



PHOTOS COURTESY GLENN MOORE LANDSCAPING.

IRRIGATION EQUIPMENT & EDUCATION

In Part III of our Irrigation Series, we get technical. Read about hydraulics and pumps; water properties; installation information; how to price it and explain it!

By BRUCE SHANK, BioCom

In these times of downsizing and less government, mandated competence of any profession is a low priority. However, water is one of the few resources that federal regulators refuse to hand over to states. As part of the national infrastructure, like highways and prisons, water supply is one of the standards by which a state is judged. States remain dependent upon federal subsidies for development of water resources, yet only three states have implemented licensing programs for irrigation. When you consider that irrigation, both agricultural and landscape, consumes 80 percent of developed water resources each year, most state legislators are overly trusting in others to regulate water.

State regulators will, however, welcome input from industry regarding competence. Even so, only Texas, New Jersey and some counties of Florida have irrigation licensing laws on the books. We can therefore assume that licensing in the other 47 states is not going to happen rapidly.

Certification shows credibility

Certification has tremendous value from a business perspective. It is one of the few ways to differentiate your company from other companies that may not be certified. You must establish a credible method of self-regulation before certification carries any significance. Consequently, self-regulation depends largely on associations, primarily state and national associations.

Since irrigation is a specialty, landscape associations look to irrigation associations for answers. One thing carries as much clout as a law, and that's bidding specifications.

Get architects and general contractors to require certification, and you will do more for technical irrigation competence than most laws will ever do.

The properties of H₂O

Landscape irrigation systems are available that waste less than 10 percent of the water pumped through them. Most systems in use today still waste up to 40 percent of the water

Get architects and general contractors to require their sub-contractors to be certified. It will do more than most laws will ever do.

cont. on page 4L

cont. from page 2L

taken from the water source. That 30 percent difference represents a huge amount of opportunity.

Water is the liquid state of a chemical compound made up of hydrogen and oxygen. Water is relatively heavy and gravity has a lot of influence on it. When it freezes, water expands instead of contracts. Most things contract (get smaller) as temperature drops. That's why water breaks pipe and sprinklers as it freezes.

Water is a solvent and mixes with many minerals and salts. Those minerals and salts change its usefulness to plants. An amazing process called osmosis regulates the amount of water that enters a plant through its roots.

In simple terms, a plant will only take in water through its cell walls if the concentration of salt is higher on the inside of the plant than in the soil solution. If irrigation water is very salty, the high concentration of salt in the soil solution will cause the plant to stop letting water through its cell walls.

The salt concentration of water is usually measured by the amount of sodium in the solution because sodium is the primary positively charged ion in salts. If the water doesn't pass through the cell walls, the important elements dissolved in it won't pass through either. Water quality is important. It takes more salty water than regular water to meet a plant's needs.

pH affect on nutrient use

Another important chemical influence on water is something called pH. This is a measure of the amount of hydroxide ions in solution. A hydroxide ion consists of one atom of hydrogen and one of oxygen. The combination has a negative electrical charge.

Water is defined chemically as two



Lateral pipe and wire are installed with vibratory plow.

Trenching is cut in for the main line.



atoms of hydrogen and one of oxygen.

That's not really true. In most cases, water is a positively charged molecule of three hydrogens and one oxygen mixed with a negatively charged hydroxide ion. When the two are in the same concentration, the result is called neutral. But, when the hydroxide ion is present in a higher concentration, the result is called basic or sodic. When the hydroxide ion concentration is less than the water molecule, the combination is acidic.

Water is water, but the difference is when you fertilize. Important nutrients, such as nitrogen, phosphorus and potassium, can only be taken into the plant when the pH is in a certain range, usually somewhere between 6.5 and 7.5.

7.0 is neutral. If your water is either highly acidic or highly basic, nutrients are not available to the plant. Bad water is a bad carrier for nutrients.

System hydraulics

The science lesson continues with an explanation of pressure, flow and resistance. Two things greatly influence water pressure, gravity and friction. Gravity is controlled by elevation. A sprinkler head below the water source will have water pressure while one above the source won't even work without energy being used to pump water up to that point. Gravity is free energy in a matter of speaking.

Friction is energy lost by resistance. The amount of resistance is determined by the

amount of water dragging against the side of the pipe. The inside of a pipe resists flow. The longer the pipe is, the more resistance there is. Also, the more pressure the water is under, the faster it will flow and the more it will press against the sides of the pipe. Consequently, resistance is greater. Finally, the larger the pipe, the lower the resistance because a lower percentage of the water is in con-

tact with the walls of the pipe.

Other fittings affect pressure

Pipe isn't the only cause of resistance in an irrigation system. Constricting water flow or changing its direction causes resistance. Sprinklers, fittings, valves, tees, flow meters and backflow prevention devices all increase resistance and lower pressure. Every time you add one of the above to a stream of water, you lower pressure.

If sprinkler heads and emitters weren't designed to operate under certain ranges of pressure, it wouldn't matter. But they were. Without a certain pressure, sprinklers will not work properly.

You need to know the pressure at the source before you can begin to determine how many sprinkler heads or emitters can be used. Then, one by one, you subtract the pressure loss of the pipe and components until you reach the minimum oper-

cont. on page 6L

cont. from page 4L

ating pressure of the sprinkler you want to use. Give yourself a little leeway to make sure you have the pressure you need.

For example, most pop-up sprayheads were designed to work properly with 15 to 20 pounds per square inch (psi) of pressure. Most impact sprinklers and gear-drive rotors need 40 psi to meet specs. Drip irrigation emitters deliver their gallons per hour at approximately 20 psi.

