Manufacturing Sector Work Plan 2019-20: Occupational Lung Disease (OLD) caused by asthmagens, carcinogens and Respirable Crystalline Silica (RCS), in manufacturing industries

Open Government status: Open

Audience: FOD Inspectors, Visiting Officers, Occupational Hygienists, Occupational Health and Process Safety Inspectors

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Inspection programme

1.1. What are we inspecting and why?

We are targeting sectors where carcinogens, asthmagens and RCS are regularly used, produced or process generated. We will ensure the risks are adequately controlled and properly managed, to reduce the incidence of serious health effects from exposure to them and to make a real difference to worker's lives. We will deal with the underlying causes of poor risk control i.e. failures in health and safety management arrangements. These include the provision of adequate information, instruction, training and supervision; adequate monitoring arrangements to ensure preventive and control measures are effective; and adequate competent advice.

This is a long-term intervention aimed at delivering sustained cross-industry improvements in the control and management of risk.

1.2. What is the extent of the problem?

Occupational Lung Disease (OLD) causes the death of 12,000 people in GB annually. There are 18,000 new cases of OLD per year that are caused or exacerbated by work and 400,000 working days are lost per year.

OLD causes premature death, significantly impacts the quality of peoples' lives and has a huge cost on the GB economy. Workers who develop asthma and/or lung disease through exposure to a substance at work often need to change career or fall-out of work all together.

Specific examples of OLD in the Manufacturing Sector include:

- Silicosis, a serious, irreversible lung disease that causes permanent disablement and early death, caused by exposure to respirable crystalline silica (RCS) in stone, rocks, sands and clay
- Sino-nasal cancer from exposure to hard wood dust
- Asthma from exposure to soft and hard wood dust
- Asthma from exposure to flour dust, the second largest cause of occupational asthma
- Lung cancer and asthma from exposure to both mild and stainless steel welding fume
- Asthma and occupational hypersensitivity pneumonitis (OHP) which can lead to permanent debilitating lung damage from exposure to metalworking fluid mist.

1.3. What must be covered at the inspections?

- The specific health issue(s) **through an assessment of the management arrangements for preventing and/or controlling** the risk of exposure
- Any matters of evident concern (MEC)

- Any matters of potential major concern (MPMC) see Appendix 5.2 – link.

1.4. What sectors and topics are we inspecting and when?

Sector	Health topic(s)	When
Fabricated metals	Welding fume, MWF	Q4
Food manufacture	Flour dust and MSDs (see separate OG for MSDs)	Q2
Mineral products	RCS	Q3
Molten metals	RCS and other substances	Q3
Rubber	Rubber fume	Q1
Woodworking	Wood dust	Q1

Further information on targeting of premises including SIC codes is contained in the *Targeting and Intelligence Guide*.

1.5. Application of the Enforcement Management Model (EMM)

If exposure to a carcinogen, asthmagen or RCS is not prevented or adequately controlled, then there is a risk of a **serious health effect** (see health EMM OG for more details).
The EMM and consideration of enforcement should also be applied to underlying management issues, particularly in circumstances where there is evidence of widespread poor control or failure to sustain compliance.

1.6. Impact evaluation inspections

A limited number of visits in woodworking, food manufacture, fabricated metals and mineral products will be impact evaluation visits. These visits will be returning to sites inspected during the early stages of the health inspections to find out if compliance has been sustained.

Sites will be identified by Sector. Inspections will be the same as others in this OG. There will be two additional questions to record (see next page) for these inspections.

2. Support and Guidance Available

Specialist Support type	Relevant specialist
Control strategies and enforcement	Occupational Hygiene Inspectors
Health surveillance and diagnosis	Occupational Health Inspectors
Industry standards and enforcement	Manufacturing Sector:
	Giles Hyder x1714 food, wood, rubber
	Cath Cottam x2760 molten metals,

	fabricated metals, mineral products, ship and boat building

Other Important Guidance for Inspections	Guidance location
Topic-specific self-learning presentations e.g. flour dust, welding, woodworking, MWF	FISH
Operational guidance on inspecting MSDs in food manufacture (this inspection topic is covered at the same time as flour dust)	MSD OG
Enforcement Management Model (EMM): Application to Health Risks	HSE website
Health and Safety Management – OG: Inspection Procedure 9 June 2018 The Management of Health and Safety at Work Regulations 1999 HSG65	FISH

The above support and guidance is supplemented by new workplan briefings, in-year work briefings, webinars and targeted sector-specific training where required.

3. Recording of inspections

Answers to the following six questions **must** be recorded in the text area of the appropriate 'risk area' under DO IT. Answers should be kept short and succinct but include sufficient information to give a clear understanding of the issues and action taken.

Capturing this information is essential to enable us to effectively analyse the inspection outcomes and determine the impact.

Questions

1. What are the processes carried out and material involving RCS, asthmagens and / or carcinogens?
2. What are the specific control failings?
3. Are the control measures used, checked and maintained?
4. Are there any management failings such as training, instruction etc.?
5. Was there any SG involvement?
6. Was there a Material Breach(es) or Enforcement action taken?

The following structure should be used (including the question number):

Q1: [answer]

Q2: [answer]
Q3: [answer]
Q4: [answer]
Q5: [answer]
Q6: [answer]

For impact evaluation visits the following additional questions must be answered:

7. Has there been sustained compliance in the control of the specific health topic (flour dust, welding fume and asthmagens, RCS or wood dust)?
8. If not what are the reasons for failing to continue maintaining the control of the specific health topic

Send examples of good or poor control (with photographs and/or video) to Sector.

4. Health and Safety

Industry-specific health and safety information is detailed in the sector specific appendices below. General health and safety information for visiting staff is on the intranet.

Appendix 5.1. Industry specific information, Initial Enforcement Expectation (IEE) tables, examples of Matters of Potential Major Concern (MPMC) and safety priorities

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Appendix 5.1.1. Food manufacture

Introduction

WEL for flour dust (inhalable dust fraction) is:

- 10 mg/m^3 8-hour TWA
- 30 mg/m^3 15 minute STEL.

However flour dust is an asthmagen and exposure should therefore be reduced as low as is reasonably practicable. 2mg/m3 8-hour TWA is viewed by HSE as a reasonably practicable level of exposure control, achievable by adopting good control practice. Inspectors should expect duty holders to be meeting this level of exposure control.

Premises manufacturing bread, pastries, pies and biscuits can range from SME's (e.g. craft bakeries) to large manufacturing premises (e.g. plant bakeries).

Larger premises tend to have better flour dust and enzyme control as there is generally a higher degree of mechanisation and use of enclosed extracted ventilation systems. There may be tasks carried out during production where exposure to flour dust and/or enzymes can occur, including:

- adding ingredients by hand into hoppers containing flour,
- maintenance activities or when breakdowns occur.

Some plant bakeries have stations away from the enclosed, mechanised plant where people are mixing, dusting and manufacturing bakery products.

In smaller premises more production is carried out by hand with a greater reliance on people mixing and using flour for dusting with no extraction or other control measures in place. For this reason SMEs should be prioritised.

Flour is used for dusting as well as a core ingredient of the product.

Enzymes are contained in improvers and may be supplied as added to the flour to prolong their shelf life.

Tasks where exposure to flour dust and/or enzymes may occur are:

- Filling mixers from bags
- Bag disposal
- Weighing
- Mixing
- Adding ingredients by hand to hoppers containing flour
- Hand dusting at tables
- Using dough brake roll machines
- Maintenance activities
- Cleaning the workplace

Flour dust and enzymes can cause:

- irritation to the eyes (conjunctivitis) resulting in watering, painful eyes;
- irritation to the nose (rhinitis), resulting in a runny nose;
- occupational dermatitis, resulting in redness, itching and blistering of the skin;
- asthma if a worker becomes sensitised, resulting in breathlessness, tightness in the chest, wheezing and bronchitis.

Among all occupations, bakers have the second highest incidence rate of occupational asthma as reported by chest physicians.

Health and safety

HSE health and safety information for visits to food manufacturing premises is available.

Inspectors should follow the company's procedures when visiting.

Ensure appropriate PPE for the premises is worn e.g. safety footwear, eye protection, hearing protection.

Inspection

Adequate control of airborne flour dust may not be achieved by a single good working practice. For specific dusty tasks, a combination of control measures should be in place to reduce workers exposure to airborne flour dust.

Follow protocol under, '1.3.What must be covered at the inspections?', supplemented by consideration of:

- Encouraging substitution including:
  - use of low-dust wheat flour or a less-allergenic substance e.g. rice flour as a lubricant and for hand dusting

- use of some ingredients in liquid form instead of powder to reduce the airborne dust generated when adding ingredients to the mixer and switching on the mixer;
- non-stick coatings on conveyor belts;
- greaseproof paper on trays;

- Ensuring ingredients in powder form are not tipped from a height into the mixing bowl (generates a plume of dust rising from mixing bowl).
- Minimising airborne dust when folding and disposing of empty bags. Roll the bag from the bottom while tipping avoiding the need to flatten or fold empty bags.
- Starting up mixers on slow speed until wet and dry ingredients are combined.
- Separating the mixing area from the remainder of the production area using enclosures to contain the flour dust within the enclosure to minimise flour dust spreading.
- Avoiding the use of compressed airlines for cleaning.
- Using high efficiency industrial vacuum cleaners rather than dry sweeping with a brush.
- Wearing suitable RPE with a particulate filter, with assigned protection factor of 20 (FFP3) for any essential short non-routine dusty tasks.

General Priorities

- Hand dusting
- Identification and implementation of a package of control measures
- Maintenance of control measures e.g. extraction
- Control of cleaning and maintenance activities

Safety Priorities

The Manufacturing Sector Plan (link) details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads
- Maintenance activities: including issues of access (fall from height) and machinery intervention. Examples relevant to the food industry include the maintenance of vehicle mounted refrigeration units (fall from height), and attempted work on potentially fragile cold store roofs.

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Presentation giving refresher briefing on flour in SME bakeries plus IEE table in Appendix 7 below.

- Bakers - time to clear the air! flour dust can cause asthma.
- COSHH and bakers for the flour milling and craft bakery sector - Available from the COSHH Essentials web site
- HSE food and drink manufacturing microsite – COSHH and Bakers Key Messages
- A Baker's Dozen - Health & Safety in Bakeries - Federation of Bakers
-

Contact

Manufacturing Sector: Warren Pennington (0203 028 3614)

Wheat flour dust health IEEs			
Task	**Situation**	**IEE**	**Comment**
Bulk sieving of flour	No suitable LEV or RPE in place.	IN	Suitable LEV + operator RPE (min FFP3) required when the operation is carried out for more than 30 mins per shift. See # note on page 11. Suitable operator RPE (min FFP3) required when the operation is carried out for less than 30 mins per shift. Where reasonably practicable the activity should also be physically or temporally separated to eliminate / reduce exposure to other employees.
Careful bench dispensing and weighing of flour and improver enzymes	No suitable LEV or RPE in place.	IN	Suitable LEV and operator RPE (min FFP3) is required when the operation is carried for more than 2 hr per shift. See # note on page 11. Suitable operator RPE (min FFP3) required when the operation is carried out for between 1 and 2 hrs per shift. Where reasonably practicable the activity should also be physically or temporally separated to eliminate / reduce exposure to other employees.
Careful tipping and transferring flour and powder improvers to mixers	No suitable LEV or RPE in place.	IN	Suitable LEV and suitable RPE (min FFP3) required when tipping more than 15 sacks per shift. See # note on page 11. Suitable RPE (minimum FFP3) required when tipping less than 15 sacks per shift. Also, where possible, add wet ingredients to the mix first to reduce airborne flour dust.
Sack disposal	No suitable RPE worn and sacks folded and compacted against the operators body.	IN	Suitable RPE (minimum FFP3) required. Minimal sack handling techniques should also be employed e.g. ensure the workers roll up the empty sacks with the open end in the extraction zone of the LEV, when it is present for sack tipping. In larger bakeries it is reasonably practicable to have a sack disposal system with LEV.
Mixer start-up	No suitable LEV for a substantial number of mixers in operation with open lids allowing dust to escape when workers are in close proximity.	IN	LEV required when a substantial number of unlidded mixers are in operation and workers are exposed to the resulting dust. Where reasonably practicable (i.e. spiral mixers) a slow mixer start-up to incorporate the flour, should be used.
Undertaking an above task requiring LEV	Inadequately designed LEV.	IN / NoC	Design issues may include the hood not adequately capturing the flour dust generated by the task. IEE depends on severity of design issue. Take a photograph if possible and seek advice from an occupational hygienist.
Undertaking an above task requiring LEV	Inadequately maintained LEV.	IN / NoC	May include signs of damage to flexible ducting and hoods. This may extend to signs of ineffective repairs. IEE depends on severity of maintenance issue.
Undertaking an above task requiring LEV	Lack of current thorough examination and test (TexT) for the LEV.	IN	Lack of thorough examination and test may be indicative of a poor standard of LEV maintenance. A TExT will only evidence that the LEV was working efficiently and in good repair at the time it was carried out. TExT will NOT give assurance that the LEV is suitable designed and achieves an adequate level of control.

