



Guidelines for the safe warehousing
of crop protection products

These guidelines are intended to complement the requirements of any local and national laws and regulations, as well as the FAO/WHO International Code of Conduct on Pesticide Management.

The information contained in this guideline is accurate to the best of the knowledge of CropLife International. No liability whatsoever can be accepted in respect of the use of this information nor in respect of any advice contained herein.

Foreword

The plant science industry, represented by CropLife International, is actively involved in and committed to programmes that promote the effective management and responsible use of crop protection products.

This is achieved through support of stewardship – the responsible and ethical management of a crop protection product throughout its lifecycle – from the initial research and development, through distribution and use, to the eventual disposal of any waste.

As part of this commitment to stewardship, CropLife International has published a number of guidelines covering different aspects of the management of crop protection products. These guidelines are the third in the series and cover the important area of warehousing and storage of products. They include general advice on the construction and operation of facilities, as well as procedures to follow in case of emergency.

These guidelines also serve both as an information source and training material. The effort to improve the knowledge and advice in this area is very much in the spirit of the FAO/WHO International Code of Conduct on Pesticide Management and I recommend these guidelines to all concerned with the responsible and effective use of crop protection products.



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Introduction

These guidelines deal with the safe warehousing of packaged crop protection products in quantities of 10 tonnes or more. However, it is recommended that the basic principles should also be followed if smaller amounts are stored. These guidelines deal only with the passive storage of packaged products, i.e. they do not cover production or filling activities that may be present in a warehouse.

It should also be recognized that a number of guidelines for the safe storage of crop protection products have been prepared by individual companies and trade or industrial associations involved in the supply of their products.. In this case, the advice or requirements of these entities should be considered and followed, especially if they are product-specific.

The information provided in this guideline is based on common good practice and combines the advice of existing documents with the lessons learnt from past incidents that have occurred. The advice given should help to ensure that crop protection products are stored and handled in a safe manner during normal warehouse operations.

The guideline also provides recommendations for the prevention of incidents and for the preparation of emergency plans.

The guideline is intended mainly for managers of warehouses and stores, distributors of crop protection products, fire brigades and national regulatory and local authorities.

In the guidelines, the word '**must**' is used to indicate the minimum standard acceptable, and the words '**should**' and '**recommended**' to indicate proven good practices.

To help managers and others carry out effective 'self audits', a checklist has been included at the end of the document.



Whenever this sign appears it indicates bad practices, which should be avoided.

Any decision about equipment or warehouse practices should not be taken without the prior agreement of the relevant authorities and the responsible fire departments. The guidelines therefore recommend close collaboration with authorities and fire departments, that they be informed of the nature of the goods stored and the preparation of emergency plans in case the recommended preventive measures listed in these guidelines should prove insufficient.

REGARDLESS OF THE RECOMMENDATIONS GIVEN, IT IS THE RESPONSIBILITY OF THE WAREHOUSE MANAGEMENT AND THE WAREHOUSE OWNER TO CONSIDER ALL APPLICABLE LEGAL REQUIREMENTS AND RESTRICTIONS FOR THE OPERATION OF THEIR BUSINESS.

'Crop protection products' is the general term used to cover the group of chemical products that includes insecticides, acaricides, molluscicides, rodenticides, nematocides, anthelmintics, plant growth regulators, fungicides and herbicides.

The same principles described in these guidelines apply to raw materials or ingredients that are used for the production (formulation, synthesis) of crop protection products and may also be stored in the warehouse.

1. Hazards

1A. Product hazards

Knowledge of product hazards is an essential prerequisite for the safe warehousing of all chemicals. The classification of a product is given by the producer/supplier and should be marked on the label. Information about the hazards and the classification are given in the Safety Data Sheet (SDS), which should be available for all crop protection products. For detailed information on Hazard Communication requirements, please refer to Appendix 2 at the end of this guideline.

Safety Data Sheets

In the context of the UN-GHS it is required that a Safety Data Sheet (SDS) is to be attached to all substances and mixtures, that have been classified as hazardous and to mixtures, that contain substances above the cutoff value that are carcinogenic, toxic for reproduction or toxic to a specific target organ. The Safety Data Sheet should provide comprehensive information about substances and mixtures including their hazards and advice concerning safe handling.

Product Labels

All pesticide products should also be labeled according to the UN GHS guidance and should carry at least the following information on the product label:

- the name, address and telephone number of the supplier(s)
- the nominal quantity of the substance or mixture in the package
- product identifiers
- hazard pictograms
- the relevant signal word
- hazard statements
- precautionary statements
- where applicable, supplemental information



Banastar®
A suspo-emulsion containing 100 g/l dimethanand, 300 g/l metazachlor and 100 g/l quinmerac

WARNING
MAY CAUSE AN ALLERGIC SKIN REACTION. SUSPECTED OF CAUSING CANCER. VERY TOXIC TO AQUATIC LIFE WITH LONG LASTING EFFECTS.

DO NOT HANDLE UNTIL ALL SAFETY PRECAUTIONS HAVE BEEN READ AND UNDERSTOOD WEAR PROTECTIVE GLOVES/CLOTHING. IF ON SKIN: WASH WITH PLENTY OF SOAP AND WATER. IF EXPOSED OR CONCERNED: GET MEDICAL ADVICE/ATTENTION. STORE LOCKED UP. DISPOSE OF CONTENTS/CONTAINER TO A LICENSED HAZARDOUS-WASTE DISPOSAL CONTRACTOR OR COLLECTION SITE EXCEPT FOR EMPTY CLEAN CONTAINERS WHICH CAN BE DISPOSED OF AS NON-HAZARDOUS WASTE

To avoid risks to human health and the environment, comply with the instructions for use.



This product is approved under the Plant Protection Product Regulations (EC) No 1107/2009.

IMPORTANT INFORMATION
FOR USE ONLY AS AN AGRICULTURAL HERBICIDE

CROPS:	Winter oilseed rape
MAXIMUM INDIVIDUAL DOSE:	2.5 l product / ha
MAXIMUM TOTAL DOSE:	2.5 l product / ha / crop
LATEST TIME OF APPLICATION:	Before 7 or more true leaf stage (GS 17)

Other specific restrictions:
Applications shall be limited to a total dose of not more than 1.0 kg metazachlor /ha in a three year period on the same field.
Following or rotational crops must not be planted until four months after application of Banastar.

READ THE LABEL BEFORE USE. USING THIS PRODUCT IN A MANNER THAT IS INCONSISTENT WITH THE LABEL MAY BE AN OFFENCE. FOLLOW THE CODE OF PRACTICE FOR USING PLANT PROTECTION PRODUCTS.



Typical label of a crop protection product acc. to GHS

There is no legal standard regarding the form of a Register of Hazardous Substances. However, an overview supports the management of hazardous substances with respect to GHS issues (see page 50).

A further kind of product classification is given in Appendix 1, where the Hazard Classes and Hazard Symbols following the UN Recommendations for the Transportation of Dangerous Goods are named. These are required for the transportation of products. More details on the safe transportation can be found in the CropLife brochure "Guidelines for the safe transport of crop protection products".

Hazardous substances and the associated risks for people and the environment play a significant role when operating a warehouse.

In the following main hazards are described for simplicity and based on the UN Recommendations for the Transportation of Dangerous Goods. However it is important to always consider the specific properties for each substance as documented in the corresponding safety data sheet (see prior section).

Flammable

These are substances that can produce flammable vapor/air mixtures and that are therefore potential sources of fire or explosion. General definitions are:

- **Flammable liquids**

Classification of flammable liquids is determined by their flash point. For warehouses, goods with a flash point of 61°C and below are considered flammable (Note: This figure may differ slightly according to local legal requirements or the classification system).

- **Combustible liquids**

Liquids with a flash point higher than 61°C are considered to be combustible if they burn once ignited (not applicable if they are water-based).

- **Flammable solids**

These are readily ignitable solids or materials that cause a fast propagation of a fire, once ignited.

- **Combustible solids**

Solid products that burn once ignited.

For safety reasons, most crop protection product formulations should be regarded as flammable.

Toxic

These are materials which may be toxic to people by way of ingestion, inhalation or skin absorption.

- **Skin contact** is the most common route by which poisoning can occur. many chemicals can readily pass through the skin into the body.
- **Inhalation** of dust and vapours can produce a particularly fast reaction due to the ease with which such contaminants can enter the bloodstream through the lungs.
- **Ingestion** is perhaps the least common cause of accidental poisoning and is most likely to be associated with eating, drinking and smoking without having first washed the hands.

Hazardous to the environment

Products are classified as hazardous to the environment on the basis of the acute toxicity data and/or environmental fate data – degradability and bioaccumulation data. Often, this property is focused on the aquatic environment.

Corrosive

Such substances will attack skin, or materials such as wood or metal. Therefore, leakage can corrode other packages and structures. The packaging material used for a product should be resistant to degradation.

Oxidizing

Oxidizing agents will increase the rate at which a fire can develop. They may also react violently with other stored materials and can be the cause of spontaneous ignition.

Dangerous when wet

Within the range of common crop protection products, some dithiocarbamates are known to react adversely with moisture to produce carbon disulphide, a toxic, volatile and extremely flammable liquid. Spontaneous ignition of this group of chemicals is also known to occur.

The type and amount of packaging material, which may also be combustible, should be considered because of its contribution to an increasing fireload, when the hazards in a warehouse are being assessed.

1B. Health hazards

Improper handling of crop protection products may cause adverse health effects; such effects may result from skin contact, inhalation or ingestion.

Therefore a systematic hazard assessment leads to effective controls to minimize the risks to people. This should be achieved by preventing product releases (spills, leakages), minimizing effects (technical installations e.g. ventilation, retention), and the use of appropriate personal protection equipment (PPE) and good hygiene standards.

1C. Fire and explosion hazards

Fire and explosion hazards occur if flammable or combustible products, sufficient oxygen (from air) and an effective ignition source come together.

The **fire hazard** of a product is determined by its flammability (ignitability), burning velocity and mobility.

Explosion hazards occur when flammable gases, vapors or dust clouds are generated.

Effective ignition sources can be hot surfaces (such as heating appliances or combustion engine of a truck or fork lift), electrical equipment, open flames (e.g. welding), mechanical sparks (caused e.g. by grinding), electric sparks, and electrostatic discharges. Even inductive discharges generated by transmitting mobile phones may be an effective ignition source and can initiate an explosion.

1D. Environmental hazards

As crop protection products can be environmentally detrimental, the effects of their release or of a fire in a crop protection product store may severely damage the environment.

This can happen by

- Insufficient retention of product that has been spilled or leaked from containers
- Combustion gases
- Insufficient retention of fire fighting water
- Flooding
- Inappropriate storage and disposal of containers, equipment or contaminated waste
- Residues of crop protection products from washing containers and equipment.

The escape of contaminated fire fighting water is a significant risk. It can heavily pollute the area surrounding the warehouse, streams, rivers or lakes, and is a particular threat to ground water used for drinking, irrigation and industry.

The clean-up of such contaminated water following a fire can be a lengthy and difficult task, and extremely costly. Some recommendations on how to cope with contaminated fire fighting water are given in Chapter 6 'Emergency Management'.

2. Warehouse safety

2A. Location

When evaluating the suitability of a site for a warehouse, consider any risks that arise from the warehouse to the surrounding neighborhood, as well as risk of the surrounding neighborhood to the warehouse. The building should be on a site that minimizes the risk of contaminated water reaching watercourses, groundwater or the public drainage system. It is strongly recommended that the rainwater drainage system be constructed in such a way that it can be blocked conveniently from reaching the above areas if the need arises. Additional technical, organizational and personal measures should avoid incidents resulting in such circumstances mentioned above.

Areas of special risk are: (see also CropLife International's 'Guidelines for the safe and effective use of crop protection products')

- Water sources, such as wells, ponds and water courses, especially if the water is used for drinking (danger to people and animals) or for irrigation (danger to other crops)
- Sensitive sites, such as nature conservation areas

When choosing a site for a new warehouse, avoid close proximity to facilities that are difficult to evacuate, such as houses, schools, hospitals, nursing homes, shopping areas, food manufacturing or storage premises or other populated places. The warehouse should be sited well away from boreholes and wells (suggested distance is greater than 250 m) and open water sources, such as ponds, dams, rivers (suggested distance is greater than 500 m).

It should also be well away from areas used for the storage of fertilizers, fuel and other combustible goods.

Preference should be given to sites devoted to industrial development or to isolated locations.

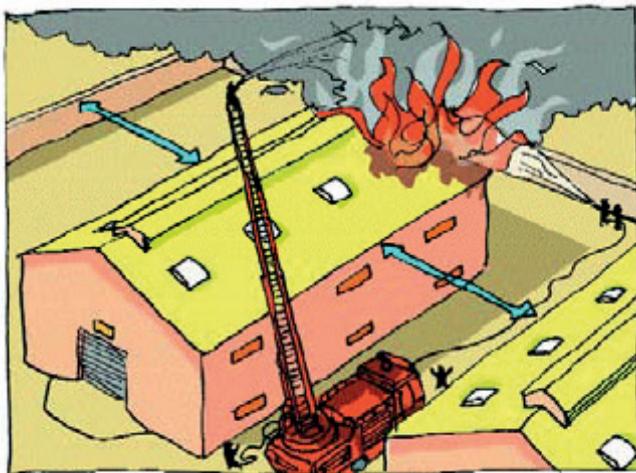
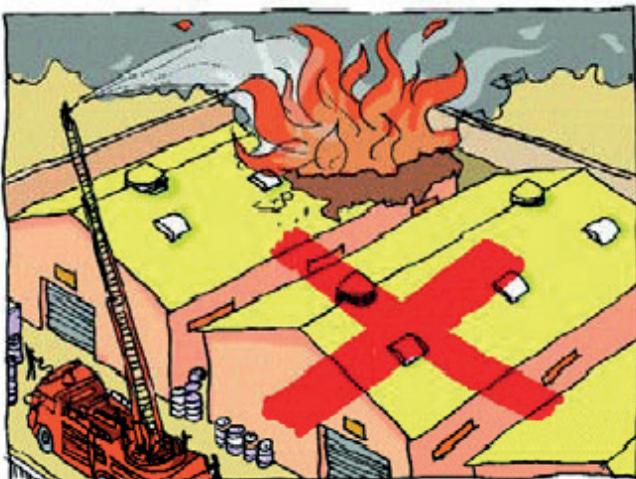
It is also recommended to avoid areas that are subject to potential environmental hazards, such as flooding or water catchment areas.

For large quantities of crop protection products, a detached, enclosed building is preferred. Where this is not practicable, crop protection products may be kept in a segregated, dedicated storeroom which is part of a larger

building provided the building does not contain a staff room, vehicle store, workshop, office or area used in any way for food or hygiene.

2B. Site access

The site provide suitable access for safe delivery and collection with a reasonable working area for loading and unloading of delivery vehicles. Ideally, the building should stand alone with a space of at least 10 meters between it and the surrounding property. The distance depends on the applicable building codes and fire protection codes and on local regulations. For example, if the warehouse contains flammables, the amount of material stored and



Provide suitable access for fire fighting

the rating of a required fire wall can determine how far away the warehouse must be from other structures. As a consequence, more buffers to the neighboring property line may be needed.

