

UNIFORMITY

Spacing Criteria

The spacing distance between the Nelson BIG GUN®* sprinkler locations will affect the uniformity of water distribution in the Quick Coupling (QC) valve system. Normally, spacing between guns is 60% of the sprinkler diameter. Closer spacings result in generally higher uniformity and may be very beneficial in areas of high wind speed.

Rectangular or Triangular Layout?

Rectangular or triangular layout is one of the first design decisions that must be made. Figure 1 shows these layout choices. The triangular layout is generally the best choice unless farming operations require that the sprinkler and valve line up in the cross-row direction.

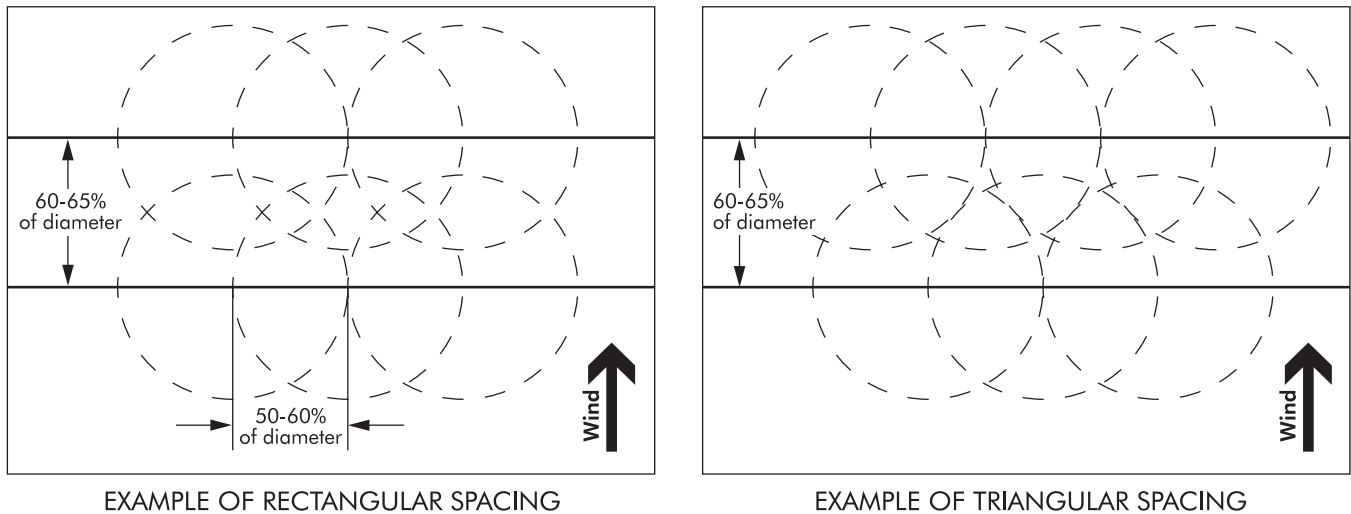


Figure 1

Wind Is a Major Factor

Wind is the major cause of water distribution uniformity problems. To the extent possible, the sprinkler layout should avoid exposing a wide sprinkler spacing to the predominate wind direction (see Figure 1).

Secondary Nozzles

The secondary nozzle in the sprinkler is important for adding the required water close to the sprinkler. Figure 2 is a plot of the distribution of water from the sprinkler showing the added water delivered by the secondary nozzle. The secondary nozzle should be sized to deliver approximately 10% of the total flowrate of the sprinkler. One point to recognize is the increased chance of plugging the smaller secondary nozzle if debris are in the water. If plugging does occur, then additional labor will be required to keep the secondary nozzle open.

*Nelson BIG GUN is a U.S. registered trademark of Nelson Irrigation Corporation, Walla Walla, WA, USA.

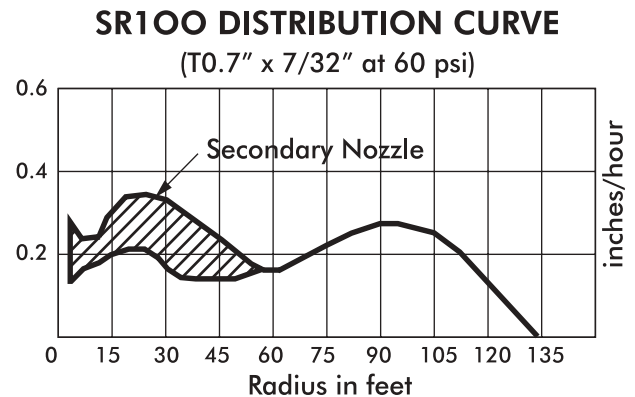


Figure 2

APPLICATION RATE

How to Calculate

The application rate of the water must not be excessive or runoff may occur. Runoff of water can be a serious cause of reduced irrigation efficiency. The soil must be able to intake the water at the rate it is applied. To calculate the total average application rate within a sprinkler pattern, it is best to assume that all sprinklers will be operated at the same time. The average application rate in inches-per-hour can be calculated with the following equation:\

$$\text{AVERAGE APPLICATION RATE (inches/hr)} = \frac{96.3 \times \text{gpm of one gun (including both primary and secondary nozzle flowrates)}}{\text{spacing in feet between guns} \times \text{spacing in feet between lines}}$$

If the soil has a low water intake rate, the application rate can be reduced by running only one gun at a time. This results in a reduced application rate of nearly 60% of that found with the Average Application Rate equation.

