4 Steps to Respiratory Protection

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Disclaimer

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The guidance and information in these slide are in “general” and each business will require its own risk assessment, method statement, and controls based on their unique circumstances. Employers have specific regulatory requirements in different countries, including making determinations of what PPE to use. Information correct at time of writing, users should check legislation and guidance from the HSE or local governing body, to ensure they are following up to date guidance and instruction.
George Elliott

UK Application Engineer
Supporting customers with expert technical information and training at a local level.
Agenda

Four Steps to Respiratory Protection

1) Identify the Hazard

2) Assess the Risk

3) Product Selection

4) Product Training
UK Safety and Health Statistics

147

Deaths in the workplace in Great Britain in 2018/19*

12,000

(approx.) Lung disease deaths each year linked to past exposures at work to primarily chemicals or dusts**

99% Health

1% Safety
Introduction

Limitations of the respiratory system’s defences...

Our defence mechanisms have problems with the following:

- **Large quantities**  
  (Can swamp our defences)

- **Toxic, poisonous or infectious particles**  
  (Can damage our lungs as well as other parts of the body)

- **Sensitising particles**  
  (Can trigger allergic reactions e.g. asthma)

- **Very small particles**  
  (Can bypass most of our defences to reach the lungs)

- **The body cannot filter out harmful gases**
Hierarchy of controls

1. Elimination: Eliminate or remove the hazard.
2. Substitution: Replace the hazard with a less hazardous one.
3. Engineering Controls: Reduce exposure, isolate people from the hazard.
4. Administrative Controls: Change, improve the way people work.
5. PPE: Protect the worker with Personal Protective Equipment (PPE).
Four Steps to Respiratory Protection

1. Identify Hazard
2. Assess Risk
3. Respiratory Selection
4. Training
Four Steps to Respiratory Protection

1. Identify Hazard
2. Assess Risk
3. Respiratory Selection
4. Training
Step 1 – Identify the Hazard

1. Identify Hazard

- Particulates
- Gases & Vapours
- Oxygen deficiency
- Bacteria, viruses & fungal spores

- Dusts
- Mists
- Other gases (Mostly N\textsubscript{2})
- Good quality air

- Metal fume
- Oxygen deficient < 19.5% oxygen
- Fibres
- 21% O\textsubscript{2}
Step 1 – Identify the Hazard

Types of RPE for different hazards

Particulates

Gases & vapours

Oxygen deficiency
Step 1 – Identify the Hazard
What is the substance or what does it contain?

Commercial product  Chemical  Process Generated

Granite?  Wood?  Asbestos?
Step 1 – Identify the Hazard

What are the other special situations to look out for?

- Explosive atmospheres
- Coal dust / silica
- Chromium / Nickel
- Nanoparticles
- Fibres
- Wood dust
- Welding Fume
- Radioactive Particles
- Lead
- Pharmaceuticals
- Grain dust
- Bio-aerosols

Examples (not inclusive)
Four Steps to Respiratory Protection

1. Identify Hazard
2. Assess Risk
3. Respiratory Selection
4. Training
Step 2 – Assess the Risk

The risk depends on a number of factors which include…

- Concentration
- Exposure time
- Toxicity
- Sensitivity
- Breathing rate
Step 2 – Assess the Risk
Measuring workplace exposures

A Workplace Protection Factor study

Measuring exposure while wearing a filtering facepieces
Step 2 – Assess the Risk

How to assess the risk

How much is in the air?

- \(8 \text{mg/m}^3\)
- ppm
- fibres/cm²

How long are they exposed to it?

- 8 hours
  - Long-term exposure
- 15 mins
  - Short-term exposure

What are the exposure limits for it?

- National Exposure Limits (EH40)
Step 2 – Assess the Risk
UK: COSHH – Direct Advice Sheets

2. Assess Risk

Rubber
Rubber [RE]
This information will help employers, the self-employed, and employees to comply with the requirements of the Control of Substances Hazardous to Health Regulations 2002 (COSHH) by controlling exposure to materials and protecting workers' health.

