

## Concrete Containment – Crack Repair and Maintenance

*This fact sheet was prepared by the Minnesota Department of Agriculture to provide information for facilities who have constructed and have permitted concrete containment systems in Minnesota. This guidance is intended to supplement— not replace—Federal and State Laws and Rules*

Since 1990, the Minnesota Department of Agriculture (MDA) has issued bulk liquid pesticide and fertilizer storage permits that include safeguards constructed of concrete. Minnesota Statute defines “safeguard” as “a facility, equipment, device, or system, or a combination of these, designed to prevent an incident as required by rule”. Over time safeguards constructed of concrete show various levels of cracking and/or deterioration – some anticipated, some not. Design specifications, use, and installation all influence how well individual safeguards (containment areas and load pads) are holding up. Pesticide and fertilizer containment areas that are constructed with concrete that have moderate cracking and/or deterioration occurring may not prevent the escape or movement of pesticides and fertilizers as intended. The MDA inspections that document moderate or severe cracking are violations. When severe cracking is documented firms may be ordered to cease storing bulk agrichemicals. In other cases where cracking is less severe a firm may be given up to ten days to correct the violation. Failure to maintain permitted containment areas is a violation and financial penalties may be assessed.

### Inspection and Maintenance

#### Pesticide Containment Requirements

A person storing pesticides in containers of a rated capacity of 500 gallons or more must obtain a pesticide storage permit from the commissioner as required by rule (Minnesota Statutes Chapter 18B.14, Subd.2).

#### Pesticide Storage Rules

A secondary containment area must be inspected for condition and leakage of the base, seams, and walls at least monthly while bulk pesticide is in storage. Load pad areas must be inspected for leakage at least monthly during the use season (Minnesota Rules, Part 1505.3110, Subpart. 2).

#### Fertilizer Containment Requirements

A person may not store a fertilizer in a manner that will cause unreasonable adverse effects on the environment (Minnesota Statutes Chapter 18C.201). In addition, a person must obtain a permit from the commissioner on forms provided by the commissioner before the person constructs or substantially alters an existing facility used for the bulk storage and handling of fertilizers. The commissioner may not grant a permit for a site without safeguards that are adequate to prevent the escape or movement of the fertilizers (liquid or dry) from the site (M.S. Chapter 18C.305)

#### Liquid Commercial Fertilizer Rules

Safeguards must be maintained and operated in a manner which will prevent the escape of any liquid commercial fertilizer from the facility. There cannot be any leaks from a bulk liquid fertilizer storage containment area (Minnesota Rules, Part 1510.0375)

#### Dry Commercial Fertilizer Rules

Safeguards, storage containers, and mixing, blending, weighing, and handling equipment must be maintained and operated in a manner which will prevent avoidable amounts of particulate matter from leaving the facility. This includes the concrete walls and floors in bin areas and dry fertilizer load pads used for impregnation (Minnesota Rules, Part 1510.0400-1510.0408).

### Containment Evaluation

When conducting inspections of a safeguard (containment or load pad areas), pay special attention to the following:

- Joint movement (floor, wall and wall/floor joints)
- Cracks – If cracks are present, try and determine whether they are active/moving cracks where additional movement can be expected or dormant/nonmoving cracks where little or no movement in the future can be expected.
- Concrete pitting, defects, or damage

## CONTAINMENT REPAIR TECHNIQUES

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If joint separation and/or moderate/severe cracking is evident in the concrete floor or wall of the concrete containment area then the integrity has likely been compromised and repairs must be made immediately.

Below are examples of repair techniques for a variety of concrete repair problems. Manufacturers may have similar or slightly different procedures to follow for their specific products.

### Dormant/Nonmoving Cracks

**For very small non-moving hairline cracks** that require repair could be done by applying a pesticide/fertilizer compatible coating over the entire area creating a thin film or seal to prevent any ag chemicals from moving through the cracks over time. When applying a coating to a floor you must follow manufacturers recommendations for cleaning and prepping the floor prior to coating the floor. This procedure has also been recommended to help preserve concrete safeguards from deterioration from the substances they are intended to capture.

### For larger non-moving cracks that are larger than hairline cracks:

- Cracks should be cleaned out and perhaps widened using a crack chasing blade to allow better sealant/concrete contact.
- Choose a compatible sealant. For example, a polyurethane sealant would work for a fertilizer safeguard but not for a pesticide.
- For nonmoving cracks sealant choice could be something more rigid, like an epoxy or something more flexible like a poly sulfide, or compatible silicone sealant.
- Larger cracks may need a backer rod or sand like material to fill in the crack to help reduce the amount of sealant needed to fill in some of the space.
- For nonmoving cracks another repair option is to apply an epoxy coating liberally to the crack and several inches on both sides of the crack. While the coating is still wet, work-in a fiberglass- mesh cloth strip over the crack with a roller until the coating has soaked its way through the cloth Once dry, apply a second coat. This repair method works best for nonmoving cracks and in low traffic areas.

