

Irrigation Pump Station Specification

Project: Montrose Rotary Park

PART 1 – GENERAL

1.1 Summary

Provide a complete, factory-fabricated irrigation pump station designed to deliver **240 GPM @ 80 PSI**, installed over a customer-supplied wet well. System includes submersible pumps, flow sleeves, drop pipes, manifolds, valves, flow meter, self-cleaning filter, controls, enclosure, and all required accessories for a fully operational irrigation pumping system.

Scope of Supply:

- The manufacturer shall provide **single source responsibility** for the manufacture, warranty, and operation of a prefabricated, skid-mounted, fully automatic pumping system for turf irrigation.
- The pumping system shall conform to these specifications in all respects. These specifications cover minimum requirements and shall not be construed as all inclusive.
- The successful vendor shall furnish all necessary appurtenances to provide for a complete, automatic, smooth-operating, and reliable pumping system.
- The manufacturer shall supply a complete set of **general arrangement drawings, electrical power schematics, and control schematics** in the operations and service manual.
- The installing contractor shall be responsible for:
 - Installing the pump station and reinforced concrete base.
 - Installing the customer supplied wet well.
 - Installing all electrical to meet **NEC**.
 - Providing all appurtenant fittings and items of a minor nature required for a fully functioning booster pumping station.

1.2 Submittals

- Pump performance curves and pump data detail sheets.
- Shop drawings: skid layout, piping arrangement, electrical panel drawings.
- Product data for valves, flow meter, filter, and accessories.
- Control system wiring diagrams and PLC logic description.
- Operation and Maintenance (O&M) manuals.

1.3 Quality Assurance

- Pump station manufacturer shall have minimum 10 years experience manufacturing packaged submersible irrigation pump stations.

- Pump station shall be **UL-listed packaged pumping system (QCZJ)**.
- Manufacturer shall maintain a **quality management system certified to ISO 9001** to ensure consistent design, fabrication, testing, and documentation practices.
- Entire system shall be factory-assembled, piped, wired, and hydrostatically tested prior to shipment.
- Controls shall be factory-programmed and functionally tested under load conditions.

1.4 Warranty

A. Scope

- Manufacturer shall maintain a **Factory Trained and Managed Service Network** to execute all warranty claims.
- All service entities must maintain as their **primary core business** the maintenance, service, and repair of pump systems.
- Service entities shall be supported by a **Factory Direct Service Group**, including dedicated factory phone support technicians available for technical assistance.
- Manufacturer shall provide technical phone support to the end user during and after the warranty period.
- Authorized Service Technicians must be **Factory Trained** and maintain a minimum of **25 hours per year of ongoing training**.

B. Warranty Coverage

- The manufacturer warrants that the water pumping system and components will be free of defects in workmanship for **two (2) years from date of startup, not to exceed thirty-six (36) months from date of shipment**.
- If properly installed and operated, the manufacturer will provide replacement parts or components during the warranty life if warranty applies.
- Labor costs for removal, replacement, or field service are excluded from warranty coverage.
- Manufacturer shall provide troubleshooting assistance during the warranty period.

C. Service & Preventative Maintenance

- Manufacturer uses only high-quality materials; however, preventative maintenance is required to enhance service life.
- Customer is encouraged to establish a **methodical maintenance program** to avoid premature failure.
- Manufacturer supports a wide network of **authorized service agents** and recommends they be utilized for warranty and service work.

D. Exclusions

This warranty does not cover damage caused by:

- Default of any agreement with manufacturer.

- Misuse, abuse, or failure to conduct routine maintenance.
- Handling any liquid other than irrigation water.
- Exposure to electrolysis, erosion, or abrasion.
- Presence of destructive gaseous or chemical solutions.
- Over-voltage or unprotected low voltage.
- Electrical phase loss or phase reversal without protection.
- **Acts of God**, including but not limited to lightning, flood, fire, earthquake, storm, or other natural disasters beyond manufacturer's control.

