either three or all four sides. Gates requiring sealing along all four sides will be denoted as requiring "closure".

.2 Sluice Gate: heavy duty cast iron gate, rated for heads up to 21 m. Not used for this application.

.3 Automatic Level Control Gate: gate automatically maintains a constant water level on the upstream side of the gate section and operates without any power, free of any manual interventions, irrespective of the volume of incoming flow and independently of the downstream water level. Not used for this application.

.4 Maximum Seating Head: The maximum seating head is defined as the maximum pressure head exerted on the gate (at the centerline elevation of the gate opening) in the direction into the frame and arising from the highest differential water level which could work to seat the gate.

.5 Maximum Unseating Head: The maximum unseating head is defined as the pressure head exerted on the gate (at the centerline elevation of the gate opening) in the direction away from the frame and arising from the maximum differential water level which could work to unseat the gate.

1.3 Submittals

.1 Shop Drawings: Submit in accordance with Section 01300 and Section 11005. In addition to the requirements of Section 11005, provide the following information:

.1 For each type of gate or weir, provide:

.1 Frame assembly details.
.2 Concrete embedment and attachment details.
.3 Installation instructions.
.4 Stem and coupling, stem guide and thrust nut details.

.2 For each gate, provide:

.1 Operator details.
.2 Seal details.
.3 Weights of gates and frames.
.4 Calculation and data for all load bearing components.

.2 Operating and Maintenance Data: Provide for incorporation in Operation and Maintenance Manual as specified in Section 01300.

.3 Design calculations and supporting data for all gates showing stresses, loads and deflection for critical parts under design head conditions.

1.4 Coordination

.1 Coordinate with other Divisions to ensure there are no conflicts in the work.

1.5 Shipment, Protection and Storage

.1 Ship the equipment pre-assembled to the degree which is practicable.

.2 Provide storage instructions indicating specific requirements to ensure there is no uneven wear, distortion or weathering of components.

2. PRODUCTS

2.1 General

.1 Shop assemble and inspect gates to ensure that field fitting will not be required.

.2 Sluice gates and stop logs isolate treatment units, as necessary.

.3 Provide products, modified as necessary, to meet the specified features and operating conditions.

.4 Provide sluice gates as a product from a single manufacturer.

.5 Refer to the detailed specification sheets at the end of this section for information on specific gates.

.6 Design for leakage not to exceed 1.04×10^{-5} m^3/s per m of seal periphery under the design seating head and 2.07×10^{-5} m^3/s per m of seal periphery for the design unseating head.

2.2 Acceptable Manufacturers

.1 Fontaine
.2 Armtec
.3 Rodney Hunt
.4 Waterman

2.3 Gate Frames (Self-Contained)

.1 Design the frame to be embedded in a concrete channel, or face-mounted in front of a wall opening, as shown on the drawings.

.2 Provide self-contained frames with integral, welded yokes. Provide extruded, one-piece guides, for the full height of the frame.

.3 Weld the yoke channels supporting the operator to the guides to provide a one-piece rigid frame. Space yoke members such that the operator stem and slide can be easily removed. Limit deflection to 1/360 of the span of the gate.

.4 Provide frames of extruded aluminum ASTM B-209, alloy 6061-T6, or stainless steel type 304.

.5 Frame members' minimum thickness is 6.35 mm.

.6 Provide a top edge sealing arrangement.

.7 Design the frame so that the top, side and bottom seals may be replaced without removing the gate.

2.4 Slides

.1 Provide slides consisting of a flat plate reinforced with formed plates or structural members to limit its defection to 1/720 of span.

.2 Provide slides of aluminum plate ASTM B-209 alloy 6061-T6, aluminum alloy 5083-H321, or stainless steel type 304.

.3 Provide clevice type connection with structural members welded to the slide and a cross bolt to act as a pivot pin.

2.5 Guides and Seals

.1 Provide guides of UHMWPE (ultra high molecular weight polyethylene) with neoprene rubber J seals with Teflon facing and of sufficient length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the full open position. The provision of Teflon faced J-seals is optional, depending on the manufacturer's standard, providing the leakage requirement can be achieved.

.2 Provide seals of the self adjusting type to maintain the specified leakage rate in both seating and unseating conditions.

.3 Provide resilient neoprene bottom seal set into the bottom member of the frame to form a flush bottom.

