

PESTICIDE STORAGE, MIXING, AND LOADING SITES

David W. Kammel
Agricultural Engineering Department
March 1991

INTRODUCTION

Commercial, aerial, and private storage and mixing/loading sites are at risk of spills of pesticides and fertilizers which may contaminate groundwater. The rules written by the WDATCP fall under Wisconsin's groundwater legislation and were implemented to reduce the risk of accidental spills and/or poor management practices from contaminating soil and water at these sites. Ag 29, which took effect on May 1, 1990 requires compliance by end users to reduce this risk by several ways. Figure 1 describes the compliance of all end users for installing a mixing/loading pad for handling pesticides. In Wisconsin these rules are impacting small commercial applicators, lawn companies, vegetable and fruit growers, golf course operators, and private applicators depending on the amount of pesticide used. These rules deal with the mixing and handling of pesticides, but the safe storage of the pesticides is also implied in the rules.

LIABILITY

There are other reasons for installing proper chemical storage and handling facilities. The liability of the owner for accidental spills on the farm causing water contamination may prompt construction of a facility. Insurance carriers are limiting policies on environmental damage caused by a fire or a spill involving pesticides, and may require certain practices be put in place before a policy can be written. The owner/operator can also protect the well from contamination for his/her own family's safety.

FUNCTIONAL DESIGN

Functional planning of an pesticide facility should be the first, item addressed in developing new or remodeling existing facilities. A well planned and designed facility is needed for environmental and human protection. Agricultural facilities are especially visible and potentially risky due to the nature of the activities at these sites. Typically, highly concentrated chemicals are stored and handled at these sites. The pesticide facility provides several distinct and separate functional areas shown in Figure 2:

- Pesticide Storage
- Secondary Containment
- Mixing/Handling Equipment
- Loading/Washpad
- Worker Safety
- Waste Disposal

Pesticide Storage

The storage area is used to store pesticides. It should be designed to protect pesticides from theft, temperature extremes if needed, and unauthorized use by untrained personnel. The storage facility should be isolated from other buildings used to store feeds or fuel and should only store pesticides. There should be visible signs indicating the materials are toxic and dangerous. The area should be ventilated to prevent a concentration of fumes from building up in the area. The storage area should also be secured by a fenced area or a locked building to prevent vandalism and unauthorized entry.

Secondary Containment

Secondary containment provides protection of the environment from accidental leaks and spills of bulk liquid storage tanks and small handling spills during the normal daily routine of mixing and loading chemicals and fertilizer into spraying equipment. Bulk liquid storage tanks are placed within a containment area to prevent release of the fertilizer or chemical in the event that the primary storage tank fails in some way. The spilled material can then be easily recovered instead of leaching into the soil or draining into surface water. Pesticides in minibulk containers and rinsate storage tanks are typically contained on a curbed pad constructed from concrete or other impermeable material.

The secondary containment is sized to hold 125% of the largest storage tank or sprayer tank in the secondary containment. The displaced volume of any other storage tanks or equipment must be considered in determining the size of secondary containment. The inside dimensions of the walls or curbed area must be used in calculating the containment volume.

Mixing/Handling Equipment

The mixing/handling area is most often located adjacent to or between the storage/containment area and loading/wash pad area for convenience. The mixing/handling area provides secondary containment during the transfer of chemicals from storage to the loading area. Pesticide containers, and minibulks are temporarily stored and handled in this area. The pumps, valves, hoses, and meters used to transfer chemicals from containers are also located in this area. Leaks and small spills occurring during the transfer and handling of chemicals is contained and collected in this area.

Loading/Washpad

The loading/wash pad is used to park application or transport equipment during the loading of pesticides. Unloading of chemicals into the storage building also takes place over the pad. Repair of sprayer equipment should also be done over this area to collect any material that leaks or is drained from the tanks or booms of the spray equipment. Typically, this area is a sloped and curbed concrete pad or other impermeable surface. The pad is sloped to a shallow sump where contaminated water (rinsate) is collected, pumped to above ground rinsate storage tanks and used as makeup water for

subsequent sprayer loads. The rinsate is segregated and reused on the target crop reducing waste. If this area does not have a roof, rainwater falling on the pad is collected and stored for future use if it is contaminated.

