

Respiratory Protection – filtering facepieces (dust masks)

Training on the use of respirators in
the workplace



Developed by the Division of Occupational Safety & Health (DOSH)
for employee training
May, 2009

Respirator Training–Module 1

Filtering Facepiece Respirators (Dust Masks)



“This training was prepared by the Dept. of Labor & Industries - DOSH with modifications and additions we added to apply to our specific workplace situation. This training is on filtering facepieces, commonly called dust masks. They are also sometimes called “disposable masks” or “single use masks.”

Respirator Training

Why Is This Training Required?

Training is required by DOSH for anyone who wears a respirator.

We also are providing this training so you will know how to protect your health.

If you don't know how to use a respirator properly, you can get a false sense of protection.



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“It is not enough just to slap on a respirator and go. You need to know the reasons for the use of respirators, how they protect you, their limitations, how to use them, keep them in good condition and store them.”

Respirator Training

Respirator Program Administrator

Our respirator administrator is [name]

This person is responsible for overseeing our respirator program.

This person has training on respirators.

3

[A single person must be designated as the respirator program administrator who has the final word on use of respirators. This person should report directly to top or upper management.]

“The respirator program administrator is responsible for assigning respirators, making sure wearers have medical evaluations and training, and managing the maintenance, repair and replacement of respirators and respirator parts. Go to this person if you have questions about your respirator.”

Respirator Use

Where We Require Filtering Facepieces

Filtering facepieces (dust masks) are required in the following locations or for the following job tasks:

[List here]

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[You should explain here why dust masks are required at your workplace and why there was no other alternative to reduce levels of dust in the air. If you have not done so, you should first explore other ways to control employee exposure to chemicals such as use of water, ventilation, process changes or substitution of less toxic chemicals.]

Respirator Use

We provide filtering facepieces (dust masks) for protection against the following kinds of dust and particles:

[List here]

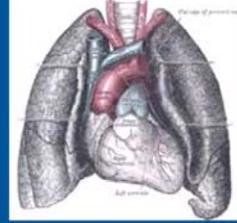
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[If you have the data, you can provide information here on air sampling results for chemicals or dust at various locations or job activities. You can also refer to material safety data sheets (MSDS) on the products in use.]

How Filtering Facepieces Work

How Do Dust Masks Protect You?

When used properly, dust masks prevent the inhalation of dust in the air and protect the lungs.



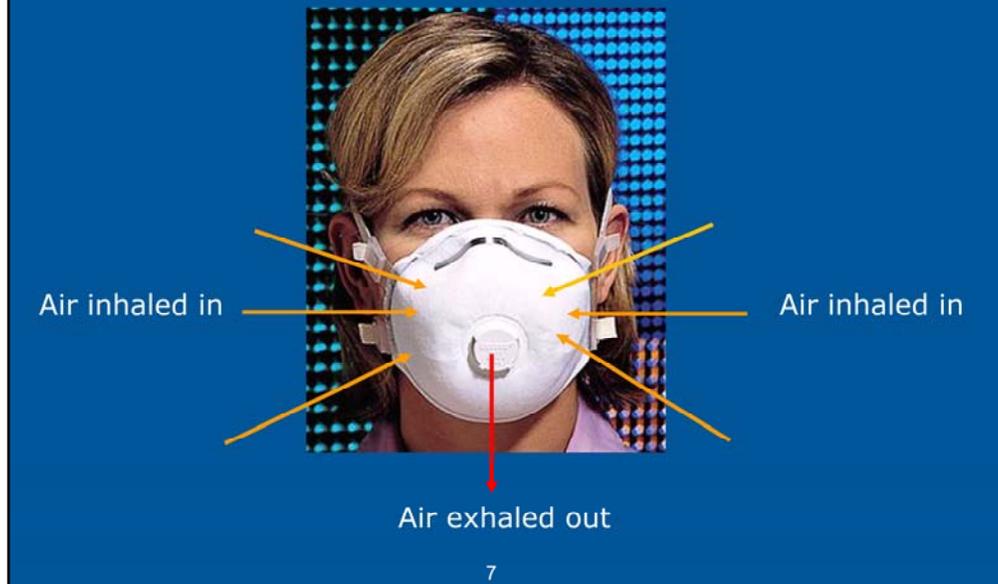
When you inhale, air is pulled through the dust mask and dust is captured on the outside of the mask.



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Some masks have an exhalation valve which makes the mask cooler, drier and easier to breathe through.

How Filtering Facepieces Work



[optional slide] This picture shows how air moves in and out of the dust mask respirator with an exhalation valve. The act of breathing creates a negative pressure inside the mask, which is why these and dust masks are sometimes called “negative pressure respirators”. If the mask does not fit properly along the edges, contaminated air can enter. This is why fit-testing is essential when using dust mask respirators. More about fit-testing in following slides.

Using Filtering Facepieces

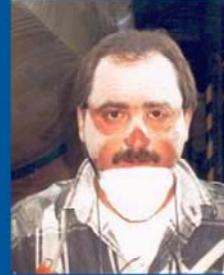
Limits of dust masks

Dust masks will leak if they don't fit your face properly.

Dust masks don't filter out chemical vapors.

Dust masks are not adequate for heavy amounts of dust.

Dust masks may not be suitable for highly toxic dusts.



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The first picture shows some leakage around the nose (dust under the nose) which means the dust mask didn't fit properly. Dust masks work well for wood dust, low levels of sandblasting dust, lime dust, grain dust, fiberglass dust, plastics dust. They can provide protection up to 10 times the permissible exposure limit of the particular dust. They won't provide enough protection against higher levels (above 10 times the "safe limit") of silica sand sandblasting dust, dry cutting of concrete or brick or dry drilling in rock, or certain toxic metal dusts such as lead, cadmium and arsenic.

Dust Mask Protection Factor

How much protection does a dust mask give?

Dust masks only provide protection to levels **10 times** above the dust permissible exposure limit (PEL).



