

**SETTLERS IRRIGATION DISTRICT**  
**PRESSURIZED IRRIGATION SYSTEM**  
**SPECIFICATIONS**

NOVEMBER 2003

This document supercedes all previous Settlers Irrigation District Pressurized Irrigation System Specifications. These Specifications address the surface water delivery of Settlers Irrigation District. The intent of the following specification is to be an extension of the Boise City Public Works and City of Meridian Pressure Irrigation System Policy Design Standards and Construction Specifications. These specifications clarify materials and methods acceptable within the Settlers Irrigation District.

**Specification Standards for Pressurized Irrigation Systems**

**System Design Life.**

System design and components shall be specified with the life expectancy of 20 years of normal operation. This precludes the use of economy-structured components. All construction and workmanship shall be of commercial or industrial standards and provide the homeowner the convenience and expected utility of pressurized irrigation. The design engineer shall provide this expectation within the scope of the design. The design engineer shall provide a schedule of each lot in the subdivision with a watering time (typically of two hours, but determined by the landscaped area) and available quantity for use by the owner (see lot delivery formula page four). The schedule shall provide all lots in the subdivision a water window of 12 hours without exceeding the design flow and pressure of the pumping system. Minimum delivery pressure shall be 45 P.S.I. at the point of delivery on each lot. Delivery pressure shall not exceed 80 P.S. I.

The engineer shall also provide Settlers Irrigation District with a projected replacement cost for the system at the end of the service life (20 years) once the cost (present value) of the system is determined. This replacement cost [future value  $S = P(1 + r)^n$ ] shall include factors for inflation and retrofitting (as far as possible).

This schedule may be used as a guide, for the district to charge customers within the service area of the system, so that future replacement and maintenance may be performed. The purpose of this schedule is to determine an annual installment  $\left[ = S * \frac{r}{(1 + r)^n - 1} \right]$ , placed at compound interest, so that the district reaches the future value of the replacement in 20 years.

The engineer shall provide a watering schedule for the subdivision that provides adequate water to each lot at full buildup within a watering window from 6 p.m. to 6 a.m. common areas may water outside the water window. Design flow to the lot and schedule delivery time shall become part of the subdivision CC&R's so that the intent of the delivery water will be conveyed to the lot owner.

Elevation changes within the system shall be carefully considered, and the pressure in the system is not to exceed the recommended P.S.I. If there is more than a 43 percent pressure variance in the system, pressure regulators shall be used at the individual lot services. Main line pressure regulators shall be used as necessary to equalize system pressures within the pipelines.

**Point of Diversion.**

The point of diversion shall be the point where Settlers Irrigation District regulates the flow of water to the subdivision based on the water right of the land. All diversions shall have a C-10 canal gate for water control. The flow of water shall be measured

over a standard weir of proper dimensions and vertical drop as provided in the University of Idaho bulletin No. 552. The measuring device shall be approved by Settlers Irrigation District. If the design of the project justifies the new point of diversion the developer shall provide a complete set of engineer's drawings for the modification. The plans shall provide both plan and elevation views of the proposed structures for the diversion. A review by Settlers Irrigation District shall determine if the new point of diversion meets the requirements of the district. The developer shall pay for new points of diversion.

**Delivery to Pumping Plant.**

A suitable tile or pipe shall be installed underground between the point of diversion and the pumping plant. Water delivered to the pumping plant shall be screened of debris prior to entering the wet well. The screen shall have an 18 mesh, or 1000 micron or 1 mm size screen opening. It shall be continuously self-cleaning while the pumping plant is operating and require only periodic maintenance. The screen shall be protected from any canal current so that it operates with no disturbances. Water around the screen shall have an overflow to rid the screen of debris. Screens shall be easily removed for maintenance and service. The tile shall be sized properly to deliver the full amount of the water right to the subdivision without restriction and a flow rate no greater than 1½ foot per second. The pumping plant shall have an overflow system incorporated in the design to protect the pumping plant from flooding. The overflow system shall be capable of bypassing the full flow of water to the pumping plant in case of an emergency.

**Easements.**

Easements shall be filed with the final plat that provide a minimum width of 10 feet of access for pressure lines delivering water to the lots in the subdivision and typically 30 feet for laterals delivering water to the pump station. Easements shall be provided for the pump house and all valves, drains, blowouts and other pertinent equipment in the pressurized irrigation system.

**Wet Well.**

The tile or pipe delivering the water shall terminate into a concrete wet well. The minimum diameter of the wet well shall be 60 inches for a pump system requiring two pumps, or 72 inches for a 3-unit pumping plant. Larger pumping plants incorporating more than three pumps shall have a wet well of suitable dimensions to provide proper pump performance. The wet well may consist of culvert or man hole sections set vertically on a concrete base and sealed so the water in the wet well will not be lost to groundwater. The wet well shall have sufficient depth to provide proper submergence of the pump intake or intakes and provide ladder steps for maintenance inside the well. The wet well design shall provide safeguards to prevent flooding of equipment or flow above the surface or rim of the wet well.

**Pumping Plant Pad.**

The top of the wet well at ground surface shall have a 6 inch thick concrete pad and collar placed as a foundation for the pumping plant. The slab shall be of sufficient dimension to accommodate the skid on the pumping plant plus an average of two feet on all four sides of the skid. The slab shall incorporate an expanded perimeter footing or a foundation wall for a pump building.

The fused disconnect and breakers may be placed on the wall of the building. All NEC (National Electrical Code) electrical clearance codes must be met. The concrete base material under the slab shall consist of six inches of one inch minus gravel compacted to 95 percent density. All pumping plant pads and pump station installations shall include a protective building that meets building codes and the pump manufacturer's requirements for venting and airflow. The building shall include a convenience out-let and proper lighting.

**System Capacity.**

The pumping system shall have a guaranteed delivery rate **at the discharge of the pumping plant** and not at the pump discharge. The project water requirement shall be determined by the following formula;

$$\text{GPM required} = \frac{27154 * \text{NetIrrigatedAcres} * .35}{12 * 60 * .65}$$

Note: 27154 = gallons per acre 1" deep

Net irrigated acres = raw acreage size minus all roads, parking, commercial parking etc.

.35 = daily water requirement at peak period of summer

12 = number of hours allowed in schedule for residential lots to irrigate daily

60 = conversion of hours to minutes

.65 = allowable efficiency of the sprinkler systems

The result of this calculation converted to gallons per day shall be compared to the water right (GPM = inches of water\*9 gpm/inch) converted to gallons per day for land being developed. This will determine if there is adequate water for the development. The pumping plant shall be sized adequately to deliver the daily-allocated water right to the subdivision lots in a maximum of 12 hours to conform to the watering window demanded by the homeowners. The water requirement shall be determined by a similar formula for each lot. This requires the homeowners to install an irrigation system that is at least 65 percent efficient.

