Supplemental Pump Station Specifications

REQUIREMENTS
Furnish and install 2 submersible non-clog wastewater pump(s). Each pump shall be equipped with a 10 HP submersible electric motor connected for operation on 460 volts, 3 phase, 60 hertz, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and have P-MSHA Approval.

PUMP DESIGN CONFIGURATION
The pump shall be supplied with a mating cast iron 4 inch discharge connection and be capable of delivering 100 GPM at 95 FT. TDH. The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. **Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable**. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with a minimum of 7X19 preformed 3/16 stainless steel cable with 2 feet of stainless steel chain at the top of pump. The working load of the lifting system shall be 50% greater than the pump unit weight.

PUMP CONSTRUCTION
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

COOLING SYSTEM
Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

CABLE ENTRY SEAL
The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

MOTOR
The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with

moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

BEARINGS
The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. **Single row lower bearings are not acceptable.**

MECHANICAL SEAL
Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion resistant **tungsten-carbide** ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion resistant **tungsten-carbide** seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor **depend on direction of rotation for sealing**. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or

conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with an lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. **The motor shall be able to operate dry without damage while pumping under load**.

Seal lubricant shall be FDA Approved, nontoxic.

PUMP SHAFT
Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

IMPELLER
The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across a spiral groove located on the volute suction which shall keep them clear of debris, maintaining an unobstructed leading edge. The impeller(s) vanes shall have screw-shaped leading edges that are hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in waste water. The screw shape of the impeller inlet shall provide an inducing effect for the handling of sludge and rag-laden wastewater. Impellers shall be locked to the shaft and held by an impeller bolt.

VOLUTE BOTTOM/INSERT RING
The pump volute shall be of A48 Class 35B gray cast iron and shall have (an) integral spiral shaped cast groove(s) at the suction of the volute. The internal volute bottom or insert ring shall provide effective sealing between the pump volute and the multi-vane, semi-open impeller. The sharp spiral groove(s) shall provide the shearing edge(s) across which each impeller vane leading edge shall cross during its rotation in order to remain unobstructed. The clearance between the internal volute bottom and the impeller leading edges shall be adjustable.

PROTECTION
All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**

The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

GENERAL
The general guide specifications is intended to cover the items applying to all ITT Flygt pumps for this project. Pump specifications follow the general section. Thus; Quality, Technical Support, Testing, and Experience apply to all ITT Flygt pumps for this project.

SCOPE
The specifications shall govern all work necessary to furnish, install and place into operation the electrical submersible pump(s) required to complete this project. This section includes electric submersible pump(s) to be supplied with motor, close coupled volute, cast iron discharge elbow, guide bar brackets, power cable and accessories. The pumps are available for wet pit (CP or NP), dry pit (CT, CZ, NT or NZ) and portable (CS, NS) installations.

QUALITY ASSURANCE
The pump(s) shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. The pumps provided shall be capable of operating in an ambient liquid temperature of **104 DEGREES F**. Since the high temperature of **104 DEGREES F** is specified by the National Electrical Manufacturers Association (NEMA) and Factory Mutual (FM), motors with a maximum ambient temperature rating below **104 DEGREES F** shall not be acceptable.

The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable.

The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

SUBMITTALS
Submittal data shall be provided to show compliance with these specifications, plans or other specifications that will influence the proper operation of the pump(s).

Standard submittal data for approval must consist of:

a. Pump Performance Curves.
b. Pump Outline Drawing.
c. Station Drawing for Accessories.
d. Electrical Motor Data.
e. Control Drawing and Data.
f. Access Frame Drawing.
g. Typical Installation Guides.
h. Technical Manuals.
i. Parts List.
j. Printed Warranty.
k. Manufacturer's Equipment Storage Recommendations.
l. Manufacturer's Standard Recommended Start-Up Report Form.

Lack of the above requested submittal data is cause for rejection.