Access for emergency vehicles should preferably be available from two sides. The emergency response vehicles (e.g. firefighters) should be able to take a route that cannot be blocked by traffic, gates, stored materials, etc..

The response to an emergency should be planned in advance, especially if it is known that the approach to the building might be restricted for any reason.

2C. Construction (follow local fire and building regulations)

Avoid materials that are combustible and that could contribute to the spread of a fire. Building Insulation materials should be non-combustible, e.g. glass fiber.

Reinforced concrete frames are preferred to unprotected steel frames. Load-bearing steel members, especially in fire walls, should be protected from heat by means of insulation, for example sprayed with vermiculite cement.

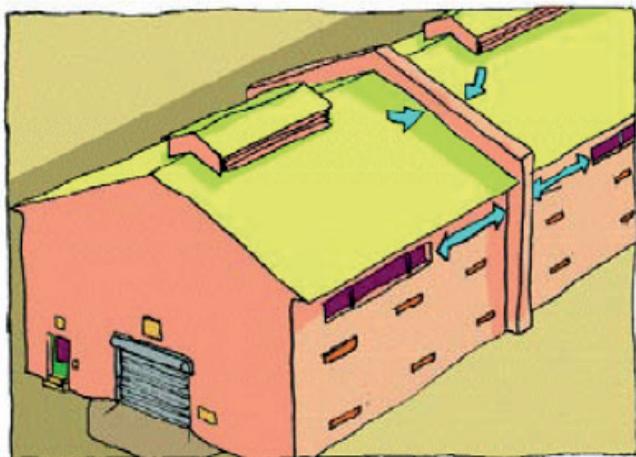
When the building of a new warehouse is being planned, it **must** have **planning approval** from the relevant local authorities (e.g. an environment agency, health authority, fire authority, municipality or other governmental agency). It is recommended to consult insurance company experts on these matters.

1. Walls

If there is a fire risk to external walls, they should be made of solid construction; otherwise, they can be clad with steel or similar sheeting.

Preferably, there should be no windows in the store. If there are windows, they **must** be fully secured, placed as high as possible, but placed so as not to allow too much sunlight to penetrate the area, as this may cause deterioration of plastic containers and labels.

Internal dividing walls, designed to act as **fire walls** (fire break walls), **must** provide at least 90 minutes fire resistance and should extend to a height of 1 m above the roof or have other means of preventing a fire from spreading. No openings, e.g. doors, should be within 2 m of the connection between the dividing wall and the main wall.



Firebreak walls should extend beyond the roof

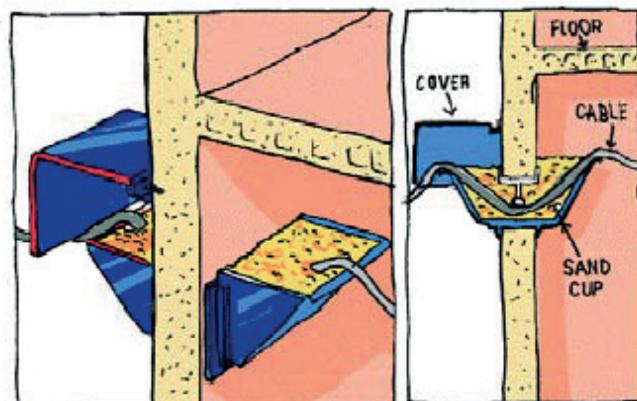
The materials best suited to combine fire resistance with physical strength and stability are concrete, solid brick or concrete blocks.

To achieve the desired fire resistance, reinforced concrete walls should be at least 15 cm thick and brick walls should be at least 23 cm thick. Hollow brick is not suitable. Concrete blocks without reinforcement require a minimum thickness of 30 cm in order to achieve the requisite strength and stability.

To achieve greater structural stability, it is recommended to use reinforced columns (pilasters) in the fire wall. The fire wall should be independent of the adjoining structure so that it will not collapse in the event of fire.

Fire walls should not be breached by electrical cables, tubes or other **conduits**; where this is unavoidable, the possibility of fire spreading **must** be prevented, e.g. by placing them in fire retardant sand cups or by filling holes with special fire resistant sealing materials.

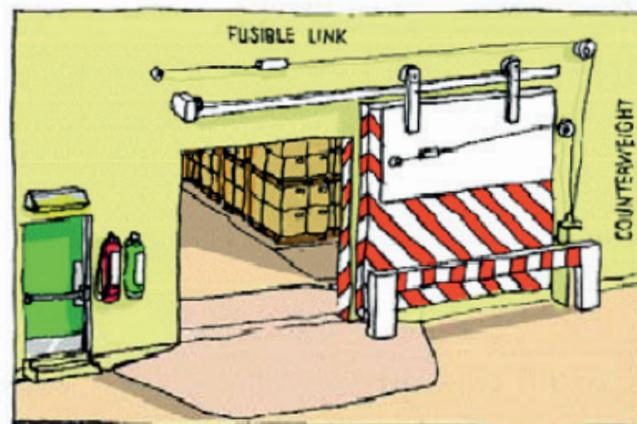
The condition and effectiveness of this special fire protecting facility equipment **must** be checked periodically.



Sand cups to protect a cable in the fire wall

Doors in firebreak walls should be as fire resistant as the wall itself (minimum 30 min; T30 quality). They **must** close automatically in the event of fire, e.g. with a fusible link. The doors should be protected from vehicle damage (and any damage that does occur **must** be repaired promptly as a damaged door could assist in the spread of fire). Stored goods and other items **must not** obstruct the doors' closure.

Fire doors must be free to move at all times and **must** be tested periodically.



*Fire doors must be free to move at all times and **MUST** be tested periodically*

2. Roof

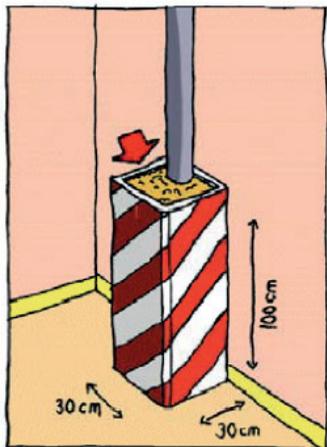
The supporting structure of the roof should be made of non-combustible materials. Hardwood or treated wood frames are acceptable, provided the roof covering itself is non-flammable. Fire walls should extend to a height of 1 m above the roof.

The roof covering of stores containing crop protection products may be of a lightweight, friable construction that will readily fail in the event of a fire and thus provide relief of smoke and heat. However, the responsible fire authorities should be consulted and their agreement sought for this type of construction.

Where the roof is of solid construction, smoke and heat relief **must** be provided with either low melting transparent panels or ventilation panels with an available opening of at least 2% of the floor area. Ventilation panels **must** either be permanently open or **must** be able to be opened by hand or they **must** open automatically in the event of a fire. This decision should be made in cooperation with the responsible local fire authority.

Early relief of smoke and heat will improve visibility of the source of the fire and retard lateral spread.

Where storm water from the roof drains inside the building, the down pipes **must** be sealed by constructing a brick or concrete kerb around the pipe at the point where it enters the floor to a height above the level of the retaining bund (see 2D Retention). This will also protect the pipe from accidental damage by vehicle and pallet movements. External down pipes should also be sealed at ground level.



Seal and protect roof drains inside buildings

3. Floors

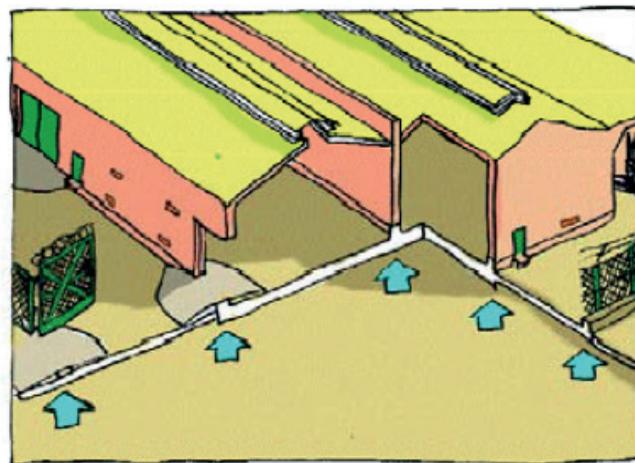
Floors **must** be crack-free (or sealed), non-slip and impervious to liquids, and should have a smooth finish for ease of cleaning. Also, floors need to be sufficiently resistant to mechanical stress caused, for example, by the weight of forklift trucks or shelving. It should be checked regularly to ensure it is in good condition and repaired in case of cracks.

The floor of the warehouse **must not** have open drains. This is imperative in order to prevent the uncontrolled release of spilled product or contaminated fire fighting water.

2D. Retention of Spillage and Fire-fighting Water

There **must** be the means to retain any spillages and all the fire fighting water. The volume to be expected in fighting a fire can be several cubic meters (m^3) of water per ton of product stored, unless special precautions are provided such as sprinklers, foam systems, or automatic alarms. Generally, volume of the water containment may be calculated as $m^2 \text{ (floor size)} \times 0.3 = V(m^3)$

Some retention can be achieved within the building by enclosing the floor area with ramps or sills at all entry points. building walls can be sited on bunds, lined with impervious material to a height of 14 cm and/or a bund can be constructed around the building.



Bunds around the warehouse and at the site perimeter

Containment of spillages

The floor of the warehouse **must** be liquid-tight and resistant to spilled product for a sufficient time in which spillages/leakages can be detected and removed before they cause major damage to the floor and the soil below.

As the package size of crop protection products is relatively small (mostly 1 – 200 l), the amount of spilled product in the case of a leakage can be contained under normal circumstances.

Containment of fire fighting water

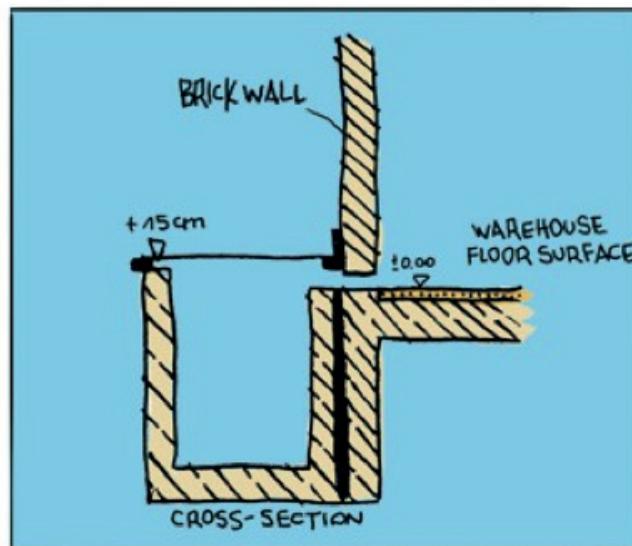
The thresholds should be at least 14 cm above finished floor level with ramps inclined to a gradient of not greater than 1 in 10 (10%, 5.7°) for access of forklift trucks. It is recommended that arrangements be made to increase the threshold height by fitting boards or sand bags in case of emergency.

Enclosing the loading and unloading area and other paved ground outside the warehouse can sometimes provide additional containment volume. If this is done, equipment must be installed either to pump away rainwater or to shut existing drains in the event of fire.

For warehouses with a floor area larger than 250 m², it is recommended to have a containment volume of at least 200 m³. Containing the total expected volume of fire fighting water generally requires a catchment basin. This can be shared between various warehouses or sections separated by a fire wall, as it is not likely that more than one section will catch fire at any one time.

It is recommended to have a pit outside the warehouse to collect the fire fighting water/effluent. From there it should be pumped into a larger collection pond.

If it is difficult in existing warehouses to provide a sufficiently large containment volume, it is recommended to reduce the expected volume of fire fighting water, e.g. by automatic alarms or extinguishing systems or by making provisions to cease fire fighting once the available capacity has been reached.



Pit as part of a water retention system

2E Safety equipment

1. FIRE PROTECTION

1a. FIRE PREVENTION

Former incidents reveal that crop protection products that are exposed to the heat of a fire or burn can give off by-products that may be hazardous to fire fighters and others in the vicinity, as well as give rise to a serious environmental threat.

Prevention of such incidents **must** be the primary concern of all warehouse operators.

Free areas/space between or around the warehouse should be kept clear of combustible material as this may contribute to a fire once ignited.

All external walls must be kept clear of stored pallets and other combustible materials, which could be misused as ready fuel by potential arsonists. All electrical equipment must be installed and maintained by a qualified electrician and should be protected from unauthorized access and tampering. Further information is given in the chapter 'Electrical equipment' on page 13.

Smoking

For reasons of hygiene as well as fire prevention, smoking in or near crop protection product warehouses **must** be prohibited.

The rule **must** be strictly observed and enforced for all employees as well as customers, truck drivers, contractors or any visitors on site. Areas where smoking is allowed should be clearly identified and kept separate from the storage areas.

Forklift truck

Where highly flammable goods are stored and an explosive atmosphere could occur, the presence of ignition sources such as sparks from a forklift truck **must** be excluded. Certified spark-proof forklift trucks are recommended. If forklift trucks that are not spark-proof have to enter such warehouse areas, the following conditions **must** be met:

- Before entering the warehouse it **must** be assured following a thorough investigation (checking for leakages or smells) that the atmosphere is not potentially explosive. If it is – do not enter!
- Forklift trucks that are not spark-proof should be used only for short periods and should leave the warehouse as soon as possible after completing the operation.

Ancillary equipment

Where used, ancillary electrical or fuel-driven equipment must be kept well away from the stored product and an isolation switch placed conveniently close to the equipment must be provided.

Battery chargers and shrink wrappers should be placed outside the warehouse or in a separate room, well away from any flammable product or materials.

1b. FIRE DETECTION

Alarm systems

Larger crop protection product warehouses **must** be equipped with an internally audible alarm and all warehouses **must** have the means to alert the local fire brigade, e.g. telephones, push buttons, etc., of an emergency.

Automatic alarm systems should be considered if a real advantage could be gained, i.e. if the fire brigade receiving the alarm could take effective action in less than 15 minutes.

The effectiveness of automatic alarm systems using smoke, flame or heat sensors, should be carefully evaluated in each individual case and verified by periodic inspection and testing.

The equipment supplier should ensure proper maintenance and service.

- Optical smoke sensors should be preferred. They detect light scattered by smoke particles which are > 0.3 μm (visible smoke)
- Heat sensors detect the rapid increase of temperature typical of an open fire
- Flame sensors react on the infrared waves of open flames. They are not suitable for the detection of smouldering fires
- Ionization smoke detectors detect smoke particles < 0.3 μm .

Sprinkler systems **must always** trigger an alarm when activated, i.e. in a sprinklered facility usually no other alarm systems are needed, except for the manual devices mentioned above (push buttons, etc.).

1c. FIRE FIGHTING

The level of installations for fire fighting measures in a warehouse depends on the size of the warehouse, the type and amount of the products stored and the size, equipment, performance and estimated response time of the responsible fire brigade.

Fire fighting water supply

The supply of fire fighting water **must** be reliable and sufficient as described below:

The necessary amount of fire fighting water depends on the storage capacity of the building, the amount and type of the stored products and the location.