2.6 Stem and Couplings

.1 Provide operating stems and couplings of stainless steel, designed to transmit in compression at least 2 times the rated output of the operating manual mechanism with a 177 N effort on the handwheel.

.2 Provide the stem with a slenderness ratio (L/R) less than 200.

.3 Hollow stems will not be accepted.

.4 Machine cut the threaded portion of the stem.

.5 For stems in more than one piece and with a diameter of 44.5 mm and larger, join the different sections together by threaded and bolted connections. Hollow stems are not acceptable.

.6 Groove and key the couplings. The couplings are to be of greater strength than the stem.

.7 Design the stem for rising arrangement.

.8 Provide two lifting mechanisms connected by a tandem shaft for gates having widths equal to or greater than two times the height.

2.7 Stem Guides

.1 Stainless steel, type 304 and UHMWPE bushed.

2.8 Thrust Nuts

.1 Manganese bronze, ASTM-B584.

.2 Locate the thrust nut at the operator level.

2.9 Manual Gear Operators

.1 Yoke mount the manual gear operators.

.2 Totally enclose all bearings and gears in a weather tight housing. Construct the pinion shaft of the gear operated mechanisms of stainless steel and support by roller bearings or needle bearings.

.3 Provide an adjustable limit nut to prevent over travel of the gate past the fully open or fully closed position.

.4 Provide a removable handcrank with a minimum 300 mm long crank handle, for manual gear operators. Mark with open-close direction arrows.

.5 Provide a pedestal, where required, constructed of Tenzaloy aluminum.

.6 Design the manual gear operator to operate the gate under the maximum seating and unseating pressure by not more than a 177 N effort on the handcrank, and able to withstand, without damage, an effort of 36 kg on the handcrank.

.7 Provide a system to which an electric or pneumatic drill can be connected to open the gate, capable of withstanding a 200 N operating force.

.8 Provide a galvanized steel stem cover equipped with windows, complete with a cap, condensation vents and position indicators.

2.10 Stop Logs and Frames

.1 The frame shall be made of stainless steel channels with integral concrete anchors.

.2 The frame shall be suitable for embedding in a channel (FE). Extend grooves in the frames to walkway level

.3 Minimum width and thickness of frames shall be 114mm and 6.35mm respectively.

.4 Stop logs shall be constructed entirely of 304L stainless steel. All hardware shall be stainless steel.

.5 Logs shall consist of a flat plate reinforced with formed plates or structural members to limit their deflection to 1/360 of the gate's span under the design head, with minimum 6.35mm thickness.

.6 Provide lifting lugs or holes near the end of each log. Recess mating logs to accommodate the lifting lugs.

.7 Downstream welds shall be continuous.

.8 Provide drainage in each stop log to prevent buoyancy and water retention.

.9 Seals shall be made of EPDM attached to the logs by means of a UHMWPE retainer guide. The bottom seal is attached to the log with a stainless steel retainer and seal on top of the log immediately underneath

.10 Supply a stainless steel lifting device for each log width. The width of the lifting device will be the same as the log channel. The lifting device shall be equipped with a device to allow releasing of the stop log from the operating floor. This device shall grab the log automatically.

.11 Supply an electric chain hoist to be compatible with the lifting device for the stop logs and rated for a load capacity of 1000 kgs. The height of lift shall be 8000 mm with a fixed suspension. Acceptable manufacturer: Konecranes- Model XN05- 1004b1 or approved equal.

2.11 Weir Plates

.1 304 stainless steel, a minimum thickness of 10.0 mm.

.2 Fabricate weir plates with slotted holes or provide with adjustable mounting clamps, each allowing for them to be firmly affixed to the supporting structure. Make overflow weirs vertically adjustable at least 150 mm. Make underflow weirs vertically adjustable at least 150 mm.

.3 Make the top edge of overflow weirs and the bottom edge of underflow weirs straight and true.

.4 Where necessary to prevent leakage around the weir plate, provide neoprene gaskets to seal between the weir and the structure.

.5 Provide all mounting angles, supports, etc. as required to install the weirs.

3. EXECUTION

3.1 Installation

.1 Verify satisfactory delivery of the equipment by completing Form 100, illustrated in Section 01650.

.2 Coordinate blockouts or cast in place items.

.3 For face-mounted gates, ensure a plane concrete surface using grout to smooth the surface, as required.

