Grain dust

Guidance Note EH66 (Third edition)

This guidance draws attention to the possible health hazards which could result from exposure to grain dust.

It gives advice on the precautions you may need to take to prevent or adequately control exposure as required by the Control of Substances Hazardous to Health Regulations 2002 (COSHH) (as amended).

The guidance is aimed more specifically at employers and managers although employees and health and safety professionals will also find it useful.

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Introduction

1 This guidance note draws attention to the possible health hazards which could result from occupational exposure to grain dust. It gives advice on the precautions you may need to take to prevent or adequately control exposure as required by the Control of Substances Hazardous to Health Regulations 2002 (COSHH) as amended. **It does not deal with safety issues, for example dust explosion risks**.

2 The guidance note is particularly aimed at employers and managers. Other groups, such as employees and health and safety professionals, will also find it useful. Read this guidance in conjunction with the COSHH Approved Code of Practice (ACOP).[1]

Occurrences and properties

3 Vast quantities of grain are imported, exported, produced and used in Britain. Grain passes through a large number of handling operations and the generation of dust is therefore widespread throughout agriculture, transport, storage and the food and drink industry.

4 Grain is the seed of cereal crops and comprises a cellulose-based seed coating and carbohydrate-based interior. After threshing, husks remain attached to the grain of barley and oats but not of wheat, rye or maize.

5 Grain may be contaminated with many other materials and as a result, grain dust is a variable and changing mixture of the different constituents of the grain and contaminants. The type of contaminants present will depend on the origin of the grain. The contaminants may include:

- bacteria;
- fungal spores;
- actinomycetes and other similar bacteria;
- microbial toxins such as endotoxins and mycotoxins;
- insects and insect parts;
- storage mites and their excreta;
- weevils and their excreta;
- animal hair;
- feathers from pigeon infestation;
- excreta from insects/animals;
- pollens;
- silica;
- soil particles;
- fungicide, pesticide and fertiliser residues;
- plant debris other than grains.

Definition of grain dust

6 Grain dust is the dust produced from the harvesting, drying, handling, storage or processing of barley, wheat, oats, maize or rye. This definition includes any and all contaminants or additives within the dust. The processing stage of grain and its derivatives includes milling and malting. Handling includes loading, unloading, packaging, transport and storage operations. All activities involving grain seed and animal feed are included.

Dusts from other grains

7 Health risks are also likely to arise from exposure to other types of grain, eg rice, sorghum, pulses (such as soya bean), peas and various oilseeds (such as rapeseed). HSE recommends that for these substances the general advice given in this guidance note should be followed.

Effects on health

8 The complex and variable nature of grain dust means that it may cause a variety of health effects. There is evidence that as well as the dust from the grain, the other plant and animal contaminants within the grain dust may also have a potential for effects on health. For example, asthma, reported among workers exposed to grain dust, is often caused by sensitisation to storage mites. The hazards presented by grain dust may also be influenced by storage conditions. For example, exposure to grain stored in a damp environment (ie mouldy grain) may lead to farmer's lung from exposure to a wide variety of antigens of bacterial and fungal species in the mould. The main health effects arising from exposure to grain dust are discussed in paragraphs 10 and 11.

Eye and skin effects

9 Eye and skin irritation are frequent reactions to grain dust exposure and include symptoms such as:

- conjunctivitis (watery or prickly eyes);
- itchy skin and skin rashes.

Respiratory effects

10 Grain dust is a respiratory sensitiser. This means it can trigger an allergic reaction in the respiratory system. Once this reaction has taken place, further exposure to the substance, even to very small amounts, may produce symptoms. Once people are sensitised (ie they have developed the allergic reaction), they can suffer symptoms either immediately they are exposed to the substance (in this case grain dust) or, as is more common, several hours later. If symptoms are delayed, they may occur during the evening or night, so their connection with work may fail to be recognised.

11 The possible ill-health outcomes are:

- rhinitis (runny or stuffy nose);
- coughing and breathing difficulties;
- asthma (attacks of coughing, wheezing and chest tightness);
- chronic bronchitis (cough and phlegm production usually in winter months and is also associated with smoking);
- chronic obstructive pulmonary disease (COPD) (a longer-term illness that makes breathing progressively difficult, and includes chronic bronchitis and chronic asthma);
- extrinsic allergic alveolitis, for example farmer's lung (fever, cough, increasing shortness of breath, muscle/joint pains and weight loss);
- organic dust toxic syndrome, for example grain fever (a sudden onset, short-lived, 'flu-like' illness with fever and often associated with cough and chest discomfort).