It should be decided on in co-operation with the local fire fighting authorities and the applicable required regulations.

A water supply of 800 l/min (for small warehouses) up to 3,200 l/min (for larger warehouses) for approximately 120 minutes should be available. The capacity of the fire fighting water pump and the respective pipes and hoses need to be appropriate. It is of advantage that the pipes supplying fire fighting water (including sprinkler

systems) are designed as a loop system ('continuous site fire loop') and that the capacity of the pipes be sufficient to support the facility with only one portion of the fire loop operational.

The fire fighting water pump **must** be reliable. It should undergo preventative maintenance and periodic testing.

For larger warehouses, a set of two pumps (e.g. one diesel-driven and one electrical) is recommended. They should be checked (started) frequently and maintained regularly. If only a single pump is available, it should be checked and maintained more frequently. The check of the water pump should be documented.

Fire extinguishers

The choice of fire extinguishers depends on a number of factors – type and amount of products or materials present, size of the warehouse building, other fire detection and suppression systems, and company policy on use by employees.

Mobile or portable fire extinguishers should be positioned on each floor near the normal entry/exit doors. The place should be kept clear and marked with a prominent sign. The number, size and type of extinguishers should be discussed and agreed with the local fire brigade and fire insurers. Foam (5%) should be available for flammable materials. Dry powder extinguishers are also effective for fighting solvent fires and may be used safely in any situation, including fires in electrical installations, but be aware of possible re-ignition or flashback. Water-filled extinguishers are most suited for fighting fires of packing materials.

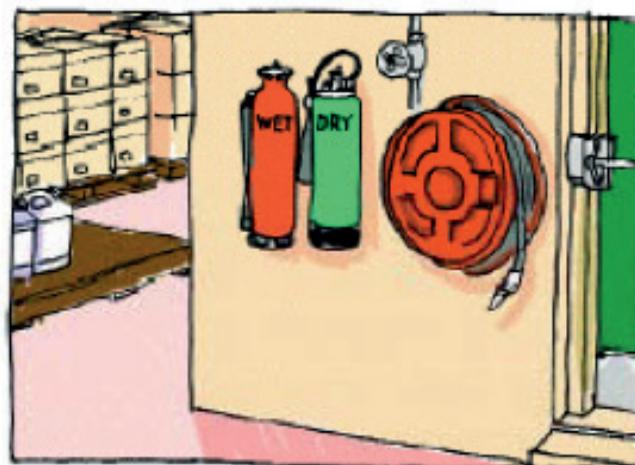
Two 10-12 kg water-based or dry powder extinguishers **must** be available for the first 50 m² of floor space, with an additional extinguisher for every additional 100 m² of floor space.

Additionally, in warehouses of more than 500 m², one mobile dry powder extinguisher of 50 to 100 kg is recommended.

The available fire extinguishers have to be visibly marked and be easily accessible (See Table 1 on page 13).

In battery-charging and electrical switch-rooms, at least one 6 kg CO₂ extinguisher **must** be provided.

Portable fire extinguishers should be serviced at least once a year and should be inspected every month. Partially-used extinguishers **must** be exchanged immediately after use.



Position fire extinguishers close to the exit and keep them clear of obstructions

Table 1: Required fire extinguisher according to type of fire

Type of fire	Required fire extinguisher						
	Foam	Carbon dioxide	water-based	Pump tank	Gas cartridge	Multi-purpose dry chemical	ordinary dry chemical
Ordinary combustibles wool, paper, cloth	Yes	No	Yes	Yes	Yes	Yes	No
Flammable liquids, gasoline, paints, oils, etc.	Yes	Yes	No	No	No	Yes	Yes
Electrical equipment	No	Yes	No	No	No	Yes	Yes

Hydrants, hose lines

Where hose reels are used, it **must** be possible to reach any part of the warehouse with the discharge from at least one hose line. Internal hose reel cabinets are recommended; otherwise, outside hydrants are considered sufficient. Water nozzles should be convertible to be able to produce a spray as well as a full jet.

Location, placement and design of hydrants should be agreed with the local fire authority to ensure compatibility of equipment (identical hose couplings, etc.). Where large amounts of flammable crop protection products are stored, it may be advantageous to stock foam concentrate and foam-making equipment to be used by the local fire brigade. Warehouse personnel that use foam-making equipment should be given special training. Alcohol resistant foam is required for water miscible solvents or emulsifiable concentrates. Foam concentrates may deteriorate with age, so they should be checked for obsolescence according to the manufacturer's instructions.

Sprinkler systems

The effectiveness of sprinkler systems is severely limited in block storage (see 'block storage' page 22), if the blocks are too compact. Correctly positioned sprinklers over blocks with inspection aisles can generally control a fire. Sprinkler systems are most effective in racked storage facilities when the sprinkler heads are installed within the racks.

In storage racks more than 6 m high, sprinklers should always be installed. Sprinkler systems **must** be installed by a competent, knowledgeable supplier and professionally maintained in accordance with manufacturer's specifications.

2. ELECTRICAL EQUIPMENT

All electrical equipment, including wiring, **must** be installed and maintained by a qualified electrician. Temporary electrical installations, should be avoided, but if they prove necessary, they **must** be installed to a high standard, by qualified personnel. All electrical equipment **must** be positioned so as to avoid accidental damage by vehicle or pallet movements or any contact with water.

Equipment **must** be adequately grounded and provided with suitable overload protection. Flexible or extension cords may only be used temporarily and must be plugged directly into a wall socket.

Provided that the ventilation in the warehouse is good (air exchange of more than 2 per hour) or if non-flammable products are stored, it is generally accepted that flameproof electrical (intrinsically safe) equipment is not normally required in storage areas. When air exchange is below this recommendation, and when flammable products are stored, it is recommended to install flameproof electrical equipment from the floor up to a height of approximately 1.5 m.

In special cases when aerosol cans (flammable gas) or highly flammable liquids are present, it may be necessary for all electrical equipment to be flame-proof or certified as intrinsically safe. The decision depends on the nature of the products, their flash point, the normal ambient temperature and the quality of the ventilation (See table 2).

In outdoor type warehouses, waterproof fittings are recommended. Where regular fittings are installed, it is recommended to have switches on the outside of the warehouse or in a room with access only from the outside and to have no electrical outlets within the store.

The local regulations must be reviewed and followed. The electrical equipment should be maintained and checked periodically by qualified electricians. The checks have to be documented.

2a. LIGHTING

Light levels (natural or artificial) **must** allow for the routine inspection of stored products and provide sufficient light for easy reading of marking, product labels and instruction signs. Light must also be sufficient for the safe operation of equipment (such as forklift trucks) and safe movement by employees.

If warehousing operations are carried out only during daytime, natural lighting may be adequate and may even be improved by inserting transparent panels in the roof.

Table 2: Requirement for flame-proof electrical equipment

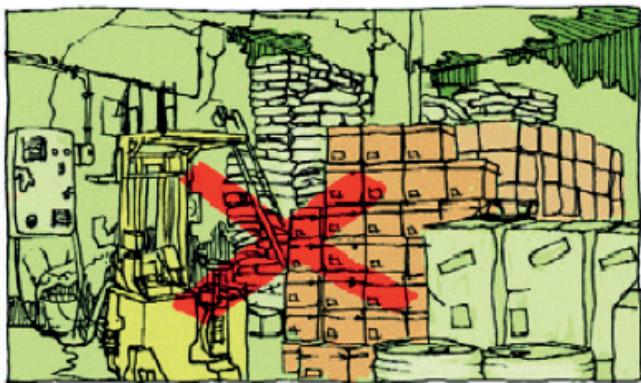
Electrical equipment	Flammable liquids (Flash Point < 61°C)		Flammable Gas (Aerosol cans < 1 l)	
	Ventilation 0,4/h	Ventilation 0,2/h	Ventilation 0,4/h	Ventilation 0,2/h
Fixed installation				
up to 1.5 m	Yes	Yes	Yes	Yes
above 1.5 m	No	No	Yes	No
Mobile equipment				
up to 1.5 m	Yes	No	Yes	No
above 1.5 m	No	No	Yes	No

Artificial lighting should be installed above aisles and at least 1 m above the topmost stored product to prevent heating of product by the lights and damage to the lights during mechanical handling operations.

Container stacking should not obscure natural and artificial light.

2b. FORKLIFT TRUCK CHARGING

Battery charging facilities for forklift trucks should be outside or in an open area, well away from the stored products. If the charging is done in an enclosed room, there must be a high-level vent for the release of the hydrogen gas generated, which is lighter than air. Note that in this case the vent system is equipped for Ex Zones (EX proved → ATEX)



Keep battery charging facilities away from stored goods

3. LIGHTNING CONDUCTION

All warehouses should be fitted with a lightning conductor. The installation should be in accordance with the local regulation and by a professional installer.

4. HEATING

In cold climates it may be necessary to provide heating within the warehouse.

Heating systems should be based on steam or hot water and the heat source **must** be segregated from the storage area. Hot water radiators or steam pipes **must** be located to avoid direct heating of a stored product.

Portable heating units should not be used; those with open flames **must** be prohibited.



Heating must be directed to avoid heating of stored products

5. VENTILATION

The warehouse should be well-ventilated to prevent the formation of hazardous and flammable atmospheres and to ensure proper health and hygiene conditions.

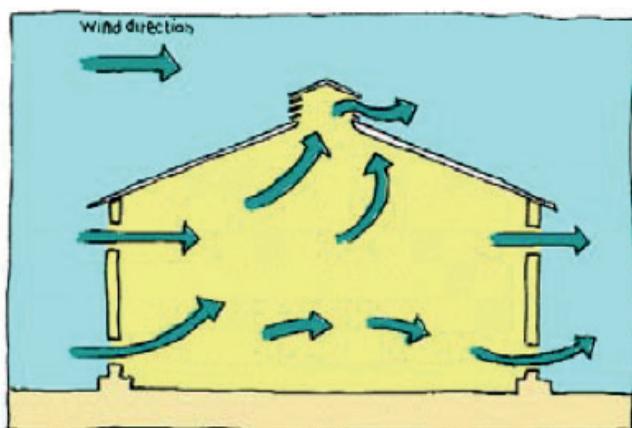
Natural ventilation should be provided where possible, e.g. by vents located in the upper and lower walls and in the roof. The lower vent **must** be positioned above the water retention level. All vents should be designed or protected in a way to prevent entry by birds, insects, or other vermin and prevent entry by intruders. A natural ventilation generally ensures an air exchange rate > 0.4 per hour.

An air exchange rate of approximately two per hour is recommended for compartments to avoid passive formation of an explosive atmosphere during the storage of flammable liquids or flammable gases.

Air bricks, louvres or extractor fans with direct access to outside air can be used.

Vents passing firebreak walls have to be equipped with fire protection valves.

High ceilings or roofs improve ventilation. For good air circulation in warehouses, it is recommended that a clear space of 1 m be maintained between the topmost products and the roof, as well as between the goods and the walls.



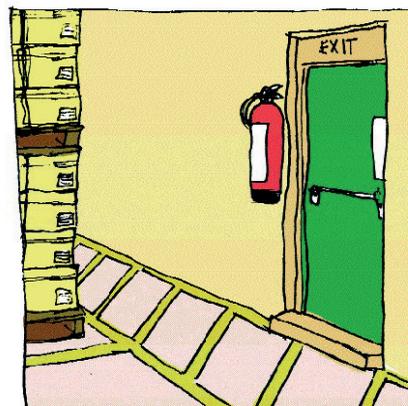
Roof and wall vents together give good ventilation

6. EMERGENCY EXITS

Exits other than the main doors **must** be available for emergency purposes. Ideally, there should be access doors on every side of the building. These should not be positioned more than 30 m from anywhere within the warehouse in order to prevent anyone being trapped inside.

Emergency exits **must** be clearly marked and kept clear. They **must** be designed so that they can be easily opened from the inside at all times. They should preferably be provided with panic bars or able to be opened with one-step activation. Emergency exits **must not** be locked or blocked at any time.

Training and drills **must** be carried out frequently and documented in the site training file.



Keep emergency exits and inspection lanes free

7. SMOKE AND HEAT VENTILATION

Smoke and heat ventilation systems are to:

- Improve the visibility for the fire fighters by ventilating smoke caused by fire.
- Prevent/mitigate by heat ventilation a build-up of heat which could lead to a forced fire spread.

Smoke and heat ventilation can be provided as:

- Permanent openings in the roof area or in the upper part of the building
- Ventilation flaps that can be opened automatically or manually when needed.

Usually, approximately 2% of the roof area should be constructed such that it can be opened.

7a. FIRE AND LIFE SAFETY DOCUMENTS

Building and site floor plans **must** be available showing channels, sewers, fire fighting pipes, hydrants, etc.

Furthermore, it is recommended to produce floor plan diagrams that show the location of safety equipment such as:

- Eye and safety showers
- Fire extinguishers
- Clean-up kits
- Emergency exits
- Emergency evacuation routes and emergency assembly area(s)

These diagrams should be reviewed with all employees and posted in prominent locations throughout the warehouse.

3. Warehouse management

3A. Responsibilities

The overall responsibility for a warehouse or store lies with the warehouse manager. They must understand that they are personally responsible for:

- intended operation of the storage facility
- assessment of risks and the stipulation of protective measures
- proper labelling of the products
- safe handling of products into, within and out of the store and the maintenance of records relating to such movements
- occupational health, safety and work hygiene of the operational staff
- proper condition, in particular of the safety installations
- training and instruction of staff and personnel
- maintenance of suitable storage conditions
- coordination of activities and work processes
- protection of the environment
- planning of emergency procedures
- fire prevention and contact with authorities.
- code of practice for external personnel

Cooperation between various companies

If several companies carry out activities in the same warehouse or on the same site parallel to each other under own responsibility an assessment of the combined or reciprocal risks is necessary. Recurring situations are to be recorded in the documentation of the risk assessment; in individual cases or in the case of special activities, a coordinator should ensure that the necessary protective measures and scheduling are coordinated between the companies.

Responsibility for separate parts of the operation may be delegated to qualified subordinates, but they **must** clearly understand their responsibilities. This delegation should be correctly documented and signed.

3B. Security

Theft, robbery, product contamination, sabotage, vandalism and arson can be significant risks for a warehouse.

Therefore, securing the warehouse or store is extremely important. Also, due to the amount and value of stored products, site security has to be considered as a major responsibility

Security arrangements **must** be initiated to prevent unauthorized entry to the warehouse and burglary:

- During working hours, by limiting access via a controlled entry system
- During off-duty hours, by securing doors and windows in the warehouse and in adjoining offices
- In large warehouses it is recommended to include intruder alarms, if fast response by security personnel can be reasonably guaranteed.

The **site** should be surrounded by a secure wall or fence. Where the wall of the warehouse forms a boundary wall, care **must** be taken to ensure that entry cannot be gained via ventilation openings, the roof or adjacent buildings.

Entry gates should be limited to the minimum required for proper operation. However, there should be access from at least two sides in the event of fire or other emergency.

The **building** itself should be constructed so as to give basic mechanical and physical security – secure doors, windows burglar barred, walls intact, roof intact, vents inaccessible.