- R60: Advice for managers
- R601: Dust control and general ventilation
- R602: Dust from bag opening and weighaging
- R603: Dust from mixing
- R604: Dust and fume from milling
- R605: Fume from rubber preserver (smaller articles)
- R606: Fume from casting mixtures (smaller articles)
- R607: Fume from cleaning and treating smaller articles

Personal protective equipment (PPE)
- Ask your safety clothing supplier to help you get the right PPE.
- Respiratory protective equipment (RPE) should not be needed if the extraction is designed correctly and working properly.
- RPE is needed for maintenance and cleaning, and for clearing up spills.
- Use a P3 standard of RPE (Assigned Protection Factor 20). Consult your supplier for advice.
- Replace RPE filters as recommended by the supplier. Throw away disposable masks after one use.
- Keep RPE clean and store it away from dust.
- Protective gloves are needed. Use nitrile gloves.
- Throw away single-use gloves every time you take them off.
- Skin creams are important for skin protection and help in washing contamination from the skin. These are not "barrier creams." After work creams help to replace skin oils.
- Never allow compressed air use for removing dust from clothing.
- Workers must not take their coveralls home for washing. Use a contract laundry.
## Step 2 – Assess the Risk

### Material Safety Datasheets (MSDS)

#### MATERIAL SAFETY DATA SHEET

<table>
<thead>
<tr>
<th>Product Name</th>
<th>ISOPAR G FLUID</th>
</tr>
</thead>
</table>

### PRODUCT AND COMPANY IDENTIFICATION

- **Product Name**: ISOPAR G FLUID
- **Supplier**: ExxonMobil Chemical Co.
  - **Address**: USA (P.O. Box 7335, Houston, TX 77252), 3M
  - **Emergency Telephone**: 1-800-22-3M3 (3M)

### HAZARDS IDENTIFICATION

- **Hazard Classification**
  - Flammable liquid, Category 3
  - Skin corrosion/irritation, Category 2
  - Specific target organ toxicity (acute exposure): Category C (Respiratory tract irritation)
  - Acute aquatic toxicity, Category 2
  - Chronic aquatic toxicity, Category 1
- **GHS Label Elements**
  - Inflammable
  - Signal Word: Warning
  - Hazard Statements
    - H225 Flammable liquid and vapor
    - H314 Causes severe eye irritation

### 2. EXPOSURE CONTROLS & PERSONAL PROTECTIONS

#### Exposure limits & Biological standards

- **Domestic standards**
  - **OSHA: No reference**
  - **Canadian Standard: NO reference**
  - **American National Standard: No reference**
  - **ACGIH: No reference**
  - **Hazardous drug standards: No reference**

#### Personal Protection

- **Respiratory protection**
  - **OSHA: NO reference**
  - **Canadian Standard: NO reference**
  - **American National Standard: NO reference**
  - **Respiratory protection equipment certified by NIOSH (National Institute for Occupational Safety and Health)**

- **Eye protection**
  - Install eye-washing facilities and emergency shower facilities to be used easily. Emergency washing facilities and eye-washing systems are recommended to be accessible easily. Contact lenses, safety glasses are recommended.

### Storage

- Store in the original container.
- Store in a dry, cool area.
- Store in a clearly labeled area.
- Store in a well-ventilated place.
- Avoid contact with reactive material.
Step 2 – Assess the Risk
Material Safety Datasheets (MSDS)

MSDS Realities

1. No exposure data
2. Incomplete set of MSDS (where is Part B?)
3. No information on how materials will be applied
4. No information on environment of use – ventilation, confined space, etc.
5. No information on duration of use
6. No information on other chemicals or processes
7. MSDS can be poorly written, vague and/or wrong!
Four Steps to Respiratory Protection

1. Identify Hazard
2. Assess Risk
3. Respiratory Selection
4. Training
Step 3 – Respiratory Selection
Step 3 – Respiratory Selection
Adequate versus Suitable

<table>
<thead>
<tr>
<th>ADEQUATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is right for the hazard and reduces exposure to the level required to protect the wearer’s health.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUITABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is right for the wearer, task and environment, such that the wearer can work freely and without additional risks due to the RPE.</td>
</tr>
</tbody>
</table>
Step 3 – Respiratory Selection

Product selection criteria

**Protection**
- Is it suitable for hazard?
  - Particulates, gases & vapours or combination
- Does it provide enough protection?
- Is it suitable for job
- Is additional protection required too?