Dough brakes – lubricating pastry dough and conveyor with flour	Hand sprinkling of flour for more than 2 hrs per shift.	IN	Suitable RPE (min FFP3) required for operations of more than 2 hrs per shift. Use flour dredgers where possible. Consideration should be given to substituting normal wheat flour with a low-dust wheat flour or a less allergenic substance e.g. rice flour. Also (if applicable) to using a conical sieve, as opposed to a round one.
Flour used as a lubricant for hand working dough	No dust control solutions in use to eliminate the need for wheat flour as a lubricant, such as: using a non-stick surface or food grade oil as a lubricant or substitution to a less dusty or less allergenic material and no LEV or RPE in place.	IN	Suitable RPE (min FFP3) and careful flour handling is required. Consideration should be given to substituting normal wheat flour with a low-dust wheat flour, a non-stick surface or a less allergenic substance e.g. rice flour. Also (if applicable) to using a conical sieve, as opposed to a round one. For larger bakeries using wheat flour as a lubricant for hand working dough, LEV at the rear of the worktable would be appropriate.
Flour sprinkled carefully on product before baking	No suitable RPE and carried out for more than 30 mins per shift.	IN	Suitable RPE (min FFP3) required. Consideration should be given to substituting normal wheat flour with a low-dust wheat flour or a less allergenic substance e.g. rice flour. Also (if applicable) to using a conical sieve, as opposed to a round one. Automation may be a reasonably practicable control measure for large operations.
Egg-spray glazing	No suitable LEV or RPE.	IN	Suitable RPE (min FFP3) required for small scale and small duration activities. Egg is a potent sensitiser and LEV is likely to be required for more extensive operations. Occupational Hygiene advice should be sought.
Routine cleaning of flour	Dry sweeping.	IN / NoC	An M-type vacuum cleaner should be used for routine cleaning of flour dust. IEE depends on whether dry sweeping is widespread (IN) or just confined to 'hard-to-reach' areas (NoC).
Cleaning large flour spills	Dry sweeping flour dust or using an M-type vacuum cleaner without RPE.	IN	Suitable RPE (min FFP3) required and the spill should be cleared using M-type vacuum cleaner.
Undertaking a task requiring RPE	RPE not maintained or no face fit test for tight fitting masks.	IN	Evidence includes filters with signs of clogging; facial hair, glasses, other PPE interfering with RPE tight fit.
Health surveillance for exposure to flour dust, improver dust and egg glaze	Absent (where guidance would indicate it is necessary)	IN	Discuss with SG Occupational Health.
# NOTE: Where installed LEV systems are tested and proven (via an adequate exposure air monitoring survey) to be effectively capturing the dust and reducing worker exposure to flour dust to a level as low a is reasonably practicable, RPE (in addition to the LEV system) may not be needed for the task.			

Food Manufacture Potential Catastrophic Event:	Due to:	Examples of indicative issues:	Existing Guidance:
Fire and explosion.	Ignition of combustible dusty and powdered substances (e.g. flour, custard/milk powder, sugar etc.), flammable gases (e.g. oven fuel) and liquids (e.g. flavourings, cooking oils etc.)	Inadequate control/release of combustible substances and flammable liquids/gases.	HSG 103 Safe handling of combustible dusts: Precautions against explosions
		Inadequate control of ignition sources in hazardous areas e.g. inadequately designed and maintained vacuum cleaners, ineffective permits for hot work etc.	HSE Web page "Prevention of Dust Explosion in the Food Industry" Appendix 1 - Guidance on the selection of vacuum cleaners for low combustibility organic granules and dusts (e.g. flour)
		Inadequate explosion relief on dust collection units.	INDG370(rev1) Controlling Fire and Explosion Risks in the Workplace
		Inadequate storage and use of flammable liquids.	HSG 51 Safe Storage of Flammable Liquids
			HSG 140 Safe Handling and Use of Flammable Liquids
Exposure to flammable/toxic/ corrosive ammonia gas.	Operation of ammonia refrigeration systems.	Inadequate systems of inspection, examination, maintenance and operation of ammonia refrigeration systems.	Safe Management of Ammonia Refrigeration Systems. Guidance for Food and Drink Industries and other Workplaces. (The document is also available at Trim Reference: 2016/253710)
		Inadequate emergency procedures (and rehearsal of such) to limit the effect of leakage if one occurs.	Safety of Pressure Systems. ACOP to the Pressure Systems Safety Regulations 2000
		Failure to ensure competent designers, maintenance contractors, operating staff etc.	INDG261 Pressure Systems at Work: A Brief Guide to Safety
Exposure to oxygen deficient atmospheres; exposure to noxious gases; engulfment (solids / liquids).	Entry into a confined space / silos	Need to enter confined space has not been designed-out.	HSG 252 A Recipe for Safety: Health and Safety in Food and Drink Manufacture
		Lack of / inadequate safe system of work for necessary confined space entry.	Safe Work in Confined Spaces. ACOP to the Confined Spaces Regulations 1997
			INDG258(rev1) Safe Work in Confined Spaces: A Guide to Working Safely.
Operation of systems e.g. for animal stunning / killing and blast chilling, using potential oxygen displacing gases such as carbon dioxide and nitrogen.		Inadequate system inspection, examination, maintenance, operation and emergency arrangements Waste gas ventilation systems have not been designed by a competent person and / or are not venting to a safe location.	

Above are specific industry examples that could lead to potentially catastrophic events. There are other events common across the industries that are not included here. See OC18/12 for more details.

Appendix 5.1.2. Woodworking

Introduction

HSE has found the woodworking industry difficult to engage with at a national level, as the industry's trade associations cover only a relatively small percentage of workplaces.

Approximately 238,000 carpenters and joiners are employed in the woodworking sector. Approximately 75% of these are estimated to be micro-businesses of less than 10 employees.

Wood dust can cause:

- asthma – both hard and soft woods are asthmagens and carpenters and joiners are 4 times more likely to develop asthma than other workers
- nasal cancer – hardwoods are classed as a carcinogen

Both hardwood and softwood dusts have a WEL of 5mg/ m3 / 8hr TWA NB From January 2020 the WEL for hardwood dust and mixed wood dust is changing to 3mg / m3 / 8 hr TWA.m^3.

Health and safety

Inspectors should follow the company's procedures when visiting.

Ensure appropriate PPE for the premises is worn e.g. safety footwear, eye protection, hearing protection.

Inspection

Exposures to wood dust can occur not only when machining wood, particularly sanding, but also when cleaning. It has been common practice in the industry to dry sweep or use an airline to blow down machinery, surfaces and clothing which increases the amount of airborne dust and potentially can increase the exposure of workers.

Wood dust can be readily controlled by the use of LEV but experience has shown there are often issues with the LEV.

Follow protocol under '1.3.What must be covered at the inspections?' supplemented by consideration of:

- Management and workers knowledge of the risks from wood dust
- Training so workers know the risks of wood dust and understand how to protect themselves
- High standards of housekeeping e.g. removing dust from machinery and not having piles of wood dust around the workplace
- Cleaning methods that reduce the risk of dust exposure e.g. vacuuming instead of dry sweeping or blowing down

Priorities

- Machining activities
- Sanding: belt sanders can produce high levels of dust, as can sanding with hand-held power tools
- Cleaning down activities: dry sweeping and blowing down with airlines should not occur
- Poor/inadequate LEV design and capture
- No LEV, including on-tool extraction, provided for dusty activities
- Poorly maintained LEV

Safety Priorities

The Manufacturing Sector Plan (link) details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads
- Maintenance activities: including issues of access (fall from height) and machinery intervention

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Presentation giving refresher briefing on woodworking plus IEE table below.

- Wood dust
- Wood dust - Controlling the risk (WIS 23)
- Selection of respiratory protective equipment for use with wood dust (WIS 14)

• • Local exhaust ventilation (LEV) • Clearing the air - A simple guide to buying and using local exhaust ventilation (INDG 408) • COSHH and woodworkers - key messages – includes links to the ‘COSHH Essentials web tool’ sheets numbers 1-9
Contacts
Manufacturing Sector: Tim Johnson (0203 028 5074)

Wood dust health IEEs			
Task	**Situation**	**IEE**	**Comment**
Use of woodworking machine	No LEV	IN	LEV hood may form part of guarding to prevent access to dangerous parts. Enforcement action may therefore also be required to address the immediate safeguarding issue.
Use of sanding machine, wall saw or chop saw	No LEV and no RPE	IN	Both LEV and suitable RPE (minimum FFP3) will be required to achieve adequate control for these particular woodworking machines
Use of woodworking machine	Inadequately designed LEV	IN	Design issues include hood and/or duct being too small to adequately capture and transport the wood dust generated. Evidenced by visible settled fine dust on workplace surfaces and visible airborne dust emanating from the machine.
Use of woodworking machine	Inadequately maintained LEV	IN	May include signs of damage to flexible ducting and hoods. This may extend to signs of ineffective repairs. Baffles seized up, preventing the system being properly balanced. Evidenced by visible settled fine dust on workplace surfaces and visible airborne dust emanating from the machine.
Use of wood working machines	LEV not being operated properly	IN	LEV hood and baffles are not correctly adjusted to effectively capture the wood dust. Baffles that are hard to open / close suggest failure to routinely operate the LEV properly. . Evidenced by visible settled fine dust on workplace surfaces and visible airborne dust emanating from the machine.
Use of hand-sander	No on-tool extraction and no RPE	IN	Both on-tool extraction and suitable RPE (FFP3 minimum) will be required to achieve adequate control
Use of wood working machine	Lack of current thorough examination and test (TExT) for the LEV	IN	Lack of thorough examination and test may be indicative of a poor standard of LEV maintenance. A TExT will only evidence that the LEV was working efficiently and in good repair at the time it was carried out. TExT will NOT give assurance that the LEV is suitable designed and achieves an adequate level of control.
Cleaning	Sweeping or using compressed air to clear wood dust	IN	An M-type vacuum cleaner should be used to clear wood dust.
Changing dust extraction bags or maintaining woodworking machines	Suitable RPE not used	IN	RPE (minimum FFP3) should be worn
RPE	RPE not maintained or no face fit test for tight fitting masks	IN	Evidence includes filters with signs of clogging; facial hair, glasses, other PPE interfering with RPE tight fit.
Health surveillance	Absent (where guidance would indicate it is necessary)	IN	Discuss with SG Occupational Health

Woodworking Potential Catastrophic Event:	Due to:	Examples of indicative issues:	Existing Guidance:
Explosion and fire	Ignition of combustible wood dust Heat treatment of waste wood and by products	Excessive dust on surfaces Inadequate control of ignition sources in hazardous areas	WIS 32 Safe collection of wood waste: prevention of fire and explosion
		Inadequate explosion relief on dust collection units	HSG 103 Safe handling of combustible dusts: Precautions against explosions http://www.hse.gov.uk/foi/internalops/sims/manuf/3_09_08/index.htm
		Poor siting of explosion relief	-
		lack of competent DSEAR risk assessment	the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR),
	Catastrophic failure of pressure vessel used in wood treatment premises	Lack of planned proactive maintenance system	INDG 126" Pressure Systems : a Brief Guide to Safety"
		Lack of thorough examination/scheme	

Above are specific industry examples that could lead to potentially catastrophic events. There are other events common across the industries that are not included here. See OC18/12 for more details.

