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TERMINAL VELOCITY

When you discuss irrigation design it doesn't take long to focus on velocity.

Velocity is a very important component of irrigation design, but it is also an important consideration in irrigation-system operation. Rarely, though, do you hear it in the conversation about irrigation-system programming and operation.

Pertaining to irrigation, velocity is how fast the water is moving in the pipe. It is analogous to the speed of your car traveling down the highway. It is most commonly measured in feet per second (fps).

Velocity control is important in any irrigation system. Velocity becomes even more of a concern as the irrigation system and its associated piping gets larger. Uncontrolled velocities can reach havoc levels. High velocities cause surge pressure and undo wear on pipe and fittings, as well as other equipment. Velocity is calculated simply by determining how much water is going through a certain size pipe.

Industry standards dictate the velocity in a buried plastic irrigation pipe be kept below 5 fps. Some designers consider 5 fps to be too low, whereas others consider it too high. Certainly the larger the pipe the lower the velocity should be. For example, where a 6-inch pipe might be fine at 5 fps, a 14-inch pipe may be better with a velocity limit of 3 fps. Remember, it's not just about speed, but also weight. A large pipe carries more water weight, and therefore, more momentum.

Before central control systems, when theses systems were mechanical, the designer could control and dictate how the system would operate and could control the velocities throughout the system. If you can dictate what comes on, where and when, then the pipes can be sized to always be below the 5 fps limit.

In the old days, the operator was not able to change the system design. If the design was correct, velocities would be controlled. It was common to have the operation of the system spread out throughout the 18 holes to minimize pipe sizes and keep system costs down.

With the implementation of central computerized control systems the operator has the ability to decide what goes on, where and when. If the operator wants a whole fairway to operate at once, then the control system can be programmed accordingly. The ability to design for a specific sequence of operation no longer existed.

> Unfortunately, if you look at most golf course irrigation system databases you will find that the flow database is not filled out except for the pump station capacity.

In all the central computerized control systems there is the ability to flow manage the system. Each manufacturer does it a little differently and calls it by a different name.

These flow databases limit the amount of water theoretically allowed to flow through a given pipe. As part of the system programming the flow database needs to be filled out. It basically takes the piping design and then limits through the database the flow through each pipe and, therefore, the velocity.

Unfortunately, if you look at most irrigation system databases you will find that the flow database is not filled out except for the pump station capacity.

So examine your irrigation control system and take a look at what is in it. Is it filled out completely with mainline and lateral piping? Or, is it just a one of a couple of numbers? Is it just mainline, or is it a pump station capacity – one number?

It is important to have a detailed database to keep from putting excessive wear and tear on the piping and control systems and to minimize water hammer.

It is also important to complete the database to allow higher velocities. Some people use higher velocities to lower their water window. However, you're asking for trouble as this will cause more fittings and other irrigation equipment to fail. Ask your original irrigation designer, distributor or other irrigation professional for assistance.

Although many only look at mainline velocities, it is important to look at lateral lines, too. Valve-in-head sprinklers are very fast closing, and a fast-closing valve, in combination with high velocities, causes high surge pressures. So it is just as important to keep lateral velocities under 5 fps even though it is common to see them closer to 7 fps.

For example, on a 2-inch fairway lateral with three sprinklers, each using 32 gpm, there is a total of 96 gallons per minute. If one sprinkler is operating on the lateral the velocity is 2.88 fps, two operating 5.76 fps and all three operating 8.64 fps.

So the operator/programmer can decide whether to operate one, two or three sprinklers on the lateral can at a time. If you were to set the capacity of the 2 inch pipe in the database to 55 gpm, the velocity would be 4.95 fps, and operation would automatically be limited to one sprinkler on the lateral. **GCI**