Health and Safety
Executive

HSE

# Construction Dusts:

## Much more than a Nuisance!

Chris Lucas

Construction Sector

Health Risk Management Unit

# “It’s only dust you know!”

# What is Construction Dust?

- A general term used to describe what is found on a construction site.
- 3 main types
  - Silica
  - Wood
  - Lower toxicity

# Respirable Crystalline Silica (RCS)

*Crystalline silica concentrations in common materials*

| | |
|---|---|
| plastic composites | up to 90% |
| sandstone, gritstone, quartzite, flint | more than 70% |
| concrete, mortar | 25% to 70% |
| shale | 40% to 60% |
| china stone | up to 50% |
| tile | 30 to 45% |
| slate | up to 40% |
| granite | up to 30% |
| brick | up to 30% |
| ironstone | up to 15% |
| basalt, dolerite | up to 5% |

# Wood Dust

- Hardwood
- Softwood
- MDF

# ‘Low Toxicity’ Dust

- Dust with very low silica content e.g:
  - Gypsum
  - Marble
  - Limestone

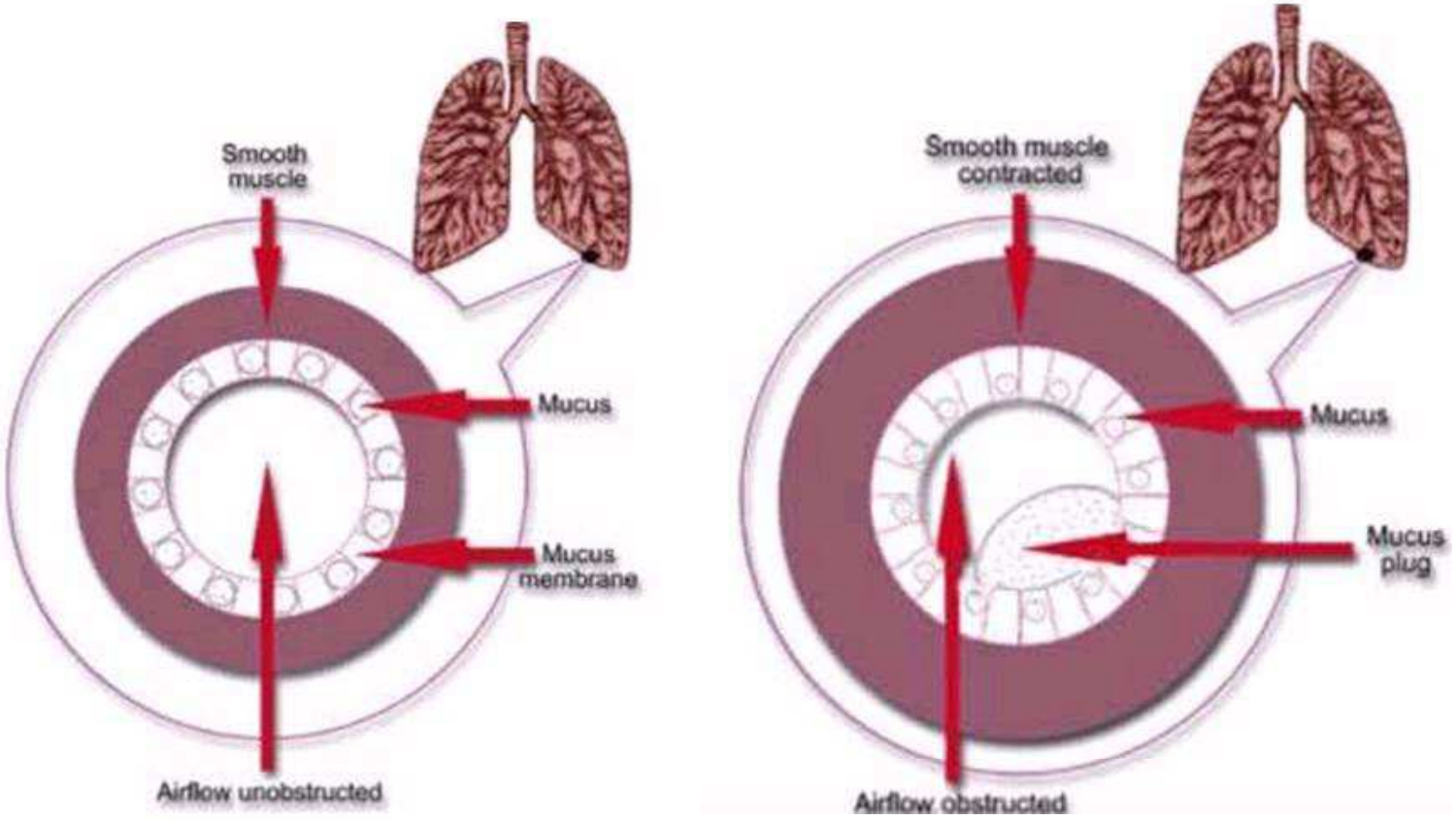
# How can it harm me?

Construction dust can cause serious lung diseases:

- **Lung Cancer**
- ***Chronic Obstructive Pulmonary Disease*** (COPD)
- **Pneumoconiosis** (including silicosis)
- **Asthma**:

# How can it harm me?

## Asthma




Normal Bronchiole  Obstructed Bronchiole

# How can it harm me?

COPD:

- Lungs and breathing tubes are damaged making it difficult to get air in and out. Common symptoms;
  - a persistent chesty cough and phlegm
  - wheeze
  - more frequent and troublesome chest infections

# How can it harm me?

- Few develop quickly – acute silicosis
- Most take a long time – years
- Regularly breathing small amounts adds up over the years
- By the time you notice it may be too late to do anything about it

> **Important to control every single exposure**

# How can it harm me?

Statistics are imprecise:

- 500+ silica related deaths in 2004 – over **10 a week**
- Silica is the second most important cause of occupational lung cancer after asbestos
- Construction workers 2-3 times greater risk of COPD
- Other research backs up link between construction work and lung disease
- Reduced quality of life and shorter working life

# How can it harm me?

It is worth remembering:

- 173 workers were killed at work in 2011/12
- In that year there are also estimated to be:
  - 8,000 occupational deaths from cancers
  - 4,000 occupational deaths due to COPD