**Lot Water Requirement.**

The water minimum allowed to each lot is dependent on the size of the lots in the subdivision. The water service to the lot is also dependent on this lot requirement. The formula that can be used as a guideline is as follows:

$$\text{GPM required} = \frac{.623 * \text{Sq. Ft. of Landscaped Area} * .35}{3 * 60 * .65}$$

- Note: .623= gallons per sq. ft. 1" deep
- Square feet of landscaped area = raw lot size minus all hardscape
- .35 = daily water requirement at peak period of summer
- 3 = number of hours allowed in schedule for each lot to irrigate daily
- 60 = conversion of hours to minutes
- .65 = allowable efficiency of the sprinkler systems

**Water Storage**

Due to the differing requirements between agriculture and subdivision watering demands, no flow fluctuations beyond the point of the diversion will be acceptable to the district unless special district consent is given. If storage is required, underground storage or a pond may accomplish it. The storage facility shall be sized to accommodate water flow during the demand period without exceeding the daily water right of the property. The purpose of the storage facility is to store water during the low periods of demand in order to provide the increased flow during the anticipated watering window of the subdivision. The storage facility will also allow a constant flow of water onto the property from the point of diversion. All water storage facilities shall be reviewed by Settlers Irrigation District.

**Pond**

A pond may be chosen for water storage. It may be incorporated into an aesthetic landscape amenity. If it is to be used as a part of the irrigation infrastructure it shall be sized so that no more than 1/4 of the pond depth is drawn down in any 24-hour period including evaporation. The minimum depth shall be five feet to prevent the growth of weeds. The engineer shall determine if a circulation or aeration mechanism is required to suppress algae growth. The pond shall be designed so that it is an acceptable water hazard or it shall be fenced with a suitable material to prevent entrance of unauthorized person or persons. Pond water loss shall be held to evaporation and if the base of the pond cannot be sealed with natural material, technicians certified for the work shall install a PVC liner. The liner shall be anchored with a key trench and covered with a minimum of 6" of sand or clean soil to block UV penetration.

**Alternate to Storage**

The advance of technology has created a competitive alternate that is acceptable by special review by Settlers Irrigation District. The technology provides specific times when water is delivered to each lot and is thus able to control the use and spread of

water in the system. The engineer can better predict the flows within the system and the water window when homeowners use irrigation water. The control system shall consist of a Windows based pc computer central control that communicates with remote field units via a two-wire communication system. The remote field units shall communicate with decoders at remote control valves at the lot services via a two-wire communication line. Landscaping and common areas may be incorporated with the lot service controls. The central computer shall be capable of communicating with up to 20 remote control units. Each remote unit shall be capable of communicating with 120 valves and 8 valves operating at one time. A power service of 117v single phase in an approved pedestal style cabinet shall be provided for each remote control unit. The central computer shall be housed inside a dust free building, be either a desk top or capable of being stored in a wall cabinet that will protect it from dust and moisture. The computer shall be provided with 117 v. single-phase service and a standard telephone service. The central computer shall have Symantec "PC Anywhere" installed on the computer's system to communicate via the telephone system. The system shall be capable of automatically recovering from power failures. The system shall be capable of operating valves remotely from a cell phone as in a manual operation with automatic return to the central control. The system shall be capable of verifying the electrical components and maintaining a system operation history. The system shall be capable of map based commands for decoder locations, system status, on /off commands and system adjustments. The system shall have flow monitoring features. The system shall have 8 separate programs. The system shall have various watering strategies including times for lot watering to fully automated soil moisture controls for landscaped common areas. The computer may be installed in a centrally located clean environment on site. The contractor shall purchase the system from a local authorized distributor for support and installation of the system according to the guidelines supplied by the manufacturer. The contractor shall coordinate technical support between the supplier, manufacturer and owner. The contractor shall be responsible for control, operation and watering results until acceptance by the owner. The contractor may request installation recommendations, and training from the factory at current rates and include the same in his quote.

### **Lightning Protection**

Lightning Arresters or other protective device shall be installed as per manufacturer's recommendations. Where equipment to ground resistance requirements are specified, the contractor shall provided verified letters of tests describing and meeting the requirements. The owner or acting party responsible for the equipment shall carry adequate insurance protection. The responsible party shall carry Property Damage Coverage Insurance and Boiler Machinery With Comprehensive Coverage Insurance.

### **Wire**

The wire shall consist of a two-conductor cable designed to operate valve decoders. Each conductor shall consist of a tin coated copper conductor and jacketed with PVC

conforming to UL standard 493 for TYPE UF rated 60 degree. The conductors shall lie in parallel with an outer jacket consisting of a 3/64" minimum pressure extruded HD PE conforming to ICEA S-61-402 and NEMA WC5. The jacket shall completely fill the spaces between the two conductors. The conductor jackets shall be red and black. The jacket color shall be available in red, blue, and green, yellow, black and white. The communication wire from the computer to the remote control units shall always be yellow. Wire sizing shall be per design. Standard wire size shall be #12 for the computer/remote control unit and #14 for the remote control unit/decoder communication. All wire splices or connections shall occur in an approved box with wire lengths extending to the ground surface for connections. Wire connectors shall be 3M DBY/DBR or approved equal.

## **The Pumping Plant**

### **General**

Flanged fittings or Victaulic grooved type couplings shall be used so that the plant components may be partially disassembled. Pump motors suited for the specific applications and the controls that drive them shall be approved by the manufacturer. Motor manufacturers shall not void warranties because of the application of use in the pumping plant. The plant shall have a pressure maintenance pump for minor pressure variations and to prevent the primary pumps from cycling. The pressure maintenance pump shall not be included as part of the total pump capacity of the pumping plant and shall shut off when primary pumps are operating. Programmable Logic Controls shall be capable of locking out the pressure maintenance from running while the primary pumps are operating. A manual bypass switch shall be furnished to allow manual operation. The pump manufacturer shall demonstrate the full capacity of the pumping plant installation prior to acceptance by Settlers Irrigation District.

The pumping plant shall be protected with a restart system. In the event of power failure and restored power, the system shall restart with a soft start system that is capable of coming back on line with a maximum of 1psi per 4 seconds until full operating pressure is achieved.

Short coupled vertical turbine pumps with nominal 3 phase, 1750 rpm motors are the preferred style of pump of the district. Other pumps may be used only after special review by Settlers Irrigation District. Each pump shall have an isolation valve at the discharge of the pump. All pumping plants shall be equipped with a hose bib for miscellaneous maintenance.

### **The Pumping Plant**

The Pumping Plant shall be assembled in a manufacturing facility to insure quality workmanship. Any pumping station that requires more than 10 horsepower shall have

multiple pumps of equal horsepower. All pumps shall be driven and controlled by a variable speed drive such as ABB or equal and capable of a soft start over 360 seconds. The plant shall be capable of alternating the pump motors as the lead variable speed pump to equalize the operating hours between the main pumps. The drive shall be sized to the horsepower ratings and ampere load of the pumps as per the drive manufacturer. It shall be capable of controlling three motors. The sequence of operation shall be as follows: when a small amount of water is demanded by the system, the first pump with the VFD control will come on line. It will increase its speed until the pump reaches its maximum output at which time the VFD will switch to the second pump. The first pump will adjust back or shut off until the demand exceeds the capacity of the number two pump. The first pump will then increase in speed to accommodate the demand. The same sequence will apply for a three-pump station. The VFD drive shall work from a Pressure Inducer located on the collector manifold pipe for the pump station. A pressure tank may be required if the pump manufacturer determines that there is insufficient mainline capacity to provide an adequate reservoir for the controls to operate properly. The pumping station shall be as manufactured by FLOTRONEX™ or a comparable, approved equal.

