

Health hazards from dusty cargoes during the loading and unloading of ships

Docks Information Sheet No 2 (Revised)

Introduction

This information sheet is one of a series prepared by HSE's Docks National Interest Group. It lists the potential health hazards from handling dusty cargoes in docks, outlines the main legal requirements and describes methods of controlling the hazards. It does not cover the control of dust under environmental protection legislation, or fire and explosion hazards.

Millions of tonnes of dusty cargoes are handled in UK ports every year. Those causing concern include grain, soya, peas, beans, animal foodstuffs, fishmeal, ores, coal and coke, aggregates containing quartz, cement, cement clinker, triple superphosphate and other fertilisers. During handling these can give off large quantities of dust; the more they are handled the more dusty they become. In some cases, eg coal and aggregates, the dust is simply small particles of the material itself. In other cases, eg grains and pulses, the dust may include contaminants such as bacteria and fungi.

Health hazards

Different dusts have different effects on health,¹⁻⁴ but the most important effects of dusty cargoes are on the lungs; the chronic effects are often permanent and disabling. The diseases caused include chronic bronchitis, occupational asthma, grain fever, farmer's lung and pneumoconioses such as silicosis.

Some of the dusts cause sensitisation. Early indications include irritation of the eye or nose, or skin rashes. People who become sensitised (allergic) to a dust need to avoid exposure completely. If they get help when they have early indications, they may be able to prevent more serious effects.

When do the legal requirements apply?

The Control of Substances Hazardous to Health Regulations 1994 (COSHH) apply to work with dusts which are hazardous to health.^{5,6} A dust is considered to be hazardous to health if:

- it has an occupational exposure limit, ie it has been given an occupational exposure standard or a maximum exposure limit;
- it is present at a substantial concentration in air, ie more than 10 mg.m⁻³ (total inhalable) or 4 mg.m⁻³ (respirable) unless there is indication of a need for a lower value;
- it is classified as dangerous to health (ie as very toxic, toxic, harmful, corrosive or irritant) under the Chemicals (Hazard Information and Packaging for Supply) Regulations 1994;⁷
- it is a biological agent, ie it contains bacteria or other microbiological organisms; or
- it presents a hazard to health comparable with any of the above.

Occupational exposure limits (OELs)

COSHH defines two types of occupational exposure limit:

- Maximum exposure limit (MEL). This should never be exceeded. Employers must reduce the dust levels to which people are exposed as far below the MEL as is reasonably practicable; the levels should not exceed the MEL when averaged over a specified period.
- Occupational exposure standard (OES). This is the level of dust at which there is no evidence of injury to people exposed day after day. Employers must reduce exposure by inhalation to at least that level. If exposure exceeds an OES, employers must find out why and take action to reduce exposure to the OES as soon as is reasonably practicable.

The current OELs are listed in HSE Guidance Note EH40 *Occupational exposure limits*.⁸

Most OELs for dusts are set as time-weighted averages (TWAs) over eight hours. These are long-term exposure limits and are intended to restrict the total intake over a whole working day.

Short-term exposure limits (STELs) are set for some substances which can damage health on brief exposure. These are usually averaged over 15 minutes. If there is no STEL, it is recommended that a figure of three times the long-term limit is used as a guideline for controlling short-term peaks in exposure. For instance, grain has a MEL of 10 mg.m⁻³ eight-hour TWA and no STEL, so it is recommended that exposure over any 15 minutes does not exceed 30 mg.m⁻³.

Some dusts do not have a specific occupational exposure limit listed in EH40. In these cases COSHH applies if personal exposures exceed 10 mg.m⁻³ eight-hour TWA for total inhalable dust or 4 mg.m⁻³ eight-hour TWA for respirable dust, unless there are indications that a lower level should apply.

Table 1 shows some of the main cargoes giving rise to dust, the primary health effects and current OELs.

