NETAFIM

Air Vent Selection and Placement Guide

Large Capacity Air Vents Provide Maximum Protection for Irrigation Systems

NETAFIM™

Why do we need to control air in irrigation systems?

The most efficient way to control air in irrigation systems is by proper use of air valves. Control of air is very important and, depending on the circumstances, both the presence of air and its absence can cause severe problems and damage to the system.

Problems and damages due to presence of air in pipelines are:

- Impedance of flow in pipelines - obstruction up to complete stoppage, at times.
- Serious head losses resulting in energy losses.
- Water hammer damage to pipes, accessories and fittings.
- Inadequate supply of water to sections of crops due to flow impediment and accumulation of pressure losses at the end of systems.
- Inadequate water supply to crops due to inaccurate meter and automatic metering valve readings.
- Serious damage to spinning internal parts of meters, metering valves, sprinklers and sprayers.
- Corrosion and cavitation.
- Physical danger to operators from air-blown flying parts and from very strong streams of high velocity escaping air.

Problems and damages due to the absence of air, when and where it is needed:

- Vacuum enhanced problems and damages
  - Suction of mud and dirt through drippers and tricklers.
  - Suction of seals and gaskets, in-line drippers and other internal accessories of pipes, into the pipelines.
  - Uncontrolled suction of injected chemicals or fertilizers into the system.
- Pipe or accessory collapse due to subatmospheric (negative) pressures.

Absence of an air cushion can increase the damages of surge and slam occurrence.

How air enters the water network

Water contains 2% - 3% soluble air. As water temperature rises and/or pressure in the line changes, this soluble air is released from the water. These bubbles grow and rise to the top of the pipe and accumulate at elbows and high points in the system. If not released, air pockets are formed, reducing the effective diameter of the pipe. Velocities higher than 5 ft/s move the air bubbles towards the end of the pipe. **Note:** The friction of the water along the air layer can be much higher than the friction along the walls of the pipe, especially when the air moves in the opposite direction to the flow of water.

Air is compressible, stores energy and reacts like a spring, causing local water hammer, greatly affecting the hydraulic characteristics of the PVC network.

If not released, air can cause the PVC to burst. Under vacuum conditions the pipe has the potential of collapsing. When using pipes with gaskets, dirt can be sucked under the gaskets and when pressurized again, a leak may occur.

Three stages of operation (air and an irrigation system)

a. At system start-up the network is full of air. As water enters the network, it pushes the air to the nearest opening.

b. During normal operation of the system, dissolved air is released from the solution and free air accumulates and must be released.

c. At the end of the irrigation cycle when the pump is stopped, vacuum conditions may occur, and air needs to be introduced into the system.

How do Air Vents control air in irrigation systems?

There are three major types of air vents.

Air/Vacuum Relief Vents are also known as kinetic air valves, large orifice air valves, vacuum breakers, low pressure air valves and air relief (not release) valves. These air vents discharge large volumes of air before a pipeline is pressurized, especially at pipe filling. They admit large quantities of air when the pipe drains and at the appearance of water column separation.

Air Release Vents are also known as automatic air valves, small orifice air valves and pressure air valves. These vents continue to discharge air, usually in smaller quantities, after the air vacuum valves close shut as the line is pressurized.

Combination Air Vents, also known as double orifice air valves, fill the functions of the two types of air vents described above, admitting and releasing large quantities of air when needed, and releasing air continuously when the lines are pressurized.

Rolling Seal Mechanism

The 1” Automatic Continuous Acting Air Vent and the 2” Combination Air/Vacuum Relief and Continuous Acting Air Vents were both developed using a revolutionary concept, the Rolling Seal Mechanism. The combination of the rolling seal and the hyrodynamic and aerodynamic float design make these air valves much more efficient and resistant to premature slamming and shut-off of the air valve.

- The unique rolling seal mechanism allows gradual opening and self-cleaning of the air vent.
- The unique aerodynamic design of the float ensures that the float will remain open and allow the venting of air at differential air pressures of up to 12 psi. The result is continuous venting of air until water reaches the vent and closes the float.

This design enabled the introduction of small, light, and cost effective air vents.

1/2", 3/4" & 1" Automatic Continuous Acting Air Vent

1" Automatic Continuous Acting Vacuum Guard

2", 3" Guardian Air/Vacuum Relief Air Vent

3/4", 1" Guardian Air/Vacuum Relief Air Vent

3/4", 1" Guardian Air/Vacuum Relief Air Vent with Shrader Valve

1/2", 3/4" & 1" Automatic Continuous Acting Air Vents

The 1" Automatic Continuous Acting Air Vent is only 3" wide, stands 5.5" high and weighs only 0.661 lbs. Yet, it has a 0.0233 in^2 orifice, enabling a discharge of 89.5 cfm of air, withstanding 232 psi pressure.

The 1" Automatic Continuous Acting Air Vent has the small orifice feature with orifice dimensions of 1/16" x 3/8".

Stages of Operation:

1. While the system is pressurized, air accumulates in the body, systematically dropping the rolling seal mechanism releasing the trapped air.
2. After air is expelled, water rises in the body and forces the float to close the vent.

Connection: 1/2", 3/4" & 1" NPT Male Connector

Optional 1" Automatic Continuous Acting Vacuum Guard:

- Has all the features of the regular Automatic Continuous Acting Air Vent in releasing air when the pipeline is pressurized.
- Grealy improves efficiency of centrifugal pumps by releasing entrapped air while ensuring continuous pump prime by not allowing air intake.
- Protects mechanical seals in vertical pumps by not allowing air to accumulate in the stuffing boxes.
- In pump suction lines, releases entrapped air, while maintaining the prime by not allowing air intake.
- Maintains siphons and prevents their collapse by continuously releasing trapped air, while not allowing air intake.

3/4", 1," 2" and 3" Guardian Air/Vacuum Relief Air Vents

The Guardian Air/Vacuum Relief Air Vents are smaller, lighter and cost effective air vents. The Guardian is suitable for working pressures ranging from 2 psi to 150 psi.

The 2" Guardian Air/Vacuum Relief Air Vent is ideal for placement downstream of valves primarily at manifolds, to break vacuum caused by system draining. It also works well when placed on sloping terrain to prevent collapsing of pipes caused by vacuum when pipe networks drain.

Built-in Shrader Valve is for measuring local line pressure in the field quickly and easily.

Stages of Operation:

1. The Guardian releases large quantities of air through an opening equal to a large size standard vent. As water enters, the float rises and forces the valve to close.
2. During normal flow, while the line is under pressure, the valve remains closed.
3. As the line empties, or during a drop in pressure, the float drops down and opens the valve. Air is admitted, breaking the vacuum created by the withdrawing water and prevents the collapse of pipelines and suction of soil into dripperlines.

Connection:

3/4", 1" Guardian: Male connector
2", 3" Guardian: Female connector

3/4", 1" and 2" Combination Air/Vacuum Relief and Continuous Acting Air Vents

The 2" Combination Air/Vacuum Relief and Continuous Acting Air Vent measures only 7" in width (including the protruding orifice draining elbow) and stands 8" high and weighs only 2.5 lbs. Yet it has a 0.0186 in^2 small orifice and an 1.25 in^2 large orifice.

The 2" Combination has a unique and innovative feature which improves its efficiency even further. The combination of a large and small orifice in one orifice creates a self-cleaning mechanism. This important design impedes clogging and stops the clinging of particles to sealing surfaces preventing leakage. This provides efficient air discharge and inflow capabilities, surpassing the performances of much larger and much heavier air valves that shut at much lower differential pressures.

In response to customer demand, especially in the irrigation sector, Netafim USA introduced a lighter, less costly version of the 2" Combination, the Polypropylene 2" Combination Air/Vacuum Relief and Continuous Acting Air Vent.

- Polypropylene 2" Combination Air Vent with orange nose:
  - 2 to 150 psi working pressure
- Nylon Reinforced 2" Combination Air Vent with red nose:
  - 3 to 230 psi working pressure

The 1" Combination Air/Vacuum Relief and Continuous Acting Air Vent's dynamic float design allows air release under pressure differential of up to 10 psi. It's durable reinforced nylon body makes it a high impact, corrosion free air vent.

