

Warehousing and Storage of Dangerous Goods

The proper storage and warehousing procedures for DG items – while extremely important – do not have a well-defined international standard like transportation of DG does. This largely stems from the fact warehouses themselves will almost never operate between two different sovereign territories. As a result, the proper storage of DG in a warehousing context is often regulated by national and local authorities; sometimes regulation is heavy, and sometimes regulation is almost non-existent.

Humanitarian organisations operating in any context should both understand the proper methods of storing DG, and should maintain and enforce internal policies. Additionally, any agency specific warehousing DG procedures should also comply with the prevailing national or local laws regarding DG management.

Identify DG/Hazardous Items

While in the course of humanitarian operations, persons working in storage or warehousing should always be alert for incoming DG/Hazardous Items. Simple steps to follow for identifying potentially hazardous materials include:

- Check labels on containers for clues such as, caution label, warning label, danger label. These are usually the indication if something is hazardous.
- Check for SDS/MSDS/PSDS for incoming shipments.
- Identify the material on the UN list of dangerous goods.

Basic DG and Hazardous Materials Handling Requirements

When storing any DG or hazardous materials for any reason and in any context, the following is recommended:

- Identify DG/hazardous materials beforehand and transport, handle, and store them in accordance with local regulations.
- Keep SDS/MSDS/PSDS in the same storage location as the stored DG/hazardous items.
- Learn and know the risk of DG/hazardous items in storage.
- If necessary, keep a separate DG/hazardous inventory.
- Separate and properly track DG/hazardous item waste.
- Keep adequate spill response equipment available and train employees on their use.
- Use the rule of “first in first out” (FIFO), use the oldest product first.
- If the expiration date marked on the side of the product has been exceeded, contact the proper authority to see if the expiration date has been or can be exceeded.

Spill Prevention

Steps that any person managing DG/hazardous materials can take to reduce or prevent spills might include:

- Understand chemical hazards.
- Follow safe storage and handling procedures.
- Read and follow the instructions on labels and material safety data sheets.
- Don't store or use chemicals in unlabelled containers.
- Inspect chemical containers for damage or leaks.
- Don't handle or open chemical containers without appropriate personnel protective equipment (PPE).

- Don't leave containers open.
- Report potential hazards to managers, other employees, and safety managers.

It is recommended that damaged or leaking hazardous materials should be removed and stored in a separate, safe space. Ideally, spilled items should be stored in a well-marked, reinforced plastic drum.

Spill Response

In the event of a spill or leaking container, the supervisor of the facility should be notified. The person discovering the spill and the site supervisor should record information on the spill (when it occurred, why it occurred, what was spilled, volume spilled, personnel involved, etc.), and keep on file at the storage location.

Necessary action to contain and control the spill by soaking up, diverting, or containing any liquid flow should be taken immediately to prevent contamination of any surface drains, soils, or waterways. Such action could include spreading absorbent materials or pads and/or using absorbent rolls or dirt to control the flow.

Spill Clean-up

Materials used to support the clean-up DG/hazardous materials spills should be readily available in all storage locations where DG/hazardous materials might be stored. These materials might include items such as the following:

- Oil absorbent pads.
- Brooms and squeegees.
- Large plastic covered trash bins.
- Nitrile gloves and latex gloves.
- Leather gloves.
- Boots.
- Respiratory masks.
- Salvage drums and containment pallets.
- Dust pans or shovels.
- Sandbags or bags of other absorbent materials.
- Danger tape.
- Safety cones.
- Helmet/ "hard hat".
- Face shield.
- Chemical resistant aprons.
- Emergency response guidelines.

In the event of spills of flammable or combustible liquids, the following steps are strongly suggested:

Inform all persons in the immediate area to evacuate, except those involved in the clean-up process.

- Notify the safety and security focal point.
- Eliminate all ignition sources, including static electricity, electrical switches, running motors, and exposed wiring.
- Increase ventilation and exhaust fumes to the outdoors.
- Put on the protective equipment.
- Confine the spill by blocking it. This is done by using the absorbent material in the spill kit.

- Prevent the spill from entering drains or sewer system.
- Cover the spill with absorbent materials and safely and properly dispose of used absorbents.
 - Safely dispose of contaminated equipment including personal protective equipment.
 - Seal and label all containers of disposed items as hazardous waste.
 - Store waste in a safe spot in or near the storage facility, ideally outside, until pickup by a licensed hazardous waste disposal company can be arranged.
 - For a major spill, or one that cannot be contained, the area and the warehouse should be fully evacuated.

Other Considerations

The scope and specifics of DG handling requirements depend on the activities of the agency in question, including the types of intervention activities and the sheer volume of DG items required.