Common levels of dust

Table 2 gives examples of dust levels measured while loading and unloading grain from ships. Dust levels produced during the handling of other cargoes are equally significant. For example: silica exposures of 2.5 times the MEL have been measured in a ship unloading stone; and personal exposures up to 20 times the OES when unloading coal and coke.

Personal exposures will depend on the precise circumstances; in dock operations it is likely that some of the people could be exposed to dust concentrations over the OEL.

What is required when COSHH applies?

Assessment

A COSHH assessment⁹ needs to assess the risks to health, taking into account how the dust causes harm, how it gets into

Table 1 Dusty cargoes, their effects and OELs

<i>Cargo</i>	<i>Agent</i>	<i>Health effect</i>	<i>Exposure limit eight-hour TWA</i>
Aggregates (quartz bearing)	Crystalline silica	Silicosis	MEL 0.3 mg.m ⁻³ respirable dust
Cement clinker	Portland cement dust	Possible irritation and reduced lung function	OES 10 mg.m ⁻³ total inhalable dust, 4 mg.m ⁻³ respirable dust
Coal	Coal dust	Possible reduced lung function	OES 2 mg.m ⁻³ respirable dust
Fertiliser (eg urea, potash) - see below for triple super-phosphate	Dust	Possible reduced lung function	Not set*
Fishmeal	Dust	Possible respiratory sensitisation	Not set**
Grain	Dust	Respiratory sensitisation	MEL 10 mg.m ⁻³ total inhalable dust
Soya, peas, beans	Dust, endotoxin	Respiratory sensitisation	Not set**
Triple super-phosphate	Phosphoric acid	Possible respiratory tract irritation	OES***

Notes

* COSHH applies if personal exposures exceed 10 mg.m⁻³ eight-hour TWA (total inhalable dust) or 4 mg.m⁻³ eight-hour TWA (respirable dust) unless there are indications that a lower level should apply

** Possible sensitiser so exposure needs to be reduced to a level as low as reasonably practicable

*** Triple superphosphate can contain up to 50% free diphosphorus pentoxide which has a short-term OES of 2 mg.m⁻³ (total inhalable)

Table 2 Examples of grain dust levels measured while loading and unloading ships (MEL 10 mg.m⁻³ eight-hour TWA)

<i>Operation</i>	<i>Dust levels (mg.m⁻³)</i>
Unloading ship using bucket elevators	1-14
Elevator operating (in cabin)	1.5-7
On quay adjacent to barge being loaded	69-267
Driving vehicle in hold of ship	13-32
Cleaning holds and quays	14-23
Loading lorries	1-30
Discharging lorries	7-17
People in vicinity of operations	1-6

the body (eg by breathing, or by skin contact or by swallowing) and the likely levels to which people will be exposed. It also needs to:

- consider whether exposure to the dust can be prevented;
- if exposure cannot be prevented, identify what is needed to achieve adequate control (in other words the steps needed to reduce exposure to the OES or to as low a level as is reasonably practicable below the MEL);
- identify the arrangements required to ensure the proper use and maintenance of control measures;
- consider whether exposure needs to be monitored;
- identify any health surveillance required; and
- identify any information, instruction and training requirements.

The assessment should be written down. It must be reviewed regularly, and whenever there is reason to suspect that it is no longer valid or circumstances have changed significantly. Reviewing means checking whether the existing assessment is still adequate and, where necessary, amending it. It does not mean repeating the whole assessment.

Control measures

The most effective and reliable control measures should be used, with personal protective equipment (PPE) a last resort. PPE may only be used as the sole method of control if it is not reasonably practicable to take any other steps to reduce exposure.