The introduction of the 1" Combination Air Vent allows more flexibility for irrigation design as this less costly vent can replace the 2" size in pipes with diameters up to 4".

2" Combination Air/Vacuum Relief and Continuous Acting Air Vent

1" Combination Air/Vacuum Relief and Continuous Acting Air Vent

2" Combination Air/Vacuum Guard and Continuous Acting Air Vent

Stages of Operation:

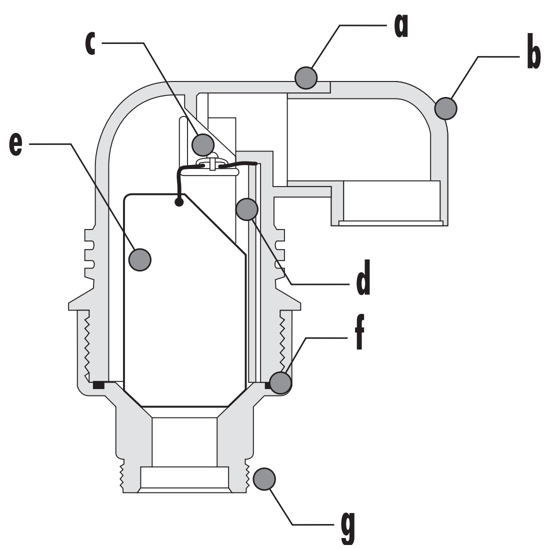
1. During start-up, the valve releases large volumes of air.
2. As the system builds pressure, the body fills with water, forcing the float upwards and closing the valve.
3. While the system is pressurized, the "automatic" function (continuously) expels accumulated air.
4. At shutdown, the valve's large opening allows air back into the system preventing the pipe and accessories from collapsing, and preventing suction of mud and debris.

Connection:

1" Combination: 1" NPT Male connector
2" Combination: 2" NPT Male connector

Optional 2" Combination Air Release/Vacuum Guard and Continuous Acting Air Vent:

- Has all the features of the regular Combination Air Vent in discharging air when the pipeline is being filled and continuously releasing air when the pipeline is pressurized.
- Greatly improves efficiency of centrifugal pumps by releasing entrapped air while ensuring continuous priming by not allowing air intake.
- Protects mechanical seals in large vertical and deep well pumps by not allowing air to accumulate in the stuffing boxes.
- In long and/or undulating suction lines to pump stations, releases infiltrated and/or entrapped air at pump priming, while maintaining the prime by not allowing air intake.
- Enables siphon build-up by releasing infiltrated and/or trapped air and maintains the siphons by continuously releasing air while not allowing air intake.



Installation and Maintenance for 3/4", 1"and 2" Combination Air/Vacuum Relief and Continuous Acting Air Vents

Installation

The air vent will be mounted on a riser, connected to the top of the pipe. An isolating valve will be installed below the air vent.

Maintenance

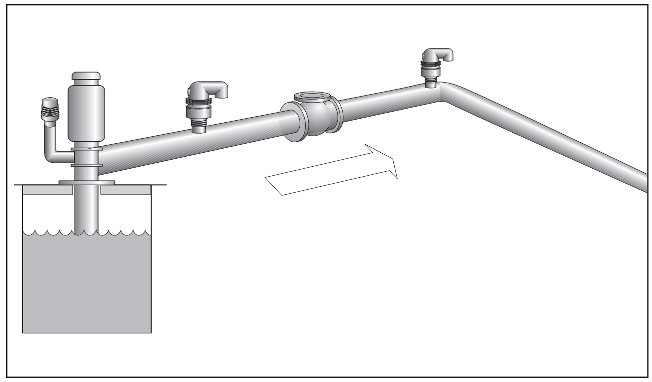
Routine service is an integral part of the standard procedure for maintenance of a water supply system. Recommended routine maintenance should be once or twice a year according to the quality and kinds of fluids in the system.

Basic periodic maintenance steps:

1) Before servicing, close the isolating valve under the valve base.
2) Turn, release and remove the air vent body (a).
3) Check the soundness of the rolling seal (c) by washing it with water and replacing it if torn.
4) Check and wash the body (a) and the float (e) with clean water. Replace the float if it is damaged.
5) Clean the drainage elbow (b) to remove insects and debris.
6) While closing the body of the air vent by turning it, be sure that the O-ring (f) is located in its place in the base of the air vent (g).
7) Open the isolating valve after servicing is complete.

Size selection and placement of Air Vents in an irrigation system

Proper selection, location and sizing of air vents are very important. Following are some rules and suggested practices to help you in your product placement:



Pumps

Many growers have their own water supply sources that include pumping from wells, rivers and private reservoirs. Air is usually present in pumps and in suction pipes. When pumps are started and during operation, air will continue to enter through the pump, fittings and related accessories.

A **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be placed directly after the pump and before the pump check valve.

The **large orifice** discharges large quantities of air at pump start-up, until water opens the check valve and lifts the float, shutting the kinetic (large) orifice. At pump shutoff, air enters through the large orifice, which acts as a vacuum breaker, protecting the pump, fittings, gaskets, and accessories from damages due to subatmospheric (negative) pressure.

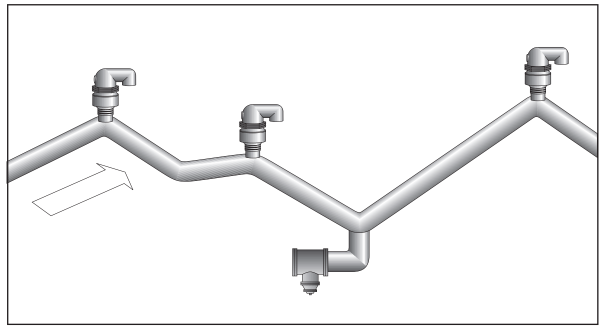
The **small orifice** continues to release air during pump operation, while the pipe is pressurized. It's position before the check valve provides considerable protection from air-bubble-induced cavitation to the check valve disc.

A **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should also be placed after the pump check valve for air intake at pump shutoff or stoppage, when the check valve closes shut, and for air discharge when the water column returns after minor water column separations.

When there is danger of **surge** occurring at this point, the addition of an **NS, Non-Slam Attachment** to the 2" Combination Air Vent should be considered.

Peaks

The **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be placed at all high points on pipes, especially where flow velocity drops below the critical level for air transport (see Critical Velocity graph below).



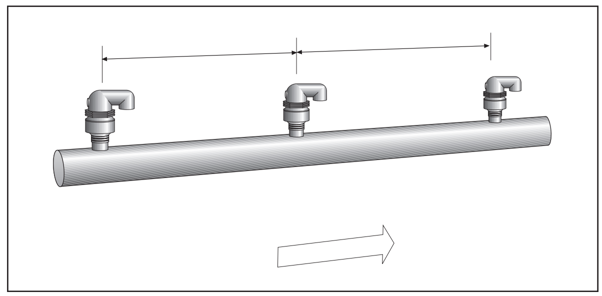
Here, the **large orifice** serves to discharge air at pipe fill-up, and for air intake during pipe drainage or when the pipe bursts.

The **small orifice** serves to release air that accumulates at peaks during normal pressurized operation.