Full Circle Versus Part Circle Operation

Full circle or part circle operation of the sprinkler has a great influence on the application rate. A sprinkler set to operate in a half-circle arc will double the application rate. Avoid over-irrigation by running part circle sprinklers for less irrigation time or using a smaller nozzle if necessary.

PRESSURE REQUIRED

What Is Ideal?

Selection of the correct pressure is an important part of the system design. The ideal pressure to target is 70 psi at the gun. This pressure will result in good general performance of the system with a gun flowrate of 100-140 gpm (0.6"-0.7" nozzle size). The minimum pressure should never be below 60 psi in this flowrate range.

Why Is Adequate Pressure Important?

Adequate pressure is necessary to achieve optimum performance of the 100 series Nelson BIG GUN® sprinkler. Avoid poor stream break-up and distribution pattern problems by designing for proper pressure. When the pressure on the gun is less than the minimum recommended above, the stream does not break apart and soil or crop damage can occur from the water intensity; also, the throw distance of the stream will be less than required for good uniformity.

Taper Nozzle or Ring Nozzle?

Taper or ring nozzle choice give field adjustability to the design. The taper nozzle is best to achieve maximum throw of the stream and the ring nozzle is best to break-up the stream and give easy change of nozzle size. The ring nozzle throw is 6% less than the taper nozzle. See the Nelson BIG GUN® sprinkler catalog for actual throw distances.

RISER ASSEMBLY

What Is Important About the Assembly?

Risers hold the QC valve and stabilize the Nelson BIG GUN® sprinkler during operation. The riser must be vertical, stable against vibration, and have low turbulence. Where risers are exposed to machinery or livestock abuse, a rugged assembly is required. The recommended alternatives are listed in the Installation Details and Options section of this manual beginning on page 4.

The 2-Elbow Swing Assembly

The 2-elbow swing assembly (see Figure 3, page 6) is the simplest method used to plumb riser assemblies, and results in the lowest turbulence and friction loss. It is used where height adjustability is not critical. This plumbing is not recommended for the QC valve-in-box installation options (see Figure 5, page 7 and Figure 6, page 8).

The 3-elbow swing assembly (see Figure 4, page 6) is the most flexible installation. If the riser is hit by machinery, the 3-axis swing allows movement, helping to limit potential damage. This option is the best choice for the QC valve-in-box installation options shown in Figures 5 and 6 on pages 7 and 8. The friction loss and turbulence generated within the riser assembly is greater than that generated in the 2-elbow swing assembly. For details, refer to Friction Loss Through the Riser Assembly and Table 2 in the next section.

HYDRAULICS

What Does Hydraulics Affect?

Proper hydraulic design allows adequate water to be delivered to each riser assembly with a minimum of flow turbulence. Consider using the latest hydraulic design tools, computer programs, looping pipe networks, etc., to achieve the best possible design. While pipe purchase and other installation costs are a one-time, fixed capital cost, energy costs and low pressure problems are ongoing and will endure throughout the life of the system.

Friction Loss Through the Valve

The center flow design of the QC Valve results in minimum friction loss and turbulence. Table 1 gives the friction loss of water flowing through the QC valve and key coupled to an SR100.

Friction Loss Through the Riser Assembly

The riser assembly is normally of the 2-elbow or 3-elbow configuration. Figures 3 and 4 on page 6 show the components of these two assemblies. The purpose of these recommended assemblies is to provide convenience for installation, protect the buried pipe lateral from damage if the riser is disturbed with machinery or livestock, and allow the valve to be plumbed vertical.

QC VALVE FRICTION LOSS

Flow (gpm)	Pressure Loss (psi)
80	0.6
100	1.2
120	1.6
140	2.4
160	3.4
180	4.4

Table 1

SWING JOINT FRICTION LOSS (2" pipe)

Flow (gpm)	2-Elbow Pressure Loss (psi)	3-Elbow Pressure Loss (psi)
80	0.6	1.0
100	1.2	1.6
120	1.6	2.1
140	2.4	4.1
160	3.6	5.4
180	4.4	5.8

Table 2

The 2-elbow assembly is less flexible and not as convenient when installing the valve at a set height. This option may be the best for standard applications where the valve is above ground.

The 3-elbow assembly is for installation flexibility when the valve is in a box. It is easier to vertically plumb the riser with this option. There is more friction loss and turbulence in this assembly than in the 2-elbow option because of the addition of one more elbow. Table 2 shows the pressure loss through 2-elbow and 3-elbow configurations at various flowrates. Proper system design must account for these losses to ensure adequate water flow and proper sprinkler performance.

THRUST FROM THE BIG GUN

How Much Thrust?