Example

Wood dust permissible limit – 5 mg/cu. meter



Dust mask protects up to 50 mg/cu. meter

mg/cu. meter = milligrams per cubic meter

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“ Another way of saying this is that it is assumed that a dust mask reduces the amount of chemical inside the respirator to one tenth of the concentration outside the respirator, providing it fits properly and has no holes or tears. If the level of chemical in the air is more than 10 times the permissible limit, you would need a more protective respirator. Permissible limits for about 600 chemicals and dusts are published by DOSH. The limits for some very toxic dusts are much lower than wood dust.”

5 mg/cu. meter of wood dust will be a noticeable dust cloud. 50 mg/cu. meter of wood would be very dense cloud and would probably only occur in a small room with no ventilation where heavy sanding or cutting was done. However, some dusts (such as silica sand dust from sandblasting) have much lower allowable limits and dust levels from sandblasting can easily exceed the protection factor of a dust mask. Most sandblasting activity requires a specialized abrasive blasting respirator with fresh air supplied to the respirator.

NIOSH-Approved Dust Masks

Dust masks come in variety of styles and brands.



Not NIOSH-approved

Not all dust masks provide adequate protection for workplace dust.



NIOSH-approved

Only NIOSH-approved dust masks can be used for protection against dust levels that exceed the PEL.

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NIOSH is the National Institute of Occupational Safety & Health. All respirators used in the workplace for protection against chemicals and dust must be NIOSH-approved. Single-strap dust masks are not NIOSH-approved. So-called “comfort masks” or “allergy masks” are also not NIOSH approved. The NIOSH approval will be found printed directly on the mask or on the mask package or carton.

Types of Dust Masks

Some masks are more protective than others

N95/R95/P95 masks filter out 95% of dust particles

N99/R95/P99 masks filter out 99% of dust particles

N100/R100/P100 masks filter out 99.7% of dust particles

N99 or N100 masks are recommended for very fine dust or dangerous dusts such as asbestos or silica.

We use [list type] masks

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[This slide is optional if you use more than one type of dust masks] The “N” means not resistant to oil mist, “R” means somewhat resistant to oil mist, and the “P” means the mask is strongly resistant to oil mist. Most work situations do not have oil mist in the air and the “N” masks suffice.

Where Dust Masks Can't Be Used

Dust masks will not provide adequate protection in the following situations:

- ✓ Exposure to chemical gases or vapors
- ✓ Dust levels more than 10 times the permissible exposure limit (PEL)
- ✓ Oxygen deficiency



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“Dust masks do not filter out gases or vapors at all, and of course do not provide oxygen. For these reason dust masks are not recommended for any confined space work. Some dust masks have a layer of charcoal to capture so-called “nuisance” odors or vapors, but these cannot be used if the chemical levels in the air exceed the PEL.”

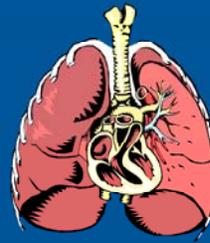
Respirators and Physical Fitness

Medical Evaluations

Medical evaluations are required for anyone required to wear respirators.

Breathing through a respirator is work for the body.

Respirators can be hazardous to people with heart or lung problems.



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“Most people have no problem wearing a dust mask. But because some people can have problems, medical evaluations are required. They start with a confidential medical questionnaire. Medical evaluations must be done before any type of respirator is used.” [Medical exams are not required if employees “voluntarily” wear dust masks, that is, they bring their own dust masks to work and wear them even though they don’t actually need them for protection from dust. Exams are required if the employer requires employees to wear respirators.]

Respirator and Physical Fitness

Medical Questionnaire

The first step of a medical evaluation is a confidential medical questionnaire.



A healthcare provider decides if you need a medical exam.

Results are only used to determine if you are fit to wear a respirator.



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[This slide is optional. You may elect to send all your employees who wear respirators for a physical exam without filling out a questionnaire first as long as the medical exam addresses the questions on the questionnaire.] “Before you wear a respirator, you must fill out a medical questionnaire. The questions in the medical questionnaire are required by DOSH. You fill out the questionnaire and send it directly to the doctor or clinic. Our medical provider for this service is [name]. We do not see the questionnaire or the results of a medical exam. We only receive notice on whether you are medically fit to wear a respirator or not.”

Respirator Fit

Dust Masks Must Fit Properly

Dust masks must fit properly to prevent leaks around the edges.

Fit-testing must be done before first wearing a dust mask.

Beards are **not allowed** when wearing a dust mask.



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[The top photo shows a worker with a poorly fitting dust mask – only one strap is used and it appears to be upside down. He was drilling in concrete and was often enveloped in a cloud of dust. Concrete dust contains silica, a substance that scars the lungs.]

Fit-testing is extremely important because without a tight fit, a respirator is nearly useless. You may think you are protected when in fact you are not, if the respirator does not fit properly. Beards are not allowed because they will always cause a respirator to leak around the edges. Even a day's growth of facial hair can cause a leak. Mustaches are usually O.K., but goatees will usually cause the respirator to leak." [Fit-testing is not required for voluntary use of dust masks.]

[Optional] "DOSH will cite us if they find employees with beards wearing respirators. This is one area where safety takes precedence over personal appearance. This is not the case however, if you want to wear a dust mask even though we don't require it. "

Respirator Fit

Fit-testing

In fit-testing, you first try on a dust mask for general comfort and fit.

After a comfortable respirator is selected, we conduct the actual fit-test.

The method we use for fit-testing is as follows: [describe]



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The two types of fit-testing shown here are the saccharin method (top) and the Portacount instrument method.

[You should describe your fit-testing method here. The banana oil method is not suited for fit-testing dust masks. Actual fit-testing can be done after this training is completed]

Replacing Dust Masks

Replace dust masks at least daily

Dust masks cannot be cleaned or repaired if soiled or damaged.

Replace dust masks if breathing becomes difficult, if they are damaged, or if they are dirty or dusty on the inside.

Dispose of dust masks at the end of the day or shift.