Risk assessment

12 COSHH requires employers to carry out an assessment of the risks to the health of employees which may be caused by hazardous substances present in the workplace. A suitable and sufficient assessment is required wherever exposure to grain dust is likely to occur.

13 To assess the risks to employees' health, you must identify all of the potential sources of exposure, who is likely to be exposed, and for how long. This may involve carrying out measurements to determine personal exposure to grain dust by air sampling. When making the assessment, you should consider all aspects of the handling and processing of grain.

14 You should carry out an assessment of individual components or additives to grain, such as pesticides used during storage and medicated products used in animal feed production.

15 It is important to tell employees and safety representatives about the risks identified by the risk assessment. They may be able to help identify cases of ill health that can be attributed to grain dust.

16 *A step-by-step guide to COSHH assessment*[2] describes in general terms how to carry out an assessment. The COSHH ACOP[1] also gives guidance. You should review your assessment regularly, again involving safety representatives.

Assessment of work involving other types of grain dust

17 You may need to carry out a risk assessment of work activities involving exposure to other types of grain not included in the definition of grain dust, eg rice, sorghum, pulses (such as soya bean), peas and various oilseeds (such as rapeseed). Dusts from these materials are also subject to COSHH because they may be potential sensitisers, or otherwise hazardous to health or present in substantial concentrations in air. The standard of control and of health surveillance required for these grains will therefore be similar to those falling within the definition of grain dust.

Prevention and control of exposure

18 The COSHH Regulations require the prevention of exposure of employees to grain dust or, if this is not reasonably practicable, to adequately control it.

Workplace exposure limits

19 A number of substances hazardous to health in the workplace have been given workplace exposure limits (WELs). These are intended to help prevent excessive exposure to specified hazardous substances by controlling exposure below a set limit. A WEL is the maximum concentration of an airborne substance averaged over a reference period, to which employees may be exposed by inhalation. Two time periods are used: long-term (8 hours); and short-term (15 minutes). Grain dust, as defined in this guidance note, has been assigned a WEL of **10 mg.m^{-3}, 8-hour time-weighted average (TWA)**. Over any 15-minute period the exposure should not normally exceed 30 mg.m^{-3}.

20 Grain dust is a respiratory sensitiser (asthmagen). Because scientific knowledge on levels below which grain dust will not cause asthma is limited, it will be necessary to reduce exposure so far as is reasonably practicable. This will involve considering the potential for short-term peaks of exposure as well as longer-term time-weighted averages.

21 For other types of dust not included in the definition of grain dust and which do not have a WEL, the principles of good practice (Schedule 2A of COSHH) for the control of substances hazardous to health should be applied, to control exposure to a level to which nearly all the population could be exposed, day after day at work, without adverse effects on health.

Control of exposure

22 Where it is not reasonably practicable to prevent exposure to grain dust, you should follow the principles of good practice to control exposure to grain dust. The measures used to control exposures to grain dust are similar for most of the industries handling, storing and processing grain. You can control exposure by a combination of methods, which may include:

- changing processes and activities to reduce grain dust at source;
- enclosing the process;
- using local exhaust ventilation (LEV);
- ensuring good general ventilation;
- organising the work to minimise the number of people exposed and the duration, frequency and level of exposure;
- ensuring proper handling of materials;
- ensuring good maintenance of plant and equipment;
- following good housekeeping principles(don't use a brush or compressed air, and never use compressed air to remove dust from clothing); and
- informing and training employees about the use of control measures.

23 **Visible dust clouds, layers of dust on floors, ledges and equipment, or dust leaking from machinery would indicate that there is a problem requiring action to be taken to reduce dust at source. Remember, you can't usually see the very fine dust that you can breathe into the deep recesses of your lungs, and which will cause most harm.**

24 For more information on common tasks generating airborne grain dust, see Appendix 1. The principles of good practice for the control of exposure to hazardous substances to health are contained in Schedule 2A of COSHH.

