Appendix 3

Backflow Prevention and Chemigation: Regulatory Requirements and Guidance

Introduction

The following information is provided to give you a more comprehensive understanding of the regulatory requirements for backflow prevention and chemigation.

In this appendix

This appendix contains the following topics.

Backflow Prevention Regulatory Requirements and Guidance

Scope

This section of Appendix 3 provides information on the Department of Pesticide Regulation's (DPR) guidance pertaining to backflow prevention requirements in Title 3 of the California Code of Regulations (3CCR) § 6610.

Background

3CCR § 6610 requires backflow prevention devices on any service rig and piece of application equipment that handles pesticides and draws water from an outside source.

Contamination prevention

A properly placed and functioning backflow prevention device prevents ground and surface water contamination by stopping the backward flow of pesticides from the mix tank to the water source in the event of a water pump failure or a decrease in water pressure.

Outside water source

For the purposes of 3CCR § 6610, an outside water source includes all sources of water except water stored in a reservoir tank that is owned or under the control of the pesticide applicator and/or the property operator.

Examples of reservoir tanks include mobile "nurse rigs," stationary water tanks (above or below ground), or reservoirs maintained exclusively for irrigation water. The reservoir tank must be separated from the original water source by an acceptable backflow prevention device.

Acceptable devices and device descriptions

The device descriptions listed below were taken from the American Society of Agricultural Engineer Standard titled "Safety Devices for Chemigation" (ASAE EP409.1 DEC97. Copyright © ASAE. All Rights Reserved.). 3CCR § 6610 does not include backflow prevention device standards nor does DPR approve backflow prevention devices or systems. The device descriptions are provided for your information and are advisory only.

Continued on next page

Acceptable devices and device descriptions (continued)

Device	Description
Air-gap separation	ASAE description: An air gap is a physical separation between the free-flowing discharge end of a water pipeline and an open or non-pressurized receiving vessel. To have an acceptable air gap, the end of the discharge pipe must be located a distance of at least twice the diameter of the pipe above the topmost rim of the receiving vessel. In no case can this distance be less than 25 mm (1 inch).
Reduced pressure principle backflow prevention device	ASAE description: This device consists of two independently acting check valves, plus a pressure differential relief valve that is located between the two check valves. It can be used for both backsiphonage and backpressure control and can handle most toxic chemicals. A minimum clearance of 300 mm (12 inches) above the ground level or grade is suggested to ensure an air gap between the relief valve and any water that might puddle beneath the device. If the relief valve is within 6.1 m (20 feet) of the water source, provide a trough or conduit to carry valve discharge away from the water source. Note: This device is also identified as a “reduced- pressure zone, backflow preventer” on pesticide labeling that allows handlers to connect chemigation systems to public water supplies.
Double check valve assembly	ASAE description: The double check valve assembly is composed of two single, independently acting check valves and can handle both backsiphonage and backpressure. A vacuum relief valve, low pressure drain and inspection port should be installed immediately upstream of this system (see “Single check valve” below).

Continued on next page

Acceptable devices and device descriptions (continued)

Device	Description
Single check valve, vacuum relief valve and low pressure drain assembly	ASAE description: This system is primarily an antisiphon device and should be constructed of corrosion-resistant materials. The check valve should be spring loaded with a chemically resistant sealing surface capable of preventing leakage. Generally, metal-to-metal surfaces would not be acceptable. The direction of flow should be clearly indicated on the outside of the device. The vacuum relief valve is installed on top of the pipe on the inlet side of the check valve to provide for vacuum relief when flow discontinues. The vacuum relief should be 19 mm (¾ inch) in diameter or sized according to ASAE Standard S376, Design, Installation and Performance of Underground, Thermoplastic Irrigation Pipelines, if underground thermoplastic pipeline is used. The low-pressure drain is for monitoring check valve performance and bleeding off any leakage. It must be located on the inlet side of the check valve at the lowest point, usually directly under the vacuum relief valve. The drain must be mounted in the pipe such that any check valve leakage enters the drain rather than flowing towards the water supply. The drain should be at least 19 mm (¾ inch) in diameter with a closing pressure of at least 7 kPA (1 psi) and not exceeding 35 kPA (5 psi). If the drain is within 6 m (20 feet) of the water source, provide a trough or conduit to carry the drainage away, and grade the surface to assure drainage away from the water source. An inspection port of at least 102 mm (4 inches) diameter should be provided to check for malfunction of the check valve and drain where the irrigation pipeline is 102 mm (4 inches) or larger. This inspection port can be combined with the mounting of the vacuum relief valve.

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Backflow Prevention Regulatory Requirements and Guidance, Continued

Device placement guidance

3CCR § 6610 requires pesticide handlers to equip service rigs and application equipment with acceptable backflow prevention devices before they draw water from an outside source. To prevent the accidental contamination of ground or surface water, a pesticide handler must properly install an acceptable, functioning backflow prevention device between the water source and the pesticide handling equipment.

DPR Guidance: Pesticide handlers may install the backflow prevention device on the pesticide handling equipment or the water source provided they position and install it properly.

Functioning devices

3CCR § 6600, General Standards of Care, requires handlers to perform pest control in a careful and effective manner, and exercise reasonable precautions to avoid contamination of the environment. To prevent ground and surface water contamination, pesticide handlers must ensure that backflow prevention devices function properly whenever regulations require the use of this equipment.

DPR Guidance: Pesticide handlers who use faulty or improperly installed backflow prevention devices violate the requirements of 3CCR § 6600 as well as 3CCR § 6610 whether or not the pesticide application caused environmental contamination.

Requirements beyond the scope of FAC or 3CCR

3CCR § 6610 states “Backflow protection must be acceptable to both the water purveyor and the local health department.” This is an informational statement that notifies pesticide handlers and property operators that local health departments and/or water purveyors may require the use of certain types of backflow prevention devices. Pesticide handlers and property operators should check with these agencies before installing backflow prevention systems to assure compliance with applicable water protection requirements that are beyond the scope of the FAC.

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Requirements beyond the scope of FAC or 3CCR (continued)

DPR and the CACs are not authorized to enforce Health and Safety Code statutes or Title 17, Public Health regulations pertaining to the protection of drinking water. 3CCR § 6610 does not oblige county agricultural commissioners to enforce regulatory requirements that are beyond the scope of their current authority.

The General Application of Standards, 3CCR § 6601 (b), states, "it is not the intent of [3CCR] to require separate or duplicate equipment or facilities." A pesticide handler or property operator may use a backflow prevention device that meets the requirements of another regulatory agency provided the device also meets requirements established by DPR. In situations where the local health department or a water purveyor has clear authority over the acceptability of backflow prevention devices, DPR recommends that the CAC defer to those agencies. Where no other backflow prevention standards apply, handlers must comply with the requirements of 3CCR § 6610.

Chemigation Regulatory Requirements and Guidance

Scope

This section of Appendix 3 provides information on the Department of Pesticide Regulation's (DPR) guidance pertaining to chemigation.

Background

Chemigation is the application of pesticides through irrigation water. Labeling for pesticides that can be chemigated has specific directions explaining exact chemigation procedures, including the installation of devices to prevent backflow of treated water into wells or other outside water sources. Although pesticides may be chemigated directly to furrows, currently most pesticides are chemigated through pressurized systems such as drip, trickle, macro-, and micro-sprinklers.

The greatest concern associated with chemigation is the potential for ground water pollution. Two specific hazards are:

(1) The irrigation pump may shut down from mechanical or electrical failure while the injection pump continues to operate, causing a mixture of water and pesticide to backflow into the water source; and
(2) The pesticide injection pump may stop while the irrigation pump continues to operate, causing water to backflow through the pesticide supply tank and overflow onto the ground.

These hazards can be avoided through installation and maintenance of the safety devices described below.

Pesticide labeling requirements

In 1987, the U.S. EPA established chemigation equipment labeling requirements in response to growing concerns about the potential for ground water contamination due to the application of pesticides through chemigation systems. As a result, current pesticide labeling clearly instructs users whether or not chemigation is allowed. If not allowed, the labeling states, "do not apply this product through any type of irrigation system." If allowed, labeling will contain specific statements that allow chemigation as an application method and lists the safety devices that are required to be installed on the chemigation system.