.4 Install slide gates with square corners, in a vertical plane, with tolerances within manufacturer's recommendations.

.5 Install gate operators as per manufacturer's recommendations. Align to ensure there is no distortion of stems or moving parts.

.6 Install weir plates as shown in the drawings. Allow for adjustment of the height of the weir plates during process performance testing to achieve the hydraulic levels as required.

.7 Installer to certify the understanding of the gate, stop log and weir installation by completing Form 101, illustrated in Section 01650.

.8 Ensure equipment is installed in accordance with Section 11020 as required to provide satisfactory service.

.9 Fulfill the requirements for satisfactory performance of the equipment as documented by Form 103, illustrated in Section 01650.

3.2 Corrosion Protection

.1 Provide bitumastic coating to all aluminum in contact with concrete.

3.3 Testing

.1 Ensure the equipment, including all component parts, operates as intended.

.2 Demonstrate satisfaction of requirements specified herein.

.3 Operate each gate with and without liquid to show that each can be operated with applied torques within design limits.

.4 Test each gate for leakage by filling the channel on one side of the gate and measuring leakage through the gate. Undertake the test after 24 hours to allow for the concrete to absorb water.

.5 Conform to the requirements of Section 01650.

3.4 Commissioning

.1 Conform to the requirements of Section 01735.

END OF SECTION

GATE SCHEDULE

Item No	Tag No	P&ID	Description	Bottom Elev.	Channel Wall Top Elev.	Frame Size (mm) W x H	Lift Type	Frame Type	Head (m)
FABRICATED SLIDE GATE									
.1	SG-301	I3-03	Slide Gate for isolation of Secondary Clarifer 1	10.926	11.526	1000 x 600	Handwheel Gear operated	Side Wall Mounted on circular tank	0.153
.2	SG-302	I3-03	Slide Gate for isolation of Secondary Clarifer 2	10.926	11.526	1000 x 600	Handwheel Gear operated	Side Wall Mounted on circular tank	0.153
STOP LOGS									
.3	SL-201	I3-02	Stop Logs for isolation of Bioreactor 1	10.654	12.875	1000 x 1500	Lifting Device	Embedded	1.5
.4	SL-202	I3-02	Stop Logs for isolation of Bioreactor 2	10.654	12.875	1000 x 1500	Lifting Device	Embedded	1.5
WEIRS/ BAFFLES									
.5	W-101	I3-01	Weir Plate for flow splitting of primary effluent	N/A	N/A	N/A	N/A	N/A	0.166
.6	W-102	I3-01	Weir Plate for flow splitting of primary effluent	N/A	N/A	N/A	N/A	N/A	0.166
.7	W-103	I3-01	Weir Plate for flow splitting of primary effluent	N/A	N/A	N/A	N/A	N/A	0.166
.8	W-201	I3-02	Weir Plate for level control of mixed liquor in Bioreactor 1	N/A	N/A	N/A	N/A	N/A	0.172
.9	W-202	I3-02	Weir Plate for level control of mixed liquor in Bioreactor 2	N/A	N/A	N/A	N/A	N/A	0.172

Abbreviation: Lift Type Hand Pull, Handwheel, Gear, Weighted
Frame Type Embedded, Surface Mounted, Side Wall Mounted

Note:
1. For fabricated slide gates, operator to be 914mm above floor elevation
2. Contractor to confirm all dimensions and elevations prior to preparation of shop drawings, then again prior to installation.

END OF SECTION

PROCESS MOTORS LESS THAN 150 kW

1. GENERAL

1.1 Description

.1 This Section specifies alternating current induction motors, 150 kW or less, to be provided with the driven equipment.

.2 This Section does not specify medium voltage (2300 V and greater) and specialty motors such as submersible motors, valve operator motors or torque rated motors.

.3 Unless specified otherwise, the manufacturer of the driven equipment is to provide electric motors as an integral component of the driven equipment, as specified in Section 11005.

.4 This Section specifies motors suitable for driving centrifugal pumps, fans, blowers, compressors, gears, progressive cavity pumps or other loads fed via the variable frequency drive or connected across-the-line.

1.2 Reference Standards

.1 Conform to the following reference standards:

.1 CSA C22.2 No. 100, Motors and Generators.

.2 CSA C22.2 No. 145, Motors and Generators for Use in Hazardous Locations.

