



**DATE:**

**QUOTE NO:**

**JOB NAME:**

**LOCATION:**

**ENGINEER:**

**CUSTOMER:**

**SPECIFICATION FOR NSF 61 CLOSE-COUPLED  
END SUCTION VFD WATER BOOSTER SYSTEM  
Simplex, Duplex, Triplex, Quadraplex**

**SECTION #:**

WORK INCLUDED - Packaged Pumping System

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Purpose: To provide a single source responsible for the manufacture and warranty of a prefabricated, skid mounted, fully automatic variable / constant speed pumping system and enclosure. The pumping system shall automatically maintain a constant discharge pressure regardless of varying flow demands within the station rating.
- B. The pumping system shall conform to the specifications herein in all aspects. This specification covers the minimum requirements, but should not be considered to be all inclusive. It is the successful vendor's responsibility to include all necessary appurtenances to provide for a complete, smooth operating, and reliable pump system. The manufacturer shall supply a complete set of general arrangement drawings, electrical power schematics, and control schematics in the operation and service manual.
- C. Manufacturers seeking authorization to furnish their product shall be a registered ISO9001:2008 manufacturer, and shall hold a current Quality Management Certificate for the assembly of custom packaged pumping systems and controls for use in commercial, irrigation, municipal, industrial, and fire applications.

**1.2 REFERENCES**

- A. American National Standards Institute (ANSI)



- B. American Society for Testing and Materials International (ASTM):
  - 1. A36: Standard Specification for Carbon Structural Steel.
  - 2. A48: Standard Specification for Gray Iron Castings.
  - 3. A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 4. A105: Standard Specification for Carbon Steel Forgings for Piping Applications.
  - 5. A276: Standard Specification for Stainless Steel Bars and Shapes.
  - 6. A307: Carbon Steel Bolts and Studs.
  - 7. A582/A582M: Standard Specification for Free-Machining Stainless Steel Bars.
  - 8. B 148: Standard Specification for Aluminum-Bronze Sand Castings.
- C. American Society of Mechanical Engineers (ASME)
  - 1. ASME B 16.5: Pipe Flanges and Flanged Fittings
- D. American Water Works Association (AWWA)
- E. American Petroleum Institute (API)
- F. Hydraulic Institute (HI)
- G. National Electric Code (NEC)
  - 1. National Electrical Manufacturers Association NEMA – MG 1

### 1.3 MANUFACTURER

- A The pumping system shall be of the type manufactured by **TIGERFLOW** Systems, LLC. The station manufacturer shall be certified to provide a UL listing for both the control panel and the pump station as a complete system, to ANSI-NSF-61 certification standards. The primary line of business of the pump station manufacturer shall be the design & manufacture of centrifugal pump booster stations. For consideration of a proposed equal system, the contractor shall furnish the following data to the Engineer at least 10 days prior to the date of the bid opening:
  - 1. A complete specification for the pumping system proposed as an equal.



2. A statement of full conformance to the specifications signed by an authorized representative of the manufacturer.
3. A D-size layout drawing showing overall dimensions and all piping discharge locations.
4. Complete submittal data for all major equipment such as pumps, motors, control components, valves, and motor starters.
5. A D-size one-line electrical schematic showing power wiring.
6. Manufacturer's electrical control panel UL508A file number.
7. A copy of the manufacturer's certificate of insurance showing as a minimum, general liability coverage of \$1,000,000 and an excess liability coverage of \$5,000,000.
8. If, in the opinion of the Engineer, the data submitted shows the pumping system to be an equal to the system specified, the bidding contractors shall be notified not less than 14 days prior to the bid opening.

#### 1.4 SUMMARY

Furnish and install a **TIGERFLOW** Series **ES-3000-VFD-NSF** (Duplex, Triplex, Quadraplex) Model # **-V-N** UL/C-UL Listed **IAMPO N-5169 NSF/ANSI-61** Listed engineered **Variable Speed** packaged water Booster System. The system shall be rated for a system flow of \_\_\_\_\_ GPM at a system pressure of \_\_\_\_\_ PSIG including a suction pressure of \_\_\_\_\_ PSIG minimum, \_\_\_\_\_ PSIG maximum.