- All doors (also internal doors, e.g. to the office area) should be mechanically stable and lockable.
- A lock/key system should be installed.
- The key holders should be registered, those who hold keys should be documented and the availability/inventory of keys should be checked periodically.
- If alternative means of ventilation and lighting are provided, it is better not to have **windows** at all. If they are present, they should be positioned high, barred against unauthorized entry and shaded.

Keys to the warehouse should be located out of view, in the office or guardhouse and should be properly labelled and accessible in case of an emergency.

Control of access during off-duty hours

Outside lighting is often a useful deterrent to intruders. Patrolling the warehouse with guards is also effective and can help in securing against burglary and in detecting fires at an early stage. The patrols have to be defined concerning route, frequency and objective. It is recommended that a 'key and clock' or similar system should be enforced to record the time and place when the inspection was actually made. The security staff should be trained appropriately.

It is desirable to have an electronic burglary control/detection system, which includes motion detectors inside the building and contact switches at the doors, gates and windows. Video systems with motion sensors can also be an option. The burglary control system should be connected to a security company or to a police station.

Access to the product store is permitted only to those **authorized personnel** who have been properly trained or to persons under strict supervision of trained personnel. A list of authorized personnel **must** be placed outside the product store.

Access to the site and to the warehouse has to be effectively controlled.

If wireless data transfer systems are used for the warehouse management and operation, the system should be encoded.

Prohibition of unauthorized entry shall be clearly and permanently indicated by means of a respective sign

External personnel should not be authorized to move uncontrolled:

- It **must** be easily and clearly recognizable for a visitor where to register
- The doors and gates should be closed during daytime, if no warehouse staff is present
- External personnel (e.g. drivers, accompanying persons) should not be left unattended in the warehouse.

3C. Supervision and training

Warehousing operations can only be conducted safely if they are based on planned procedures that are well understood and obeyed by everyone.

All personnel working in the warehouse must be thoroughly trained. A permanent record of the training provided should be in personnel training files. Thorough training means understanding the job

Training should include:

- Knowledge of the product hazards
- Use of proper personal protective equipment (PPE)
- General safety operating procedures and operation of equipment
- Procedures to follow in case of emergency, reporting injuries, or reporting hazards

3D. Warehouse structure

The following areas should be distinguished for planning and operation of warehouses:

- Storage room
- Receipt and dispatch area including areas for commissioning operations
- Loading/unloading area
- Area for administration and ancillary operations
- Personal Protective Equipment storage, equipment room
- Amenities (civilian clothing storage, shower and toilet).

1. STORAGE ROOM

The chemical storage area should be separate room(s)/ compartment(s) for keeping crop protection products away from office and ancillary areas. The number and the size of the warehouse compartments are based on the type and amount of products to be stored and the available safety equipment.

The products **must** be stored only in the intended areas, on pallets, in racks and – if necessary – safety closets.

2. RECEIPT AND DISPATCH AREA

In the receipt and dispatch area, the products are received and controlled when arriving in the warehouse, products are consigned for transport to the customer and allocated/prepared for subsequent transport.

When receiving goods in the warehouse, identity, quantity and labelling of the goods must be checked against the transport documents. Package integrity should be established. Any leaking or damaged packs **must** be isolated and dealt with immediately. Packs with defaced or missing labels should be set aside for re-labelling or identification. The goods delivered should match the delivery note with respect to type, quantity and condition of the goods. Any comments can be written on the delivery note for later action by the management. It is important to ensure adherence to any kind of storage restrictions when different hazardous substances are stored. The product specific Safety Data Sheet contains the necessary information. In that respect the Register of Substances, mentioned in the chapter on hazardous substances, supports organizing and coordinating storage in the warehouse with consideration of all product risks.

Receipt and dispatch recommendations are given in CropLife International's brochure 'Guidelines for the safe transport of crop protection products'.

Safety Data Sheets (SDS) **must** be available for all the goods in storage.

There **must** be a receipt and dispatch control system in place, covering the dealing with products when they arrive, while they are in storage, when they are issued for use, and for returned or unused products.

3. LOADING AREA

The area where trucks/vehicles are loaded or unloaded should be surfaced or paved. A ramp can be a part of the loading area.

Precautions for retaining spillages/leakages **must** be taken. Any drainage for rainwater should have installations to retain the water if necessary.

4. AREA FOR ADMINISTRATION AND ANCILLARY OPERATIONS

The following rooms may be needed for the warehouse operation:

- **offices**
- **equipment room:** for storing equipment, tools, spare parts, personal protective equipment e.g. waterproofs, gloves, and respirators, all appropriately numbered on numbered pegs; signs including 'Wear Protective Clothing', 'No Eating or Drinking', 'No Smoking', 'Wash Equipment before Storing' should be prominently displayed.
- **wash down area:** for the equipment, such as knapsack and tractor sprayers a concrete slab with walls to prevent drift and sills to prevent spills; drain to sump; running water and hoses; signed 'Keep Out', 'Not a Drinking Point'.
- **rooms for electrical installation**
- **room for central heating, cooling and ventilation systems**
- **room for forklift truck/battery charging**
- **amenities** including:
 - **changing room:** numbered pegs or areas for overalls and boots; separate area for every day clothes; direct access to shower; sign that says 'Wash before Leaving' or other appropriate wording
 - **shower and basin:** supplied with soap and towels.
 - **toilet:** with paper, and signs 'wash hands before using toilet' and 'wash hands after using toilet'. Or other appropriate wording
 - **a separate washbasin** for washing personal protective equipment (clothing), within a fenced- off drying area.

Whenever possible, offices and amenities should be located away from the main building of the warehouse. If such facilities are located within the warehouse structure, they **must** be segregated from the storage areas and the construction should be designed to provide at least one hour of fire resistance. A means of exit other than via the warehouse **must** also be provided.

If smoking is allowed in the office or amenity rooms, metal or glass ashtrays **must** be provided and these **must** be routinely emptied in a safe manner. Ashtrays **must not** be emptied into waste paper bins; this has been a frequent, yet obvious and common source of fires.

5. PACKAGING AND STORAGE TECHNIQUES

Crop protection products **must** not be stored directly on the floor. They must be stored off or above the floor. Packaging and containers (hereinafter referred to as "packaging") are the primary protective measures when storing hazardous substances. Their design must be such that none of the contents can escape unintentionally. Wherever possible, hazardous substances should be stored in in the original containers or in the original packaging. Empty packaging that still contains residual material is subject to the same regulations as filled packaging unless appropriate steps have been taken to exclude any danger. Packaging are best stored on shelves or on pallets off the floor, to avoid damage caused by damp, allow for easier transport, and so that there is more efficient use of space in the store. Shelves should be made of non-absorbent materials such as metal to avoid contamination. Packages with orientation arrows must be stored respecting these markings in order to prevent any package leaking as a result of permanent pressure from fluids on the closure, vents or sealing materials.



Securing palletized load units

The correct condition of the load is an important requirement for safe working during transporting, entering into and removing from storage, stacking and unstacking. The load must be packed in such a way that it does not fall apart, becomes dislodged or has parts falling off when picked up, transported and set down.

Choice of load support

The secure structure of a palletized load unit starts with the load support (e.g. flat pallets, wire-mesh box pallets). The "Chemical Pallet System" (CP-System) has established itself in this respect in the chemical industry. The euro-pallet has also proven to be suitable for this purpose.

Pallet design	Area of use
CP 1 (1000 x 1200 mm)	Mostly used pallet for chemical products (e.g. bagged goods/sacks)
CP 2 (800 x 1200 mm)	In consumer-related areas, chainstores, alternative to reusable Europool pallets
CP 3 und 9 (1140 x 1140 mm)	Container pallet, suitable for FIBC, corrugated cardboard octagon containers, drums with rolling hoops Ø 585 mm
CP 4 und 7 (1100 x 1300 mm)	Dispatch of bulk goods in sacks, primarily plastic granulate and fertilizers
CP 5 (1140 x 760 mm)	Container-suitable pallet, suitable for small piece goods, e.g. corrugated cardboard boxes
CP 6 (1200 x 1000 mm)	Dispatch of bulk goods in sacks
CP 8 (1140 x 1140 mm)	Container-suitable special pallet for large containers with base outlet (FIBC/corrugated cardboard octagon containers)

Nine standard pallets have been included in the CP system and a pallet life-cycle was developed. Hence, there is the possibility to reuse the pallets or recycle them through a CP-registered pallet manufacturer/reconditioner.

Damaged or faulty pallets, e.g. mouldy or chemically contaminated, are to be replaced. The damage must not be rectified by placing a second flat pallet underneath.

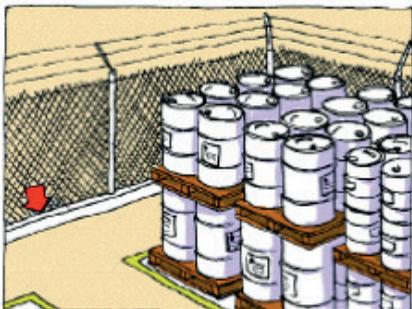
Wooden pallets are not suitable for use if for example

1. a board is missing or broken at an angle or broken crossways,
2. more than two bottom edge or top edge boards or a cross-board have broken away to such an extent that more than one nail or screw shaft is visible per board,
3. a block is missing, broken or broken away to such an extent that more than one nail or screw shaft is visible,
4. main marking is missing or non-legible,
5. apparently non-permitted components have been used for repair (boards or blocks which are too thin, too narrow or too short),
6. the general condition is so bad that the load bearing capacity can no longer be guaranteed (rotten, mouldy, or several broken-away boards or blocks).

Wooden pallets should be sealed to prevent absorption of liquid. If not possible contaminated wooden pallets must be disposed as hazardous waste. Do not store different products or package types on top of each other.

5a. Outdoor storage

In general, all crop protection products should be stored under a roof. Weather-proof packs such as 200 litre drums may be temporarily stored in the open provided their contents are not sensitive to temperature extremes and security can be guaranteed.



Storage areas should have a firm, impermeable base surrounded by a containment bund. Asphalt is not recommended because it softens in hot climates and under the influence of certain solvents. If the area is not covered by a roof, there **must** be adequate facilities for the disposal of collected rainwater.

It's recommended that stored drums are placed upright on pallets. Drums stored on the roll **must** be chocked. All drums **must** be stored in such a way that there is always sufficient space for fire fighting access.

5b. Block storage

Packages in block warehouses are placed straight on the floor in parallel rows. Block storage is only suitable for large quantities of identical products as access is only available to the pallets at the front. Block storage consists of rows of blocks standing next to each other with aisles in between. Permitted carrying loads, vertical loads and stacking heights (often determined by the product manufacturer) may not be exceeded when stacking pallets and stack-nest containers.

Packaging for the transportation of hazardous goods (with the exception of sacks, non-stackable combination and large packaging) is generally tested for a stacking height of 3 m.

If remaining below the maximum permitted gross weight (e.g. shown on the packaging label), the stacking height may amount to a maximum of a 6:1 ratio of height to narrow side of the ground area. The angle of the warehouse floor

– and the wind load if storing outdoors – is to be taken into account when stacking.

In addition, the load capacity of floor elements and stacking aids must be observed. Flat pallets are only stackable if the load is stable and has a horizontal resting surface. If the stack has an angle of more than 2% or if the product spills from the containers, the stack is to be taken down in a non-hazardous manner.

Two rows each of inspection aisles are to be provided for block storage. These aisles must have a width of at least 0.5 m.

A 1 m gap along the wall should be included. Limit the blocks to a width of 2 pallets; for practical reasons, their length should not exceed 8 pallets.

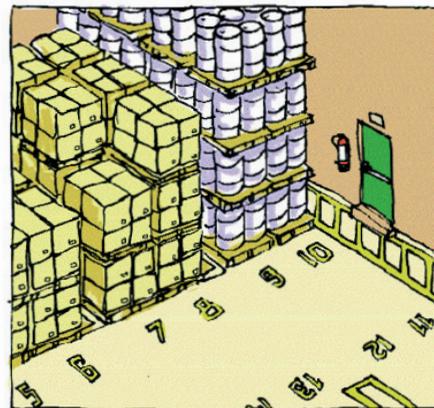
Mark the position of the blocks and inspection aisles on the floor and number each bay.

Access for forklift trucks or lifting devices need only be from the narrow end of the block.

Block storage can make access for firefighting difficult. The dimensions of the blocks with flammable materials **must** therefore be restricted as described above.

Restricting the dimensions of blocks of combustible goods is also recommended.

If sprinklers are installed, they should be positioned at least 1 m above the top of the stack.



Mark aisle and number each storage bay

5c. Rack storage

The storage facilities of larger warehouses are often divided into pallet, mobile-rack, walk-through, drive-through and high-bay stores.

Individual shelving units are formed into shelving aisles. These aisles can consist of single or double shelves. Push-through protectors are to be provided on double shelves to ensure a safety space of at least 0.1 m between the pallets. There is a wide range of shelf systems each optimized for specific operational and space requirements.

Pallet storage is carried out by industrial trucks (forklift trucks) or storage retrieval equipment. When placing pallets into storage, care needs to be taken that

- the contour of the pallet units are retained (no overhang by packaging slipping out of place),
- the pallet weight does not exceed specifications for shelf and bay loads,
- specific features for individual spots or levels of the shelf such as restricted height or width because of obstacles (e.g. sprinkler pipes or ventilation shafts) are observed.

The pallets are to be placed straight and centered on the shelving beams or shelving areas. Opened pallets (commissioning pallets) should preferably be stored on the lowest shelving level and not on upper shelving levels.

If shelves are being serviced by industrial trucks (except track-bound), the corner areas must be protected by collision guards.

The collision guard, at least 0.3 m high, must not be connected to the shelf and should have black-yellow marking.

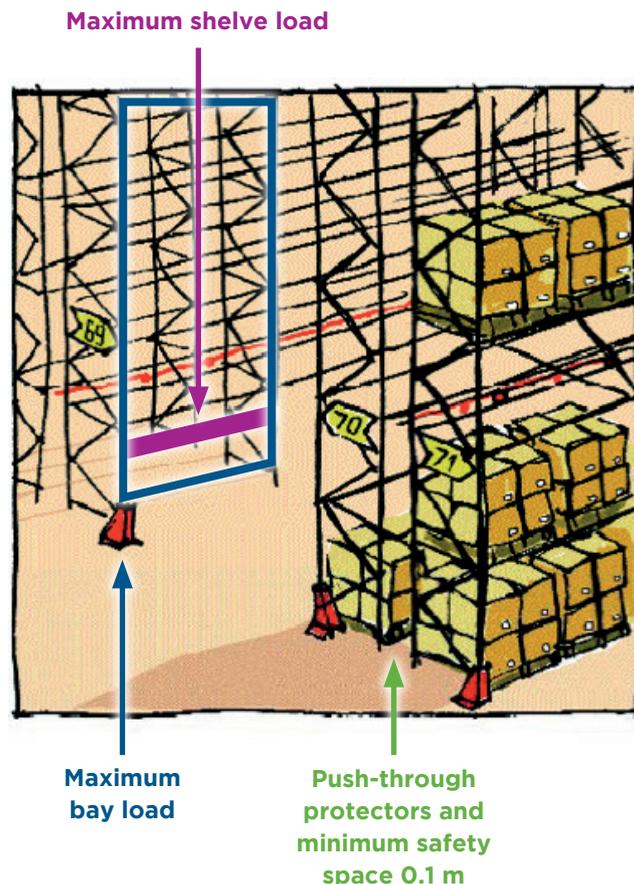
The maximum permitted shelf loads are to be clearly marked on the storage shelves.