.3 CSA C390, Energy Efficient Test Methods for Three Phase Induction Motors.

.4 EEMAC M1-7, Motors and Generators.

.5 NEMA Std. MG1, Motors and Generators.

.6 IEEE 112, Polyphase Induction Motors and Generators - Testing.

.7 IEEE 114, Single Phase Induction Motors - Testing.

1.3 Submittals

.1 Shop Drawings: Submit with the related items of equipment in accordance with Section 01300 and Section 11005. In addition, submit the following details: Provide the specified information for each typical size or type of motor driven equipment.

.1 Shop drawings and product data in accordance with Division 16.

.2 Overall dimensions of motor.

.3 Shaft centreline to base dimension.

.4 Shaft extension diameter and keyway, coupling dimensions and details.

.5 Fixing support dimensions.

.6 Terminal box location and size of terminals.

.7 Arrangement and dimensions of accessories.

.8 Diagram of connections.

.9 Speed/torque characteristic.

.10 Weight of motor

.11 Installation data.

.12 Rotation direction.

.13 Starting restrictions (time between starts).

.14 Terminal leads marking.

.15 Bearing data (including part numbers).

.16 Recommended lubricant.

.17 Design ambient temperature and temperature rise ratings.

.18 Torque characteristics including rated starting torque and breakdown torque.

.19 The AFBMA L-10 rated life for the motor bearings.

.20 The nominal efficiency of all motors.

.21 Class, division, group, and UL frame temperature limit code for explosion-proof motors.

.2 Operating and Maintenance Data: Provide for incorporation in Operation and Maintenance Manual of the related item of process equipment as specified in Section 01300.

1.4 Coordination

.1 For motors fed via variable frequency drives (VFD), communicate motor requirements to, and comply with drive requirements of, the VFD manufacturer in accordance with Division 16.

1.5 Quality Assurance

.1 Build motors in accordance with CSA C22.2 No. 100, CSA C22.2 No. 145, NEMA Standard MG1, and to the requirements specified.

1.6 Shipment, Protection and Storage

.1 Ship, protect and store equipment in a manner that prevents damage or premature aging.

.2 Handle motors with suitable lifting equipment.

.3 Store motors in heated, dry, weather-protected enclosure.

2. PRODUCTS

2.1 Description

.1 Unless specified otherwise, provide motors suitable for continuous operation at sea level.

.2 Provide motors suitable for continuous operation in a 20°C ambient temperature.

2.2 Acceptable Manufacturers

.1 Baldor
.2 General Electric
.3 GEC Alsthom
.4 Reliance
.5 Siemens
.6 Toshiba
.7 U.S. Motors
.8 Westinghouse

2.3 Materials

.1 Motors: to EEMAC M1-6.

.2 Lead markings: to EEMAC M2-1.

.3 Unless specified otherwise, provide all motors with:

.1 Cast iron frame
.2 Cast metal fan blades and shrouds
.3 Stainless steel hardware
.4 Non hygroscopic windings

2.4 Components

.1 Bearings

.1 Provide sealed ball bearing type on motors less than 37.5 kW.

.2 Bearings on 37.5 kW motors or larger to be greasable ball bearing type, rated for a minimum L-10 life of 100,000 hours at the ambient temperature specified herein.

.2 Provide adequately sized, diagonally split, gasketted, EEMAC 4 terminal boxes complete with threaded hub for conduit entry for ODP and TEFC motors.

.3 Provide adequately sized, diagonally split, gasketted EEMAC 7 terminal boxes complete with threaded hub for conduit entry for explosion-proof motors.

.4 Provide a ground connection and lifting eyes or lugs.

.5 Align and balance the motor with the related equipment in the shop to minimize vibration and undue stresses.

.6 Where specified, equip motors with anti-condensation heaters suitable for connection to 120 volts, single phase, 60 Hz power supply.

.7 Current Imbalance

.1 Do not exceed the values listed below when the motor is operating at any load within its service factor rating and is supplied by a balanced voltage system:

.1 Under 37.5 kW: 25 percent
.2 37.5 kW and above: 10 percent

.2 Base imbalance criteria upon the lowest value measured.

.8 Winding Over Temperature Protection

.1 Provide stator winding over temperature protection on all motors rated 45 kW and larger.

.2 Provide stator winding over temperature protection on motors rated less than 45 kW, when required by the specific equipment specification section, or if recommended by the driven equipment manufacturer.