5.1.3. Welding fume (fabricated metal, shipbuilding and repair)

Introduction

All welding fume (including mild steel) is now classed as a carcinogen which can cause lung cancer and has the potential to cause kidney cancer. This is based on the outcome of recently published research by the International Agency for Research on Cancer (IARC).

Inspectors will need to consider the overall risk to health from exposure to all types of 'welding fume' (including mild and stainless steels[1], high chrome steels, armour plating and exotic metals). This will be judged by any visible fume generated, the controls provided and an assessment of the effectiveness of those controls (this may be supported by relevant duty holder exposure monitoring data).

The control measure(s) will be dependent on the task, as there is no one control solution that will be effective for all cases. The exposure controls required will be:

- **the provision of suitable engineering controls e.g. LEV for all welding fume inside, with RPE for any residual fume; and**
- **the provision of appropriate RPE for welding outdoors.**

HSE will no longer be accepting short-duration work without any appropriate exposure control.

HSE accept that looking for residual fume is not a 100% effective way of assessing residual risk, as not all fume is visible. However, this is a 'rule of thumb' pragmatic solution.

Inspector's applying the EMM will identify the health outcome following exposure to mild steel welding fume as having a 'serious' health effect (previously this was a 'significant 'health effect) potentially resulting in letters and notices to improve exposure control (see IEE table).

Carcinogens:

- Welding fume has been classified as carcinogenic (by IARC) and therefore must be 'adequately controlled' to prevent exposure in accordance with Reg 7 of COSHH 2002. It WILL NOT be subject to the 'as low as reasonably practicable (ALARP)' requirement because it does not fall within the descriptions of substances that carry a specific hazard statement; and
- Control is only adequate if the principles of control in Schedule 2A to COSHH are applied. Given the relevant risk is lung cancer; you can apply the same principles of ALARP as the control measures should be proportionate to the serious health risk presented.

Asthmagens:

- Exposure to welding fume has been linked to causing occupational asthma but the evidence is not strong enough to classify it as an asthmagen.
- Exposure to welding fume must be 'adequately controlled' in accordance with Reg 7 of COSHH 2002. It WILL NOT be subject to the 'as low as reasonably practicable' requirement UNLESS the employer identifies it as a potential cause of occupational asthma through their risk assessment.

Exposure to some welding fumes may also cause metal fume fever, the most common cause is from welding galvanised steels but may also occur in those metals with higher copper, cadmium and zinc content.

Exposure also increases susceptibility to pneumonia. Current evidence suggests that exposure to welding fume may cause COPD but there is insufficient evidence to prove a definitive link.

Improving the control of welding fume will have other benefits such as controlling exposure to manganese, a commonly found constituent in welding consumables. Manganese is recognised by SCOEL as a neurotoxic metal associated with effects similar to Parkinson's Disease.

Health Surveillance for Occupational Asthma (stainless steel only):

- Respiratory health surveillance is likely to be necessary when welding stainless steel, where a known asthmagen, for example chromium, is present in the fume (unless the risk assessment has shown there isn't a reasonable likelihood of developing the condition).
- If through a risk assessment a dutyholder has identified a need for health surveillance for any reason, this should be provided as it can provide early detection of work related ill-health and checks the adequacy of the control measures.
- General principle expectations for asthma health surveillance are:
  - Baseline questionnaire and spirometry
  - Further questionnaire at 6 and 12 weeks post start of work (Note: the periodicity of questionnaire etc may vary)
  - Annual questionnaire and spirometry.
- Workers need to be provided with adequate information, instruction and training so that they report any relevant intercurrent symptoms appropriately.
- Advice should be sought from a competent person (Occupational Health Provider).

[1]Stainless steels can also include Duplex, Super Duplex, Ferritic, Austenitic and Martensitic

Health and safety

HSE health and safety information for visits to engineering premises (including fabricated metal premises) is available with additional information relating to shipbuilding and repair .

Inspectors should follow the company's procedures when visiting.

Ensure appropriate PPE for the premises is worn e.g. safety footwear, eye protection, hearing protection.

Inspection

Follow protocol under 'inspector action' supplemented by consideration of:

- What welding technique is being used (MMA/FCA/MAG/MIG/TIG)?
- How much of the workload involves welding in this work area (pattern of work)?
- Where is the welding being carried out (confined space/booth/open workshop/outdoors in the open air)?
- Is there visible fume being generated by the welding activity?
- On visual inspection is all fume generated being controlled?
- What controls are provided (LEV e.g. on-torch, below bench, booth, adjustable)?
- Where LEV is provided is it being used properly by the workers?
- Is the LEV adequately maintained (are there obvious signs of damage, in-house repair)?
- Is the LEV being thoroughly examined and tested?
- Is there any obvious residual fume remaining?
- Where there is residual fume, is suitable RPE provided?
- Is there an RPE Management Programme in place to ensure suitable selection, provision, face-fit testing, maintenance etc.?
- Does the dutyholder have any relevant exposure monitoring data***** and does this indicate adequate control?
- Is this monitoring data suitable and sufficient***** (refer to Occupational Hygiene Specialist Group)?
- Is adequate information, instruction, training and supervision provided?
- Is Health Surveillance provided, where it has been identified as being required?

***If the exposure monitoring data shows control to below the relevant WELs (e.g. chrome, nickel, manganese, cobalt etc.) then no further action is required.**

Priorities

- Welding carried out in a restricted or confined space[2] (e.g. internal welds for containers) and there is no extraction or RPE provided.
- There is visual evidence of welding fume, yet no engineering controls are provided and used e.g. LEV.
- If the LEV system is of recirculating type, returning filtered air to the workplace, you should discuss further with Occupational Hygiene.

- Engineering controls are present but are not effective in controlling the generated fume.
- The LEV provided is not effective at controlling the fume generated and presents some risk from residual fume to welders and others in the vicinity.
- Where there is obvious residual fume, no suitable RPE has been provided.
- LEV shows signs of damage or deterioration and there is no evidence of a maintenance regime.
- LEV does not have a valid/current thorough examination and test.
- MMA creates the most fume and is therefore harder to control.

[2] welding within a 'confined space' is MOEC

Safety Priorities

The Manufacturing Sector Plan details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads e.g. large structures, tanks and vessels
- Maintenance activities: including issues of access (fall from height) and machinery intervention

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Presentation giving refresher briefing on welding fume plus IEE table below:

- RPE Webpages
- LEV Webpages
- L5 - Control of Substances Hazardous to Health Regulations 2002 ACOP
- L22 - Provision and use of Work Equipment Regulation 1998 ACOP
- HSG129 - Health and Safety in Engineering Workshops
- HSG139 - Safe use of compressed gases in welding, flame cutting and allied processes
- INDG390 - Choosing a welding set
- INDG327 - Take care with acetylene
- INDG297 - Safety in gas welding, cutting and similar processes
- INDG314 - Hot work on small tanks and drums

NOTE: HSE acknowledges the application of the BOHS Breathe Freely Selector Tool, as an appropriate method for complying with the COSHH Requirements for Good Practice, in controlling exposure to welding fume.

Contact

Manufacturing Sector: Sarah Palfreyman (0203 028 1760)

No.	Task (Indoors unless stated)	Situation	PN/IEE	Comment
1	MMA, MIG, MAG, FCA, TIG welding	No LEV	IN Consider PR	The fume level is likely to be high and clearly visible and therefore needs to be captured to prevent exposure to fumes.
2	MMA, MIG, MAG, FCA, TIG welding	LEV present but is poorly designed, maintained and/or operated and adjusted	IN	LEV must be improved and/or modified to ensure adequate capture of fume, taking into account the work process.
3	MMA, MIG, MAG, FCA, TIG welding	RPE provided only	IN	Fume not being controlled in accordance with the hierarchy of control and the COSHH principles of good control practice.
4	MMA, MIG, MAG, FCA, TIG welding	LEV present and properly used but residual visible fume remains present	IN	Suitable RPE should be provided in addition to the LEV. (See IEE 10)
5	MMA, MIG, MAG, FCA, TIG welding being undertaken outdoors, in the open air	No RPE/Unsuitable RPE being used	NoC	LEV not practicable therefore RPE required however, there will be an element of general ventilation and therefore the risk gap will be lower.
6	MMA, MIG, MAG, FCA, TIG welding	Welding where LEV has been assessed as not reasonably practicable (e.g. working at height) but no other controls provided	IN	If based on a risk assessment LEV is not practicable then suitable RPE should be provided.
7	LEV maintenance	Poor LEV maintenance	IN	Sign of poor repair, damaged ducting in-house repairs (e.g. duct tape). If in the Inspector's opinion when repaired the system is likely to be effective, then enforce on the maintenance issue. If LEV is unlikely to be effective in the repaired state, then enforce on the 'control' issue (see No.3). Refer to Occupational Hygiene if further advice is required.
8	LEV examination	No certificate provided for proof of a current thorough examination and test (TExT) for the LEV	IN	This is an absolute duty and must be provided.
9	LEV examination	A TExT has been carried out but the information provided is inadequate	NoC	Ensure the content of the TExT is compliant with the requirement of the COSHH ACoP (para 186). If you have doubts with regard to compliance, please refer the matter to SG Occupational Hygiene.

10	Use of RPE	Incorrect RPE provided	IN	If a disposable mask is provided this must be FFP3. If half-mask provided this should be fitted with a P3. Unshaven workers should be provided with an appropriate alternative e.g. a loose-fitting powered respirator. Note: tight fitting RPE is not appropriate for unshaven workers.
11	Use of RPE	Not maintained Evidence of damage/dirty No face fit testing	IN	RPE management programme expected.
12	Health surveillance	Absent (where a risk assessment would indicate it is necessary)	IN	Discuss with SG Occupational Health.
13	Health Surveillance	Absent but company is welding a metal containing a known asthmagen e.g. chromium in stainless steel NOT REQUIRED FOR MILD STEEL	IN	Discuss with Occupational Health
14	Health Surveillance	Has been provided but inadequate	NoC	Discuss with SG Occupational Health.
15	Information, Instruction and Training	None provided to those exposed	IN	Suitable IIT to be provided to ensure control measures correctly used and employees undertaking welding (and others potentially exposed) understand of the risks from exposure. Discuss with Occupation Hygiene if further advice needed
16	Confined Space working	Inadequate procedures for confined space working	PN	This must be discussed with SG Occupational Hygiene. Note: Fabricating objects such as box sections may create a confined space during the process.