DPR Guidance: Handlers who comply with the backflow prevention requirements on the pesticide product labeling also meet the requirements of 3CCR § 6610.

Chemigation Regulatory Requirements and Guidance,
Continued

FAC § 12973

It is a violation of the Food and Agricultural Code (FAC) § 12973 to use a registered pesticide in a manner inconsistent with its labeling. Handlers must comply with the specific chemigation equipment requirements shown on the registered labels of the pesticides they use.

DPR Guidance: DPR will consider handlers in compliance with FAC § 12973 when they use the chemigation devices specified on the product label or when they use alternative chemigation devices according to the specifications and requirements stated in this appendix.

Backflow prevention for connections to public water systems

Pesticide labeling that allows connection to a public water system requires handlers to use a reduced-pressure zone, backflow prevention device, or the functional equivalent. The labeling will also state that they may discharge the water into a reservoir tank prior to pesticide introduction as long as they maintain an air gap between the public water source and the top of the reservoir of at least twice the inside diameter of the fill pipe.

Some pesticide labeling does not allow chemigation if the system is physically connected to the public water source and therefore only allow chemigation if there is an air gap as described above.

Acceptable alternative devices

The 1987 U.S. EPA chemigation requirements did not take into account all the irrigation systems and practices that were commonly used in California. To address this oversight, the U.S. EPA established a list of alternative devices in 1991 that DPR accepted by policy in 2001.

NOTE: Pesticide handlers must comply with the pesticide product labeling regarding chemigation devices that are required by labeling but have no listed alternative(s).

Acceptable Devices for Chemigation Systems

Scope

The following section lists the devices required by labeling statements and the legal alternatives by location in the chemigation system. Verify that each of the devices listed below or their alternatives are present and in the appropriate location on the chemigation system.

Chemigation diagrams and checklist

The following blocks refer to figures at the end of the Appendix that illustrate various chemigation systems. These diagrams are included to assist staff in better understanding the systems they are inspecting. The last page is a chemigation checklist that can be copied and used in the field to verify that all of the required chemigation devices are present.

Irrigation pipeline – check valve, vacuum relief valve and low pressure drain

To prevent backflow of pesticide residues to the water source, pesticide labeling states, *"the system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow."*

These devices must be installed in the following manner. (Figure 1)

1. The check valve must be installed between the water source and the pesticide injection point.
2. The low-pressure drain must be installed upstream of the check valve, directly below the vacuum relief valve, to dispose of small volumes of fluid which may leak past the check valve.
3. The vacuum relief valve must be installed upstream of the check valve, directly above the low-pressure drain, to prevent the formation of a vacuum which could cause backsiphonage.

Alternative Devices (Figure 3 & 4):
A gooseneck pipe loop located in the main water line immediately downstream of the irrigation water pump. The bottom side of the pipe at the loop apex must be at least 24 inches above the highest sprinkler or other type of water emitting device in the field. The loop must contain a vacuum relief valve (or combination air and vacuum relief valve) at the apex of the pipe loop. The pesticide injection port must be located downstream of the apex of the pipe loop and at least 6 inches below the bottom side of the pipe at the loop apex.

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Irrigation pipeline – Irrigation pipeline – (continued)

Alternative Device (Figure 1):
An alternative that substitutes for the vacuum relief valve is a combination pressure release and vacuum relief valve.

Devices listed on page 289 of this appendix or allowed by the local water purveyor are also acceptable (including the configuration shown in Figure 2).

Injection line – check valve, solenoid-operated valve

When an injection pump is used, the pesticide labeling lists two devices that are required to be installed on the pesticide injection pipeline.

1. "*The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump*." This device prevents the irrigation water from overflowing the pesticide tank. (Figure 1)
2. "*The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system in either automatically or manually shut down.*" (Figure 1)

Alternative Devices

1) Functional spring-loaded check valve with a minimum of 10 pounds per square inch (psi) cracking pressure (Figure 5).
   - This device must prevent irrigation water under pressure from entering the pesticide injection line and must prevent leakage from the pesticide supply tank on system shutdown.
   - It must be constructed of pesticide resistant materials.
   - This single device can substitute for both the solenoid-operated valve and the functional, automatic, quick closing check valve in the pesticide injection line.

2) Functional normally closed, hydraulically operated check valve (Figure 6 & 8).
   - The control line must be connected to the main water line such that the valve opens only when the main water line is adequately pressurized.
   - This device must prevent leakage from the pesticide supply tank on system shutdown.
   - It must be constructed of pesticide resistant materials.

Continued on next page

Injection line – check valve, solenoid-operated valve (continued)

3) Functional vacuum relief valve located in the pesticide injection line between the positive displacement pesticide injection pump and the check valve (Figure 7).
   - This alternative is appropriate only for those chemigation systems using a positive displacement pesticide injection pump and is not for use with Venturi injection systems.
   - This device must be elevated at least 12 inches above the highest fluid level in the pesticide supply tank and must be the highest point in the injection line.
   - It must open at 6 inches water vacuum or less and must be spring loaded or otherwise constructed such that it does not leak on closing.
   - It must prevent leakage from the pesticide supply tank on system shutdown.
   - It must be constructed of pesticide resistant materials.

System interlocks and automatic shutoff

To automatically stop the pesticide application if there is a loss of pressure or if the irrigation pump stops, the pesticide labeling states, "*the system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.*" (Figure 1 & 8)

- The system must interlock the normally closed solenoid or hydraulically operated valve with the injection pump or Venturi bypass booster pump so that the valve closes upon shut down of the injection pump or Venturi bypass booster pump.
- It must also interlock the normally closed solenoid or hydraulically operated valve with the low pressure switch so that the valve opens only when the main irrigation line is adequately pressurized.

Irrigation pipeline – pressure switch

To help ensure the efficiency of the chemigation, pesticide labeling states, "*the irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution in adversely affected.*"(Figure 1)

The proper use of this device requires that the pressure switch be installed downstream of the irrigation pump to identify pressures too low for proper pesticide application or low pressure conditions signifying irrigation pump failure.

Continued on next page

Injection line – metering pump

To inject the pesticide into the irrigation line, pesticide labeling states, "*systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.*" (Figure 1)

Alternative Device
The Venturi injector may be used in place of the metering pump if it complies with the requirements listed below (Figures 9 - 18).

Venturi injector requirements

A Venturi injector may be used in place of the metering pump and may be inserted directly into the main irrigation line, into a bypass line, or into a bypass line boosted with an auxiliary water pump.

Alternative Device to a Metering Pump: (Figures 9 - 18)
Venturi systems including those inserted directly into the main water line (Figures 17 & 18), those installed in bypass systems (Figures 9 - 12), and those bypass systems boosted with an auxiliary water pump (Figures 13 - 16).

- Booster or auxiliary water pumps must be connected with the system interlock such that they are automatically shut off when the main line irrigation pump stops or in cases where there is no main line irrigation pump, when the water pressure decreases to the point where pesticide distribution is adversely affected (Figure 13).
- Venturi systems must be constructed of pesticide resistant materials.
- The line from the pesticide supply tank to the Venturi must contain a functional, automatic, quick closing check valve to prevent the flow of the liquid back toward the pesticide supply tank. This valve must be located immediately adjacent to the Venturi pesticide inlet (Figure 9).
- This same supply line must also contain either a functional normally closed solenoid-operated valve connected to the system interlock or a functional normally closed hydraulically operated valve which opens when the main water line is adequately pressurized (Figures 9, 10, 13 & 14).
- In bypass systems, as an option to placing both valves in the line from the pesticide supply tank, the check valve may be installed in the bypass immediately upstream of the Venturi water inlet and either the normally closed solenoid or hydraulically operated valve may be installed immediately downstream of the Venturi water outlet (Figures 11, 12, 15 & 16).