Worker Safety

The worker safety area should be equipped with all the necessary emergency equipment needed to prevent harm or provide emergency aid to the workers. An eyewash and/or deluge shower should be provided to rinse spilled chemical from the eyes, face and body. A first aid kit and spill response kit should also be provided to deal with accidents in a timely manner. A fire extinguisher should also be provided. Personal protection equipment should also be available at the chemigation site.

Waste Disposal

The waste disposal area is used to hold empty containers temporarily until they can be disposed of properly. The pressure rinsed empty containers should be stored on a covered, curbed area to prevent rain entry into the container or leaks from containers contaminating the soil. Old burn piles and uncovered empty container piles have been identified as a major contamination source at many existing storage facilities. Empty minibulk or returnable containers should also be stored in this area until they can be returned or refilled. Returnable and/or reusable containers should be used whenever possible. The private applicators training manual should be consulted to determine best method for cleaning up a spill and to determine when a spill is to be reported.

Chemigation System Equipment

The pesticide container, pesticide injection unit, and all connections between them must be located in secondary containment. This may be concrete curbed area, or a large tank which is sized to hold the chemigation system equipment and the pesticide container. A transportable secondary containment system may be of benefit for use at multiple application sites. The secondary containment must be located at least 8 feet from the water supply.

Figure 3 shows a general schematic of the equipment requirements for chemigation. The construction materials must be resistant to corrosion, puncture and cracking and be chemically compatible with the pesticides used in the system. Written confirmation of compatibility must be kept on file by the operator and be available for inspection by WDATCP upon request. Backflow prevention must be incorporated into the system to protect the water supply from contamination. Most chemigation systems will find the reduced pressure principle backflow preventor to be the most practical for protecting a well or surface water supply. Alternatives for protecting a well water supply are a fixed air gap/repump system or barometric loop. Alternatives for protecting a surface water supply are a double check valve system, gooseneck loop and check valve, or a barometric loop. A low pressure switch must be installed to shut off the irrigation system power supply if water pressure decreases to the point where pesticide is no longer being applied according to label rates. A pump interlock between the water supply and the pesticide injection pump shuts the injection pump off if the water supply is interrupted.

A flow interrupter is placed in the pesticide supply line which shuts off the pesticide supply if the injection pump fails. A flow sensor installed in the pesticide injection line near the injection pump shuts off the injection pump if the injection line fails. A check valve with a minimum opening or cracking pressure of 10 psi must be installed in the pesticide injection line between the injection pump and the point of injection. This prevents backflow of irrigation water into the pesticide tank, and prevents low pressure flow of pesticide into the irrigation system if the injection pump fails.

Farm Sized Facility

No matter what the size of the operation each of the functional areas should be incorporated into the total system facility plan. The size or scale of the functional areas of an operation is dependent on the amount of pesticide and/or fertilizer stored at the facility and the number of employees. In many cases a single space can be used to provide for several functional areas such as minibulk storage, rinsate storage and mixing and loading chemicals. This provides for flexibility in the layout and design of the facility. Noyes and Kammel 1989 discuss a detailed set of plans for a mixing/loading pad that can also incorporate agrichemical storage. As the size of the facility increases the space needed for each functional area becomes larger and more well defined. Functional areas should be placed adjacent to each other to provide for efficient traffic flow and easy access from one area to another. Remote chemigation sites should also incorporate these same design concepts as much as possible.

Facility Management Plan

Pesticide storage and handling on the farm is carried out according to a facility management plan. The plan specifies the storage, handling, cleaning, and application of pesticide materials and equipment used in the farm operation. The facility management plan is to be used in conjunction with the plans and specifications of the chemical storage building and loading pad to reduce the potential for groundwater contamination from the storage and handling of pesticides on the farm, and to provide a safe environment for the operator/owner using the pesticides.

