

PRACTICAL GUIDELINES ON THE USE OF RESPIRATORY PROTECTIVE EQUIPMENT

INTRODUCTION

In most industry today, even under normal operation, there are bound to be tasks that require the use of respiratory protective equipment (RPE) or respirator. The provision for RPE is emphasised in the existing regulations, FMA 1967 and OSHA 1994.

The purpose of this document is to provide a practical guidance on the selection and use of RPE.

OBJECTIVES

Usually we put a 'to' in front of objectives ...

1. Selection, use and maintenance of RPE.
2. Selection and assessment of personnel who are required to wear a respirator as part of their job.
3. Guidance and training on fit testing for respirator users.
4. Health aspects of respirator users.

TYPES OF RESPIRATORS

- Air-Supplying Respirators (Breathing Apparatus)
- Air-Purifying Respirators
- Paper Masks (dusts/fumes/mists)

USAGE CAUTION AND LIMITATIONS OF RPE

RPE should not be used as the first line protection against exposure to hazardous materials. Adequate engineering or administrative controls or ventilation should be employed as far as reasonably practicable to limit the exposure. RPE should only be introduced where this is not possible or during an emergency when it is used mainly for escape or rescue purposes.

Air-purifying RPE must only be used in situations in which there is certainty that the correct selection of RPE has been made.

There are several technical issues that could limit the effectiveness of RPE in practice. Medical assessment is necessary to ensure that employees (a bit awkward ...) 'are medically fit' better ?, are psychologically capable of wearing RPE effectively and safely. It is thus important to seek the advice of an occupational health physician or industrial hygienist (IH) whenever in doubt.

CONTROL PROCEDURE

1. If the work to be done is not covered (encompassed ?) by a written procedure, a Job Safety Analysis (JSA) should be carried out for the specific tasks where RPE is required. This should also include the number of people who will be required to wear the RPE. The site industrial hygienist (IH) or IH contact should be asked to review the Task Analysis.
2. Selection of RPE should be based on conditions stated in Tables 1 and 2.
3. Select the personnel who will need to wear the RPE using the '*Fitness for wearing RPE*' guide as shown in Table 3.
4. Train and fit test the selected personnel using the '*Training and Fit test procedures for the various RPE*' as shown in Tables 4a, 4b & 5.
5. RPE must be maintained in good condition. Regular inspection and tests as stated in Table 6 must be followed.

Table 1: RESPIRATOR (RPE): TYPES AND GENERAL USAGE

TYPES OF RPE	GENERAL CONDITIONS FOR USE	TYPICAL JOB EXAMPLES
AIR-SUPPLYING/BREATHING APPARATUS (Self Contained Breathing Apparatus or Supplied Air-SCBA)	<ul style="list-style-type: none"> • For atmospheres where a lack of oxygen is known or suspected • For atmospheres known to, suspected to, or which may, in an emergency, contain toxic gases/vapors in concentrations, which are immediately life threatening or harmful. 	<ul style="list-style-type: none"> • Confined space entry and work (low oxygen) • Work in acutely toxic atmospheres, e.g. Chlorine, H₂S
AIR-PURIFYING RESPIRATORS (See Table 2)	<ul style="list-style-type: none"> • For atmospheres containing toxic/harmful/irritant corrosive vapors, gases, dusts or fumes above the Occupational Exposure Limit (OEL) but at concentrations which are not Immediately Dangerous to Life or Health (IDLH). • Subject to the limitations shown in Table 2. • Not to be used for material that have poor warning properties (odor, irritation or taste) • Not to be used where oxygen deficiency is suspected (<21%) • Full face masks must be used for protection against contaminants that are irritating to the eyes 	<ul style="list-style-type: none"> • Work in open or confined spaces <ul style="list-style-type: none"> - Dusts, organic vapors - Grinding, chipping, welding - Insulation • Work with solvents (vapors), acids (fumes) • Work where oil mists are generated • Paint spraying • Asbestos stripping • Welding
DISPOSABLE PAPER MASKS (See Table 2)	<ul style="list-style-type: none"> • For atmospheres containing non-toxic dusts • For atmospheres containing non-toxic Dusts and mists at lower concentrations • Subject to limitations shown in Table 2 • Not to be used where oxygen deficiency is suspected (<21%) 	<ul style="list-style-type: none"> • General manual work both inside and outside vessels • Woodwork • General work in dusty atmospheres • Construction
AIR FED ABRASIVE BLASTING HELMET	<ul style="list-style-type: none"> • Abrasive blasting 	<ul style="list-style-type: none"> • Abrasive blasting

Table 2: RESPIRATOR (RPE): PAPER MASKS AND CARTRIDGE FILTERS
(Would it be better to split this table or to present it separately in landscape format ?)