Diagram of Required Chemigation Devices

1) MAIN WATER LINE:

- **Backflow Prevention Device**
  - Located between water source and point of pesticide injection
  - Prevents contamination of water source
  - Shown: Functional check valve, vacuum relief valve, low pressure drain
  - **OTHER DEVICES AS ALLOWED BY LABEL OR POLICY**

2) PESTICIDE INJECTION PIPELINE:

- **Automatic, Quick Closing Check Valve**
  - Located between main water line and pesticide injection pump
  - Prevents flow of fluid back towards pesticide injection pump
  - **NO ALTERNATIVE DEVICES ALLOWED**
- **Normally Closed, Solenoid-operated Check Valve**
  - Located between pesticide injection pump and pesticide container or mix tank
  - Check valve connected to system interlock
  - Prevents pesticide from being withdrawn when irrigation system shuts down
  - **ALTERNATIVE DEVICES ALLOWED BY POLICY**

3) PESTICIDE METERING PUMP:

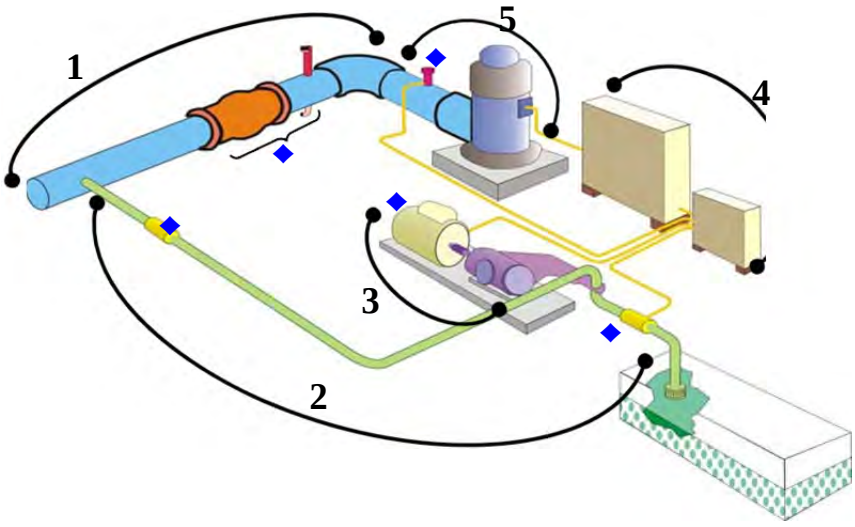
- **Positive Displacement Injection Pump**
  - Connected to system interlocking controls and pesticide injection pipeline
  - Assures proper rate of pesticide injection
  - **ALTERNATIVE DEVICES ALLOWED BY POLICY**

4) INTERLOCKING SYSTEM CONTROLS:

- Located between the pesticide metering pump and the water pump motor
- Automatically shuts off pesticide metering pump when water pump motor stops
- **NO ALTERNATIVE DEVICES ALLOWED**

5) IRRIGATION LINE OR WATER PUMP:

- **Functional Pressure Switch**
  - Located on irrigation pipeline
  - Stops water pump when drop in water pressure adversely affects pesticide distribution
  - **NO ALTERNATIVE DEVICES ALLOWED**