The thrust generated by a Nelson BIG GUN® sprinkler can be substantial, and provisions must be made to prevent tipping or vibration of the risers. Portable aluminum tripod supports can be used for sprinkler mounting to avoid the need to stabilize the riser with a concrete block or post.

The amount of thrust generated by the sprinkler when equipped with a T0.7" nozzle is shown in Table 3.

BIG GUN THRUST (T0.7" Nozzle)

Pressure (psi)	Thrust in Pounds
50	34
70	48
90	62

Table 3

Importance of Stability

A stable riser is required for correct sprinkler operation. The QC valve and key connection form a rigid coupling between the gun and the riser. With a stable riser, the gun's drive arm is able to consistently input the proper drive force resulting in uniform sprinkler rotation. A stable riser also dampens out vibration created by the drive arm. If vibration is not dampened, and is allowed to travel down to the lateral pipe, it could cause fatigue and possible failure of the tee joint. An unstable riser that does not provide a solid mount for the gun can reduce stream throw radius by as much as 20%.

INSTALLATION DETAILS AND OPTIONS

Typical Riser Plumbing Components

Typical riser assemblies and methods to mount the QC valve are shown on the following pages. The options are shown as suggestions. It is possible that a loose soil will require more stabilization than shown. The methods shown have been successfully used in normal clay and clay-loam soils.

Valve Box with Concrete Stabilizing

This option is shown in Figure 5, page 7. The primary advantage of the valve in the box is the reduced exposure to damage and interference with cultural practices.

Valve Box with Tripod Gun Support

This option is shown in Figure 6, page 8. The primary advantages of the valve in the box are reduced exposure of the valve to damage and less interference with equipment operation. The tripod is portable and is used to stabilize the sprinkler without the need of concrete or a post on the riser.

Valve on Riser with Stabilizing Post

This option is shown in Figure 7, page 9. The primary advantage of the valve on riser with stabilizing post is the ease of mounting and removing the sprinkler. Because no concrete is required, there is no need to allow for forming or curing time during the installation process.

Valve on Riser with Concrete Stabilizing

This option is shown in Figure 8, page 10. The primary advantage of the valve on riser with concrete stabilizing is the longer life expectancy of concrete compared to wood. With this option, the forming, placing and curing time of concrete must be allowed for during installation.

TRAJECTORY ANGLE OF THE BIG GUN

Selection of the correct trajectory angle for the Nelson BIG GUN® sprinkler will result in optimization of pattern uniformity, minimized wind drift and evaporation, maximized radius of throw, and best droplet conditions possible. Generally the 24 degree trajectory angle proves the best choice. At 80 psi with the T0.7" nozzle, the stream height of the 24 degree trajectory is 24 feet above the nozzle at the maximum point. Under the same conditions, the 21 degree trajectory throws 19 feet above the nozzle.

INSTALLATION HINTS

The following hints may be useful during installation and use of the QC valve system.

