

IDAHO DEPARTMENT OF AGRICULTURE
Ag Resources Division
Chemigation Use & Application Protocols

Who does this protocol apply to?

This protocol applies to those injecting chemicals through irrigation systems:

- Any person engaged in the application of chemicals through any type of irrigation system.

What is the purpose of this protocol?

This protocol establishes the licensing and equipment requirements for Chemigation.

What is the legal authority for the agency to promulgate this protocol?

This protocol is referenced in IDAPA 02.03.03:

- [22-3421, Idaho Code](#) – Adoption and Scope of Rules Pesticides and Chemigation

Who do I contact for more information on this protocol?

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Chemigation Use & Application Protocols

DEFINITIONS.

The Idaho Department of Agriculture adopts the definitions set forth in Section 22-3401, Idaho Code, and the following definitions:

1. **Air Gap.** A physical separation between the free-flowing discharge end of a domestic water supply system pipeline and an open or non-pressure receiving vessel.
2. **Basin Irrigation.** Irrigation by flooding areas of level land surrounded by dikes.
3. **Border Irrigation.** Irrigation by flooding strips of land, rectangular in shape and cross leveled, bordered by dikes.
4. **Check Valve.** A certified valve designed and constructed to close a water supply pipeline, chemical injection line, or other conduit in a chemigation system to prevent reverse flow in that line.
5. **Cross-Connection.** Any connection that may have chemical injected or introduced into the domestic water supply system and has the potential of or is connected to the domestic water supply system.
6. **Domestic Water Supply System.** Any system providing water for human use.
8. **Drip Irrigation.** A method of micro-irrigation wherein water is applied as drops or small streams through emitters.
9. **Flood Irrigation.** Method of irrigation where water is applied to the soil surface without flow controls.
10. **Flow Rate.** The weight or volume of flowable material per unit of time.
11. **Furrow Irrigation.** Method of surface irrigation where the water is supplied to small ditches or furrows for guiding the water across the field.
12. **Injection Pump.** A pump that uses a gear, rotary, piston or diaphragm to develop the pressures exceeding the irrigation system pressure to inject a chemical.
13. **Inspection Port.** An orifice or other viewing device from which the low pressure drain and check valve may be observed.
14. **Pressure Switch.** A device which will stop the chemical injection pump when the water pressure decreases to the point where chemical distribution is adversely affected.
15. **Reduced Pressure Principal Backflow Prevention Assembly (RP).** An assembly containing two (2) independently acting approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located resilient seated test cocks and tightly closing resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly.
16. **Sprinkler Irrigation.** Method of irrigation in which the water is sprayed, through the air to the ground surface.

17. **System Interlock.** Safety equipment used to ensure that a chemical injection pump will stop if the irrigation pumping plant stops to prevent the entire chemical mixture from emptying from the supply tank into the irrigation pipeline. The safety equipment may also be used to shut down the irrigation system if the injection system fails.
18. **Vacuum Relief Valve.** A device to automatically relieve or break a vacuum.
19. **Venturi.** A differential pressure injector that operates on a pressure difference between the inlet and outlet of the injector and creates a vacuum inside the body, which results in suction through the suction port.
20. **Venturi Injection System.** A chemical injection system which operates with a venturi to inject and mix chemicals into the water.
21. **Working Pressure.** The internal operating pressure of a vessel, tank or piping used to hold or transport liquid.
22. **Waters of the State.** Any surface waters such as canals, ditches, laterals, lakes, streams, or rivers.

CHEMIGATION EQUIPMENT REQUIREMENTS

A. GENERAL CHEMIGATION REQUIREMENTS.

1. **Pesticides Labeled for Chemigation.** The chemigation applicator will use only pesticides labeled for chemigation when chemigating.
2. **Monitoring Chemigation.** Licensed chemigation applicators that start the application of chemicals through chemigation equipment do not have to be present during the entire application but must return to monitor the proper application at least once every four (4) hours for the duration of the application.
3. **Chemigation Equipment Standards.** Equipment will be placed on the Department's list of approved chemigation equipment after the manufacturers provide to the Department verification that the equipment meets the standards established in these rules.
4. **Chemigating Over Waters of the State.** Shall be prohibited, except for variances allowed in the Department's chemigation protocol.