You need to know the pressure loss of the water meter, the backflow prevention



Main line tees are ready for thrust blocking.

device, each fitting, every valve, and each subsequent sprinkler head before you can determine when you run out of the pressure necessary to run the last head. Don't forget elevation. That's why there are irrigation consultants and computer aided design software to figure out all the pressure losses.

Equipment needed

The less dirt you have to move the cleaner the result will be. Trenches for half-inch and three-quarter-inch pipe can be cut with a small earth saw. These relatively inexpensive trenchers can cut eight or more inches deep. For larger mains and laterals, and in areas where codes require deeper trenching, you'll probably require a chain trencher. Large earth saws are made for cutting through rock.

Assemble and glue pipe and fittings

cont. on page 12L

'Plug it in-and-go' pumps have service advantages

Over the last 10 years, turf and landscape professionals have seen a number of changes in prefabricated—or manufactured—pumping systems. Most agree that these advances successfully boost system reliability and increase the options for end-users. These changes



The improvements in manufactured pumps include 'one call service' offered by prefabricated systems makers saves time and money.

also simplify service issues, reduce repair needs and cut service costs.

Systems manufacturers select all components, assemble, ship and provide warranties to cover every system. Should a service need arise, the manufacturer is held responsible for it, no matter which component may have caused the problem.

"One call service" offered by prefabricated systems makers saves time and money.

Manufactured pumping systems also have been improved over time. Many in this field now have as much as 20 years of practical pumping system knowledge, in landscape, golf course and industrial applications.

Variable Frequency Drive takes the system up to desired pressure level slowly, rather

than kicking in at full force as in earlier conventional systems.

Source: John Murtaugh, manager of product support for the Flowtronex PSI FLOBOY line of pumps, Columbus, Ohio.

TOP THREE PUMP PROBLEMS & POSSIBLE CAUSES

Problem

Pump won't start automatically

Possible cause

Power is off
H-O-A switch not in 'Auto' position
Pressure switch sense line plugged
Fuse blown
Overload relay tripped
Safety tripped
Defective pressure gauge
Pressure switch misadjusted
Pressure switch defective
Defective H-O-A switch
Defective starter, motor or PLC

Problem

Pump operates but won't build pressure

Possible cause

Pump has lost prime
Plugged intake

Suction pressure too low

Control valve malfunction

Isolation valve partially closed

System overdemand

Wrong pump rotation

Problem

Pump shuts down on low pressure

Possible cause

Pump has lost prime
Plugged intake
Suction pressure too low
Control valve malfunction
System overdemand
Wrong pump rotation
Pump is cavitating
Material lodged in pump
Bad pressure switch
Bad PLC



The staging area, where irrigation construction materials are held for use. Keep it organized.

above ground where possible. Give yourself more room for valve boxes and sprinkler heads. Use swing joints or flexible risers for sprinklers. Valve boxes should be accessible for maintenance later. Pre-assembled valve assemblies can save time and increase reliability while providing for system expansion. Keep in mind that valve-in-head sprinklers are available for larger-radius heads. If elevation changes exceed ten feet for a station, consider splitting the station into two stations.

Locate satellites to keep wire length to a minimum. You can use battery-powered controllers until power is brought to the satellite. Install receivers for remotes on satellites when the budget allows. Hand-held remotes are great time savers once the system is operational.

Make sure you meet local backflow prevention codes. In some areas, only licensed plumbers can install backflow prevention devices. If the system doesn't include a master valve, install a manual valve so repairs can be made with an unpressurized system.

Pipe racks and bins on trucks can save time. Buy bulk items like fittings, pipe and wire on sale. Try to buy sprinklers, valves and controllers by case loads. Sticking to a few brands will reduce your parts inventory considerably.

Theories regarding head spacing differ by the area and the dependence on irrigation for plant water needs. Two basic designs are rectangular and triangular. The application uniformity of any method is based on the overlap of sprinkler distribution at design pressure and flow. All designs re-

quire some overlap of application. Slope and wind can affect distribution. Do not mix sprinklers or brands within a station. Not only should the sprinklers be the same type, they should have the same nozzles.

Networking and education

Distributors and associations are the primary suppliers of educational support in the industry. Manufacturers also have schools during the year. For a list of books on irrigation, look up the Irrigation Association's web site at www.irrigation.org. You'll find a wide selection of books, many of which are used in the IA's certification programs. You can also find information on local irrigation organizations on the web site, as well as a list of members, manufacturers, distributors, and certified irrigation contractors, consultants, and designers.

The largest assortment of educational sessions on irrigation is available during the IA Irrigation Exposition each November.

The Expo also features the largest display of irrigation materials, in addition to installation equipment, computer software, and consulting services.

Explain the system to clients

DeSantis Landscapes, Salem, OR, gives clients detailed explanations of what the irrigation system includes, and how to avoid problems. Here are some excerpts (-ed.)

"The system has been equipped with an up-to-code backflow device...to comply with water district, city county and/or state law. It allows for water to enter your irrigation system and not be allowed to return to your potable water. In most areas, your backflow device will need to be tested by a certified test, at least once a year, in compliance with water purveyors code.

XYZ valves have been installed. They will be found in the green valve boxes located in your yard. Please, do not cover these with bark dust, dirt, etc., as the location is easily forgotten. Each valve operates a number of sprinklers in a certain area called a 'zone' or 'station.'

XYZ popup heads are used in the lawn area and XYZ pop-ups in the shrub beds.

XYZ heads are used in larger areas because of the distance they spray and the ability to adjust their arc (radius) from 10 degrees to 350 degrees. □

Bruce Shank operates BioCOM Horticultural Communications out of Palmdale, CA.



The main line and laterals are in, the area is cleaned up and seeded.