Torn mask

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Note the tear in the mask in the red circle. This mask must be replaced. Dust masks must also be worn with both straps attached to the head, otherwise they will probably leak.

Respirator Problems

When it Smells Bad or You Feel Sick

If you notice an odor, find dust inside the mask, feel ill, or you think your respirator leaks, notify your supervisor.

Leave the area if you know your mask is leaking.



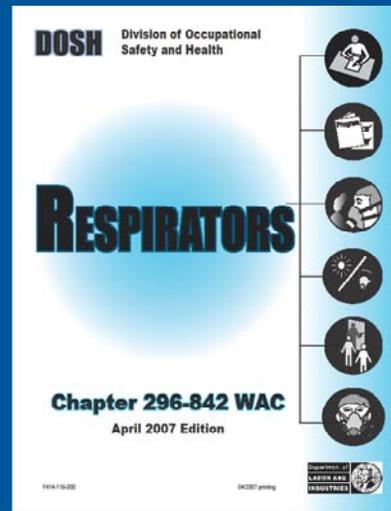
18

“Your respirator may leak because of a poor fit or a tear or hole in the mask. Sometimes you may feel ill without noticing an odor since some chemicals and most dusts have no noticeable odor. If you do smell an odor, remember dust masks don’t filter out chemical vapors or gases which can have odors. Be especially aware of such symptoms as dizziness, nausea, coughing, nose or throat irritation, feeling “high”, or having trouble breathing.”

Respirator Regulations

L & I – DOSH has regulations on respirator use.

Everything covered in this training is required in these regulations.



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The regulations on respirators is in WAC 296-842 – [Respirators](#)

Optional Quiz

The following questions are optional. They can be used to check employees' understanding of this training and promote discussion. You can add more questions for a short written or verbal quiz.

Quiz

Question 1

1. What do filtering facepieces protect you from?

- a) solvents and dust
- b) only dust and particles
- c) nothing much
- d) only pollen

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The correct answer is b).

Quiz

Question 2

Why can't you wear a dust mask over a beard?

- a) The beard will interfere with your breathing
- b) It will cause the respirator to leak
- c) It will cause skin irritation
- d) It will look stupid

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The correct answer is b).

Quiz

Question 3

What does it mean if you smell a chemical while wearing your dust mask?

- a) You may need a different kind of respirator
- b) The dust mask doesn't fit properly
- c) You have a very sensitive nose

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a) is the best answer since dust masks do not filter chemical vapors with an odor. c) may be true, but the point is that dust masks don't provide protection from chemical gases or vapors.

Respiratory Protection – Half and Full Face Cartridge Respirators

Training on the use of respirators in the workplace – module 2



Developed by the Division of Occupational Safety & Health (DOSH)
for employee training
June, 2009

Respirator Training – Module 2

Half-face & Full-face Cartridge Respirators



Half-face respirator



Full-face respirator

2

“This training covers only respirators with cartridges. These respirators in this slide are very similar. The main difference is that the full-face respirator provides eye protection and a better seal on the face. This training does not apply to one-piece dust masks or respirators that supply air from tanks or through hoses. This training was prepared by the Dept. of Labor & Industries with modifications and additions we have added to apply to our specific workplace situation.”

Powered Air-Purifying Respirators (PAPR)

A PAPR is an air-purifying respirator with a battery powered fan that sucks air through cartridges and blows it into the facepiece.



PAPRs are not positive pressure respirators, but they can provide better protection than other cartridge respirators.



3

Power sources are usually a battery or a plug-in (i.e., to tractor cigarette lighters). Batteries must last at least 4 hours.

Here's how they work:

The battery powers a small fan that sucks air into the unit and through the air purifying elements (this is mechanically produced negative pressure). This clean air is then blown to the wearer through a tube at a minimum steady amount (or flow rate) of 4 cubic meters per minute. The result is a cool, purified air supply to the user.

These are designed to provide only a constant amount of air over time so in case of heavy exertion, there is a risk of leakage around the edge of the mask because the user may breathe at a rate higher than 4 cubic meters per minute. This is why we avoid calling these respirators true "positive-pressure" respirators. In general, they are usually more protective than non-powered types.

As you can see PAPRs come in tight-fitting and loose-fitting styles. These are also available in half-face models. Some models are designed to use one cartridge and some may use three! Most cartridges are bigger in capacity compared to those used in non-powered types so they may be good to consider if you want a longer lasting air purifying element.

Respirator Training

Why is This Training Required?

Training is required by WISHA for anyone who wears a respirator.

We also are providing this training so you will know how to protect your health.

If you don't know how to use a respirator properly, you can get a false sense of protection.



4

“It is not enough just to slap on a respirator and go. You need to know the reasons for the use of respirators, how they protect you, their limitations, how to use them, keep them in good condition and store them.”

Respirator Training

Respirator Program Administrator

Our respirator administrator is [name]

This person is responsible for overseeing our respirator program.

This person has training on respirators.

5

[A single person must be designated as the respirator program administrator who has the final word on use of respirators. This person should report directly to top or upper management.]

“The respirator program administrator is responsible for assigning respirators, making sure wearers have medical evaluations and training, and managing the maintenance, repair and replacement of respirators and respirator parts. Go to this person if you have questions about your respirator.”

Where We Require Cartridge Respirators

Respirators are required in the following locations or for the following job tasks:

[List here]



6

[You should explain here why respirators are required at your workplace and why there was no other alternative to reduce levels of chemicals in the air. If you have not done so, you should first explore other ways to control employee exposure to chemicals such as ventilation, process changes or substitution of less toxic chemicals.]

Respirator Use

The dust, chemicals or products we provide respirators for are the following:



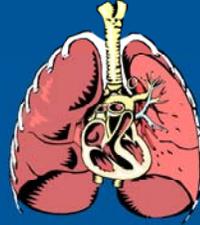
[List your chemicals or products used here.]

7

[If you have the data, you can provide information here on air sampling results for chemicals or dust at various locations or job activities. You can also refer to material safety data sheets (MSDS) on the chemical products in use.]

How Do Cartridge Respirators Work?