Chemigation Figures

Figure 1

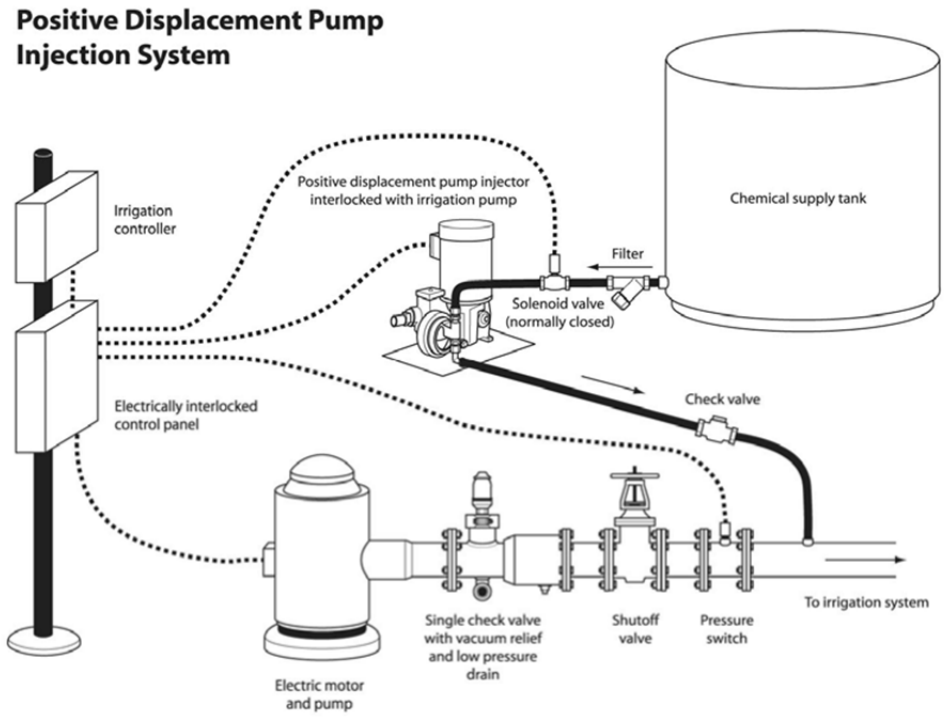


Figure 2

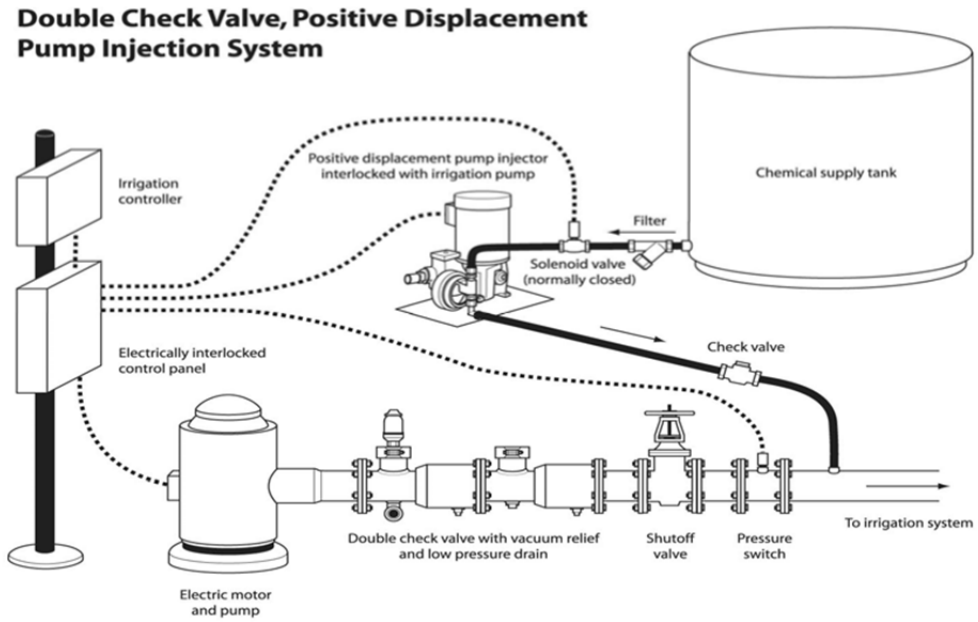


Figure 3

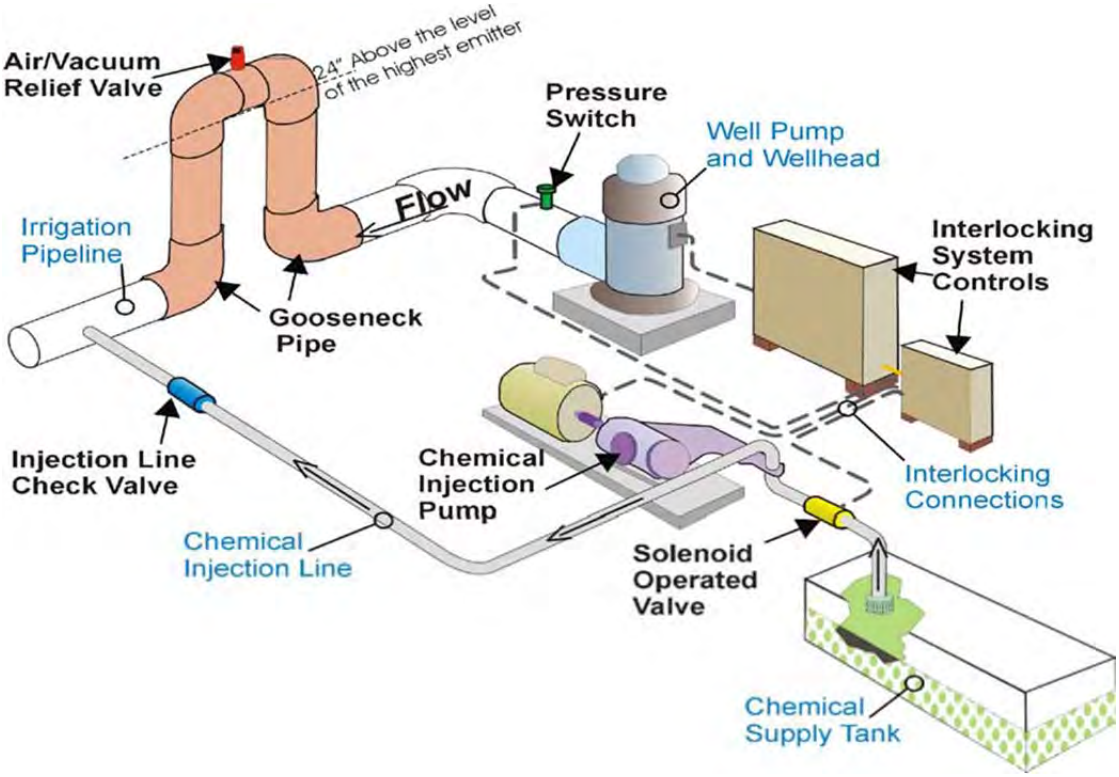


Figure 4

Modified Gooseneck Loop on a Media Filtered System