TESTING
Testing performed upon each pump shall include the following inspections:

a. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.

b. Prior to submergence, each pump shall be run dry to establish correct rotation.

c. Each pump shall be run submerged in water.

d. Motor and cable insulation shall be tested for moisture content or insulation defects.

Upon request, a written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the time of shipment.

Each pump (when specified) shall be tested in accordance with the latest test code of the Hydraulic Institute (H.I.) at the manufacturer to determine head vs. capacity and kilowatt draw required. Witness tests shall be available at the factory upon request.

The pump(s) shall be rejected if the above requirements are not satisfied.

START-UP SERVICE
The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for 8-hour working day(s) at the site to inspect the installation and instruct the owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the following:

a. Megger stator and power cables.
b. Check seal lubrication.
c. Check for proper rotation.
d. Check power supply voltage.
e. Measure motor operating load and no load current.
f. Check level control operation and sequence.

During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the owner's personnel.

FACTORY SERVICE
Factory-Approved service facilities with qualified factory-trained mechanics shall be available for prompt emergency and routine service.

GUARANTEE
See individual market sector **Warranty** policies as presented under **General Information** in this catalog.

The warranty shall be in printed form and previously published as the manufacturer's standard warranty for all similar units manufactured.

EXPERIENCE
The pump manufacturer shall have a minimum of 10,000 heavy-duty submersible wastewater pumps installed and operating for no less than 5 years in the United States.

MANUFACTURERS

a. The pump, mechanical seals and motor shall be from the same manufacturer.

b. The pump, mechanical seals and motor manufacturer shall be ITT Flygt, ABS or approved equal.

MODIFICATIONS:

OIL FILLED MOTORS - Since the complete motor requires total oil immersion for adequate heat dissipation, **oil filled motors shall not be considered for dry pit installations.**

STANDARD ACCESSORIES:

Standard Accessories to be included in the pump station are as follows:

a. Type 304 Universal stainless steel rail system
b. All hardware shall be stainless steel
c. Pump lifting mechanism shall be a minimum of 7X19 preformed 3/16 stainless steel cable with 2 feet of stainless steel chain at the top of pump.
d. Cable grips shall be Kellum grips stainless steel weaved grips (0.75"-0.87")

FLOATS
Standard normally open or normally closed floats (see below for control status).

WET WELL HATCH COVERS
All hatch covers shall be aluminum, door leaf shall be a minimum of ¼ inch thickness reinforced with aluminum flat bar to attain 300 lbs per square foot loading rating. All hardware shall be stainless steel. Preferred model for single hatch opening is S1S. Preferred model for double hatch opening is S2S.

Safety grates are required for all hatches. Nets must have a 300 lb rating or higher.

COATING
Zebron 386 shall be used for for final protective lining to be applied at a minimum of 100 mills thick.

Primer for protective coating shall be Zebron Low temp Epoxy applied at 2 to 3 mill minimum prior to applying Zebron 386.

QSR patching material to be used for fill joints cracks and any rough areas.

VALVES
All valves will be supplied with valve wheels for operation of valve

CONTROL ROOM
Standard fiberglass house shall be sized to fit controls with lockable walk in door.

STANDBY GENERATOR
Generator set shall be 35 kW, radiator cooled, LP fueled, 460 volt, three phase, 60 HZ with the following options:

Unit mounted circuit breaker, 80°C Main alternator (IMS), PMG voltage regulator, detector 12 controls (NFPA 110), alarm contacts, AC meter package, electronic engine governor, 122°F High ambient cooling system, engine coolant heater, oil and coolant drain extensions, weather protective enclosure, and unit mounted exhaust silencer (mounted within enclosure).

An automotive transfer switch, 460 volt, three phase, 3 pole, 60 HZ shall be provided with the following options:

NEMA 3R cabinet, programmed transition, level II controls, bargraph meters, digital display, keyed security switch, dry contacts for customer alarm points, and 2-amp float type battery charger.

