Customer ID #_____

Irrigation-Mart, Inc.

Drip and Micro Irrigation System Installation and Maintenance Guide

Robbins Association/Irrigation-Mart, Inc.

300 South Service Road East, Ruston, La 71270

Phone 800-SAY-RAIN Fax 318-255-7572

www.irrigation-mart.com

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Introduction

Thank you for purchasing an irrigation system from Robbins Association/Irrigation-Mart, Inc. We greatly value your business and hope we can continue to serve your irrigation needs in the future.

Review this manual for important installation and maintenance information.

Owner's manuals may be available for some of the items you have purchased. These manuals will supersede any general information stated in this manual.

If any questions arise that are not addressed in this manual or that remain unclear after reading, do not hesitate to call and talk to one of our Technical Service Representatives.

Please have your Customer ID number ready when you call for technical support or to place an order. This number can be found on any of your Pick Tickets, Order Acknowledgement, Invoices or on the front of this manual.

Policy and Conditions of Sales

Terms of Payment. Terms are Net due on delivery/receipt. Methods of payment accepted are Credit Cards (Visa, Master Card, American Express, Discover) Check, Money Order, C.O.D., & Cash. A late payment fee of 2%/month will apply to all past due accounts. There will be a $25 charge on all returned checks.

Warranty. We strive to supply high quality merchandise to our customers. However, no warranty, expressed or implied is made by Irrigation-Mart or its employees except that of the manufacturer.

Return Merchandise. A Return Goods Authorization Number (RGA number) must be obtained prior to returning product. Restocking fee of 20% is charged on all retuned items.

Freight. All pricing is FOB Ruston, LA unless otherwise arranged. Material damaged in freight must be noted at time of delivery. It is the responsibility of the receiver to file the damage claim with the freight company.

Applicable Law. The laws of the state of Louisiana will prevail over any actions stated above.

Irrigation Consumer Bill of Rights™

Existing and emerging technologies make it possible to design irrigation systems that increase crop production while conserving natural resources and enhancing environmental quality.

Designer Qualifications

- References and credentials (formal training, certification, or professional agricultural engineer license)

Design Features (General)

- Life expectancy
- Safety features
- Upgrade options
- Recommended list of spare parts

Specific Operating/Design Parameters

- Distribution Uniformity of flow throughout the whole field when brand new
- Anticipated Irrigation Efficiency (IE)
- Water requirements.
    - Peak daily needs (acre-inches)
    - System delivery in 24 hours (acre-inches)
    - Frequency of irrigation during of peak water use period
    - Anticipated amount of water to be used per year (Acre-feet)
- Energy consumption
    - Is it possible to pump all water during off peak hours?
    - What are the pump and motor efficiencies?
    - Are you provided with a pump curve showing the GPM and pressure
    - What is the sensitivity of pump flow rates to well water level changes?
    - What is the energy cost per acre-foot?
- Filtration
    - Is filtration necessary, and if so, what type is provided?
    - What is the equivalent mesh size?
    - Is the equivalent mesh size no more than 1/10 of the diameter of the smallest holes in the emitters?
    - How frequently will filter flushing be necessary, and how much water will be used per (back) flush?
    - What is the procedure for flushing (manual, automatic, take apart)?
    - How will the flush water be disposed of?
    - Does the pump provide enough water to operate both the filter backflush and the irrigation system simultaneously?
    - What are the initial adjustments necessary for the filter, and who will do them?
    - If there is a backflush adjustment, is it possible to view and sample the backflush water in order to make proper filter adjustments?
    - What are the design safety factors (pressure) of the filters?
- Chemical injection.
    - Are approved backflow prevention and safety devices provided?
    - What is the injection rate, in gallons per hour?
    - Can the equipment inject both fertilizers and other chemicals?
- Flow meter
    - Does it measure both flow rate (GPM) and volume (Acre-feet) applied?
    - Does installation follow manufacturer's recommendations with regard to lengths of straight pipe, pipe diameter, and straightening vanes?
- Pressure, air, and flushing
    - Are there adequate continuous air vents vacuum relief valves, and flushouts?
    - What are the number, type, and size of pressure relief valves?
    - Is the pressure rating of pipe sufficiently high for the anticipated water temperature, surge pressures, and normal pressures?

Warranties

- Who provides equipment installation, start-up, and adjustment?
- What are warranties on individual component and "system" design performance?
- Who is providing warranties and what do the warranties cover and exclude?
- Are the providers financially capable of standing behind their warranties?
- What is the availability of replacement parts and the projection of the longest possible down time due to unavailability of parts?
- Will you be provided with a binder containing manufacturers' literature, warranties, and operation instruction for the system?