Maintenance, examination and testing of control measures

25 You must ensure that:

- all equipment used to control exposure to grain dust is maintained and in good working order, in good repair and in a clean condition;
- competent people carry out frequent visual checks and periodically carry out thorough examinations of LEV and check that its efficiency is being maintained; and

- all LEV is thoroughly examined and tested at least once every 14 months. A record of such tests must be kept for at least five years after the date on which they are made.

26 Further information about LEV is contained in HSE guidance HSG258 *Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV)*.[3]

Safety representatives

27 Consultation with employees is an essential aspect of arrangements for managing health and safety effectively. Employee representatives can have a particularly important part to play in this. Safety representatives appointed by recognised trade unions under the Safety Representatives and Safety Committees Regulations 1977 (as amended) should be consulted. Other employees not covered by such representatives must be consulted either directly or indirectly through elected representatives of employee safety, according to the Health and Safety (Consultation with Employees) Regulations 1996 (as amended). Such consultations allow employees or their representatives to help you develop the most suitable control measures for the workplace. More information is given in the leaflet *Consulting employees on health and safety: A brief guide to the law*.[4]

Information, instruction and training for employees

28 All your employees who are, or who may be, exposed to grain dust must be given sufficient information, instruction and training to understand the potential health issues and the precautions they need to take. The training should include details on how control measures are to be used. Proper supervision, particularly of new or inexperienced workers, should also be in place. Those who carry out the various assessments, thorough examinations and tests, monitoring and health surveillance should have received the necessary information, instruction and training to ensure that they are competent to do the work.

29 Employees should be told to report any obvious defects in the control measures to their supervisor. Employers have a legal duty to provide information, instruction and training for employees who may be exposed to grain dust under COSHH (regulation 12).

Monitoring exposure

30 Monitoring employees' exposure to grain dust may be necessary:

- to confirm that the WEL is not exceeded; and
- to establish that engineering controls are effective.

31 Guidance on monitoring and its frequency, and the record-keeping required, is given in the COSHH ACOP, while detailed information and advice on air monitoring strategies are given in *Monitoring strategies for toxic substances* HSG173.[5]

32 A variety of methods can be used to measure exposure to grain dust. HSE recommends the methods explained in *General methods for sampling and gravimetric analysis of respirable and inhalable dust* MDHS14/3.[6]

Personal protective equipment and respiratory protective equipment

33 Personal protective equipment (PPE) includes protective clothing and respiratory protective equipment (RPE) and should only use it as the primary means of controlling exposure when adequate control cannot be achieved by other methods. You may also use PPE as secondary protection in combination with other control methods if those methods do not adequately control exposure by themselves. PPE may be provided for welfare purposes or to protect other clothing.

34 Any RPE used for control must be kept clean and, unless it is of a single-use disposable type, must be properly maintained and safely stored when not in use. For a tight-fitting facepiece (filtering facepieces usually known as disposable masks, half and full-face masks) the initial selection should include fit testing to ensure the wearer has the correct device. Employers and employees should be aware that people with stubble, beards or glasses may not get the required protection from those face masks which rely on the integrity of a seal around the face (tight-fitting facepiece).

35 Where appropriate, overalls and gloves can reduce skin exposure. PPE should be suitable for the job and the wearer, and it should fit correctly. Employees should be properly trained and supervised in the use of PPE, which should be regularly cleaned and checked to ensure that it remains effective.

36 Protective clothing, worn to minimise body contamination, may also reduce body cooling by restricting the movement of air over the body and the evaporation of sweat. RPE may restrict breathing and movement. These factors should be taken into account when selecting suitable PPE.

37 Further guidance on the selection and use of RPE is given in *Respiratory protective equipment at work: A practical guide* HSG53[7] and for PPE *Personal protective equipment at work* L25.[8]

Washing facilities

38 Dust can stick to employees' clothing, hair and skin. It is important that adequate washing facilities are provided so that employees can wash off these dusts before they leave work. Whenever possible, these washing facilities should be easily accessible and sited near the point of dust creation. The importance of suitable washing facilities as a means of controlling exposure to dusts should not be underestimated.

Health surveillance

39 Employers have a duty to carry out health surveillance under COSHH (regulation 11, Appendix 3).

40 The objective of health surveillance is to:

- protect the health of individual workers by detecting, as early as possible, symptoms that may be caused by exposure to substances hazardous to health;
- help evaluate the effectiveness of measures taken to control exposure; and
- collect information to update knowledge of health hazards in the workplace.