The pump station shall be protected with the following U.L. approved devices: Lightning and surge protection of Category C and Category B to adequately protect the solid state electronics of the pump station; a Main Disconnect to completely isolate all controls and motors from incoming power; load side devices to protect each motor from low voltage, phase failure or unbalance or reversal and overload protection; low intake water level control to shut down station in the event of low water levels or loss of intake water. All controls and panel shall conform to the NEC.

All appurtenant piping in the pumping plants shall have a working pressure of 250 psi with a standard safety factor and be rigidly supported. A pressure relief valve (PRV) shall be located on the discharge piping and vented to the wet well. The PRV shall be of sufficient size and rating to offer full protection of the system in the event that the electronic controls fail. One or more air release valve(s) shall be placed so the discharge pipe shall not collect air and form pockets that will hinder the performance of the pumping plant. The platform or skid on which the pumping plant is built shall be minimum of 10 gauge metal with a substructure of I beams or channel iron. No tubing shall be allowed since the interior of the tubes cannot be coated with corrosion proofing materials. All metal, top and bottom, shall be cleaned and prepared to accept a two-part epoxy coating of a minimum thickness of 10 mils.

### **Discharge Filter**

The water on the discharge side of the pumps shall have a serviceable automatic filter with no greater than a 300-micron screen. The filter shall be sized to accommodate the design flow in the system according to the manufacture's rating. Cycling of the filter

shall be automated with a differential inlet and outlet pressure control. The cleaning cycle shall be a suction-scan type of action with the wastewater drained by a gravity line to a neutral drain. The water shall be analyzed for the removable contaminants to irrigation heads. Drip systems shall be filtered at the homeowner's expense.

A pump station isolation valve shall be located at the discharge of the pumping station and provide complete isolation between the pumping system and the irrigation system. A 1½ inch inlet connection just downstream of the isolation valve shall be provided for winterization.

### **System Piping**

System piping less than 8 inch diameter shall be Pressure Rated PVC 1120, Class 200, SDR 21, conforming to ASTM D2241, IPS, gasketed pipe. System piping greater than 8 inch diameter shall be Pressure Rated PVC 1120, Class 160, SDR 26, conforming to ASTM D2241, IPS, gasketed pipe. Where possible, the mainline shall form a looped system. Minimum size of the main line pipe shall not be less than 4 inches unless a pipe is on a spur lateral. Design flow velocities in the system shall not exceed 4.5 feet per second in any section of the system outside the pumping plant.

Piping shall be laid in straight lines. Deflection in the bell end of the pipe shall not exceed manufacturer's recommendations. Fittings of 11¼<sup>0</sup>, 22½<sup>0</sup>, 45<sup>0</sup>, and 90<sup>0</sup> in the Harco or Leemco ductile iron fitting line shall be used to prevent undue strain in the joints of the pipe. In order to follow the prescribed alignment or the lot lines as shown on the plans, proper fittings shall be used to maintain a uniform offset from the lot lines.

Separation of Pressure Irrigation piping and potable waterlines shall conform to Section 400 of the ISPWC and State Health Department regulations.

Elevation changes within the system shall be carefully considered so that the pressure in the system does not exceed 90 psi. If there is more than a 20% pressure variance in the system, pressure regulators shall be used at the individual lot services. Mainline pressure regulators shall be used as necessary to equalized system pressures within the pipelines.

### **Secondary Source**

A secondary source of water shall be incorporated into the system for preseason and post season system demands. A typical irrigation season for surface water is from April 15 to October 15. The secondary source shall provide adequate flows and pressure for typical evapotranspiration rates for spring and fall conditions. A connection to potable water or a well shall have an approved backflow device. Cost of the water shall be the responsibility of the Homeowner's Association.

**Fittings**

Fittings shall be lightweight ductile iron with a pressure rating of 350 psi. Fittings shall be manufactured of ASTM A-536, Grade 65-45-12 ductile iron with a tensile strength of 65,000 psi. Fittings shall have a deep socket bell with a joint 2-4 times deeper than the conventional mechanical joint. Fittings shall have lugs cast into the fitting to accommodate restraint rings where reducers or adapters are joined with fittings. Fittings shall be as manufactured by Harco (Harrington Corp.) or Leemco Inc.

**Service Tees.**

Service Tees shall be provided ten feet from the lot corner. The mainline tees shall consist of a ductile iron "tap" tee or a saddle tee having a 2" wide stainless steel strap (ASTM A240) and a cast ductile iron saddle tee (ASTM A536) with stainless steel bolts, washers and nuts (ASTM A240). The rubber gasket shall be virgin SBR (ASTM F477). The saddle tee shall be installed at 45 degrees in the direction of the lot to be served or vertically as in detail. The outlet shall normally be 3/4 " NPT female threads (size based on square footage of lot). An 18" polyethylene flexible water service pipe with IP inside diameter shall be connected to the saddle tee with a pack joint MIP x PJ for PE pipe rated at 160 psi and a molecular density of 3408 (this assembly may be substituted with brass nipples and a brass 45<sup>0</sup> ell and a FIPT x PJ curb stop with approval). A PJ x PJ curb stop shall then be installed (See detail for alternate). The shut-off curb stop shall constitute the end of Settlers Irrigation District responsibility. Piping beyond the curb stop shall be a minimum of 100 psi rated Polyethylene pipe with a molecular density of 3408. This pipe shall extend 18 inches above ground with a plug. PJ fittings and curb stop shall be Ford or equal and utilize insert stiffeners for proper sealing. Piping beyond the Lot Shut Off Valve shall be the owner's responsibility for maintenance.

**Warning Post.**

At each lot connection at a point where the homeowner makes a connection to the service, a flat fiberglass stake measuring 3" X 60" shall be driven into the ground or an approved post. A decal shall be placed on the marker stating, "NON POTABLE WATER - DO NOT DRINK".

**Isolation Valves.**

Mainline valves shall be located at tees and branches in the system to isolate areas of the system in the event of repairs or maintenance without suspending service in the whole system. Isolation valves shall be the same size as the line on which they are placed and shall be a gasketed push-on valve such as Matco 100RT cast iron valve with ring-tite ends or equal. Valves shall be supported with concrete or secured with restraint assemblies as per Leemco manufacturing. Suitable Valve Boxes shall be

provided to allow access to the valve operator. Road crossings shall be valved on both sides as per Ada County Highway District requirements.