Ship / boatbuilding Potential Catastrophic Event:	Due to:	Examples of indicative issues:	Existing Guidance:
Fire and explosion	Use of fuel gases and oxygen	poor control of cylinders and tubing	Welding fire and explosion webpages Safe use of oxygen and fuel gases on board ships - EIS43
Entry in confined spaces	Poor controls or understanding	Manufacturing process creating smaller spaces. Refurbishment of existing ships / boats. Use of solvents. Tanks or other contaminated areas being worked on	Welding and confined spaces webpages
Fabricated Metals Potential Catastrophic Event:	Due to:	Examples of indicative issues:	Existing Guidance:
Fire and explosion	Use of fuel gases and oxygen	poor control of cylinders and tubing etc.	Welding fire and explosion webpages
Fire and explosion	Ignition of metal powders/dusts	Inadequate control provided	Safe handling of combustible dusts - HSG103
Entry in confined spaces	No r/a, poor controls, inadequate training and emergency procedures	Manufacturing process creating smaller spaces. Refurbishment of metal structures/tanks etc. Use of solvents and welding kit during activities in enclosed space.	Welding and confined spaces webpages
Heavy loads	Poor management and control of movement and storage of heavy loads	Poorly designed workplace transport arrangements, no segregation, lack of planning and poor storage arrangements	Safety in the storage and handling of steel and other metal stock - HSG246f

Above are specific industry examples that could lead to potentially catastrophic events. There are other events common across the industries that are not included here. See OC18/12 for more details.

Appendix 5.1.4: Metal working fluids

Introduction

Metalworking fluids (MWF) often referred to as coolant, are universally used across engineering and manufacturing sectors. They are used to cool and lubricate components during various machining process. **This inspection programme is focusing on water-mix fluids only.**

The health risks are:

- Respiratory disease from inhaling mist from water-mix MWFs e.g. Occupational Hypersensitivity Pneumonitis (OHP) (a serious lung condition previously known as Extrinsic Allergic Alveolitis) and Occupational Asthma (from water-mix MWFs)
- Skin disease from contact with neat and diluted fluid e.g. dermatitis.

There are concerns about the rise in cases of OHP and OA in machine operators using water-mix MWFs. The exact causal agent(s) are not fully understood, but one or more of the following are likely to be involved:

- the ingredients in the fluid concentrate
- microbial contaminants
- substances deliberately added to the fluid (e.g. biocides) or contaminating the fluid (e.g. metal fines).

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Coolant can stay in the machine for long periods (typically many months), and subsequently its composition will change through degradation and contamination. The on-going maintenance of fluid quality **and** cleanliness of the fluid delivery system are a key part of risk control and suitable arrangements must be in place to ensure this is effectively monitored and managed.

Exposure to MWF mist should be adequately controlled. This will mean controlling exposure to as low as is reasonably practicable (ALARP). This is because there is a strong evidence base that there is a risk of OA from exposure to MWF mist. Adequate control will be achieved through enclosing machines as much as possible, preventing operator exposure on opening machine enclosures and avoiding compressed air use.

There is no WEL for water-mix MWF.

Health and safety

HSE health and safety information for visits to engineering premises (including fabricated metal premises) is available with additional information relating to metalworking machine tools.

Inspectors should follow the company's procedures when visiting.

Ensure appropriate PPE for the premises is worn e.g. safety footwear, eye protection, hearing protection where required.

As a precaution wash hands after inspection completed to ensure any residual MWF's is removed from the skin.

Inspection

First establish that water-mix MWF is in use (typically made up from a concentrate solution mixed with water usually with a resultant milky appearance).

Follow protocol under '1.3. What must be covered at the inspections' supplemented by consideration of:

- Are there activities where exposure to mist is highly likely?
  - (1) CNC machines?
  - (2) Use of compressed air to clean components and internal machine surfaces?
  - (3) Use of a power washer to clean internal machine surfaces and coolant sumps?
- What controls are in place?
  - (1) Are CNC machines fully enclosed, if not, can they be enclosed further?
  - (2) Is a delay observed on completion of machining to allow mist to settle out/be extracted before the operator opens/enters the enclosure?
  - (3) How was this determined e.g. smoke, visually with backlighting **and** how is this implemented e.g. programmed interlocks, operator judgement?
  - (4) Is LEV present to remove mist that builds up inside the enclosure?
  - (5) Where the extracted air is re-circulated back into the workshop, does this incorporate a mist filtration system?

(6) Have alternatives to compressed air been considered?

(7) Where compressed air is used is this only used where necessary, used within an enclosed cabinet, fitted with low pressure nozzles?

(8) Is there an adequate system in place for monitoring and managing fluid quality that includes:

- dip slides (to estimate levels of living bacteria).
- pH (Note: pH is **not** considered a reliable surrogate for microbial levels at the 'lower action level' i.e. above 10^4cfu/ml and up to 10^6 cfu/ml).
- fluid concentration (specified by fluid supplier but typically between 4-8% and measured using a refractometer).
- tramp oil (visible layer of oil that sits on top of the emulsion).
- unusual odours (sulphurous, rancid), visible biological contamination.

(9) Have employees been provided with adequate information and training in relation to the potential ill health risks associated with exposure to MWF's **and** the controls in place to prevent or reduce exposure in their work area?

(10) Is suitable RPE/PPE provided for mixing and cleaning/maintenance tasks?

- Is health surveillance (skin and respiratory) provided?
- Have they had any reports of ill-health (skin or respiratory)?

Priorities

- Processes where high levels of MWF mist is generated e.g. CNC machining with absent or ineffective LEV.
- Widespread use of compressed air with no or ineffective controls.
- Poor management of MWF (inadequate or absent monitoring and/or review of test results, timely corrective action not taken).
- Poor fluid quality indicated by unusual odours (sulphurous, rancid), discolouration of the fluid, visible scum/tramp oil in sumps, fungus, biofilms.

Inspectors will also need to consider serving a prohibition notice if there is immediate serious risk to health and prosecution if the risk gap is extreme and in line with the Enforcement Policy Statement.

Safety Priorities

The Manufacturing Sector Plan (link) details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads e.g. moving or relocating machinery
- Maintenance activities: including issues of access (fall from height) and machinery intervention

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Health PowerPoint on MWFs plus IEE table overleaf. The Health PowerPoint has been updated in 2019 and provides additional information on control measures.

UKLA Good Practice Guide for the Safe Handling and Disposal of Metalworking Fluids. (2018)

INDG365 Working safely with Metalworking Fluids (2011)

COSHH Essentials Sheets (updated 2019):
MW0: Advice for Managers
MW1: Mist control. Inhalation Risks
MW2: Fluid control. Skin risks
MW3: Sump cleaning. Water mix fluids
MW4: Sump cleaning. Neat oils
MW5: Managing sumps and bacterial contamination

HSE MWF web pages

Contacts
Manufacturing Sector: Fiona McGarry (0203 028 2620)

Metalworking fluids health PNs and IEEs				
	Task	**Situation (giving rise to risk)**	**PN or IEE**	**Comment**
Inhalation risk	Operation of a CNC machine(s)/cleaning of components and/or internal machine surfaces.	No or inadequate assessment of risk to health from exposure to MWF mist and/or machines and work practices that expose operators to mist. OA is not identified in the risk assessment as a risk to health from exposure to MWF mist.	NoC/IN COSHH Reg 6	Duty holders should establish which machines and work practices expose operators to mist e.g. using a high-intensity inspection lamp (spot beam) to look for the presence of mist in and around machines where operators are working, (see MDHS82/2 *The Dust Lamp*: http://www.hse.gov.uk/pubns/mdhs/pdfs/mdhs82-2.pdf) This will enable them to identify and prioritise machines and work practices that require measures to prevent or control exposure. Duty holders should identify in their risk assessment that OA can be caused by exposure to MWF mist. This is a well-known and publicised risk with a strong evidence base. Therefore, exposure must be controlled to as low as is reasonably practicable (ALARP).
	Operation of a CNC machine(s).	CNC machine is not: i. fully enclosed; and/or; ii. no/ineffective LEV is provided and/or iii. no/ineffective delay to allow mist to settle out/be extracted before opening enclosure doors. such that workers are exposed to mist.	IN COSHH Reg 7	**Enclosures** are designed as machine guards and not for mist control. Some enclosures e.g. vertical milling machines will be open at the top. It may be possible to retrofit additional panels to further enclosure and facilitate installation of LEV. Mist levels will be highest during and immediately after machining. There should be a **delay** that is long enough for the LEV to remove the mist or to allow mist to settle out. This needs to be demonstrated as suitable and implemented by operators e.g. by incorporating a time-delay into the machine program based on a smoke clearance test. **Note**: Anecdotal information gathered from inspections has found the time for an enclosure fitted with LEV to clear, ranges from 20 seconds to around 5 minutes and around 10 to 30 minutes without LEV. Machines that are not fitted with LEV must be fully enclosed and mist must not escape from the enclosure during machining such that operators are exposed. **LEV** should be designed (and maintained) to keep the mist inside the enclosure during machining i.e. under negative pressure and extract the mist before the operator needs to open the enclosure doors. Where the extracted air is re-circulated back into the workshop, this should incorporate a mist filtration system. Large CNC machines e.g. gantry or bridge Unlike standard CNCs the guarding options may mean that these machines will be open. Retrofitting of enclosures and/or LEV may be practicable where operator exposure to mist is evident due to increased background levels and/or when changing the tool etc. or standing at the control panel (consider operator position during machine cycle). Seek SG Occ Hyg/Sector advice where necessary.

			PN COSHH Reg 7	A PN should be considered for machines in use where: • Recent dip slide results indicate bacterial levels are **consistently above 10^6 cfu/ml** and no remedial action has been taken **or** there are no dip slide results **at the time** of the inspection; **and** • **T**here is evidence of excessive biological contamination of the fluid or sump internal surfaces e.g. fungal growth, biofilm, sulphurous/rancid odours. Seek SG Occ Hyg/Sector advice where necessary.
	Cleaning of components and/or internal machine surfaces.	Widespread use of compressed air.	IN COSHH Reg 7	Alternatives to cleaning down with compressed air should be explored. Where there is no reasonably practicable alternative, there are a variety of measures that should be taken to capture the mist and/or reduce the mist being generated e.g. cleaning within the enclosure with LEV operating, reducing air pressures, nozzle design etc.
Dermal risk	**Task**	**Situation (giving rise to risk)**	**IEE**	**Comment**
	Repeated and/or prolonged exposure of skin to water-mix MWF and/or neat concentrate	Exposure may occur during the following activities: • Removal of components from any type of machine (CNC, NC, manual). • Widespread use of compressed air. • Fluid handling (mixing, decanting, topping up sumps). • Sump/machine cleaning. • Poor glove donning and doffing.	IN COSHH Reg 7	Dermatitis may develop from: • Frequent contact with water-mix fluids is ‘wet work’. • Contact with MWF concentrates containing biocides and other substances that are irritant or cause an allergic reaction to the skin. Check SDS for Hazard Statements e.g.H315 Causes skin irritation, H317 May cause an allergic skin reaction.
Risk Manage	**Action**	**Situation**	**IEE**	**Comment**
	Fluid monitoring and maintenance arrangements	Routine testing not being undertaken **or** at the frequency recommended e.g. dip slides.	NoC/IN MHSW Reg 5	For the purposes of EMM this is a compliance and administrative arrangements breach. Note: Check whether the fluid is Bioconcept fluid (deliberately dosed with bacteria) and refer to the updated advice on the webpage. Seek SG/Sector advice where necessary.

