The following article was contributed by Paul Bando of SISCO.

LIGHTNING

The occurrence of rainfall brings positive charged ions from the air to the ground, leaving a surplus of electrons in the air. When the potential difference between the earth and the surrounding air builds to a certain limit, an arc is formed as the electrons move at the speed of light toward the positive charge. Ionization of air between the two areas of positive and negative charge generates the flash of light and discharge of energy called lightning.

Protection of Sprinkler Equipment From Lightning

Lightning, or any other form of electricity, will seek the path of least resistance in its attempt to reach the ground potential. If lightning strikes an area where both an electrical insulator and a metal object are present, both tied to the ground, the lightning will strike the metal object, since it is the path of least resistance to ground.

A sprinkler system which uses electrically operated remote control valves will usually have a common wire tied to all valves in the system. If this wire is not grounded and lightning strikes it (with many thousands of volts) an instantaneous current will flow through all the solenoids to the control wires and eventually through the insulation to ground. This instantaneous high voltage and current will destroy any solenoid through which it passes.

It is recommended that in order to protect against destruction of all solenoids in areas susceptible to lightning, that the common wire to the valves be grounded to any good electrical ground. This ground can be a metal water pipe, a third ground wire provided with the 115 volt service, or a steel rod driven into the ground a minimum of 6 feet. The electrical path of least resistance will then be through the water pipe (or other ground connection) and not through the solenoid. If lightning does strike a solenoid or a control wire to the solenoid, the current will pass through only that solenoid to ground. The other solenoids will therefore be protected.

Automatic controllers should have their cases grounded. Controllers which actuate pumps should use the pump switch to actuate only a pump relay. This will isolate the pump circuit from the controller and isolate any possible electrical overload in the pump circuit from acting on the controller.

The 115 volt power lines to the controller should have a lightning protection device installed in each controller between these two lines. This device will protect the input side of the controller against high voltage trancients caused by lightning striking the power lines.

There are two basic types of lightning arresters presently available. The most common is the spark gap type of arrester. This is a device which has two electrodes mounted in a capsule filled with gas. When voltage reaches a predetermined maximum the gas is ionized creating a direct short between the two electrodes. With one of the electrodes connected to ground, the high voltage trancient is shorted to ground, thus protecting any devices down the power lines. Spark gap type of protectors generally protect against voltage surges above 1000 volts with response times anywhere from instantaneous to one second. Some are good for only one shot and then must be replaced. Others may be reset or are good for 50 to 100 strikes.

Zener type protectors are solid state devices which can be purchased to protect against voltage surges of 6 volts and up. Due to the precise firing level that can be obtained from this type of device, they are excellent for protecting sensitive electronic circuitry. They will dissipate up to 1500 watts of peak pulse power or 200 amps for 1/120 second.

In summary, grounding of all common wires and insertion of lightning arresters in incoming power lines where necessary, will vertually eliminate mass damage to irrigation systems caused by lightning.