Metal racks or frame pallets allow better use of available height, but need specialized forklift trucks as normal forklift trucks would need too much floor space.

The advantages of racks over block storage are:

- more stable storage with less damage to the lower layer of packs
- Better stock control and easier order picking
- Better access to each pallet and good visual inspection
- Efficient sprinkler systems can be installed close to the goods within the racks.

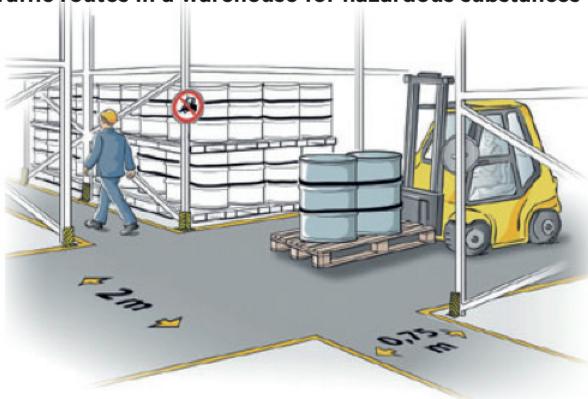
Any damage to shelf supports or beams during storage or removal must be reported to warehouse management immediately so that the extent of the damage can be assessed without delay. If necessary, loads must be removed from the shelf immediately and the damage parts replaced



5d Traffic routes

Traffic routes in warehouses for hazardous substances must have a specific width. In the case of traffic routes for persons, these must be at least 0.75 m wide, and for fork-lift traffic the routes must have the width of the fork-lift plus at least 0.5 m on each side of the fork-lift truck.

Traffic routes in a warehouse for hazardous substances



Example: Width of the forklift truck 1 m; in this case, the traffic route should have a minimum width of $1\text{ m} + 2 \times 0.5\text{ m} = 2\text{ m}$.

The aisle for inserting and removing pallets must be dimensioned so that safe maneuvering of the forklift truck is possible. If the shelving is designed accordingly, a part of the storage area for the pallet may be used by the forklift truck forks during insertion or removal.

Transit pathways and routes must be provided with a cover (chipboard, grating). The clear transit height must be at least 2 m.

3E. Storage considering/depending on product properties

Due to their potentially hazardous nature, crop protection products must not be stored in the same warehouse as foodstuffs, animal feeds or other materials such as clothing, tobacco, cosmetics, etc.

If it is unavoidable that goods, other than those mentioned above, have to be stored together with crop protection products in a single warehouse, the former must be segregated from the crop protection products and be stored in a different room.

Product segregation and separation

Segregation means storing incompatible products separately in different rooms with a wall as a barrier or in separate buildings. In case flammable and non-flammable materials have to be separated the wall between the different rooms must be a fire wall

Separation means storing compatible products in different areas of the same room. This can be achieved by spacing the products or by using a non-combustible crop protection product as a barrier between combustible products.



Segregation with a fire wall as a barrier.

Crop protection products should be stored in groups corresponding to their different hazard categories, e.g. flammability, combustibility, corrosivity, toxicity, oxidizing potential, etc.

For reasons of product quality contamination prevention during storage must be implemented as well. It is thus recommended to obtain detailed product information from the producer to manage the prevention of contamination. Contamination prevention can also necessitate segregation or separation of specific types of products. Detailed information can be found in the CropLife International guideline "Contamination Prevention in the Manufacture of Crop Protection Products (4th edition).

As a fundamental principle, it is not acceptable to store materials without identification, classification, marking, labeling, and neither material damaged or not properly packaged. In case a material in such a condition arrives at the warehouse, it must be separated immediately and blocked for use.

Incompatible products or goods should be segregated from one another so as to minimize hazards and risk of contamination effectively. For the purposes of segregation, substances or articles are considered mutually incompatible when their storage together may result in undue hazards in the case of fire, leakage, spill or any other incident.

Whenever dangerous goods are stored together, the most stringent separation or segregation provisions for any of the goods should be applied.

The separation of non-conforming and/or incompatible products from released products is mandatory. Residues and materials to be destroyed must be separated and properly identified.

The principal benefits of these measures are:

- To minimize the risks and consequences of a fire or spillage
- To implement specific safety measures for fire fighting appropriate to the risk level.

It is acceptable merely to separate small amounts of products of different categories. However, it is strongly recommended to segregate large amounts of each of the various groups. If significant cross-contamination risks exist even small amounts of incompatible materials need to be segregated.

Compatibility guide for storage of crop protection products.

	Joint storage permitted		Segregation required
	Reduced joint storage permitted 1) Limited amounts 2) Separation required		Segregation recommended due to fire fighting water contamination
			Common storage following special legal requirements

	Flammable liquids	Flammable solids	Combustible liquids	Combustible solids	Toxic substances – Combustible	Toxic substances – Non-Combustible	Corrosive substances	Oxidizing substances	Dangerous when wet
Flammable liquids	1		1						
Flammable solids		1	2	2			2		
Combustible liquids	1	2							
Combustible solids		2							2
Toxic substances – Combustible									
Toxic substances – Non-Combustible									
Corrosive substances		2							2
Oxidizing substances									
Dangerous when wet				2			2		

For contamination risks please refer to the CropLife International guideline “Contamination Prevention in the Manufacture of Crop Protection Products (4th edition), Chapter 7.6”.

The storage quantity of flammable liquid goods with a flash point below 61°C within one compartment exceed 250 tonnes unless the storage room is equipped with special fire protection (automatic alarm in combination with a quick fire brigade response or sprinkler or other automatic fire-extinguishing systems). Segregation by a fire wall is necessary for larger quantities.

It is also recommended to limit liquids with a flash point above 61°C to 250 tonnes, if no special fire protection is provided.

Combustible packaging materials should be separated from other goods, as they can contribute significantly to a fire and are often readily ignited. They should not be stored in the separation space between products.

3F. Storage plan – stock control system

If a site contains several storage rooms or buildings, each one should be separately numbered for easy identification. The numbers should be recorded on a **site storage plan and emergency evacuation map**, designating where which groups and which amounts of crop protection products are stored. This is of use in case of accidents, fire or other disaster.

It should be kept outside the warehouse at a safe place where the fire brigade can get access to it when needed. It should also be posted in each building for review by employees.

Stock control systems

The stock control system (or inventory) **must** guarantee knowledge of the quantity and location of goods in the warehouse at all times. An inventory, a plan of positions of the goods and the required Safety Data Sheets, which can be referred to in case of a fire or emergency, must be available in a safe place away from the storage area. The following information should be available:

- Product name
- Amount
- Storage location in the warehouse
- Suitable fire fighting media (and, if appropriate, what media cannot be used).

The stock control list needs to be updated in the event of significant changes in the stock or at least weekly. It also has to be kept in a safe place where it is available/accessible in case of an emergency.

Stock Checks

It is important to carry out regular stock and inventory checks, to ensure that:

- Product use-by dates do not expire before use
- Products are still valid with regard to current spray programmes
- Products are still legal for sale and use
- A **first-in, first-out** stock use system is working
- Records are up to date and complete
- Any deterioration of containers is detected early and dealt with
- Damaged packaging is collected and stored in a separated area.
- Slow moving products are noted.

Record keeping is a very important aspect of store keeping. The stock records are used to monitor stock levels so that the product supply is not exhausted or products are not over ordered; to check on security; and to provide information on chemical usage. Records are only useful if they are accurate, complete, up to date, presented clearly and legibly, and there is a system of records inside the store backed up by a system in the office. All records should be signed by the deliverer and the receiver.

Requisitions for products should be given in writing to ensure correct issuing and attributing responsibility and accountability to the relevant staff members.

Safety Signs

In general, each warehouse compartment, room or area must be equipped with adequate safety signs. Safety signs are necessary to warn of any potential hazards or to instruct employees of the measures they should take in relation to these hazards.

For example, in some workplaces there may be a risk of foot injury despite taking measures to control the risk and it may be appropriate to remind staff by using a sign indicating that wearing foot protection is mandatory. The safety signs should be easy to understand by handlers, drivers and any person working on the site or in the

warehouse, should meet any regulatory requirements and must be prominently displayed.

In addition, a list of authorized personnel, as well as emergency services contact details must be displayed. It also makes sense to display wall charts and posters on safe handling of crop protection products.

Safety sign - Prohibition signs

are signs prohibiting behavior likely to increase or cause danger. The intrinsic features are: round shape and a black pictogram on white background, red edging and diagonal line (the red part to take up at least 35% of the area of the sign). Examples are:



No access for unauthorised persons



Smoking and naked flames forbidden



No smoking



No access for pedestrians



Not drinkable



Do not extinguish with water



No access for industrial vehicles



Do not touch

Safety signs - Warning signs

Intrinsic features are: triangular shape, black pictogram on a yellow background with black edging (the yellow part to take up at least 50% of the area of the sign). Examples are:



Flammable material or high temperature*



Explosive material



Toxic material



Corrosive material



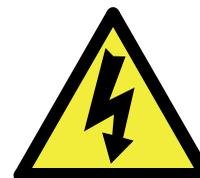
Radioactive material



Overhead load



Industrial vehicles



Danger: electricity



General danger

Safety signs - Mandatory signs

Intrinsic features are: round shape and a white pictogram on a blue background (the blue part to take up at least 50% of the area of the sign). Examples are:



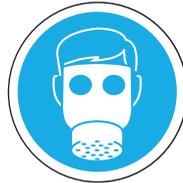
Eye protection must be worn



Safety helmet must be worn



Ear protection must be worn



Respiratory equipment must be worn



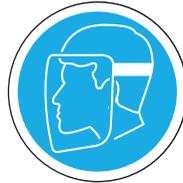
Safety boots must be worn



Safety gloves must be worn



Safety harness must be worn



Face protection must be worn



Safety overalls must be worn

Safety signs - Emergency escape or first-aid signs

Intrinsic features are a rectangular or square shape and white pictogram on a green background (the green part to take up at least 50% of the area of the sign).

Emergency exit/escape route signs (examples)



First aid signs (examples)



First-aid poster



Stretcher



Eyewash



Safety shower



Emergency telephone for first aid or escape

Safety signs - Firefighting signs

The intrinsic features are rectangular or square shape and white pictogram on a red background (the red part to take up at least 50% of the area of the sign). Examples are:



Fire hose



Fire extinguisher



Ladder



Emergency fire telephone

Examples from BS EN ISO 7010



Fire extinguisher



Fire alarm

3G. Ancillary and non-routine operations

Contractors and visitors

Visitors should not be allowed to enter the warehouse unaccompanied and they **must** be informed of emergency procedures, required PPE and other relevant rules, such as 'NO SMOKING'.

Contractors who may have to work in the warehouse **must** be similarly informed. For them, a formal work permit or paperwork **must** be issued before such work commences (see this chapter, paragraph 'non-routine activities').

Activities other than warehousing should be avoided in storage area.

Re-packing or refilling facilities and activities may be necessary, but these **must** be located in a segregated area, free of stored products and following task-specific safety requirements

Vehicle maintenance and the overnight garaging of vehicles, other than electric forklift trucks, should not be permitted unless fitted with a battery isolation switch.

Equipment for securing pallets

Danger can ensue from equipment for securing pallets (ignition sources, product release). The choice of equipment depends on the type of packaging, the number of pallets to be secured and the available working area. Stretch wrapping equipment is fundamentally suitable. Electrostatic charging during the wrapping operation has to be considered and should be avoided where flammable goods are stored.

Stationary shrink wrapping systems with encapsulated flame, electric heating or steam may only be used if temperature and retention time are limited. These systems are to be located outside the warehouse area, preferably in the finishing area.

Manual shrinking equipment with open flames must not be used.

Non-stationary electrical equipment

Only explosion-protected (intrinsically safe) electrical equipment may be used in potentially explosive atmospheres (e.g. in case of spillage of flammable liquids).

Mobile electrical equipment such as sweeping machines and vacuum cleaners, as well as lamps, scanners, hand-held-equipment and tools, must be suitable for the respective warehouse sector (according to conformity declaration, manufacturer's operating manual).

Electrical equipment must be checked for apparent faults before being used.

The use of personal electronic equipment by employees (such as mobile phones, radios or MP3 players) should not be permitted as their safety status cannot be ensured.

Forklift trucks and similar elevating equipment

There is a wide variety of forklift trucks and elevating equipment. The local conditions of the warehouse and the intended purpose are decisive for the selection of suitable industrial trucks. In particular, the following points are to be taken into account for procurement and stipulation of work areas of forklift trucks:

- Forklift type
 - Type of drive with regard to emissions, carrying load and ignition sources,
 - Type (front-loaders, side-loaders, high-reach forklifts, four-way stackers).
- Dimensions
 - Height and width (depending on transit heights, aisle widths and turning circle),
 - Mast height (depending on shelf heights),
 - Floor clearance (driving over sills),
 - Load suspension means (depending on pallets).
- Permitted loads
 - Pallet weights,
 - Stacking heights.
- Necessary attachments e.g.
 - Drum grips,
 - Hydraulic fork extension.
- Ergonomic design, e.g.
 - Operator's seat,
 - Weather protection.

Charging equipment/loading stations for forklift trucks are to be installed in well-ventilated rooms or outside and under no circumstances in potentially explosive atmospheres. Loading equipment/loading stations are to be separated from the warehouse area by distance or walls. The manufacturer's operating instructions must contain recommendations and safety instructions for the forklift operator.

Only authorized and properly trained drivers must be allowed to operate forklift trucks. Driver certification must follow local regulations but should be reviewed at least annually or as equipment changes.

Traffic flow **must** be properly regulated.

Forklift trucks must travel with forks lowered and **must not** carry passengers. It is recommended that a suitable fire extinguisher is available on every forklift truck. Such fire extinguishers should be serviced annually and inspected monthly.

Forklift trucks should be inspected before each shift use. Items to check for proper operation include:

- Overall condition: forks, locking pins, tires, fuel tank, hoses, seat belt
- Operational condition: engine sound, fuel level, steering, instruments, lights, horn, signals,
- Other items, as needed.

Non-routine activities

All precautions to ensure safe normal working procedures can be undermined if maintenance or construction activities, which can produce sources of ignition or other risks, are allowed.

All non-routine activities **must** be authorized in writing. The written work permit **must**:

- Record that the immediate work area is cleared of combustible materials
- Warn of possible dangers and indicate precautions to ensure that the job can be done safely
- Record who is assigned with the task of observing that sparks are properly quenched.

4. Hygiene and personal safety

4A. Housekeeping

Good housekeeping goes hand in hand with an efficient and safe operation. Poor housekeeping is not only an indication of a poor work attitude, but also provides the potential for an unsafe operation and injury.