#### 1.5 QUALITY ASSURANCE

- All equipment under this section shall be furnished by a single supplier and shall be products that the manufacturer regularly engages in. The supplier shall have sole responsibility for proper functioning of the system and equipment supplied.
- Equipment shall be a manufacturer's standard product presently in commercial production.
- The manufacturer shall have in place a quality assurance program to assure the quality of the material furnished.
- NIST Traceable test facility
- **TIGERFLOW** complies with the Buy American Requirement of Section 1605 of the American Recovery & Reinvestment Act of 2009. Public Law 111-5 (ARRA) for manufactured goods. Systems are manufactured in Dallas, TX, USA.



- Package shall be manufactured in an ISO 9001 certified facility

## 1.6 THIRD PARTY TESTING AND CERTIFICATIONS

Package shall be:

- **UL/C-UL QCZJ Listed as a system** for its intended use.
- **NSF/ANSI 61 certified for potable drinking water by IAPMO, NSF, UL or other ANSI third party testing agency.**
- In compliance with:
  - OSHA Federal Regulations 29 CFR 1910.303 and 399
  - NFPA Pamphlet #70 (National Electric Code) Article 90-7,
  - City of Los Angeles Approval Code, CMR248
  - ASHRAE 90.1 (2010) compliant

## 1.7 QUALIFICATIONS

- The manufacturer shall have a minimum of twenty years manufacturing and application experience.
- Upon request from the engineer, the pump station manufacturer shall demonstrate proof of financial responsibility with respect to performance and delivery date.
- Upon request from the engineer, the pump station manufacturer shall provide proof or evidence of facilities, equipment and skills required to produce the equipment specified herein

## 1.8 APPROVED MANUFACTURERS

Base bid: **TIGERFLOW**

Alternates: Must supply written certification that the pump system and manufacturer are Listed NSF/ANSI 61 certified for potable drinking water.

## 1.9 SUBMITTALS & INSURANCE CERTIFICATIONS

Submittals shall be in accordance with requirements of general specifications. Submit 6 copies to the engineer for approval. All submittals must include the following:

- Complete shop drawings and complete wiring diagrams. All drawings must be Inventor 2014 or AUTO-CAD electrical; complete with 3-D drawings available in Inventor, CAD, or Revit.
- Provide written certification that manufacturers' pump system is NSF/ANSI-61 certified for potable drinking water.



- Provide written certification that manufacturers' production facility is NSF/ANSI-61 certified to manufacture packaged pumping systems for potable drinking water.
- Furnish written certification of the manufacturers listing with Underwriters Laboratories as an approved manufacturer of control panels.
- Furnish written certification that the manufacturer is listed by UL/C-UL as an approved manufacturer of factory assembled pumping systems.
- A complete, easily readable functional description of the proposed equipment.
- Upon completion of the installation, the results of the field and acceptance tests as specified under this section of the specification shall be submitted to the engineer.
- Furnished written certification from the manufacturers' representative of the proper installation of the station.
- Provide written certification that, a nationally recognized manufacturer of package pump systems, manufactures the pump system. A corporate officer must sign this certification.
- Provide written certifications that pump system and pump system manufacturer are NSF/ANSI 61 certified for potable drinking water by a third party ANSI certifier.
- Operation and maintenance manuals:  
Submit complete operations and maintenance information for this specific equipment. The engineer shall review these manuals for completeness. They shall include complete parts list including manufacturers' reference and ordering number, the local representative name, address and phone number, the model and serial number of the system.
- The manufacturers shall submit a certificate of product liability insurance for no less than five million dollars (\$5,000,000)

## PART 2 – PRODUCTS

### 2.1 PUMPS AND MOTORS

Pumps shall be **NSF-61 approved**, series \_\_\_\_\_, cast iron, stainless fitted, mechanical seal end suction centrifugal type each coupled to a \_\_\_\_\_ **RPM**, \_\_\_\_\_ **Voltage**, \_\_\_\_\_ **Phase**, \_\_\_\_\_ **Hz**, ODP high efficiency motor.