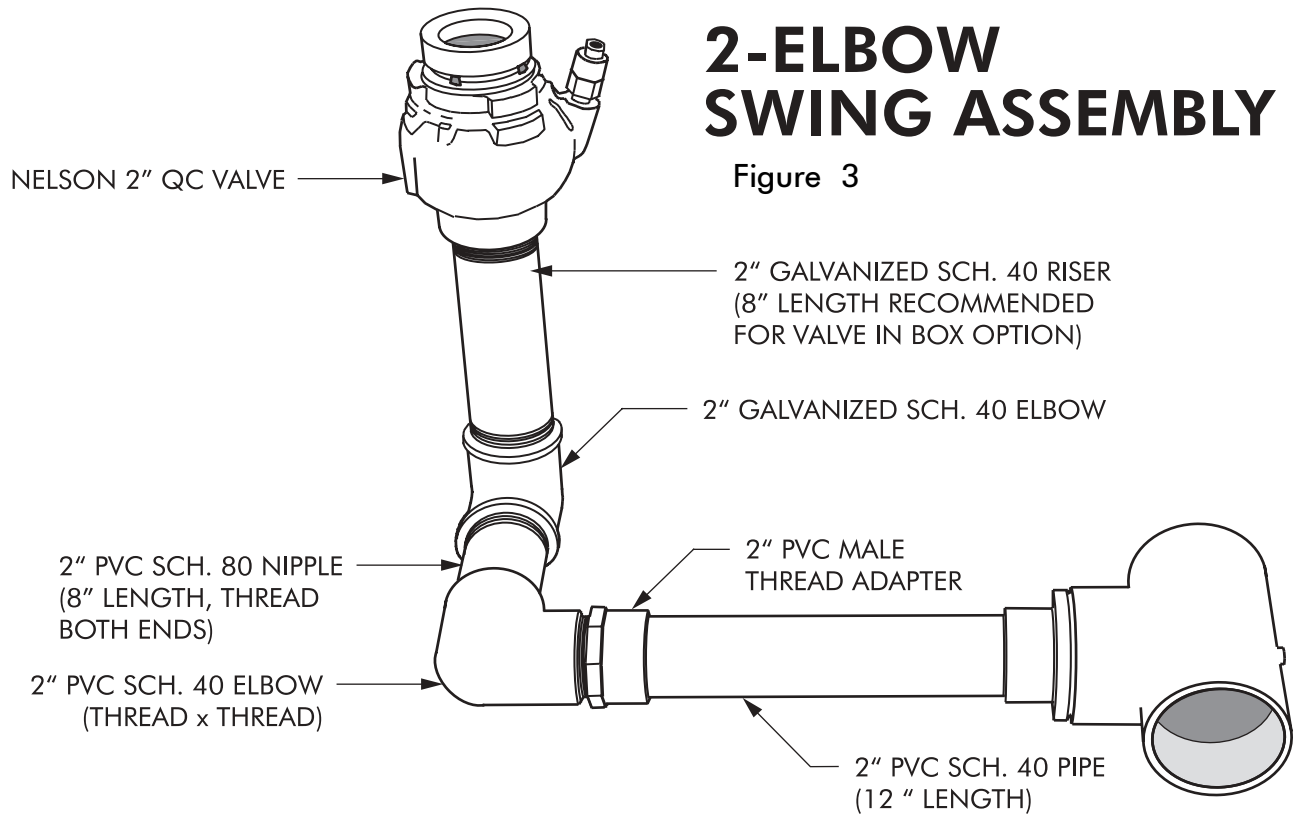
- Select the proper valve box. Adequate clearance for the valve allows for easy mounting of the sprinkler and key, and connecting of the pilot connector. Also, the gun drive mechanism will clear obstructions best if the valve is located as high as possible within the valve box.
- When placing the QC valve near a fence line or other obstruction, be sure to allow for and check clearance of the gun and stream through the entire arc of rotation.
- When installing several valves which will be used as part circles, orient the valve pilot connector in a consistent direction. This will avoid unnecessary changing of the arc setting stops on the gun when the gun and key are moved from valve to valve.
- In areas where freezing could damage the piping, be sure to provide drain valves at all low points. The ball-valve type has the highest durability against leakage.
- A magnetized plumbing level is very useful during installation to get the riser vertical.
- An ACV200 Air Control Valve will release air trapped in the riser. It should be located in close proximity to the QC valve.

OPERATION MODES

To operate a Nelson BIG GUN® Quick Coupling system manually when one or more guns are involved, hook up the hydraulic assist. For easier operation and increased system flexibility, equip the valve key with a timer controlled solenoid to automatically turn the hydraulic assist on and off in sequence. Since the solenoids are controlled with a 9-volt battery, no wires are required. Typically, six to eight guns are set out on QC valves, automatically sequenced over a 24-hour period, and then moved to a new set of locations where the sequence is repeated. Referred to as "semiautomation", this mode reduces the irrigation function to a once-a-day operation that can be done without shutting the system down.