Good standards of hygiene should be maintained, including:

- Regular and systematic cleaning of floors and shelves, preferably using an industrial vacuum cleaner
- Washing facilities (amenities) for employees **must** be provided and, if feasible, with separation into 'clean and dirty' areas. The company should provide towels and soap
- Work clothing should be provided in a sufficient supply to be able to be changed, preferably daily, but at least weekly, and, if contaminated
- Workers **must not** be allowed to take their contaminated protective clothing home for washing. Instead, it should be washed on site or by an external laundry company. The laundry company should be able to deal with (potentially) contaminated clothes and the washing water should be treated/disposed of properly. Regular checks of the laundry should be made by the warehouse management.

4B. Personal protective equipment (PPE)

When handling crop protection products, it is important that appropriate protective equipment is worn.

Specific PPE (eye protection, gloves, protective suits, respiratory protection) has to be selected following a risk assessment or hazard analysis of the work to be carried out and products handled and stored. Information from the product SDS will need to be taken into account. In extreme cases consultation with an Occupational Hygienist is advisable.

For certain work tasks the following should be considered in addition to the usual work clothing:

- Unloading and loading of delivery vehicles: safety boots, overalls, gloves, eye protection; hard hats or bump caps,

- Storage of containers: safety boots, gloves, eye protections, hard hats or bump caps,
- Spillages: PVC or chemical resistant aprons, overalls or suits made of special materials such as non-woven polypropylene or other materials, appropriate gloves, appropriate eye protection (goggles or goggles and face shields),
- appropriate respiratory protection (against dust and/or vapours), if the worker is approved to wear respiratory protection.

PPE **must** be inspected routinely, maintained in a clean, sound condition and replaced whenever necessary. Respirators will require replacement of the pre-filter at the time of cleaning, although it may be possible to use the main filter cartridge on more than one occasion. Alternatively, for powders, disposable dust masks are available for use on a 'once-only' basis. It is strongly recommended that all protective equipment be issued on a personal basis and must be supplied by the employer.

4C. First aid

A first aid kit **must** be provided. A clearly visible sign should indicate its location. It is recommended that posters giving basic first aid advice and emergency telephone numbers should be prominently displayed (See also CropLife International's publication 'Guidelines for emergency measures in case of crop protection product poisoning'). The employees are to be notified of the alarm procedure; the effectiveness of stipulated emergency measures should be checked on a regular basis.

Further installations, facilities and appliances for first-aid and emergency rescue in the warehouse can include:

- Eye showers, body showers (emergency safety showers)
- Fire blankets,
- Medical equipment, first-aid treatment room, antidotes (only available for certain pesticide exposures).

Steps are to be taken to ensure the completeness and usability of all existing emergency equipment. For example, first-aid boxes are to be re-filled after use, and the contents of first-aid boxes, respiratory protective devices and antidotes are to be replaced if they have reached their expiration dates. In the case of eyewashes and emergency safety showers, tests are to be carried out to ensure the appropriate volume flow and water quality (danger of frost,

water contamination). The supply pipes are to be cleaned regularly; the water condition must also be checked.

1. SKIN CONTAMINATION

Any product contamination of the skin **must** be washed off without delay. The installation of an emergency shower including eyewash station should be considered. In all cases, washing with copious amounts of water is mandatory.

Contaminated clothing, including footwear, **must** be removed immediately and completely, if necessary under the emergency shower. Lightly contaminated clothing **must** be washed before re-use. Heavily contaminated clothing **must** be disposed of in the appropriate way (see CropLife International's publication 'Guidelines for the avoidance, limitation and disposal of crop protection product waste on the farm').

Any severe contamination **must** be followed by prompt medical attention. **The SDS or the product label should** be sent with the affected person to the doctor or hospital.

2. EYE CONTAMINATION

Contamination of the eyes must be followed immediately by thorough rinsing, using an eyewash solution or clean running water for at least 15 minutes and check the SDS. If complaints persist, if the SDS states eye irritation potential, or if corneal or conjunctival damage is visible, it is strongly recommended that this treatment be followed by professional attention from a doctor or at a hospital.

3. INHALATION/INGESTION

Accidental ingestion of crop protection products must, in all cases, be referred immediately to a doctor or hospital. Inhalation of excessive amounts of dusts and vapours, if suspected, should be treated similarly.

Specific measures (e.g. induced vomiting, gastric lavage, specific treatments) should be described in the SDS. In many cases, vomiting should not be induced due to aspiration hazards.

For further information, refer to CropLife International's publication 'Guidelines for emergency measures in cases of crop protection product poisoning'.

5. Spillages and waste disposal

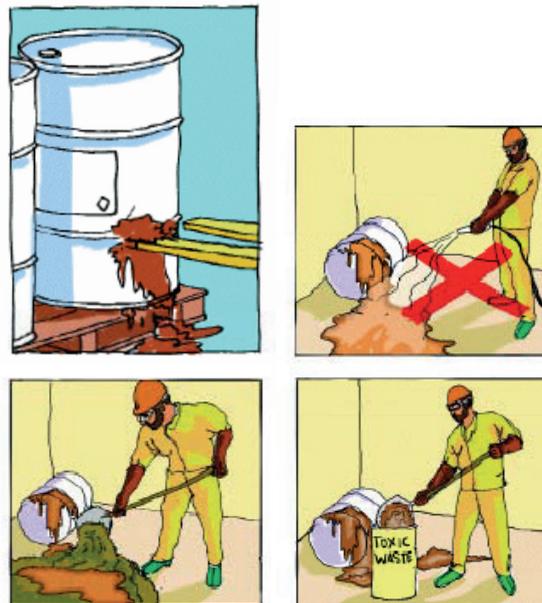
5A. Spillages

Mechanical loads, chemical effects (e.g. damage to the inner coating of metal containers), ageing and moisture can lead to packaging failure and, consequently, product leakage. A further possible cause for leakages is incorrect closure of packaging.

Hazardous substances must be stored in such a way that any leakages can be detected and acted upon. Leakages must be dealt with promptly in order to restrict the duration and extent of exposure. Regular inspection walks are to be carried out in order to detect leaking substances. Employees must leave the area immediately in the event of any danger.

Personal protective equipment is to be worn and protective measures are to be taken depending on the properties of the respective substance and the volume of the leakage (observe safety data sheet).

All spillages **must** be reported to a responsible person.



Water **must not** be used to wash away liquid spills.

Spilled product **must not** be allowed to accumulate or spread about the store.

Equipment to deal with spills

The following equipment should be reserved for emergencies and placed on a pallet or cart kept in a readily accessible location and marked with a prominent sign. The number of items and quantities of materials required will depend on the store size and likelihood and potential size of spill:

- Containers of granular clay or other absorbent material
- Neutralization agents and detergents
- Broom, non-sparking flat shovel and rubber wiper
- Empty large heavy-duty plastic bags
- Empty open-head drums
- Cloth and bucket of water, for washing surfaces
- Optionally, bags of sand (enough to build a protective dam).
- If necessary, industrial vacuum cleaners and fluid pumps (attention must be paid to explosion protection where applicable).

5B. Clean-up

First, put on protective clothing (always treat the product as hazardous until you have had a chance to check the label). Put the container on its side or upside down to stop the leak.

Spilled liquid products should first be absorbed onto sand or inert clay filler. Surround the spill with the sand or inert clay filler and allow the liquid to be absorbed. Then brush up by carefully mixing the spill with the absorbent material. Place the sweepings into a labelled, sealed container or strong plastic bag to await proper disposal.

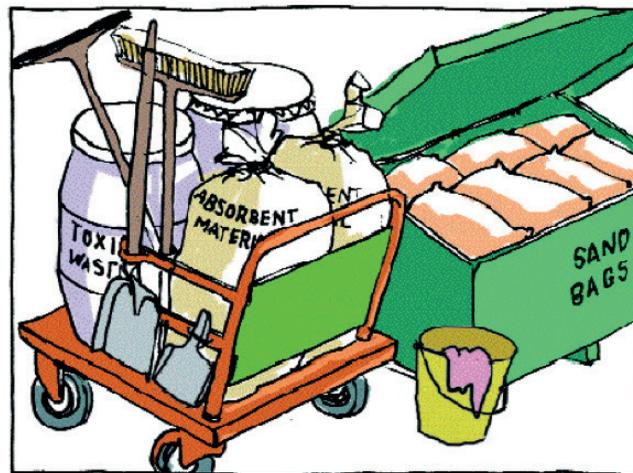
Decant the remaining liquid crop protection product into a clean, labelled container, or reseal the container. Wash the contaminated floor thoroughly with detergent and water.

Do not let the water run off; soak it up with more absorbent material as described above.

Powders and granules should be removed, preferably using an industrial quality vacuum cleaner fitted with both a primary and secondary filter. If a brush and shovel is used,

airborne dust can be reduced by first spreading damp sand over the spillage. Then follow the same procedure as for spills.

Where outside drains exist, plugs or plastic bags filled with sand and water (including anti-freeze where necessary) **must** be positioned close to the drains to be able to block them.



Keep clean-up equipment for spills handy

5C. Wastes for disposal

All chemical wastes **must** be disposed of in a safe and approved manner. On no account **must** even small amounts of spillage be flushed into the surface water drainage system or sewers or any watercourses.

Chemical waste generated by a warehousing operation usually falls into three categories:

- Obsolete stocks
- Waste associated with spillage
- Contaminated packaging materials.

Waste associated with spillage will normally consist of:

- Collected spillage
- Contaminated absorbent material
- Contaminated empty containers.

1. EMPTY CONTAINERS

Empty crop protection product containers **must not** be re-used. In special circumstances, e.g. for another formulation of the same active ingredient or where the container is regularly returned to the formulator for refilling, exceptions can be made. To prevent unauthorized re-use, containers **must** be thoroughly emptied, decontaminated by triple rinsing and punctured or crushed before disposal. Expert advice on all disposal questions should be obtained from the Safety Data Sheet (SDS) or from the manufacturer.

2. OBSOLETE STOCKS

Although waste associated with spillage tends to be disposed of fairly quickly, obsolete stocks are often simply left where they are. Prolonged inattention to obsolete stocks can lead to package deterioration and leakage at which point they can present a serious safety hazard. Moreover, after a long period of time they may become unidentifiable. These stocks should therefore be routinely and safely disposed of.

Advice on the disposal of obsolete stocks should always be sought from the supplier or from the local authorities.

5D. Disposal methods

1. INCINERATION

The recommended method for disposal of hazardous waste and contaminated materials is high-temperature incineration, operating at 1100°C with sufficient residence time (preferably > 2 sec) with integral combustion gas scrubbing facilities. It is also the most effective method of disposal for the majority of crop protection product waste types. The combustion gas/ air mixture should have a 6% minimum oxygen content.

Destruction efficiency is dependent upon time as well as temperature and most licensed waste incinerators operate at higher temperatures and longer residence times. Often, cement kilns are used for such a purpose.

Incineration should only be undertaken in licensed commercial facilities, suitable for the purpose.

Incineration of products containing mercury and iodine compounds can liberate dangerous gases/vapours and must therefore be disposed of via an alternative,

approved disposal route. If in doubt, consult the appropriate SDS or ask the supplier or manufacturer for expert advice.

2. DISPOSAL IN A WASTE LANDFILL

In the absence of high-temperature incineration, wastes for disposal should be directed to an appropriately licensed and approved landfill facility, which is suitable for the disposal of hazardous materials. If there are no other options available, controlled landfill may be undertaken. In these circumstances, disposal sites remote from watercourses should be selected and wherever possible, disposal operations should be supervised by a technically-competent person.

Any containers should have been emptied completely and, where possible, properly rinsed. Only approved landfills appropriate for the disposal of the waste should be used. The contamination of soil or groundwater due to the disposed waste **must** be avoided.

All crop protection product wastes and crushed or punctured contaminated containers disposed of by this method **must** be immediately covered with soil to prevent contact exposure risk to humans, birds and animals.

Local waste disposal authorities or water disposal contractors may be able to advise on suitable sites for the disposal of collected spillage, contaminated absorbents and punctured empty contaminated or properly (triple-rinsed) containers.

Concentrated crop protection product wastes and unwanted products **must never** be disposed of at unlicensed, non-secure landfill sites, public rubbish tips or garbage dumps.

All hazardous materials disposal activities must follow any applicable regulations for the region. It is recommended to obtain a 'certificate of destruction' of the materials that have been transported out of the warehouse facility for destruction.

6. Emergency management

6A. Emergency planning

1. EMERGENCY PLANNING

An effective emergency plan will reduce the risk of injury to people and damage to property and environment. It should cover potential emergency situations including product contamination/poisoning, fire, flooding, leakage, accidents, tornado, hurricane, earthquake, and criminal action.

Therefore it is vitally important to analyze what are the circumstances in which an emergency could occur, which measures have to be taken and who would make the appropriate decisions. An effective emergency plan includes an equipment plan, training and drills. Practicing the plan will identify any difficulties or weaknesses and ensure that everyone knows what to do in an emergency.

Any emergency plan should include collaboration and agreement with the local authorities. Also, it is highly recommended to establish co-operation with experts (e.g. environmental, medical) who can supply appropriate advice in case of necessity. A review of communication systems (e.g. mobile phones, Internet) also supports effective emergency response.

Planning should not consider just the fire fighting arrangements, but also the consequences of smoke or fumes and the possible escape of fire fighting water. If during a fire, containment cannot be guaranteed and a serious threat to outside water courses becomes imminent, then, provided there is no immediate threat to people or other property, a decision to stop fire fighting may result in the least damage overall.

Other types of emergencies, which would require the involvement of other authorities, should be discussed and co-ordinated with the responsible parties e.g. environmental authorities, hospitals, poison centers and police.



The emergency plan should show where to get help

2. EQUIPMENT PLAN

A diagram showing the position of all fire fighting equipment including the location of all fire fighting pipes, hydrants and hoses, and all protective devices on site should be displayed in at least two places, one of which should be the store manager's office. A copy of the written plan should be displayed at the same place.

6B. Emergency training

Emergency training/drill

The staff of the warehouse/site should be trained in how to act in case of an emergency e.g. significant leakage or fire. Fire drills should be carried out together with the responsible local fire brigade. Drills should not only focus on fire fighting, but also on dealing with leakages.

Fire emergency plans must be practiced regularly to familiarize fire fighters with procedures and to test the equipment.

Fire drills should be supervised by line management and, if possible, also by the fire brigade.

It is important that drills should be carried out on site and that equipment is actually used, i.e. they should simulate an actual fire emergency.

All employees should be trained in the use of all types of fire fighting equipment present on site and practice their duties under the fire plan. This will provide for flexibility in an emergency and will provide cover in case of absence or injury.

Activities covered should include:

- Initiating the alarm
- The correct use of fire extinguishers
- Site evacuation procedures
- Accounting for all personnel present.

	<p>WATER-BASED Direct stream at base of fire</p>
	<p>DRY POWDER Start at base of flame and move up where burning</p>
	<p>CO Discharge as close to fire as possible from edge of flame forwards and upwards</p>
	<p>FOAM Do not direct stream onto the burning liquid. Allow foam to fall lightly on fire</p>

Different types of fires need the correct extinguishing techniques

6C Fire fighting actions

1. GENERAL

During a fire, noxious fumes will be emitted and all smoke, regardless of the type of material burning, **must** be treated as hazardous.

