

Best Management Practices for Fertilizer Storage and Handling

Rationale

Fertilizers can cause harm if they reach surface or ground water. For example, high nitrates in potable water cause heart damage in unborn and newly born infants and excessively high phosphorus in wetlands and estuaries causes eutrophication and loss of aquatic life. Potential problems associated with fertilizers fall into four primary phases of use- storage, handling, delivery, and management. For this document, only the first 2 are relevant. 1. Storage – greenhouse fertilizer storage areas contain relatively large quantities of concentrated chemicals. Risks in storage areas include release

through broken, damaged, or leaking containers; loss of security leading to irresponsible use; accumulation of outdated materials leading to excessive quantity of fertilizer thus unnecessarily raising risk level; and combustion of oxidizing compounds in fertilizer (e.g., nitrates) caused by fire or another disaster event. 2. Handling – opening fertilizer product containers, measuring amounts, and transferring fertilizer to the delivery system involve some level of risk from spills. Since most products are granular, ease of containment and clean-up is possible.

Environmental Principle: Fertilizers and nutrient solutions can have a significant impact on surface and groundwater when accidents or misapplications occur. Care in storage and handling is essential to environmental stewardship. Factors including construction of storage facility types of shelving, methods of containment, and cleanliness are all important to preventing losses of fertilizers and nutrients to the environment.

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Overview			
Emergency Preparedness	All staff know to call 911 in the event of an emergency Emergency contact numbers are posted	All staff know to call 911 in the event of an emergency Emergency contact numbers are posted All staff know the locations of spill kits and how to use them	All staff know to call 911 in the event of an emergency Emergency contact numbers are posted All staff know the locations of spill kits and how to use them
Environmental Awareness	Staff are made aware of hazards to surface and groundwater by spills of fertilizer	Staff receive training on environmental hazards, and how hazards can be reduced	Staff receive training on environmental hazards and how hazards can be reduced Hazards have been eliminated or are minimal and closely monitored

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Training	Greenhouse manager ensures all staff receive basic training on fertilizer handling	Greenhouse manager ensures all staff receive basic training and updates on fertilizer handling and storage, and are trained in the cleanup of small spills of fertilizers during new staff orientation with follow up training as necessary by their supervisor	Greenhouse manager ensures all staff receive basic training and updates on fertilizer handling and storage, and are trained in the cleanup of small spills of fertilizers during new staff orientation with follow up training as necessary by their supervisor
Communication	Greenhouse manager provides information on fertilizer storage to individual staff as necessary	Greenhouse manager and all staff exchange information on fertilizer storage and handling in a group setting	Greenhouse manager and all staff exchange information on fertilizer storage and handling in a group setting. Staff are encouraged to gain and exchange additional knowledge on fertilizer handling and storage with the entire work group
Management			
Inventory and Recordkeeping	Records are kept on amount of fertilizer purchased. Materials no longer used are occasionally removed and discarded properly	Records are kept on amount of fertilizer purchased. Containers are dated when purchased An annual inventory of fertilizers in the storage area is posted outside of storage area. Materials no longer used are removed on an annual basis and discarded properly	Records are kept on amount of fertilizer purchased and amounts of fertilizer used. Containers are dated when purchased An actively maintained inventory of fertilizers in the storage area is posted outside of storage area. Inventory is controlled to prevent the accumulation of material that may become difficult to use Outdated materials are removed at the time of inventorying and discarded properly.
Health and Safety	First aid kit, emergency shower, and eye wash are readily available outside the storage area in a nearby building	First aid kit, emergency shower, and eye wash are readily available outside the storage area in the same building	First aid kit, emergency shower, and eye wash are readily available outside the storage area within visible distance of the storage area
PPE for Handling Fertilizer in the Storage Area	Staff wear appropriate Personal Protective Equipment (PEE) according to the label and conditions (e.g., potential for dust)	Staff wear appropriate PPE according to the label and conditions (e.g., potential for dust) Basic and label specific PPE will be provided by the employer	Staff wear appropriate PPE according to the label and conditions (e.g., potential for dust) Basic and label specific PPE will be provided by the employer