1.5 Substitutions

- Pump station described in this specification establishes the **standard of quality, performance, and configuration** required for this project.
- Substitutions or alternate packaged pump stations may be considered only if:
 - The proposed alternate system is submitted to the Engineer/Owner **a minimum of ten (10) calendar days prior to the bid date**.
 - Submittal shall include complete product data, drawings, pump performance curves, control descriptions, and a list of deviations from the specified system.
 - The Engineer/Owner reserves the sole right to determine the acceptability of any alternate system.
- Submittals received after the 10-day pre-bid deadline shall not be considered.
- Cost differences, redesign requirements, or additional work resulting from an approved substitution shall be the responsibility of the contractor/vendor providing the alternate.

PART 2 – PRODUCTS

2.1 Pump Station Assembly

Pump Skid

- Skid shall be fabricated from **structural carbon steel** tubing or channel and plate.
- Dimensions: 108" x 96" as shown in drawings.
- Fabrication: Welded construction.
- Finish:
 - Surfaces shall be cleaned and prepared to a near-white blast cleaning.
 - Skid shall be powder-coated to a minimum of 3–5 mils dry film thickness.
 - Color: Manufacturer's standard.
- Lifting eyes or forklift slots shall be provided for safe handling.
- Skid shall include integral supports and anchors for pumps, manifolds, valves, and electrical panel.

Aluminum Enclosure

- Enclosure shall be **custom-fabricated aluminum** with welded seams for strength and corrosion resistance.
- Dimensions: 108" x 96" footprint, with roof access hatch.
- Finish: Powder-coated to a minimum of 2–4 mils dry film thickness.
- Ventilation:
 - Forced-air ventilation fans sized for internal heat dissipation of VFDs and electrical equipment.
 - Louvers with insect/dust screens provided on intake/exhaust openings.
- Access:
 - Lockable double doors with full-width stainless steel hinges.
 - Roof hatch with gas-assist lift struts for pump and filter service access.
- Clearances: Minimum 24" side clearance, 46" at filter, and 74" for filter removal as shown on submittal drawings.
- Weather Protection: Enclosure shall be rated for outdoor installation and designed to withstand wind, rain, and snow loads typical of the project location.

2.2 Pumps

- Pumps shall be **Franklin Electric SR Series submersible turbine pumps** (or approved equal), constructed and tested in accordance with **Hydraulic Institute (HI)** and **AWWA** standards for submersible turbine pumps.
- Models:
 - (2) Franklin SR Series 6" Submersible Pumps, Model 175SR6-4, 10 HP, 230V, 3-phase.
 - (1) Franklin SR Series 4" Submersible Pump, Model 90FH5S4-5, 5 HP, 230V, 3-phase.
- Construction:
 - Pump bowls, impellers, diffusers, and discharge head: 304 stainless steel, precision machined and fitted to close tolerances.
 - Impellers: Enclosed type, 304 stainless steel, secured to shaft with 316 stainless steel taper-lock collets.
 - Pump shaft: AISI 431 stainless steel.
 - Bearings: Water-lubricated NBR 70 or bronze bearings as required.
 - Suction strainer: 316 stainless steel, provided to prevent debris entry.
 - Outer shell: 304 stainless steel.
 - Cable guard: 316 stainless steel.
 - Motor coupling: Stainless steel, NEMA-compliant, capable of transmitting full starting torque.
- Performance:
 - Duty point: 120 GPM @ 80 PSI (185 ft TDH).
 - Minimum efficiency: as published by manufacturer's tested curve.
- Nameplate: Each pump shall be furnished with a permanently affixed nameplate showing:
 - Manufacturer's name

- Model number
- Serial number
- Motor power required

2.3 Piping and Valves

Common Header and Piping

- The pump station shall include a **fabricated common discharge header** and interconnecting piping.
- Material: Schedule 40 carbon steel pipe, ASTM A53.
- Flanges: ANSI 150# steel flanges with raised-face or flat-face connection as required for valves, flow meter, and filter installation.
- Surface Preparation: All piping and manifolds shall be sandblasted to near-white blast cleaning prior to coating.
- Coating: Powder-coated to a minimum **3–5 mils dry film thickness** for corrosion protection.
- Pressure Rating: Designed for a minimum working pressure of 200 PSI.
- Supports: Header and piping shall be fully supported on skid, with vibration-isolating brackets and clamps where required.
- Drainage: Header shall include threaded drain ports at low points with isolation valves for winterization and service.
- Instrumentation: Pressure gauge taps and transducer ports shall be factory-installed on the discharge header.