Professional Firefighters engaged in fighting the fire may require the protection of a self-contained breathing apparatus; this equipment will be provided by the fire agency. Near-by evacuation of people working and living beyond the immediate site of the fire will not normally require evacuation may not be necessary. This is because the ascending force of the hot gases (thermal up-current) causes high dilution of the combustion gases and these can normally penetrate only slowly into 'closed' rooms. Thus, such people should simply be advised to stay indoors, close windows and doors and switch off any ventilation systems (also known as "shelter in place") .

Unpleasant odors caused by minute, but non-toxic quantities of strongly smelling substances may be detected even at great distances from the fire and cause alarm though they are harmless.

2. WHAT TO DO WHEN A FIRE IS DISCOVERED

1. Sound the alarm locally or send a co-worker to do so.
2. Make sure the fire brigade is called quickly. In the meantime, try to limit the fire from spreading to other locations by closing doors.
3. If you think you can deal with the small fire yourself, use the nearest available extinguisher.
4. If assistance is required, DO NOT DELAY. Clear the area of all personnel except those actually dealing with the fire and have them report to the assembly point.
5. The warehouse fire brigade should carry out the procedures agreed upon.
6. Only professional fire fighters equipped with self-contained breathing apparatus may enter the fire area.
7. Anyone exposed to fumes or smoke in a crop protection product store should be relieved of duty and checked by medical personnel for possible injury or illness.

1. Fumes and smoke given off by the fire **must** be assumed to be toxic. Be ready to keep employees upwind. Prepare with the police on how to warn residents downwind of the fire to stay indoors and close all windows and doors and switch off any ventilation systems or to evacuate if necessary.
2. To collect run-off water from the fire, close sluices and drain plugs and, where necessary, construct a barrier of earth or sand bags to contain run-off or burning liquids.
3. Any incident may attract public media enquiries. Experience has shown that, if possible, only one responsible person from the warehouse with sufficient training should deal with such enquiries to avoid confusion and misinformation amongst the public.

Beware:

Conditions within a building on fire will quickly become untenable for personnel not equipped with self-contained breathing apparatus.

It is recommended that samples should be taken by a third party to evaluate the impact of a fire on the neighborhood. This should be done in co-operation with the relevant authorities. Samples may include air from the smoke clouds, fire fighting water, water from neighboring wells or surface water or plants or soil from the neighborhood that may have been contaminated.

Hints on fire fighting

Fighting large out-of-control fires **must** be left to professional fire fighters. Try to extinguish small fires to prevent them spreading. However, never put yourself or others in danger.

Use water sparingly, preferably as a fine spray. It is suitable for fires of wood, paper, cardboard or for cooling nearby items. Dry powder or foam is preferred for burning liquids.



Use water sparingly



A spray is preferable to a jet

3. CLEAN UP AFTER A FIRE

During clean-up operations great care **must** be taken to ensure adequate personal protection and to prevent environmental pollution. The following actions should be taken:

Before entering the damaged area, evaluate the hazards sourced from the fire e.g. toxic combusting products, dust or other residues.

1. Post warning signs and rope off or close off the contaminated burned-out area and water 'run-off' area to prevent unauthorized entry. If possible, prevent further spread of contamination by rain, by bonding or covering the area with tarpaulins. Allow access only to personnel concerned with the clean-up. maintain continuous supervision until clean-up is completed.
2. The person in charge of the clean-up operation **must** be familiar with crop protection products. Otherwise, expert help should be called upon.
3. Prepare a detailed plan, in co-operation with the local authorities. Include arrangements to ensure that only materials that are proven to harmless are transferred to non-company-controlled operators, like scrap dealers. Disposal can be made easier where sorting of the waste is possible. Notify the local public health authorities of the plan. In many cases, their assistance and co-operation can be very helpful. In some instances, their involvement is mandatory.
4. Provide all personnel with protective clothing including rubber boots, solvent-proof gloves, goggles and, if necessary, a suitable respirator or mask.
5. Prohibit smoking, eating and drinking in the contaminated area.
6. Check if there is a risk of the building collapsing. Be careful not to carry chemicals out of the area on boots, wheels, etc. Arrange means of scrubbing wheels and boots at the gate.
7. Store contaminated fire fighting water until a decontamination process has been instigated or disposal in a treatment plant becomes possible.
8. Waste from the fire (e.g. ash, contaminated materials) should be covered until it can be safely removed. This is to avoid it contaminating surface water via rain water or being blown away by the wind. Toxic liquids

and residues should be absorbed with sand, inert clay filler, pumice or other suitable absorbents.

Do not wash any material into surface water drains, waterways or sewer systems.

Solid wastes and residues should be collected, packed in polythene bags and placed inside steel containers to await disposal. High temperature incineration is the recommended disposal route for these waste types.

9. Use mechanical loaders, dump trucks, etc. to minimize human contact with contaminated material. Avoid raising dust. If dust is a problem, moisten or cover the load with disposable covers. Transport debris to an approved dumping area in tight metal-bodied dump trucks or tight containers. Avoid overloading so that no spills will occur en route.
10. Obtain professional help to sample fields, banks and ditches for analysis, if contamination with water or atmospheric fallout has occurred. The results of the analysis will determine whether wells **must** be closed, cattle moved, etc.
11. Carefully decontaminate tools, vehicles and clothing after the clean-up.
12. Document the clean-up procedure used.

7. Checklist

In the case of existing warehouses, an assessment must be made, based on the fulfilment of the recommendations of these guidelines. This will determine whether continued use of the warehouse can be justified.

In the case of the construction of a new warehouse, the rules as described in these guidelines should be applied.

The following checklist has been prepared in a way that makes it easy to complete. The answers will assist in the identification of what actions are needed.

Warehouse management / Organisation	Yes	No
1. Is there a defined management structure with clear areas of responsibility?		
Comments:		
2. Do these responsibilities include supporting functions as follows:		
Receipt and dispatch of goods?		
Occupational health and safety?		
Industrial hygiene		
Maintenance of suitable storage conditions?		
Emergency response and emergency procedure plans?		
Security?		
Protection of environment?		
3. Is the management structure clearly depicted in an organizational chart?		
Comments:		
4. Are there written rules for delegation of responsibilities in case of manager absence (e.g. for warehouse management)?		
Comments:		

Warehouse management / Organisation	Yes	No
5. Is there an overview of all legal permits?		
Comments:		
6. Are current material Safety Data Sheets (mSDS) available for all products?		
Comments:		
7. Are all staff adequately trained concerning:		
Occupational Health and Safety		
General Safety procedures		
Eating, drinking, smoking, hygiene?		
Location & use of material Data Safety Sheets (mSDS)?		
Knowledge of product hazards and personal protective equipment?		
Respiratory protection training (including medical evaluation and fit testing)?		
Spill response training?		
Powered industrial truck operation and fueling (forklift trucks etc)?		
How to report incidents/illnesses?		
Emergency Response & First Aid		
Emergency response procedures?		
Fire extinguisher usage?		
Safety equipment e.g. safety showers and eye washes		
Have an adequate number of employees been trained as first-aiders?		
FAO International Code of Conduct on the Distribution and Use of Pesticides?		
General company policies and procedures		
Comments:		

Warehouse management / Organisation	Yes	No
8. Is a supervisor present during receipt and dispatch of all goods in order to check documents, package integrity, etc.?		
Are only approved substances placed in storage?		
Are the substances in the correct warehouse sector?		
Is the joint storage prohibition observed?		
Are the permitted quantities observed?		
Are there critical substances that have to be placed under special control?		
Comments:		
9. Is an outline of the materials storage plan available in each warehouse and kept up to date?		
Comments:		
10. If any product is stored outside the warehouse are conditions satisfactory regarding		
Security?		
Weather protection?		
Access for fire fighting?		
Comments:		
11. Does the arrangement for block storage comply with recommendations?		
Comments:		
12. Are stock (inventory) records kept current?		
Comments:		

Warehouse management / Organisation	Yes	No
13. Do the stock (inventory) records guarantee knowledge of the quantity and location of the goods at any time?		
Comments:		
14. Are all non-routine maintenance or construction activities authorised in writing?		
Comments:		
15. Do maintenance plans exist, are they up-to-date and followed?		
Comments:		

Location and Buildings	Yes	No
1. Does the warehouse satisfy the following requirements relating to the location?		
Away from bore holes & wells?		
Away from open water sources?		
Away from domestic areas? (schools, homes, markets, etc.)		
Away from human activity?		
Away from food or grain storage areas?		
Away from community service areas?		
If NO, in what respects does it fail?		
2. Does the warehouse satisfy the stipulations for site access?		
Comments:		
3. What is the nominal storage capacity of the warehouse? (specify units of measure)		
Comments:		
4. Does the warehouse fulfil accepted building requirements regarding:		
construction materials?		
floor surface?		
internal fire-break walls?		
roof covering and ventilation?		
heat and smoke release?		
drainage?		
local fire regulations?		
If NO, in what respects does it fail?		

Location and Buildings	Yes	No
5. Ventilation systems/Extractors/Heating/Air-conditioning		
Is the ventilation system operational?		
Is the heating/air-conditioning operating correctly?		
Are all vents above bunding height?		
Is the heating source located away from the storage area of chemicals and other combustibles?		
Is direct heating of products avoided?		
Comments:		
6. Interior lighting?		
Is it adequate for safety of personnel and equipment activity?		
Is it properly positioned?		
Comments:		
7. Traffic routes, loading ramps and storage spaces		
Are traffic routes and storage spaces signposted (visible and legible)?		
Are the traffic routes freely accessible or are they obstructed?		
Are passageways clearly marked and accessible?		
Is there any damage causing potential hazards?		
Are all handrails in proper condition?		
Comments:		

Location and Buildings	Yes	No
8. Signposting		
Are signs in place and legible?		
Are the warehouse sections clearly identifiable?		
Comments:		
9. Is the warehouse fitted with a lightning conductor?		
Comments:		
10. If any office or amenity accommodation exists in the warehouse structure:		
Is it adequately segregated from the storage area?		
Does it have an exit other than through the warehouse?		
Comments:		
11. Are the racks used in the warehouse		
Are the racks made of non combustible materials?		
Are shelves damaged or in dis-repair?		
Are collision guards in place and undamaged?		
Are racks marked to identify the maximum storage weight of each?		
Comments:		

Location and Buildings	Yes	No
12. Does the warehouse have adequate precautions against arson and burglary?		
Do these precautions include:		
Alarm systems?		
Burglar-proof gates and windows?		
Fenced-in premises?		
24-hour guard service?		
Perimeter lighting?		
Comments:		
13. If ancillary operations like shrink wrapping, refilling or repacking are carried out, are these done in a segregated room?		
Comments:		
14. Is the warehouse divided into distinct and separate storage bays?		
Comments:		

Fire and Environmental Protection	Yes	No
1. Is there a plan to deal with emergencies?		
Comments:		
2. Has this been agreed with the local fire brigade?		
Comments:		
3. Is there a fire plan showing positions of all fire fighting equipment?		
Comments:		
4. Is the fire plan legible, accessible and up-to-date?		
Comments:		
5. Are personnel trained in fire fighting?		
Comments:		
6. Is a fire drill regularly practised in co-operation with the local fire brigade?		
Comments:		
7. Can the emergency agencies be contacted immediately?		
Comments:		
8. Are sufficient emergency exits provided?		
Comments:		
9. Are the escape and emergency routes, as well as emergency exits, freely accessible, not blocked, not obstructed by parking and not locked?"		
Comments:		

Fire and Environmental Protection	Yes	No
11. Are the location points of fire extinguishers well marked?		
Is the equipment in place and freely accessible?		
Do they have surpassed their inspection dates/use-by dates?		
Comments:		
12. What additional system for containment of fire fighting water exists?		
None?		
Underground retention pit?		
External containment wall?		
Other?		
Describe:		
13. Is the warehouse bunding at least 14 cm (approximately 5 inches) in height?		
Comments:		
14. What is the overall capacity of containment?	m ³
Is this sufficient to contain the expected volume of fire fighting water?		
Comments:		
15. Are all vents above bunding height?		
Comments:		

Fire and Environmental Protection	Yes	No
16. Are the collecting and shut-off systems functioning?		
Do the collecting systems leak (visual inspection)?		
Are the collecting systems empty (not venting residual material) and clean (e.g. from leaves in the autumn)?		
Are drain covers in place and undamaged?		
Are adsorbing materials and suitable disposal containers in place?		
Comments:		
16. Spillages		
Is there an agreed written procedure for dealing with spillages?		
Are spilled dry products removed by vacuum cleaner?		
Is there a full set of spill equipment?		
Is absorbent material available?		
Comments:		
17. Waste disposal		
Are wastes disposed of in a safe and compliant manner?		
Have the methods of disposal been approved by the authorities?		
Is the re-use of emptied containers satisfactorily prevented?		
Comments:		
18. Does product segregation or separation within the premises satisfy requirements?		
Comments:		

Hygiene and Personal Safety	Yes	No
1. Are standards of hygiene and housekeeping adequate?		
Does the warehouse create an overall clean and tidy impression?		
Are there any items/tools/appliances lying around?		
Are the workplaces tidy?		
Are storage items stored in correct places?		
Are passageways, warehouse aisles and access routes free of obstructions and hazards?		
Is there any waste lying around?		
Are cleaning rags lying around (off-gassing hazardous substances)?		
Is the floor unclean? In particular, oil and grease must be cleaned up immediately.		
Comments:		
2. Are the sanitary, changing and social rooms in a clean and orderly condition?		
Comments:		
3. Do employees wear suitable work clothes and are those in an appropriate condition?		
Comments:		
4. Does protective equipment exist on the premises for handling spills?		
Are the staff familiar with its use?		
Comments:		

Hygiene and Personal Safety	Yes	No
5. Is protective equipment stored at the correct point outside of a potentially contaminated area?		
Is this routinely worn when handling products?		
Have they surpassed their use-by-dates (e.g. for respiratory protection filters)?		
Comments:		
6. Are adequate first aid materials and facilities provided?		
Are the means for first-aid easily accessible?		
Is the location of the nearest hospital or clinic known and posted?		
Comments:		
7. Are equipments/tools functioning, in good condition and have they been inspected?		
Ladders?		
Industrial trucks (forklifts)?		
Hoists/Loading equipment?		
Packing machines (including shrink wrappers)?		
Comments:		

Hygiene and Personal Safety	Yes	No
8. Are the containers in a proper condition (original container, damage, cleanliness)?		
Are the containers correctly labelled (per GHS)?		
Are the packing materials such as pallets or wire-mesh box pallets undamaged?		
Are there any leakages noted?		
Are the pallets correctly secured?		
Comments:		
9. Are permitted storage heights, stacking heights, storage weights, floor loads etc. observed?		
Are the stored goods secured against falling over, falling down, tipping over etc.?		
Comments:		
10. Are permits to work filled in correctly (hot work, welding, confined space entry)?		
Comments:		

8. Appendix 1: Dangerous Goods Labeling

Dangerous goods are substances and articles that pose an acute risk to people, property and the environment due to their chemical or physical properties. Besides the substance classification and labeling based on the UN Globally

Harmonized system of Classification and Labelling of Chemicals (as described in Chapter 1) dangerous goods are given Hazard Classes and Hazards Symbols following the UN Recommendations for the Transport of Dangerous Goods.