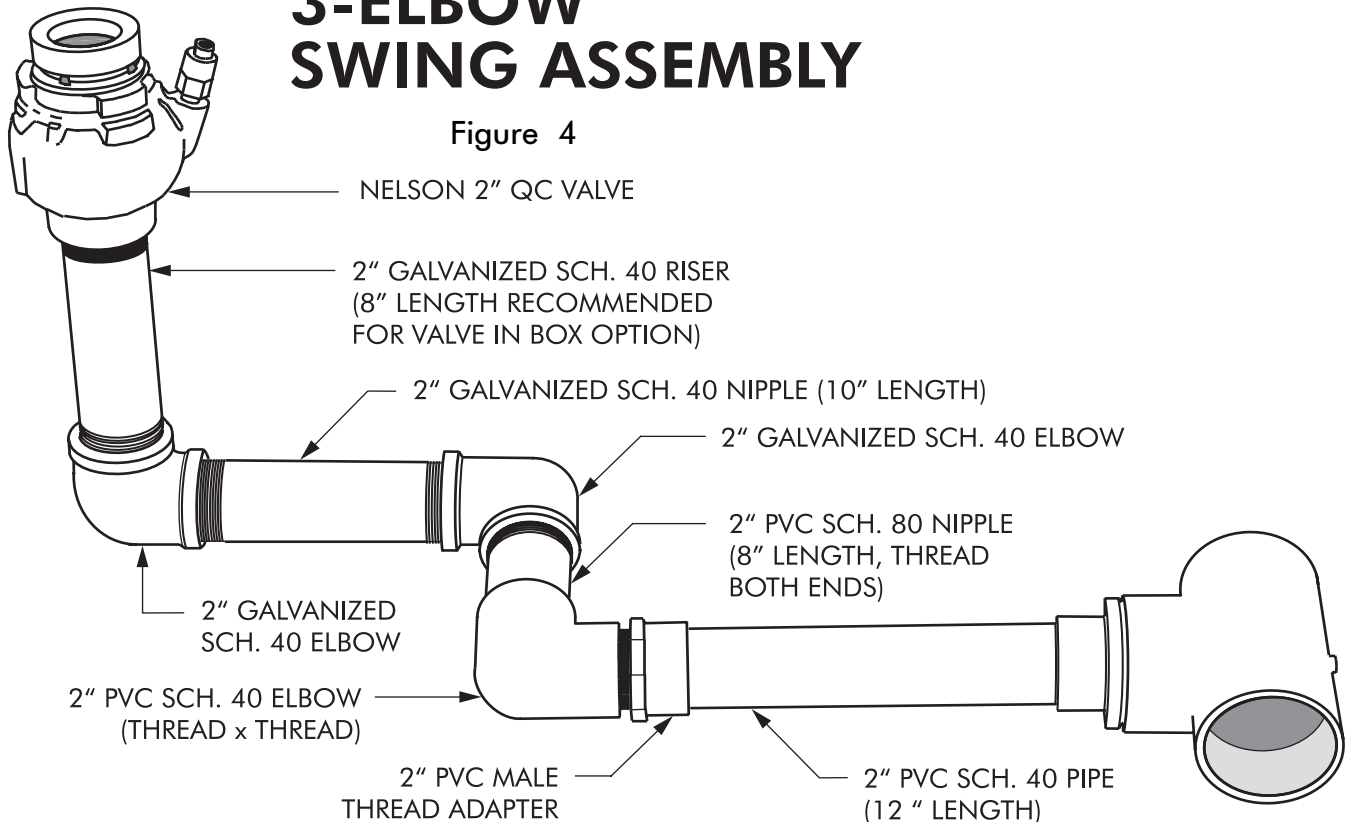
2-ELBOW SWING ASSEMBLY

Figure 3



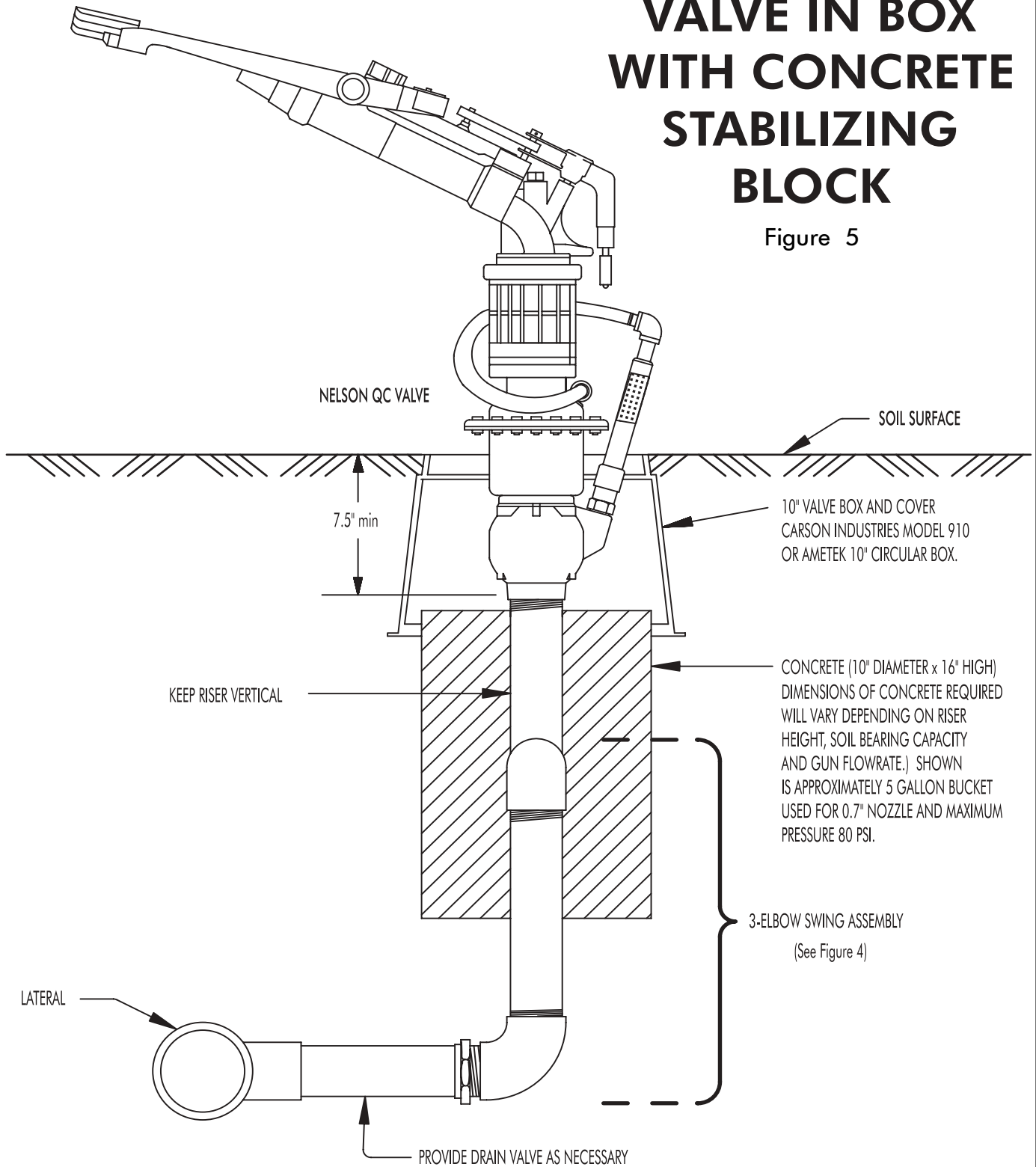
3-ELBOW SWING ASSEMBLY