Getting Started

Check in your materials. Find the Pick Ticket for your order. The Pick Ticket is a record of the items that were packaged and delivered for this particular shipment. The Pick Ticket may be found attached to the outside of the shipment or inside one of the boxes in that shipment.

Note that the Pick Ticket may have the disposition D (Direct Shipment), S (Special Shipment), C (Canceled Item) or B (Backorder Item). If an item on the Pick Ticket has one of these above dispositions, it will **not** be included in this shipment. It will be in another shipment.

Immediately call Customer Service if the items you received in the shipment do not match the Pick Ticket record of materials shipped.

Arrange your parts. Sort your system components into specialty parts (emitters, tubing, valves, filters, chemical injectors, etc.), system accessories (barbs, tubing fittings, pressure gauges, etc.) and PVC fittings. This will help you predict if any additional materials will be needed to complete your project.

Review the irrigation plan. Take time to look over any drawings that may have been provided to assist the installation process. Planning ahead is the best way to avoid installation mistakes and prevent expensive expedited orders.

Mock-up installation. Pre-assemble all components that allow for a dry assembly. An example of a dry assembly would be connecting the pump to the filter station using the proper PVC fittings, accessories, and pipe lengths **without** using glue, pipe thread compound, or fully tightening threaded joints.

Check flow directions. Check and recheck the flow direction indicators on all components during the mock-up. The arrows on the components will denote the flow direction of the water, i.e. pointing from the water source to the field. A good rule of thumb is if it looks expensive, it probably needs to be installed with a particular direction of flow.

Disassemble mock-up assemblies. Once you have mocked-up all possible component assemblies, disassemble components for the final permanent assembly.

Read the following sections to familiarize yourself with the installation and maintenance practices and procedures that pertain to your specific system.

Call with any questions. As always, we are here to help. If you have a question, do not hesitate to call our Customer Service or Technical Service Departments.

Installing PVC Pipe and Fittings

Unloading and handling PVC pipe must be done with extreme caution. Most PVC pipe will be shipped in 20 foot lengths. The long lengths make it imperative to be aware of your surrounding area when unloading. The inside and outside edges of ends of the PVC pipe will sometimes be sharp. Always wear hand protection when handling PVC pipe.

Proper installation procedures and trench preparation are essential to successful PVC pipe performance. Trench preparation procedures for PVC pipe do not vary substantially from procedures used with other piping products.

There should be no more trench prepared than the footage of pipe which can be laid in a day. A typical trench cross section and terminology are given in figure 1.