When ground level is relatively flat, pipe slopes are small, and peaks are close together, place a **1" Automatic Continuous Acting Air Vent** at some of the peaks instead of the **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent.**

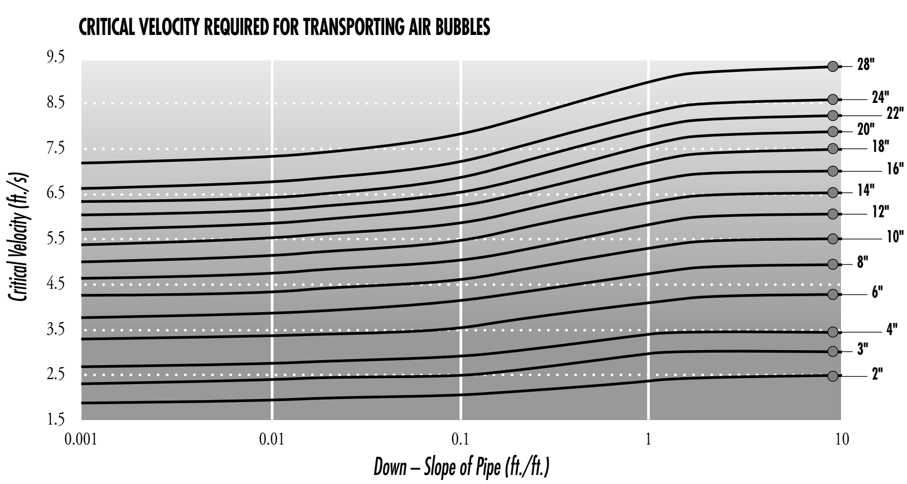
Long Runs

The **2" Combination** or the **1" Automatic Continuous Acting Air Vent** should be placed on long runs, at 550-900 yard intervals. The 2" Combination should be placed on <u>both ends</u> of horizontal runs.



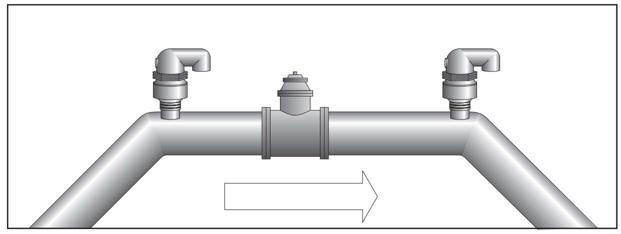
When water flow velocity is below the critical level for air transport, it is very important to place air valves in all critical locations, including:

- Long horizontal runs.
- Where gravitational forces cannot help transporting air bubbles and pockets to air vents at peaks.
- Where water flow is not enough to transport air bubbles to the next air vent.
- In long descending runs where water flow has to overcome cross-flow of air. (See Critical Velocity graph below).



Line Isolating Valves

A **1" Automatic Continuous Acting Air Vent** should be placed before line isolating valves to release air under pressure when the valve is closed, and also to provide considerable protection from air-bubble-induced cavitation to the isolating valve disc.

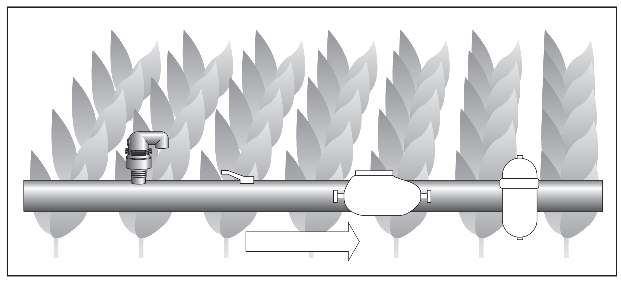


The **1" Automatic Continuous Acting Air Vent** also provides slow, end-of-pipe air release, while filling the pipe when the valve is closed, cushioning the filling operation. Netafim USA's **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be placed before isolating valves with higher diameter, higher flow rate pipelines.

The **2" Combination Air/Vacuum Relief and Continuous Acting Vent** should also be placed after isolating valves to provide vacuum protection at sudden closures, and to aid in the filling operations when the valve is open.

Water Meters and Automatic Metering Valves

One of the most important places to locate air vents in irrigation systems is before water meters and automatic metering valves. The velocity of air can be 29 times that of water, depending on pressure and temperature. When air rushes through a water meter or the metering component of an automatic metering valve, it spins the velocity measuring spinning accelerator with great speed, registering very high volumes of flow. The metering instruments cannot distinguish between air and water and will register very high water flow rates that do not exist. Besides paying high water bills for air, a more severe problem is created - crops receive only a small portion of the water the meters registered and supposedly supplied. This phenomenon can cause severe, often irreversible damage to crops.

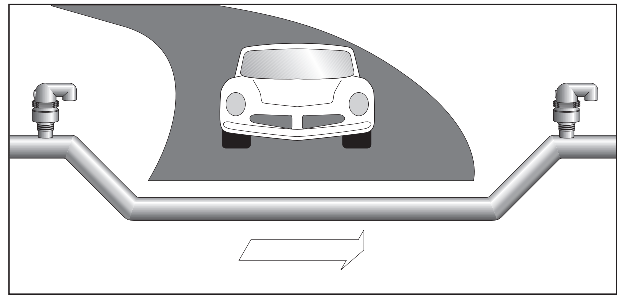


When water spins the spinning accelerator of a metering device, it lubricates and cools it. When air spins the accelerator or spindle, it heats and damages it. If the spinning element is made of plastic, it may even melt. Placing an air vent before a metering device protects it from this phenomenon.

For the above mentioned reasons, a **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be placed upstream from the meter or metering valve. Since an automatic metering valve is a special isolating valve, a **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be installed after it as well.

Road Crossings

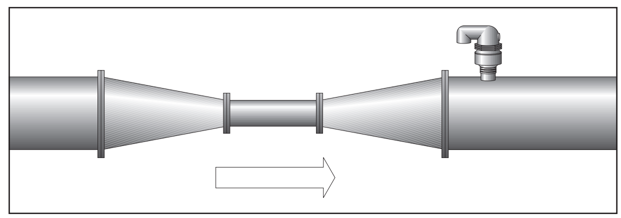
At road crossings where larger diameter pipes dip down and then rise up again in sharp slopes, the 2" **Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be installed. If the crossing is wide and/or deep, air vents should be installed on the top elbows **at both sides** of the crossing. If the crossing is narrow and shallow, placing one combination air vent on the upstream top elbow may be sufficient.



Pressure Changes

In areas of pressure changes, such as pressure reducing valves or pressure breakers, turbulence may result and air may be released from the water to the pipe. During pipe filling, these areas may also be problematic if not properly vented.

Where pressure changes are minor, a 1" **Automatic Continuous Acting Air Vent** should be installed very close and downstream from the accessory or disturbance. If the pressure change and disturbance are major, the 2" **Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be installed.



Even small irrigation systems are complicated for the following reasons:

- High frequency of changes in flow conditions and characteristics.
- The need for in-the-field treatment (filtration) of the water.
- The need for injection of chemicals and fertilizers into the system.

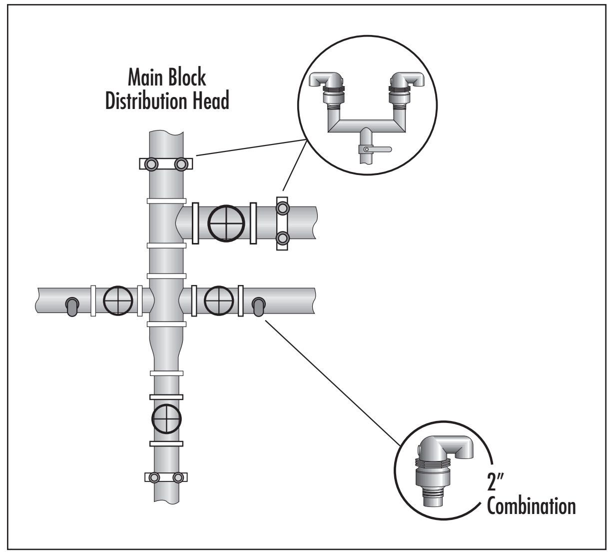
However, these systems are much more flexible and open to in-the-field changes, improvements, improvisations and adaptations. Though mistakes could have serious consequences in damage to crops and equipment, much of the piping and most of the accessories are out in the open, visible, and readily available for maintenance, servicing and repair.

Control Heads

The first accessory on the control head, directly above the riser, should be a **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent.** This ensures air-free water supply to the field and protects the other accessories on the control head and those downstream. It will also protect the water meter. (See page 19 for Control Head with Manifolds schematic enlargement).