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Storage Area			
Building Materials	<p>Common construction materials for floors, walls and ceilings/roofing - no special properties</p> <p>Wooden shelves are not preferred</p>	<p>Construction materials for floors, walls and ceilings/roofing are largely fire resistant</p> <p>Wooden shelves are not permissible</p>	<p>All construction materials for floors, walls and ceilings/roofing are fire resistant</p> <p>Rust-resistant metal, water-resistant, or chemical-resistant shelves</p>
Floors and Containment	<p>If porous floor, all fertilizers must be in secondary containment to prevent spills reaching floor</p> <p>No floor drain unless raised with a berm or with temporary plug;</p>	<p>Nonporous floor</p> <p>No floor drain unless raised with a berm or with temporary plug</p>	<p>Floor or additional built in containment provides containment in the event of a spill (non-porous floor)</p> <p>No floor drain</p>
Location of Storage Area	<p>Consideration is given to reducing environmental impact and ease of use in selecting location for storage area</p> <p>Can be freestanding</p>	<p>If fertilizer storage is within another building, it is structurally segregated from general work areas</p> <p>In all cases, consideration is given to location of storage area away from environmentally sensitive areas.</p> <p>Flooding is unlikely</p>	<p>Fertilizer storage is located away from environmentally sensitive areas, separated from offices, workshops, laboratories, surface water, neighboring dwellings and bodies of water</p> <p>Flooding is unlikely</p> <p>Storage area is in close proximity to where fertilizers will be mixed and used</p>
Lighting	<p>Minimal electrical or natural lighting provided</p> <p>If present, electrical lighting in good working order</p>	<p>Electrical lighting in good working order</p>	<p>Electrical lighting in good working order and allows clear view into all areas and cabinets within storage area</p>
Protection for Electrical Equipment (for fire, spark, and heat prevention)	<p>Protection for electrical equipment includes switch plate covers and junction boxes</p> <p>No electrical panels in storage areas</p>	<p>Protection for electrical equipment includes switch plate covers and junction boxes, light bulb covers</p> <p>NEMA rating 3 for light switches</p> <p>No electrical panels in storage areas. If possible, light switches should be outside the storage area.</p>	<p>Protection for electrical equipment includes switch plate covers and junction boxes, light bulb covers</p> <p>Anti-spark protection where needed</p> <p>NEMA rating 4 for light switches</p> <p>No electrical panels in storage areas. If possible, light switches should be outside the storage area.</p>

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Fire Prevention and Suppression	<p>Correct type of fire extinguisher (water) available within general area (25 feet)</p> <p>Oxidizers and flammable materials stored in a separate storage area,</p> <p>HASP signs present</p>	<p>Fire detection and alarm system present,</p> <p>Correct type of fire extinguisher (water) available within storage area</p> <p>Oxidizers and flammable materials stored in a separate storage area</p> <p>HASP signs reviewed annually</p>	<p>Fire detection and alarm system present, sprinkler system (with 18 in. clearance) present</p> <p>Oxidizers and flammable materials stored in a separate storage area</p> <p>Correct type of fire extinguisher (water) immediately available</p> <p>HASP signs reviewed annually</p>
Inspection of Storage Area	<p>Annual inspection of storage area for signs of container corrosion or other damage, or other facility maintenance by staff, and by fire inspectors for faulty electrical, and fire suppression systems</p> <p>Problems are reported and corrected</p>	<p>Quarterly inspection of storage for signs of container corrosion or other damage, or other facility maintenance by staff, and annually by fire inspectors for faulty electrical, and fire suppression systems</p> <p>Problems are reported and corrected immediately</p>	<p>Monthly inspection of storage for signs of container corrosion or other damage, or other facility maintenance by staff, and annually by fire inspectors for faulty electrical, and fire suppression systems –</p> <p>Problems are reported and corrected immediately</p>
Temperature	<p>No temperature control system</p> <p>Area not insulated</p>	<p>Temperature control system for heating and cooling the building</p> <p>No direct sources of heat (sunny windows, steam pipes, furnaces, etc.) in the storage area</p> <p>Area will not freeze</p>	<p>Temperature control system for heating and cooling the building and/or the storage facility</p> <p>No direct sources of heat (sunny windows, steam pipes, furnaces, etc.) in the storage area</p>
Ventilation	<p>No or passive ventilation only</p> <p>Humidity is not controlled</p> <p>Systems are not blocked by any material</p>	<p>Mechanical ventilation available, working and used,</p> <p>Limited humidity control</p> <p>Systems are not blocked by any material</p>	<p>Automated climate control working and used,</p> <p>Humidity actively controlled</p> <p>Systems are not blocked by any material</p>

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Pest Control (Insects & Mammals)	Program is in place to control pests	Fertilizer storage is constructed to prevent pest access Program is in place to control pests	Fertilizer storage is constructed to prevent pest access. Staff is proactive in identifying pests, access and damage Program is in place to control pests
Security	Fertilizer is stored in a dedicated fertilizer storage area. Only authorized personnel may access this area	Fertilizer is stored in a dedicated fertilizer storage area that is locked. Access to keys is controlled by the greenhouse supervisor.	Dedicated fertilizer storage area is locked. Access is restricted to trained personnel and controlled by the greenhouse supervisor
Exterior signage	Legible HASP signage and identification as fertilizer storage	Annually updated HASP signage and identification as fertilizer storage	Annually updated HASP signage and identification as fertilizer storage Warning signs used as needed (e.g., for oxidizers) All signage is waterproof
Handling			
Contents	Storage area has clearly defined area for fertilizers Storage area may also contain other greenhouse chemicals (no pesticides or oxidizers or flammables), and general greenhouse supplies No food, drink, tobacco products, or livestock feed is present Storage area does not allow mixing If ammonium nitrate is stored in	Storage area contains only fertilizers. Storage area does not allow mixing If ammonium nitrate is stored in the storage area, it must be under restricted access**	Storage area contains only fertilizers Storage area does not allow mixing If ammonium nitrate is stored in the storage area, it must be under restricted access**