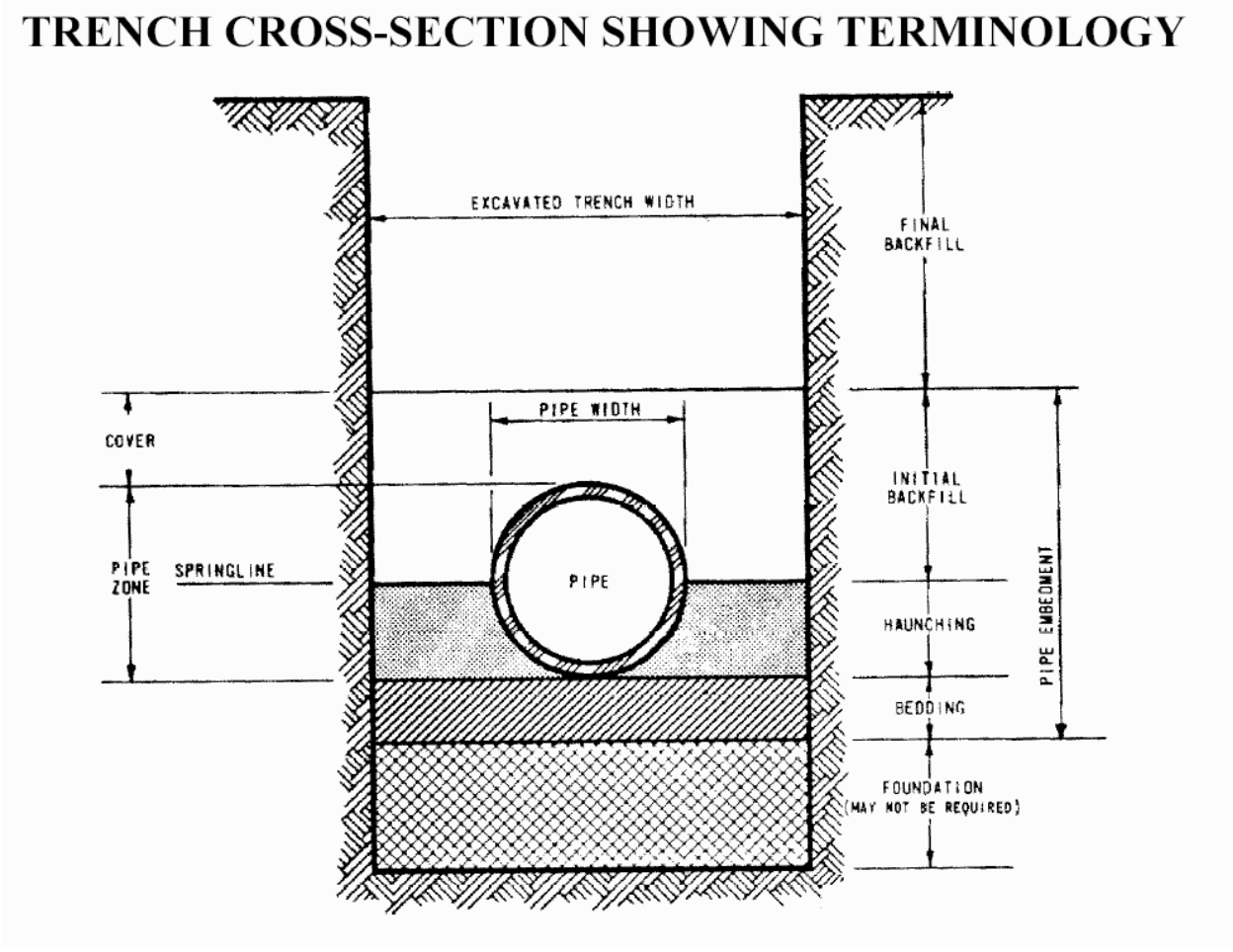


Figure 1.

Pipe that is ready to be installed should be placed near the trench on the opposite side of the excavated earth. The coupling should be pointed in the direction of work progress.

Trench width should allow sufficient room to work safely, for proper alignment and assembly of the joints. The outside diameter of the pipe plus one foot should be considered the minimum trench width at the height of the top of the pipe. The maximum trench width at the top of the pipe is equal to the pipe outside diameter plus two feet.

When more than one pipeline is installed in a common trench, pipe to pipe contact is not permitted. The pipes must be separated by a minimum of six inches of haunch material, and the pipe-zone haunching must be compacted on both sides of each pipe.

The trench depth should be established, after consideration is given to the requirements for the foundation, bedding, grades, pipe size, and cover by the design engineer of the piping system. A minimum of three feet of cover is recommended when surface loads are expected. The pipe should be buried below the plow depth and below the depth of frost penetration.

An adequate or stable foundation should be present (or provided) to uniformly support the full length of the pipe. Bell holes should be provided at each joint to permit proper assembly and support of the pipe. Unstable trench bottoms shall be stabilized by methods and with materials required, by the specifying engineer, to provide adequate and permanent support for the conditions encountered.

When rock, hard pan, boulders, or other material (which might damage the pipe) are encountered in the trench, the trench bottom should be over excavated 1/4th of the pipe diameter, or a minimum of four inches to permit bedding. The bedding should consist of an evenly graded, free flowing, granular material that is free of stones or other hard particles larger than 3/4 inch in size. Bell holes should be utilized to reduce axial deflection and support the barrel of the pipe.

For gasketed pipe and fittings, assembly is made by sliding the lubricated spigot end into the gasketed bell end. The gasket seals the joint against leaks, into or out of the pipeline.

Clean dirt and foreign material from the gasketed socket and the spigot end being sure to remove any burs that were left if the pipe was cut to length. Uniformly, apply lubricant to the spigot end of the pipe up to the insert reference mark and to the gasket surface which makes contact with the spigot end of the pipe.

Insert the spigot end into the bell so that it is near contact with the gasket. Keep the pipe lengths in proper alignment. Proper alignment is described as no angle being formed between the spigot and bell.

Brace the opposite end of the stationary pipe while the spigot end of the joining pipe is pushed through the gasket so that the insert reference mark is flush with the end of the pipe.

Some joints may require barring to seat the joint. If so, use a wood block to protect the end of the pipe. Where the physical weight or trench conditions make the recommended methods unsafe, joints may be assembled using mechanical equipment provided that the pipe is properly lubed and aligned. The end must be protected from damage, and the joint must not be “over belled” or inserted beyond the insert reference mark.

For glue joint pipe (bell end) and fittings, assembly is made by sliding the primed and glued spigot end into the primed bell end. The glue seals the joint against leaks, into or out of the pipeline.

