



AEM Tier II Worksheet

Fertilizer Storage & Handling in the Greenhouse

Glossary

Backflow Protection: Use of a device to prevent contaminated water from siphoning back into a water supply.

Calibration: Determining accuracy of equipment and methods; using standards to maintain accuracy in equipment capacity and volumes delivered. With liquids, the amount applied to a known area must be known and consistent.

Electrical Conductivity: A measurement of the amount of dissolved salts in the plant substrate and water that affects the ability of plants to take up nutrients.

Fertigation: The addition of fertilizers to irrigation water.

Fertilizer Injector: Device that dilutes by a known ratio the amount of fertilizer and water solution into the irrigation line.

Impermeable Flooring: Non-porous flooring constructed to resist absorption.

Leaching: Applying an overabundance of water or solution to wash toxic chemicals and concentrations away from the root zone (out of growing container).

pH: The measure of free hydrogen ions in solution. A pH of less than 5.5 is considered low (acidic), over 6.2 is considered high (basic) in greenhouse situations

Precipitate: The resulting solids that have separated from water in a chemical solution.

Stock Solution: concentrate of liquid fertilizer used to supply the fertilizer injection system.

Background

Greenhouse fertilizer storage areas contain concentrated nutrients that must be stored and managed properly to prevent their potential release, through broken, damaged or leaking containers. When mixed with water, either intentionally or unintentionally, these nutrients can leach into groundwater or be carried away by runoff into surface waters. Excessive nitrate concentrations in drinking water can cause health risks, especially in young children. Phosphorus can be transported to surface waters and cause algae blooms and eutrophication; resulting in poor water quality. Storing fertilizers separate from other chemicals in dry conditions can minimize all these problems. Extra care needs to be given to concentrate stock solutions. Secondary containment should always be used. In addition, it is important to inspect and maintain all irrigation systems, repairing leaks and fittings in a timely manner.

Agricultural Water Quality Principle:

The concentration of chemicals found in fertilizers makes proper storage of utmost importance for the safety of human health and the environment.

AEM Tier II Worksheets Fertilizer Storage		Potential Concern		
	1 - Lower Risk	Level 2	Level 3	4 - Higher Risk
Where are fertilizers stored?	Building dedicated to fertilizer storage; separate from pesticides AND protected from extreme heat and flooding.	Area dedicated to fertilizer storage; separate from pesticides AND protected from extreme heat and flooding.	Designated work area; stored with pesticides.	No specific area.
How is fertilizer stored and contained?	Stored on impermeable floor with secondary containment, away from plant material and high traffic areas. Clean-up equipment is readily available.	Stored on impermeable floor with secondary containment.	Stored on permeable floor with secondary containment.	Stored on permeable floor.
How are damaged containers dealt with?	Fertilizer is repackaged and labeled OR placed in suitable secondary containment that can be sealed.			Damaged containers may go unnoticed; repackaging does not occur consistently.
What type of fertilizer injector is used?	Automatically monitored and controlled injection system.	Positive displacement or metering device injection, manual control.		Inexpensive Venturi-type injector; injector equipment is in need of replacement or overhaul.
How often is equipment inspected?	Injector equipment is inspected weekly; stock tank is inspected weekly for deterioration and cracks.	Injector equipment and stock tank are inspected quarterly.		Injector equipment and stock tank are repaired when problems are noticed.

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Is system calibrated regularly?	Accuracy of fertilizer injector and fertilizer measurement is tested after each preparation of new stock solution.	Accuracy of fertilizer injector and fertilizer measurement is tested monthly.	Accuracy of fertilizer injector and fertilizer measurement is tested annually.	Unlikely to be monitored.
How frequently are nutrients applied?	Automated controls monitor and apply fertilizers at the proper rate at each watering.	Fertilization at regular intervals with the proper dilution ratio and flow rate.	Application of fertilizer is done at irregular intervals when monitoring shows obvious need.	Occasional application of fertilizer at the discretion of the employees.
How frequently are pH and electrical conductivity of the planting mix and water monitored?	Plant mix and water tested before each growing season.		Monitoring occurs when crop health problems arise.	Monitoring is not done.
How often is pH and EC monitoring equipment calibrated and maintained?	Calibrating solutions are refreshed yearly, equipment is calibrated before each use, faulty equipment is repaired or replaced promptly.			Calibrating solutions are not refreshed, equipment is not calibrated.
How are fertilizer use and application records kept?	Inventory kept on amount of fertilizer purchased and location of application; records are updated after each use.	Inventory kept on amount of fertilizer purchased and location of application; records are updated weekly.	Inventory kept on amount of fertilizer purchased. Use records are not consistently kept.	No consistent inventory is taken. Records are not kept.

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How are precipitates discarded?	Fertilizer systems are cleaned; solids and rinsate are added to a compost pile.	When fertilizer systems are cleaned, solids are removed first and discarded as solid waste before rinsate is flushed to sanitary sewer.	Fertilizer systems are cleaned; solids and rinsate are flushed to sanitary sewer.	Fertilizer systems are not cleaned on a regular basis and rinsate is subject to varying disposal methods.
How is irrigation and leaching managed?	Leaching of fertigated water is limited to 10% using trickle tube irrigation, zero effluent systems used whenever possible.	Conscious attempt to limit the amount of leaching of fertigated water to 10%.		Leaching of fertigated water has not been addressed.

Other:

1. How do you dispose of empty fertilizer containers?