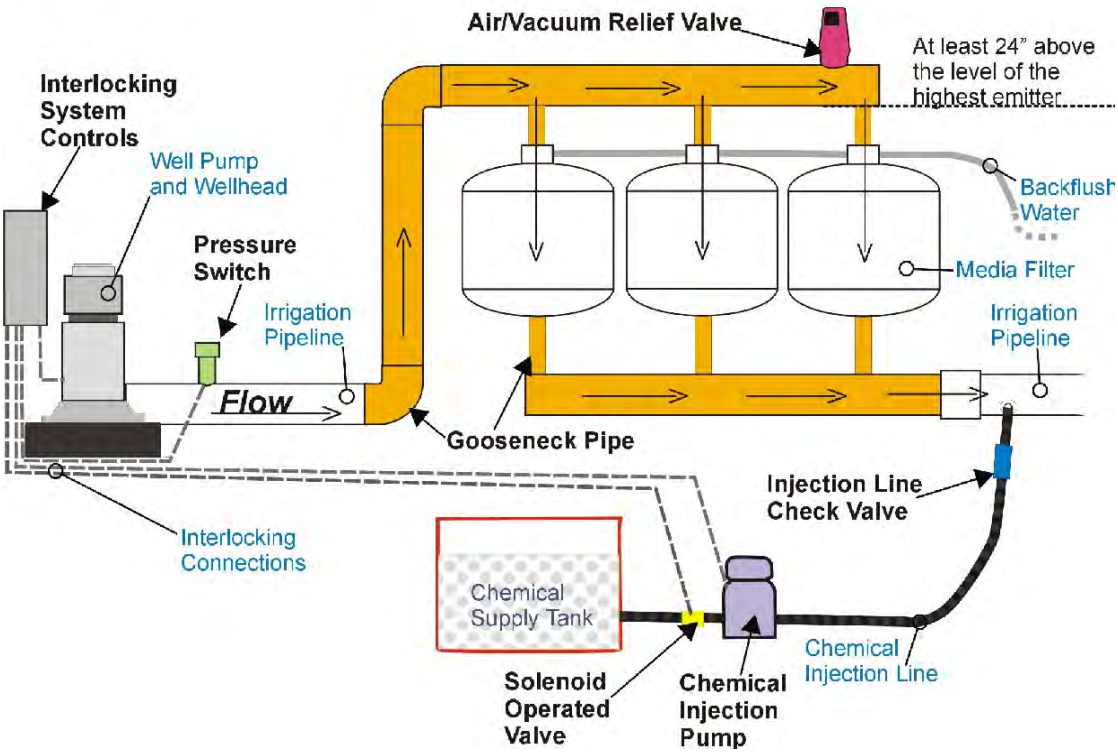


Figure 5

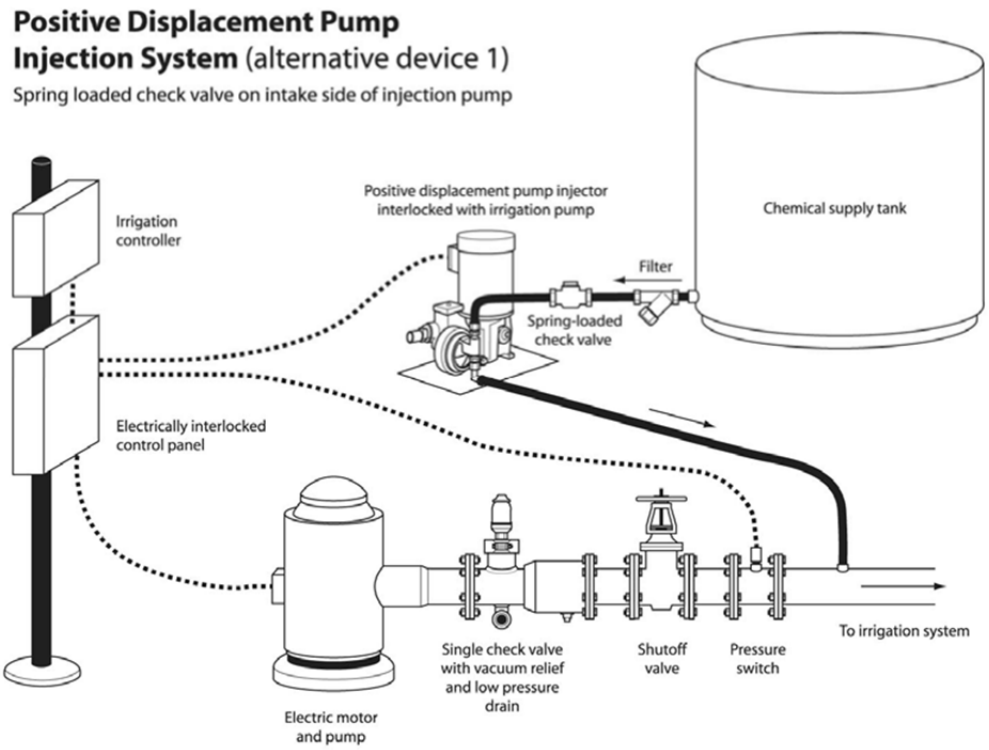


Figure 6

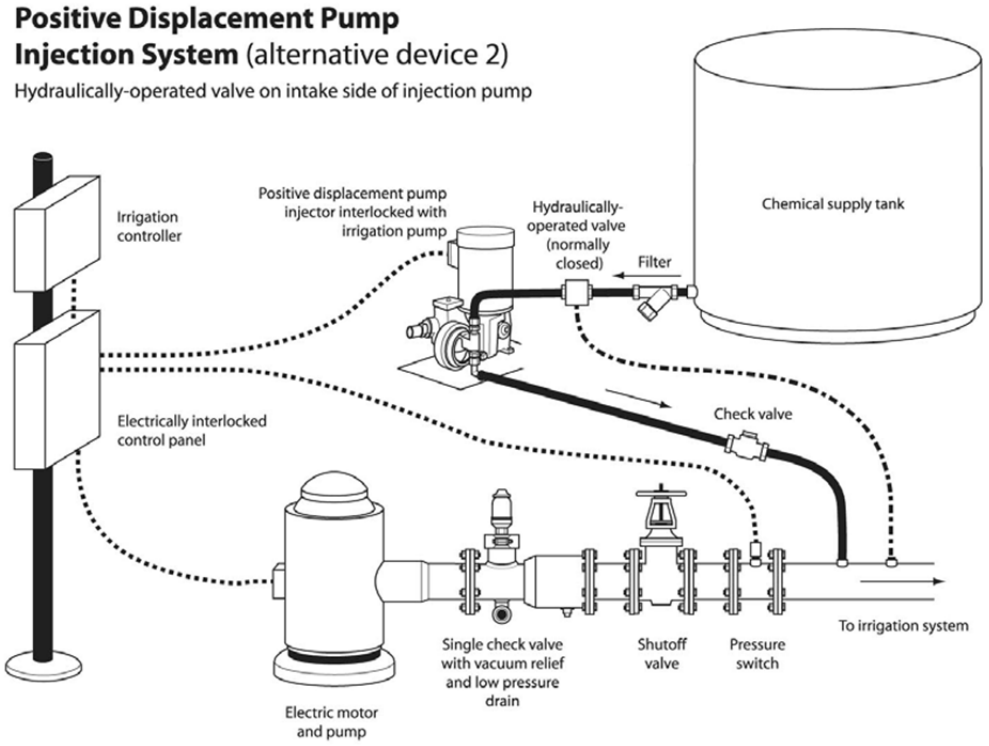


Figure 7

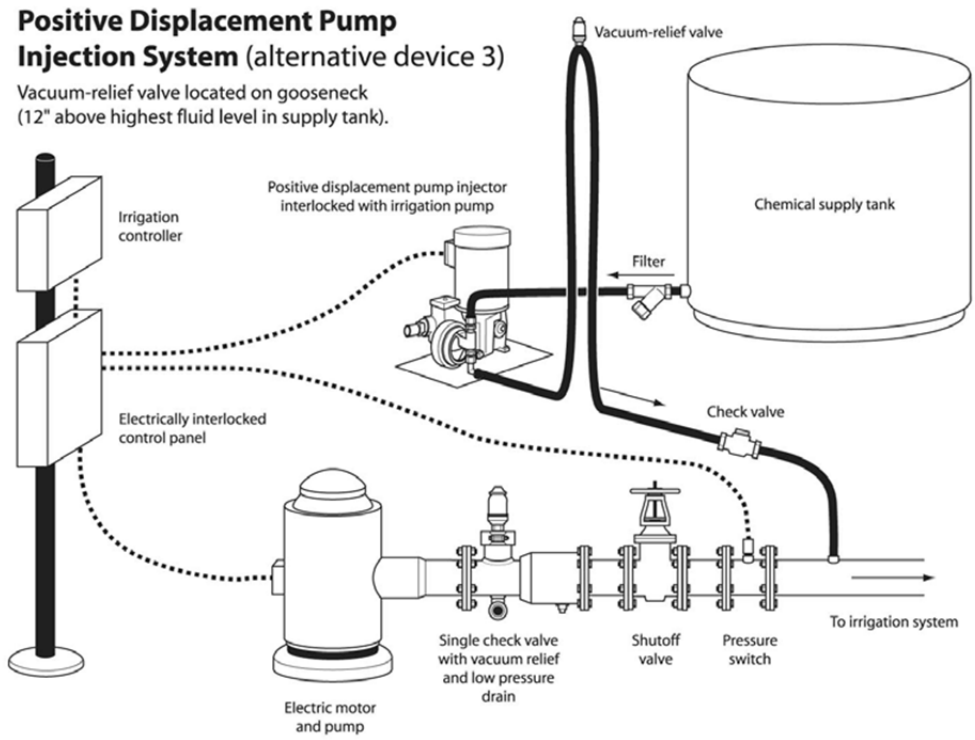


Figure 8