Pump No. \_\_\_\_\_ shall be a **Model** \_\_\_\_\_, \_\_\_\_\_ **GPM at** \_\_\_\_\_ ' **TDH**, \_\_\_\_\_ **HP (each)**



## 2.2 VALVES

Isolation Valves: ” Individual pump suction and discharge valves shall be NSF 61 certified lug style butterfly valve(s) with gear operator(s). Provide a ” wafer style non-slam check valve NSF 61 certified on the discharge of each pump.

## 2.3 GAUGES (*OPTIONAL*)

Provide one Gauge stand with ( ) ” diameter liquid filled stainless steel case gauges, cocks and copper sensing lines.

## 2.4 OVER-TEMPERATURE PROTECTION

Each pump shall be equipped with an individual combination type non-electric temperature probe and purge assembly with PRV on Purge line

## 2.5 POWER AND CONTROLS

Provide UL Listed, NEMA 3R, **TIGER'S EYE Mark V** Solid State, Power and Control Panel consisting of:

- UL/C-UL 508 Label
- Single point power connection
- Through door control power disconnect with safety interlock to prevent door from being opened while in ON position.
- Fused 120 V AC control voltage transformer
- Fused 24 V DC power supply, 1 Watt.
- Suction and system pressure transducers
  - All wetted parts are to be stainless steel.
  - 4-20 mA signals with a minimum accuracy of  $\pm 1\%$ .
- Micro Controller: PLC with non-volatile memory (battery backup not required)
- **TIGERFLOW “TAP” Technology ASHRAE 90.1 compliant**
- **Tuning – TIGERFLOW Stepped Proportional Response**
- Operator interface: 6-inch color scale touch screen HMI (Human Machine Interface) including but not limited to the following:
  - Main Screen with the following features:
    - Individual pump HOA (Hand – Off – Auto) switches
    - Pump run indication, including current % speed
    - Pump Failure indication
    - Current pressures readings in psig (suction and system)
    - Current flow in GPM (if flowmeter specified)
    - Adjustable manual (hand) speed setting
    - Direct access to menu screen
  - Menu screen providing direct access to all system settings and status screens



- Pump settings screen displays current settings and allows user changes
  - o Lead and lag pump start and stop pressures, psig.
  - o Lead and lag pump ON and OFF delay times, seconds
- Alarm settings screen displays current settings for all alarms and allows user changes.
  - o Low suction alarm settings
    - Low suction pressure, psig
    - ON and OFF delays, seconds
    - Manual or automatic reset
  - o Low system alarm settings
    - Low system pressure, psig
    - ON and OFF delays, seconds
    - Manual or automatic reset
  - o High system alarm settings
    - High system pressure, psig
    - ON and OFF delays, seconds
    - Manual or automatic reset
  - o High suction economy mode
    - Economy mode suction pressure, psig
    - Economy mode enable / disable
    - ON and OFF delays, seconds
- Separate Alarm Silence and Alarm Reset buttons
- Current system status screen displays:
  - o Pump(s) currently running
  - o Active alarms and warning messages
- System event history screen displays a minimum of the last 10 system events, including pump start /stops, alarm conditions and alarm acknowledgements.
- Pump run time screen displays the total operating time for each pump. Provide individual resets for each pump run time
- Lead pump alternation options will include:
  - o Automatic alternation on lead pump shutdown.
  - o Manual alternation when operator touches alternate button
  - o Timed alternation:
    - Daily (user specified time of day)
    - Weekly (user specified day of week and time of day)
    - Monthly (first week of month on user specified day of week and time of day)
- Multi Level Security
  - o 8 Password protected security levels (field changeable passwords)
- Common alarm relay provides dry contacts for customer monitoring.
- Alarm horn, 85 db, annunciates all alarm conditions.