B. IRRIGATION SYSTEMS.

Equipment required for each type of irrigation system when chemigation is to be used includes:

1. **Sprinkler or Drip Irrigation.**
 - a. Irrigation Line Check Valve, with the following:
 - i. Automatic Low Pressure Drain,
 - ii. Inspection Port,
 - iii. Vacuum Relief Valve or a combination Air and Vacuum Relief Valve,

- iv. Chemical Injection System,
 - v. Chemical Injection Line Shut Down (System Interlock),
 - b. Gooseneck Pipe Loop, Downhill and Over-A-Hill backflow devices prevention may be used for surface water with
 - i. Chemical Injection System,
 - ii. Chemical Injection Line Shut Down (System Interlock),
- 2. **Flood, Basin, Furrow, or Border Irrigation.** If a chemical, including anhydrous ammonia, will be applied by flood, basin, furrow, or border chemigation through a gravity flow system, the chemigator will verify that the system uses a gravity flow dispensing system that meters the chemical into the water at the head of the field and downstream of a hydraulic discontinuity such as a drop structure or weir box to decrease potential for water source contamination from backflow if water flow stops.
- 3. **Domestic Water Supply System Cross-Connected for Chemigation.** Any irrigation system used for chemical application cross-connected to a domestic water supply system will be verified that the system contains either:
 - a. Reduced Pressure Principle Backflow Prevention Assembly (RP) that:
 - i. Is located on the irrigation pipeline between the water supply pump and the point of chemical injection, and downstream from any domestic water supply diversion point.
 - ii. Keep contaminated water from flowing back into a domestic water supply system when some abnormality in the system causes pressure to be temporarily higher in the contaminated part of the system than in the domestic water supply system piping.
 - iii. Has been manufactured in full conformance with the American National Standards Institute (ANSI)/American Water Works Association (AWWA) ANSI/WWA C511 Standard for Reduced Pressure Principle Backflow Prevention Assemblies established by the AWWA; and have met completely the laboratory and field performance specifications of the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California (USC FCCCHR); or an equivalent, Department-approved testing facility.
 - b. Chemical Injection System; with either:
 - i. Chemical Injection Line Shut Down
 - ii. Air Gap (AG). The water from the domestic water supply system will be discharged into a reservoir tank prior to the chemical injection. An air gap will be at least double the diameter of the supply pipe measured vertically above the overflow rim of the vessel - in no case less than one (1) inch. Chemical injection will not occur upstream of the air gap; and

- (a) Chemical Injection System,
- (b) Chemical Injection Line Shut Down (System Interlock)

C. CHEMICAL INJECTION LINE SHUT DOWN (SYSTEM INTERLOCK).

In every chemigation system, a functional system interlock designed and installed to shut down the chemical injection unit when chemical distribution is adversely affected will connect the water supply pump and the chemical injection unit or connect the irrigation line pressure switch and the chemical injection unit if there is no water supply pump and the system is pressurized. The chemical injection line will contain one (1) of the following interlocks; Electrical Interlock, Mechanical Interlock, Hydraulic Interlock, Human Interlock, or another Department approved interlock, to ensure that a chemical injection pump will stop if the irrigation pump stops to prevent the entire chemical mixture from emptying from the supply tank into the irrigation pipeline:

- 1. Electrical Interlock.** Electrical interlock which contains at least one (1) of the following options plus all the additionally specified equipment for each:
 - a.** Electric Motor-Driven Irrigation Pump or Power Panel: The electrical controls for the irrigation pump will be interlocked with an electric powered chemical injection pump so that if the water pump shuts off or the pressure switch shuts off power at the panel, the chemical injection pump will shut off); plus
 - i.** Injection Line Check Valve will be installed; and
 - ii.** In pressurized irrigation systems, the irrigation line or water pump will include a functional pressure switch.
 - b.** Solenoid Operated Valve. A functional automatic quick-closing check valve and a functional normally closed solenoid operated valve connected to the system interlock will be:
 - i.** Normally be closed; open only when there is adequate pressure in the irrigation line to ensure uniform chemical distribution; and
 - ii.** Be located on the intake side of the injection pump;
 - iii.** Open only when there is adequate pressure in the irrigation line to insure uniform chemical distribution; and
 - iv.** In pressurized irrigation systems, include a functional pressure switch for the irrigation line or water pump.
 - c.** A functional automatic quick-closing check valve and a functional normally closed hydraulically operated check valve. The hydraulically operated check valve will:
 - i.** Be connected to the main water line such the way the valve only opens when the main water line is adequately pressurized;
 - ii.** In pressurized irrigation systems, include a functional pressure switch for the irrigation line or water pump;