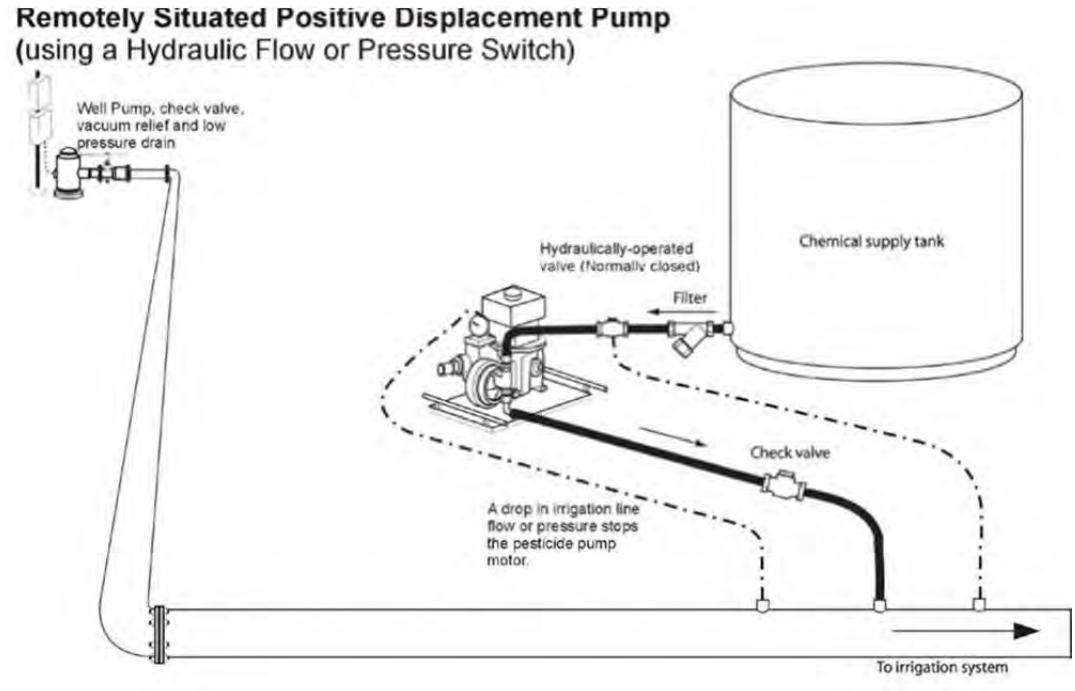


Figure 9

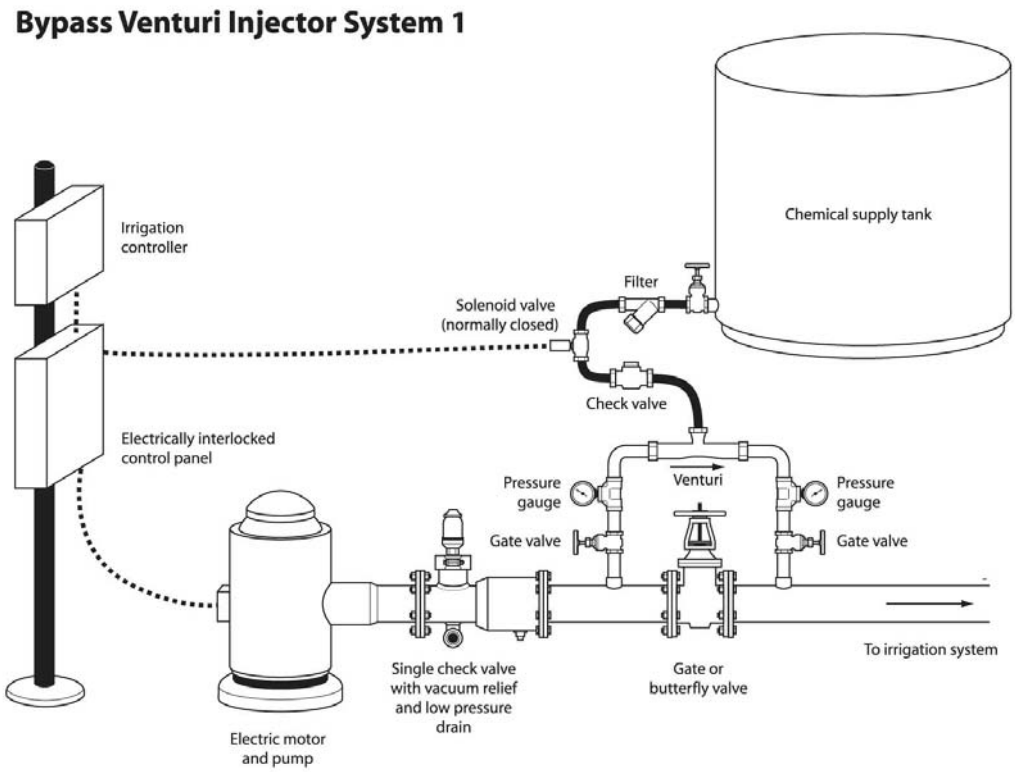


Figure 10

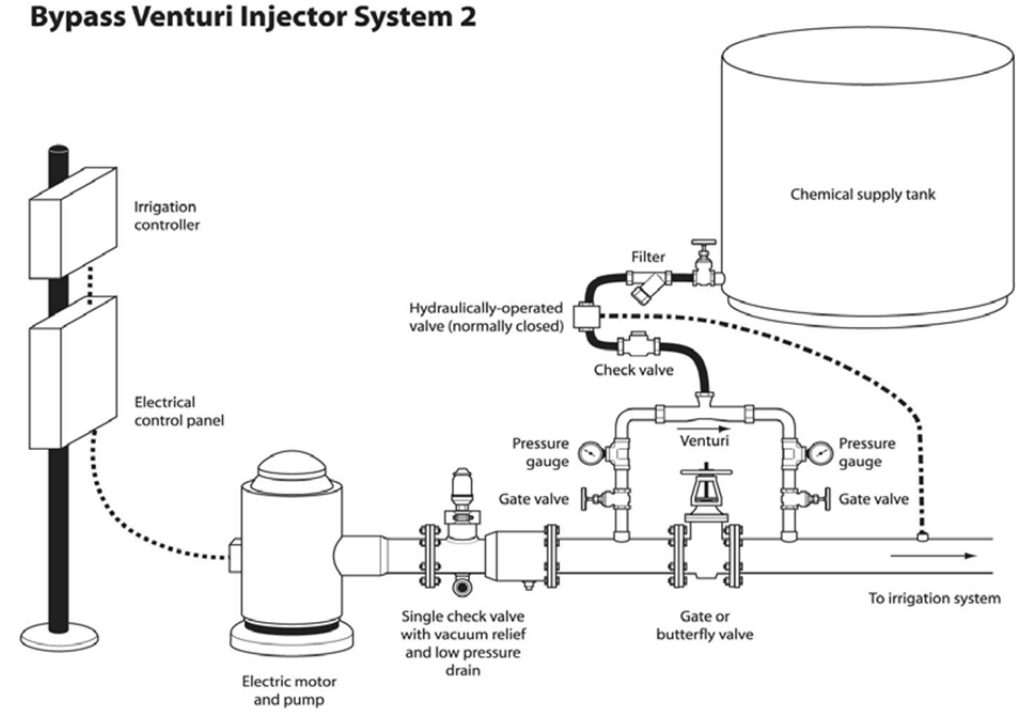


Figure 11

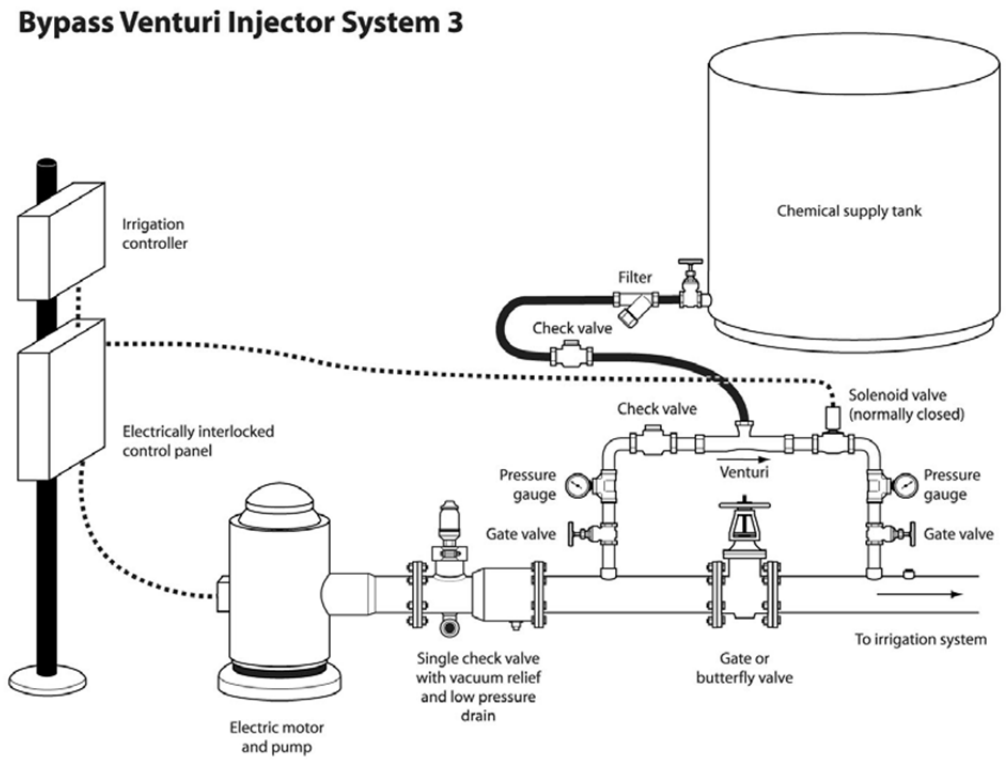
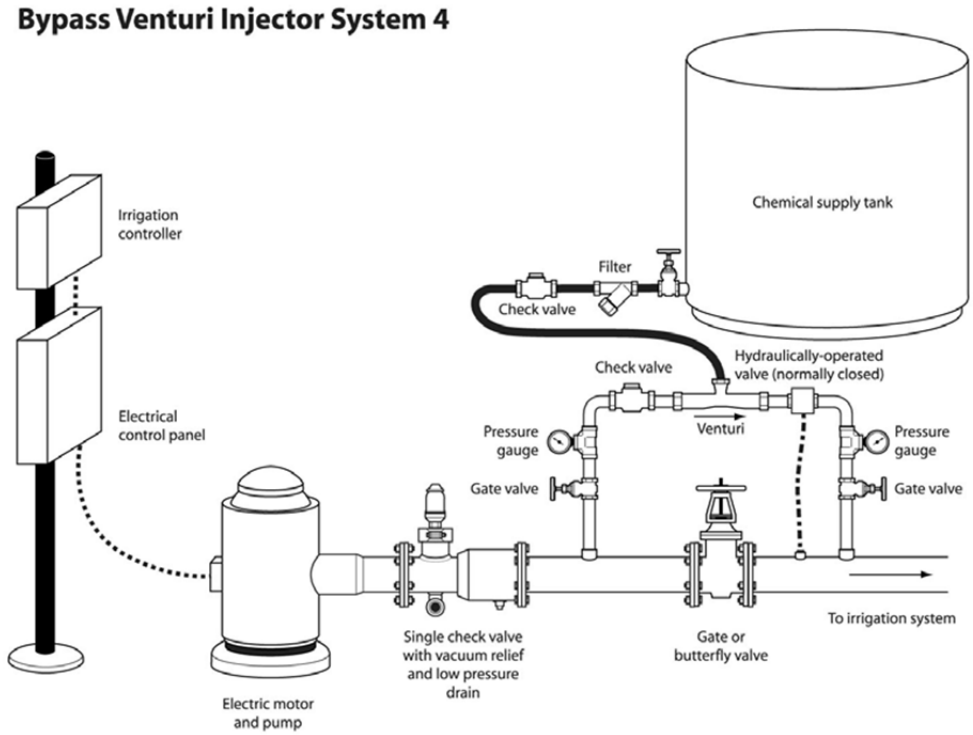