Chemigation Operation Plan

The chemigation operation plan is part of the facility management plan. The owner/operator of the chemigation system must prepare a written observation plan prior to operating the system. The plan must be followed during system operation. The plan must be kept at the site or with the operator while the system is functioning, and a copy must be kept at the residence or business office of the owner/operator. The operation plan must include a) A list or drawing indicating sensitive areas which may be subject to drift. This includes nontarget areas such as roads within 100 feet of system, public or populated areas within 300 feet of the system, surface water and wetlands. b) a description of methods and procedures used to prevent drift and overspray. c) A description of the backflow prevention system. d) A description of methods and procedures to assure calibration of the system. e) A description of the monitoring procedure to follow to assure the system is functioning properly according to the plan and the law. f) A statement indicating the flush time for the system. g) A description of

the safety protection for persons observing the system or entering the treated area for repairs.

Emergency Response Plan

An emergency response plan is part of the facility management plan. This response plan contains:

- A set of plans and specifications for the facility.
- A facility site plan.
- An inventory list of chemicals stored.
- The facility management plan.

Copies of the emergency response plan should be available:

- At the facility.
- At the owner's house.
- Local emergency government office.
- Local fire official office.

Summary

With proper planning and consideration of design fundamentals, a pesticide application facility can be incorporated into commercial and private applicator sites. These facilities will reduce potential harm to workers and also protect the environment, especially the groundwater. These sites are especially visible and potentially dangerous because of the quantity and concentration of the chemicals used. Farm sites may not require a complex design, but still need to address certain design fundamentals to reduce groundwater contamination.

REFERENCES

Noyes, R., D. Kammel. 1989. Modular Concrete Wash/Containment Pad for Agricultural Chemicals. American Society of Agricultural Engineers Winter Meeting, New Orleans, LO. ASAE Paper No. 891613. December 12-15, 1989.

Pesticide Use and Control. 1990. Chapter Ag 29. WDATCP. Agricultural Resource Management Division, 801 W. Badger Rd. P.O. box 8911, Madison, WI 53708

Chemigation System Requirements. 1990. Interpretation of Rule Changes for Ag 29. WDATCP. Agricultural Resource Management Division, 801 W. Badger Rd. P.O. box 8911, Madison, WI 53708