When used properly, respirators prevent the inhalation of chemicals and dust in the air and protect the lungs.



When you inhale, air is pulled through the cartridge, where air contaminants are trapped.

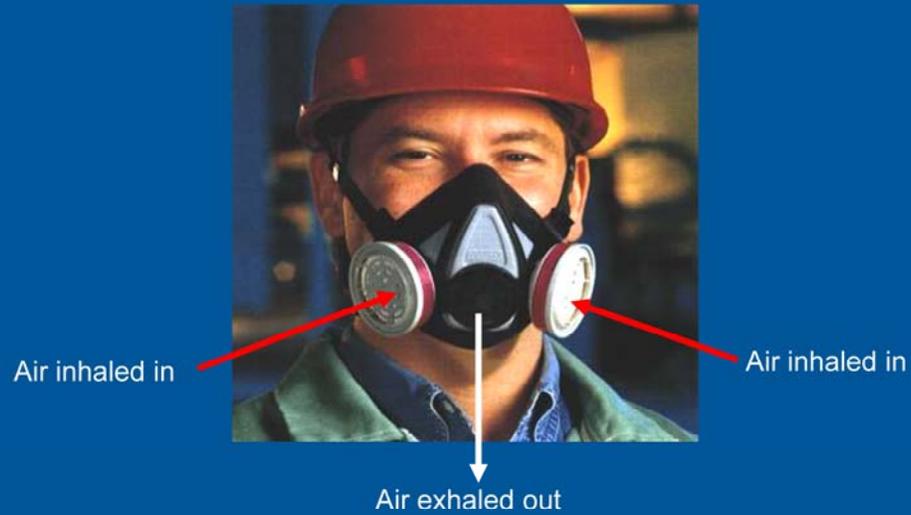


8

Because workplace air is breathed, these respirators are also called “air-purifying respirators.”

[It is recommended that employees have their respirator on hand at this point. You can demonstrate how air flows through the cartridge and inhalation valve and back out through the exhalation valve. See next slide for illustration of air flow.]

How Cartridge Respirators Work



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“This picture shows how air moves in and out of the respirator. We are going to take apart our respirators so we can see how air flow is controlled by the inhalation and exhalation valves.”

How Cartridge Respirators Work

Air movement is controlled by rubber inhalation and exhalation valves.

The adjustable straps are used to keep the respirator snug on the face.



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[Employees should take apart their respirators here while you explain the different parts and their function. The single exhalation valve prevents outside air from bypassing the cartridges through the exhalation port. The two inhalation valves prevent moist exhaled air from going out through the cartridges. Too much moisture will reduce the effectiveness of the cartridges.]

“The valves must be in good condition at all times to prevent contaminated air from entering the respirator. If they are cracked, ripped or warped, they must be replaced.” The straps must be snug, but not too tight to assure a good seal on the face. Make sure they are not twisted when you put on the respirator. Be sure respirator parts are all the same brand. Respirator parts from different brands are not interchangeable and will rarely fit or work properly.”

The facepiece should be the right size to fit you properly. Respirators usually come in 3 sizes – small, medium and large. We will make sure you have the right size for you through fit-testing.”

Types of Cartridges



Particulate cartridges filter out dusts, mists and fumes only.

Chemical cartridges trap different types of chemicals, but not dust, mists or fumes.

Cartridges are color-coded for the type of chemical or dust.

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Particulate cartridges only have a filtering material in them which trap or block the dust, mist or fumes, much like a furnace filter. "Fumes" in this case means primarily welding fumes or smoke, rather than the more generic meaning of fumes which people sometimes used to describe chemical vapors. Chemical cartridges have materials such as activated charcoal which absorb and trap the chemicals."

"Combination cartridges have both filters and chemical absorbing material. They are more difficult to breathe through than dust or chemical cartridges alone since they have twice as much material."

Types of Particulate Cartridges

Some particulate cartridges are more protective than others

N95/R95/P95 cartridges filter out 95% of dust particles

N99/R95/P99 cartridges filter out 99% of dust particles

N100/R100/P100 cartridges filter out 99.7% of dust particles

N99 or N100 masks are recommended for very fine dust or dangerous dusts such as asbestos or silica.

We use [list type] cartridges

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[This slide is optional if you use more than one type of respirator for dusts] The “N” means not resistant to oil mist, “R” means somewhat resistant to oil mist, and the “P” means the mask is strongly resistant to oil mist. Most work situations do not have oil mist in the air and the “N” masks suffice. N100/R100/P100 filters are also called “HEPA” filters – high efficiency particle filters.

Respirator Cartridge Color Coding

| | |
|---|---|
|  | Dust/fumes/mists - teal |
|  | Dust/fumes - pink (HEPA filter) |
|  | Ammonia- green |
|  | Organic vapor (solvents) - black |
|  | Acid gas (sulfuric acid, for example) - white |
|  | Acid gas and organic vapor - yellow |
|  | Chlorine – white & yellow |

These are some commonly used cartridges

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“Cartridges are colored-coded to show what substance they should be used for. The pink HEPA cartridges would be used for highly toxic dusts like silica, asbestos or certain welding fumes. Cartridges are also labeled for the chemicals for which they provide protection. There are no cartridges for carbon monoxide”

[If you have different types of cartridges at your workplace, you can show or pass them around.]

Limits of Chemical Cartridges

Chemical cartridges can absorb only so much chemical.

When their capacity is reached, breakthrough will occur.

You can't always tell if a respirator leaks by a chemical odor.

Some chemicals have no odor, or can only be smelled at high levels.



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“ Breakthrough means the chemical goes through the cartridge into the facepiece. If you smell the chemical with your respirator on , you know it is not working. But if the chemical has no odor, or it can only be detected at high levels above the permissible limit, you may not know if your respirator is working properly. That’s why they are changed regularly.”

Changing Cartridges

Cartridges must be changed regularly.

Particulate cartridges are changed when they become difficult to breathe through or are damaged.

Chemical cartridges are changed on a pre-determined schedule.