		No or ineffective management/actions following test results (no regular review and /or timely corrective action).	NoC/IN MHSW Reg 5	Examine a representative sample of records e.g. last 3 months: • Dip slides **consistently above 10^4 cfu/ml** indicate microbial growth. **Action required**: Check that all good practice measures to maintain fluid quality have been followed e.g. fluid concentration, tramp oil content, circulation and flow. • Dip slides **consistently above 10^6 cfu/ml** indicate heavy contamination with bacteria and poor control. **Immediate action is required.** This normally means draining and disposal of the MWF and a complete system clean. • Fluid concentration should be maintained within the limits set by fluid supplier e.g. 4-8% to reduce risk of ill health (too concentrated can increase the amount of biocide and other constituents, too weak can increase levels of bacteria). Plotting results on a graph/chart will make it easier for duty holders to monitor trends. Duty holders should contact their fluid supplier should for advice where necessary. Seek SG/Sector advice where necessary.
	LEV examination	No current thorough, examination and test (TExT).	IN COSHH Reg 9(2)	Lack of a thorough, examination and test may be indicative of a poor standard of LEV maintenance. (Note: TExT will NOT give assurance that the LEV is of a suitable design and achieves adequate control.) A TExT will only evidence that the LEV was working efficiently and in good repair at the time it was carried out, please see next IEE below.
	LEV maintenance	No LEV maintenance e.g. swarf blocking extract inlets, damaged ductwork, no filter inspection.	IN COSHH Reg 9(1)	MWF, chips and swarf can significantly reduce the performance of a LEV system over relatively short period of time. Regular checks and maintenance must be in place.
	Health surveillance	No health surveillance programme in place where there is a risk from dermal and/or inhalation exposure.	IN COSHH Reg 11	Inadequate provision: IEE NOC. Discuss with SG Occupational Health where necessary.
	Information, Instruction, training	None provided to employees/operators who may be at risk from exposure.	IN COSHH Reg 12	Employees should be aware of the ill health risks/symptoms associated with exposure to MWF's **and** the controls in place to prevent or reduce exposure in their work area.

See appendix 5.1.3. Fabricated Metals for industry specific examples of Matters of Potential Major Concern (MPMC)

Appendix 5.1.5. Shipbuilding and boat building – for IEEs and examples of MPMC see Appendix 5.1.3. Welding fume

Introduction
Shipbuilding and repair activities can involve tasks that generate worker exposures of asthmagens and carcinogens. The following tasks have been identified as areas where asthmagens and carcinogens may be generated: • Welding • flame cutting • paint spraying (occasionally contain isocyanates) • applying coatings • paint removal (occasionally containing chromates).
Health and safety
HSE health and safety information for visits to engineering premises (including fabricated metal premises) is available with additional information relating to shipbuilding and repair premises. Inspectors should follow the company's procedures when visiting. Ensure appropriate PPE for the premises, e.g. safety footwear, eye protection, hearing protection.
Inspection
More information on the woodworking aspects of this work can be found in Appendix 5.1.2. More information on the welding aspects of this work can be found in Appendix 5.1.3. Follow protocol under '1.3. What must be covered at the inspections?' supplemented by: • Have they properly assessed tasks and identified ways to reduce exposure following the COSHH principles of good control practice • Have they substituted materials where possible? • What suitable controls are provided?
Priorities
• Provision of suitable controls: LEV, Adequate general ventilation, RPE etc. • Information, Instruction and Training of operators to make sure they understand the risks and how to reduce fume exposure.
Guidance
• HSE sector sHSE sector sp[4]
Safety Priorities
The Manufacturing Sector Plan details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are: • The movement and storage of heavy loads • Maintenance activities: including issues of access (fall from height) and machinery intervention. Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.
Contacts
Manufacturing Sector: Sarah Palfreyman (0203 028 1760)

Appendix 5.1.6: Molten Metals

Introduction

Long established, often large employers but with a significant number of SMEs.

Historical exposures to metal fumes and dusts (but improving).

In places processing molten metals, such as foundries, there are a number of processes that can expose workers to significant levels of asthmagens and carcinogens if controls are not properly implemented and maintained e.g. during fettling and welding.

Workers in ferrous (iron and steel) foundries are potentially exposed to ferrous foundry particulate (FFP) whereas workers in non-ferrous foundries are potentially exposed to dust and fume. Both can contain a multiplicity of toxic substances. These include silica (see silica RCS OG) and other mineral dusts, metal fume and dust, polycyclic aromatic hydrocarbons (PAHs), aromatic amines, benzene, binding agents (isocyanates, organic chemicals, tar, coal), mould release agents and other constituents with the potential to cause long latency diseases such as cancer and COPD. Workers may also be exposed to wood dust and isocyanates in the Pattern making shop (if there is one) or CI Solvent Red 164 at NDT.

Good trade association representation. The Cast Metal Federation (CMF) are fully engaged with HSE in trying to raise standards in the industry via the SHIFT initiative. Companies should be encouraged to join SHIFT. The CMF website includes an overview of casting processes.

Health and safety

Inspectors should follow the company's procedures when visiting.

Inspectors may require molten metal PPE, discuss with dutyholder prior to visit where appropriate.

Ensure appropriate PPE for the premises, e.g. safety footwear, eye protection, hearing protection. Hi Visibility jacket/tabard may be required.

HSE health and safety information for visits to sites using molten metal is available.

Inspection

Follow protocol under '1.3. What must be covered at the inspections?' supplemented by consideration of:

- Enclose all sand handling plant where it is reasonably practicable,
- Look for appropriately designed and positioned LEV at mould and core making where possible (LEV is being developed for this and should be considered),
- Look for LEV at knock out and shake out tables,
- Significant sand residues on castings should be removed by enclosed shot blasting where possible,
- Fettling should be carried out in extracted booths. Consideration should be given to including a turntable for ease of handling and working on the casting without blocking the LEV airflow.
- Powered RPE preferred to tight fit RPE. If tight fit RPE is used then fit testing must be carried out by a suitably competent person.

Priorities

Management systems and organisational structures need to ensure that high level commitment is put into practice to prevent poor performance.

Exposure from processing and handling can be generated in many areas of the foundry including:

- mould making and core making
- casting,
- knockout
- fettling and finishing
- furnace wrecking and relining
- sand recovery
- shot blasting.

Safety Priorities

The Manufacturing Sector Plan details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads, such as movement of castings, moulds and metals (both ingots for primary melting and waste product).
- Maintenance activities: including issues of access (fall from height) and machinery intervention, such as furnace maintenance, machinery maintenance in machine shop.

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Presentation giving refresher briefing on foundries plus IEE table in Appendix 7 below:

- Molten Metal webpages
- Molten metal protective clothing webpage
- Cast Metals Federation (CMF)
- CMF SHIFT initiative

Contacts

Manufacturing Sector: Sarah Palfreyman (0203 028 1760)

Molten Metal (Foundry) health IEEs				
Task	**Possible substances**	**Situation**	**IEE**	**Comment**
Mould making	Benzene sulphonic acid	No LEV and RPE	IN	Consider substituting for xylene sulphonic acid
	RCS	No LEV and RPE	IN	Exposure can be significant
Core making	RCS, variety of chemicals	No LEV	IN	Automated core making m/c, with LEV, is reasonably practicable resulting in normally adequate control
Melting	Melting alloys containing a significant proportion of chromium, nickel and/or cobalt	No LEV, inadequate control	IN	
Pouring	Ferrous	No LEV, no RPE, poor general ventilation	NoC or IN	Prolonged exposure would raise IEE to IN.
	Pouring alloys containing a significant proportion of chromium, nickel and/or cobalt	No LEV, no RPE, poor general ventilation	IN	
Knockout, shakeout	RCS	No LEV and RPE	IN	
Blasting	RCS	Poor containment of blasting medium	IN	Check LEV TExT is monthly. Expect Full enclosure, LEV and compressed airline RPE
Fettling, polishing, linishing	RCS	No LEV, RPE	IN	Large castings should normally have turntable to avoid disrupting the airflow.
		Poorly performing LEV/ inadequate RPE	IN	
Maintenance of plant	RCS	Escape of sand from plant	IN	
Cleaning	RCS, various	Dry sweeping	NoC or IN	Expect vacuum equipment which should be at least M (medium hazard) classification
LEV maintenance	Various	Poor LEV	IN	

LEV examination	Various	Lack of current thorough examination and test (TExT) for the LEV	IN	Blasting monthly TExT, grinding of castings and non-ferrous casting production six monthly, others 14 monthly. Lack of thorough examination and test may be indicative of a poor standard of LEV maintenance. A TExT will only evidence that the LEV was working efficiently and in good repair at the time it was carried out. TExT will NOT give assurance that the LEV is suitable designed and achieves an adequate level of control.
RPE maintenance	Various	Poorly manage RPE system	IN	Management systems
Health surveillance	Various	Absent (where guidance would indicate it is necessary)	IN	Discuss with SG Occupational Health

Molten Metals Potential Catastrophic Event:	Due to:	Examples of indicative issues:	Existing Guidance:
Explosion	Most commonly due to water ingress into molten metal/furnace	Scrap stored uncovered outside, wet scrap observed, water on the floor	Safety Alerts for molten metals
Failure of Heavy Loads during transportation and loading/unloading of castings	Poor management and control of movement and storage of heavy loads	Poorly designed workplace transport arrangements, no segregation, lack of planning and poor storage arrangements	Safety in the storage and handling of steel and other metal stock - HSG246

Above are specific industry examples that could lead to potentially catastrophic events. There are other events common across the industries that are not included here. See OC18/12 for more details.

Appendix 5.1.7: Concrete Products – for IEEs see Stone working IEE table - link

Introduction

The concrete industry includes the full range of company size from multi-site internationals to small micro-businesses. Businesses manufacture precast concrete units, primarily for the construction industry and some will split their activity between factory and construction site.
Concrete can contain large amounts of crystalline silica (commonly between 25 – 70%). Cutting or breaking up concrete can produce airborne respirable crystalline silica (RCS). This can occur when dealing with rejected product or when cutting down product. Exposure may also occur when the raw materials are dry during movement, transfer and mixing, although much of this activity may be enclosed.
Much of the production process is wet and so risk of exposure to RCS is expected to be lower. There are some semi-dry mixes (e.g. cast stone).
The current workplace exposure limit for RCS is 0.1 mg/m3 (TWA).

Health and safety

Inspectors should follow the company's procedures when visiting.
Ensure appropriate PPE for the premises, e.g. safety footwear, eye protection, hearing protection. Hi Visibility jacket/tabard, hard hat and gloves may be required.
Do not walk near or between unsupported precast units.
Where dust is very poorly controlled do not approach until work is stopped and minimise time in area (RCS does not have a STEL).

Inspection

Follow protocol under '1.3. What must be covered at the inspections?' supplemented by consideration of:

- Segregation of higher RCS exposure tasks to prevent secondary exposure.
- High standards of housekeeping (vacuum or wet cleaning, not dry sweeping).
- Clear identification of tasks requiring RPE.

Priorities

Issues:

- Failure to adequately control RCS dust at source via suitable enclosed systems, use of LEV or water suppression.
- Clear identification of those tasks requiring RPE.
- Tight fitting RPE worn for excessive periods.
- Tight fitting RPE not face fit tested.
- All work with powered hand tools generating RCS dust.
- Poor housekeeping arrangements, wet cleaning methods or suitable vacuum equipment should be used, not dry sweeping.
- Manually cleaning mixers (particularly when jack hammer type equipment is used to remove concrete) can be a high source of RCS exposure.
- Dry raw material handling (not automated) either using manual methods or using machines with unfiltered cabs.
- Maintenance work, especially around conveyors and automated lines where there may be high RCS dust levels generated.

Safety Priorities

The Manufacturing Sector Plan (link) details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads including pre-cast concrete panels.
- Maintenance activities: including issues of access (falls from height including work on and around fragile roof elements) and machinery interventions including suitable isolation procedures.

- The management of stressing operations.
- Assessment of the crush risks from the movement of adjacent rail mounted machinery working on pre- stressing lines.