Measures which control exposure to dusty cargoes include:

- keeping away people who do not need to be in dusty areas;
- using totally enclosed, continuous handling systems - these usually provide the best control and should be used whenever reasonably practicable;
- enclosing transfer points, eg between conveyors;
- enclosing the bottoms of discharge chutes and spouts with correctly adjusted socks and skirts;
- using telescopic cascade chutes - kept properly adjusted, these dramatically reduce dust levels during bulk loading, minimising the distance of free fall;
- enclosing the boots or hoppers of conveyors as far as possible, and discharging them via a spout with a correctly adjusted sock or skirt;
- suppressing dusts with sprays of water or edible or mineral oil or other binding agents;
- not tipping material directly down chutes into holds - this generates great quantities of dust. It is much better if lorries are discharged evenly into the boot of a conveyor which can then discharge to the required area of the hold;
- not unloading by grab - this generates large quantities of dust. When it is unavoidable:

- use closed (covered) grabs to prevent overfill, encourage clean run-off and prevent wind stripping;
 - maintain the jaws to prevent leakage;
 - use a hopper into which the grab discharges to load a lorry or a conveyor;
 - minimise the drop height by opening the grab within the hopper;
 - minimise the free height from the hopper to vehicle, and enclosing the loading point as far as is reasonably practicable;
 - fit hoppers with extraction and or baffles; and
- planning the work to eliminate or minimise the need for trimming holds and to avoid creating slopes of material which are so steep that they are liable to collapse and create more dust.

If trimming cannot be avoided and a vehicle is used, the cab should have dust filters. Suitable dust filtration systems should be fitted to the cabs of all new loading shovels used to handle dusty cargoes.

More detailed information on the control of dust during loading and unloading operations and on extraction systems is given in references 10 and 11.

Respiratory protective equipment (RPE)

When loading or unloading dusty cargoes, RPE¹²⁻¹⁴ may be needed in addition to other control measures, particularly when trimming. Any RPE provided must be suitable for its purpose and the wearer, and compatible with any other personal protective equipment needed. RPE must be maintained so that it works properly.

The RPE must provide adequate protection against the environment in which it is used. For example, the driver's short-term exposure to dust could easily be over 30 mg.m⁻³ when trimming a hold of grain using a loading shovel without a cab filter. A simple half-mask respirator would not reduce exposure as far below the MEL as is reasonably practicable, as equipment providing better protection, such as positive pressure RPE, is readily available. Powered respirators with helmets are often used in the docks industry, particularly for operations where dust levels are likely to significantly exceed the OEL, for example trimming holds or working on the quay close to the source of the dust.

When providing RPE ensure that:

- the wearer is sufficiently physically fit to cope with the demands of working with RPE;
- it fits well, taking into account facial characteristics - facial hair reduces the effectiveness of any RPE which relies on face seals (powered helmets or visors, air-fed hoods and blouses, or air-fed suits are more suitable); equipment with full face masks is generally not suitable for people who wear glasses;

- it does not interfere with the demands of the job, for example, work rate and the need to move around, communicate and have good visibility;
- there are adequate storage arrangements for the RPE;
- it is kept clean and inspected each time it is used;
- the filters of non-disposable RPE are changed as necessary.

Maintenance

The maintenance of control measures is vital. This applies not only to dust extraction equipment, but also to RPE and mechanical handling plant such as elevators, suction legs and grabs. All should be examined at appropriate intervals. Local exhaust ventilation plant must be examined at least once every 14 months.¹¹

Monitoring of exposure

COSHH requires monitoring of employee exposure to dust when it is necessary to ensure that adequate control is maintained.⁶ Routine monitoring is not necessary where reliance is placed on RPE. However, air sampling may be needed as part of the COSHH assessment to help select the correct RPE.

Health surveillance

Health surveillance is required for workers who are exposed to dusts which are respiratory sensitisers, such as grain and soya, and those exposed to respirable crystalline silica where there is a reasonable likelihood of silicosis.

Workers exposed to known sensitisers require high level health surveillance; those exposed to possible sensitisers require at least low level surveillance, and some may need medium level surveillance. Booklet L55 *Preventing asthma at work*³ describes what is involved.