Approved manufacturers are Onan/Cummins and Caterpillar. Supplier shall provide unit startup and customer instructions.

LIFT STATION CONTROL STANDARDS

The pump manufacturer will furnish the pump control panels.

VFD's for pumps shall only be used if deemed necessary by engineering for system hydraulics. Drives will be "smart" (ABB ACS550 series) and use internal PID's for wetwell level control. PLC's shall not be used for VFD control.

A PAC 2 controller (CSI Controls) will be used for the level transmitter.

Floats will be used for the level alarms. (Low, Hi and HiHi) (the HiHi level float will serve as an alarm and a back up to the PAC 2 for pump start)

Unless otherwise specified no additional control equipment will be required.

Minimally the following alarms will be made available for monitoring at the Filter Plant.

Low Level
Hi Level
HiHi Level

Pump Run Status'
Pump Fails (if available by manufacturer)

Man Down (if LS is below ground)
Station Flooding (if LS is below ground)
Intrusion Alarm (on all hatches and structures)

Generator Running
Generator Fail
Main Power Fail

Points to be made available to the Filter Plant will be terminated on a terminal block with isolation relays between the manufacturers control panel and the terminal block.

Telemetry must be established to the Filter Plant and all HMI and PLC programming completed prior to the station being put in service. Filter Plant Staff must be given 30 days notice to complete this work. A signal strength test (-90dB or better, -80dB to -85dB is desirable) must be performed to determine proper antenna height. A list of equipment to be monitored will be sent to the Filter Plant and they will generate the I/O list for the PLC.

The Filter Plant Staff will be contacted to confirm the following Telemetry equipment.

SCADA Telemetry Hardware

Equipment List:

A. Enclosure: NEMA 4 enclosure with sub panel, drip shield, and heater:
    1. Enclosure Hoffman A36H30DLP
    2. Sub Panel Hoffman A36P30
    3. Drip Shield Hoffman A-DK30SS
    4. Heater Hoffman D-AH4001B
    5. Temperature switch Stancor STO-1 20

B. Programmable Logical Controller Hardware: Automation Direct
    1. CPU PLC Direct DL350 # D3-350
    2. Base D3-05B-1
    3. DI Card F3-16ND3F
    4. DO Card D3-08TD2
    5. AI Card F3-04ADS
    6. AO Card F3-04DA-1

C. Radio Equipment: Wireless Data Communications (Ph. 620.626.6800)
    1. Micro Data System (MDS) 9710A Radio
    2. Antenna Cable Times Flexible Coax LMR400 (Length as required)
    3. PLC to Radio Cable DB25 Serial Cable
    4. Directional Antenna Scala TY-900 10db Gain
    5. Cable and connector from Lightning Arrestor to Radio
    6. Antenna Structure:
        a. Short Base Antenna Section Rohn SB25G5
        b. 10' Antenna Section Rohn 25G
        c. 9' Top Antenna Section Rohn 25AG2
        d. Anti Climb Section Rohn 25ACL3

D. UPS APC 500va ES series

E. Miscellaneous equipment: Most Electrical Supply Houses
    1. Gray Wireway Panduit El. 5x3WH6
    2. Gray Wireway Cover Panduit Cl. 5WX6
    3. Terminal Blocks Allen Bradley 1492-CA1
    4. Fuseholders AB 1492-CE6
    5. 15A Circuit Breaker AB 1492-GH 1 50
    6. Mounting Channel AB 1492-N1
    7. Fuse Puller AB 1492-N12
    8. Anchors AB 1492-N23
    9. Power Supply Tripp Lite PR-15A 120vac/12vdc
    10. Surge suppressor Polyphaser IS-PSP-120
    11. Coaxial Lighting Arrestor
        a. Bulkhead Polyphaser IS-B50LN-C2-ME
        b. Surface Polyphaser IS-50NX-C2-ME