41 The precise form of health surveillance will depend on the particular circumstances of exposure (level, frequency and duration) identified by the risk assessment.

42 As a minimum it is recommended that there should be:

- pre-placement screening that includes a questionnaire about present or past asthma or chest illness;
- information to new starters about what symptoms they should look out for and how to report;
- the completion of a questionnaire for all workers after employment at six weeks, 12 weeks (or similar intervals) and at least annually thereafter to enquire about any developing symptoms. The questionnaire should be administered by a responsible, trained person who understands the purpose of the questionnaire and what action to take if any adverse effects are declared. The responsible person should not be expected to make judgements on the cause of symptoms, diagnosis or other issues related to employability; and
- an individual health record for each worker. This should not include any sensitive clinical or medical information. Any such medical/clinical information should be treated in confidence and kept separately and securely by the occupational health professional generating it.

43 Lung function testing may also help to assess a worker's lung health. Consider measuring lung function (preferably by spirometry) at the same intervals as for the questionnaire, ie pre-placement, six weeks, 12 weeks and annually thereafter.

44 Each employer must also identify a named occupational health professional (doctor or nurse) as the competent advisor who can:

- help to develop the scheme;
- train the responsible person;
- advise on any adverse findings from the questionnaire and, in particular, fitness to continue in the work; and
- make arrangements for further investigations where necessary.

Notification of reportable disease

45 All employers, the self-employed and people in control of work premises have duties under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR). They must report certain work-related injuries, cases of ill health and dangerous occurrences. HSE will pass details to the relevant enforcing authority.

46 RIDDOR applies to all work activities but not all incidents are reportable.

47 Further information about what must be reported and how to report it can be found at www.hse.gov.uk/riddor or in the leaflet *Reporting accidents and incidents at work*.[9]

Appendix 1 Common tasks generating airborne grain dust

Table 1 Common tasks generating airborne grain dust by process and industry sector

Process	Industry sector	Task
Harvesting	Farming	Harvesting grain and transferring grain from combines into trailers.
		Transferring grain from trailers into grain intake pits or stores.
Feeding animals	Farming	Feeding animals with dry animal feed containing grain.
Drying grain	Farming, terminals & docks (grain import/export), commercial storage	Manual operation of drier from console beside drier.
		Cleaning drier at the end of harvest.
Storage operations	Farming, terminals & docks (grain import/export), commercial storage, malting, animal feed	Transferring grain around yard & into and around stores by vehicle.
		Maintaining/repairing pedestal ventilation pipes or augers in a store.
		Unblocking obstructions in transfer systems (eg elevators, conveyors).
		Sweeping edges of grain piles with brush.
		Sweeping store floors between grain piles and emptied stores manually and/or with mechanised sweeper.
Ship loading	Terminals & docks (grain import/export), road haulier	Tipping operations at grain elevators.
		Sweeping up spills from lorries after tipping into grain elevator.
		Transfer of grain along grain elevator.
		Dropping grain into ship's hold via elevator chute.
		Levelling off grain in the ship's hold by ship's crew.
		Scraping/sweeping residual grain from inside lorry after tipping operations.

Process	Industry sector	Task
Ship unloading	Terminals & docks (grain import/ export), road haulier	Unloading grain from ship's hold using crane clam-shell grab.
		Loading lorries with grain via hopper and tipping grain into store.
		Sweeping up spills around hopper created by crane clam-shell grab and from conveyor system during unloading operations.
		Use of excavator in the ship's hold to assist with the clam-shell grabs unloading operation.
		Use of loader (eg skid-steer) during the final clearing of grain from ship's hold.
		Manually scraping and shovelling grain in the ship's hold during final clearing operation (eg trimming).
		Tipping grain onto a store floor from overhead conveyors.
		Scraping/sweeping residual grain from inside lorry after tipping operations.
Loading with a shovel	Farming, terminals & docks (grain import/export), commercial storage, animal feed, road haulier	Loading open topped lorries or plant (eg blending machines) with shovel loader.
Intake	Farming, terminals & docks (grain import/export), commercial storage, milling, malting, brewery, distillery, animal feed, road haulier	Tipping grain into intake pit or on to store floor.
		Fitting/removing dust sock on to/off hatch before/after tipping.
		Sweeping up residual grain around intake pit after tipping operation.
		Scraping/sweeping residual grain from inside lorry after tipping operations.
Control room/laboratory	Farming, terminals & docks (grain import/export), commercial storage, milling, malting	Grinding grain and measuring grain moisture.
	Terminals & docks (grain import/ export), commercial storage, milling, malting, animal feed	Grinding and analysing grain samples – laboratory bench work.
Manually adding bags of grain	Small brewery, small distillery	Manually adding bags of grain into vessels.
Manually adding food additives to animal feed	Animal feed	Manually adding bags of additives into vessels for mixing with animal feed.
		Manually adding bags of additives into the shovel of a shovel loader for tipping into blending machine.

