City of Eagle, Idaho

Pressure Irrigation Standards

USER INSTRUCTIONS AND GENERAL INFORMATION

These standards supplement the Idaho Standards for Public Works Construction (ISPWC) to guide the design and construction of pressure irrigation systems in subdivisions. The standards were created to define implementation of city ordinances, 9-4-1-9 of Water Supply and Sewer Systems, approved by the City of Eagle and of the pertinent requirements of IC 31-3805.

This document is not meant to replace use of the ISPWC, it is supplemental and does not include all specifications for use on public works projects due to many specialized applications. However, in the event of direct conflict between ISPWC and this document, this document shall govern.

IRRIGATION SYSTEMS

I. Existing Ground and Surface Water Use

Designer shall supply information and discuss each of the following:

A. Available groundwater rights or surface rights (or shares) including the history of irrigation practice for the site including all parcels or phases.
B. Availability and timing of surface water for distribution. Note if a specific amount of water is available certain days of the week or similar restrictions.
C. Seasonal fluctuations including history of reduced availability
D. Acres historically served versus development irrigable acres.
E. Amenities served and anticipated consumptive water use.
F. Requirements for supplemental irrigation needs before and after water is distributed by an irrigation company or district.
G. Downstream obligations.

II. Ownership of the Irrigation System

Developer shall provide for the following:

A. The entire pressure distribution system including but not limited to gravity supply or well, pump station, controls and distribution piping will be owned and maintained by a homeowners association. System management calculations and guidelines shall be developed and included with plans, specifications and CC&Rs.
B. Developer's contractor shall coordinate on and offsite irrigation construction with the irrigation company or district of record, owner's engineer, and adjacent property owners associated with the existing irrigation system.

C. Developer shall demonstrate compliance with Title 31, Chapter 38, Idaho Code.
D. The city's engineer may make periodic visit(s) during construction and shall be present during testing of the system. As-built drawings and specifications shall be submitted to the City as a condition of final acceptance of the subdivision or development.
E. DEVELOPER SHALL RETAIN FULL RESPONSIBILITY FOR THE MAINTENANCE AND OPERATION OF THE SYSTEM UNTIL THE HOMEOWNERS OBTAIN MAJORITY SHARE OF VOTING RIGHTS IN THEIR ASSOCIATION.
F. It is not the intent of these provisions that larger systems service more than one development should be prohibited. Such systems are to be encouraged, but are subject to review by all concerned officers and advisers of the City on a case-by-case basis. Assurance of the presence of a competent permanent operating entity is the crucial concern in such cases.

III. Defined Water Source determined by availability

Irrigation water shall be supplied in sufficient amounts to meet the requirements of each development. Developments are encouraged to incorporate a variety of water saving measures to reduce irrigation over use. Designers may utilize a variety of schedules and products to ensure that irrigation use coincides with water availability. Common irrigation practices (such as, lawn sprinklers on timers to allow for nighttime application) shall be assumed unless otherwise identified. The designer shall identify all design and control assumptions. Any assumption leading to a design flow rate lower than the probable peak demand as defined by the algorithm following shall be explicitly stated as an instruction in the Operation and Maintenance Manual.

IV. Design Standards

The following standards shall be used to govern the design of a pressurized irrigation system for development and subdivisions.

A. Minimum Flow Rate Requirement

Adequacy of pressurized irrigation systems will be based on the Required Capacity Flow Rate calculation (QMax) for the development. The Required Capacity Calculation will be compared to the allotted irrigation water for the development in question. The following analysis method shall be used to determine the Required Capacity:

qind = Flow at individual lot.
QMax = Required Capacity Flow Rate.
KCo = Coincidence Coefficient
QAve = Mean irrigation flow based on a lawn requirement of 0.4 in/day
CAvail = Coefficient of Availability
= Ratio of hours in full week to number of hours per week irrigation water is available.

n = Number of lots
p = Probability of all lots irrigating at the same time.

Formulas:

$$p = \frac{QAve}{n \cdot CAvail \cdot qind}$$

$$KCo \quad 3.0\sqrt{n \cdot p \cdot (1 - p)}$$

$$QMax = \frac{QAve}{CAvail} + KCo \cdot qind$$

Note: If the proposed irrigation system is controlled manually rather than by automatic timers, a multiplying factor of two shall be applied to QMax.

Allotted irrigation flow verification documents shall include all stipulations of use imposed by the entity supplying water to the development and any other information affecting the conditions of delivery of irrigation water. If it is determined that there is insufficient flow, measures shall be taken, and will be subject to review by the City or City Engineer, to ensure delivery of adequate supply of irrigation water to the development.

B. Diversion Structure

The irrigation district providing water to the site may have specific standards that govern the diversion structure. These standards shall apply if other comparable standards do not exist. Conflicts shall be presented to the city for resolution.