Figure 4



VALVE IN BOX WITH CONCRETE STABILIZING BLOCK

Figure 5



VALVE IN BOX WITH ELBOW KEY ADAPTER

FOR USE WITH TRIPOD
MOUNTED GUN

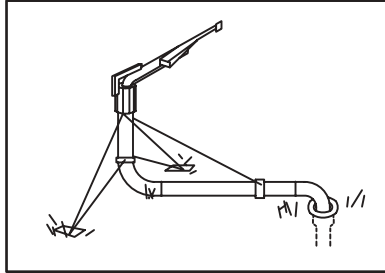
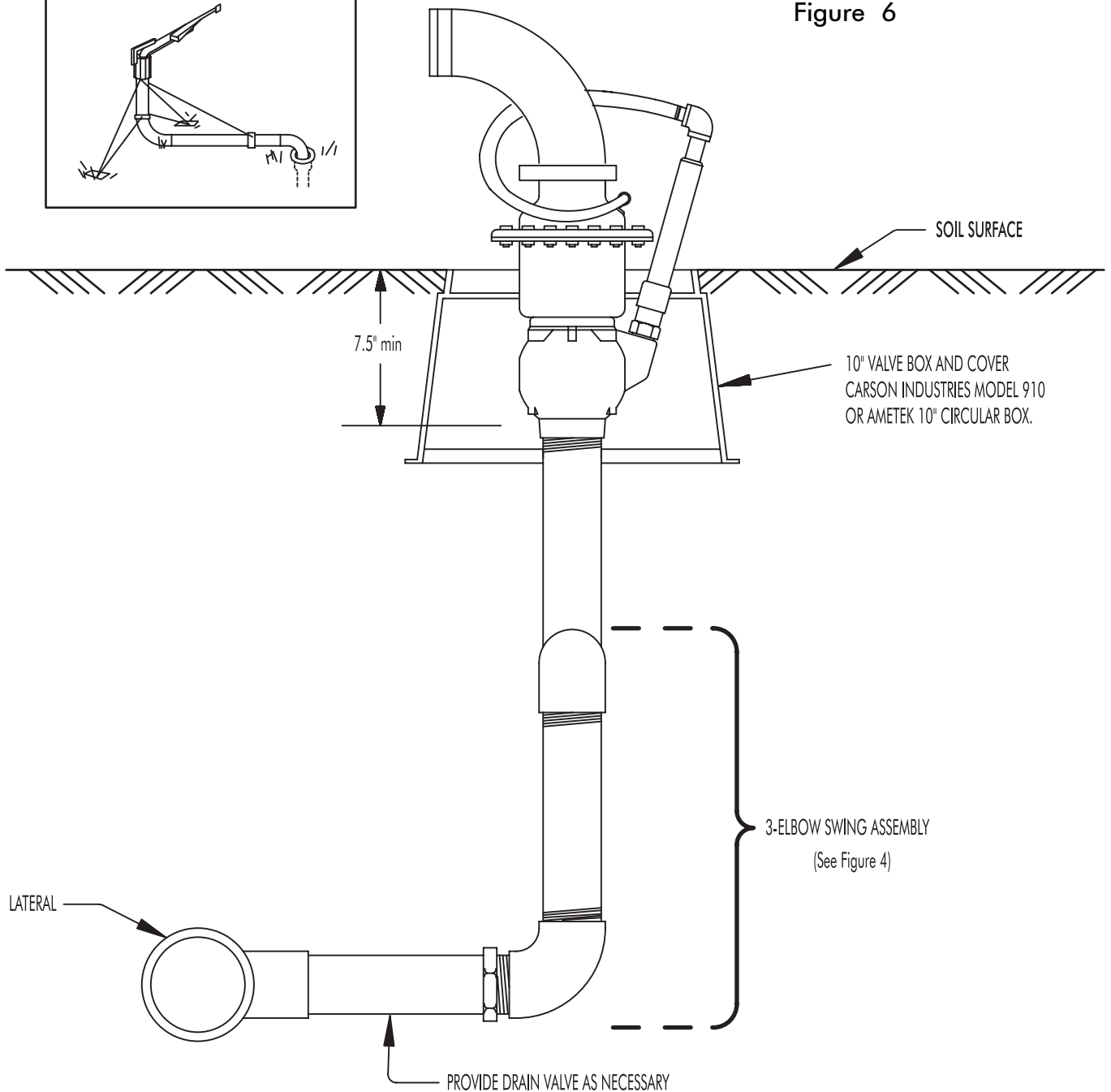
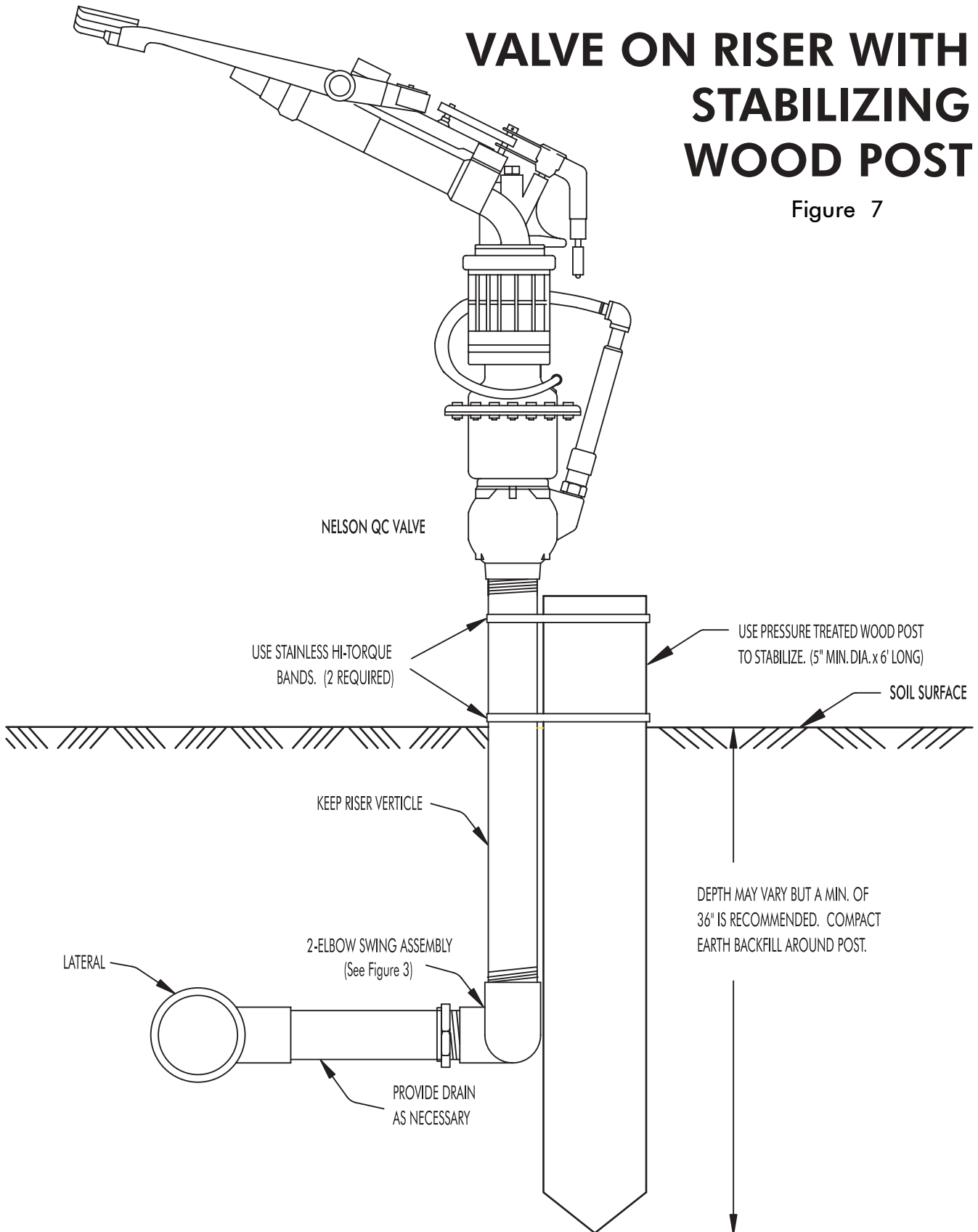