.3 Over temperature protection for motors rated 45 kW and larger and other motors, where specified, to be NEMA MG1-12.53, Type 1, winding running and locked rotor over temperature protection. Provide one detector per phase. Detectors to be positive thermal protection (PTC) thermistor type, with leads brought out to a terminal strip in a NEMA 4 enclosure in Type 2 motors and a NEMA 7C or 9 enclosure for Type 3 motors.

2.5 High Efficiency Motors

.1 Use motors that have efficiencies that conform to or exceed the requirements of EPACT.

.2 Where vertical motors are specified or provided, ensure efficiency is within 0.5 percent of the values specified for horizontal motors.

.3 Test motor efficiency in accordance with CSA C390 and NEMA MG1, accounting for stray load losses, measured indirectly based on the IEEE method.

2.6 Motors Smaller Than 0.25 kW

.1 General

.1 Unless otherwise specified, provide squirrel cage, single phase, capacitor start, induction run type motors 0.25 kW and smaller.

.2 Provide single phase motors with Class F insulation.

.3 Small fan motors may be split-phase or shaded pole type.

.4 Provide copper windings.

.2 Rating

.1 Unless specified otherwise, provide motors rated for operation at 115/1/60 VAC, and continuous-time rated in conformance with NEMA Standard MG1, paragraph 10.35.

.3 Enclosures

.1 Unless otherwise specified, provide motors with totally enclosed fan cooled (TEFC) or totally enclosed non-ventilated (TENV) enclosures.

.2 Where explosion-proof motors are specified or required, provide explosion-proof motors bearing the UL label for Class I, Division 1, Group D hazardous locations.

.3 Provide advice in the enclosure to detect over temperature and automatically de-energize the motor.

2.7 Motors 0.25 kW to 150 kW

.1 General

.1 Unless otherwise specified, provide 3-phase, squirrel cage, full voltage start, high efficiency induction type motors 0.25 kW to 150 kW.

.2 Rating

.1 Unless otherwise specified, provide heavy duty, high efficiency, and TEFC motors for all motors which run continuously.

.2 Unless otherwise specified, provide squirrel cage induction type motors, with a service factor of 1.15 at 40°C ambient, Class F insulation and non hygroscopic windings.

.3 Provide motors with EEMAC Design B torque characteristics. Size motors to satisfy the driven equipment's starting torque requirements. For special high torque applications such as sweep arm drives, motors with Design C characteristics may be specified or provided subject to the Engineer's acceptance.

.4 Rated for 600/3/60 VAC service unless otherwise specified.

.5 Design motors for full voltage starting, capable of running successfully when terminal voltage is from +10% to -10% of nameplate voltage.

.6 Motors with a service factor of 1.0 to operate at no more than 90% of their nameplate current rating and motors with a service factor of 1.15 to operate at not more than 100% of their nameplate current rating.

.7 Ensure sufficient capacity to operate the driven load and associated devices under all conditions of operation without overloading.

.3 Enclosure and Insulation

.1 Classify motors as:

.1 Type 1 (General Duty)
.2 Type 2 (Process)
.3 Type 3 (Explosion-proof)

.2 Enclosures and insulation systems are specified in the following clauses. Temperature rise for all motor types not to exceed that permitted by Note II, paragraph 12.42, NEMA MG1.

.3 Provide non hygroscopic insulation.

.4 Type 1 Motors (General Duty): Unless specified otherwise, provide TEFC enclosures with Class F insulation.

.5 Type 2 Motors (Process): Provide TEFC enclosures, with Class F insulation, suitable for moist and corrosive environment. Provide Class F insulation with Class B temperature rise for motors rated 7.5 kW and larger. Coat all internal surfaces with an epoxy paint. Aluminum frame motors are permitted. Steel frame motors are permitted for motors with frames 184 and smaller.

.6 Type 3 Motors (Explosion-proof): Provide motors to be rated for operation in a Class 1, Division 1, Group D hazardous location in accordance with CSA C22.1. Provide a Class F insulation. Steel frame motors are not permitted. Provide an approved breather/drain device in the motor drain hole.

2.8 Motors for Variable Frequency Drives

.1 Comply with the requirements of the intended variable frequency drives and Division 16.

.2 Select premium efficiency units, inverter duty rated, in conformance with NEMA MG1.

.3 Use Type 2 or Type 3 motors.