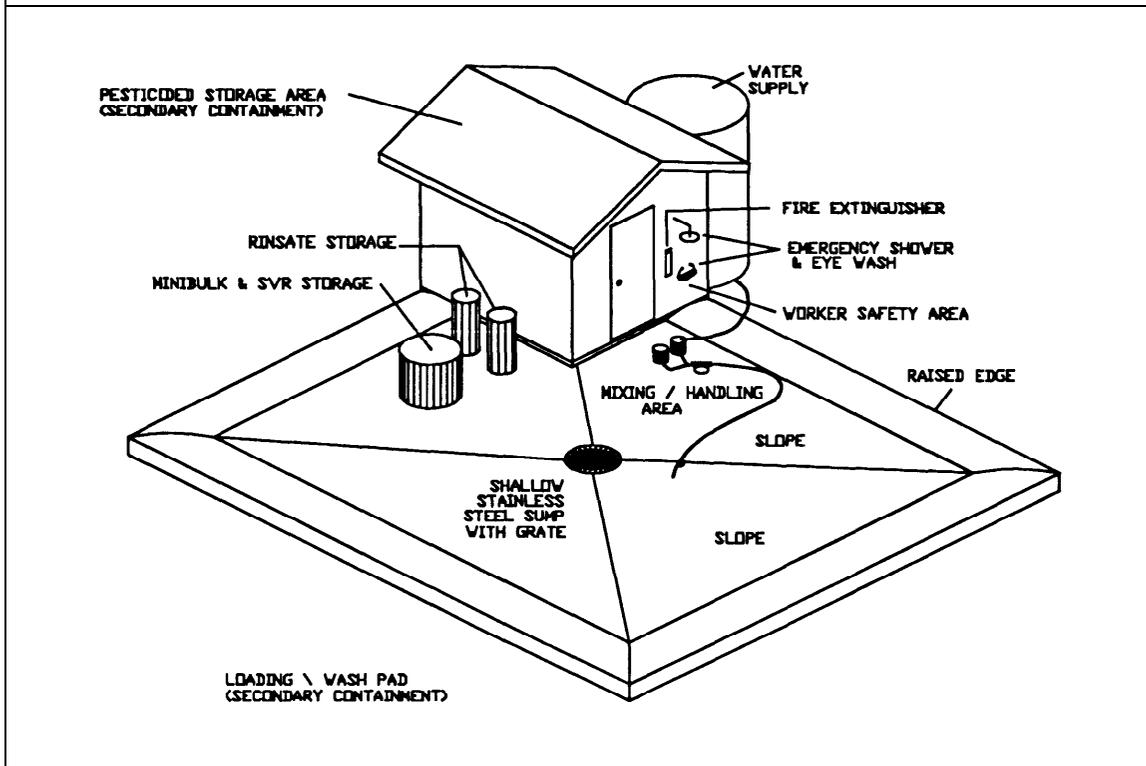


Figure 2 Farm Sized Pesticide Storage, Mixing/loading Facility

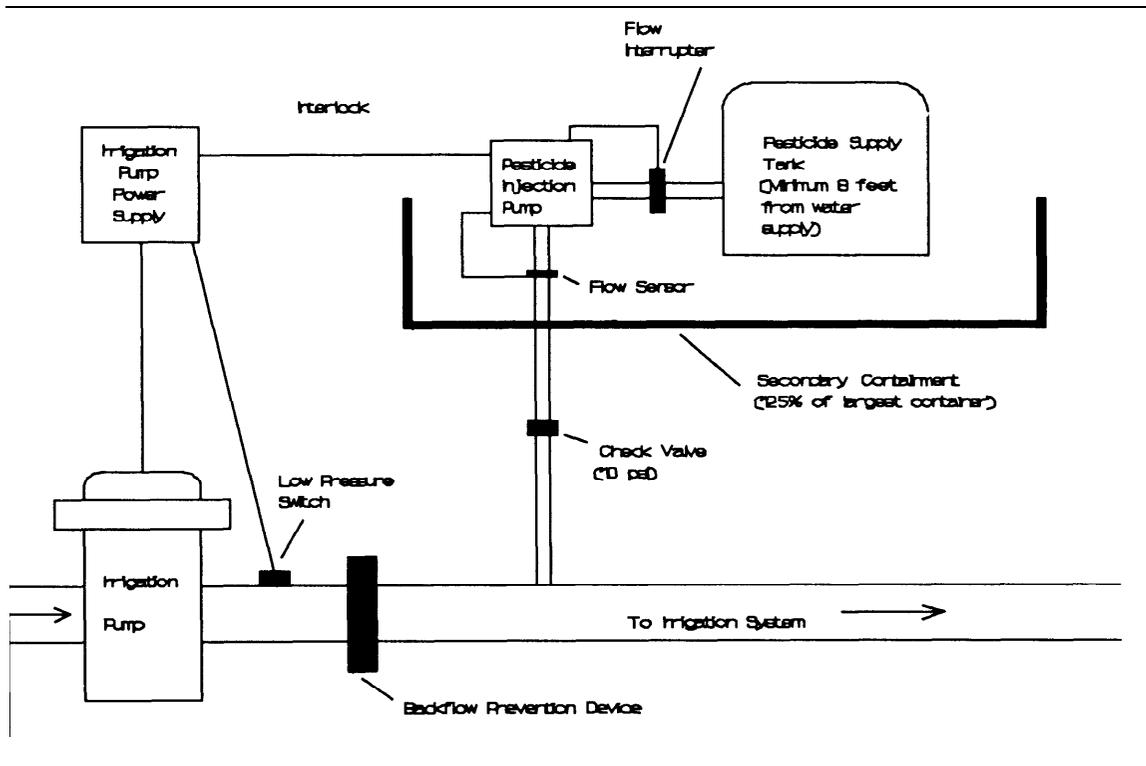


Figure 3 Ag 29 Chemigation Equipment Requirements

