

FIRE SAFETY GUIDE TO BULK STORAGE OF GRAIN AND OILSEEDS



NFU Mutual
RISK MANAGEMENT SERVICES

INTRODUCTION

The potential for serious fire losses sustained by stores, distributors or dryers of grain, oilseeds and other similar crops can be reduced by implementing a practicable Risk Management Programme to minimise potential hazards.

A designated person or team should oversee the programme to ensure all aspects are properly managed and any required corrective actions implemented without delay.

The following information is provided for guidance purposes only.

SPONTANEOUS FERMENTATION/ COMBUSTION

As grains and oilseeds are living, respiring organisms, the control of moisture content, crop temperature and impurities are critical to prevent spontaneous fermentation, combustion and ignition.

The following safe storage practice to be adopted:

1. Cooling, after drying is completed, to be undertaken as appropriate for the type of crop being stored and, where required, assisted by fixed or portable fan systems. In addition:
 - i. Perforations and ducting in the flooring to be kept clear and cleaned before grain is loaded into the store;
 - ii. The required air flow to be checked to ensure effective drying and cooling;
 - iii. The filling auger to be moved whilst crop is being discharged to ensure excess dust build up does not occur on one location and restrict the airflow;
 - iv. A stirrer, to increase airflow and ensure pockets of higher moisture are disturbed, is recommended.

2. The moisture content of the crop to be monitored regularly. There is a greater risk in some crops e.g. oilseed rape or linseed and to achieve safe storage conditions, the moisture content to be reduced, as soon as possible, to under 15% for grain and under 9% for oilseeds. If more than one drying run is required, the crop to be cooled before the second commences.
3. Temperature monitoring and recording to be undertaken at regular intervals as appropriate and at least weekly. Any rise in temperature to be investigated promptly and actioned. Temperature probes to be evenly located throughout the stored crop to ensure representative data is recorded.
4. An Emergency Action Plan to be formulated and documented for control procedures to be implemented in the event of overheating to ensure that grain or oilseeds can be removed quickly if required and alternative storage premises sourced. It is recommended that the Action Plan be discussed with the local Fire Officer to ensure Fire and Rescue Service are fully aware of site emergency control procedures.
5. Any detection of deteriorating conditions of grain in storage such as unusual odours or visual signs of mould or insect infestation to prompt further inspection to investigate whether mould is developing.

STORAGE FACILITY

1. Storage buildings, even when empty, to be maintained in a serviceable condition to ensure moisture content of the crop is not increased by rainwater ingress and prevent the access of vermin and birds.
2. Appropriate action to be taken to remedy water ingress, bird and rodent activity.
3. To prevent contamination and infestation all openings in the external building fabric to be effectively sealed, and a pest control programme implemented by an experienced contractor or an appropriately trained employee to identify, monitor and

control insects. Recommend use of “Insect” traps to identify potential infestation problems at an early stage.

4. Storage facilities not to be used for other ancillary activities such as plant repair/ workshops and vehicles not to be parked in the stores.
5. Incoming crop to be sampled on arrival for moisture content and treated according to the test results, with all sampling and analysis procedures carried out and documented in accordance with **BS EN ISO 24333 Cereals and cereal products – sampling**.
6. Incoming crop to be visually inspected for green material, impurities and insect infestation prior to acceptance into the store. The storage facility to be inspected annually in accordance with relevant trade codes of practice.

ELECTRICAL INSTALLATION

Electrical testing of the fixed installation to be undertaken in accordance with the current edition of **BS7671 Requirements for Electrical Installations. Institution of Engineering and Technology (IET) Wiring Regulations**. by a member of National Inspection Council for Electrical Installation Contractors (NICEIC), who is regulated for commercial installations. The frequency of electrical inspection of the premises to be every 3 years in accordance with the recommendations of BS 7671 or Electricity at Work Regulations, or more frequently if advised by your electrician and any remedial action to be corrected without delay.

Dryers, elevators and conveyors to be connected to the electrical installation in accordance with the current edition of the rules of the IET.

It is also recommended that thermographic inspections are undertaken of all main electrical systems, plant and equipment with immediate corrective action taken in respect of any remedial action identified.

Further guidance can be found in the Fire Safety Guide for Electrical Installations.

DUST MANAGEMENT

The drying and movement of grain generates significant quantities of dust which can be explosive in certain conditions or should a source of ignition such as static electricity, grain drying, belt bearing failure or ‘hot work’ operations such as welding be introduced.

A Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) risk assessment to be undertaken, and following the assessment any identified control measures to be implemented, including:

1. Provision of electrical bonding and earthing to prevent build-up of electrical static;
2. Provision of earthing cables for bonding delivery vehicles;
3. Provision of explosion relief panels to storage buildings and
4. Use of ATEX rated equipment in Zoned 20/21 areas.

Dust clouds in the explosive region, i.e. above the minimum explosible concentration are categorised into 3 zones under relevant standard **EN 60079-10-2 Explosive atmospheres. Classification of areas. Explosive dust atmospheres** based upon the grade of release:

1. Zone 20 – A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently (Such as within silos and conveying systems e.g. bucket elevators)
2. Zone 21 – A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally (Such as

Loading and unloading areas e.g. feeders and hoppers and adjacent areas)

3. Zone 22 – A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only (Such as areas where dust can be deposited in layers or locations near equipment that are opened at infrequent intervals)

After identifying zones, you should then properly select and install apparatus that will be safe for use in the explosive atmosphere. You must protect the classified hazard zones from coming into contact with sources of ignition and can mark the entry points with appropriate warning signage.