1. Install a Waterman ® C-9 Slide Gate, with 10' seating head, 0 feet unseating head, threaded stem and lift with handwheel standard, extended frames or stem extensions optional, onto a concrete headwall attached to corrugated metal, plastic or HDPE pipe or equivalent.
2. System design shall include primary flow and secondary overflow; pipes shall be sized to accommodate the maximum possible flow.
3. Install a Cipoletti weir downstream of the diversion valve to accommodate the maximum possible flow. A pre-filter screen or other filter shall be constructed in line prior to pump station. Pre-filter must have irrigation district approval or be located outside their jurisdictional area.

C. Storage Ponds

Storage ponds may be used to retain irrigation water for flow equalization or for recapture and reuse, or as a water amenity.

1. All ponds shall conform to the following standards:
    a. Safety shelf at maximum 3 feet water depth with a 3:1 stabilized slope.
    b. Total depth, 6-feet minimum.
    c. Supplemental aeration may be required for ponds less than 12-feet deep.
    d. If utilized for storm water retention, pond should include an emergency spillway to handle a 50-year frequency storm or be sized to retain 100-year event.
    e. A minimum 30-foot perimeter easement from the top of bank shall be required for maintenance.
2. Landscape vegetation in accordance with design review approval should be established on all embankment slopes, borrow areas, or any other areas disturbed during construction.
3. Provide location of the pond area, cross sections, and if used for storm water retention, emergency outlet; required capacity and available capacity specifying personnel, budget, and sediment disposal procedures (this may be incorporated into the NPDES II storm water pollution prevention plan, if one is required).
4. Maintenance operation should be specified in the Operations and Maintenance Manual. Clean out of sediment basin shall occur when its effective storage capacity is reduced by 15 percent. The elevation corresponding to this level should be determined and specified in the design data as a measurable distance below the top of the riser. Disturbed areas should be revegetated immediately upon completing of the basin cleaning.
5. Tanks may be used in lieu of ponds for flow equalization. Design parameters for tanks will be reviewed on a case-by-case basis with particular emphasis on long-term maintenance capability.

D. Filtration

Each pressurized system using surface water shall be filtered. Filtration shall incorporate at a minimum a thirty mesh or smaller screen.

1. An appropriate filtration system shall be installed prior to entering the pump station such as a Clemons Clearwater Self Cleaning Suction Screen Model CW 200 or equivalent
2. The filter shall ensure no significant (or minimize) headloss
3. Filters must be self-cleaning suction or shall include a headgate for screen box cleanout.
4. Replacement part numbers and suppliers for controls, pressure transducers, and screen elements shall be provided.

E. Wet Well

The purpose of the wet well is to allow the pump to draw water without cavitating by insuring sufficient submersion of the pump or intake. Wet well construction shall meet the following:

1. A minimum 72" diameter pre-cast concrete wet well. A larger wet well may be required based on design. Construction area shall be mechanically compacted to 95% of standard proctor.
2. Pre-cast concrete base may be used. If an open bottom base is used it shall be set on a precast base ring and use a minimum of 6 inches of 2 inch washed rock to prevent sediment uptake. An open bottom base shall not be used if groundwater is above the base.
2. All strap or clamp attachments within the wet well shall be stainless steel.
3. Maintain a minimum of 2 feet separation from submersible pump from concrete base.
4. Wet well shall have a lockable expanded or solid metal protective cover.
5. The easement accessing the wet well shall be a minimum of 12 feet and provide for vehicle access at all times.

F. Pump system

A pump system design shall include an alarm system to alert the operator of inadequate water supply, electrical malfunction, and other common problems.

1. Actual number of pumps and configuration to be determined by the designer subject to review by the City Engineer, but the system must have a minimum of two pumps. System must be capable of meeting maximum demand with any pump out of service. System must be capable of functioning at a minimum flow not greater than the demand to irrigate a single lot. Variable frequency drive systems or other means may be used to attain variable delivery rate.
   Exception: Single-pump system may be used if development is smaller than 10 (ten) acres. System operator in such case shall maintain spare pump on shelf ready to install.
2. Pumps, controls, piping, filter, and related items shall be installed in strict accordance with manufactures specifications and instructions. All construction shall be completed in conformance with ISPWC and any other plumbing or electrical codes that may be applicable. System shall be pressure tested to 1.5 times operating pressure. Pump controls shall include auto restart.
3. Power and control systems shall be located within the irrigation easement provided by the developer and shall conform to current applicable codes.
4. Perform pump rotation, NPSH and total head tests per pump manufacturer recommendation prior to placing the system in operation.
5. Pump contractor to provide shop drawings of pump configuration and plumbing to be used in record drawings.
6. Contractor to provide a screen or a full enclosure around pump station hardware and controls. Any full enclosure shall include an attic-type fan and thermostat. All screens and enclosures shall be submitted to the Design Review Committee for recommendation.