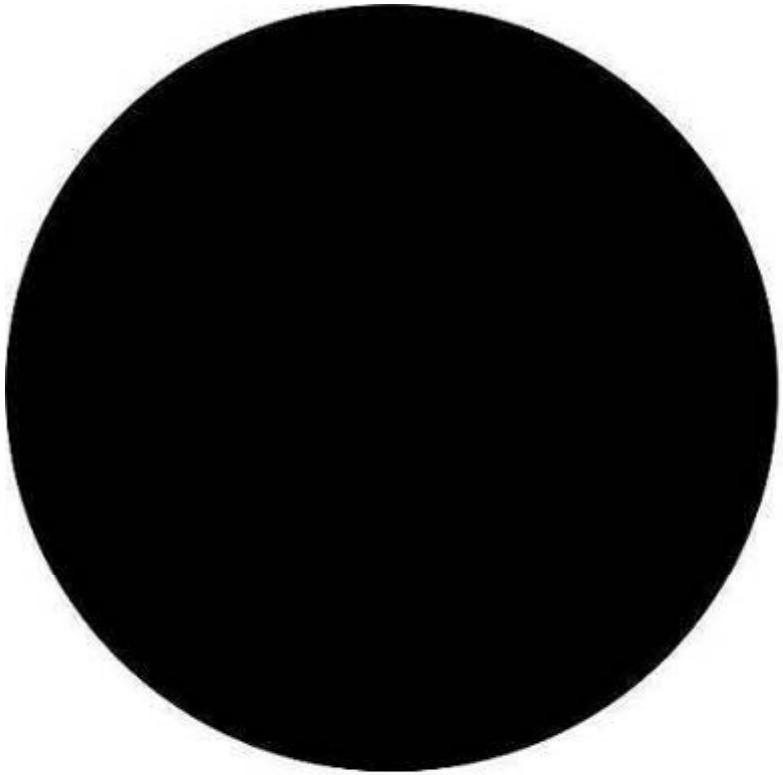
- Over 40% of new cancer case are in construction workers

# How much dust is a problem?

- Depends upon
  - Amount of dust
  - Size of the dust particles
  - Type of dust

# How much dust is a problem?

- Dust comes in different sizes

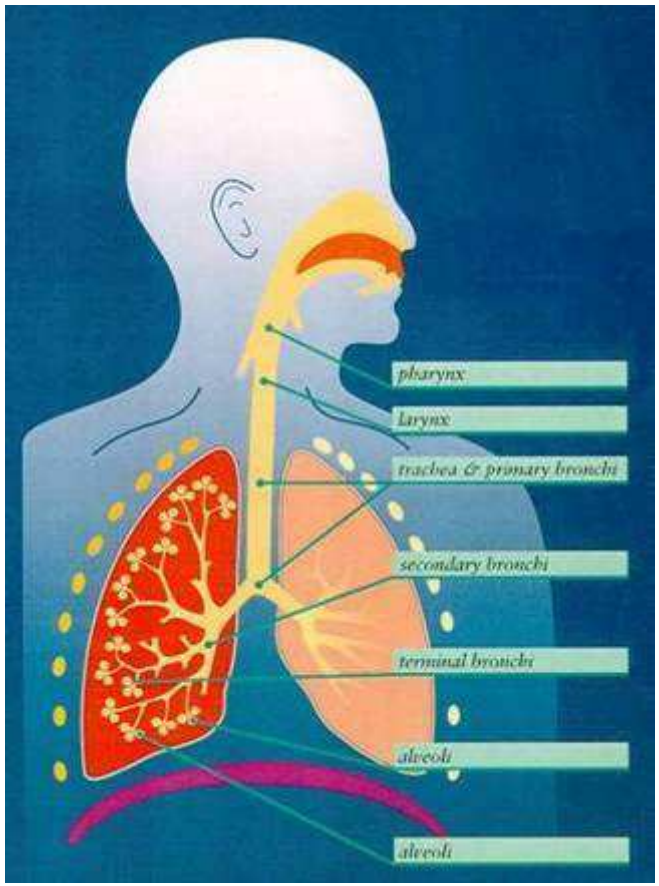


150 microns -
Human Hair

25 microns -
Particles visible
to the naked eye

10 microns
(PM10)
thoracic dust

5 microns
(PM5)
respirable dust



# How much dust is a problem?

Small size of respirable dust means often invisible under normal conditions

# How much dust is a problem?

- Measured in mg/m3
  - Bag of sugar = 1kg / 1,000 grams / 1 million mg
  - Teaspoon of sugar = 5 grams / 5,000 mg

| Dust | Inhalable | Respirable |
|---|---|---|
| RCS | _____ | 0.1 $mgm^3$ |
| Wood | 5 $mgm^3$ | As inhalable |
| Lower Toxicity | 10 $mgm^3$ | 4 $mgm^3$ |

Based on an 8 hour average

# How much dust is a problem?

- Limit is the legal maximum, the most you can breathe **after** the right controls have been used.
- No short term limits **BUT** should not exceed x3 over a 15 min period
- Many construction tasks are short duration with very high exposure peaks

# How much dust is a problem?

# Managing Dust Risks:

# Plan

# Act

# Check

# Plan

## Identify your High Risk Tasks:

Think about the:

- Material
- Task
- Work area
- Time
- Frequency

# Plan: Silica Dust

## Concrete, Granite etc:

- Some Tasks ALWAYS produce very high levels:
  - Cut-off saws
  - Grinders
  - Chasers
  - Grit Blasting

# Plan: Silica Dust

- Some tasks can in right conditions
  - Pneumatic drilling / coring with poor ventilation
  - Internal structural demolition
  - Dry sweeping indoors