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

HSE website for Concrete industry
CIS54 - Dust control on cut off saws used for stone or concrete cutting
Health surveillance for those exposed to respirable crystalline silica (RCS) G404
Health surveillance for those exposed to respirable crystalline silica, supplementary guidance for occupational health professionals (amended January 2016).

Contacts

Manufacturing Sector: Andrew Bowker (0203 028 1328)

Concrete manufacture Potential Catastrophic Event:	Due to:	Examples of indicative issues:	Existing Guidance:
Fire and explosion	Uncontrolled release of stored energy at autoclaves.	Lack of / inadequate proactive maintenance system.	http://www.hse.gov.uk/pubns/guidance/pm73.pdf Safety requirements for autoclaves
		Lack of thorough examination/scheme.	
	Ignition of combustible dust.	Inadequate control/release of combustible substances.	http://www.hse.gov.uk/pUbns/priced/hsg103.pdf
		Inadequate explosion relief on dust collection units.	http://www.hse.gov.uk/foi/internalops/sims/manuf/3_09_08/index.htm
Fire and explosion	silo over pressurisation during delivery of cement.	Inadequate maintenance of pressure release valves on cement storage silos.	MPA guidance on www.Safeprecast.com
Fire and explosion	autoclaves in lightweight block production	Inadequate maintenance of safety critical parts	http://www.hse.gov.uk/pubns/guidance/pm73.htm
Collapse	sequential collapse of large size precast panels stored on end.	poorly designed storage	

Above are specific industry examples that could lead to potentially catastrophic events. There are other events common across the industries that are not included here. See OC18/12 for more details.

Appendix 5.1.8 Stone working

Introduction

The stone working industry is made up of primarily micro SME business.
There are four distinct sectors:

- extraction (inspected by NQIT)
- traditional and heritage stone workers
- memorial masons
- worktop producers and suppliers.

The use of artificial stone is increasing and artificial stone may have high RCS levels.
The sector has a long history of high exposure to RCS.
RCS exposure levels within Stone work can be considerably above the workplace exposure limit which is currently 0.1mg/m3 TWA.

Health and safety

Inspectors should follow the company's procedures when visiting.
Ensure appropriate PPE for the premises, e.g. safety footwear, eye protection, hearing protection. Hi Visibility jacket/tabard may be required.
Do not walk near or between unsupported stone slabs.
Where dust from stonework is very poorly controlled, do not approach until work is stopped and minimise time in area (RCS does not have a STEL).

Inspection

Exposure to RCS is highly dependent upon the crystalline silica content of the type of stone being worked. Values for different stone types are found in INDG 463. Worker awareness of this is important. Limestone and marble generally have low RCS levels but values can occasionally vary above the values given in INDG 463. Sandstone, and some artificial stone can have very high crystalline silica content.
Water suppression or LEV can be used to control exposure to RCS dust at source. Water suppression is usually used when cutting with primary and secondary saws and exposure to mist should be controlled. LEV is also used, for example when grinding with hand held power tools. Hand held manual tools tend to generate a coarser dust at a slower rate so the risk from RCS is usually lower than when using power tools. Work pieces vary in size and shape resulting in the effectiveness of LEV varying. RPE is a common additional control measure.
Follow protocol under '1.3. What must be covered at the inspections?' supplemented by consideration of:

- High standards of housekeeping (use of vacuum or wet cleaning, not dry sweeping)
- Water suppression
- LEV booths and hoods
- Rotating bankers
- Powered RPE
- Segregated work areas.

Priorities

- Failure to adequately control RCS dust at source via suitable LEV or water suppression methods.
- All work with high crystalline silica content natural (e.g. sandstone) or artificial stone. Generally high crystalline silica content is anything above 30 %.
- Segregation of higher RCS exposure areas to prevent secondary exposure to non-stoneworkers.
- Control of mist when using water suppression on saws e.g. baffles, absorptive materials on walls and segregation of area.
- Poorly designed and poorly used LEV systems e.g. hoods, booths, on tool extraction or recirculation of extracted air back into the work room.
- Water backed booths being used to control high RCS dust levels generated from hand held power tools when the booth does not have sufficient sides and roof.

- All work with powered hand tools generating RCS dust.
- Clear identification of those tasks requiring RPE in addition to engineering controls.
- Tight fitting RPE worn for excessive periods.
- Tight fitting RPE not face fit tested.
- Poor housekeeping arrangements, wet cleaning methods or suitable vacuum equipment should be used instead of dry sweeping.
- Workers wearing their own clothing or taking work clothing home to launder.

Safety Priorities

The Manufacturing Sector Plan (link) details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads including stone slabs.
- Maintenance activities: including issues of access (falls from height including work on and around fragile roof elements) and machinery interventions including suitable isolation procedures.

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Inspector power point presentation located on FISH showing common Stone working RCS controls.

[8]COSHH essentials for stone workers; silica (ST series)[6]:

- ST0- Advice to Managers.
- ST1 - Primary and secondary sawing
- ST2 – Automated boring and polishing using rotary tools
- ST3 - Cutting and polishing using hand-held rotary tools
- ST4 - Hand and pneumatic chiselling
- ST5 - Slate sawing
- ST6 – Manual slate splitting
- ST7 – Dressing slate (edge bevelling)

HSE's website for the Stone industry[3],
HSG201 Controlling exposure to stonemasonry dust: Guidance for employers (Please note this contains the old Maximum Exposure Limit and threshold limits that are not current)
Control of exposure to silica dust INDG463
Health surveillance for those exposed to respirable crystalline silica (RCS) G404
Health surveillance for those exposed to respirable crystalline silica, supplementary guidance for occupational health professionals (amended January 2016).

Contacts

Manufacturing Sector: Andrew Bowker (0203 028 1328)

Stone working health IEEs			
Task	**Situation**	**IEE**	**Comment**
Primary and Secondary machine cutting.	A lack of water suppression/LEV or other effective controls when working high silica content stone.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. For example, where water suppression has been provided but there is a lack of some other controls such as RPE (minimum APF 20) for work near the running saw, mist reduction measures and adequate segregation from the broader workforce. More information on controls can be found in COSHH essentials for Stone workers: Silica ST1
Work with hand-held power tools.	A lack of water suppression/LEV or other effective controls when working high silica content stone.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. For example, where suitable LEV has been provided but there is a lack of RPE (APF 20 minimum, but 40 may be required) to address any residual exposure. Moveable arm capturing hood LEV is unlikely to be suitable to control very high energy dust emissions. More information on controls can be found in COSHH essentials for Stone workers: Silica ST3 and ST4
CNC and other automated machines.	A lack of water suppression/LEV or other effective controls when working high silica content stone.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. For example, where water suppression or LEV has been provided but any residual risk has not been addressed by adequate enclosure of the process or by use of RPE. More information on controls can be found in COSHH essentials for Stone workers: Silica ST2
Work with hand held manual tools	A lack of LEV and RPE when working high silica content stone.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there

			are no controls in place. An extracted booth is preferred for high silica content stone and if effective, RPE may not be required. Control can also be achieved through using movable arm capturing hood LEV and RPE and by making sure the stone is damp. RPE alone may be suitable for construction related short duration work where LEV may not be practical.
Cleaning and housekeeping	Dry sweeping or use of compressed air cleaning. Accumulation of dust in workshop.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS dust and where there are no controls in place. The site should have suitable arrangements in place to ensure a consistent level of acceptable site cleanliness. This should include suitable wet cleaning systems or vacuum equipment to dust class M or higher. Compressed air should not be used to remove dust from skin and clothing.
Training and supervision	Workers not aware of the RCS risks associated with their work	IN	Workers should be aware of the RCS risks associated with their work and should know how to use control measures correctly.
Maintenance of control measures	Poor maintenance of LEV/water suppression systems.	IN	Failure to deal effectively with reported or observed faults and to maintain engineering control measures.
LEV examination	Lack of current thorough examination and test (TExT) for the LEV	IN	Lack of thorough examination and test may be indicative of a poor standard of LEV maintenance or a lack of understanding of the legal requirement. A TExT will only evidence that the LEV was working efficiently and in good repair at the time it was carried out. TExT will NOT give assurance that the LEV is suitable designed and achieves an adequate level of control.
RPE management programme	Poorly managed RPE system	IN	Poor selection, use, storage and maintenance of RPE. This will include a lack of face fit testing for tight fitting RPE. Tight fitting (disposable) RPE is only recommended for use for approximately 1 hour. Consider alternative options such as powered respirators for extended use.
Health surveillance	Absent (where guidance would indicate it is necessary). Inadequate provision.	IN NOC	Discuss with SG Occupational Health inspectors if there are concerns over the adequacy of provision.

Appendix 5.1.9. brick and tile

Introduction

Brick and tile making covers several different techniques but involves forming heavy clay into shapes which are then fired in a kiln until hard. Many brickworks are fully automated, but others produce handmade bricks. The premium price for handmade bricks means that automation as a way of eliminating RCS exposure may not always be appropriate. Clay tiles are also a premium product.
Often local clays are used, commonly from an on-site quarry. Substitution to another clay to reduce RCS exposure is not usually appropriate. The clay used can be up to 40% crystalline silica content, but also additives and facing sands used may have a very high silica content. It may be possible to substitute for lower silica content additives.
RCS exposure levels can be above the workplace exposure limit which is currently 0.1mg/m3
Good trade association representation. The British Ceramics Confederation (BCC) are fully engaged with HSE in trying to raise standards in the industry. Companies should be encouraged to join BCC.
The industry has four main brick producers: Weinerberger, Michelmersch, Ibstock and Forterra, and all are BCC members. It is understood that there are 13 other sites operated by BCC members.

Health and safety

Inspectors should follow the company's procedures when visiting.
Ensure appropriate PPE for the premises, e.g. safety footwear, eye protection, hearing protection. Hi Visibility jacket/tabard may be required.
Where dust is very poorly controlled do not approach until work is stopped and minimise time in area (RCS does not have a STEL).
Many brick works have attached quarries. Only members of National Quarry Inspection Team should enter the quarry area even if inactive.

Inspection

Follow protocol under '1.3. What must be covered at the inspections?' supplemented by consideration of:

- Enclosure, LEV and segregation in the clay preparation area.
- High standards of housekeeping (suitable vacuum equipment or wet cleaning methods not dry sweeping).
- Clear identification of tasks requiring RPE.

Priorities

Dust can be generated every time a brick is moved, whether it is green or fired. This commonly gives rise to RCS exposure levels that can be above the WEL. The risk can depend on the amount of time a worker needs to be interacting with a process.
Clay preparation can lead to high RCS exposure. Dehacking (especially if manual), sand facing, automated movement of bricks and poor cleaning methods can also lead to high exposure levels.
Issues:

- Failure to adequately control RCS dust at source for key tasks e.g. movement and milling of clay, coating moulds/bricks with sand, setting and dehacking bricks.
- Poorly designed and poorly used LEV systems e.g. hoods, booths or recirculation of extracted air back into the work room.
- Water mist systems relied on as the primary dust control measure.
- Clear identification of those tasks requiring RPE in addition to engineering controls.
- Tight fitting RPE worn for excessive periods.
- Tight fitting RPE not face fit tested.
- Poor housekeeping/cleaning regimes leading to excessive dust build up on floors and on and around equipment.
- Maintenance work, especially around conveyors and automated lines where high RCS dust levels may be generated.
- Workers wearing their own clothing or taking work clothing home for laundering.

Safety Priorities

The Manufacturing Sector Plan details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads
- Maintenance activities: including issues of access (falls from height, including work on or around fragile roof elements) and machinery intervention including suitable isolation procedures.

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Inspector power point presentation located on FISH covering common RCS control in brick making.