Clean dirt and foreign material from the bell end and the spigot end being sure to remove any burs that were left if the pipe was cut to length. Uniformly, apply primer to the spigot end of the pipe up to the insert reference mark and to the bell surface which makes contact with the spigot end of the pipe.

While primer is still wet, uniformly apply glue to the spigot end of the pipe up to the insert reference mark and to the bell surface which makes contact with the spigot end of the pipe.

Twist joint ¼ turn, and hold joint in place until it has completed initial set up. See below for approximate set up times.

Initial Set up Times

Temperature Range	Pipe Sizes 1/2 to 1-1/4	Pipe Sizes 1-1/2 to 2	Pipe Sizes 2-1/2 to 8
60°-100°F	2 minutes	5 minutes	30 minutes
40°-60°F	5 minutes	10 minutes	2 hours
0°-40°F	10 minutes	15 minutes	12 hours

Do not pressurize pipeline or fittings until they have had the proper time to cure. See below for approximate cure times.

Cure Times

Temperature Range	Pipe Sizes 1/2 to 1-1/4	Pipe Sizes 1-1/2 to 2	Pipe Sizes 2-1/2 to 8
60°-100°F	6 hours	12 hours	24 hours
40°-60°F	12 hours	24 hours	48 hours
0°-40°F	48 hours	96 hours	8 days

For threaded pipe and connections¸ use pipe thread compound, when available, not Teflon tape. If thread compound is used, apply to male threads only. If tape is used, start at the end of the male fitting wrapping in the tread direction for only two or three wraps.

Thread fitting hand tight, then use a pipe wrench or strap wrench to turn the fitting the remained amount.

Tighten PVC threaded connections a maximum of two complete turns. Do not over-tighten.

Thrust blocking is required at certain points in the piping system such as at valves, change in horizontal or vertical direction fittings, change in line size fittings, and at end fittings. The size of the thrust block should be adequate to prevent pipe movement at the point of thrust.

Thrust blocks should be constructed directly in line with the force created by the pipe or fitting. The cavity for the thrust block should be hand dug into undisturbed soil. Simple forms are adequate to hold the freshly poured concrete. Concrete should be fluid enough to be worked around the fitting. Prior to pressurizing the pipeline, make sure the concrete has adequate time to set. Figure 2 shows typical thrust block locations.