MASK	USAGE AND FILTER TYPE						Remarks
	Nuisance Dusts	Fine Dusts	Toxic Dusts & Fumes	Organic Gases & Vapors	Organic Vapors & Dusts	Acid Gases	
Disposable Dusts/Fumes/Mist Mask	Yes	Yes	Arc Welding Oxy-Acetylene Cutting	No	No	No	Up to 10 times OEL. Not for use against asbestos.
Half Mask Air-Purifying Respirator	As above	As above	As above	With correct filters	With correct filters	With correct filters	Up to 10 times OEL. Filters are available for other substances and combinations by special order.
Full Mask Air-Purifying Respirator	As above	As above	As above	As above	As above	As above	Provides eye and face protection and a better face seal for higher concentrations (up to 50 times OEL).
Example of Contaminants	Large Non-Toxic Dusts >5 Microns - Cement - Plaster - Softwood - Refractory - Grinding - Dessicants	Fine Non-Toxic Dusts >0.5 Microns - Cement - Plaster - Carbon - Softwood - Grinding - Dessicants	- Inorganic lead - Silica - Chromium - Hardwood - Asbestos - Ceramic filters - Welding fumes - Dessicants (P)	- Crude oil - Diesel - Benzene - Gasoline - General hydrocarbons - Solvents - Methanol (A)	Combination of columns (P) & (A) - Paint spray - Oil mists	- Acid fumes - Mercaptans - SO ₂ - Ammonia (Refer to Industrial Hygienist before use)	* Depending on hazard, check MSDS. See Selection Guide-Table 1 for Further guidance. Negative pressure (air purifying) respirators must not be used in atmospheres that are deficient in oxygen (<21%).

Table 3. FITNESS FOR WEARING RESPIRATOR (RPE)

	Action description	Remarks
1	Supervisor gets user of RPE to fill in form RPE 1 - <i>'Questionnaire for Respirator Users'</i> . (See attachment 1)	This is the screening medical questionnaire
2	If the employee has answered YES to any question, then they will need a formal medical clearance before being assigned to a task which requires the wearing of a respirator	
3	If the employee answers NO to all questions, the supervisor carries out the actions required to fill in form RPE 2 - <i>'Respirator User Evaluation'</i> (See attachment 2). Supervisor should caution the employee on the facial hair issue if appropriate.	Facial hair, including more than two-day growth of beard, which interferes with the fit of the face piece is not to be permitted. If the hair fits completely within or outside the sealing surface of the face piece, it can be accepted.
4	Prior to being assigned to operations requiring the use of respirators, employees must be properly trained and fitted for a respirator.	The Training, Fit Testing and Medical Evaluation can be accomplished jointly.
5	Medical Clearance Review should be repeated every two years.	

Table 4a: TRAINING AND INITIAL FIT TESTING PROCEDURES FOR AIR-PURIFYING RESPIRATORS

	Action description	Remarks
1	<p>Training</p> <p>Use training materials supplied by the supplier of the respirators</p>	Availability of training materials may be taken into account when selecting respirators for purchase.
1	<p>Respirator Fit Testing for Air Purifying Respirators - Negative & Positive Pressure Tests</p> <p>Adjust mask, with cartridges in place, to a comfortable but not tight fit.</p>	Employees can achieve superior fit by making the mask fit very tightly to the face. However, if the respirator is readjusted later for more comfortable fit, then the fit testing will be invalid.
2	Place palms of hands lightly over cartridges to seal air inlet. Do not distort the fit by applying too much pressure.	
3	Inhale. Mask should collapse against the face. Negative pressure must be maintained without air leakage for 15 seconds. If leakage occurs reset the mask and/or adjust straps and retest. If leakage persists, administer an irritant smoke test.	
4	Cover exhalation valve with heel or hand, being careful not to distort the fit.	