# Plan: Wood and MDF

## Wood and MDF:

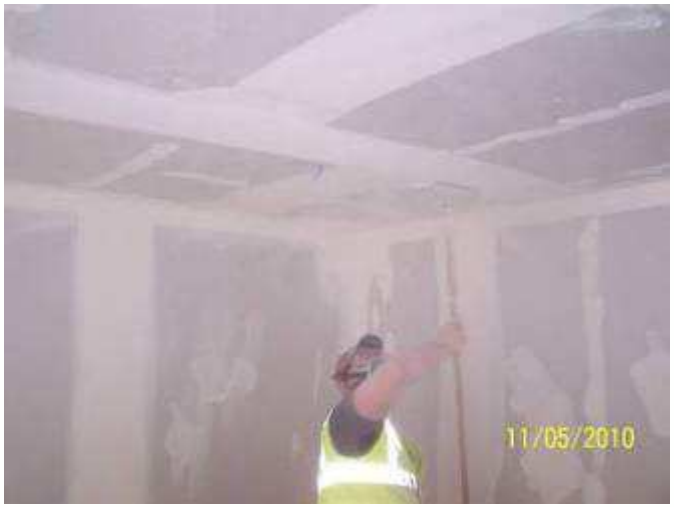
Cutting and Sanding



# Plan: Lower Toxicity Dust

## Plasterboard sanding:

- Very dusty
- Tends to be done in smallish rooms with poor ventilations




## Grinding / Cutting:

- Marble etc

# Act

**COSHH requires:**

- Prevent exposure to employees where reasonably practicable:
  - Overriding duty
  - Do this by substitution
  - Eliminates or reduces risk
- Adequately control where not reasonably practicable:
  - Higher the risk the better the controls needed
  - Not exceed exposure levels

# Act

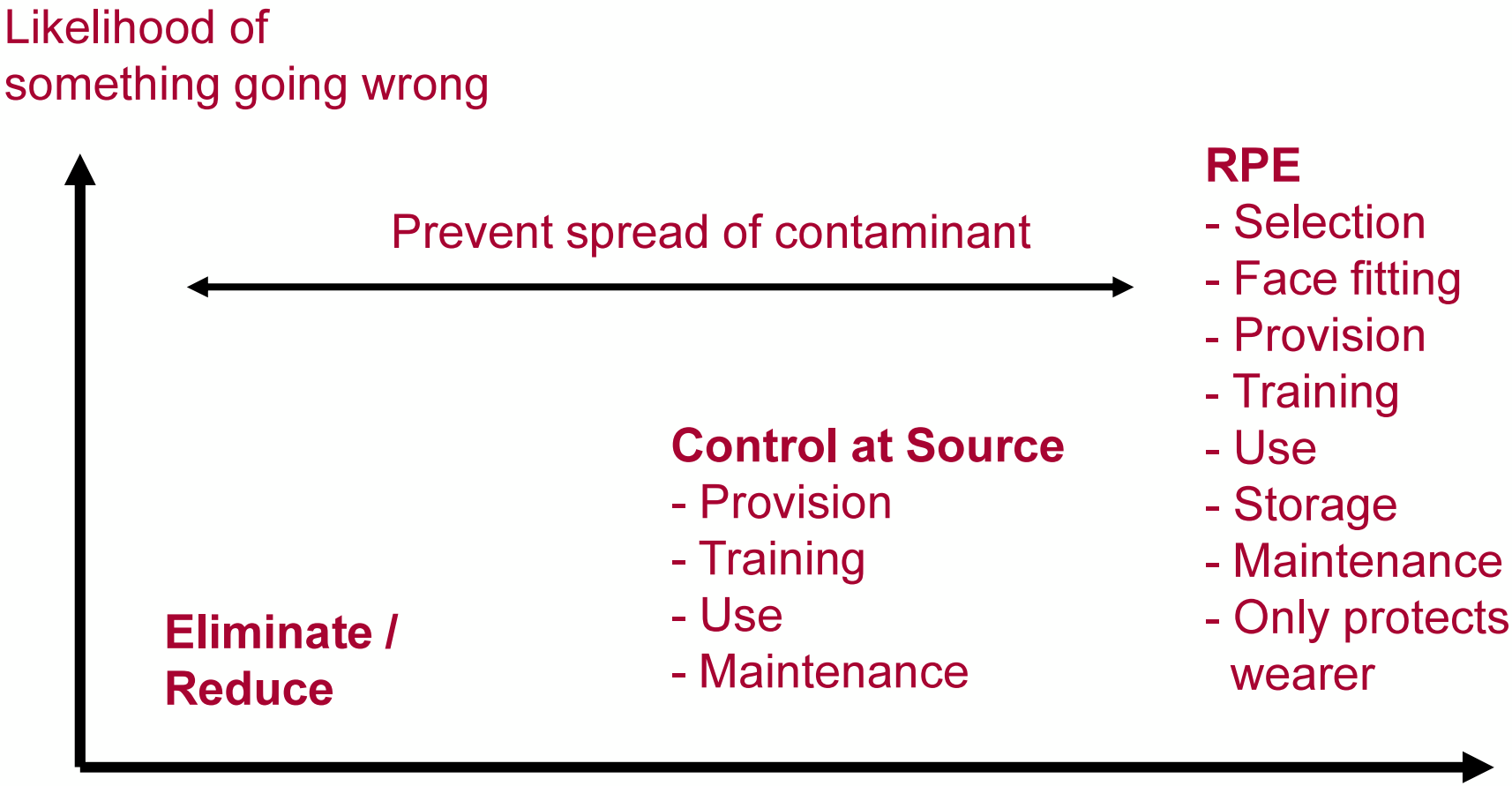

Appropriate work system, equipment, materials

Control at Source

PPE/RPE as well where above inadequate

- Safe handling/ storage
- Maintenance
- Limit people, duration, quantity
- Ventilation
- Hygiene
- Management
- Training

# Act


Likelihood of
something going wrong
Prevent spread of contaminant
RPE
- Selection
- Face fitting
- Provision
- Training
- Use
- Storage
- Maintenance
- Only protects wearer
Control at Source
- Provision
- Training
- Use
- Maintenance
Eliminate / Reduce