Check Valves

- Check valves shall be **wafer-style, spring-assisted, silent closing type** (Val-Matic or approved equal).
- Body: Cast iron or ductile iron, epoxy-coated, suitable for buried or exposed service.
- Disc: Stainless steel, one-piece, guided for proper seating.
- Seat: Resilient, replaceable, Buna-N or EPDM, designed for tight shutoff.
- Spring: Stainless steel, designed to provide fast closure and minimize water hammer.
- Connections: 3" wafer style, suitable for installation between ANSI 125/150 flanges.
- Pressure Rating: Minimum 200 PSI working pressure.
- Compliance: Valves shall conform to **AWWA C508** standards where applicable.
- Testing: Each valve shall be factory hydrostatically tested to 1.5 times rated pressure.
- Identification: Each valve shall have a nameplate with manufacturer, model, size, and pressure rating.

Butterfly Valves

- Butterfly valves shall be **full-lug style** (3" and 4" sizes as shown on drawings).
- Body: Ductile iron, ASTM A536, epoxy-coated inside and out for corrosion resistance.
- Disc: Ductile iron with fusion-bonded epoxy coating or nickel-plated ductile iron.

- Seat: Resilient, replaceable EPDM or Buna-N seat, suitable for continuous irrigation water service.
- Shaft: Stainless steel, one-piece, corrosion resistant.
- Bearings: Self-lubricated, maintenance-free type.
- Operator: Manual lever operator for valves 4" and smaller, with 10-position locking plate.
- Connections: Full-lug style, drilled to ANSI 125/150 flange pattern, suitable for dead-end service.
- Pressure Rating: Minimum 200 PSI working pressure.
- Compliance: Valves shall conform to **AWWA C504** standard for rubber-seated butterfly valves.
- Testing: Each valve shall be hydrostatically tested to 1.5 times rated working pressure.
- Identification: Each valve shall have a nameplate or permanent marking with manufacturer, model, size, and pressure rating.

Additional Valves & Accessories

- (1) 1" air release valve.
- (1) 2" Bermad 73Q pressure relief valve.
- Isolation valves, drain ports, and gauges provided as required for proper system operation.

2.4 Flow Meter and Filter

Flow Meter

- Flow meter shall be **Badger M2000 magnetic type** (or approved equal) designed for continuous irrigation service.
- Size: 4" line size, ANSI 150 flanged ends.
- Body: Epoxy-coated carbon steel or stainless steel, rated for 200 PSI minimum working pressure.
- Liner: Hard rubber, or other non-conductive corrosion-resistant liner suitable for irrigation water.
- Electrodes: 316 stainless steel (standard), with optional Hastelloy or platinum electrodes for water with high solids content.
- Accuracy: $\pm 0.5\%$ of rate over velocity range 1–30 ft/sec.
- Repeatability: $\pm 0.05\%$.
- Power Supply: 110–240 VAC, 50/60 Hz.
- Output Signals:
 - Digital pulse output, opto-isolated.
 - 4–20 mA analog output, opto-isolated.
 - RS485 Modbus RTU communication port.
- Display: Integral LCD display with totalizer, rate of flow, diagnostics, and programming interface.
- Protection: NEMA 4X/IP67 enclosure for outdoor weather resistance.
- Testing: Factory calibrated.

- Identification: Each meter shall be permanently tagged with manufacturer, model, size, flow range, accuracy, and serial number.

Filter

- Filter shall be an **Orival 6” automatic self-cleaning screen filter** (or approved equal), designed for irrigation pumping systems.
- Size: 6” inlet/outlet, ANSI 150 flanged connections.
- Body: Fabricated steel, fusion-bonded epoxy coated, or optional stainless steel construction.
- Screen: 200 micron stainless steel wedge-wire screen element, removable and replaceable.
- Cleaning System:
 - Self-cleaning, line-pressure driven, with suction-scanning technology.
 - Backwash initiated automatically by pressure differential across screen (typically 7 PSI).
 - Flush cycle duration: 8–15 seconds, with uninterrupted forward flow.
 - Manual initiation available through local controls.
- Pressure Rating: Minimum 150 PSI working pressure, hydrostatically tested to 225 PSI.
- Flow Capacity: Sized for system duty point of 240 GPM @ 80 PSI with minimal head loss (<3 PSI clean screen).
- Controls: Filter controller integrated with pump station PLC, including differential pressure sensor and cycle logging.
- Identification: Filter body shall be permanently tagged with manufacturer’s name, model number, screen rating, and serial number.