Table 4b: IRRITANT SMOKE FIT TESTING PROCEDURES FOR AIR-PURIFYING RESPIRATORS

	Action description	Remarks
1	Test area must be free of drafts	Avoid areas with highly sensitive smoke detection systems.
2	Respirator must be equipped with high efficiency particulate Cartridges	Particle size of the irritant smoke is small and may penetrate low efficiency particulate filters.
3	Subject to fit mask to the best of his ability. Subject wears mask for 5 minutes prior to test.	Helps avoid excessive tight fits giving misleading results.
4	Review protocol with subject before test. Include fact that smoke may be irritating to eyes. Instruct subject to keep eyes closed during the test.	
5	Prepare smoke tube with a short length of tubing on one end of tube.	To prevent injury to subject during test.
6	Direct smoke toward face seal area of test subject, gradually moving around the perimeter of the mask.	Start gently at first; increase smoke only when satisfied there are no gross leaks.
7	The test subject shall perform the following exercises for 30 seconds each while the respirator is being challenged with the test. If the subject shows any smoke. a) Breath normally b) Breath deeply - inhaling and exhaling slowly c) Turn head completely from side to side, inhale on each side but do not bump respirator on shoulders. d) Nod head up and down, once per second inhale with head in the up position. e) Recite a paragraph from the newspaper or a magazine aloud repeating after trainer. f) Jog in place. g) Breath normally	Observe subject carefully during test. If the subject shows any signs of discomfort, stop the test. It is a good practice to ask the subject if they are experiencing any discomfort at frequent intervals as the test progresses.
8	The subject will inform the trainer if irritation from the smoke is experienced. Trainer will stop test and allow subject to refit respirator and repeat test.	Training and fit testing is to be accomplished prior to use of the equipment. Repeated failures to properly use respirators will require repeat training.
9	After test is completed, advise employee to wash their face to avoid possible skin irritation.	

Table 5: TRAINING AND FIT TESTING PROCEDURES FOR AIR-SUPPLYING BREATHING APPARATUS

	Action description	Remarks
	Training for Emergency Use	
1	Explain to employees the purpose of the emergency equipment, and its location.	
2	Demonstrate the donning of the mask and have employees practiced until they are proficient.	
3	Have them turn on air and wear mask for five minutes while performing mild physical activities such as walking, climbing or other activity comparable to work which will be required to be performed while wearing the respirators.	
4	Clean mask after each use and place in a plastic bag.	
5	Refill tank to operating pressure. The air used to replenish the tank must meet the specifications for Grade D air.	
1	Fit Testing Don the mask with the tank and adjust it to a comfortable but not tight fit.	
2	With the air off ask employee to inhale. If the mask collapses against the face with no leakage noted, have employee repeat the inhalation while rotating his or her head. If leakage is still absent, fit is OK. If leakage is noted have employee reset the face piece and test again.	
3	If employee cannot obtain an acceptable fit with the mask provided using the method described above, conduct an irritant smoke test described in air purifying section with the mask connected to and with the air supply on. If this test also fails, it may be necessary to special order a small or large size mask depending on the contour of the face.	It should be borne in mind that if leakage is excessive; the 30 minutes air supply will be significantly reduced. If the failure to obtain a fit is due to a distortion to obtain a fit is due to a distortion of the facial features, such as missing teeth or dentures, it is of the facial features, such as missing teeth or dentures, it is possible that another size would be of no benefit. In these cases, it may be necessary to place the employee on the ineligible list for the use of emergency type respirators.

Table 6: PROCEDURES FOR THE USE AND MAINTENANCE OF RPE

Respirators must be maintained in good condition. All equipment (except disposable items) needs to be regularly inspected and tested.

	Action description	Remarks
1	SCBA Inspect every 6 months and after each use	The persons responsible for inspecting the equipment must be clearly identified and have received additional training.
2	Follow manufacturer's recommendations	The manufacturer should have a detailed maintenance and recommended test schedule.
1	Air Breathing Apparatus Inspect every 6 months and after each use	The person responsible for inspecting the equipment must be clearly identified and have received additional training.
2	Follow manufacturer's recommendations	The manufacturer should have a detailed maintenance and recommended test schedule.
3	Ensure air supply meets quality standards.	The best practice is to have dedicated breathing air compressors which are designed to deliver about 200 litres/mm/person of high quality air. The use of non-dedicated compressors will require a greater quality monitoring effort.
1	Air-Purifying Cartridge or Canister Respirators - Half or Full Mask Clean after each use. Remove cartridges, wash mask in warm water and a mild soap. Rinse with clean water and air dry in a clean location away from direct sunlight.	These masks are issued from the stores for the duration of the job or for personal use. If the mask has been used in an environment containing dusts or mists, it is also good practice to clean the exhalation valves and their seats.
2	Inspect the mask paying particular attention to the exhalation valves and to the cartridge seals.	These are potential leak points.
3	Change the cartridge filter at least daily (dusts) or for gases, as often as required.	
4	Store the mask in a clean location between use.	It is good to store reusable masks in sealed plastic bags to ensure they remain clean and ready for use.
5	Test the fit using at least the positive and negative pressure tests every time it is used.	
1	Disposable Paper Mask The user is to use a new mask daily or more often if necessary, following the instructions given with the mask,	The user should exchange the mask if it becomes damaged or heavily

	and ensuring that there is a close fit against the face.	contaminated during the shift.
2	These masks are issued for one-shift use only and should then be disposed of in a normal waste skip.	