## 2.6 VARIABLE FREQUENCY DRIVES (VFD)

Each drive will have individual disconnects and short circuit protection. Drive manufacturer must provide a two year minimum warranty.



Drives will be configured to provide the following operating features:

- Drive keypad will have manual, off and automatic mode selection and will be accessible to operators without opening an enclosure.
- When in automatic, drive will run upon closure of the respective run permissive contact
- When in automatic and with a run permissive signal, drive speed will respond to a 0-10 V DC speed reference signal from pump controller.
- Drive will provide a limited number of automatic resets for fault conditions and will maintain a history of faults.

## 2.7 FLOW METER (*OPTIONAL*)

Provide a brass, insertion type paddle wheel flow meter with frequency / pulse output. Flow meter must allow field calibration for pipe sizes ranging from 3 to 36-inches. Provide Data Industrial 220B or approved equal.

## 2.8 HYDRO-PNEUMATIC TANK (*OPTIONAL*)

Provide a Section VIII, ASME Code, National Board stamped, hydro-pneumatic tank. Tank shall be provided complete with a NSF approved replaceable bladder, bottom connection, air fill valve, tank drain valve and gauge. Tank shall be: (Model TF-132E, 132 gallon, 150 PSI) (Model TF-185E, 185 gallon, 200 PSI).

The hydro-pneumatic tank shall be (skid mounted) (adjacent to system) with feed line and full port ball valve on discharge header (remote mounted as shown per drawings) (no tank – continuous run operation).

Note: Adjacent mounting requires contractor field connection.

## 2.9 PUMP SEQUENCING

- PRESSURE SEQUENCING (*Packages without a flow meter*)

Lag pump(s) are staged ON and OFF based on pressure only. When system pressure falls to a lag pump start pressure for the defined on-delay time period, lag pump starts. If system pressure continues to fall, additional lag pumps (if available) will start as pressure falls to the respective start pressure settings. Pumps are staged OFF, one at a time, in reverse order of start as system pressure setpoint is maintained for the pump OFF-delay time period.

- PRESSURE AND FLOW SEQUENCING (*Packages with a flow meter*)

Lag pump(s) are staged ON and OFF based on pressure and flow. When system pressure falls to a lag pump start pressure or if flow exceeds lag pump start flow for the defined on-delay time period, lag pump starts. If system pressure continues to fall or if flow continues to increase, additional lag pumps (if available) will start as pressure falls to the respective start pressure settings or as flow exceeds the respective start flow settings. Pumps are staged OFF, one at a time, in reverse order of start as system





pressure setpoint is maintained and flow becomes less than pump start settings for the pump OFF-delay time period.

## **PART 3 - EXECUTION**

### **3.1 FACTORY FABRICATION**

Provide each system as a complete package system on an open structural steel mounting frame, piped, tubed, mounted and wired. Unit shall be factory primed and painted with machine grade finish coat. All welding shall be performed by ASME Section 9 certified welders. System shall be (Horizontal) (Vertical) construction. Branches, Suction and discharge headers shall be: Schedule 40, 304 stainless steel ” grooved connections. System manufacturer shall isolate all ferrous from all non-ferrous materials.

### **3.2 FACTORY TEST**

The package shall be electrically and hydrostatically tested before shipment, in addition, each system shall be factory tested from 0-100% of flow and pressure. **Provide certified X-Y test report. NIST traceable test.**

### **3.3 SITE COMMISSIONING AND TRAINING**

The factory authorized local representative shall provide (4) hours of startup and field training.

### **3.4 WARRANTY**

Each **TIGERFLOW** system shall be warranted for a period of (18) months from date of shipment or (12) months from date of startup, whichever occurs first.