2.5 Controls

Control Panel Enclosure

- Enclosure shall be manufactured by **Saginaw Controls Engineering (SCE)** or approved equal.
- Type: UL Type 1 indoor-rated, free-standing, powder-coated steel construction.
- Dimensions: 60” H x 60” W x 18” D.
- Doors: Hinged double doors, lockable latches, and oil-resistant gaskets.
- Finish: ANSI 61 gray polyester powder coat, inside and out.
- Certification: Panel shall be **UL 508A** certified.

Cooling System

- Enclosure shall be equipped with an **Enviro-Therm packaged enclosure air conditioner**.
- Cooling Capacity: Minimum 6,800 BTU/hr.
- Power: 230V single-phase.
- Features: Closed-loop design, digital thermostat, high-temperature/fault alarms, and washable or replaceable intake filter.

Variable Frequency Drives (VFDs)

- VFDs shall be **LS Electric H100+ series** (or approved equal).
- Quantity: (2) 10 HP drives, (1) 7.5 HP drive.
- Input Power: 230V single-phase.
- Output: 230V 3-phase to submersible pump motors.
- Features:
 - Integral keypad and display.
 - Built-in motor protection (overload, phase loss, ground fault).
 - Automatic restart and sleep mode functions.
 - Communication-ready with Modbus RTU/RS485 protocol.
- Accessories: Each drive shall include a 3% impedance output line reactor.

PLC and HMI

- PLC: **Delta AS Series PLC** (or approved equal).
- Functions:
 - Automatic pump sequencing with duty rotation.
 - Adjustable pressure setpoint with deadband control.
 - Alarm management with local indication and history logging.
 - Remote start/stop and pressure setpoint adjustment via irrigation controller input.
- HMI: **Delta DOP Series, 7" color touchscreen**.
 - Password-protected access to operating menus.
 - Display of pump status, discharge pressure, flow rate, alarms, and runtime hours.
 - Alarm/event history storage for minimum 100 events with timestamps.
- Programming: PLC and HMI shall be factory-programmed and tested before shipment.

Instrumentation and Devices

- **HOA (Hand-Off-Auto) switches:** One per pump.
- **Manual speed rheostats:** One per pump, enabling manual speed adjustment in hand mode.
- **Pressure Transducers:**
 - (1) Stainless steel discharge transducer, 0–200 PSI, 1–11 VDC output.
 - (1) Stainless steel submersible level transducer, 0–22 ft water column, 1–11 VDC output.
- **Surge Protection:** SPD installed on incoming AC power feed.
- **Terminal Blocks:** All line, load, and control terminations clearly labeled.

Certification

- Entire control assembly, including panel, VFDs, and PLC wiring, shall be **UL 508A listed**.
-

PART 3 – EXECUTION

3.1 Installation

- Install pump station on reinforced concrete pad.
- Maintain clearances as indicated on submittal drawings:
 - 46” minimum clearance at filter.
 - 24” side clearance.
 - 74” clearance for filter removal.
- Contractor to coordinate electrical service per NEC.

3.2 Field Quality Control

- Factory startup assistance required (onsite or remote per manufacturer’s policy).
- Verify pump performance at design flow/head.
- Demonstrate filter backwash cycle.
- Simulate alarms (high pressure, low pressure, overload, VFD fault).

3.3 Training

- Provide onsite training for Owner’s staff, minimum 4 hours.
- Training to cover pump sequencing, manual override, filter cleaning, transducer calibration, and alarm reset.

3.4 Closeout

- Deliver as-built drawings and O&M manuals (printed and digital).
- Provide warranty documentation.
- Furnish list of recommended spare parts.