COSHH essentials for brick and tile (BK series):

- BK0 - Advice for managers
- BK1 - Clay milling (pug-mill)
- BK2 - Sand handling and screening
- BK3 - Facing green bricks with sand
- BK4 - Moving green and fired bricks
- BK5 - Manual dehacking and batching
- BK7 - Ventilated vehicle cabs

Health surveillance for those exposed to respirable crystalline silica (RCS) G404
Health surveillance for those exposed to respirable crystalline silica, supplementary guidance for occupational health professionals (amended January 2016).

Contacts

Manufacturing Sector: Andrew Bowker (0203 028 1328)

Brick making health IEEs			
Task	**Situation**	**IEE**	**Comment**
Moving clay/sand by shovel loader	No suitable cab filtration or no suitable RPE for the driver.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS dust and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. There can be high dust levels from transferring clay and sand in dry weather from storage to a conveyor or hopper. RPE with an APF of at least 20 is likely to be required for the driver where there is no suitable cab filtration or if he is working outside the cab. Consider if surfaces are kept wet. More information on controls can be found in COSHH essentials brick and tile making: Silica BK7
Moving clay/sand by shovel loader	Working outside of cab for prolonged periods without RPE.	IN	RPE with an APF of at least 20 is likely to be required in dry weather. Consider the role of natural ventilation if working outside and if surfaces are kept wet.
Clay preparation and milling	Lack of segregation, suitable LEV and RPE to control RCS from dry raw materials and clay.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. LEV is required for the milling process (which should be enclosed) and at the drop points on the indoor conveyors. Additional controls could include enclosures and/or LEV at other points on the conveyor, segregation and limiting worker time in the area. For clearing blockages or cleaning very dusty areas RPE with an APF of 40 is likely to be required. Once the clay is watered to produce a feedstock (10-30% water) dust emissions becomes unlikely. More information on controls can be found in COSHH essentials in brick and tile making: Silica BK1
Brick and heavy clay tile formation: high pressure extrusion	Lack of enclosure and suitable LEV system where free sand is used for facing bricks.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. An improvement notice should be considered where the controls in place are only partially effective and improvements are needed either to the LEV, the segregation arrangements or to RPE provision.

			The need for LEV will depend upon whether free sand is used. Sanding machines can be inserted into the extrusion line and will blow or gravity feed sand onto the bricks and can generate high RCS dust levels. They should be enclosed and have extraction, RPE may be required to address any residual exposure. More information on controls can be found in COSHH essentials in brick and tile making: Silica BK3
Brick and heavy clay tile formation: moulding	Lack of either suitable LEV or RPE during the spraying, or hand sprinkling of dry sand on moulds or bricks.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. For automated processes LEV systems and enclosure should be provided. RPE may be required to address any residual exposure. For manual sprinkling of dry sand, where suitable LEV systems are not practical, provide good general ventilation and RPE (APF at least 20).
Automated setting of bricks for firing	Lack of LEV at locations where dust is most likely to be generated.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. LEV should be located where dust is most likely to be generated for example moving or turning bricks, especially if they have excess sand on the surfaces. It may be appropriate to use vacuum systems to remove excess sand along with the provision of good general ventilation. Workers should be segregated from the task by locating them and their controls at a distance or in a clean area. Where there is still a residual risk RPE with an APF of at least 20 is required. Misting may be used to reduce back ground RCS levels. More information on controls can be found in COSHH essentials in brick and tile making: Silica BK4
Cleaning the kiln cars	Manual cleaning without suitable RPE.	IN	An improvement notice should be considered if Kiln car cleaning is done manually without suitable RPE. Automated kiln car cleaning systems are preferred, but suitable vacuum systems can be used. RPE with an APF of at least 20 will normally be required when using a manual vacuum. Dry brushing should be avoided.

Dehacking of bricks	Lack of adequate engineering controls or no suitable RPE	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS and where there are no controls in place. This may be more relevant for manual dehacking. An improvement notice should be considered where there are only partial controls in place. Dehacking of bricks should be automated and segregated whenever possible. Workers positioned on lines to remove defective bricks may need RPE with an APF of 20 depending on duration and dustiness. Good general ventilation and misting can help to reduce background levels. If manual dehacking is necessary, then a local air displacement system and general ventilation can reduce exposure but RPE with an APF of at least 20 is usually required. Powered respirators should be considered. More information on controls can be found in COSHH essentials in brick and tile making: BK5
Ancillary Processes: kiln chambers	No FLT cab filtration and no suitable RPE	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS dust and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. Use of Chambers as opposed to more modern kilns will only occur on very traditional sites. There can be a heavy dust build up in this type of kiln during loading and unloading and the FLT driver will require cab air filtration and any observer will require RPE with an APF of 40.
Ancillary Processes: brick tumbling	Lack of suitable enclosure and LEV.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS dust and where there are no controls in place. An improvement notice should be considered where there are only partial controls in place. Water spray should be used to damp bricks before they enter, and as they leave, the tumbler, and dust generated during the enclosed tumbling should be extracted by LEV.
Ancillary Processes: sand reclamation and transfer	Poor control	IN	Transport of reclaimed sand from inside the building without suitable controls. Enclosure, extraction, general ventilation and segregation should all be considered. More information on controls can be found in COSHH essentials for brick

			making BK2
Training and supervision	Workers not aware of the RCS risk associated with their work.	IN	Workers should be aware of the RCS risks associated with their work and should know how to use control measures correctly.
Cleaning and housekeeping	Dry sweeping or use of compressed air cleaning. Accumulation of dust in workshop.	IN	Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS dust and where there are no controls in place. The site should have suitable arrangements in place to ensure a consistent level of acceptable site cleanliness. This should include suitable wet cleaning systems or vacuum equipment to dust class M or higher. Compressed air should not be used to remove dust from skin and clothing.
Maintenance of control measures	Poor maintenance of LEV/water suppression systems	IN	Failure to deal effectively with reported or observed faults and to maintain engineering control measures.
LEV examination	Lack of current thorough examination and test (TExT) for the LEV	IN	Lack of thorough examination and test may be indicative of a poor standard of LEV maintenance or a lack of understanding of the legal requirement. A TExT will only evidence that the LEV was working efficiently and in good repair at the time it was carried out. TExT will NOT give assurance that the LEV is suitable designed and achieves an adequate level of control.
RPE management programme	Poorly managed RPE system	IN	Poor selection, use, storage and maintenance of RPE. This will include the lack of face fit testing for tight fitting RPE. Tight fitting (disposable) RPE is only recommended for use for approximately 1 hour. Consider alternative options such as powered respirators for extended use.
Health surveillance	Absent (where guidance would indicate it is necessary) Inadequate	IN NOC	Discuss with SG Occupational Health inspectors if there are concerns over the adequacy of provision.

Appendix 5.1.10. Potteries and ceramics

Introduction

The ceramic industry is varied and includes:

- table and gift ware
- sanitary ware
- ceramic tiles
- various other specialist products.

Refractory manufacture is a related industry which primarily makes ceramic products for high temperature applications.
Clay is mixed with other materials, and is sometimes glazed, to give a variety of properties and finishes. The clay and some of these additives have moderately high crystalline silica content. Some of the additives pose other respiratory or dermal risks.
The RCS exposure limit is currently 0.1mg/m3.
The industry had a history of ill health in the past including silica related diseases and is generally self-aware of its health risks. Lead use has been significantly reduced, especially for table ware, and RCS levels are usually reasonably controlled.
Risks have been reduced by sites often buying in pre-made glazes and colours. Some even buy in pre-made clay body cylinders. A few companies will simply decorate blanks manufactured overseas giving a low RCS exposure.
Good trade association representation. The British Ceramics Confederation (BCC) are fully engaged with HSE in trying to raise standards in the industry. Companies should be encouraged to join BCC.

Health and safety

Inspectors should follow the company's procedures when visiting.
Ensure appropriate PPE for the premises, e.g. safety footwear, eye protection, hearing protection. Hi Visibility jacket/tabard may be required.
Where dust is very poorly controlled, do not approach until work is stopped and minimise time in area (RCS does not have a STEL).

Inspection

Follow protocol under '1.3. What must be covered at the inspections?' supplemented by consideration of:

- High standards of housekeeping within areas liable to have RCS dust (suitable vacuum equipment or wet cleaning methods not dry sweeping)
- Engineering controls especially extraction during fettling
- Clear identification of tasks requiring RPE.

Priorities

There is some potential for RCS exposure at many stages of the process especially when clay scraps or spills dry out.
Issues:

- Failure to adequately control RCS dust at source via suitable LEV or other methods.
- Dry raw material handling (not automated) in the sliphouse (clay body preparation area) either using manual methods or when using machines with unfiltered cabs.
- Poor housekeeping in the sliphouse, clay making areas, biscuit warehouse and biscuit kiln will see the highest potential for RCS exposure.
- Dry clay should not be allowed to accumulate on floors and work stations.
- Dry sweeping of dust containing RCS.
- Manual fettling of clay items (usually following slip casting) without adequate LEV.
- Glaze spraying in poorly designed LEV booths (overspray evident).
- Poor control of glaze dust within the glazing department and Glost kiln area.
- Removing faults by both grinding and polishing without LEV. Grinding is commonly done in the biscuit warehouse on product following the first firing. Polishing is normally carried out on glazed

product after the second firing.

- Maintenance work, especially around conveyors and automated lines where there may be high RCS dust levels generated.
- Kiln car rebuilds if involving refractory ceramic fibre.
- Workers should be wearing coveralls to provide added protection. This is normally required in the sliphouse, clay production, glazing and biscuit ware house areas. Ceramic Terylene is currently used in the industry although other synthetic materials with similar properties may be suitable.
- Clear identification of those tasks requiring RPE in addition to engineering controls.
- Tight fitting RPE worn for excessive periods.
- Tight fitting RPE not face fit tested.

Safety Priorities

The Manufacturing Sector Plan details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads
- Maintenance activities: including issues of access (falls from height, including work on or around fragile roof elements) and machinery intervention including suitable isolation procedures.

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

COSHH essentials for potteries and ceramics (CR series):

- CR0 - Advice for managers
- CR1 - Glaze and colour preparation
- CR2 - Casting
- CR3 – Dry Fettling
- CR4 - Kiln loading (placing) and unloading
- CR5 - Spraying glazes and colours

COSHH essentials in manufacturing (MN series)
L60 Control of substances hazardous to health in the production of pottery (please note parts are out of date)
Health surveillance for those exposed to respirable crystalline silica (RCS) G404
Health surveillance for those exposed to respirable crystalline silica, supplementary guidance for occupational health professionals (amended January 2016).
Skin – health surveillance http://www.hse.gov.uk/pubns/guidance/g403.pdf

Contacts

Manufacturing Sector: Andrew Bowker (0203 028 1328)

Pottery and Ceramics IEEs

Where there is failure to control exposure to RCS the IEE is normally an Improvement Notice.
Consider a PN and possible PR where there is evidence of repeated and/or prolonged exposure to high concentrations of RCS dust and where there are no controls in place.
An improvement notice should be considered where there are only partial controls in place.

The Sector contact above can provide context specific advice on IEEs for the wide variety of situations that may be encountered.

Appendix 5.1.11: Rubber Products

Introduction

The rubber manufacturing industry includes a range of company size from multi-site internationals to SME businesses.