DG in warehouses should always be marked and accounted for. Cartons should always have the appropriate markings, and where necessary DG items might even require signs or marking denoting their location inside the warehouse or storage facility. Depending on the local regulations, warehouses with sufficient quantities of DG may be required to be properly marked or placarded on the outside.

All DG items should be clearly visible and clearly accessible. DG items that give off fumes, are considered combustible, corrosive, oxidising or toxic should be properly sealed and properly ventilated. DG items in containers that display distress or compromise must be removed, repacked, or secured in the appropriate manner. If at all avoidable, DG items of different types should not be stored next to each other in a warehouse, and ideally should be stored in separate structures.

Warehouse staff should be informed of which items are DG, and be instructed on the proper hazards and handling procedures associated with them. Humanitarian agencies should never expect casual or local labour to understand or respect the concerns surrounding DG, and safety should be of paramount concern.

Toxic or Corrosive Compounds – Compounds considered poisonous or toxic to humans can range across many DG items. Toxic substances should be well sealed and well-marked. If required, they should be stored in a separate location, and only handled using the appropriate protective gear. Items like refillable lead acid batteries may appear inert, but can cause harm to warehouse workers.

Explosive Compounds – While relatively unusual for humanitarian response, agencies can and do handle explosive compounds without realising it. As an example, chemical based fertilisers can be extremely explosive when intermixed with other substances. Explosive compounds should be clearly identified and segregated from the remaining cargo items. If possible, explosive compound should be stored in an entirely separate storage area, ideally someplace not commonly accessed by persons. Explosive compounds should not be exposed to excessive heat, open flames, or other reactive compounds for any period of time.

Oxidising Compounds – Corrosive compounds that may be common in humanitarian response included medical grade cleaning compounds or household cleaning supplies. Oxidising compounds react with metals nearby, and can cause violent reactions with fuels and other combustible materials. Though warehouses may take steps to prevent violent reactions with combustible compounds, warehouse workers may not notice the slowly forming impact of oxidation on other things in the warehouse. Oxidising compounds will slowly degrade

shelving, racks, and warehouse super structures increasing risk of serious injury to warehouse workers, as well as impacting any metal objects stored near it. Storage facilities that keep oxidising compounds may end up damaging the objects immediately around the substance over a long period of time without noticing it.

Bio-hazards – Bio-hazardous substances such as medical waste or live biological samples should be handled by trained personnel only! Bio-hazardous materials should be properly sealed, and stored in separate secure areas, and at the required temperatures if any exist.

Pressurised Containers – It is strongly advised that pressurised containers of any size are not stored in a warehouse for any period of time. Flammable compressed gas should be handled in a separate storage area all together, while non-flammable compressed gas should ideally be stored temporarily, or not at all. If compressed gas or other pressured containers must be stored for any period of time, they should be stored at the ground level and properly braced to avoid falling or rupturing. If pressurised containers have valves or nozzles that are exposed, they should be safely and securely covered to avoid rupturing or becoming damaged in movement. Pressurised containers should not be exposed to excessive heat above the normal room temperature range – even inert or non-flammable compressed compounds can violently rupture harming nearby persons.

Fuel – Fuel products are extremely common in field bases humanitarian response, including:

- Diesel
- Gasoline/Petrol
- Compressed Gas

Stored fuel is usually accessed frequently, and is equally frequently exposed to the open air. General tips for storage of fuel include:

- Fuel should be stored in an independent, secure storage facility separated from any main warehouse structure by at least 10 meters (preferably more).
- Fuel storage areas should be extremely well ventilated, while still be locked or inaccessible by unauthorised persons.
- Fuel storage areas should be properly marked with the appropriate placard.
- Fuel storage areas should have fully charged and maintained fire extinguishers easily accessible, and of the appropriate type (Class B for flammable liquids, Class C for flammable gasses).
- Fuel containers should be sealed, not exposed to air when not in use or being accessed, and not be compromised or leaking in any way.

Fuel by nature is both highly combustible, and highly reactive. Fuel should not come into contact with or be stored near any other volatile or reactive chemicals, such as nitrogen-based fertilisers or chlorine based compounds. Natural gas contained in compressed cylinders should be properly secured to avoid falling or damage.

Additionally, fuel should not be exposed to open flames, sparks or excessive heat sources, including any form of welding or electrical work nearby. Employees should refrain from smoking near the area, and no smoking signs should be clearly visible. Different fuel compounds [have different flash points](#) – the temperature at which they are combustible. Note that gasoline (petrol) has a significantly lower flash point, meaning it can be ignited in negative temperatures. Other compounds vary based on things such as air temperature and ventilation.

Please reference the [Fuel Management section of this guide](#) for more information on proper

fuel handling in storage and transport.