Figure 12



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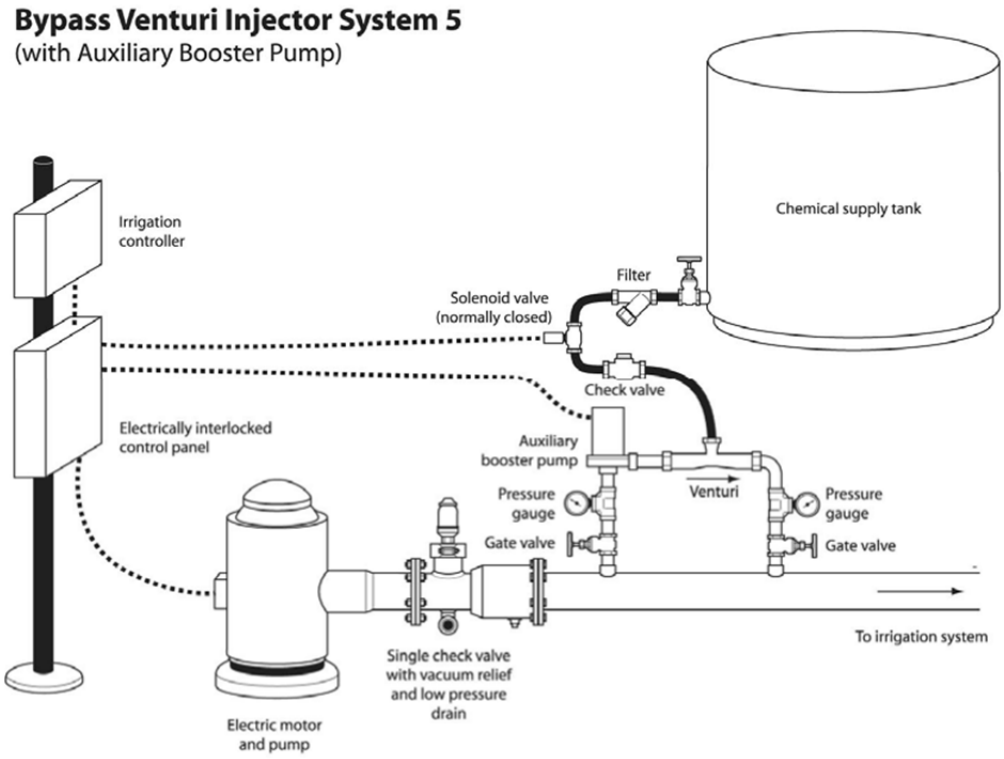

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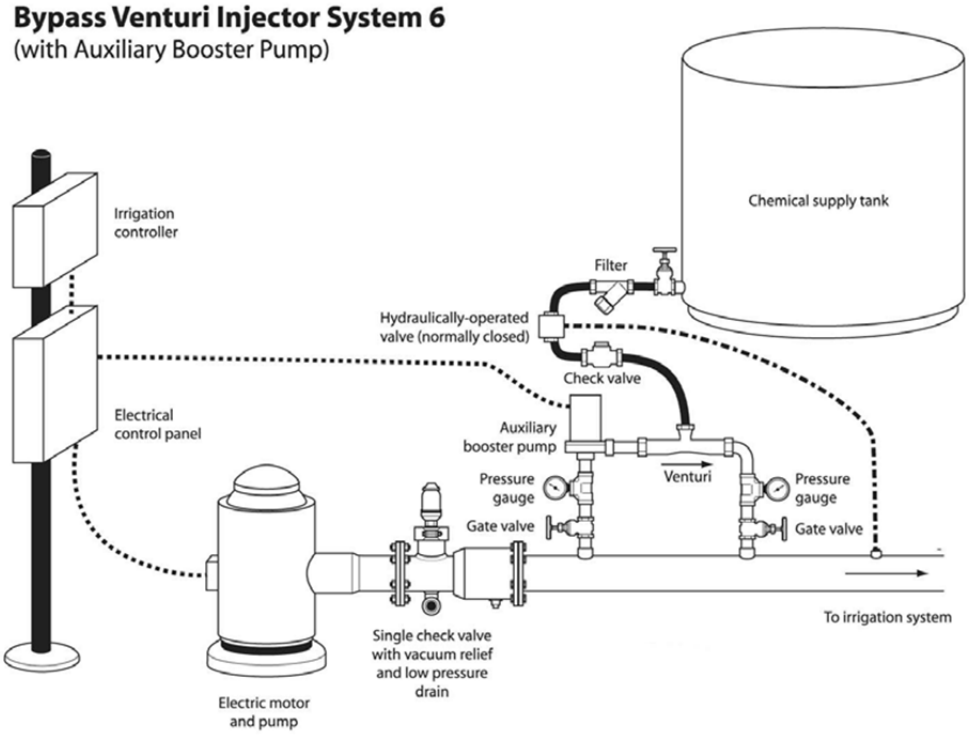