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- d. A functional automatic quick-closing check valve and a functional vacuum relief valve located in the chemical injection line between the positive displacement chemical injection pump and the chemical check valve which:
 - i. Is appropriate only for those chemigation systems using a positive displacement chemical injection pump and is not for use with Venturi injection systems;
 - ii. Is elevated at least twelve (12) inches above the highest fluid level in the chemical supply tank and is the highest point in the injection line;
 - iii. Opens at six (6) inches water vacuum or less and is spring-loaded or otherwise constructed such that it does not leak on closing;
 - iv. Prevents leakage from the chemical supply tank on system shutdown;
 - v. Is constructed of chemically resistant materials;
 - vi. In pressurized irrigation systems, the irrigation line or water pump shall include a functional pressure switch.
 2. **Mechanical Interlock.** Irrigation pumps driven by an internal combustion engine will be interlocked between the chemical injection pump and the irrigation pump by either:
 - a. By operating the chemical injection equipment from the engine electrical system, or an electrical generator driven by the pumping plant power unit.
 - b. By belt from the drive shaft of the irrigation pump or an accessory pulley of the engine: with
 - c. Injection Line Check Valve, installed in pressurized irrigation systems, a functional pressure switch included for the irrigation line or water pump.
 3. **Hydraulic Interlock.** With functional, normally closed, hydraulically operated check valve. 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 valve must prevent leakage from the chemical supply tank on system shutdown. The valve must be constructed of chemically resistant materials.
 4. **Human Interlock.** Human supervision on-site during the injection of a chemical into the irrigation system for one (1) hour or less to shut down the system in case of failure of the injection pump or irrigation system; with
 - a. Injection Line Check Valve installed;
 - b. In pressurized irrigation systems, a functional pressure switch included for the irrigation line or water pump.
 5. **Other Approved Options.** Any other option approved by the Director.

D. INJECTION LINE CHECK VALVE.

1. **Attributes:** A minimum of ten (10) pounds per square inch (psi) opening pressure:
 - a. Located between the chemical injection pump and the point of chemical injection into the irrigation line;

- b. Made of chemically resistant material;
 - c. Designed to prevent irrigation water under operating pressure from entering the chemical injection line; and
 - d. Designed to prevent leakage from the chemical supply tank on system shut down.
2. **Substitute System.** The injection line check valve is a substitute for both the solenoid-operated valve and the functional, automatic, quick closing check valve in the chemical injection line.

E. CHEMICAL INJECTION SYSTEM.

All chemical injection systems, except for flood, basin, furrow, or border chemigation through a gravity flow system, will use either:

- 1. **Metering Pump.** A positive displacement injection pump effectively designed and constructed of materials that are compatible with chemicals and capable of being fitted with a system interlock; or
- 2. **Venturi System.** Including those inserted directly into the main water line, those installed in a bypass system, and those bypass systems boosted with an auxiliary water pump that meet the following criteria:
 - a. Booster or auxiliary water pumps shall 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;
 - b. Venturi shall be constructed of chemically resistant materials; and
 - c. The line from the chemical supply tank to the Venturi will contain a functional, automatic, quick closing check valve to prevent the flow of liquid back toward the chemical supply tank. This valve will be located immediately adjacent to the Venturi chemical inlet.
 - d. This same supply line will 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 only when the main water line is adequately pressurized.
 - e. In bypass systems as an option to placing both valves in the line from the chemical 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.

F. IRRIGATION LINE CHECK VALVE.

- 1. **Construction:**
 - a. Consist of at least a single check valve;
 - b. Be heavy duty with all materials resistant to corrosion or protected to resist corrosion;
 - c. Be spring-loaded with a chemically resistant and resilient seal that provides a watertight seal against reverse flow;