### Active/Moving Cracks

The same repair procedures as noted above can be applied when sealing moving cracks. The only difference is when sealing a moving crack, you must choose a compatible sealant that has some flexibility so it will continue to stay in place even if the concrete shifts causing the crack to move or expand in width or length. Sealants that are not flexible will pull away or reopen if/when the crack moves so it is very critical to choose the correct sealant for all moving cracks.

**For small moving cracks (1/4 inch or less)** Small moving cracks if not attended to could get worse with time so firms need to stay on top of maintaining the smaller cracks.

**For larger moving cracks (greater than 1/4 inch)** Large moving cracks pose a larger threat since there is a better likelihood that the safeguard has been compromised. If not compromised, a larger crack will only get worse if proper attention is not given to sealing them up when they are first discovered. Preparing the crack prior to sealing is as important as choosing the correct sealant. Follow the manufacturer's recommendations to insure you get the best results.

Many manufacturers have created YouTube videos to demonstrate how to make concrete repairs. Some of these videos go step by step explaining and demonstrating the proper way to seal a crack. Depending on the product, a sealant used in the videos may need to be substituted for a proper pesticide/fertilizer compatible sealant, but the procedures demonstrated are still applicable to properly sealing cracks in concrete.

### Wall/Floor Joints

There are several repair techniques adequate for wall/floor joints that are in need of repair. Examples:

- Caulk the corner joint with a compatible sealant and then cove over the joint with an appropriate coving material.
- Caulk the corner joint with a compatible sealant and then apply compatible coating material on both sides and while still wet work in the fiberglass mesh cloth so half is on one side and half is on the other side. Once dry, apply a second coating layer on top of the fiberglass mesh.

### Voids and Bugholes

All voids and bugholes should be filled and patched when present to ensure dike integrity. Though they may not be cause for immediate concern, they can become problems in the future. Any quality patching material can be used if the area is to be coated with a compatible coating following the patchwork.

## Selecting a Coating or Sealant

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It is important to note that there are many repair methods and techniques available for dealing with a variety of concrete damage or deterioration. When selecting a coating or sealant, the following considerations must be thought out:

- What will be the potential chemical exposure?
- Will the coating or sealant be compatible with the substrate?
- What are the application conditions in the area needing to be maintained?

In most pesticide and fertilizer containment applications, the following coating and sealant types have been shown to provide satisfactory resistance to various agricultural chemicals:

### Best Chemical Resistance

- Vinyl ester
- Epoxy phenolic resin
- Epoxy novalac resin
- Polysiloxane epoxy

### Acceptable Chemical Resistance

- Polysulfide compounds for sealing larger moving cracks/joints
- 100% solid polyamide cured epoxy
- Amido amine cured epoxy
- Some silicone sealers have also tested well for resistance. Ask the MDA staff for products that have performed well.

### Acceptable Fertilizer-Only Resistance

- Polyurethane
- Urea urethane
- Other urethane sealants compatible with fertilizer products

The sealant types listed above are not inclusive and are provided solely to help readers get started in selecting compatible products for containment repair. Before using specific products containing any of these compounds it is best to check first with the manufacturer for recommended applications. It is best to choose a sealant or coating that has performed well in extended tests of continuous exposure.

In all cases, proper concrete preparation is critical to ensure a proper bond of sealant to concrete. The surface must be sound and free of contaminants (clean). In addition, all application instructions, including those regarding temperature range at which the product may be applied, should be followed carefully. Don't hesitate to call the manufacturer with application questions. Attention to detail will help to ensure long-term performance.

New and improved products are continually being made available. If choosing a sealant or coating type different from the recommendations, have the manufacturer provide you with compatibility test results and forward a copy of these results to the MDA.

## Selecting a Commercial Contractor for Concrete Containment Repair

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Firms may opt to hire someone else to perform needed repair work on their concrete containment system. This may be necessary due to:

- Time limitations
- Lack of personnel qualified to do the repair(s)
- Severity of repairs required to be done is too large to handle in-house.

When hiring an outside contractor make sure they are aware of all the factors discussed in the factsheet so proper and compatible sealants and coatings are used for making the repairs.

Screening commercial companies before you hire a contractor is also a critical step to make sure you get a quality job.

Things to consider:

- Check references
- Check with the Better Business Bureau
- Contact the proper state agency(s) to verify whether the potential contractor has a business license and carries workers' compensation insurance
- Finally get in writing performance warranties for the repairs being done.

## Summary

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It is important to ensure that the repair solution chosen addresses the problem. Choosing the correct repair method along with using a compatible sealant/coating will provide the best long-lasting results.

Regular inspection and maintenance of your concrete containment system is required by law. By staying on top of repairs you can preserve the life and integrity of your system.

Firms are strongly recommended to purchase and keep an inventory of enough sealant to do small crack repair jobs as they appear. For a typical pesticide dike and load pad area you may want to have on hand enough sealant to fix and repair a minimum of 25 linear feet. For larger fertilizer dikes and load pad areas you may want to double that amount.

Plan ahead by identifying your suppliers, the type of sealants available, and keep an inventory of enough sealant to repair small crack problems as they appear.

## Further Information

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