If the control head includes a manifold from which a number of distribution mains originate, a **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be mounted after each main's isolating valve, at the point where the main drops down from the horizontal manifold. (See page 19 for Control Heads with Manifolds schematic enlargement).

On small control heads that are close to an upstream air vent, it may be sufficient to place a **1" Automatic Continuous Acting Air Vent** above the upstream riser and a **2" Guardian Air/Vacuum Relief Air Vent** on the downstream side of the isolating valve, above the down-dipping vertical pipe.



Control Heads

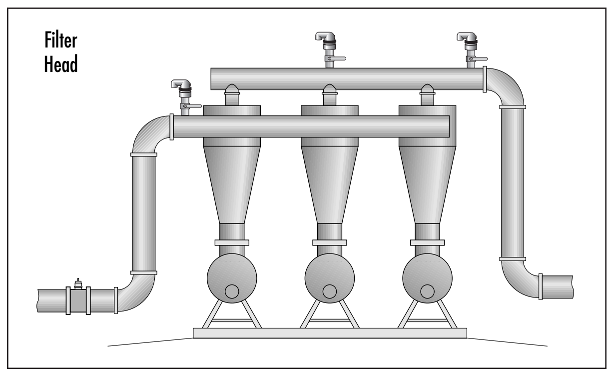
Filter Heads

The **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be installed at the inflow side of filter heads to prevent air from entering the filters.

Additional recommended mounting locations include:

- On top of the filters to release air from within and to enable draining and backwashing.
- At the outflow side to release remaining air and to prevent vacuum conditions and suction of filter media out of the filter.

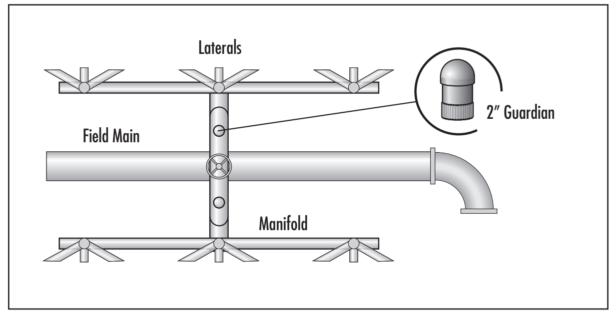
(See page 18 for Control Heads schematic enlargement.)



Filter Heads

Drip Irrigation Manifolds

In drip irrigation systems, it is extremely important to place a **Guardian Air/Vacuum Relief Air Vent** after the isolating valve of the manifold from which the drip laterals originate. If the manifold is long, it may be wise to install a number of **Guardians,** strategically located along its length. These **Guardians** are needed to protect the drippers from collecting mud and dirt when the valve's sudden shutoff may cause water column separation and subatmospheric vacuum conditions. (See page 21 for Drip Irrigation Systems schematic enlargement.)



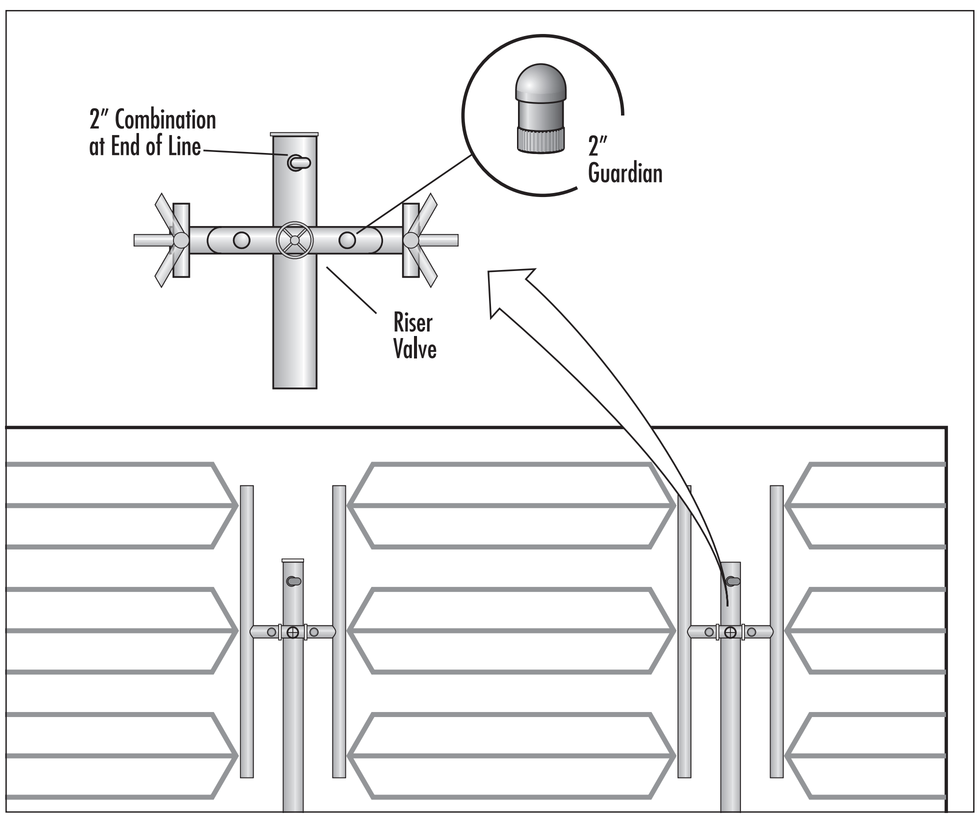
Drip Irrigation Systems

End of Lines

There should always be a **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** at the end of lines and before end-of-the-line isolating valves. If the line is short, position the **1" Guardian Air/Vacuum Relief Air Vent** upstream of a **1" Automatic Continuous Acting Air Vent.** (See page 21 for Drip Irrigation Systems schematic enlargement.)

Irrigation Equipment

In irrigation equipment, such as linears and Center Pivots, a **2" Combination Air/Vacuum Relief and Continuous Acting Air Vent** should be mounted on the pipe knee at the top of the seed tower, and before the isolating valve at the bottom of the feed tower. (See page 22 for schematic of Air Vent placement in Center Pivot Irrigation System.)



Drip Irrigation Systems

Determining the number of Air Vents required at each location

In most irrigation systems, pipe diameters are not very large and flow rates are generally not very high. In most cases, a single 1” **Automatic Continuous Acting Air Vent** will be sufficient at each location.

There are two major criteria usually considered for determining the number of 2” **Combination Air/Vacuum Relief and Continuous Acting Air Vents** required at a particular location:

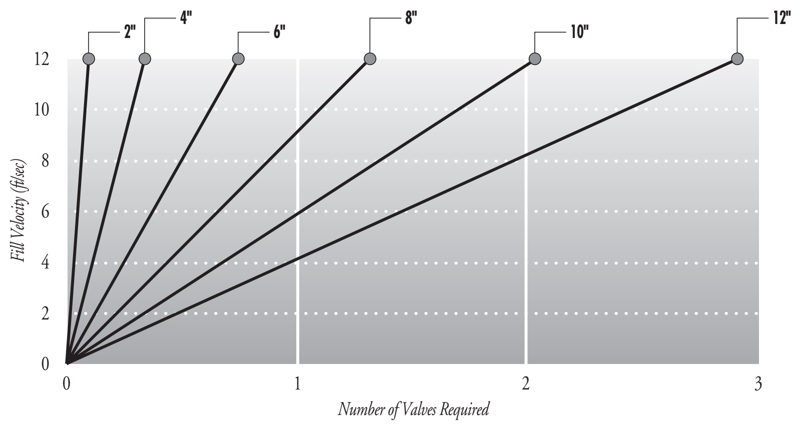
1. The vacuum protection needs provided by air intake.
2. Air discharge requirements at pipe filling.

Since fill velocities are generally kept low to prevent damage to equipment, air discharge requirements are generally lower than air inflow requirements. The following graphs can be used for determination of pipe-fill air discharge requirements.

As can be seen on the graph, in pipes of up to 8 inch diameters, and in most cases, up to 10 inch diameters, one 2” Combination will be sufficient at most locations. This graph is based on air discharge at a differential pressure of 9.7 psi.