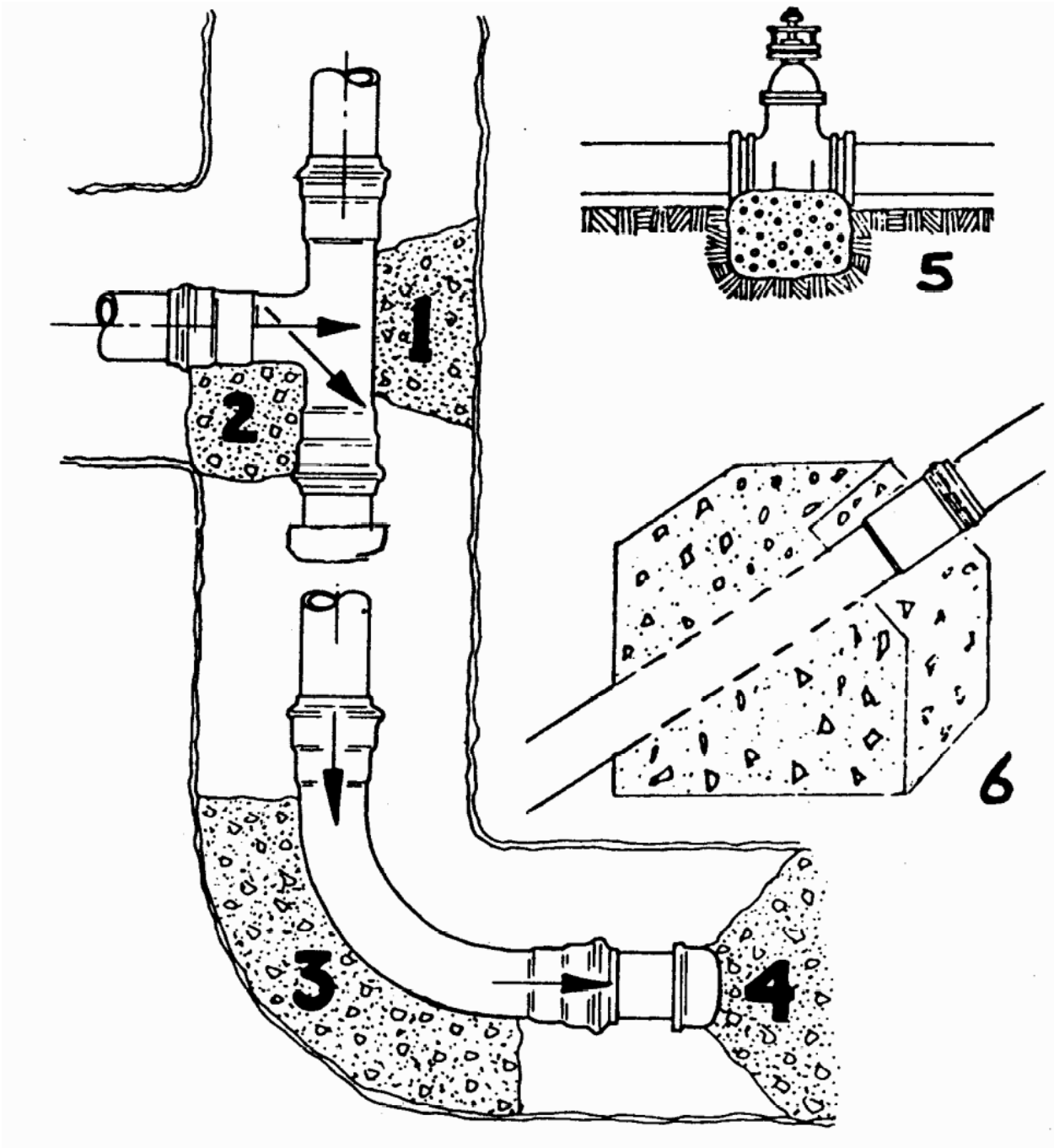


Figure 2.

Installing and Maintenance of Hose

Unroll hose; do not pull hose off of the side of the reel. To prevent damage from kinking, the hose should be unrolled off of the coil. Hold the end of the hose stationary and roll the coil similarly to how you would roll a tire. Another method is to pull the end of the hose while you rotate the coil in a laterally stationary position. Hose un-rollers are available that can speed this process and protect the hose from damage.

Layflat (Polyvinyl) and Oval/Flat (Polyethylene) can be used as general mainline transfer piping to get water from the source to the field. It can also be used as sub-main piping to get water from the mainline to drip tape or drip tubing laterals.

Layflat and Oval hose are to be installed above ground, not below ground level. Because Layflat and Oval/Flat hose is not rigid enough to hold its diameter when it is not under pressure, if they are installed below ground the soil can be compressed around it and restrict the flow of water.

Non-Pressurized Layflat and Oval hose can be driven over. Driving over Layflat and Oval hose should be minimized to extend the life of the product, but general traffic that occurs during the growing season is OK.

Clamps should be used at all hose fitting connections. Clamps should be located on the barb section of the fitting.

Do not over tighten clamps. Clamps that are over tightened can cut into the inside wall of layflat hose causing water to penetrate between the hose walls and therefore cause hose failure. “Blisters” on the hose are a sign of over tightened clamps.

Round low density Polyethylene hose (LDPE) is relatively flexible and widely used in micro-irrigation. Round LDPE can be installed above ground or below ground. It has a large enough wall thickness that it will hold its diameter when it is not under pressure. Poly hose can be trenched or plowed in at a shallow depth to protect it from harvest equipment, cultivation equipment and rodents. If you have a below ground rodent problem (moles, gophers, etc.) it may not be a wise application to install tubing below ground.

High density (HDPE) is pressure rated and very stiff, and is not used in micro irrigation.

Consult with your hose supplier if there is a question about below ground or above ground installation.

Hose can be retrieved out of the field during the off-season to make field operations easier. Hose should be stored in a dry area where it can be shielded from rodents.

Installing and Maintenance of Drip Tubing and Drip Tape

Dripline or Emitterline (hose with emitters built-in) installation can follow the same installation practices and procedures that are outlined above for poly hose. In trellised systems, it is often hung on a wire.

Drip tape can be installed above ground, underneath plastic or organic mulch, or below ground. Drip tape is relatively thin walled, so above ground installation should be practiced for short term use only. To help protect drip tape from rodents, insects, and equipment, a shallow below ground installation or installation below mulch is generally recommended.

Permanent below ground installation of drip tape requires special design and precise installation considerations that will not be covered in this manual.

The outlet on drip tape should be installed facing upward.