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“There are number of ways to calculate how long chemical cartridges will last, or how often to change them. Usually, the respirator manufacturer or distributor provides some information. We need to have some knowledge of a persons level of physical activity on their job, and the kind and amount of chemical found in the work area. The less the physical activity and the lower the levels of chemical in the air, the less frequently cartridges need to be changed.”

“Our cartridges are changed according to the following schedule: [specify]”

Half-face Respirator Protection Factor

Half-face cartridge respirators only provide protection to levels **10 times** above the chemical or dust permissible limit.



Example

Ammonia Permissible
Limit – 25 ppm



Respirator Protection
Factor for ammonia –
250 ppm

ppm = parts per million

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“ Another way of saying this is that it is assumed that a half-face respirator reduces the amount of chemical inside the respirator to one tenth of the concentration outside the respirator. If the level of chemical in the air is more than 10 times the permissible limit, you would need a more protective respirator. Permissible limits for about 600 chemicals are published by WISHA. They are often listed in “parts per million” or “ppm” in the air. 100 ppm is one hundred parts per million of the chemical in one million parts of air. 100 ppm is not much chemical in the air, but it can be enough to make you sick. The limits for some very toxic chemicals are much lower.”

[Optional] “The permissible limits for the chemicals we use are as follows or can be found at the following location:

Full-face Respirator Protection Factor

Full-face respirators can provide protection to levels **50** times above the permissible limit.

Full-face respirators also provide eye protection for irritating chemicals.



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“Full-face respirators provide better protection because more of the face is covered and the seal around the edges is better. The disadvantage of this kind of respirator is that it limits vision somewhat and some people find them more confining and uncomfortable than a half-face respirator.”

PAPR Protection Factor

A powered air purifying respirator can provide protection from 25 to 1000 times above the permissible limit.

The protection factor is unique to the manufacturer of the PAPR and how it is designed.



The protection factor of our PAPRs is [specify]

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[Optional slide if you provide PAPRs. There is wide variety of PAPRs on the market with varying protection factors. If you don't know the protection factor of the PAPR you provide your employees, contact the manufacturer.]

What is a Chemical "IDLH" Level?

"IDLH" means "immediately dangerous to life or health".

Most chemicals have an IDLH level in the air where cartridge respirators can't be worn.

A cartridge respirator is too prone to leaking to use at levels above IDLH.

The only alternative is a respirator that supplies clean breathing air.



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" A chemical that is at IDLH levels in the air would be immediately dangerous if a person was breathing that contaminated air had a leaking respirator, removed his respirator even for a few seconds, or didn't wear one at all. Quite often IDLH levels can be below 50 times the PEL, so even a full-face respirator would not be allowed. This information is given to show the limitations of cartridge respirators. The next two slides show examples where chemicals in the air could possibly exceed IDLH levels."

Where Cartridge Respirators Don't Work



Cartridge respirators are not good for large chemical spills or leaks, or thick dust clouds.

Don't use them in emergency situations including fires – they won't provide enough protection.

In the event of a major leak or spill, leave the area.



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“The protection factor or limit of a cartridge respirators can be exceeded in situations of large leaks or spills. Cartridge respirator are not appropriate for fire fighting or being in close proximity to a fire since most fires produce large amounts of toxic combustion products including carbon monoxide.

“In emergencies, either you must leave the area, or use a more protective respirator that provide clean air through hoses or tanks must be worn.”

[Optional] “We have different respirators for emergencies and provide separate training for emergencies.”

[See Module 3 for supplied air respirator training]

Where Cartridge Respirators Don't Work

Cartridge respirators don't work where there is a lack of oxygen.

Cartridge respirators cannot protect against high levels of toxic chemicals.

Confined spaces like tanks or manholes can have an oxygen deficiency or high levels of toxic chemicals.



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“Cartridge respirators do not supply fresh or clean air, they only purify existing air. If you are in an area where there is a lack of oxygen, you would need a respirator that supplies clean air from a tank or hose. Confined spaces can also have air contaminant levels above IDLH, and cartridge respirators would not provide sufficient protection.”

When it Smells Bad or You Feel Sick

Sometimes respirators don't work even when levels of airborne chemicals are low.

If you notice an odor or feel ill, or you think your respirator leaks, notify your supervisor.

Leave the area when necessary.



“Your respirator can leak for several reasons. The cause may be a poor fit, a missing valve, a tear or hole in the facepiece, a cartridge not tightened properly, or the cartridge may need changing. You may feel ill without noticing an odor if the respirator is leaking and the chemical has no odor. Be especially aware of such symptoms as dizziness, nausea, coughing, nose or throat irritation, feeling “high”, or having trouble breathing.”

Respirators and Physical Fitness

Medical Evaluations

Medical evaluations are required for anyone wearing respirators.

Breathing through a respirator is work for the body.

Respirators can be hazardous to people with heart or lung problems.



23

“Most people have no problem wearing a cartridge respirator. But because some people can have problems, medical evaluations are required. They start with a confidential medical questionnaire. Medical evaluations must be done before a respirator is ever used.”

Medical Questionnaire

The first step is a confidential medical questionnaire.

A healthcare provider decides if you need a medical exam.

Results are only used to determine if you are fit to wear a respirator.

We do not see the details or results of the medical exam



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[This slide is optional. You may elect to send all your employees who wear respirators for a physical exam without filling out a questionnaire first.] “Before you wear a respirator, you must fill out a medical questionnaire. The questions in the medical questionnaire are required by WISHA. You fill out the questionnaire and send it directly to the doctor or clinic. Our medical provider for this service is [name]. We do not see the questionnaire or the results of a medical exam. We only receive notice on whether you are medically fit to wear a respirator or not.”

Respirators Must Fit Properly

Respirators must fit properly to prevent leaks around the edges.

Fit-testing must be done before first wearing a respirator.

Beards are **not allowed** when wearing a respirator.