NUMBER OF 2" COMBINATION AIR/VACUUM RELIEF AND CONTINUOUS ACTING AIR VENTS NEEDED FOR PIPE FILLING AS DETERMINED BY FILL VELOCITY

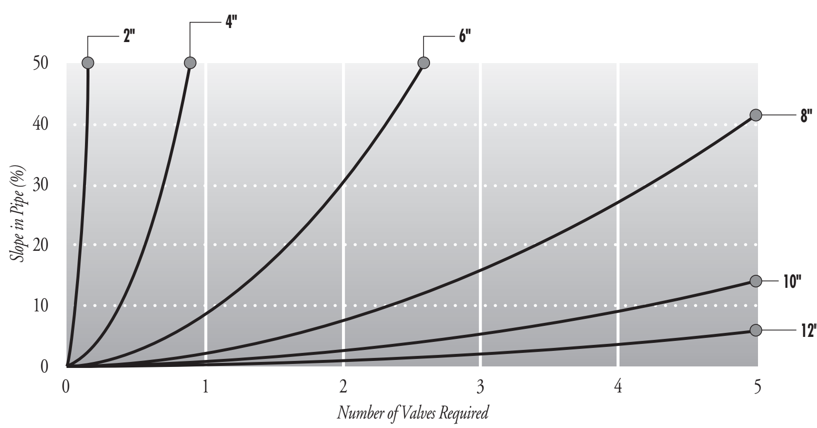
At 8.6 psi differential pressure



Requirements for vacuum protection are generally higher, especially at higher slopes and with larger pipe diameters. The following graph is based on the Burst Analysis, using the Hasen-Williams Formula. The Hasen-Williams Coefficient of 110 and a differential subatmospheric (negative) pressure of 5.8 psi.

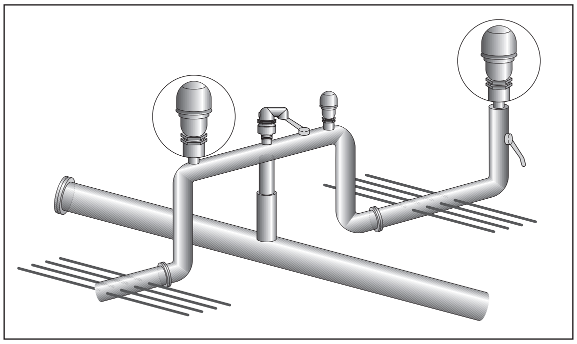
NUMBER OF 2" COMBINATION AIR/VACUUM RELIEF AND CONTINUOUS ACTING AIR VENTS NEEDED FOR VACUUM PROTECTION AS DETERMINED BY PIPE DIAMETER AND SLOPE

At 5.8 psi differential sub-atmospheric pressure



The following schematic drawings show an example of an irrigation system and air valve locations. The first schematic shows the general plan of an irrigation system and its source of water supply. On this schematic, three areas were marked and enlarged in three separate, additional schematics.

Guardian Air/Vacuum Relief Air Vents for vacuum protection in drip irrigation



In drip irrigation, especially subsurface drip irrigation, vacuum prevention is essential, even at very low negative pressure, for the prevention of suction of dirt through drippers, and damage to piping and accessories.

There are three major causes for the formation of vacuum cavities in manifolds from which dripper laterals emanate (distribution manifolds) and in manifolds to which they drain (collection manifolds):

1. At sudden pump stoppage or valve shut-off, water column separation occurs after the inline isolating valve and at peaks, because water supply is suddenly stopped. The existing water mass continues to flow, driven by the forces of inertia. Vacuum cavities are developed exerting negative pressure and suction.
2. At system drainage, if air is not admitted at the rate water is drained, vacuum cavities form, exerting negative pressure and suction. In extreme cases, this can result in pipe or accessory collapse.
3. At pipe or accessory burst (blind flanges, risers, or on-line isolating valves breaking off, for instance), water is drained, sometimes at great flow rates. If water supply is slower than the rate of drainage, and air is not admitted into the pipe, vacuum cavities form causing suction and sometimes even pipe or accessory collapse.

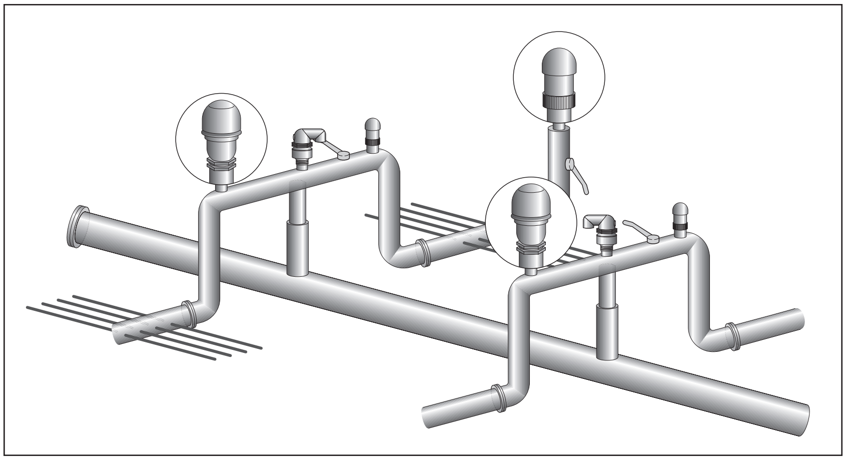
For the above reasons the **Guardian Air/Vacuum Relief Air Vents** are required:

- After inline isolating valves at valve heads, and in distribution and collection manifolds
- At peaks along distribution and collection manifolds
- On tops of risers at the ends of the manifolds.

Sizing of the air vents should be determined according to the maximum water flow rate at water column separation.

If the field is relatively flat, without serious elevation differences and/or significant slopes, yet the operating flow rate is significant, air vent sizing should be determined according to the operating flow rate. At sudden valve closure, the water column continues flowing at the operating flow rate, at least for a very short time. Thus, air intake should be equal to the operating flow rate.

If the field has a varied topography, with differences in elevations and/or significant slopes, air vent sizing should be determined in accordance to the maximum drainage flow rate at controlled drainage or burst (the higher of the two). Air intake should be equal to maximum drainage flow rate. To prevent suction even at low negative pressures, air intake should be determined at low negative pressure, say 0.1 atmosphere (1.45 psi).



The graph on page 17 will help determine the number and size of **Guardian Air/Vacuum Relief Air Vents** required for vacuum protection in plastic manifolds at 1.45 psi vacuum pressure. This covers slopes from 0% to 10%.

The slope to be considered is the steepest slope of any section of the manifold, from the location of the air vent to the lowest point on either side of the air vent not protected by another air vent.

