CITY OF EVANS

MINIMUM STANDARDS FOR RAW WATER IRRIGATION PUMPING SYSTEMS

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SCOPE-OF-WORK

The intent of these specifications are to provide a minimum acceptable standard for pumping systems used to provide or deliver untreated (raw) water for landscape irrigation systems.

A. Documentation:

1. For all equipment supplied furnish at least four copies of a bound Maintenance Manual that includes manufacturers' catalog cuts, performance curves, specifications, capacity, and operating instructions. Submit complete instructions for installation, operation, and recommended maintenance of the pumping system. Include guide for troubleshooting operational problems with the pump station and complete documentation for programming, recommended settings and adjustments.

2. For all structures, piping, wiring, and other components installed, provide accurate reproducible record drawings showing location, size, type, construction, etc. of components that will enable the user to locate, service, and repair any component or device associated with the installation.

B. General Requirements:

1. All construction shall conform to all applicable City of Evans codes and requirements.

2. All electrical devices and components shall be UL listed. All work and materials shall be in accordance with the latest edition of the National Electric Code and the Uniform Plumbing Code as published by the Western Plumbing Officials Association.

3. All electrical control panels with controls shall be built in accordance to N.E.C., U.L. and E.T.L. standards. The electrical components and enclosure shall be labeled as a complete U.L. listed assembly with manufacturer's U.L. label applied to the door. All equipment and wiring shall be mounted within the enclosure and labeled for proper identification.

4. All raw water irrigation pumping systems shall be furnished with an automatic self-cleaning filtration system designed to filter the water to at least 80-mesh. The

filtration systems shall be commercial quality devices designed for continuous duty operation in the water supply and quality where installed. All filtration units furnished and installed shall be within the manufacturer's recommendations and published catalog data sheets for size, flow, capacity, material construction, pressure ratings, and pressure loss. Acceptable manufacturers include: Amiad, Yardney, Filtomat, or approved equal.

5. Electrical Controls: At a minimum, the pumping system electrical controls shall include the following:

    a. Main Station Disconnect

    b. Pump Motor Starters, Time Delay Fuses, and Overload Relays

    c. Lightning Arrestor

    d. Secondary Control Circuit Fuses

    e. Phase Failure, Low Voltage Safety Shutdown

    f. Low System Pressure / High System Pressure Safety Shutdowns

    g. Low Water Level Safety Shutdown

    h. Enclosures: The pumping station electrical controls shall be mounted in a self contained NEMA 3S **(minimum NEMA rating)** enclosure with a drip lip fabricated from not less that 14-gauge steel. Door gasket seals shall be neoprene sponge, sufficient to protect interior components from weather and dust. The electrical panel doors shall be constructed from 12-gauge steel, epoxy coated, with integral locking screws and latches.

    i. Software operated PLC controller with Operator Interface Device.

    j. All pumping systems greater than 5 horsepower shall be equipped with a variable frequency drive controller. All pumping systems greater than 40 horsepower shall be equipped with two or more main pumps and a pump alternator controller.

C. Surface Water Pumping Systems:

2. All surface water pumping systems shall be designed and installed with an intake screen, an intake pipe, conduit, or flume, and a wet well.

    a. The intake screen shall be designed for "coarse" screening and constructed from stainless steel. The screen shall be designed with sufficient "free open area" to limit the water velocity through the screen to less than ½ feet per second.

b. The intake pipe and screen shall be sized to have hydraulic losses less than 1 foot at the design flow.

c. The wet well shall be pre-cast concrete construction designed to have sufficient capacity and clearances for the pumping equipment installed and be accessible for cleaning or maintenance. The minimum diameter of the wet well is 6D (six times the diameter of the pump bowl).

3. All turnout structures from irrigation ditches or other inflows shall include a water measurement method approved by the governing ditch company and/or the City. Examples include Parshall flumes, weirs, and flow meters.

4. Where a pond is necessary to retain the irrigation water, the pond design shall be conform to the following criteria:

   a. The design capacity of the pond shall contain a useable volume of water greater than or equal to five (5) days of the peak season irrigation requirement.

   b. The pond design shall include a 4:1 slope for the first three feet drop (12-ft horizontal distance) and then a maximum of 2:1 slope for the remaining depth.

   c. The minimum pond depth shall be 8-ft and the maximum pond depth shall be 10-ft.

   d. The pond design shall include a suitable drainage overflow that discharges into a drainage basin or swale approved by the City of Greeley Drainage Department for that purpose.

   e. The pond shall be designed and constructed to achieve a maximum coefficient of permeability of $K = 1x10^{-7}$ cm/sec., under the designed head pressure.

   f. The pond design shall include a suitable aeration system to maintain "high quality" water. Acceptable aeration systems include motorized floating aerators and compressor equipped lake bed aeration systems. The aeration control panel shall be located in the pump enclosure for access.