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“Fit-testing is extremely important because without a tight fit, a respirator is nearly useless. You may think you are protected when in fact you are not, if the respirator does not fit properly. Some loose-fitting respirators do not require fit-testing and work with beards, but we are not covering them in this training. Beards are not allowed because they will always cause a respirator to leak around the edges. Even a day’s growth of facial hair can cause a leak. Mustaches are usually O.K. Goatees usually cause the respirator to leak unless they are small.”

[Optional] “WISHA will cite us if they find employees with beards wearing respirators. This is one area where safety takes precedence over personal appearance.”

Respirator Fit-testing

In fit-testing, you first try on several types and sizes of respirators.

After a comfortable respirator is selected, we conduct the actual fit-test.

The method we use for fit-testing is as follows:
[describe]



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[You should describe your fit-testing method here. Actual fit-testing can be done after this training is completed]

Respirator Seal Check



Inhalation check



Exhalation check

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“The seal check is done to make sure the respirator is sealing properly on your face. The first step is to cover the cartridges with you two hands and inhale or suck in. You should feel the respirator pull against your face with no leaking around the edges. The second step is to cover the exhalation valve, and blow gently. You should feel the respirator bulge first before the seal breaks around the edges. If you have lost or gained weight, had major dental work, or have new facial scars since your last seal check, the respirator may not fit properly”

“This seal check should be done whenever you first put on your respirator. If you detect any leaks, readjust the respirator and try again. If it still leaks, notify your supervisor or the respirator administrator.”

(optional) “We will break here and have you all do seal checks with you respirator.”

How to Clean and Maintain Respirators

Respirators must be cleaned, inspected and maintained regularly.

Cleaning is especially important in dusty areas.

Clean in warm soapy water.

Allow to dry thoroughly before storing or using.



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[Respirator disinfecting can also be done with a mild bleach solution or with special wipes provided by respirator vendors. You can explain here how respirators are cleaned and disinfected at your facility]

“Respirator cartridges cannot be washed. Cartridge respirators should not be shared or exchanged with other employees for sanitary reasons and because they may not fit. Notify your supervisor or the respirator administrator if you notice your respirator is noticeably dirty between cleanings.”

How Should Respirators be Stored

Respirators must be stored in a clean dry place.

Don't store them unprotected in your work area.

The storage location for your respirators is: [state location here]



Don't store them like this!

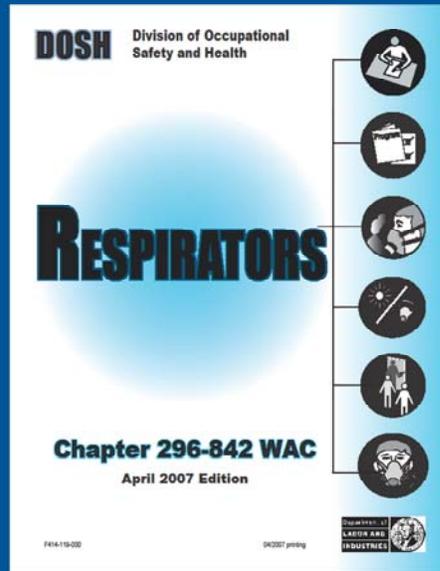
29

“Storing a respirator on a hook in the work area is not acceptable. If respirators are stored in plastic bags, they should be thoroughly dried first. They should also be stored in such a way that the facepiece is not deformed or bent out of shape” [You can describe or show how respirators are to be stored at your workplace here.]

DOSH Regulations

L & I – DOSH has regulations on respirator use.

Everything covered in this training is required in these regulations.



30

The DOSH regulations on respirators is under WAC 296-842 - [Respirators](#)

Optional Quiz

The following questions are optional. They can be used to check employees' understanding of this training and promote discussion. You can add more questions for a short written or verbal quiz.

Question 1

What kind of cartridge is needed for ammonia?

- a) A large one
- b) A chemical cartridge
- c) A black one
- d) Any kind will work

32

The answer is b) a chemical cartridge since ammonia is in the form of a gas, not a dust. A black color-coded cartridge is for solvents, not for ammonia.

Question 2

When should a chemical cartridge be changed?

- a) Every day
- b) When it is hard to breathe through
- c) When you feel like it
- d) On a regular basis depending on the chemical

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The best answer is d). The answer could also be a) if that is company policy or it is needed in a particular case. Answer b) applies only to dust cartridges.

Question 3

Why can't you wear a respirator over a beard?

- a) The beard will interfere with your breathing
- b) It will cause the respirator to leak
- c) It will cause skin irritation
- d) It will look stupid

34

The correct answer is b).

Question 4

When is a half-face or full-face respirator not protective enough?

- a) In the case of a large chemical spill
- b) When you have to talk to other employees
- c) When you have to enter a tank
- d) When your eyes burn

35

a) is the best answer. c) could be correct if there is lack of oxygen, lots of welding to be done, or lots of chemical in the tank.

Question 5

What does it mean if you smell a chemical while wearing your respirator?

- a) The cartridge is used up
- b) The respirator doesn't fit properly
- c) The exhalation valve is missing
- d) You have a very sensitive nose

36

All answers could be the reason and are correct. The person with an impaired sense of smell may not smell anything and a), b), or c) could still be true.

Respiratory Protection- supplied air respirators

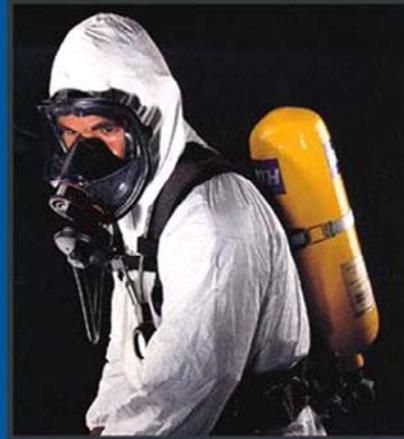
Training on the use of respirators in
the workplace – module 3



Developed by the Division of Occupational Safety & Health (DOSH)
for employee training
June, 2009

Supplied Air Respirators – Module 3

Airline Respirators & SCBAs



2

We are providing this training because you wear supplied air respirators as part of your job duties. Supplied air respirators work differently from air-purifying respirators. They provide clean air rather than filtering out contaminants from dirty air. This training will cover when they are used, what their capabilities and limitations are, how they work and the importance of good air quality.”