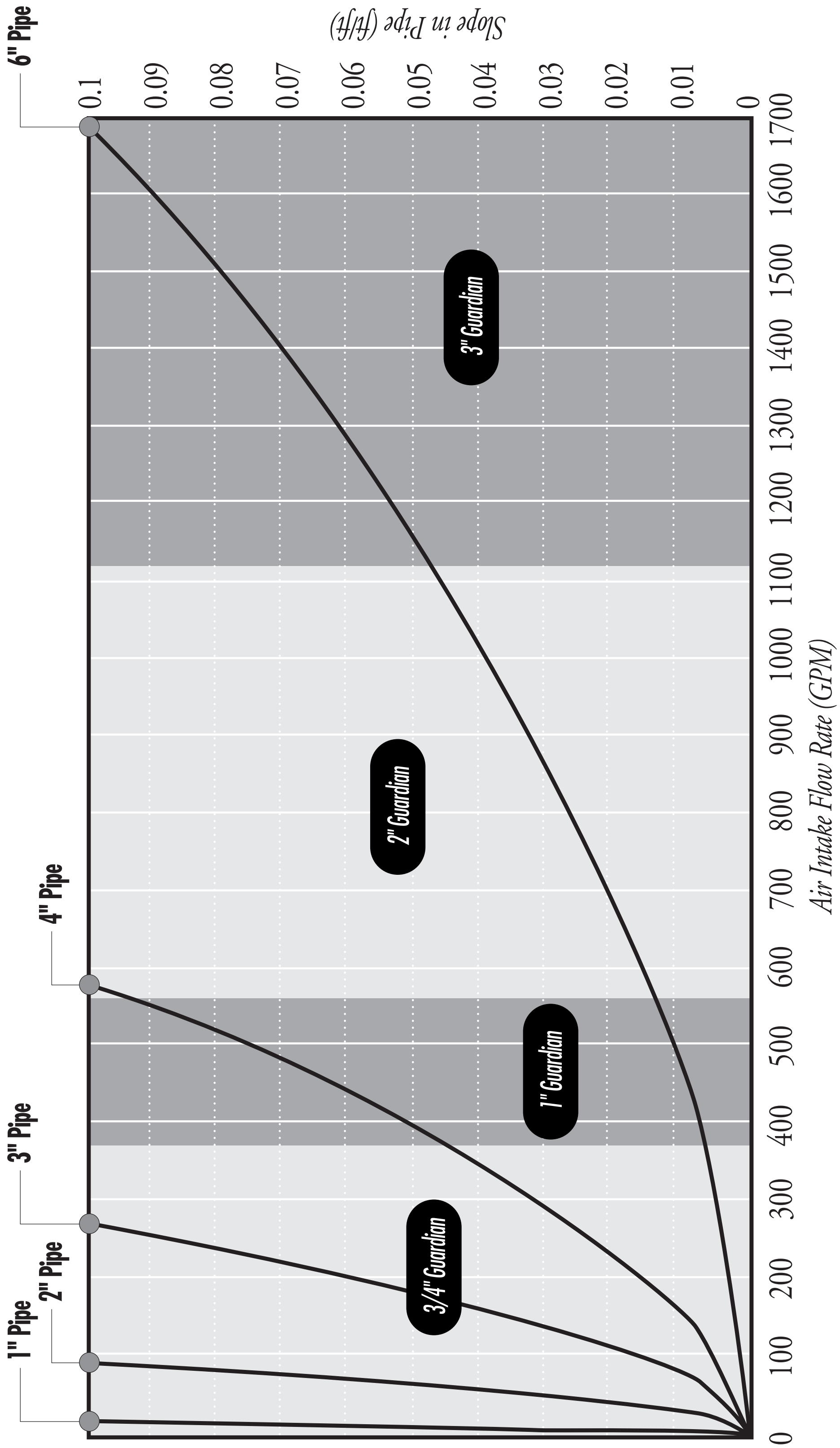
If the air intake flow rate determined by the slope is lower than the operating flow rate at the particular section of the manifold, use the operating flow rate to determine air vent sizing.

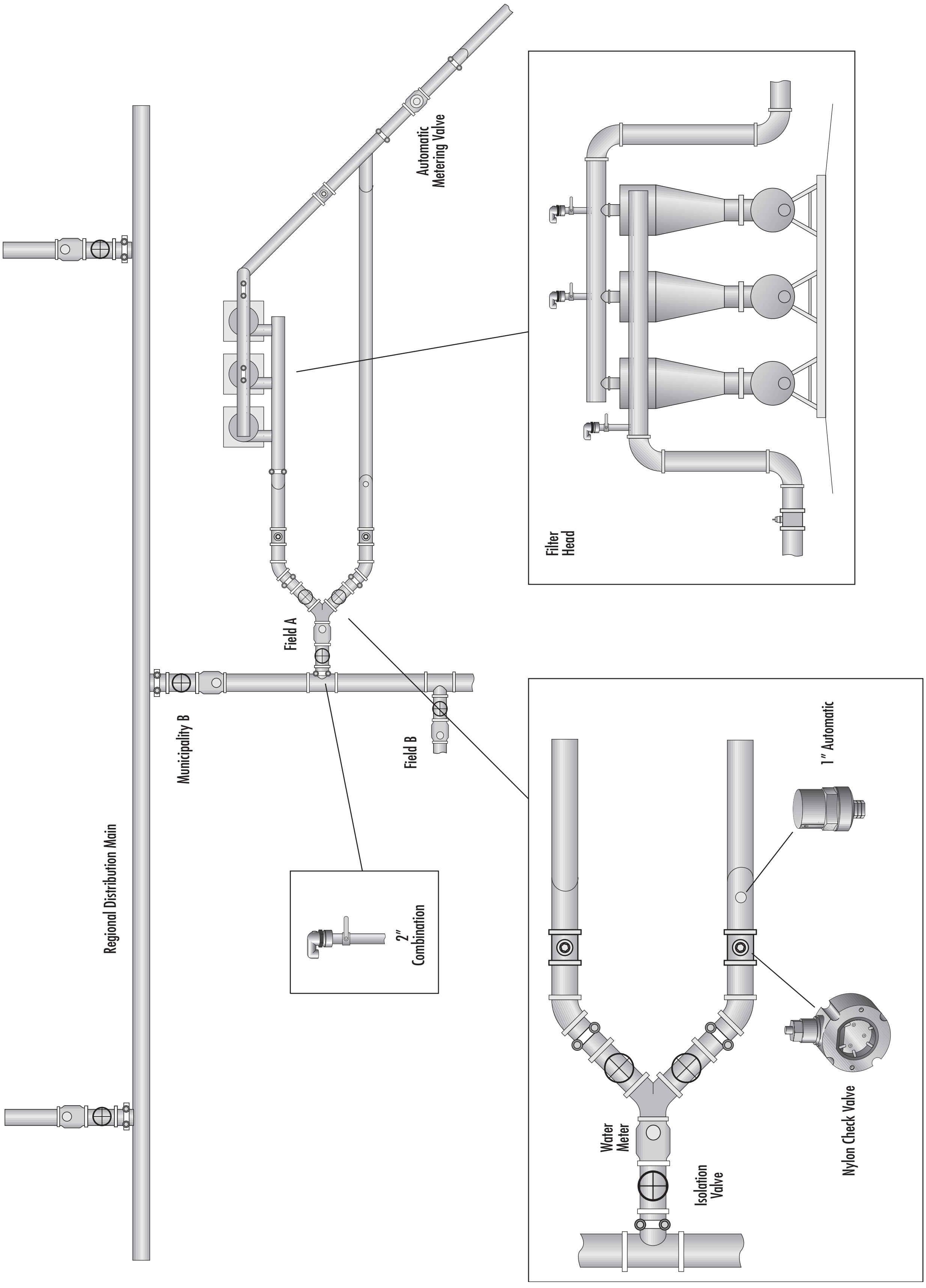
For instance, if the manifold is 4" in diameter and the slope is 5%
(0.05 ft/ft), the air intake flow rate is 300 GPM, according to the graph. If the operating flow rate is 370 GPM, sizing should be determined by the operating flow rate. According to the flow rate determined by the slope (300 GPM), one 3/4" **Guardian Air/Vacuum Relief Air Vent** would be sufficient. But, according to the graph, at 370 GPM operating flow rate, one 1" is required, and this air vent should be used.