# Act: Elimination

- Design Out
- Alternative grit blasting media
- Work processes



# Act: Control at Source

- Water Suppression

# Act: Water Suppression

- Water Sources

# Act: Water Suppression

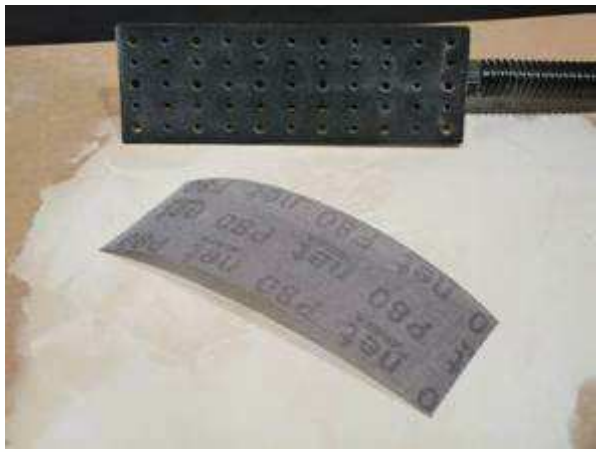
Issues associated with water suppression use:

- Marking the cut line
- Slurry generation
- Wet clothing

# Act: On-Tool Extraction


# Act: On-Tool Extraction

On-tool Extraction is a system approach



Consumables


Capture Hood


Tubing

# Act: On-Tool Extraction

## Extraction Unit

Cyclonic


Compact

# Act: On-Tool Extraction

- Different classifications:

| Dust Class | Suitable for dusts with WEL | Degree of penetration |
|---|---|---|
| L (Light Hazard) | Greater than 1mg.m3 | Less than 1% |
| M (Medium Hazard) | Greater / equal to 0.1mg.m3 | Less than 0.1% |
| H (High Hazard) | Less than 0.1mg.m3 including carcinogenic dusts | Less than 0.005% |