- d. Not consist of metal to metal seal surfaces;
 - e. Be rated at a pressure equal to or greater than the system working pressure; and
 - f. Be positioned and oriented according to manufacturer specifications to ensure proper functioning.
 - g. Be located in the pipeline between the irrigation pump and the point of chemical injection into the irrigation pipeline, and downstream from a vacuum relief valve and automatic low pressure drain.
 - h. Be leveled and on a horizontal plane with deviation of not more than ten (10) degrees from horizontal when installed.
 - i. Be labeled with the following:
 - i. Manufacturer's name and model;
 - ii. Direction of flow.
2. **Model Certification.** The manufacturer of the irrigation line check valve will provide verification to the director that the valve model has been tested and certified by an independent laboratory, or other Department approved facility as meeting the following leakage test criteria:
- a. **Low Pressure Drip Test.** A check valve withstands for sixteen (16) hours without leakage at the valve seat an internal hydrostatic pressure equivalent to the head of a column of water five (5) feet (1.5m) high retained within the downstream portion of the valve body. No leakage occurs as evidenced by wetting of paper placed beneath the valve assembly. This test is to be conducted with the valve in both the horizontal and vertical position if intended for such use.
 - b. **High Pressure Test.** A check valve withstands for one (1) minute, without leakage at joints or at the valve seat, an internal hydrostatic pressure of two (2) times the rate of working pressure of the valve.

G. GOOSENECK PIPE LOOP, DOWNHILL AND OVER-A-HILL.

- 1. **Location.** In the main water line downstream of the irrigation water pump.
- 2. **Position.** The bottom side of the pipe at the loop apex will be at least twenty-four (24) inches above the highest sprinkler or other type of water emitting device on the highest part of the field.
- 3. **Pipe Loop.** The loop will contain either a vacuum relief or combination air and vacuum relief valve at the apex of the pipe loop, and if the water pump is portable and the apex is a straight, horizontal section of pipe, the pipe will be level.
- 4. **Location of Chemical Injection Port.** Downstream of the apex of the pipe loop and at least six (6) inches below the bottom side of the pipe at the loop apex.
- 5. **Use Restriction.** Is not to be allowed when pumping from a groundwater source.

H. VACUUM RELIEF VALVE OR COMBINATION AIR AND VACUUM RELIEF VALVE.

- 1. **Location.** On top of the horizontal irrigation pipeline on the upstream side of the check valve.

2. **Orifice Size.** Have a total (individually or combined) orifice size of at least three-fourths (3/4) inch diameter for a four (4) inch pipe, a one (1) inch diameter for a five (5) to eight (8) inch pipe, a two (2) inch diameter for a nine (9) to eighteen (18) inch pipe, and a three (3) inch diameter for a nineteen (19) inch and greater pipe.

I. INSPECTION PORT.

1. Location.

- a. On the pipeline between the irrigation pump and the irrigation pipeline check valve directly above the low pressure drain;
- b. Near the irrigation line check valve to allow for inspections and check for malfunctioning of the irrigation line check valve and low pressure drain.

2. **Orifice Size.** Have a minimum diameter opening of four (4) inches from which the check valves and low pressure drain will be visible;

3. **Mounting:** Be mounted with quick disconnects, quick coupler, ring lock or flange fittings, dresser couplings or other fittings that allow for easy removal of the inspection port with any bolts located on the outside of the irrigation water pipe; and

J. AUTOMATIC LOW-PRESSURE DRAIN.

1. **Criteria.** An automatic low-pressure drain will meet the following criteria:

- a. Is installed upstream of the irrigation line check valve at the lowest point of the horizontal water supply pipeline;
- b. Does not extend into the horizontal pipe beyond the inside surface of the bottom of the pipe;
- c. Is at least three-fourths (3/4) inch in diameter with a closing pressure of not less than five (5) psi;
- d. If the drain is within twenty (20) feet of the water source, contains a corrosion resistant tube, pipe, hose, or similar conduit one-half (1/2) inch in diameter to discharge a solution at least twenty (20) feet down slope from the irrigation water source and away from any other water sources; and
- e. Does not have any valves located on the outlet side of the drain tube.

K. VARIANCES.

The Department may grant variances with such conditions and safeguards as it determines are necessary to prevent contamination or pollution of the waters of the state. Issuance of variances do not relieve the recipient from compliance with all other responsibilities under the Pesticide and Chemigation Act and Rules. Such variances may be granted upon a request from the owner or operator of the property affected and approval by the Director. The application will state fully the grounds of the application, and the facts relied upon. Upon the Department's further investigation, if certain antipollution devices otherwise required by these rules or the Pesticide and Chemigation Act, are not necessary or consequences inconsistent with the rules or act, such variances may be granted.