**Excavation and Backfill**

All excavation, placement of pipe bedding, backfill, compaction and surface repair shall be in accordance with Section 300 of the ISPWC except as follows: Pipe shall have a minimum cover of 24 inches and a maximum cover of 36 inches. In no circumstance shall pipe be buried in loose or non-compacted fill where subsequent settling may occur. Pipe shall be placed in trenches with uniform bottom grades and without rocks or stones or clay clods, which create bridging. Import material of rock-free sand or topsoil shall be used for bedding and filled 6 inches above the top of the pipe. In no case shall there be less than 2 inches of rock-free soil surrounding the pipe. Backfill shall be compacted to 80% or to match undisturbed soil outside of the trench. Pipe shall be backfilled in the cooler part of the day before temperatures exceed 85<sup>0</sup>F. No thrust blocks shall be placed while pipe is in expanded condition in the heat of the day.

**Tracing Wire.**

A green #14 single strand copper wire with PVC coating and rated UF shall be laid on top of the mainline and terminated or looped into each shut-off valve box so that the entire system can be traced with tracing equipment from the pumping station throughout piping network. The mainline shall be marked with a purple 2 inch wide warning tape with 1 ½ inch letters indicating a buried irrigation line below. The tape shall be buried 12 inches below the surface.

**Thrust Blocks.**

Thrust blocks shall provide adequate surface area to prevent linear separation of the piping. Factors including type of soil, working pressure in the line and size of pipe shall be included to determine the area required for the thrust block. Soil shall be stable, undisturbed earth with a vertical surface for the thrust block. See Thrust Block Detail Sheet. Where the mainline must cross roads or change vertical alignment, ductile iron joint restrainers as manufactured by Leemco Manufacturing shall be used if thrust blocks are impractical. Manufacturer's recommendations for joint restraints shall be followed. A minimum 30mil plastic sheet shall be used between the surface of the fitting and the concrete so that no concrete comes in contact with the actual pipe or fitting.

**Road Crossings.**

All road crossings shall as far as practical be 90<sup>0</sup> to the centerline of the road. Clearances between potable water lines and other utilities shall be as required by the governing agency. Backfill and compaction shall meet or exceed the requirements of the road or highway agency having jurisdiction. Road crossings shall be sleeved with a conduit 1.5 times the main line pipe or a 2-inch schedule 40-pipe sleeve shall be laid

parallel to the main line for future wire access. Sleeving shall be water tight to the ends of the sleeve.

### **Air Vents.**

Continuous acting air release valves shall be installed at high points in the system or on continuous long runs. Air release valves shall be spaced at a maximum of 1000 feet and sized per manufacturer's recommendations for the size of pipe being vented.

### **Exposed Ditch or similar crossings**

Where the pressurized irrigation mainline is exposed as in crossing a main ditch or canal within the system, mild steel pipe with a pressure rating of 250 psi shall be used from two feet inside the point of exposure. Any steel pipe covered with earth or gravel material shall be cold tar wrapped or epoxy coated to protect it from corrosion and the coating shall extend one foot beyond the point of contact with the soil. The steel pipe shall have adequate support so that there is no deflection due to the weight of the water flowing in the pipe. A concrete bulkhead shall be provided on each end of the exposed pipe. If the pipe spans over another flowing body of water i.e. a ditch or canal, there shall be no contact with the existing flow.

### **Blowouts**

At a mid point in the system loop or at the end of laterals where the system may be flushed to drainage ditch or road drainage, a valved discharge pipe shall be exposed to atmosphere for the purpose of flushing the line without erosion or damage to the landscape or to homeowner's property. The vented pipe shall be 2 inch and equipped with a removable, threaded cap as per detail on the plans.

### **Drains**

At low points in the system, based on the contours of the finished grade, drains shall be installed. The drains shall be designed so that the pipeline is completely drained to the low point in the line. A sump shall be created with drain rock 1 inch in diameter. The sump shall be sized at the rate of 1 cubic foot per diameter inch. The drain rock shall be covered with a fabric that will prevent soil particles from infiltrating the drain rock. Access to the drains shall be provided (off of roadways, public access areas etc.)

### **Testing**

The contractor shall be required to perform a pressure test on the pipe installation. Prior to the test the pipeline shall be flushed of all debris. Partial backfilling shall be permitted to prevent movement of the pipe but the pipe joints and fitting shall be exposed for inspection. Thrust blocks shall be in place. The contractor may isolate sections of the system to perform sectional tests. The pipe shall be filled with water and all air expelled prior to the test. The section shall be isolated so that the static condition may be established for 30 minutes. Pressure for the test shall be at 150 psi

with not more than 5% pressure loss in thirty minutes and no visible leaks. Successful test sections shall allow full backfilling to proceed. Testing shall not relieve the contractor from repair of blowouts or leaks during the warranty period.

**As-built drawings**

As the installation progresses the contractor shall provide measurements for locating pipe, valves, services, etc. on a set of as-built plans. This is in addition to any field inspectors or representatives of the owner or Irrigation District. This as-built plan shall be neat and legible and three copies shall be given to the Irrigation District prior to final acceptance.

**Warranty**

All material, pumping plant components and workmanship shall be warranted for a minimum of two years with the developer in the contract from the time Settler's Irrigation District accepts the operation and maintenance of the system. Some components such as pumps, motors and etc. are warranted more than one year. All warranty cards or contracts for warranty shall be handed to the Irrigation District at the time of acceptance. A letter of acceptance shall be issued by the entity having jurisdiction over the system. Acceptance shall not occur until the contractor can demonstrate full working operation of the system with acceptable tests showing full system parameter flows and adjustments. Motor amperage draw and other test shall be performed to the satisfaction of the controlling entity (ies). A Professional Engineer may submit a letter to Settler's Irrigation District verifying he witnessed the installation to be in full compliance with the specifications.