# Act: RPE

- Controls are not 100% effective
- RPE is still needed for high risk tasks

**Disposable** (FFP3)

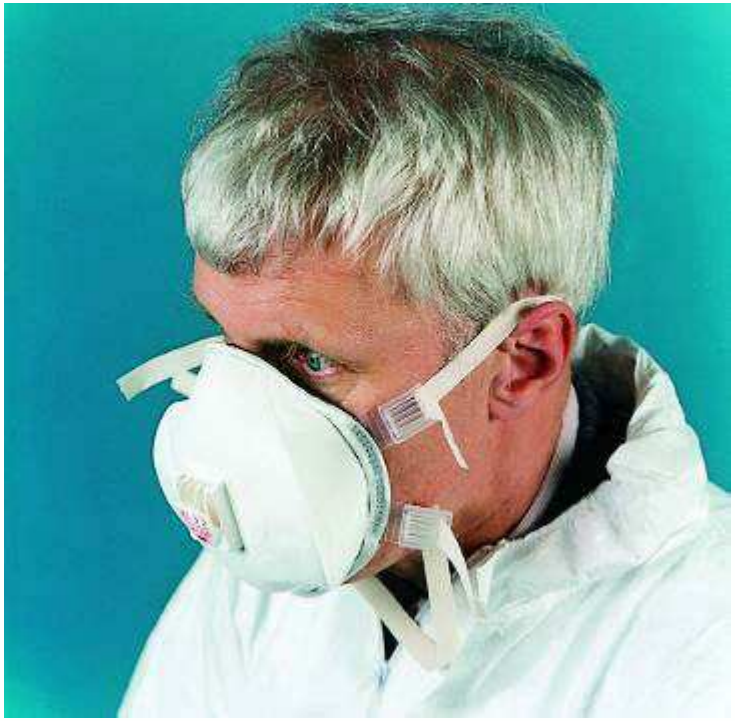
APF = 20

**Orinasal Half Mask**

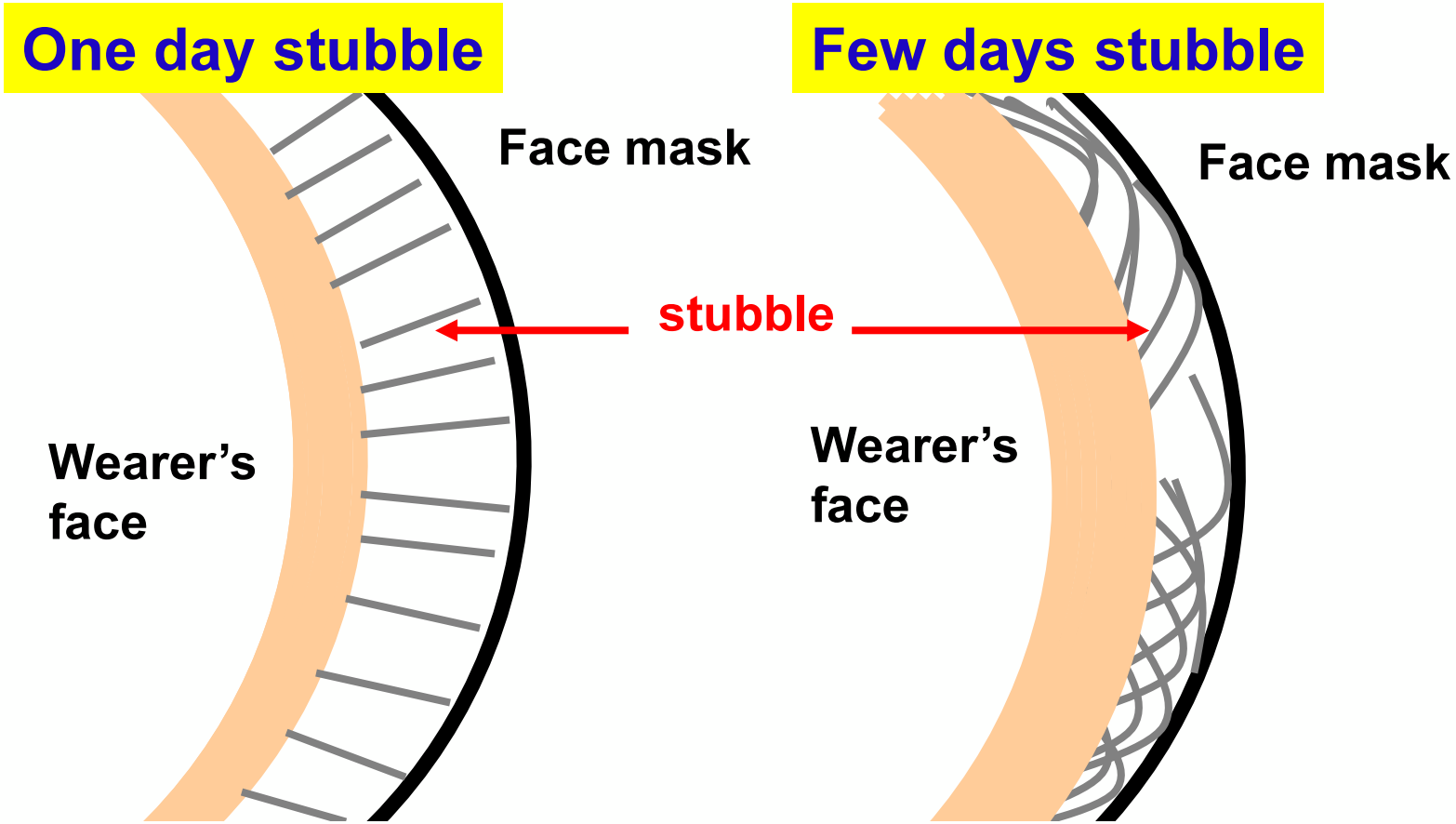
# Act: RPE

## Must fit correctly

## Be worn correctly



# Act: RPE




Short hairs act like stilts and hold the mask away from the face

Longer hairs tend to lay flatter than short hair

# Act: Other Controls

- Also Consider:
  - Segregation
  - Ventilation – long duration power tool tasks, internal demolition
  - Limiting people / duration
  - Training
  - Involving workers

# Check:

- Have work procedures
- Check controls working
- Maintenance
- Supervision

# Putting it all together

Some examples:

# Silica Tasks: Cutting

- Eliminate or minimise




Interpave
THE PRECAST CONCRETE PAVING AND KERB ASSOCIATION

## EFFICIENT DESIGN FOR SAFE CONSTRUCTION USING PRECAST CONCRETE KERBS

**Case Study – April 2008**
**SUPERMARKET DISTRIBUTION WAREHOUSE, DONCASTER**

**BACKGROUND**
Interpave has worked closely with HSE in developing good practice guidance for the use of precast concrete paving products on site. Also, Interpave members work within their supply chains to promote and deliver safer working practices. This case study provides just one example of an Interpave member working to reduce risks on site by using efficient design.

**PROJECT AND BRIEF**
Heavy duty kerbs were required at this new Distribution Warehouse at Redhouse Business Park near Doncaster to contain a substantial flow of large delivery vehicles: because of their durability and resistance to impact loading, precast concrete kerbs offered the ideal solution. The brief from the main contractor was to eliminate on-site cutting of the kerbs, despite complex layout requirements.

**PRINCIPLES**
Cutting concrete kerbs without the correct precautions can produce dust that could cause health problems. Guidance on managing the risk can be found in Interpave's 'Cutting Paving – Cutting Precast Concrete Blocks, Flags and Kerbs – Efficient Design and Managing the Risk' which highlights the correct hierarchical approach when planning work – **AMC**:

**A**void cutting
**M**inimise cutting
**C**ontrol dust generation during cutting

Moulidng off site

Saw cutting and drilling under factory controlled conditions

www.paving.org.uk

# Silica Tasks: Cutting

- Control:
  - Water (or on-tool extraction)
  - Mask APF 20

# Silica Tasks: Roof Tile Cutting

- Eliminate or minimise:
  - Hand cutting natural / fibre cement slates
  - Use of ½ and 1 ½ tiles
  - Correct setting out / design
  - Hand cutting tiles where possible
  - Minimising valleys / use of dry valleys


# Silica Tasks: Roof Tile Cutting

- Control
  - Water
  - Dedicated cutting area
  - Scaffold board protection
  - RPE with APF of 20


NFRC THE NATIONAL FEDERATION OF ROOFING CONTRACTORS LIMITED
September 2012

## HEALTH & SAFETY GUIDANCE SHEET s

### CONTROLLING SILICA WHEN DISC CUTTING ROOF TILES

#### 1. INTRODUCTION

This guidance sheet gives information about the control of Respirable Crystalline Silica (RCS) issues associated with the disc cutting of concrete and clay roof tiles. However, the requirement to use water suppression applies to all roof tiles and related roof coverings such as artificial slates, concrete slates etc as well as all related fittings. This guidance note does not cover the practice of hand cutting, with the exception that this is recommended where possible to further reduce the risks.

Roof tiles often need to be cut in the verge, ridge, hip and valley area. Most roofers use a disc cutter saw for this. These saws produce large amounts of dust that contains silica that can easily be inhaled by the operator and others in the vicinity. Over time this dust can be very harmful to the lungs. Because of this it needs proper control in line with the Control of Substances Hazardous to Health Regulations (as amended) 2002 – commonly known as COSHH.

The Health and Safety Executive (HSE) has, for some time, seen the control of silica dust as a priority. NFRC has worked with them and others within the housing industry to provide a practical solution to this issue. This resulted in an interim agreement to use water suppression and respiratory protective equipment (RPE) for the cutting of all roof tiles except for valleys. Here, the established industry practice of only using RPE was allowed to continue. Wet cutting these tiles created a number of difficulties that some felt could not be effectively overcome at the time. There was also insufficient information on the level of risk created.

Subsequently, HSE has undertaken further work in this area. This has revealed that the levels of silica dust created when dry cutting valley tiles is much higher than published safety limits. Following a series of tests, effective methods of wet cutting valley tiles have also been devised. HSE therefore wants a high standard of control for cutting all roof tiles. This guidance note has been produced to assist members in complying with this requirement and COSHH. HSE will expect roofing contractors to follow it from 1st October 2012.

#### 2. THE RISK

Silica is a natural mineral found in large amounts in things like sand, sandstone and granite. It is also commonly found in many construction materials such as concrete and mortar. The silica is broken into very fine dust (also known as Respirable Crystalline Silica or RCS) during many common tasks such as cutting, drilling and grinding. It is often called silica dust.

Silica dust damages lungs and airways. It can cause lung cancer, silicosis and Chronic Obstructive Pulmonary Disease (COPD). While some of these lung diseases, like advanced silicosis, can come on quite quickly, most take a long time. Often this is over years. They happen because regularly breathing even small amounts of dust add up and damage the lungs and airways. Unfortunately, by the time the damage is noticed it is more difficult to treat. Because of this it is important to limit the amount of silica dust every time work is done so that the total amount someone may breathe in over the years does not build up.