Figure 6



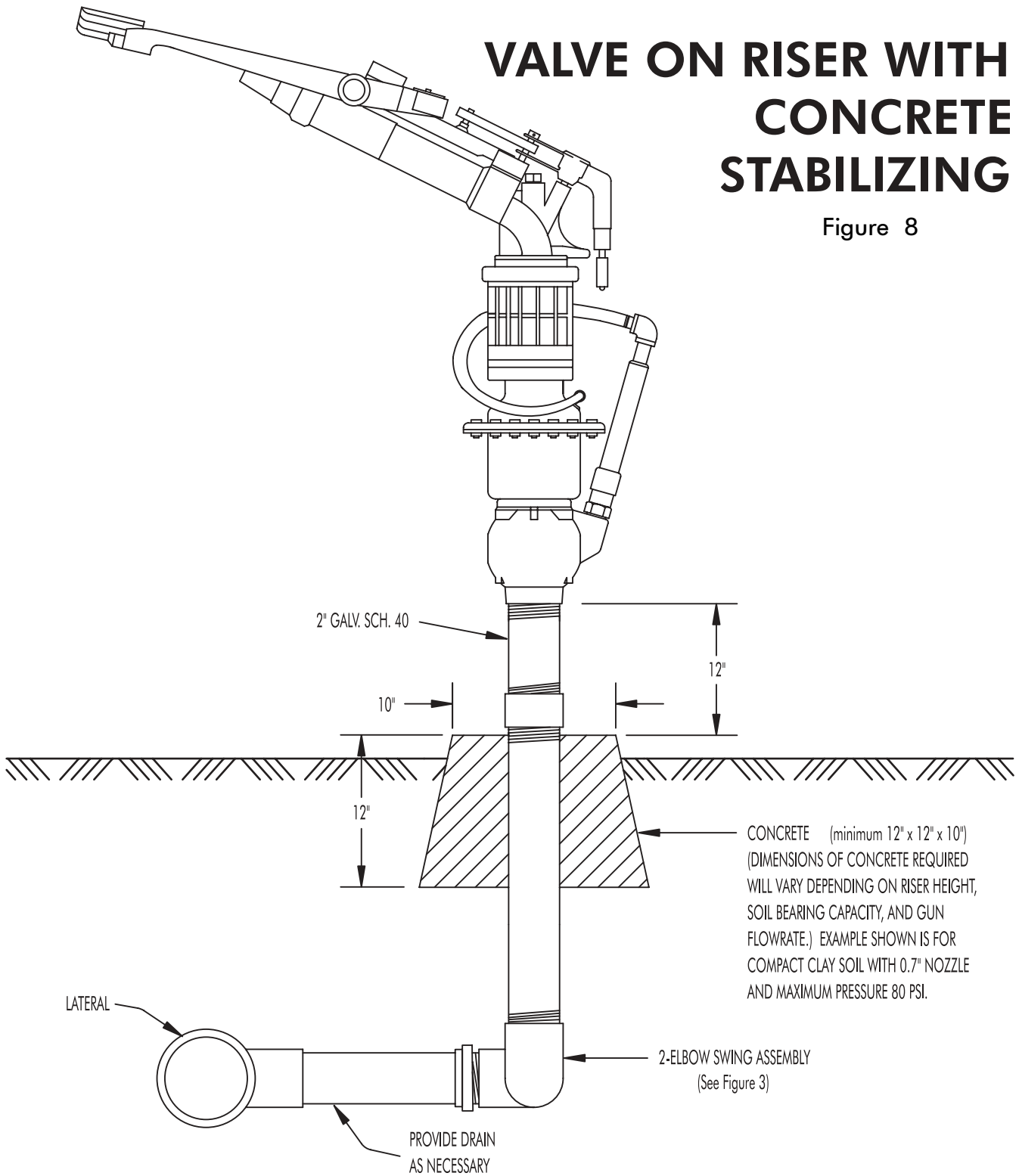
VALVE ON RISER WITH STABILIZING WOOD POST

Figure 7



VALVE ON RISER WITH CONCRETE STABILIZING

Figure 8





CAUTION!

Persons operating the BIG GUN® Quick Coupling system, or persons who will be in areas where the system operates, should be warned that personal injury may result from the high velocity water stream. A special danger exists when a BIG GUN® Quick Coupling is automatically controlled because the high velocity water stream may be emitted without warning when the valve automatically opens. Post warning signs or take other steps to prevent passersby from being injured.

- Read and obey all warning labels and cautions.
- Read operating instructions before operating or adjusting any part of the system.
- Use the Quick Coupling Valve and Key only with the Nelson SRI00, F100, SR75, or F75 sprinklers.
- Never remove or modify the safety guards.
- Be sure water flow through the valve has stopped before turning the key to disengage sprinkler from valve.
- Never make adjustments or perform service while the sprinkler is in operation.
- Stand clear of operating sprinkler and high velocity water stream.
- Never direct water stream onto roadway or electrical transmission lines.

ADDITIONAL INFORMATION

Additional information is available from your irrigation dealer or from Nelson Irrigation Corporation. If you have any questions please call 509-525-7660.

A WORD OF THANKS

Thank you for designing with NELSON IRRIGATION CORPORATION BIG GUN® sprinklers and Quick Coupling valves. Our commitment at Nelson Irrigation Corporation is to provide you with the highest quality products. We work hard at manufacturing and quality assurance to satisfy your requirements. We would appreciate hearing from you. If you have any suggestions for ways to improve our products, this application guide, or our service, please give us a call at 509-525-7660.

WARRANTY AND DISCLAIMER

Nelson BIG GUN® sprinklers and Quick Coupling valves are warranted for one year from date of original sale to be free of defective materials and workmanship when used within the working specifications for which the product was designed and under normal use and service. The manufacturer assumes no responsibility for installation, removal or unauthorized repair. The manufacturer’s liability under this warranty is limited solely to replacement or repair of defective parts, and the manufacturer will not be liable for any crop or other consequential damages resulting from any defects in design or breach of warranty.

This warranty is expressly in lieu of all other warranties, express or implied, including the warranties of merchantability and fitness for particular purposes and of all other obligations or liabilities of manufacturer.

No agent, employee, or representative of the manufacturer has authority to waive, alter or add to the provisions of this warranty, nor to make representations or warranty not contained herein.

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