There are numerous rules, regulations and recommendations on the safe use of pesticides. These include the registration of pesticides, transportation, the training of applicators, storage facilities, spills and proper disposal of containers, excess pesticides and rinseates. The majority of activities dealing with pesticides, from manufacturing, through marketing and transportation, to application and disposal, are adequately controlled and well-managed.

THE PROBLEM AND THE SOLUTION

One area of pesticide activity needs improvement, however, and that is the mixing-loading operation. At many locations this operation is repeated over and over, often near a well or near surface water, or only a few feet from a high water table. If only a few drops of pesticide fall on the ground during each mixing-loading operation, over time the soil can become contaminated and pesticides can move into a ground- or surface-water supply. This must be avoided.

Water supplies for entire communities have become contaminated and unusable. In the National Pesticide Survey of Drinking Water Wells by the Environmental Protection Agency (EPA), about ten percent of the nation's community drinking water wells and about four percent of rural domestic wells contained detectable levels of at least one pesticide. Fortunately, less than one percent of the wells contained pesticide residues that exceeded health advisory levels established by the agency.

The costs of cleaning up a pesticide-contaminated site are astronomical. These costs, along with the potential fines and legal fees, could easily bankrupt an agribusiness or any other business involved with pesticides.

The solution is simple: Prevent the pesticide contamination of soil and water supplies. This means:

- no major pesticide spills,
- no series of minor spills in one location, and
- should a spill occur, its immediate cleanup.

The major problem is the repeated minor spills in any mixing-loading or cleanup activity. Nozzles and hoses leak, valves are left open, tanks overflow, pesticides are spilled, and spray equipment must be washed down. Gloves, boots, respirators, aprons, clothing and workers must be cleaned. Spray equipment must be maintained on a regular basis, and faulty hoses, valves, etc. must be replaced.

This rinseate material must be captured to prevent contamination of the ground, surface water or ground water.

There are three possible solutions to the problem:

2. Ray A. Bucklin, Associate Professor and William J. Becker, Professor and Extension Safety Specialist, Agricultural Engineering Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville FL 32611.
1. Stop mixing and loading pesticides on your property. Contract with a commercial applicator to apply pesticides.

2. Mix and load EACH TANKFUL AT A DIFFERENT LOCATION, some distance away from a well or surface water supply.

3. Do ALL of your mixing-loading and cleanup operations on a concrete pad where all spilled materials can be captured, reclaimed and applied in accordance with the requirements of the pesticide label.

The remainder of this publication provides recommendations and design for a pesticide mixing-loading facility.

**RECOMMENDATIONS**

The following recommendations are provided for a pesticide mixing-loading facility:

- The mixing-loading facility should be located adjacent to or near the pesticide storage building.
- Both should be located a minimum of 100 ft. from a well-head or surface-water supply.
- Both should be isolated from other buildings used to store feed, seed, petroleum products, livestock or from residences, and located downwind from these buildings.
- It is recommended that the mixing-loading pad and sump have a minimum capacity of 250 gallons, or 110 percent of the largest storage or spray tank brought onto the pad, to provide maximum protection. EPA's proposed regulations suggest a capacity of 250 gallons or 110 percent capacity of the largest tank, whichever is smaller.
- An adequate work and storage area for pesticides should be provided on the pad. The pumps, valves, hoses, meters and other equipment used to mix and load chemicals should also be kept on the pad.
- Sidewalls and an adequate roof should be provided to keep precipitation from collecting on the pad or in the sump.

- On a daily basis, and when changing from one pesticide to another, the sprayer should be cleaned and the pad rinsed down, the rinseate should be pumped back into the sprayer and applied to a labeled site or collected and used for mixing subsequent batches of the same pesticide.
- The sump pit should be thoroughly cleaned between pesticides. The resulting rinseate can be applied as a dilute pesticide to a labeled site or used as make-up water for subsequent batches of pesticides that are labeled for the same crop. Any sediment which accumulates in the sump pit can probably be land applied to a labeled crop at a rate well below the label recommendation. This sludge can be dried or pulverized, then mixed and applied by a broadcast fertilizer applicator. Be certain to comply with label requirements when performing these operations.