Even though roof tiles can be cut quickly this does not mean that the work is low risk. HSE has found that dry cutting a single valley side can produce very high silica levels. COSHH sets a limit on the amount of silica dust that someone can breathe. This limit is not large. The image shows the maximum amount of silica you can breathe when averaged over a normal working day as compared to a penny. This limit is the legal maximum, the most you can breathe **after** the right controls have been used. For tasks that can create high levels of silica, like cutting roof tiles these controls have to be very good as the risk from the silica is high.



1

# Silica Tasks: Wall Chasing

- Eliminate or minimise
  - Design out
  - Use another method

# Silica Tasks: Wall Chasing

- Control
  - On-tool extraction (M or H class)
  - Mask APF 20

# Silica Tasks: Wall Chasing

- Power Assisted RPE for mortar raking?


# Silica Tasks: Rotary Drilling

- Eliminate or minimise:
  - Direct fastening
  - Limiting holes at design

# Silica Tasks: Rotary Drilling

- One-off holes
  - No special controls
- Multiple holes ’15-30’ minutes trigger time
  - Dust collector
  - Cordless extraction
  - On-tool adaptor to M or H class unit
- Main activity
  - On-tool extraction with M or H class unit where possible
  - RPE with APF of 20

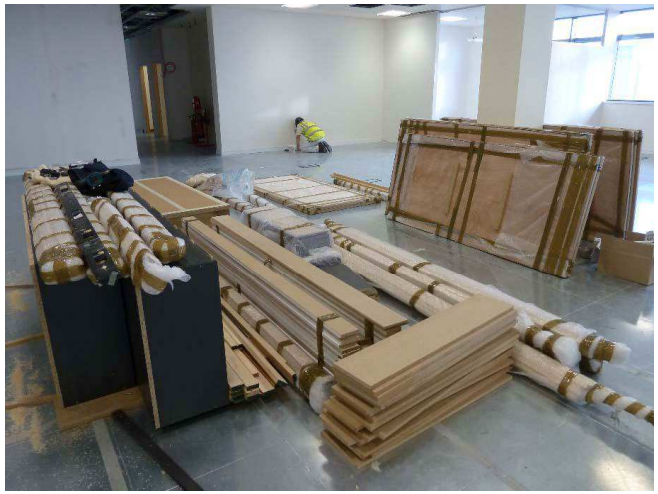
# Silica Tasks: Sweeping

- Eliminate or minimise:
  - Control other tasks!

- Control
  - Remove larger bits
  - Rake
  - M or H extraction with vacuum attachments etc
  - APF 20 mask depending on what else happening

# Wood Tasks: Cutting

- Eliminate or minimise:
  - Order pre-cut
  - Dedicated cutting areas to minimise spread

# Wood Tasks: Cutting

- Control
  - On-tool extraction (M or H class unit)
  - Mask APF10/20 as well for longer cutting periods (15-30 minutes) /more enclosed space

# Low Toxicity: Grinding/Cutting

- Eliminate or minimise:
  - Use other systems or finishes

- Control
  - On-tool extraction (L class unit+)
  - No mask needed

# Guidance

HSE

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Health and Safety Executive

## Construction dust

HSE Information sheet

Construction Information Sheet No 36 (Revision 2)

Construction dust is not just a nuisance. It can seriously damage your health and some types can eventually even kill. Regularly breathing these dusts over a long time can therefore cause life-changing lung diseases.

This sheet tells employers what they need to know to prevent or adequately control construction dust risks. It is also provided to advise the safety representatives and workers.

### Construction dust

This is a general term used to describe different dusts that you may find on a construction site. There are three main types:

- silica dust – created when working on silica containing materials like concrete, mortar and sandstone (also known as respirable crystalline silica or RCS);
- wood dust – created when working on softwood, hardwood and wood-based products like MDF and plywood;
- low-toxicity dusts – created when working on materials containing very little or no silica. The most common include gypsum (eg in plasterboard), limestone, marble and dolomite.

### Health risks

Anyone who breathes in these dusts should know the damage they can do to the lungs and airways. The main dust-related diseases affecting construction workers are:

- lung cancer;
- silicosis;
- chronic obstructive pulmonary disease (COPD);
- asthma.

Some lung disease, like advanced silicosis or asthma, can come on quite quickly.

Figure 1 Common tools like cutting can create very high dust levels

However, most of these diseases take a long time to develop. Dust can build up in the lungs and harm them gradually over time. The effects are often not immediately obvious. Unfortunately, by the time it is noticed the total damage done may already be serious and life changing. It may mean permanent disability and early death.

Construction workers have a high risk of developing these diseases because many common construction tasks can create high dust levels. Over 600 construction workers are believed to die from exposure to silica dust every year. The amounts needed to cause this damage are not large. The largest amount of silica someone should be breathing in a day after using the right controls is shown below next to the penny.


Figure 2 Your maximum daily silica exposure is tiny when compared to a penny



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## Dust in the workplace
## General principles of protection

Guidance Note EH44 (Fourth edition)

### Contents



HSE Books

# Guidance

HSE

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## Controlling construction dust with on-tool extraction

**HSE information sheet**

**Construction Information Sheet No 69**

### Introduction

This information sheet gives guidance on choosing, using and maintaining on-tool extraction for controlling construction dust. It is mainly for managers and supervisors but is also useful for trade union safety representatives and workers.

### The hazards posed by construction dust

Regularly breathing construction dust can cause diseases like lung cancer, asthma, chronic obstructive pulmonary disease (COPD – which includes emphysema and other breathing difficulties) and silicosis. Silica is the second biggest killer of construction workers after asbestos.[1]

Some of the most common construction jobs create high dust levels. These jobs often involve the use of power tools like cut-off saws, grinders, breakers and sanders. There is a legal duty for employers[2] to prevent or adequately control worker exposure to construction dust. On-tool extraction is an effective control for this dust and will reduce ill health.