Workers regularly exposed to silica above 0.1 mg.m⁻³ eight-hour TWA (measured as respirable crystalline silica) should be subject to health surveillance consisting of a respiratory questionnaire and chest X-rays, as described in Guidance Note EH59 *Respirable crystalline silica*.¹⁵ The advice of an occupational health professional is needed when making arrangements for medical surveillance.

Information, instruction, training and supervision

Workers need to know how to minimise exposure to dust, when to use respiratory protection, how to clean it, how to replace the filters and how to test that it is working properly. It is important that they receive clear information on the nature of the substances being handled, the risks to health, the early signs of ill health, and how the controls in use should work. They need to be properly instructed on the correct procedures and use of control measures, including the setting up, adjustment and operation of handling equipment such as conveyors and grabs. Line managers need to provide adequate supervision to ensure control measures are properly used.

Involvement of employees

The Safety Representatives and Safety Committees Regulations 1977 and The Health and Safety (Consultation with Employees) Regulations 1996 require employers to consult their employees and their representatives in good time about specified aspects of their health and safety at work. In practice employers have found that it is beneficial to involve employees and their representatives in all aspects, including risk assessment.¹⁶

References

- 1 *Dust: General principles of protection* EH44 (Third edition) HSE Books 1997 ISBN 0 7176 1435 2
- 2 *Grain dust* EH66 HSE Books 1993 (Third edition) ISBN 0 7176 1535 9
- 3 *Preventing asthma at work: How to control respiratory sensitisers* L55 HSE Books 1994 ISBN 0 7176 0661 9
- 4 *Medical aspects of occupational asthma* MS25 HSE Books 1991 ISBN 0 11 885584 0
- 5 *Control of Substances Hazardous to Health Regulations 1994* (SI 1994/3246) as amended by SIs 1996/138 and 1997/11, HMSO ISBN 0 11 043721 7, ISBN 0 11 063430 6, ISBN 0 11 663577 9
- 6 *General COSHH ACOP and Carcinogens ACOP and Biological agents ACOP. Control of Substances Hazardous to Health Regulations 1994. Approved Codes of Practice* L5 HSE Books 1997 ISBN 0 7176 1308 9
- 7 *Chemicals (Hazard Information and Packaging for Supply) Regulations 1994* (SI 1994/3247) as amended by SIs 1996/1092 and 1997/1460, HMSO ISBN 0 11 043877 9, ISBN 0 11 054570 2, ISBN 0 11 063750 X
- 8 *Occupational exposure limits* EH40/98 HSE Books 1998 ISBN 0 7176 1474 3 (updated annually)
- 9 *A step by step guide to COSHH assessment* 1993 HSG97 HSE Books ISBN 0 11 886379 7
- 10 *Guide to the handling of dusty materials in ports* (Second edition) British Materials Handling Board 1990 ISBN 0 946637 08 3
- 11 *Introduction to local exhaust ventilation* HSG37 HSE Books 1993 ISBN 0 7176 1001 2
- 12 *Respiratory protective equipment: a practical guide for users* HSG53 HSE Books 1990 ISBN 0 7176 1198 1
- 13 *Guide to implementing an effective respiratory protective device programme* BS 4275: 1997 BSI
- 14 *Personal protective equipment at work: guidance on the Personal Protective Equipment at Work Regulations 1992* L25 HSE Books 1992 ISBN 0 71760 415 2
- 15 *Respirable crystalline silica* EH59 (Second edition) HSE Books 1997 ISBN 0 7176 1432 8
- 16 *Consulting employees on health and safety* INDG232 HSE Books 1996

Further reading

British Ports Federation *Recommendations on the application of certain health and safety legislation to port operations* Section 4.3 Dry Bulk Cargoes 1991 (Obtainable from PSO (Technical Services) Ltd, Room 220, Africa House, 64-78 Kingsway, London WC2B 6AH Tel: 0171 242 3538)

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