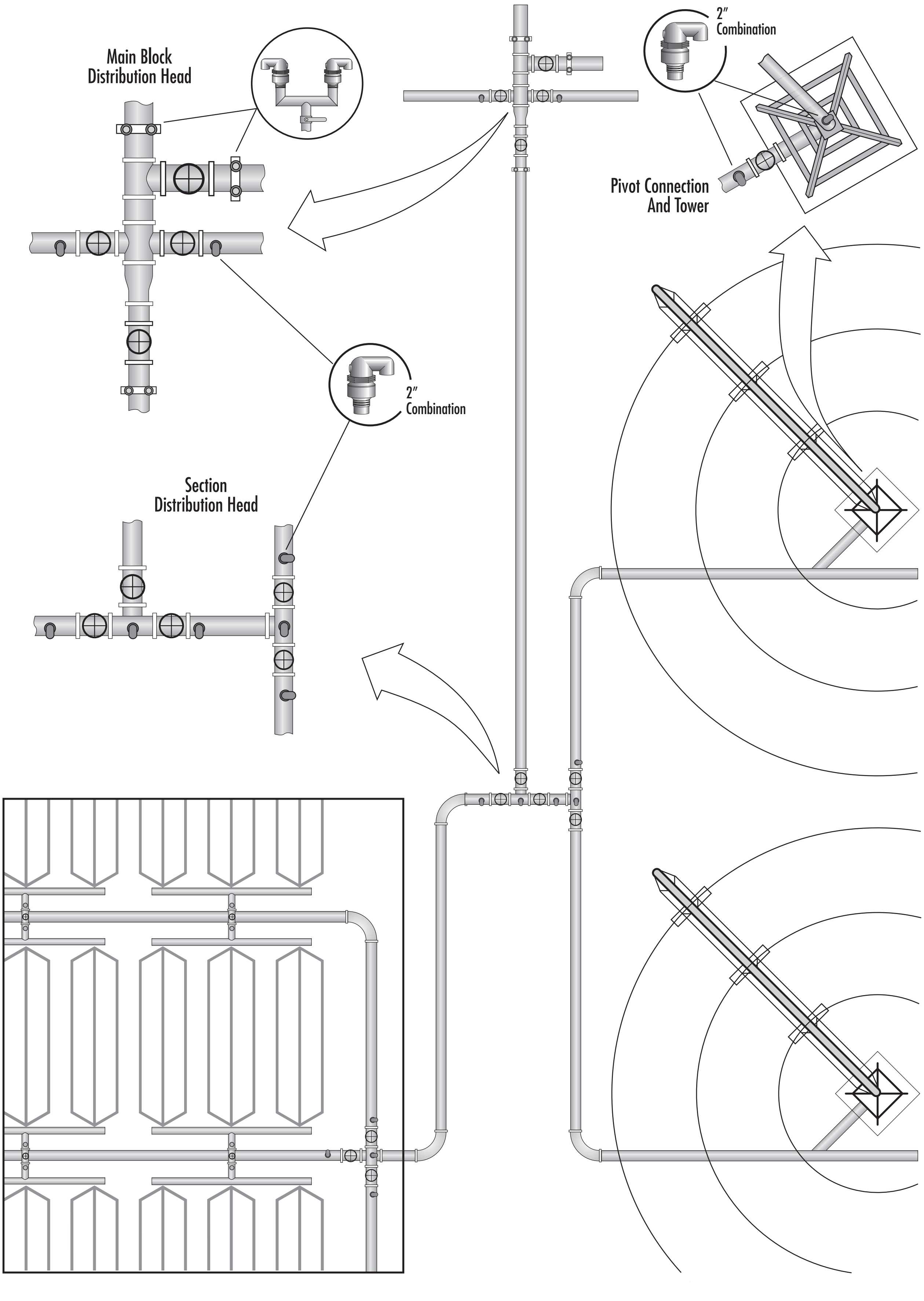
The graph's plot areas are shaded, according to the number and sizes of **Guardian Air/ Vacuum Relief Air Vents** required, to make the graph easier to read.