5. The pumping system shall be a prefabricated pumping system constructed on a structural steel skid with one or more vertical turbine or submersible turbine pumps connected with the valves, piping, wiring, pressure gauges, flow meters, and electrical controls.

6. Horizontal centrifugal pumping systems equipped with foot valves are acceptable only for pumping systems of 5 horsepower or less.

7. All components of the pumping system shall be designed to function in an outdoor environment exposed to all of the elements. The pump manufacturer shall furnish protective enclosures and covers as required for proper operation of the system.

8. Fabricated Piping: All fabricated piping shall conform to ASTM specifications A53 for Grade B welded or seamless pipe. Piping 16" and smaller shall be Schedule 40. All welding flanges shall be forged steel with slip-on or welding neck type. All welding fittings shall be seamless, conforming to ASTM Specification A234, with pressure rating not less that 150 psi. All pressurized tube fittings shall be copper or brass.

9. Winterization Connection: All pumping systems shall include a capped threaded nipple in pump system discharge manifold for compressed air winterization of the irrigation system.

10. Valves: All pumping systems shall be equipped with the following:

    a. A check valve and isolation valve on the discharge of each pump

    b. A continuously acting air/vacuum relief valve on the discharge manifold

    c. Drain valves at all possible low points on the piping system

    d. Isolation valve on the pump discharge

    e. A pilot operated pressure relief valve sized to bypass sufficient water to avoid operating at or near pump shut-off head conditions.

11. Acceptable manufacturers for skid mounted pumping systems:

    a. Flowtronex PSI LTD. 10717 Harry Lines Blvd., Dallas, Texas 75220, (214) 357-1320. Local Representative: Jay Folk, Arapahoe Pumping Systems, P.O. Box 3482, Littleton, Colorado 80161, (303) 794-8344.

    b. FloBoy Pumping Systems. 401 Broadway, Swanton, Ohio 43558, (800) 426-0370. Local Representative: John Inman, Inman Water Products, Inc, 7985 Vance Drive, Suite 200, Arvada, Colorado 80003, (303) 421-7885.

    c. Syncroflo. 6700 Best Friend Rd., Norcross, Georgia, 30071, (770) 447--4443. Local Representative: John MacIntyre, Munro Supply, 1271 Elmwood Court, Colorado 80020, (303) 439-2600

    d. Watertronics. 525 Industrial Drive, Hartland, Wisconsin 53029, (800)356-6686, (414)367-5000, F: (414) 367-5551

    e. Engineer approved equal.

D. Well and Well Water Pumping Systems:

1. All water well construction; pump installation, repair, or modification shall be performed by, or under the direct supervision, of a person currently licensed with the Colorado State Board of Examiners of Water Well and Pump Installation Contractors.

2. All water well construction; materials, pump installation, repair, or modification shall be in accordance with the Revised and Amended Rules and Regulations and Colorado Statutes Governing the Construction of Water Wells and the Installation of Pumping Equipment.

3. Well Construction Materials:

    a. Use Sch. 40 Steel well casing for conductor casing and / or inner casing.

    b. Use type 304 stainless steel slotted "vee-wire" well screen sized as required to provide optimum formation development and well production manufactured by Johnson Well Screens or approved equal.

    c. Use silica sand or approved "pea" gravel pack with an aggregate sized to provide optimum well capacity based on the formation requirements.

    d. Use an "Industrial Type" pitless adapter unit for submersible well pump installations. Install a building or protective enclosure for vertical turbine well pump installations

4. Well Pumps:

    a. Use 1800 RPM pumps and motors for all pumps that are greater than 40 horsepower.

    b. Use pumps constructed with iron, bronze, or stainless steel casing, bronze or stainless steel diffusers and impellers, and stainless steel shafts. Plastic internal components will not be accepted.

    c. Furnish pumps with stainless steel suction strainer.

    d. Furnish submersible or vertical hollow shaft motors designed for continuous operation under any thrust that may develop throughout the pump performance curve

5. Piping and components:

    a. Use Sch. 40 steel piping, resilient seated isolation gate valves, iron body or bronze fitted check valves.