HOUSEKEEPING & MANAGEMENT

The following housekeeping controls to be implemented:

1. A dust control and cleaning programme.
2. Strict no smoking policy to be enforced within the building and suitable notices displayed to this effect. Smoking to be permitted only in a dedicated area, preferably at least 7 metres (but wherever possible 10 metres) away from the site buildings, ash trays and fire extinguishers to be provided and suitable notices prominently displayed.
3. External storage of combustible or trade waste materials to be at least 7 metres (but wherever possible 10 metres) from the fabric of the building, preferably within fenced or enclosed areas.
4. Vegetation growing in the immediate vicinity of all buildings and structures to be cut back regularly.
5. All plant and equipment to be inspected, serviced and maintained in accordance with the manufacturer's recommendations but at least once a year, by an approved and qualified engineer or suitably trained and qualified person.
6. Regular checks on bearings to elevators/conveyors to be undertaken.
7. Essential maintenance works and servicing to be undertaken by an approved engineer under a strict Permit to Work system.
8. All records relating to periodic inspections, servicing and maintenance to be retained, ideally stored away from the premises.
9. Avoid unnecessary fire hazards in control rooms such as portable heating appliances and LPG cylinders.

CROP DRYERS

The application of heat to a combinable crop can create a major fire hazard and the following controls are recommended to help reduce the risks:

1. Where practicable, dryers to be sited in a separate building from the store or otherwise in an area segregated by walls, ceiling and doors achieving a minimum of 60 to 120 minutes fire resistance for both integrity and insulation.
2. The dryer to be indirectly fired using a heat exchanger, but if otherwise fired adequate baffles to be provided between the furnace and the drying compartment. A suitable fire safety fusible link to be fitted to incoming oil supplies if applicable.
3. The operating temperature laid down for the operation of the plant by the manufacturer not to be exceeded. All temperature measuring devices, fire safety cut outs, thermostats and other automatic controls to be regularly maintained and serviced, with annual calibration of thermostats recommended.
4. Transportable dryers which polish/clean in addition to drying produce dust and to be sited in open sided/ended buildings to allow a through flow of air. Consideration should be given to the use of dust collectors for this type of plant.
5. Only automatic plant fitted with temperature measuring devices and auto-shut off in event of overheating to be left unattended during drying operation, with

unattended plant visited by staff at regular intervals for fire safety checks.

6. All operatives to be trained and familiar with all plant emergency shutdown procedures, and a remote isolation switch provided.
7. All ducts and cavities where dust and other combustible materials may accumulate to be inspected and cleared daily. The space around the dryer to be kept clear of the dried crop and other combustible materials.

FIRE RISK ASSESSMENT

A fire risk assessment to be undertaken to identify and evaluate the potential for a serious fire at your premises. Responsibility for the fire risk assessment rests with occupiers and owners of business premises and should include the construction of the grain store, working practices within, fire inception hazards, likely fire spread potential and the suitability and standard of fire protections including your fire alarm (if present), fire doors, emergency lighting, escape signage and fire extinguishing appliances. The risk assessment to be carried out by a suitably competent person and any necessary control measures carried out to reduce the risk and effects of fire.

We recommend the local Fire & Rescue Service are invited to visit the location to assess water sources and familiarise themselves with the layout and the location of the premises.

AUTOMATIC FIRE ALARMS

Consider installation of, or upgrading existing system, to an automatic fire alarm system conforming to **BS5839: Fire Detection and Alarm Systems for Buildings: Part 1: Code of Practice for Design installation, commissioning and maintenance of systems in non-domestic premises**, minimum Category M (Manual) standard. Where involving large building shed ranges consider added installation of automatic detection with auto-signalling to nominated staff telephone raise early warning response.

A programme of testing, servicing, checking and maintenance in accordance with the installer's recommendations to be in place and documented.

AUTOMATIC FIRE SUPPRESSION

Consider fitting a direct, low pressure application, fixed fire suppression system to electrical control cabinets. Any such system to comply with **LPS1666: Requirements and test procedures for the LPCB approval of direct low pressure (DLP) application fixed fire suppression systems** and upon activation isolate the power supply and activate the fire alarm system via a relay switch. Further guidance can be found at www.redbooklive.com/download/pdf/LPS1666-Issue-Direct-Low-Pressure-Application-Fire-Suppression-System-Standard.pdf

EXPLOSION VENTING

Explosion venting to key plant provides a simple and practical method of protecting plant which is not strong enough to withstand the pressure developed by an explosion. If the relief panel is of a suitable size and design, it will safely vent the explosion without significant damage to the vessel or injury to nearby plant/personnel. Care must be taken in vent sizing and placement and should be in accordance with the requirements of **BS EN 14491: Dust explosion venting protective systems**.

PORTABLE FIRE EXTINGUISHERS

Adequate extinguishers to be located throughout the premises, with at least one dry powder appliance located within the control room of each shed. Regular inspection and maintenance to be undertaken and recorded by an approved supplier. Staff should be provided with instruction and training in the correct use of extinguishers.

FURTHER GUIDANCE

The information above is for general guidance only and more specific technical information, advice and trade codes of practice is contained within the following publications (please note this list is not exhaustive):

- HGCA (Home Grown Cereals Authority UK) - The Grain Storage Guide
- AIC (Agricultural Industries Confederation) - TASCC (Trade Assurance Scheme For Combinable Crops) - Code of Practice for the Storage of Combinable Crops and Animal Feeds)
- GAFTA (Grain and Feed Trade Association) - Bulk Storage & Handling
- BS EN ISO 24333 Cereals and cereal products - sampling
- Red Tractor Farm Assurance - Combinable Crops and Sugar Beet Standards.

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