To get tape loc fittings to seal properly, cut the tape on a perpendicular line from the flow of the water. Screw the nut on the fitting toward the center of the fitting to expose as much of the tape barb as possible. Press the tape on to the barb as far as allowed. On all fittings except couplings, keep the tape stationary by holding the tape on the fitting barb using your palm, middle finger, and ring finger. With the same hand hold the nut stationary with your index finger and thumb. Use the opposite hand to twist the fitting. This method allows you to hold the tape onto the barb while you are tightening the nut.

For couplings, follow above directions for one side of the fitting. For the remaining side the tape must be held on barb while the nut is tightened.

Installing Automatic Valves and Controllers

These instructions are for 24volt AC powered solenoid valves only.

Determine flow direction of valves. When plumbing the valve into the system, make sure the arrow on the valve is pointing in the direction of the flow of water, i.e. from the water source toward the field.

Mount the controller following the directions provided with the product.

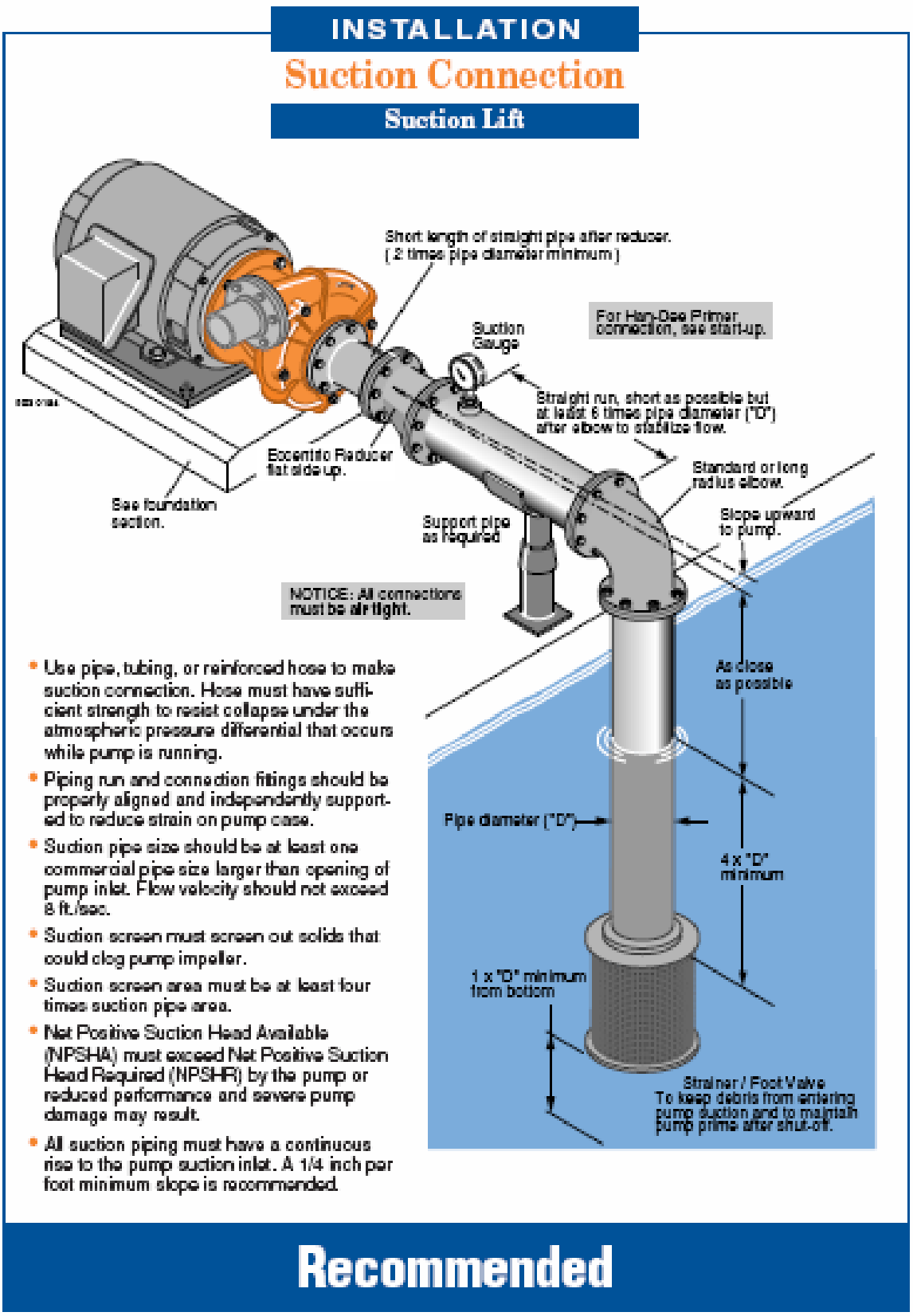
Using the proper size copper wire, connect one of the leads on the solenoid to the terminal on the controller marked common. Connect the second lead on the solenoid to the corresponding zone number terminal that you desire.