.4 Insulation: Class F insulation with Class B temperature rise, suitable for moist and corrosive environments and in accordance with NEMA MG1, Part 30 and Part 31.

.5 Motors for variable frequency systems are not to deliver more than 80 percent of the motor's service factor rating by any load imposed by the driven machine at any specified operating

condition or any condition imposed by the driven machine's performance curve at maximum operating speed.

.6 Ensure motors have adequate cooling capacity when operating through the entire speed range capacity of the drive.

2.9 Vertical Motors

.1 Unless otherwise specified, provide full voltage vertical motors with a Type P base specifically designed for vertical installation.

.2 Universal position motors are not acceptable.

.3 Provide vertical motors with solid shafts unless specified otherwise.

.4 Provide thrust bearing rating compatible with the loads imposed by the driven equipment.

2.10 Two Speed Motors

.1 Provide two speed motors with separate windings. Single winding two speed motors are not acceptable.

2.11 Power Factor Correction Capacitor Sizing

.1 Confirm the maximum capacitor size which may be connected to motors 37.5 kW and larger, on constant speed drives.

2.12 Finishes

.1 Finish motors in accordance with Division 16.

2.13 Equipment Identification

.1 Provide equipment identification in accordance with Division 11 and Division 16.

.2 Nameplates

.1 Provide motor nameplates on engraved or stamped stainless steel. Include information enumerated in NEMA Standard MG1, paragraph 10.37, 10.38 or 20.60, as applicable.

.2 Additionally, indicate:

.1 The AFBMA L-10 rated life for the motor bearings for motors 37.5 kW and larger.

.2 The nominal efficiency for all motors.

.3 Class, division, group and UL frame temperature limit code for explosion-proof motors.

.4 Permanently fasten nameplates to the motor frame and position to be easily visible for inspection.

2.14 Spare Parts

.1 Provide spare parts in accordance with Section 11005.

3. EXECUTION

3.1 Manufacturers Representative

.1 All motors are supplied as an integral component of some other item of equipment. The manufacturer's representative for that equipment is responsible for the supervision of installation, site testing, and commissioning of the motor as part of the equipment as specified in other sections. Ensure that the motor manufacturer's representative informs both the representative for the equipment and the installer of requirements for the motor, installation, testing and commissioning.

3.2 Installation

.1 Dry the motor if dampness is present, in accordance with manufacturer's recommendations.

.2 Install or ensure the motor is properly installed to provide satisfactory service.

.3 Make connections as indicated. Use liquid-tight PVC jacketed flexible conduit between rigid conduit and motor.

.4 Make flexible conduit long enough to permit movement of motor over entire length of slide rails, when applicable.

.5 Check for correct direction of rotation, with motor uncoupled from driven equipment.

.6 Align and couple motor to driven machinery to manufacturers instructions, using only correct parts such as couplings, belts, sheaves, as provided by manufacturer.

.7 Install anchor devices and setting templates in accordance with Division 3.

3.3 Testing

.1 Perform tests and document results in accordance with Division 16.

3.4 Testing and Commissioning

.1 Ensure the motor operates as intended during testing of the individual equipment and during process commissioning.

END OF SECTION

SUBMERSIBLE MOTORS

1. GENERAL

1.1 Work Included

.1 Supply and supervision of the installation, testing, and commissioning of submersible motors.

1.2 Submittals

.1 Shop Drawings: Submit with the related item of process equipment in accordance with Section 01300 and Section 11005. In addition, submit the following details:

.1 Submit efficiency and power factor information at 100% and 75% load for each motor size and type required.

.2 Operating and Maintenance Data: Provide for incorporation in Operation and Maintenance Manual of the related item of process equipment as specified in Section 01730.

1.3 Coordination

.1 For motors fed via variable frequency drives, communicate motor requirements to and comply with drive requirements of the manufacturer of the VFD in accordance with Division 16.

1.4 Quality Assurance

.1 Build motors in accordance with CSA C22.2 No. 100, CSA C22.2 No. 145, NEMA Standard MG1, and to the requirements specified.

1.5 Shipment, Protection and Storage

.1 Ship, protect and store equipment in a manner that prevents damage or premature aging.

.2 Handle motors with suitable lifting equipment.

.3 Store motors in heated, dry, weather-protected enclosure.