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
	the storage area, it must be under restricted access**		
Containers	<p>All chemicals stored in their original containers unless damaged. Food or beverage containers are never used for storage</p> <p>Labels are visible and readable.</p> <p>All damaged containers are in labeled secondary containment</p> <p>Any containers in contact with floor are in secondary containment</p> <p>Any fertilizer stock tanks are labeled with fertilizer formulation and concentration.</p>	<p>All chemicals stored in their original containers unless damaged. Food or beverage containers are never used for storage</p> <p>Labels are visible and readable and inspected annually</p> <p>All damaged containers are in labeled secondary containment</p> <p>Any containers in contact with floor are in secondary containment</p> <p>Any fertilizer stock tanks are labeled with fertilizer formulation and concentration.</p> <p>Partially used fertilizers will be stored in closed plastic containers if appropriate</p> <p>Packaging is routinely checked for damage</p> <p>Small non-bulk items placed immediately in secondary containers</p>	<p>All chemicals stored in their original containers unless damaged. Food or beverage containers are never used for storage</p> <p>Labels are visible and readable and inspected annually</p> <p>All damaged containers are in labeled secondary containment</p> <p>Any containers in contact with floor are in secondary containment</p> <p>Any fertilizer stock tanks are labeled with fertilizer formulation and concentration.</p> <p>Partially used fertilizers will be stored in closed plastic containers if appropriate</p> <p>Packaging is routinely checked for damage</p> <p>Small non-bulk items placed immediately in secondary containers</p>
Partially-used Containers	Unsealed containers are resealed	<p>Paper bags and boxes are always opened with a box cutter or scissors</p> <p>Unsealed containers are resealed</p> <p>All open paper bags and boxes are sealed inside another, larger plastic container, sealed and labeled</p>	<p>Paper bags and boxes are always opened with a box cutter or scissors</p> <p>Unsealed containers are resealed in an airtight container</p> <p>All open paper bags and boxes are sealed inside another, larger plastic container, sealed and labeled</p>

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Damaged Containers	When damaged containers are noticed, containers are placed in suitable secondary containment which can be sealed and labeled	Containers routinely checked for damage. When damaged containers are noticed, contents are repackaged in a suitable secondary container, sealed, and labeled	Containers routinely checked for damage. When damaged containers are noticed, contents are repackaged in a suitable secondary container, sealed, and labeled Original received date and repackaged date written on container
Disposal of Fertilizer and Containers	Unusable or surplus fertilizer products are discarded or distributed in an environmentally appropriate manner Empty fertilizer containers are discarded based on latest advice from environmental protection authorities	Unusable or surplus fertilizer products are discarded or distributed in an environmentally appropriate manner Planning and ordering adapted to minimize disposal Empty fertilizer containers are discarded based on latest advice from environmental protection authorities	Unusable or surplus fertilizer products are discarded or distributed in an environmentally appropriate manner Planning and ordering adapted to minimize disposal Empty fertilizer containers are discarded based on latest advice from environmental protection authorities
Spill Preparedness	Spill clean-up materials for liquids (e.g., absorbent materials) and solids (e.g., shovel, dustpan, broom and empty and/or buckets) are available within the general area	Spill clean-up materials for liquids (e.g., absorbent materials) and solids (e.g., shovel, dustpan, broom and empty and/or buckets) are available within the storage facility. Spill kits are readily available	Spill clean-up materials for liquids (e.g., absorbent materials) and solids (e.g., shovel, dustpan, broom and empty and/or buckets) available within the storage facility Spill kits are in the storage facility
Container Arrangement	Labels in plain sight. Liquid containers stored upright. Containers are stored in an orderly and easily accessible manner Oxidizers are not stored on wood (shelves or pallets)	Labels in plain sight. No containers in contact with floor (except bulk orders on pallets or in secondary containment) All unsealed containers stored up-right Aisles wide enough to comfortably accommodate workers	Labels in plain sight. No containers in contact with floor(except bulk orders on pallets or in secondary containment) All unsealed containers stored up-right Aisles wide enough to comfortably accommodate workers

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
		Containers are stored in an orderly and easily accessible manner Liquids below solids Oxidizers are not stored on wood (shelves or pallets)	Containers are stored in an orderly and easily accessible manner Liquids below solids Arranged by formulation Oxidizers are not stored on wood (shelves or pallets)
Cleanliness	Area is clean	Area is clean Shelving is provided to help maintain order in inventory	Area is clean, and inventory arrangement is orderly The floor, shelving and counters are kept free of debris and miscellaneous items

** For information on storage of ammonium nitrate:

<https://www.epa.gov/rmp/chemical-advisory-solid-ammonium-nitrate-storage-handling-and-management>