Training Notes

This module is introductory training for employees who wear supplied air respirators.

The two main types of supplied air respirators are covered in this module. Abrasive blasting hoods or re-breather type respirators are not covered.

This module only covers basic facts of supplied air respirators and is not complete training by itself.

Employees must also be given hands-on training with the respiratory equipment they will use.

Why Is This Training Required?

Training is required by WISHA for anyone who wears a respirator.

We also are providing this training so you will know how to protect your health.

If you don't know how to use a respirator properly, you can get a false sense of protection.



4

“It is not enough just to slap on a respirator and go. You need to know the reasons for the use of respirators, how they protect you, their limitations, how to use them, keep them in good condition and store them.”

Respirator Program Administrator

Our respirator administrator is **[name]**

This person is responsible for overseeing our respirator program.

This person has training on respirators.

5

[A single person must be designated as the respirator program administrator who has the final word on use of respirators. This person should report directly to top or upper management.]

“The respirator program administrator is responsible for assigning respirators, making sure wearers have medical evaluations and training, and managing the maintenance, repair and replacement of respirators and respirator parts. Go to this person if you have questions about your respirator.”

What are supplied air respirators?

Two Types



Airline respirator – air from a compressor



SCBA (self-contained breathing apparatus) – air from a tank

6

Airline respirators are connected by a hose to an air compressor or air pump which provides unlimited supply of air as long as the compressor operates. They can also be connected to a series of large air tanks which provide many hours of air. Great care must be taken to be sure the compressor provides clean air. More about that later. SCBA have tanks strapped on the back with a 30 to 60 minute supply of air under pressure. These are typically used by firefighters or in emergency situations. Both types require hands-on training and regular practice to be able to use properly.

Typical Examples of Use



Sandblasting



Firefighting



Chemical leak or spill response



Confined space work

Some other possible situations where supplied air respirators may be needed is hazardous waste site work, asbestos abatement work, response to a terrorist attack, tunneling, certain spray-painting operations, some spray-on truck bed liner operations, or work in a chemical manufacturing plant.

Where we use supplied air respirators

We use supplied air respirators in the following locations, jobs or situations:

Supplied-air respirators are required for protection in cases of:

- ✓ Oxygen deficiency
- ✓ High levels of toxic chemicals in the air – above “IDLH” levels
- ✓ Other conditions of high levels of highly toxic chemicals in the air
- ✓ Firefighting



9

More about “IDLH” in the following slides. Unlike air-purifying respirators (cartridge-type respirators or dust masks), supplied air respirators provide a high degree of protection for the user in these life-threatening situations. WISHA regulations require the use of supplied air respirators in the situations listed.

If air contaminant or oxygen levels are unknown and testing can’t be done in confined spaces, emergency spills or leaks or at hazardous waste sites, it must be assumed that IDLH levels are exceeded and a supplied air respirator must be worn. In these high risk situations, you must assume the worst unless you have evidence otherwise.

Firefighting is a special case and firefighters routinely use SCBAs. Firefighters are covered by separate regulations.

What is Oxygen Deficiency?

An oxygen deficiency can be life-threatening

Normal air contains 21% oxygen. A space with oxygen content below 19.5% is "oxygen deficient".

Lack of oxygen can cause immediate collapse and death.

Oxygen deficiency can occur in confined or enclosed spaces or areas of large chemical leaks.



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In a confined space, oxygen deficiency can occur from tank rusting, microbial activity or replacement by another gas. In addition, a large chemical leak can fill a room, building or area with so much gas or vapor that oxygen levels are reduced to dangerously low levels. So if the toxic effects of the chemical don't get you, the lack of oxygen will.

We have or can have oxygen deficiency in the following locations or situations:

Effects of Oxygen Deficiency

| <u>% Oxygen</u> | <u>Symptoms</u> |
|-----------------|---|
| 19.5% - 16% | Fatigue, mild impaired coordination |
| 16% - 12% | Increased breathing rate and pulse; impaired coordination, perception or judgment |
| 12% - 10% | Further increased breathing rate, blue lips, mental confusion |
| 10% - 8% | Fainting, nausea, vomiting, mental confusion within minutes, collapse |
| 8% - 6% | Collapse, death within 8 minutes |
| 6% - 0% | Coma within 40 seconds, death |

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There are not warning signs of oxygen deficiency other than the effects it has on you. You can't see it or smell it. If a person enters a space with oxygen levels below 10 %, the first sign of oxygen deficiency is that he will suddenly collapse. Even though most people will not collapse in oxygen deficiency as low as 16%, impaired judgment and coordination can put them at greater risk of injury. In addition, a person with heart or lung problems may experience more severe symptoms at higher levels of oxygen than a healthy person.

What is “IDLH”?

Immediately Dangerous to Life or Health

“IDLH” means immediately dangerous to life or health

Many chemicals have a listed IDLH level [link to NIOSH IDLH Table](#)

Oxygen deficiency is also IDLH

IDLH conditions can occur in confined spaces, large chemical spills or leaks and fires

IDLH



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IDLH is defined as “ an atmospheric condition that would cause an immediate threat to life, or cause permanent or delayed adverse health effects or interfere with an employee’s ability to escape”. In other words, the amount of chemical in the air is so high, it will cause death or permanent harm.

In addition to confined spaces (tanks, vaults, sewers etc), IDLH conditions can occur in “enclosed spaces” such as rooms or buildings with little or no ventilation where there has been a chemical release of a highly toxic chemical.

In most workplaces, IDLH conditions rarely occur. However, confined spaces are a notable exception - IDLH conditions commonly occur in sewers or tanks where welding is done or which contained chemicals or fuel.

The NIOSH IDLH table has two lists of IDLH levels – “Original IDLH Values” and “Revised IDLH Values”. Either one can be used - original values are typically higher than revised values. The “Original Values” are enforced by WISHA.