MIXING/LOADING SITE COMPLIANCE FLOW CHART

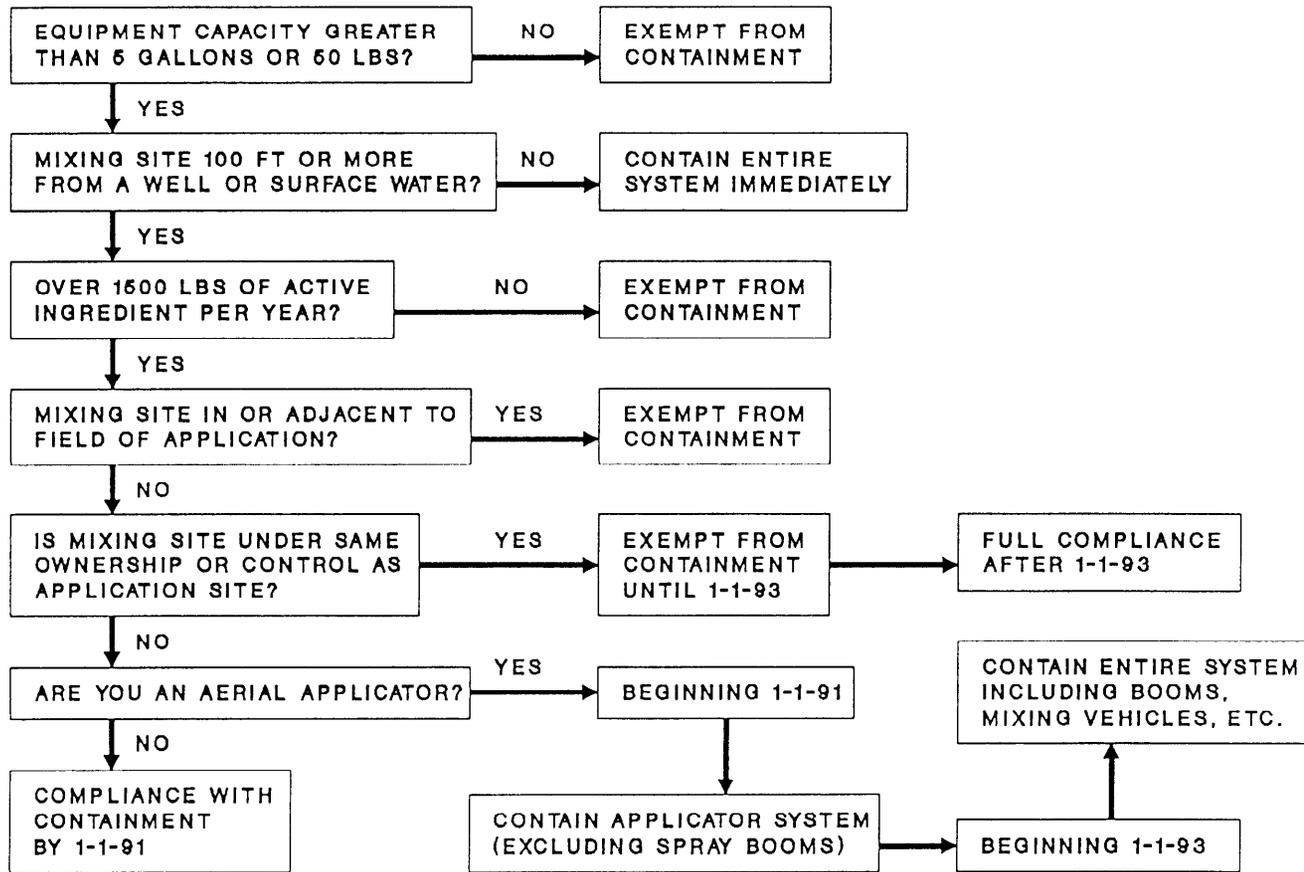


Figure 1 Mixing/loading Site Compliance Flow Chart (W DATCP 1990)