There are two distinct sectors:

- Manufacture of rubber tyres and tubes and the re-treading and re-building of rubber tyres (SIC 2211)
- Manufacture of other rubber products (SIC 2219)

- Rubber process dust means dust created in rubber manufacture where ingredients are handled, weighed, added to or mixed with uncured natural or synthetic elastomers. **Rubber process dust does not include dusts arising from the abrasion of cured rubber, e.g. from buffing or trimming.**
- Rubber fume is given off when converting ingredients into finished parts or products e.g. from the mixing, milling and blending of natural rubber or synthetic elastomers.
- It is also fume from natural rubber and synthetic polymers combined with chemicals, and in the processes which convert the resultant blends into finished products (or parts thereof). It also includes any inspection procedures where fume continues to be evolved e.g. cooling.
- Workplace exposure limits for individual chemical substances which may be present will also apply, for example carbon black, certain whitings and most common solvents.
- Rubber dust and fume can cause cancer. There is also a dermatitis risk for rubber makers.
- **Exposure Limits**
- The current WEL for rubber process dust is 6mg/m3 8 hour time weighted average.
- The current WEL for rubber fume is 0.6mg/m3 8 hour time weighted average.
- Exposures need to be kept as low as is reasonably practicable (ALARP) below these limits.
- In determining 'risk gap' the actual risk needs to be considered alongside consequence and likelihood. Assistance in determining actual risk can be found within 'Appendix 1: Determination of Actual Risk: Hazardous Substances' at http://www.hse.gov.uk/foi/internalops/ocs/200-299/273_19-app1.pdf.
- Inspectors will need to consider level and duration of exposure in determining reduction to ALARP and deciding appropriate action.
- Rubber process dust and fume are listed in Schedule 1 of COSHH, where these are produced the requirements of COSHH Regulation 7(5) apply in addition to those required in COSHH Regulation 7(3).

Health and Safety

Inspectors should follow the company's procedures when visiting.

Ensure appropriate PPE for the premises is worn e.g. safety footwear, eye protection, hearing protection.

Inspection

Inhalation and skin exposures to rubber dust and fume can occur at various stages of the rubber making process.

Follow protocol under '1.3. What must be covered at the inspections?' supplemented by consideration of:

- Encouraging substitution including:
  - Using pre-weighed additives in process-compatible bags or in 'pre-dispersed' forms such as wax pellets, pastilles, granules with binder or dust-reduced powders.
- Where reasonably practicable can the activity be physically or temporarily separated to eliminate / reduce exposure to other employees.
- Access should be restricted to those staff who need to be there.
- Extract air at bag opening and powder weighing operations.
- Consideration should be given to enclosed and ventilated 'rip and tip' stations.
- Minimising airborne dust when folding and disposing of empty bags. Use an extracted bag collector, or have bags rolled up with the open end in the extractor hood.
- Workers should scoop powder gently - not dump it.
- Avoiding the use of compressed airlines for cleaning (surfaces and clothing).
- Using high efficiency industrial vacuum cleaners rather than dry sweeping with a brush.
- Wearing suitable RPE with a particulate filter, with assigned protection factor of 20 (FFP3 for any essential short non-routine dusty tasks).

- Workers must not take their coveralls home for washing. Use a contract laundry.
- Protective gloves are needed with some processes.
- The prohibition of eating and drinking in areas that may be contaminated by rubber process dust and fume.
- The cleaning of floors, walls and other surfaces at regular intervals and whenever necessary.
- Designating those areas and installations which may be contaminated by carcinogens and using suitable and sufficient warning signs..
- Reduce exposure to rubber fume:
    - Extract fume given off from freshly milled rubber, e.g. on conveyors.
    - Enclose presses as much as possible.
    - Locate the cooling rack or cooling water close to the press.
    - Channel hot fume towards the extractor. Fit solid screens at the sides and behind the press.
    - Rubber cooled with water still needs fume extraction.
    - Use a ventilated workstation for hot trimming and finishing.
    - Use a lidded trimmings bin.
- Extracted air should be discharged to a safe place outside the building, away from doors, windows and air inlets.

Priorities

- Exposure to rubber process dust and fume to be ALARP below the WEL.
- Consider exposure routes, level/duration of exposure, consequence and likelihood, alongside existing control measures.
- No LEV provided where there is exposure to rubber process dust and fume.
- Maintenance of control measures e.g. extraction.
- Control of cleaning and maintenance activities, particularly short duration high exposure tasks.
- Prohibit eating and drinking in areas that may be contaminated by rubber process dust.

Safety Priorities

The Manufacturing Sector Plan (link) details HSEs' safety priorities for the Sector. These safety issues are the most common causes of safety-related deaths and serious injuries in the Sector. They are:

- The movement and storage of heavy loads
- Maintenance activities: including issues of access (fall from height) and machinery intervention

Although these safety priorities are not a specific focus of this inspection programme, visiting staff should be aware these issues may well manifest as MECs.

Guidance

Presentation giving refresher briefing on rubber process dust and fume plus IEE table below.

RB0 Advice for Managers

RB01 Fume control and general ventilation

RB02 Dust from bag opening and weighing

RB03 Dust from mixing

RB04 Dust and fume from milling

RB05 Fume and rubber presses (smaller articles)

RB06 Fume from cooling racks for smaller articles

RB07 Fume from trimming and finishing smaller articles

Sack Emptying

Contacts

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Rubber dust and fume health IEEs			
Task	**Situation**	**IEE**	**Comment**
Bag opening and weighing	No LEV	IN	Restrict access to those staff that need to be there. Bag crushing creates a lot of dust. Use an extracted bag collector, or have bags rolled up with the open end in the extractor hood. Consideration should be given to enclosed and ventilated 'rip and tip' stations. Where reasonably practicable the activity should also be physically or temporarily separated to eliminate / reduce exposure to other employees. Extracted air should be discharged to a safe place outside the building, away from doors, windows and air inlets. Consider PR where there is evidence of repeated and/or prolonged uncontrolled exposure to rubber process dust.
Tipping of powdered ingredients	No LEV	IN	Restrict access to those staff that need to be there. Mixer feed opening should be enclosed as much as possible –peak exposures can occur at regular intervals. Consideration should be given to enclosed and ventilated 'rip and tip' stations. Where reasonably practicable the activity should also be physically or temporarily separated to eliminate / reduce exposure to other employees. Extracted air should be discharged to a safe place outside the building, away from doors, windows and air inlets. Consider PR where there is evidence of repeated and/or prolonged uncontrolled exposure to rubber process dust.
Milling on an open mill	No LEV	IN	Restrict access to those staff that need to be there. Extract fume given off from freshly milled rubber, e.g. on conveyors. Deal with spills immediately, this needs coveralls, a respirator and single-use gloves.
Curing (Industry may refer to vulcanisation) Curing can be carried out by press or autoclave. Continuous extrusion can be carried out by curing baths.	No LEV	IN	Restrict access to those staff that need to be there. To reduce exposure to rubber fume, enclose the press as much as possible. Locate cooling rack/cooling water close to the press. Hot fume should be channelled towards the extractor, solid screens should be fitted at the sides and behind the press. Some compounds produce blue fume. Inspector Note: The use of carbon disulphide in the cold-cure process of vulcanising in the proofing of cloth with rubber is prohibited by Schedule 2 of COSHH.
Tyre Curing	No LEV	IN	LEV required. Seek support from Occupational Hygiene. Restrict access to those staff that need to be there. Freshly cured tyres should be stored under extraction and allowed to cool before they are inspected.
Cooling	No LEV	IN	Restrict access to those staff that need to be there. Rubber cooled with water still requires fume extraction.

Trimming/Finishing	No LEV	IN	Restrict access to those staff that need to be there. A lidded trimmings bin is required. Do not use compressed air for demoulding. Protective gloves are needed.
Cleaning/changing dust extraction bags or maintaining LEV General workrooms	Suitable RPE not used.	IN	RPE (minimum FFP3) should be worn.
	Cleaning with a brush or compressed air.	IN	An M-type vacuum cleaner should be used to clear rubber process dust.
Evidence of eating and/or drinking in areas that may be contaminated by rubber process dust and/or fume.	Crockery, cutlery, kettles, lunchboxes, etc. within the workroom.	IN	This regulation is explicit: eating, drinking (and smoking) in areas that may be contaminated by carcinogens is prohibited. Inspectors will need to determine whether suitable and sufficient rest facilities are provided as required by The Workplace (Health, Safety and Welfare) Regulations (Reg 25). COSHH also requires appropriate hygiene measures including adequate washing facilities. Employees will need clean facilities for eating and drinking away from workrooms. An IN would be appropriate if this is not the case.
Floors, walls and other surfaces coated with rubber process dust.	Evidence of floors, walls and other surfaces coated with rubber process dust.	IN	Floors, walls and other surfaces should be cleaned at regular intervals and whenever necessary. Suitable and sufficient warning signs should be used to designate areas and installations which may be contaminated by rubber process dust (carcinogens).
RPE	RPE not maintained or no face fit test for tight fitting masks	IN	Evidence includes filters with signs of clogging; facial hair, glasses, other PPE interfering with RPE tight fit.
Dermal exposure to rubber dust and fume	PPE not used	IN	Rubber dust and fume can cause allergic and/or irritant dermatitis. Some processes will also require heat resistant gloves. Discuss with SG Occupational Hygiene.
Health surveillance for inhalation/dermal exposure to rubber process dust and fume	Absent (where guidance would indicate it is necessary)	IN NoC	Where health surveillance absent. Where health surveillance present but inadequate. Discuss with SG Occupational Health
LEV maintenance	Poor LEV maintenance	IN	Regular maintenance is a requirement of COSHH.
LEV examination	Lack of current thorough examination and test (TExT) for the LEV	IN	Lack of thorough examination and test may be indicative of a poor standard of LEV maintenance. A TExT will only evidence that the LEV was working efficiently and in good repair at the time it was carried out. TExT will NOT give assurance that the LEV is suitable designed and achieves an adequate level of control.

Rubber manufacture Potential Catastrophic Event:	Due to:	Examples of indicative issues:	Existing Guidance:
Fire and explosion	Uncontrolled release of stored energy at autoclaves.	Lack of / inadequate proactive maintenance system.	http://www.hse.gov.uk/pubns/guidance/pm73.pdf Safety requirements for autoclaves
		Lack of thorough examination/scheme.	
	Ignition of combustible dust.	Inadequate control/release of combustible substances.	http://www.hse.gov.uk/pUbns/priced/hsg103.pdf
		Inadequate explosion relief on dust collection units.	http://www.hse.gov.uk/foi/internalops/sims/manuf/3_09_08/index.htm

Above are specific industry examples that could lead to potentially catastrophic events. There are other events common across the industries that are not included here. See OC18/12 for more details.

Appendix 5.1.2. Examples of industry specific Matters of Potential Major Concern (MPMC)

Inspectors must consider action in relation to Matters of Evident Concern (MEC) or Matters of Potential Major Concern (MPMC) at all visits (see OC18/12).

Recent events, including multiple fatalities from a wood dust explosion and a number of fatalities involving explosions and fires involving solvents, have reinforced the importance of taking action on the management systems to prevent catastrophic events. OC18/12 explains the actions required and gives examples of the issues to consider that could lead to catastrophic events.

Included in the industry-specific appendices (5.1.1. to 5.1.12. above) are specific examples of situations that could lead to potentially catastrophic events. There are other events common across the industries that are not included here. See above and OC18/12 for more details.

Inspectors should discuss with Process Safety Inspectors if further assistance is required.

Appendix 5.3 : general references

General COSHH references:

COSHH gateway

COSHH ACOP L5 (sixth edition)

COSHH essentials

Respiratory Protective Equipment (including enforcement guidance)

General asthmagen references:

Asthma pages of HSE web site

Asthmagen? Critical assessments of the evidence for agents implicated in occupation asthma – 'Asthmagen compendium

Health Surveillance for Occupational Asthma (G402)

General carcinogen references:

Occupational cancer pages of HSE website

General RCS references:

RCS pages of HSE website

Control of exposure to silica dust: a guide for employees (INDG 463)

Construction Dust (including RCS): Inspection and Enforcement Guidance