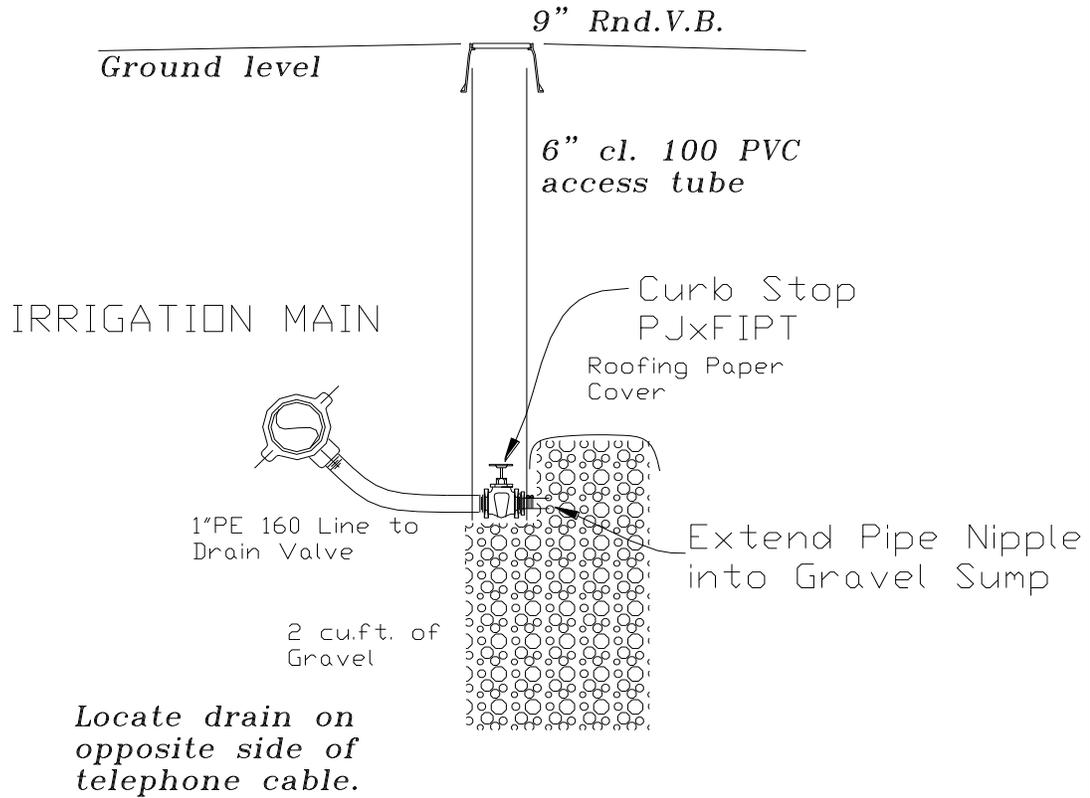
**Operation and Maintenance Manual**

Two copies of the manual shall be provided covering all aspects of the daily operation and upkeep of the system for optimum performance and service of the system. The manual shall include cut sheets of the material used in the installation, method of winterization, start up procedures, and local sources of materials used in the installation.

End of written specifications

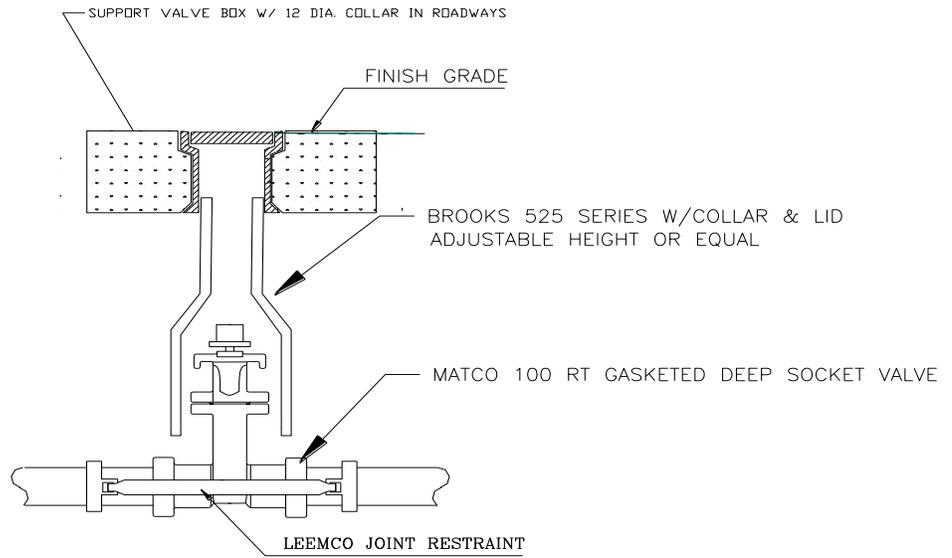
**Notes:**

1. Locate drains at all low areas in the mainline.
2. Locate valves on as-built drawings for Settlers Irrigation Records.
3. Brass and Stainless Steel material shall be used with adaptors and drain valve.
4. Leemco ductile iron saddle tee with hinged strap and single tightening bolt.



**Mainline Drain Detail**

<p>SETTLERS IRRIGATION DISTRICT PRESSURIZED IRRIGATION STANDARD</p>	<p><b>Mainline Drain Detail</b></p>	<p>DWG. NO. PIRR03001</p>
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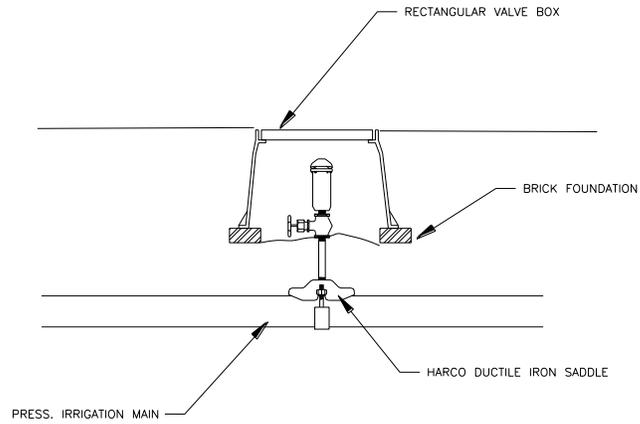


ISOLATION VALVE DETAIL  
NTS

SETTLERS IRRIGATION  
DISTRICT PRESSURIZED  
IRRIGATION STANDARD

**ISOLATION VALVE DETAIL**

DWG. NO.  
PIRR03002



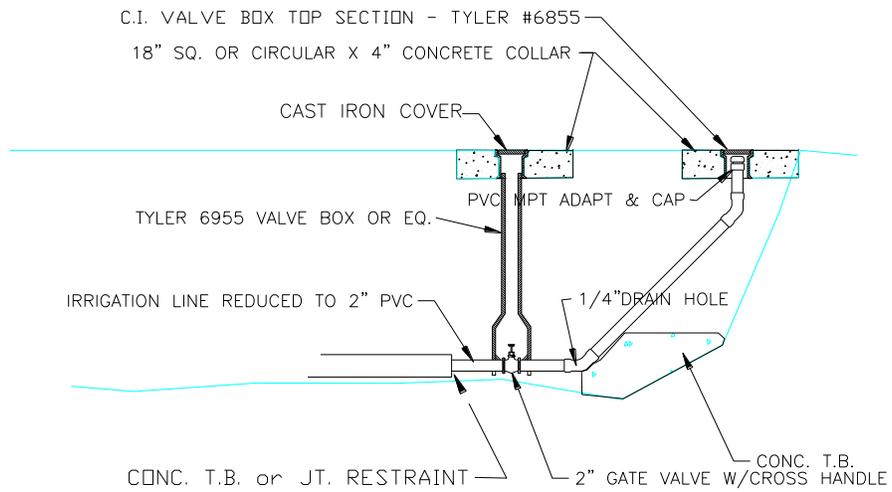
AIR/VACUUM RELEASE VALVE  
01-AR-C-P-NP BERMAD OR EQ.