G. Control system

1. The pump control panel shall be constructed to NEMA 3R or better standards and shall include, but not limited to, the following features: Lightening surge arrestor; low/high voltage protection; low level pump shut-off with manual re-set; soft start systems for start up and shut down; phase failure and phase reversal protection; HOA switch; pumps shall be controlled by pressure switches; and motor rated circuit breakers with overload protection. The completed electrical system shall be a complete and operation component of the pumping system. The electrical system shall also include a 110 V, 30-amp convenience outlet and necessary transformer.
2. The electrical control panel shall include a digital sprinkler irrigation clock to control the solenoid-operated valve for timed cleaning of the Clemons or similar filter screen.

H. Distribution System

1. All lots shall be provided with irrigation water with a minimum pressure of 50 psi under design operation conditions and minimum one (1) bib per lot, minimum 1-inch diameter service. Design flows may necessitate larger diameter service or pressure.
2. All pipe shall be minimum class 120 psi or approved equal and services shall be minimum 1 ¼" DR 9.0 Polyethylene or equivalent pipe. Pipe shall be placed a minimum of 30 inches deep and be sloped to drain to the locations shown on the plans. Trenches shall be water settled or compacted.
3. Direct tapping of main is not allowed; tees or saddles required.
4. Thrust blocks of joint restraints, per water note #5 shall be installed where unequal forces exist. Thrust blocks shall be installed per section SD-403 of the ISPWC.
5. Identification tape: All irrigation mainlines shall be marked with warning tape as per ISPWC. The tape shall be buried 6 inches below the surface to 18 inches above the top of the pipe.
6. Gravity flow irrigation pipe shall be PVC SDR-41 or approved equivalent. All connections shall be watertight.
7. Cover all irrigation and drain boxes with expanded galvanized steel or aluminum grating or approved equivalent. All covers shall be securely fastened to the tops of concrete walls.
8. All irrigation risers and faucets shall be identified with durable tags carrying the warning "Danger-Unsafe Water" or "Non-Potable Water" or equivalent. If valve box lids intended for use in potable water systems are used, the word "water" shall be obliterated prior to installation.
9. No irrigation system shall be cross connected in any manner to any public water system unless the provisions for cross connection protection as referenced in ECC 9-4-1-9c.1a are incorporated in the design.
10. Ten feet of horizontal separation shall be maintained between water mains and non-potable water lines. At any location where pressure irrigation main and water main cross, the water pipe shall be centered so that both joints are located as far as possible from the crossing. A vertical separation distance of 18" shall be maintained wherever possible.

11. If drain plugs and drain boxes are employed to winterize the system, the location of valves and drain sumps shall be identified on the plan set and on the site by a sign identifying the drain.

I. Operation and Maintenance Manual

1. Owner shall deliver five copies of As-Built drawings and specifications along with five copies of an Operation and Maintenance assembled by the Engineer of Record to the Homeowners Association at such time as system is turned over to the Association.
2. The Operation and Maintenance Manual shall include the following:
    a. Copies of pertinent sections of the CC&R's
    b. Water right documentation
    c. Maintenance requirements including agreements regarding source ditch
    d. Copies of all manufacturer's recommended maintenance schedules for all pump system components
    e. Manufacturer's specifications sheets, serial numbers, and date of manufacture of all components
    f. Parts lists for all components
    g. Electrical Schematics
    h. Site specific start up and shut down procedures, along with winterizing procedures
    i. Designer's and Installer's names and phone numbers
    j. A section on Trouble Shooting
    k. Pond or reservoir maintenance section
    l. A reduced (11x17) Plan Set for the system

Conversion Factors - Irrigation

Miners Inches (Idaho)	Cubic Feet per Second	Gallons per Minute	Acre Feet Day
1.0	0.02	9.0	0.04
2.0	0.04	18.0	0.08
3.0	0.06	26.9	0.12
4.0	0.08	35.9	0.16
5.0	0.10	44.9	0.20
10.0	0.20	89.8	0.40
15.0	0.30	134.6	0.60
20.0	0.40	179.5	0.79
25.0	0.50	224.4	0.99
30.0	0.60	269.3	1.19
35.0	0.70	314.2	1.39
40.0	0.80	359.0	1.59
45.0	0.90	403.9	1.79
50.0	1.00	448.8	1.98

To Convert	Multiply By	To Obtain
Miners Inch	**0.0200**	Cubic feet per second (CFS)
CFS	**448.831**	Gallons per minute (GPM)
GPM	**0.002228**	CFS
CFS	**1.9835**	Acre feet per day (AFD)

For purposes of design and review, Irrigation Shares available for the subject property shall be quantified in terms of total volume over a period of time, flow rate, or in another manner as defined by the irrigation company or district responsible for delivery.