**DESIGN**

The design presented is for a sprayer of 500-gallon capacity. Naturally, the size of the facility is determined by the size, length, width, height and gallon capacity of the largest sprayer to use the facility. As shown in Figure 1 and Figure 2, this facility has a fill slab of 16 ft x 24 ft with an entrance and exit ramp, each 6 ft x 16 ft. Elevations shown in Figure 2 are for reference purposes only. The fill slab slopes more than two percent in all directions to a sump pit, 3 ft x 3 ft x 2 ft, covered with an expanded metal plate. Also provided are a shower, sink, fire extinguisher and first aid kit. If a pesticide storage facility is adjacent to the mixing and loading facility, these items could serve both facilities.

A raised loading platform, adjacent to the parked pesticide sprayer, 3 to 4 ft high with a work area with a minimum size of 3 ft x 6 ft, could be constructed in the area of the sump.

The concrete fill slab and sump should be a continuous pour with no seams or expansion joints, except at the entrance and exit ramps where the slope is reversed. There are to be NO openings in the fill slab. Supports for the roof (building) structure and the pipe for the water source are all outside the slab.

**Sump Pump**

The sump pump must be operated manually. The pump should create a minimum of turbulence within the sump, which will reduce the amount of solids
Figure 1. Layout of pesticide mixing-loading facility.
Figure 2. Layout of foundation concrete.
being drawn into the system. A filter must be installed between the sump pump and the sprayer to reduce the amount of sediment entering the spray tank and to minimize nozzle blockage.

All electrical components within the pesticide mixing-loading facility should be waterproof and explosive proof.

Concrete Slab

Details of the concrete slab are shown in Figures 3a, 3b, and 3c and Figures 4a and 4b. The following steps should be used for construction of the concrete slab:

1. The pad should be located at a site elevated above the surrounding area, so that the ground slopes away from the pad on all sides.

2. Remove all organic matter and topsoil.

3. Lay a minimum of a 6 inches base of gravel or crushed rock over well-compacted soil. The base should be even with, or above, the surrounding ground level.

4. The sump and pad should be lined with a 20 mil polyethylene liner.

5. Construct forms and place rebar. Rebar grade should be a minimum of Type 60. A minimum of 3 inches of concrete cover should be provided over all rebar between the slab's edges and bottom.

6. Concrete should be air entrained with a 28-day strength of 2500 psi. A 5-inch-thick concrete slab should be sufficient for most facilities. Concrete slabs 6 or 8 inches thick may be required when heavier equipment is utilized.

7. Pour concrete in a single pour.

8. The slab must have a minimum two percent slope toward the sump.

9. The concrete surface should be finished with a light broom finish.

10. After the concrete has cured for a minimum of four days, the surface should be washed with a mixture of one part muriatic acid to five parts water, and then be sealed with a petroleum resistant epoxy coating. Allow sealant to thoroughly cure prior to use of the pad.

11. Locate all building supports and plumbing outside of the concrete slab.

Roof Structure

A roof structure, as shown in Figure 5 and Figure 6, must be provided to prevent rain from flooding the sump and fill slab. This will prevent pesticide-contaminated run-off water from contaminating the surrounding area. A pole-type structure is recommended which will:

- Provide adequate width and height clearance for the largest sprayer to be filled on the pad.

- Provide sufficient overhang (30 degrees as shown in Figure 6, with a minimum of two feet overhang) to prevent rain from blowing onto the fill slab in any significant quantity. Side-walls can be used on one or more sides to reduce the amount of overhang required.

- Provide a minimum 10-feet eave height, as shown in Figures 5 and 6.

PLEASE NOTE: The recommended roof type is sheet metal gable with a minimum 3:12 slope as shown in Figure 6. A structure of this type will cost about $2,500 for the slab and roof. This cost will vary with local costs of materials and labor.

Plans for this pesticide mixing-loading facility are available from the Florida Plan Service, Agricultural Engineering Department, Frazier Rogers Hall, University of Florida, Gainesville, Florida 32611. Request Plan SP-5173, "Pesticide Mixing and Loading Facility."
Figure 3. Foundation concrete details for Sections A, B, and C for Figure 2.
Figure 4. Foundation concrete details for Sections D and E for Figure 2.
Figure 5. Side elevation of pesticide mixing-loading facility.

Figure 6. Front elevation of pesticides mixing-loading facility.