## PRESSURE AIR RELEASE VALVE

SETTLERS IRRIGATION  
DISTRICT PRESSURIZED  
IRRIGATION STANDARD

## PRESSURE AIR RELEASE VALVE

DWG. NO.  
PIRR03003

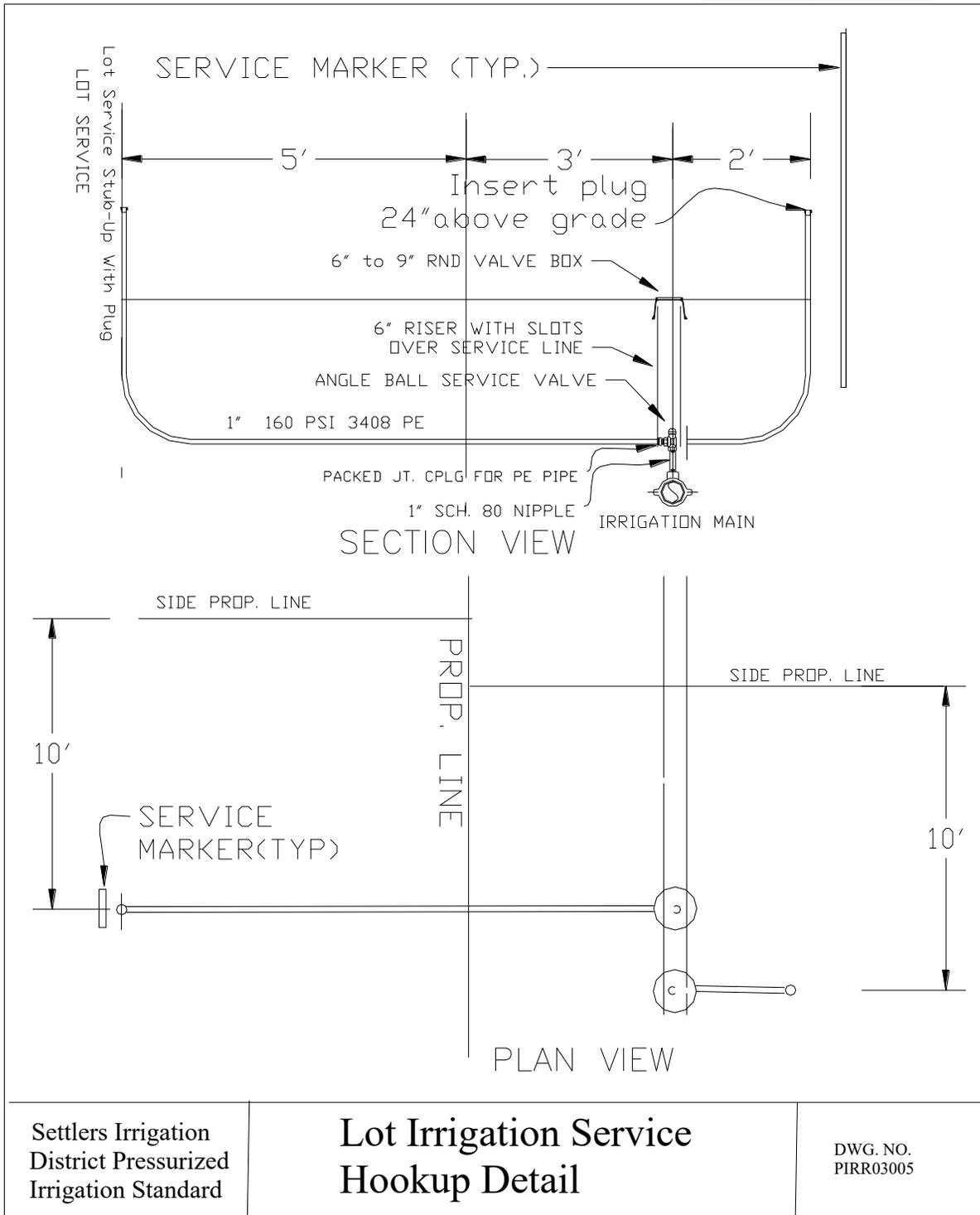


TYPICAL 2" BLOWOFF  
ASSEMBLY

SETTLERS IRRIGATION  
DISTRICT PRESSURIZED  
IRRIGATION STANDARD

**TWO INCH BLOWOFF  
ASSEMBLY**

DWG. NO.  
PIRR03004



### Thrust Blocking Instructions

1. Provide thrust blocks at all changes in size or direction. Bends, reducers, plugs, and the opposite side of tee branches all require thrust blocks.
2. The sizes of the block is determined by the working pressure, the size and type of fitting, and soil conditions at the job site. To calculate the area of contact with the soil, follow these steps:

Calculate the thrust by selecting thrust / 100 by size and type of fitting from Table 1 and multiplying thrust / 100 by system pressure divided by 100.  
 3. Divide the total thrust by bearing capacity of the soil in excavation (from Table 2) to determine the area (in square feet) of thrust block required to be in contact with the undisturbed soil.

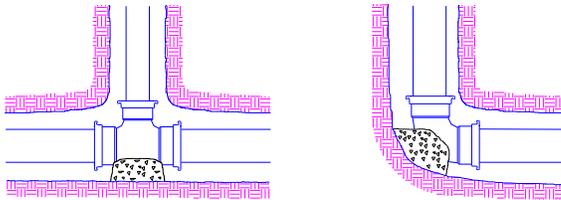
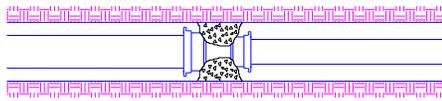


Table 1

Size	Tees. Plugs	90° Bends	45° Bends	22.5° Bends
2	363	513	259	141
2 1/2	531	751	379	207
3	788	1,114	562	307
4	1,302	1,841	928	508
6	2,822	3,990	2,012	1,101
8	4,783	6,763	3,410	1,865
10	7,430	10,506	5,297	2,898
12	10,452	14,778	7,452	4,076

For Reducers, subtract small opening plug thrust from large opening plug thrust to calculate thrust / 100.

Table 2

SOIL TYPE	SAFE BEARING LOAD LBS PER SQ. FT.*
Soft Clay	1,000
Sand	2,000
Sand & Gravel	3,000
Sand & Gravel cemented w/Clay	4,000
Hard Pan	10,000

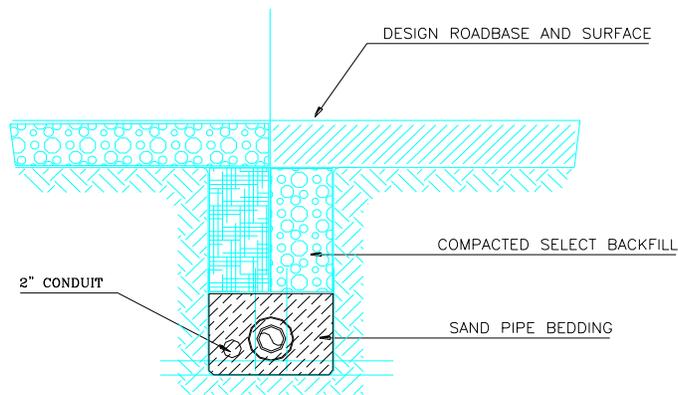
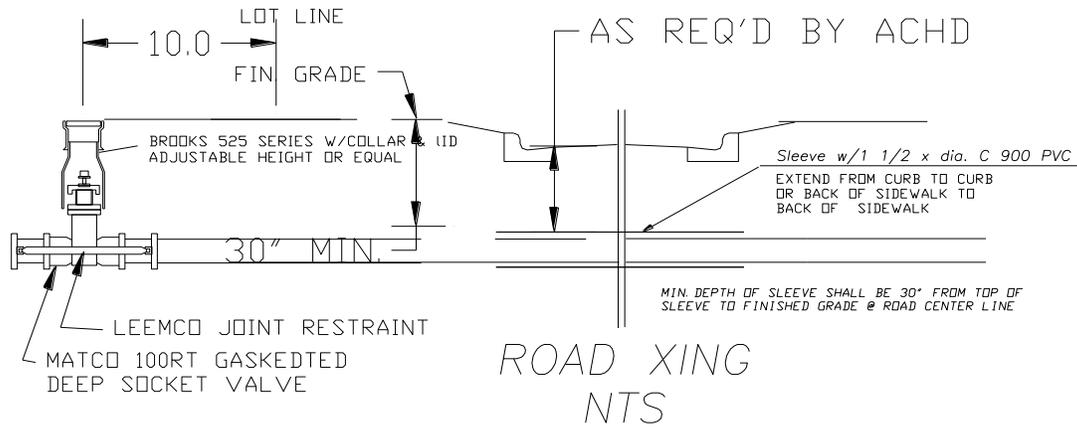
The engineer is responsible for determining safe bearing loads and when doubt exists, soil bearing test should be specified. The bearing loads given are for horizontal thrusts when depth of cover exceeds 2 ft.