Figure 15

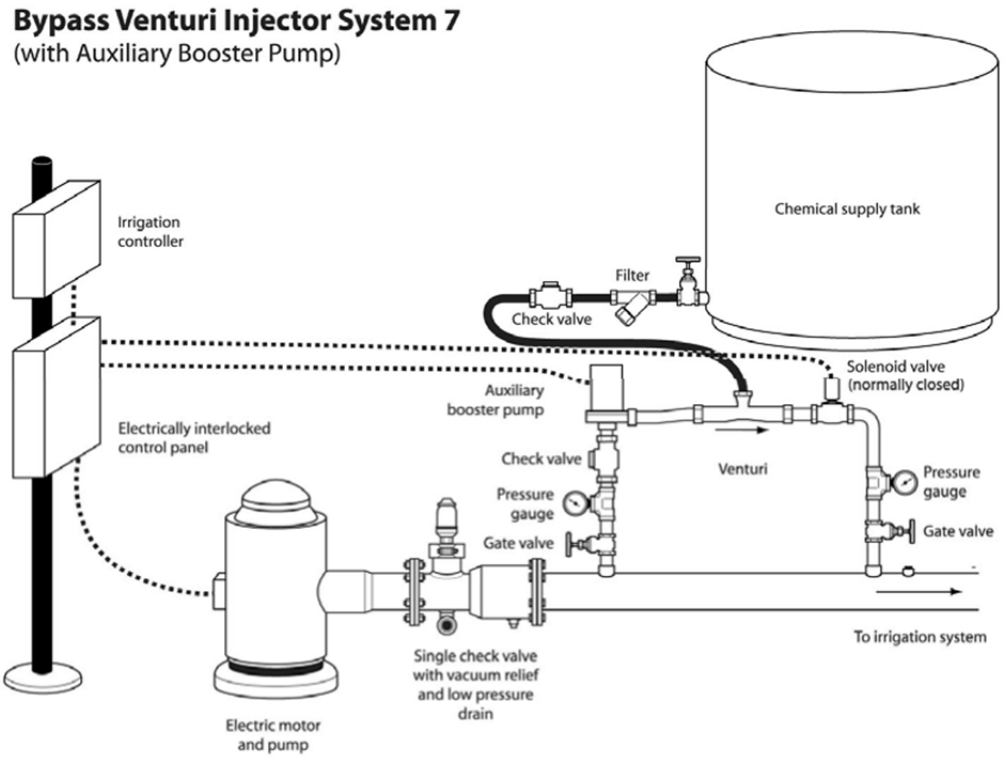


Figure 16

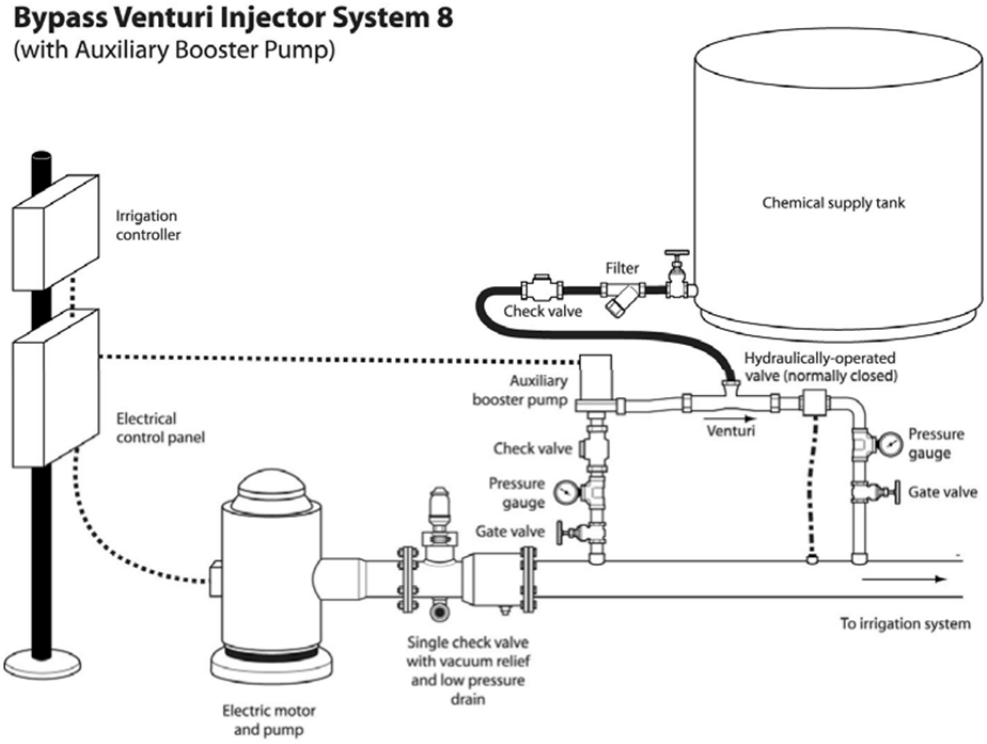


Figure 17

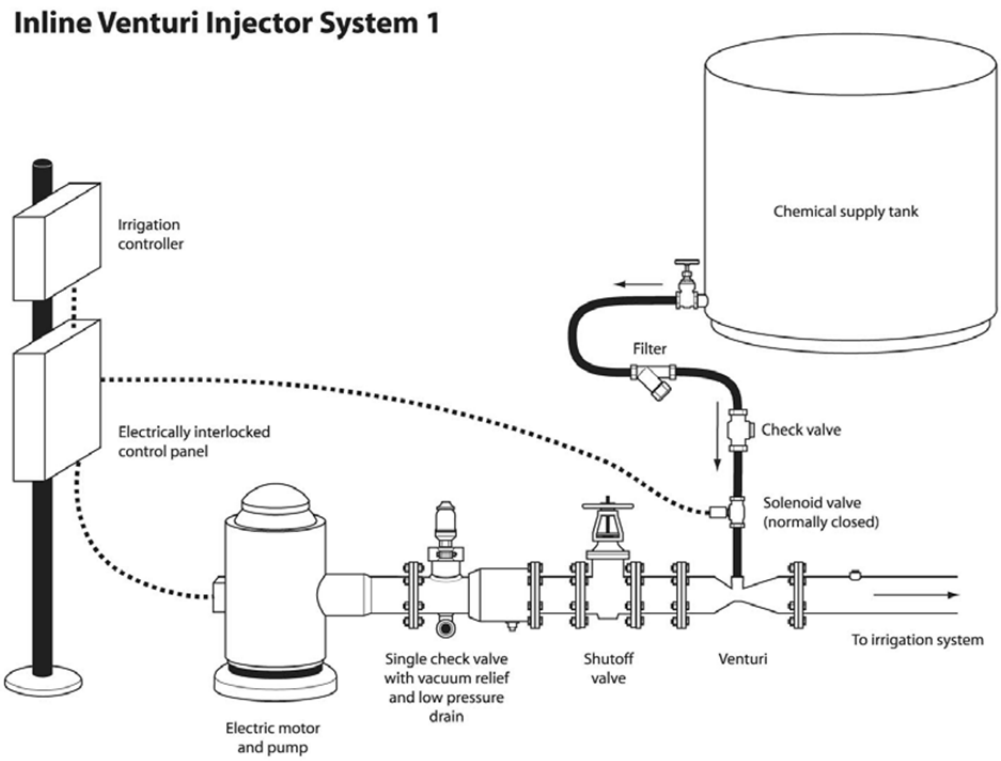
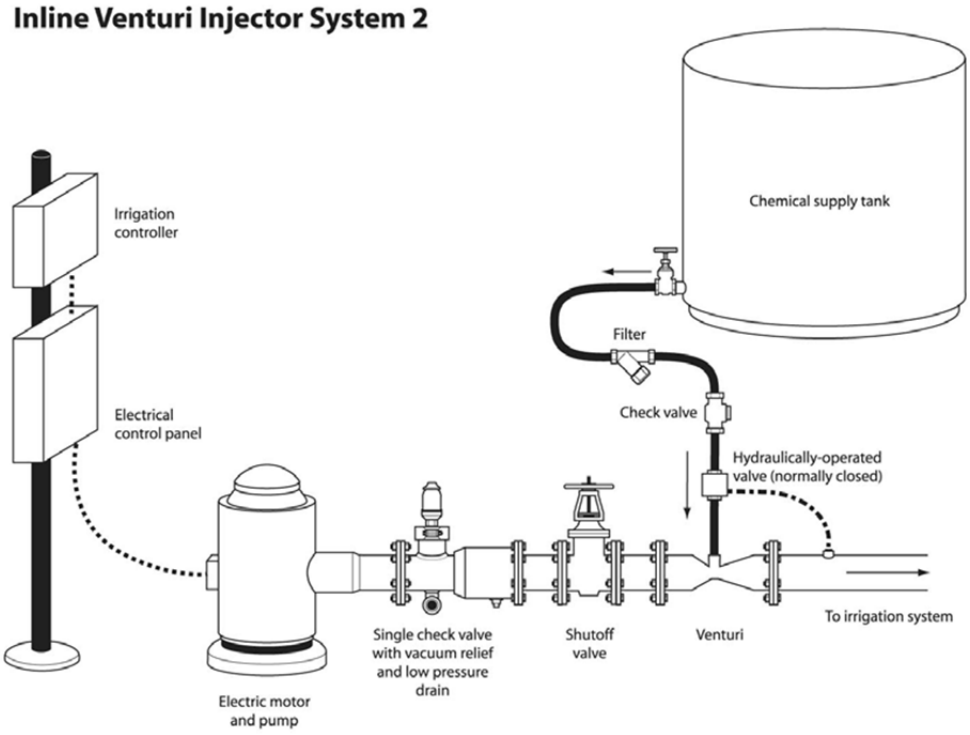


Figure 18



CHEMIGATION CHECKLIST

Please check the components that are currently on the growers' chemigation system

A. Water Source:

Farm Irrigation Well..... ⋯
Public Water Supply ..... ⋯
Other ..... ⋯
Describe: _____

B. Chemigation System Location and Configuration:

At Wellhead..... ⋯
Remote from Wellhead ..... ⋯

C. **Required** Irrigation System Components**:**

1. **BACKFLOW PREVENTER ASSEMBLY ON IRRIGATION PIPELINE**

- Check Valve..... Single Valve ⋯ Double Valve ⋯ !
- Vacuum Relief Valve ..... ⋯ !
- Low Pressure Drain ..... ⋯

Approved Alternatives - choose one

- Gooseneck Pipe Loop with Vacuum Relief Valve ..... ⋯ !
- Reduced Pressure Principle Backflow Prevention Device ..... ⋯ !
- Air Gap..... ⋯ !

2. **AUTOMATIC QUICK CLOSING CHECK VALVE** on Pesticide Injection Line..... ⋯ !

3. **NORMALLY CLOSED SOLENOID OPERATED VALVE** ..... ⋯ !

- On Intake Side of Injection Pump ..... ⋯ !
- Interlocked to Pump..... ⋯

Approved Alternatives – choose one

- Spring-loaded Check Valve with 10 psi Minimum Cracking Pressure..... ⋯ !
- Normally-closed Hydraulically Operated Check Valve ..... ⋯ !
- Vacuum Relief Valve in Pesticide Pipeline 12 inches above highest fluid level ⋯

4. **SYSTEM INTERLOCK** to Automatically Shut Off Pesticide Injection Pump **-** choose one

- Electrical Interlock to Chemical Injection Pump..... ⋯ !
- Hydraulic Interlock to Chemical Injection Pump ..... ⋯ !
- Belt Drive Direct to Drive Shaft..... ⋯ !

5. **LOW PRESSURE SWITCH** on Irrigation Line to Stop Irrigation Pump..... ⋯ !

6. **CHEMICAL INJECTION DEVICE** - choose one

- Positive Displacement Injection Pump ..... ⋯ !
- Other..... ⋯ !
- Describe _____

Approved Alternative

- Venturi Based Injection Device with Proper Check Valves ..... ⋯ !

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