It does not matter which lead is connected to which terminal.

Multiple "common" solenoid leads can be connected together in the field, and then be brought to the controller to reduce the amount of required wire.

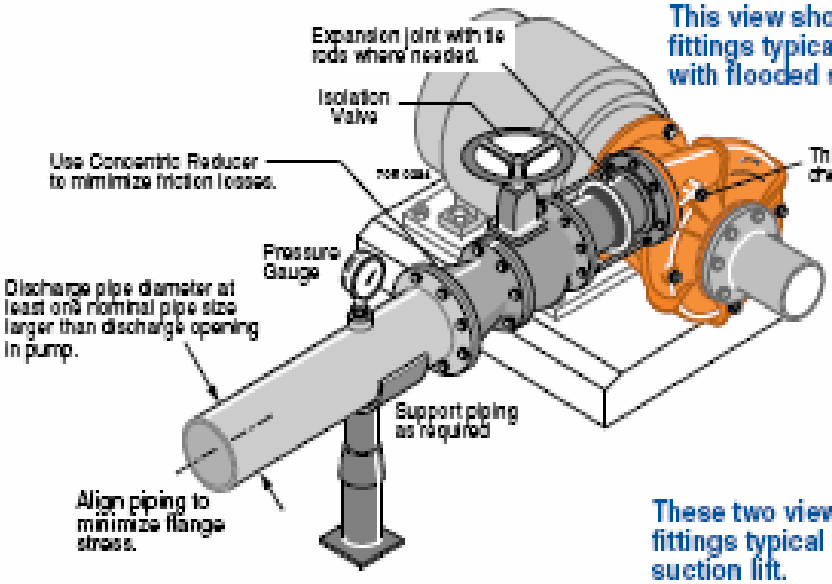
Solenoid valves do not have motors in them. There is a diaphragm inside of the valve that the water used to irrigate with can pass under. When the valve is closed, inlet water is allowed on top of the diaphragm, which pushes the diaphragm down, closing the valve. 24volt AC power is sent to the solenoid, therefore magnetizing the solenoid. The magnetized solenoid lifts a stopper that was blocking the exit flow of water on the top of the diaphragm. With the exit flow on top of the valve now open, the water pressure on top of the diaphragm equalizes with the water pressure under it, the diaphragm lifts and the valve is opened.

Installing and Priming a Pump



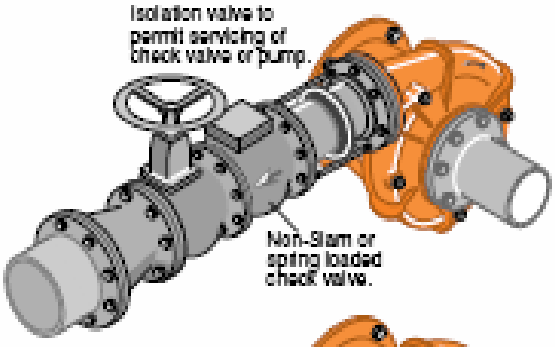
INSTALLATION

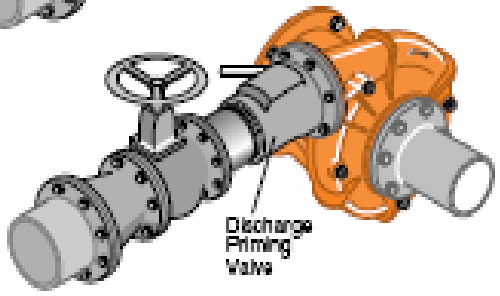
Discharge Connection



This view shows discharge fittings typical of pump with flooded suction.

These two views show discharge fittings typical of pump with suction lift.





- Use pipe, tubing, or reinforced hose to make discharge connection. Material selected must have sufficient strength for operating pressures.
- Discharge pipe should be sized so that flow velocity is below 8 ft./sec.
- Use only non-slamming check valves to prevent hydraulic shock (water hammer).
- Use gate, ball, or butterfly valve for isolation. Valve should be full open during operation.
- Maintain proper pipe size throughout discharge system, using as few elbows and tees as possible to keep friction loss to a minimum.
- Install pressure gauge after reducer as shown to check operating pressure.

Recommended

To prime a self-priming pump, all air must be vacated from the pump caseing. To vacate the air,remove the priming plug from the pump caseing and fill the caseing with water. Return plug into caseing and start pump.