## THRUST BLOCK DETAIL AND INSTRUCTIONS

SETTLERS IRRIGATION DISTRICT PRESSURIZED IRRIGATION STANDARD

THRUST BLOCK DETAIL AND INSTRUCTIONS

DWG. NO. PIRR03006

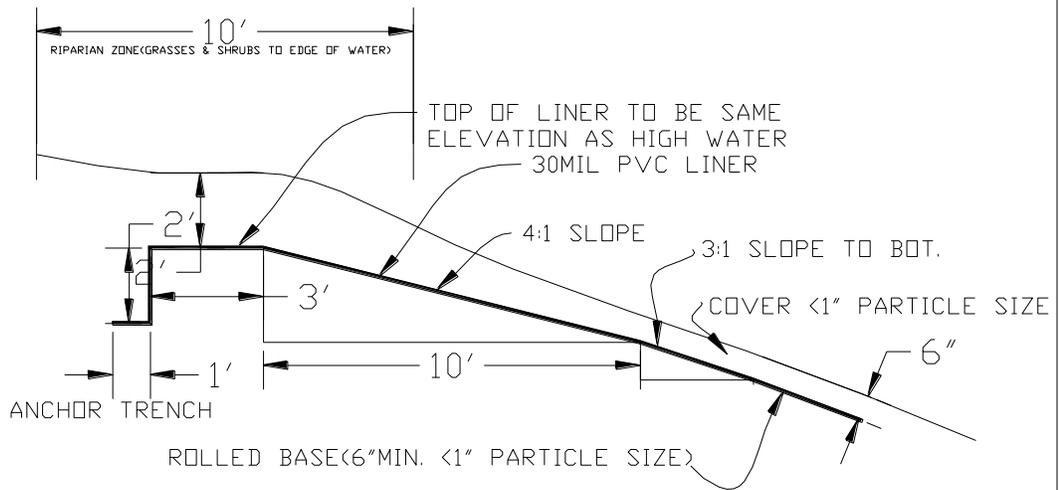


X-SECTION ROAD CROSSING

SETTLERS IRRIGATION  
DISTRICT PRESSURIZED  
IRRIGATION STANDARD

X-SECTION  
ROAD CROSSING

DWG. NO.  
PIRR03007



POND LINER DETAIL

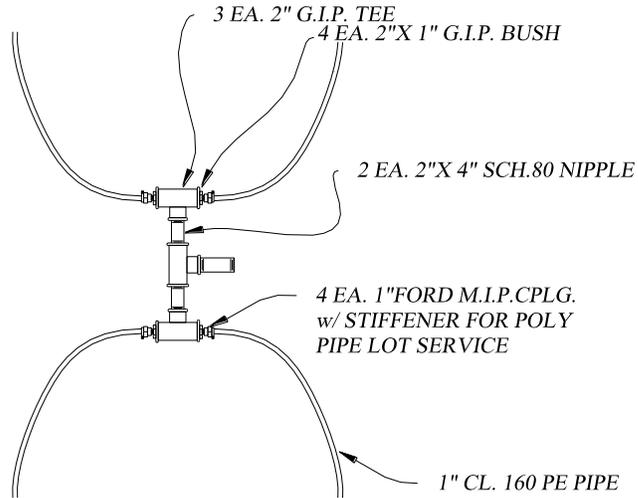
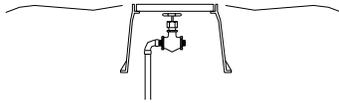
SETTLERS IRRIGATION  
DISTRICT PRESSURIZED  
IRRIGATION STANDARD

POND LINER DETAIL

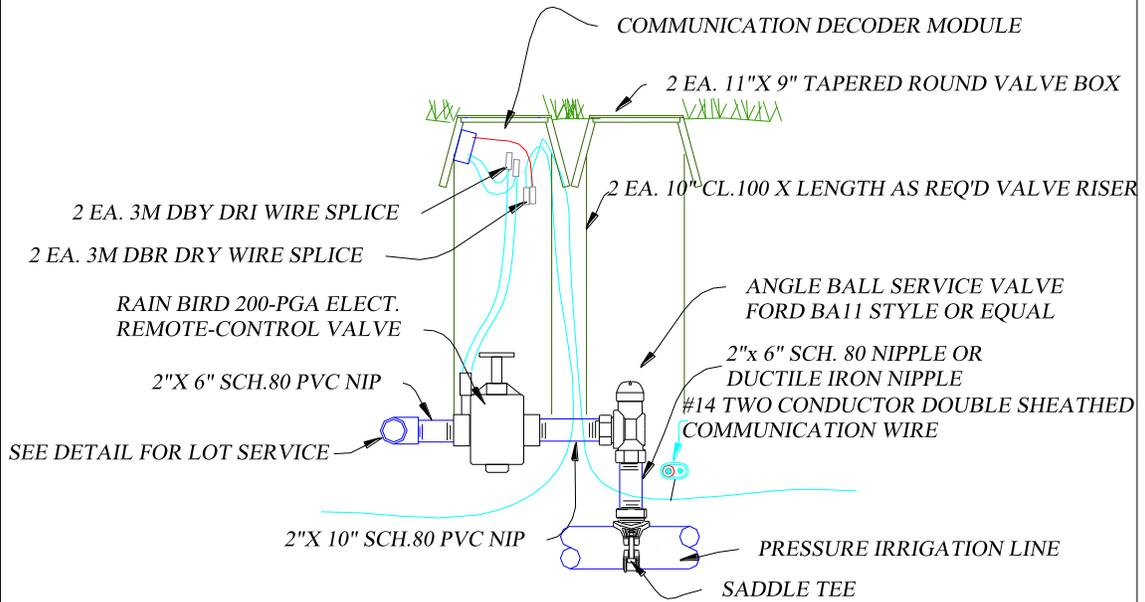
DWG. NO.  
PIRR03008

NOTE: CENTRAL CONTROL SYSTEM ALTERNATE IN LIEU OF A STORAGE FACILITY. THIS SYSTEM ALLOWS TOTAL CONTROL OVER LOT IRRIGATION SCHEDULE AND DELIVERY. RESPONSIBILITY OF SETTLERS IRRIGATION DISTRICT ENDS AT THE SERVICE VALVE. THE REMOTE CONTROL VALVE IS THE HOME OWNERS RESPONSIBILITY.