### How to choose on-tool extraction

On-tool extraction is a type of local exhaust ventilation (LEV) system which is fitted directly onto the tool. The 'system' consists of several individual parts – the tool, captor hood, extraction unit and tubing. Each part plays a role in establishing how effective the system is and the level of control it gives. Manufacturers/suppliers do provide complete systems but some parts (especially extraction units) can be used with other tool makes and models.

It is important to choose parts that are compatible and work together. The dust may be poorly controlled if you do not. Make sure the system is right for the particular task(s) and the method(s) of work. Involve workers in the selection process. Use the following guidelines:

#### Tools and accessories

Limit the amount of dust created by choosing appropriate tools and accessories – eg sanding blocks/pads or grinding discs with enough holes to allow the dust to be extracted through them (see Figure 1).

**Figure 1** Tools and accessories allowing effective dust removal

#### Captor hood

The hood is the most important part of the LEV system. It is often manufactured as part of the power tool but it can also be retro-fitted to existing equipment. See Figure 2 for examples.



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## Toxic woods

**HSE information sheet**

**Woodworking Sheet No 30 (Revision 1)**

### Introduction

This information sheet provides employers and operatives with information on the reported adverse health effects associated with the more common woods used in commercial quantities within the UK, as detailed in Table 2. This will help you take suitable precautions so that you can avoid or minimise their ill-health effects.

Inclusion of a wood in Table 2 does not automatically mean its use will result in adverse health effects. Many timbers are used regularly without any problems but this will depend on:

- the species involved;
- the concentration and extent of exposure;
- the levels of toxic agent within the timber;
- the sensitivity of the user, or the chance of developing sensitivity to the wood.

This information sheet does not provide adverse health effect information for all woods. There are other woods that are not listed in Table 2 that may also have toxic effects.

### Classification

Wood is classified into two broad families:

- hardwood;
- softwood.

The classification is botanical and depends on the fine structure of the cells in the wood species. It does not refer to the physical properties of the wood. For example, balsa wood is a hardwood!

### Wood products

You should remember that veneers are often made of hardwoods; so are composite materials such as plywood.

The type of wood making up particle boards (eg chipboard, hardboard, MDF) is not always known, but is usually a high proportion of softwood.

### Toxicity

The hazardous forms of wood that are most likely to cause health risks are:

- wood dust;
- sap, latex or lichens associated with a wood.

#### Toxic activity

Toxic activity is specific to a wood species, so knowing the exact species is important in establishing what the potential toxic effects may be. It is easy to confuse individual wood species (of which more than 100 are commercially important in the UK). For example, the term 'rosewood' may be used for up to 30 different species; and an individual species may have up to ten different trade names.[1]

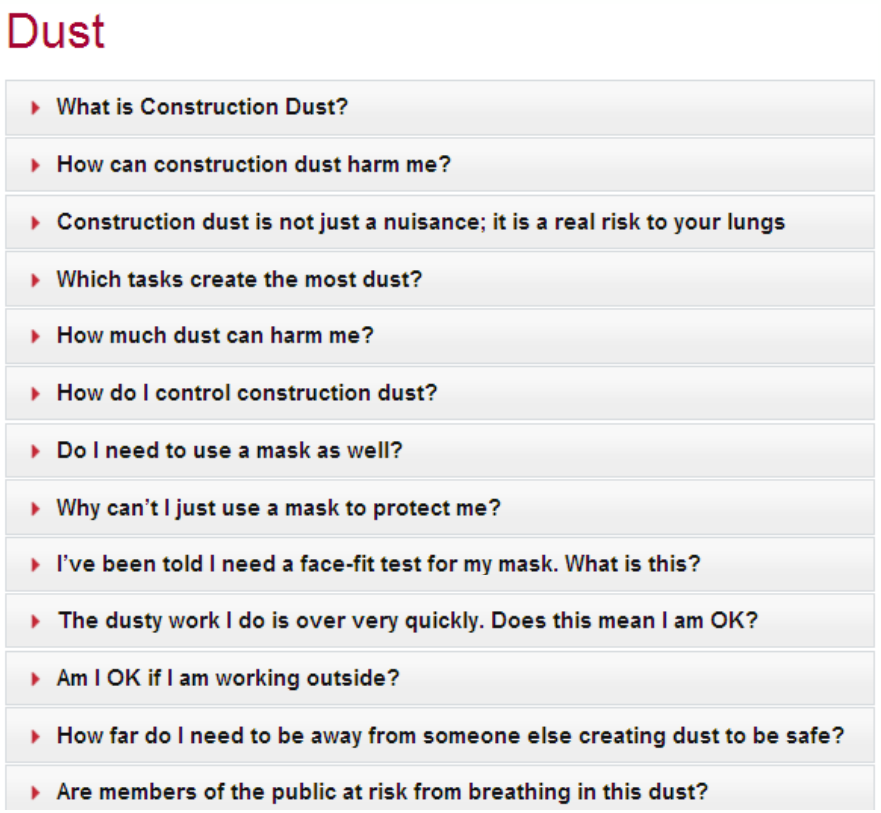
An additional difficulty is that trees vary within a species. One specimen may contain low levels of its toxic agent and the next contain much higher levels.

### Workplace exposure limits

Under the Control of Substances Hazardous to Health Regulations 2002 (COSHH),[2] both hardwood dust and softwood dust have been assigned workplace exposure limits (WELs) of 5 mg/m$^3$ (8-hour time-weighted average, total inhalable dust). Both hardwood dust and softwood dust are respiratory sensitisers and hardwood dusts are listed in Schedule 1 of COSHH as carcinogenic. This means you must reduce exposures to levels 'as far as is reasonably practicable' but they must not in any case exceed the WEL.