**User**
- Is it comfortable?
  - Comfortable fit, higher work rates, different temperatures etc
- Does it fit & seal properly?
- Is it acceptable?
- Compatibility

**Business**
- Cost?
- Productivity?
- Usage?
- Maintenance?
- Other?
Step 3 – Respiratory Selection

3. Respiratory Selection

Tight-fitting filtering respirators

Powered filtering respirators

Supplied air respirators

Breathing Apparatus (BA or SCBA)
Step 3 – Respiratory Selection

Filtering Facepiece Respirators
Protection Levels
FFP1: Particulates up to 4x WEL
FFP2: Particulates up to 10x the WEL
FFP3: Particulates up to 20x the WEL*

Reusable Respirators
Filter Markings
A organic vapours >65˚C
B inorganic gases
E acid gases
K ammonia
P particulates
P1 (particulates up to 4x WEL)
P2 (particulates up to 10x WEL)
P3 (particulates up to 20x WEL*)
Hg mercury vapour
AX organic vapours <65˚C

Powered Air
TH1 – 10 x WEL
TH2 – 20 x WEL
TH3 – 40 x WEL

Supplied Air
1A/1B – 10 x WEL
2A/2B – 20 x WEL
3A/3B – 20/40 x WEL*

*Workplace Exposure Limit – see HSG 53

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Step 3 – Respiratory Selection

HSG53

It makes it awkward to work
It interferes with my other PPE

Separate items of PPE

Provide integrated solutions

Source: HSE
Step 3 – Respiratory Selection
Facial Hair

I don't like having to shave every day

3. Respiratory Selection
Step 3 – Respiratory Selection

Facial Hair – Loose Fitting Headtops
Step 3 – Respiratory Selection
Face Fit Testing

3. Respiratory Selection

- Negative pressure principle
- Every wearer is different
- Every model is different
- One-to-one training opportunity
- Best practice
- Company policy
- It is the law

- Company policy
- Best practice
- It is the law
- Every model is different
- Every wearer is different
- One-to-one training opportunity

- Negative pressure principle
Step 3 – Respiratory Selection
Which types of RPE require to be fit tested?

Any tight-fitting facepiece
- Including powered devices
- Including supplied air and SCBA
Step 3 – Respiratory Selection

Face Fit Testing

• Means of assessing how well a respirator seals to a face
• Two Principle Methods used:

  Qualitative taste test

  Quantitative test using Portacount
Step 3 – Respiratory Selection
Face Fit Testing: Which method should I use?

Qualitative or Quantitative

Quantitative
Who can perform fit testing?

Competence

Can be either:

In-house provision or External fit test provider
Four Steps to Respiratory Protection

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Step 4 – Training

Key issues good training should tackle...

- The need for protection
- Limitations of use
- Putting on and removing
- Getting a good fit
- Maintenance procedures
- Storage
Step 4 – Training

How can manufacturers help with training?

- Fit testing
- User instructions
- Online training materials
- On site training
Step 4 – Training

...the wearer

4. Training

I don’t think I need it

It’s only a quick job

![Image source: HSE](image_url)

Effective Protection Factor

<table>
<thead>
<tr>
<th>Minutes for which a respirator is not worn during an 8hr working day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective protection provided by RPE</td>
</tr>
<tr>
<td>APF=2000</td>
</tr>
<tr>
<td>APF=40</td>
</tr>
</tbody>
</table>

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Step 4 – Training

...the wearer

Stress to the wearers the importance of wearing RPE even when they can’t see the hazard

Make it easy for wearers to obtain their RPE

Think about RPE locker/store in relation to where people work
Four Steps to Respiratory Protection

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Further reading

- **3M Worker Health and Safety** [www.3m.co.uk/3M/en_GB/worker-health-safety-uk/](www.3m.co.uk/3M/en_GB/worker-health-safety-uk/)
- HSG53 Respiratory protective equipment at work: A practical guide
  Available from: [www.hse.gov.uk/pubns/books/hsg53.htm](www.hse.gov.uk/pubns/books/hsg53.htm)
- 3M RPE fit testing [www.3m.co.uk/fittestrespirator](www.3m.co.uk/fittestrespirator)
- Fit2Fit competency scheme [www.fit2fit.org](www.fit2fit.org)
- HSG53 Respiratory protective equipment at work: A practical guide
  Available from: [www.hse.gov.uk/pubns/books/hsg53.htm](www.hse.gov.uk/pubns/books/hsg53.htm)
- The effect of wearer stubble on the protection given by Filtering Facepieces Class 3 (FFP3) and Half Masks. Available from: [www.hse.gov.uk/research/rrpdf/rr1052.pdf](www.hse.gov.uk/research/rrpdf/rr1052.pdf)
Thank you