HEALTH ASPECT OF RESPIRATOR USERS

The following Conditions can affect a person's ability to wear a respirator. Employees with any of these Conditions should get a medical opinion and evaluation on fitness for using the respirator particularly the air-supplying respirator.

Lungs

- A history of asthma, chronic bronchitis or emphysema
- Difficulty in breathing
- Chest/lung infection
- Any other lung diseases

Heart

- High blood pressure
- Coronary artery diseases
- Valvular heart diseases
- Heart failure

Other

- Missing or arthritic fingers
- Facial scars
- Anaemia
- Claustrophobia
- Perforated eardrum

Attachment I

Form RPE I: QUESTIONNAIRE FOR RESPIRATOR USERS

Full name	Job title/Unit	Date
Please answer the following to the best of your ability by checking only the boxes that apply to you.		
		Yes No
1.	Do you have chest pain when you exert yourself (e.g. Running, climbing stairs)?	<input type="checkbox"/> <input type="checkbox"/>
2.	Do you have coronary artery disease or other heart disease that would interfere with your ability to wear a respirator?	<input type="checkbox"/> <input type="checkbox"/>
3.	Have you had a heart attack or coronary artery by-pass surgery?	<input type="checkbox"/> <input type="checkbox"/>
4.	Do you have more than borderline high blood pressure which is not being treated?	<input type="checkbox"/> <input type="checkbox"/>
5.	Do you have more shortness of breath while climbing or running than others of your age and weight?	<input type="checkbox"/> <input type="checkbox"/>
6.	Do you have a chronic cough or other respiratory problems (for example asthma or emphysema) that would interfere with your ability to wear a respirator?	<input type="checkbox"/> <input type="checkbox"/>
7.	Has a doctor told you that you have an abnormal lung function test?	<input type="checkbox"/> <input type="checkbox"/>
8.	Do you have significant concerns about being in a confined space (claustrophobia)?	<input type="checkbox"/> <input type="checkbox"/>
9.	Do you have any medical condition not covered above that would interfere with your ability to wear a respirator?	<input type="checkbox"/> <input type="checkbox"/>

The remaining questions apply only to SCBA users and members of a fire/emergency team.

- 10. Have you ever had a pneumothorax (ruptured lung)?
- 11. Do you currently have severe head or neck problems that will preclude you from wearing SCBA cylinders?
- 12. Do you have any other medical conditions (e.g. severe skin problems) which might impact your ability to wear SCBA or to be a fire fighter?

If you answered "No" to ALL of the questions, give this form to your Supervisor or Evaluator. Proceed with Respirator user Evaluation.

If you answered "Yes" to ANY question, a Medical Evaluation is required before the employee is evaluated wearing the respirator or before the respirator is used on the job.

Employee's signature

Note: *File in Medical or Personal File*

Attachment 2

Form RPE 2: RESPIRATOR USER EVALUATION

Employee's Name: _____

Evaluator's Name: _____

Respirator Type: _____

1. Administer the Medical Questionnaire for respirator users. If the employee answers "yes" to any of the seven questions in Attachment 1 - Form RPE 1- 'Questionnaire for Respirator Users', he or she should be referred to a physician or nurse for medical evaluation before continuing with this evaluation and before using a respirator on the job.
2. If the employee answered "no" to all the questions, observe the employee wearing the respirator (after determining there are no leaks) for about 5 minutes. Have him or her perform physical activity comparable to the work he/she will be required to do while wearing the respirator including climbing stairs. If at any time the employee complains of chest pain, marked breathlessness, dizziness or other health related problems, discontinue the evaluation and refer the employee to a doctor for medical evaluation. If the employee successfully completes this evaluation and, in your judgement, seems able to wear the respirator on the job, check the "approved" block below. If for some reason you feel the employee should not wear a respirator for reasons that do not require medical evaluation, check the "disapproved" block (e.g. Claustrophobic, etc.)
3. The results of this evaluation should be placed in the employee's company medical file.

EVALUATION RESULTS:

Relatively comfortable wearing respirator while:

Yes No

- Sitting or standing
- Walking
- Climbing

Approved

Referred for Medical Evaluation

Disapproved

Comments: _____

Supervisor's Signature: _____

Note: File in Medical or Personal File