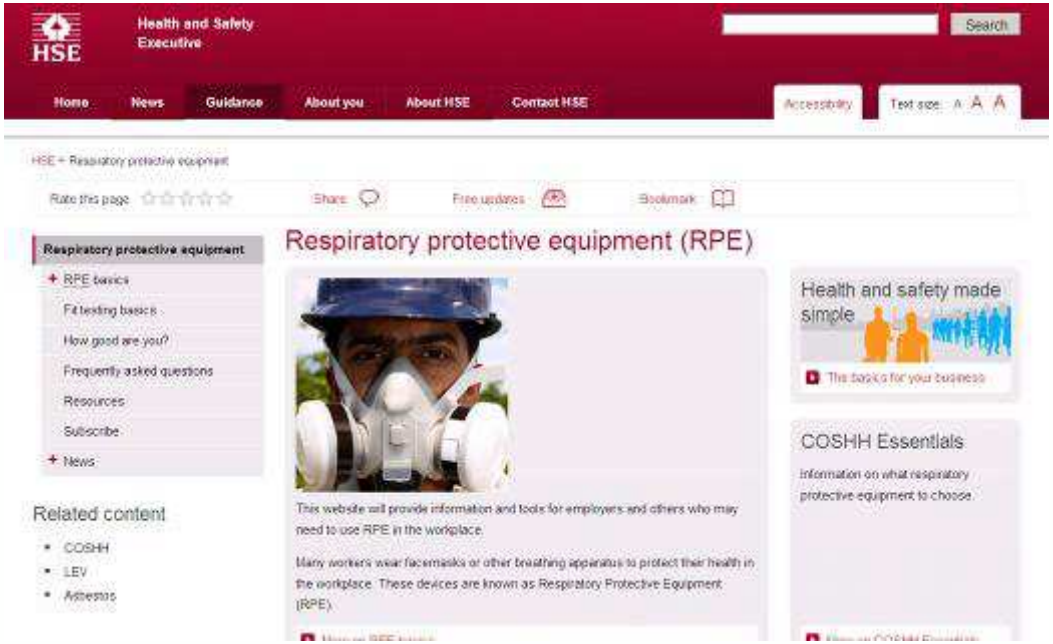
# Guidance

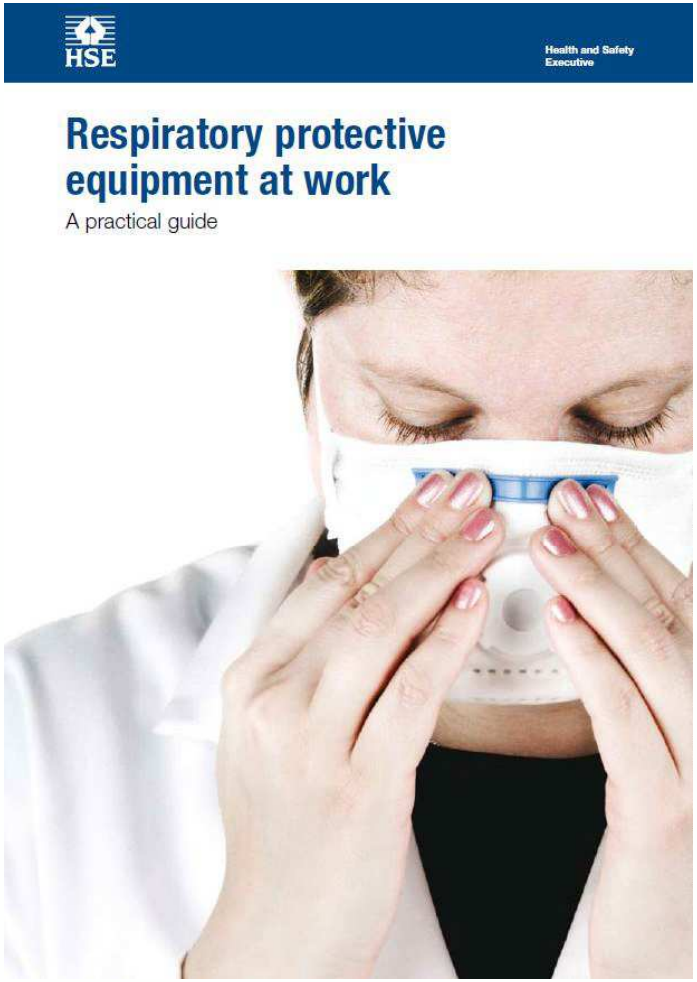
- FAQ: http://www.hse.gov.uk/construction/faq-dust.htm
- Other parts of HSE website:
  - Woodworking
  - LEV
- Forthcoming revisions
  - Website
  - COSHH task sheets



# RPE Guidance

- New website
- HSG 53 revision
- DVD Bundle



# RPE Guidance

## Fit2Fit

Important statement from the HSE

*"In preparing the Fit2Fit RPE fit testers accreditation scheme, BSIF and other industry stakeholders have worked closely with the experts in Health and Safety Executive (HSE). Following this scheme is not compulsory and employers are free to take other action to comply with the law. But if you follow this scheme, you will be doing enough to demonstrate good practice."*

home

contact us

Register your interest in the scheme now by clicking on the 'Contact Us' link above. This will ensure your participation and compliance with the regulations.

The fit2fit scheme is administered by Dave Elsworth.

dave.elsworth@bsif.co.uk

Tel: 07704 221378

### fit2fit accreditation

Are you sure that the RPE you provide to your employees fits them properly? Are you sure the face fit test was carried out competently? You ought to be, because the health of your employees could be at serious risk.

Recent research indicates that up to 50% of all RPE used does not offer the wearer the level of protection assumed and one of the major reasons is that it simply does not fit! Yet, under the regulations RPE must be correctly selected and this includes, for many types of RPE, a face piece Fit Test conducted by a competent person. So how can you be sure the person conducting the fit test is competent?

In view of these major concerns the British Safety Industry Federation, along with the HSE and other industry stakeholders have developed a competency scheme for Fit Test Providers. The Fit2Fit RPE Fit Test Providers Accreditation Scheme is designed to confirm the competency of any person performing face piece fit testing. Follow the useful links and downloads below to find out more.

### useful links

HSE 282/28
British Safety Industry Federation (BSIF)
Institute of Occupational Medicine (IOM)
Asbestos Removal Contractors Assoc. (ARCA)
BOHS
TSI
ACAD - Asbestos Control & Abatement Division

Click here to see a list of Accredited Providers

Click here to view our Fit2Fit presentation

### downloads

Fit2Fit Scheme Brochure
RPE Fit Test Provider Syllabus
Candidates Handbook
Candidates Application for Accreditation

# Guidance

## Scottish Healthy Working lives


# Not asking for anything new!

Questions?