Process	Industry sector	Task
Bulk outloading	Terminals & docks (grain import/ export), commercial storage, animal feed, road haulier	Filling open topped lorries from a grain bin, where bulk outloading operations involve an operator at the filling point to initiate/terminate filling.
Clearing blockages	Farming, terminals & docks (grain import/export), commercial storage, milling, malting, brewery, distillery, animal feed	Unblocking obstructions in transfer systems such as elevators or processing plant (eg screens).
Cleaning – silos	Farming, terminals & docks (grain import/export), commercial storage, milling, malting, brewery, distillery, animal feed	Scraping and sweeping inside silos during cleaning operations.
Cleaning – compressed air	Farming, terminals & docks (grain import/export), commercial storage, milling, malting, brewery, distillery, animal feed, road haulier	Blowing out settled dust from plant, equipment and vehicles.
Other cleaning – wet cleaning	Farming, terminals & docks (grain import/export), commercial storage, milling, malting, brewery, distillery, animal feed, road haulier	Manually pressure washing plant, equipment & vehicles.
	Malting	Manually pressure washing inside steeps and underneath germinators/kilns.
Other cleaning – dry sweeping	Farming, terminals & docks (grain import/export), commercial storage, milling, malting, animal feed	Sweeping up spills from leaks or opened plants with brush.
	Malting	Sweeping dry waste and culms out from underneath/inside kiln.
Other cleaning	Farming, terminals & docks (grain import/export), commercial storage, milling, malting, brewery, distillery, animal feed	Removing and disposing of waste bags from local extraction ventilation systems.

References

1 *Control of substances hazardous to health (Fifth edition). The Control of Substances Hazardous to Health Regulations 2002 (as amended). Approved Code of Practice and guidance* L5 (Fifth edition) HSE Books 2005 ISBN 978 0 7176 2981 7 www.hse.gov.uk/pubns/books/L5.htm

2 *A step by step guide to COSHH assessment* HSG97 (Second edition) HSE Books 2004 ISBN 978 0 7176 2785 1 www.hse.gov.uk/pubns/books/HSG97.htm

3 *Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV)* HSG258 (Second edition) HSE Books 2011 ISBN 978 0 7176 6415 3 www.hse.gov.uk/pubns/books/HSG258.htm

4 *Consulting employees on health and safety: A brief guide to the law* Leaflet INDG232(rev2) HSE Books 2013 www.hse.gov.uk/pubns/indg232.htm

5 *Monitoring strategies for toxic substances* HSG173 (Second edition) HSE Books 2006 ISBN 978 0 7176 6188 6 www.hse.gov.uk/pubns/books/HSG173.htm

6 *General methods for sampling and gravimetric analysis of respirable and inhalable dust* MDHS14/3 HSE Books 2000 ISBN 978 0 7176 1749 4 www.hse.gov.uk/pubns/mdhs

7 *Respiratory protective equipment at work: A practical guide* HSG53 (Third edition) HSE Books 2005 ISBN 978 0 7176 2904 6 www.hse.gov.uk/pubns/books/HSG53.htm

8 *Personal Protective Equipment at Work (Second edition). Personal Protective Equipment at Work Regulations 1992 (as amended). Guidance on Regulations* L25 (Second edition) HSE Books 2005 ISBN 978 0 7176 6139 8 www.hse.gov.uk/pubns/books/l25.htm

9 *Reporting accidents and incidents at work: A brief guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)* Leaflet INDG453 HSE Books 2012 www.hse.gov.uk/pubns/indg453.htm

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This leaflet is available at: www.hse.gov.uk/pubns/eh66.htm.