GUARDIAN AIR INTAKE FOR VACUUM PROTECTION IN PLASTIC PIPES AT 1.45 psi VACUUM PRESSURE

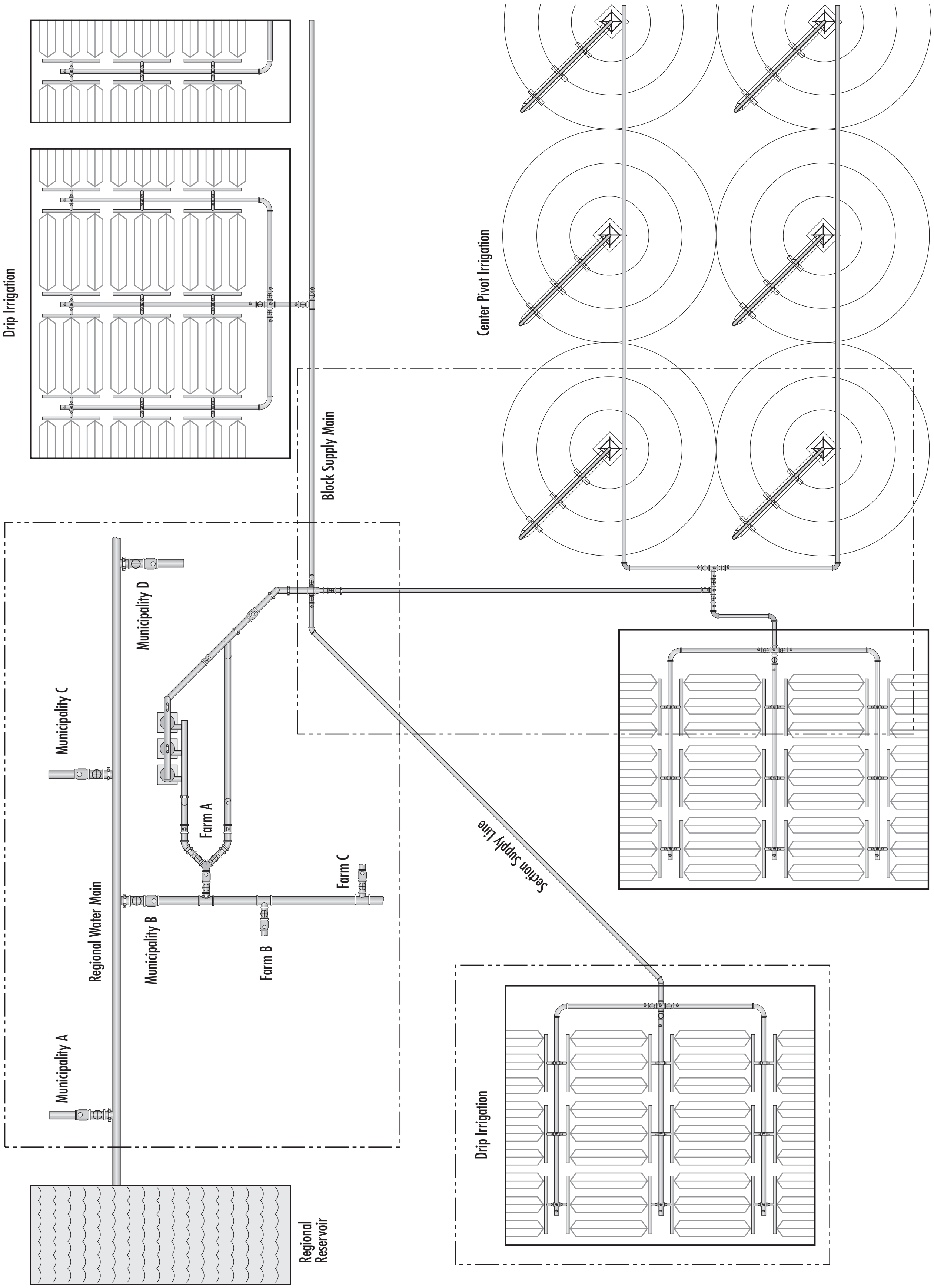
Up to 10% slope

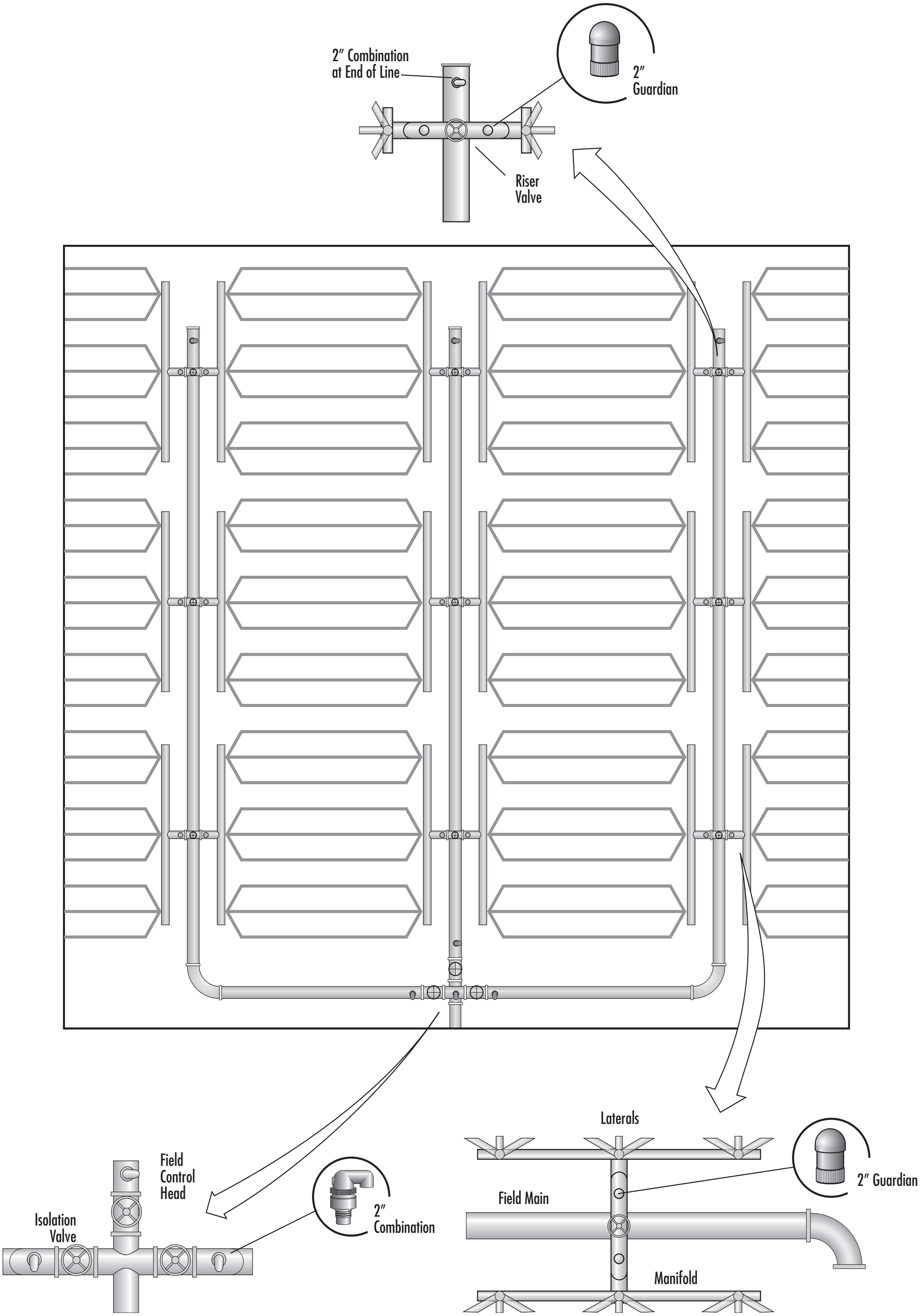


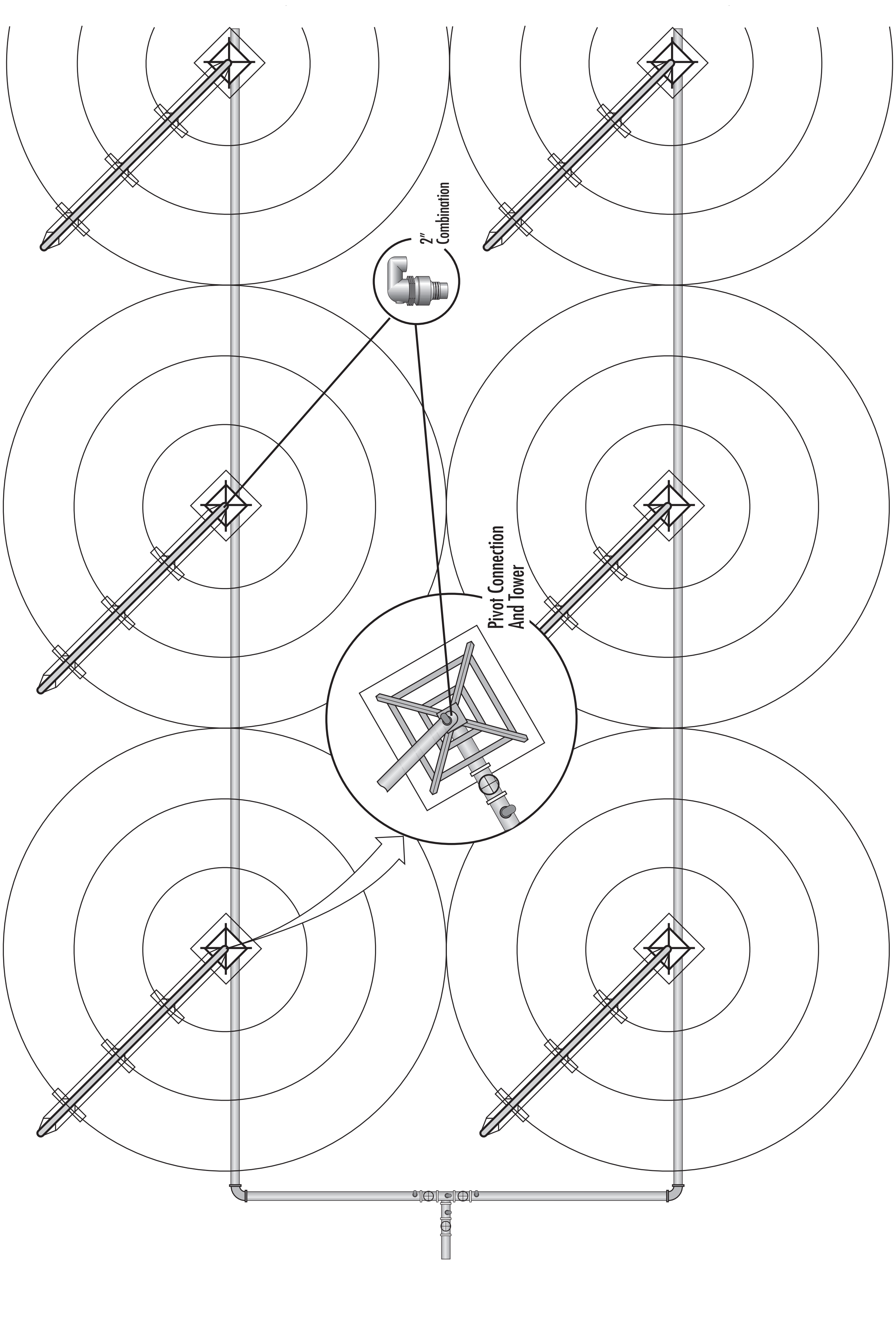

Automatic
Metering Valve
Filter
Head
Field A
Municipality B
Field B
Regional Distribution Main
2"
Combination
1" Automatic
Nylon Check Valve
Water
Meter
Isolation
Valve


Main Block
Distribution Head
2″
Combination
2″
Combination
Pivot Connection
And Tower
Section
Distribution Head

Irrigation Water Supply System




2″ Combination
at End of Line
2″
Guardian
Riser
Valve
Laterals
2″ Guardian
Field Main
Manifold
Field
Control
Head
Isolation
Valve
2″
Combination


2"
Combination
Pivot Connection
And Tower

PROBLEM	CAUSE	SOLUTION
An air vent, usually at the pump station, keeps spitting water.	If an air vent is installed in a very turbulent area, like at the outlet of the pump, direct onto the pipe, the float keeps moving up and down.	By installing a 6-12" riser on the pipe line the problem is solved.
PVC line breaks occur in the same area.	It is very likely that air accumulates and cannot escape, causing local surges and water hammer. The pipes fatigue and eventually break.	Analyze the system and place the correct air vent in the proper location. Also, check if thrusts blocks were installed.

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