The following information shows the relation between dangerous goods labeling (for transportation purposes) and recommendations for storage. In contrast, scenarios for open handling, e.g. in case of spillage, are covered by substance labelling as described in Chapter 1.

United Nations Classes of Hazard label*	Dangerous Goods Hazard Class	Method of Storage / Special Recommendations
	2 (in)flammable** gas	segregate; explosion-proof equipment or open-air storage needed
	3 (in)flammable** liquids Flashpoint 61° or below	not to exceed 250 tonnes, unless fire-protected
	Combustible liquids Flashpoint above 61°	recommended not to exceed 250 tonnes
	4 (in)flammable** solids	recommended not to exceed 250 tonnes

*Note: hand drawn signs must not be used.

Size and quality of signs are defined by regulations

**Note: Inflammable and flammable have the same meaning (British vs. American usage)

United Nations Classes of Hazard label*	Dangerous Goods Hazard Class	Method of Storage / Special Recommendations
	4.2 Spontaneously combustible	segregate; open-air storage recommended
	4.3 Dangerous when wet	segregate; no sprinkler! protect from rain
	5	separate from flammables or combustibles
	5 Toxic substances	legal requirements may demand segregation if highly toxic (LD50 oral <25mg/kg)

*Note: hand drawn signs must not be used.

Size and quality of signs are defined by regulations

United Nations Classes of Hazard label*	Dangerous Goods Hazard Class		Method of Storage / Special Recommendations
 	6 & 3	Toxic flammable	treat as flammable or combustible as mentioned above (max. 250 tonnes)
	8	Corrosives	separate from crop protection product packed in metal
 	9	Various dangerous substances	no limit: if non-combustible use as a barrier for separation; consideration of combustible solids is recommended

*Note: hand drawn signs must not be used.

Size and quality of signs are defined by regulations

9. Appendix 2: Hazard Communication Information

Product hazards

Knowledge of product hazards is an essential prerequisite for the safe warehousing of all chemicals. The classification of a product is given by the producer/supplier and should be marked on the label. Information about the hazards and the classification are given in the Safety Data Sheet (SDS), which should be available for all crop protection products.

Safety Data Sheets

In the context of the UN-GHS it is required that a safety data sheet is to be attached to all substances and mixtures, that have been classified as hazardous and to mixtures, that contain substances above the cutoff value that are carcinogenic, toxic for reproduction or toxic to a specific target organ. The safety data sheet should provide comprehensive information about substances and mixtures including their hazards and advice concerning safe handling.

Structure and content of the safety data sheet should be as follows:

General details

The manufacturer's/supplier's identification, the trade name of the product and the revision date are to be shown on the first page of the safety data sheet. In addition, the respective page number and the total number of pages are to be stated on each page. Alternatively, reference can also be made to further following pages - in which case, the last page is to be marked clearly.

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/ MIXTURE AND OF THE COMPANY/UNDERTAKING

This section contains details of product identification, on its use and distribution, and an emergency phone number.

SECTION 2: HAZARDS IDENTIFICATION

This section contains the classification and labelling elements of a substance or a mixture.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Using these details, it is possible to recognize the hazardous properties of the relevant components of a mixture. As it is not necessary to specify the complete composition (type of components and their respective concentrations), the total of specified ingredients can deviate from 100 %. The actual hazardous properties of the mixture are stated under section 2.

SECTION 4: FIRST-AID MEASURES

This section describes which steps are to be taken immediately in the event of accidents, whether medical assistance is necessary or advisable or whether immediate medical attendance is necessary, whether possible delayed effects have to be expected because of the exposure and what symptoms and effects can occur, but also when no first-aid should be carried out by untrained personnel.

SECTION 5: FIRE-FIGHTING MEASURES

This section specifies the requirements for fighting a fire caused by the substance or mixture.

SECTION 6: ACCIDENTAL RELEASE MEASURES

This section contains details on personal protective measures, environmental protection measures and cleaning procedures.

SECTION 7: HANDLING AND STORAGE

The details in this section help the business operator to stipulate suitable work procedures and organizational measures.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

The details on limitation and monitoring of exposure help to keep employee exposure as low as possible whilst using the substance or mixture.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

This information provides details on how to take appropriate protective measures. For this reason, it is necessary to specify all known relevant physical-chemical properties of the substance or mixture.

SECTION 10: STABILITY AND REACTIVITY

The stability of the substance or mixture, as well as possible dangerous reactions, are described in this section. Both the intended use as well as a foreseeable improper use of the product should be taken into account.

SECTION 11: TOXICOLOGICAL INFORMATION

This section contains a brief but complete description of the various toxicological effects (on health) that may arise if coming into contact with the substance or the mixture.

SECTION 12: ECOLOGICAL INFORMATION

This section describes the possible effects and the behavior and remaining traces of the substance in the environment (air, water and/or soil).

SECTION 13: DISPOSAL CONSIDERATIONS

This section contains appropriate disposal procedures for the substance or mixture and for soiled packaging materials (incineration, recycling, depot etc.).

SECTION 14: TRANSPORT INFORMATION

Details are provided of the special precautions that need to be observed with regard to transport and transport containers. Where relevant, details of rating according to the respective regulations on the various types of transport are to be provided: IMDG (sea transport), ADR (road transport), RID (rail transport), ICAO/IATA (air transport).

SECTION 15: REGULATORY INFORMATION

Information regarding relevant Community safety, health and environmental provisions for substances and mixtures which are not listed in the preceding sections of this safety data sheet, they are to be provided as far as possible in this section. Wherever possible, reference is also to be made to special national regulations and other relevant national features. Here, it can be seen whether the supplier has subjected the substance or mixture to a chemical safety assessment.

SECTION 16: OTHER INFORMATION

Contains all other information that is of significance for understanding the safety data sheet. This also includes details concerning revisions of the safety data sheet (amendments can be specified and explained here), main abbreviations and important literature references and data sources.

Register of Hazardous Substances

A Register of Hazardous Substances is a systematic compilation of all hazardous substances stored in a given warehouse. It provides information that forms the basis for preparing risk assessments and necessary safety measures in the warehouse. A Register of Hazardous Substances must contain the following details:

1. The names of the hazardous substances (e.g. product or trade name from the Safety Data Sheet).
2. Classification of the hazardous substance or information on the hazardous properties.
3. The tonnage levels used and
4. Affected working areas (typical working areas can include warehouse, warehouse areas and warehouse sections).

There is no legal standard regarding the form of a Register of Hazardous Substances

Hazard information according to GHS consists of

- hazard pictograms,
- signal word,
- hazard statements (H-phrases),
- precautionary statements (P-phrases)
- and if necessary statements for additional hazards

Hazard Pictograms

Hazard pictograms have a black symbol on a white background with a red square frame set at a point.

Signal Words

The signal word indicates the severity of a potential hazard. The GHS uses “Danger” and “Warning”. “Danger” is used for the more severe hazard categories (i.e. categories 1 and 2), while “Warning” is used for the less severe.

Examples overleaf



GHS01
Exploding bomb



GHS02
Flame



GHS03
Flame over circle



GHS04
Gas cylinder



GHS05
Corrosion



GHS06
Skull and crossbones



GHS07
Exclamation mark



GHS08
Health hazard



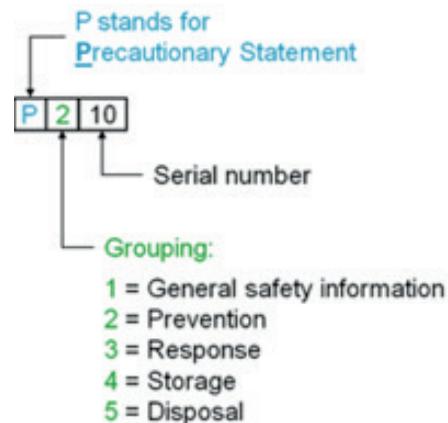
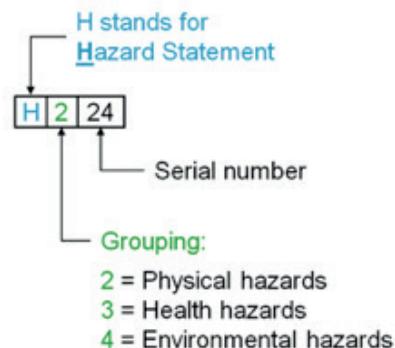
GHS09
Environment

One signal word is assigned depending on the severity of the hazard:

- **Danger** (for serious hazard categories)
- **Warning** (for less severe hazard categories)

Hazard Statements & Precautionary Statements

Hazard statements are standardized phrases indicating the type and severity of a hazard. They are identified by an alphanumeric code that consists of the letter H and a number with 3 digits. Precautionary statements describe recommended measure(s) to minimize or prevent adverse effects resulting from exposure to a hazardous substance or mixture due to its use. They are identified by an alphanumeric code that consists of the letter P and a number with 3 digits.



Labeling according to GHS

Apart from the classification criteria the UN-GHS supplies also a framework for generating labels.

The label shall include the following elements:

- the name, address and telephone number of the supplier(s)
- the nominal quantity of the substance or mixture in the package
- product identifiers
- hazard pictograms
- the relevant signal word
- hazard statements
- precautionary statements
- where applicable, supplemental information

Where the packaging is either in such a shape or form or is so small that it is impossible to meet the requirements for a label or the volume is so small that no hazard to human health or environment is to be expected, national authorities can permit simplifications of the label.



Banastar®
A suspo-emulsion containing
100 g/l dimethenamid-p, 300 g/l metazachlor
and 100 g/l quinmerac



WARNING
MAY CAUSE AN ALLERGIC SKIN REACTION.
SUSPECTED OF CAUSING CANCER.
VERY TOXIC TO AQUATIC LIFE WITH LONG
LASTING EFFECTS.

DO NOT HANDLE UNTIL ALL SAFETY PRECAUTIONS
HAVE BEEN READ AND UNDERSTOOD WEAR
PROTECTIVE GLOVES/CLOTHING.
IF ON SKIN: WASH WITH PLENTY OF SOAP AND WATER.
IF EXPOSED OR CONCERNED: GET MEDICAL ADVICE/ATTENTION.
STORE LOCKED UP.
DISPOSE OF CONTENTS/CONTAINER TO A LICENSED HAZARDOUS-WASTE DISPOSAL
CONTRACTOR OR COLLECTION SITE EXCEPT FOR EMPTY CLEAN CONTAINERS WHICH CAN BE
DISPOSED OF AS NON-HAZARDOUS WASTE

To avoid risks to human health and the environment, comply with the instructions for use.

This product is approved under the Plant Protection Product Regulations (EC) No 1107/2009.

IMPORTANT INFORMATION
FOR USE ONLY AS AN AGRICULTURAL HERBICIDE

CROPS:	Winter oilseed rape
MAXIMUM INDIVIDUAL DOSE:	2.5 l product / ha
MAXIMUM TOTAL DOSE:	2.5 l product / ha / crop
LATEST TIME OF APPLICATION:	Before 7 or more true leaf stage (GS 17)

Other specific restrictions:
Applications shall be limited to a total dose of not more than 1.0 kg metazachlor /ha in a three year period on the same field.
Following or rotational crops must not be planted until four months after application of Banastar.

READ THE LABEL BEFORE USE. USING THIS PRODUCT IN A MANNER THAT IS INCONSISTENT WITH THE LABEL MAY BE AN OFFENCE. FOLLOW THE CODE OF PRACTICE FOR USING PLANT PROTECTION PRODUCTS.

A further kind of product classification is given in Appendix 1, where the Hazard Classes and Hazard Symbols following the UN Recommendations for the Transportation of Dangerous Goods are named. These are required for the transportation of products. More details on the safe transportation can be found in the CropLife brochure “Guidelines for the safe transport of crop protection products”

Hazardous substances and the associated risks for people and the environment play a significant role when operating a warehouse.

In the following main hazards are described for simplicity. However it is important to always consider the specific properties for each substance as documented in the corresponding safety data sheet (see prior section).

Flammable

These are substances that can produce flammable vapor/air mixtures and that are therefore potential sources of fire or explosion. General definitions are:

- **Flammable liquids**
Classification of flammable liquids is determined by their flash point. For warehouses, goods with a flash point of 61°C and below are considered flammable (Note: This figure may differ slightly according to local legal requirements or the classification system).
- **Combustible liquids**
Liquids with a flash point higher than 61°C are considered to be combustible if they burn once ignited (not applicable if they are water-based).
- **Flammable solids**
These are readily ignitable solids or materials that cause a fast propagation of a fire, once ignited.
- **Combustible solids**
Solid products that burn once ignited.

For safety reasons, most crop protection product formulations should be regarded as flammable.

Typical label of a crop protection product acc. to GHS

Toxic:

These are materials which may be toxic to people by way of ingestion, inhalation or skin absorption.

- **Skin contact** is the most common route by which poisoning can occur. many chemicals can readily pass through the skin into the body.
- **Inhalation** of dust and vapours can produce a particularly fast reaction due to the ease with which such contaminants can enter the bloodstream through the lungs.
- **Ingestion** is perhaps the least common cause of accidental poisoning and is most likely to be associated with eating, drinking and smoking without having first washed the hands.

Hazardous to the environment:

Products are classified as hazardous to the environment on the basis of the acute toxicity data and/or environmental fate data – degradability and bioaccumulation data. Often, this property is focused on the aquatic environment.

Corrosive:

Such substances will attack skin, or materials such as wood or metal. Therefore, leakage can corrode other packages and structures. The packaging material used for a product should be resistant to degradation.

Oxidizing:

Oxidizing agents will increase the rate at which a fire can develop. They may also react violently with other stored materials and can be the cause of spontaneous ignition.

Dangerous when wet:

Within the range of common crop protection products, some dithiocarbamates are known to react adversely with moisture to produce carbon disulphide, a toxic, volatile and extremely flammable liquid. Spontaneous ignition of this group of chemicals is also known to occur.

The type and amount of packaging material, which may also be combustible, should be considered because of its contribution to an increasing fireload, when the hazards in a warehouse are being assessed.

10. Useful References

10A. CropLife International publications

Guidelines for the safe and effective use of crop protection products (Guideline 1)

Guidelines for personal protection when using crop protection products in hot climates (Guideline 2)

Guidelines for the safe transport of crop protection products (Guideline 4)

Guidelines for emergency measures in cases of crop protection product poisoning (Guideline 7)

Also visit the CropLife International website for latest information and publications.

www.croplife.org

10B. Other publications

Food and Agriculture Organization of the United Nations (FAO) Pesticide Storage And Stock Control Manual (publication V8966).

<http://www.fao.org/docrep/v8966e/v8966e00.htm>

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CropLife International is the voice of the global plant science industry. It champions the role of agricultural innovations in crop protection and plant biotechnology in supporting and advancing sustainable agriculture; helping farmers feed a growing population while looking after the planet; and progressing rural communities. The world needs farmers, and farmers need plant science. CropLife International is proud to be at the heart of helping farmers grow.