It is not necessary to fill the suction line with water or to use a footvalve with a self-priming pump. However, installing a footvavle and filling the suction line with water will ease the priming process and reduce the propabilit of starting the pump dry.

To prime a non self-priming pump, all air must be vacated from the pump caseing and the suction line. To vacate the air,remove the priming plug from the pump caseing and fill the caseing and the suction line with water. Return plug into caseing and start pump.

It is necessary to use a footvalve with a non self-priming pump to prevent the water you are using to vacating the air in casing and suction line from running out of the end of the suction line.

To prime a self-priming or non self-priming pump using a positive displacment priming device, an air tight discharge valve must be in the set in the closed postion. Ativate the device until all of the air is vacated then start the pump while imediately opening the discharge valve. This process will have to be followed each time the pump is started.

System Start up

Verify the flow direction of all components.

Verify all joints are properly glued, tightened, and thrust blocked according to instructions above.

Slowly open main water source control valve until air is purged from the area of the system that is being flushed.

Flush entire system before considering system operational.

Flush mainlines first by opening flush valves at the ends of the mainline. Keep inlet to all sub-main lines and lateral lines closed during this process.

Flush sub-laterals after mainlines are clean by opening flush valves at the ends of each sub-main line. Flush only one zone at a time. Keep inlet to all lateral lines closed during this process.

Flush lateral lines after sub-mains are clean by opening the ends of each lateral. Your pumping station may not have the capacity to flush all laterals at once. Start by opening the ends of half of the laterals, as you open a new line to flush, close one that is already clean.

After all lines have been flushed, the system can be considered operational.

Sand Media Filters need to be flushed before system lines are flushed. The impurities in the media should be flushed out of the system immediately after the water source is turned on.

Injecting Chemicals

Verify the chemicals you are using will not damage irrigation system components (including chemical injector) or the crop that it is being applied to.

Start up irrigation system.

Measure the length of time it takes to get water out of the emission device farthest from the chemical injector from the start up of the system. This is the time it takes to fill the system with water.

The system must have completed its fill up time before chemical injection begins.

Turn on chemical injector.

Adjust injection rate.

When desired injection amount has been reached, remove injector suction line from chemical and place in container of clean water.

Continue to operate irrigation system while chemical injector is injecting clean water for 1.5 times the fill up time. This will insure that all chemical is purged from the system and all system components are clean.

Turn off chemical injector to return system to normal operation.

The method of operation and installation of your chemical injector will be dependent on the specific style of your injector. Refer to chemical injector owner's manual or call to talk to one of our Technical Service Representatives for any further questions.

Operational Season Maintenance

Monitor flow meter and pressure gauges. Write down the flow rate (gallons per minute) and pressure (psi) that your system operates at for each zone during normal operation. Check these downstream of all filters, chemical injectors and main system control valves. Also, monitor pressure between the pump station and filter system.

Check flow rate and pressures at the start up of each cycle and compare to normal operation.

Higher than normal flow rates can often indicate leaks, while lower than normal flow rates can indicate plugging.

Higher than normal pressures downstream of filter system can be a sign of plugging or partially open zone valves. Lower than normal pressures here can point to leaks, pump suction problems, or clogged filters.

Higher than normal pressures between the pump station and filter system can be a sign of plugging or partially open zone valves or clogged filters. Lower than normal pressures here can point to leaks or pump suction problems.

Regularly flush filter system based on the pressure loss across the filter.

Run time (i.e. every four hours) is not a reliable flush schedule.

A properly sized unclogged screen filter will cause the upstream pressure gauge to read approximately 1psi to 2psi higher than the downstream gauge. Flushing normally should occur when the pressure differential reaches 5psi.

A properly sized unclogged media filter will cause the upstream pressure gauge to read approximately 1psi to 4psi higher than the downstream gauge. Flushing normally should occur when the pressure differential reaches 10psi.

Flushing should continue until the pressure differential returns to the minimum loss recorded under clean condition.

End of Season Maintenance

Flush drip lines by opening the ends of all drip lines. Chemicals can be added to aid the flushing process.

Drain all system components (pumps, filters, valves, PVC Pipe, etc.) that are not installed below frost line or that are not properly insulated.

Polyethylene tubing does not have to be drained.

Turn off electricity at the power source**.**

References

"Installation Guide for PVC Water Pipe", Diamond Plastics Corporation

"Weld-On Solvent Cement Set and Cure Time Table", Weld-On IPS Company

"How To Make Solvent Cement Joints", Spears Manufacturing

"Drip and Micro Irrigation for Trees, Vines, and Row Crops", ITRC

"Berkeley Care Manual", Pentair