Lot Services to terminate with HoseBibb in an Irrigation Box or a Bent Nose Garden Valve (Matco 203TF4 or eq.) Supported by a 4x4 Redwood Post.



**LOT SERVICE DETAIL**



**ELEVATION**

SETTLERS IRRIGATION DISTRICT PRESSURIZED IRRIGATION STANDARD	<b>LOT SERVICE ALTERNATE</b>	DWG. NO. PIRR03009
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**PROJECT NAME:** \_\_\_\_\_  
**LOCATION:** \_\_\_\_\_  
**DEVELOPER:** \_\_\_\_\_  
 ADDRESS: \_\_\_\_\_  
 PHONE: \_\_\_\_\_ FAX: \_\_\_\_\_  
**DESIGN FIRM:** \_\_\_\_\_  
 ADDRESS: \_\_\_\_\_  
 PHONE: \_\_\_\_\_ FAX: \_\_\_\_\_  
 DESIGNER: \_\_\_\_\_  
 EXTENSION: \_\_\_\_\_

Check List of Items (not all inclusive – see standards)

STANDARDS SECTION	ITEM	REQUIRED	YES	NO
System Design Life	20 year components	yes		
	45-80 psi Delivery Pressure	yes		
	Estimated cost	yes		
	Watering Schedule	yes		
Point of Diversion	Elevation considered	Influences delivery		
	Canal Gate	yes		
	Measuring Device	yes		
Delivery to Pump Plant	Diversion Detail	Adequate		
	Water is Prescreened out of currents	18 mesh		
	Pipe Delivery to Pump	1 1/2-ft./sec max.		
Easements	Overflow bypass	Capable of full right		
	Pressure Lines	10 feet		
Wet Well	Delivery Laterals	30 feet typically		
	Two Pumps	60 inch diameter		
	Three Pumps	72 inch diameter		
	Four Pumps	84 inch diameter		
	Concrete	Sealed – no leakage		
Pumping Plant Pad	Elevations	Prevent flooding		
	Concrete	6 in. thick		
	Electrical Clearances	42 “ in front of Panel and NEC		
	Pump Building	2’ larger than skid		
	Ventilation	16 cfm / horsepower		
	Lighting and outlets	Adequate		
System Capacity	Delivery Q and psi	At pumping plant discharge		

STANDARDS SECTION	ITEM	REQUIRED	YES	NO
	Net Irrigated Area	12-14 hr. Period		
	Water Right	Not exceeded above		
Lot Water Required	Landscaped Area	Adequate w/in 3 hr.		
Water Storage	Size	Allows constant District Flow		
Pond	Draw down	<1/4 pond depth		
	Minimum Depth	5 Feet		
	Acceptable hazard	Fence or acceptable barrier		
	Liner	If can't be sealed naturally		
Alternate to Storage	Central Control	See requirements		
Lightning Protection	Devices to protect	Per Manufacturer's recommendations		
	Insurance Coverage	recommended		
Wire	Two conductor Valve Wires	Yes		
	Two Conductor Communication	For Remote bases		
	Connectors	Water Proof		
Pumping Plant	Flanged or Victaulic	For equipment removal		
	Motor suitability	Warranties intact		
	Jockey pump	Pressure Maintenance only		
	Programmable Logic	Integrated system		
	Manual Bypass	Allow full manual operation		
	Short Coupled Vertical Turbine	3 ph 480 V 1750rpm where Possible		
Pumping Plant	Multiple Pump	Equal horsepower when > 10 hp		
	Equalized use	Alternating lead motor		
	Soft Start	1 psi increase /4secs.		
	Variable Speed Drive	Constant pressure variable gallonage		
	Pump and Motor Protection	See Standards		
	Pressure Relief Valve	100% by pass		

STANDARDS SECTION	ITEM	REQUIRED	YES	NO
	Pressure Air Relief	Yes		
	Pump Skid	10 gauge and No Tubing in frame		
	Isolation Valve	At discharge of P.S.		
	1 <sup>1/2</sup> " connection	Winterization Conn.		
Discharge Filter	Automatic filter	300 micron filtration		
	Suction scan type	Gravity drainage waste		
System Piping	1120 PVC pressure rated SDR 21 & 26	Gasketed		
	Flow velocity	> 4.5 feet per second		
	Minimum Size	4 in and larger		
	No deflection in Pipe	Gasketed Fitting DI		
	Separation to Potable water	State Health Dept. regulations		
Secondary Source	Backup water outside surface water period	Spring and Fall water to meet ET conditions		
Fittings	No solvent welds	DI rating 350 psi		
Service Tee	Lot services	Tapped Tee or Wide band Saddle Tee		
	Lot Shut off	Curb Stop Angle pattern or globe		
	Packed joint connectors	No insert fittings		
	Polyethylene Pipe	3408 molecular density and Service duty		
Warning Post	Warning placard	Fiberglas stake or Post		
Isolation Valves	Mainline Valves	Allow maintenance with interruption to system.		
Excav. And Bkfill	Meet minimum spec	Sec.300 ISPWC		
	Depth	24 – 30 in cover		
	Trench bottom	Natural or compacted bottom and uniform		
	Bedding	Rock free and Clod free		
	Bedding	2" minimum sides 6" top		

STANDARDS SECTION	ITEM	REQUIRED	YES	NO
	Backfill	During Cooler part of day.		
Trace Wire	Single strand #14 wire	Used to located pipe		
	Warning tape	12 in below surface		
Thrust Block	Resist linear Separation	Against undisturbed Soil.		
	Placement	During contracted state of pipe		
	Amount of area	Consult tables		
	Joint restraints	When no undisturbed soil exists		
	Separation of fittings	A plastic sheet between fitting and concrete		
Road Crossings	Sleeving	1.5 diameter of pressure pipe		
	Sleeving	All joints water tight		
	Sleeving	2" Conduit for future		
	Separation	Other utilities		
Air Vents	Continuous Acting	At High Points in system or 1000 ft.		
Exposed Ditch Crossing	Mild Steel Pipe	Concrete Bulkhead support and Cold tar wrapped		
	Pipe	No contact with existing flow		
Blowouts	Flushing points	To drain ditch or basin		
Drains	Low points	Drain sump		
Testing	Pressure test	150 psi, 30 min., >5% drop in press.		
As-built drawings	As constructed items	Measurements from permanent structures		
	Plans	3 copies		
Warranty	Two years	Full compliance with specifications		
O & P Manual	At close out	Cut sheets and info relating to O&P of system		
	Winterization	Procedural details		