2. PRODUCTS

2.1 Description

.1 Unless specified otherwise, provide motors suitable for continuous operation at sea level.

.2 Provide motors suitable for continuous operation in a 20°C ambient temperature.

2.2 Acceptable Manufacturers

.1 Siemens
.2 General Electric
.3 Toshiba
.4 Westinghouse
.5 Reliance Electric
.6 Flygt

2.3 Exposure Classification

.1 The exposure classification for each motor is specified with the related equipment.

.2 Provide as a minimum TEXP motors for areas where dangerous gases may occur or which are to be immersed in flammable liquids.

.3 In all other areas, provide totally enclosed, waterproof motors.

2.4 Motors - Sewage Application

.1 Provide motors suitable for heavy duty service.

.2 Squirrel cage induction type with non-hygroscopic windings. Insulation temperature rise not to exceed Class F. Insulation to be moisture resistant.

.3 For starting and torque characteristics, conform to EEMAC Design B.

.4 316, 416 or 417L stainless steel motor shafts.

.5 For services 0.37 kW and greater provide motors nameplate rated for 600 V, 60 Hz, 3-phase service unless otherwise specified.

.6 Design motors for full voltage starting and capable of running successfully when terminal voltage is from +10% to -10% of nameplate voltage. Motors with a service factor of 1.0 shall run at not more than 90% of nameplate current rating and motors with a service factor of 1.15 shall operate at not more than 100% of nameplate current rating.

.7 Provide motors capable of 10 evenly spaced starts per hour on a continuous basis without temperature rises which would harm insulation and windings.

.8 Design motors for semi-continuous immersion in liquid with an ambient temperature of 40°C unless higher temperatures are noted. Design casing for adequate heat rejection. Designs utilizing the circulation of the pumping liquid are not permitted.

.9 Where motors are designated for intermittent immersion, provide cooling fins, sealed fan units, or other devices suitable for the function.

.10 Provide thermal protection. Two bimetallic sensors shall sense when the motor temperature rises above 140°C. The motor shall automatically restart after cool-down. For TEXP motors, calibrate the two bimetallic sensors to shut down the motor at 120°C. Include three additional thermistors which shut down the motor if a temperature of 140°C is sensed. On sensing this condition, the motor will be shut down and held until reset. Use the thermal switches in conjunction with and supplemental to external thermal motor overload protection.

.11 For motors greater than 10 kW, provide a moisture sensing device in the stator housing.

.12 Attach an oil-filled reservoir to the bottom of the motor. Prohibit the ingress of moisture with inner and outer single mechanical seals. Mechanical seals to be tungsten carbide or sintered silicon carbide, both faces.

.13 Place a moisture sensing device in the reservoir to indicate seal failure.

.14 Provide sealed ball bearing type bearings with an AFBMA B10 life of 100,000 hours.

.15 Provide 304 or 316 stainless steel hardware.

.16 Ensure motors used with variable speed drives have adequate cooling capacity when operating through the entire speed range capacity of the drive.

2.5 Cable

.1 Supply submersible motors with a minimum length of cable to reach the pump's control panel/starter, and capable of continuous submergence under water without loss of watertight integrity to a depth of 20 metres.

.2 Provide cable that contains power and ground wires, copper, of sufficient size for the service and in compliance with applicable codes.

.3 Provide cable that contains instrument leads, shielded as necessary to prevent electrical interference.

.4 Provide heavy duty cable, water tight and capable of withstanding operating loads.

.5 Seal end of cable prior to shipping to prevent ingress of moisture.

2.6 Finishes

.1 Factory paint submersible motors as specified in Section 09905.

2.7 Mounting

.1 Supply all motors integrally with the related equipment.

.2 Factory align and balance the motor with the related equipment to minimize vibration and undue stresses.

3. EXECUTION

3.1 Manufacturer's Representative

.1 All motors are supplied as an integral component of some other item of equipment. The manufacturer's representative for that equipment is responsible for the supervision of installation, site testing, and commissioning of the motor as part of the equipment as specified in other Sections. Ensure that the motor manufacturer's representative informs both the representative for the equipment and the installer of requirements for the motor, installation, testing, and commissioning.

3.2 Installation

.1 Ensure the motor is properly installed to provide satisfactory service.

3.3 Testing and Commissioning

.1 Ensure the motor operates as intended during testing of the individual equipment and during process commissioning.

END OF SECTION