[Discuss your locations or tasks where IDLH conditions may exist here]

Entering an IDLH Atmosphere

Several safeguards must be used to enter an area with IDLH conditions:

- ✓ Must have at least one or two standby persons at entrance.
- ✓ Standby employees must be trained to conduct emergency rescue.
- ✓ Appropriate retrieval equipment may be needed.



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“Only well-trained persons can enter an area with IDLH conditions. Entering a confined space or enclosure that has chemicals above their IDLH level is a high-risk activity and the highest form of respiratory protection must be worn. Entry should only be done when there is no alternative, or when someone is injured and must be rescued. Entry into a confined space requires a confined space program using written permits. Firefighters deal with these conditions on a regular basis, but the average employee does not. Two standby persons are normally required by WISHA rules. One standby person is allowed if it can be shown that the IDLH condition is well known and will remain stable, and the one standby person can adequately monitor and communicate with employees in the IDLH area and initiate rescue.

[optional] The policy at our company is to use [one or two] standby person(s).

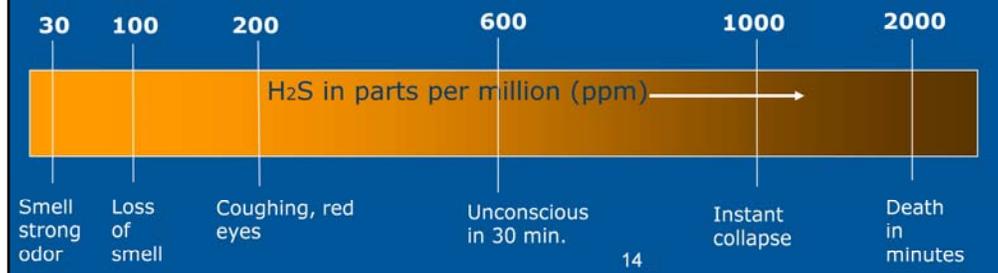
Example of IDLH - Hydrogen Sulfide (H₂S)

Hydrogen sulfide gas is commonly found in sewers.

It can be instantly fatal at higher levels in a confined space. IDLH level is 100 ppm.

Disturbing sewage sludge can release more hydrogen sulfide gas.

Supplied air respirators are normally needed to enter sewers.



[Optional slide for employee who must enter sewer lines or sewage treatment plant tanks.]

Escaping an IDLH Atmosphere

In IDLH conditions, a worker may need to escape or immediately leave the area.

An SCBA allows escape at any time.

Airline respirators need a small escape bottle of air attached at the waist.



Airline respirator with emergency escape cylinder

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The small escape bottle contains about 5-7 minutes of air giving the wearer enough time to move out of danger. Escape cylinder can only be used for escape, never for entering an area that is IDLH.

Escape-only Respirators

Escape-only respirators can be used in situations where chemical releases might occur, but the air is normally uncontaminated.



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[optional slide] “These can’t be used for entry – going in a room to turn off a valve or make a repair. A regular supplied air respirator would be necessary for that task. They only contain 5-10 minutes supply of air, enough time to exit a room or building where there has been a major chemical leak or spill. These are sometimes used in chemical plants.

Respirator Air Pressure

Pressure Demand vs. Demand

Air pressure inside the respirator facepiece is controlled by the respirator regulator.

“Pressure-demand” means air flows into the facepiece as needed, but the facepiece is always positively-pressured.

“Demand” means air flows into the facepiece only when you inhale.

Only pressure-demand can be used in IDLH conditions.



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[optional slide if you have older supplied air respirators that have a “demand mode” regulator or can be switched to “demand mode”.]

All newer supplied air respirators are equipped with pressure-demand regulators only. Some regulators manufactured before 2000 could be switched to the demand mode as a means to reduce air use. However, the demand mode creates a slight vacuum inside the facepiece when you inhale and if the seal is not perfect, or you adjust your facepiece and break the seal even slightly, contaminants can leak into the facepiece during inhalation. In the pressure-demand mode, air will escape along the edge of the facepiece if the fit is not good or when you adjust the facepiece or it is knocked loose. This air movement along the edge will prevent air contaminants from entering the facepiece.

Air Flow in Supplied Air Respirators

Continuous flow airline respirators

“Continuous flow” means air is constantly blowing into the respirator facepiece.

Continuous flow is found in loose-fitting airline respirators.

This type is often more comfortable and hoods can be worn over a beard.

This type cannot be used in IDLH conditions.



Loose-fitting hood



Loose-fitting facepiece

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[This slide can be deleted if these type of respirators are not used at your workplace]

“Continuous or constant flow is found in loose-fitting airline respirators attached to air compressors. These compressors must deliver at least 4 cubic feet of air per minute (cfm) of air to a tight-fitting facepiece or 6 cfm of air to a loose-fitting facepieces). At high rates of breathing, they can be “overbreathed” meaning the person can breath at rate faster than 4 cfm. High rates of breathing can occur during physical exertion or in highly stressful emergency conditions. Because of the possibility of overbreathing, continuous flow airline respirators can’t be used in IDLH conditions.

Loose-fitting respirators come in two types – a facepiece which just covers the face or a hood that enclosed the whole head. The loose-fitting facepiece provides much less protection than the hood.

[If used, describe where or what tasks these respirators are used for.]

Supplied Air Respirator Selection

| Conditions | Type of Respirator |
|---|--|
| IDLH conditions or oxygen deficiency | SCBA or airline with escape bottle |
| Dust/chemical levels up to 1000 times PEL | Airline with tight-fitting full facepiece or full hood |
| Dust/chemical levels up to 50 times PEL | Airline with tight-fitting half facepiece |
| Dust/chemical levels up to 25 times PEL | Airline with loose facepiece |

PEL = permissible exposure limit

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This table shows levels of protection provided by several types of supplied air respirators from most protective to least protective. "PEL" means "permissible exposure limits". The above table assumes that the airline respirator either has continuous flow of air or a pressure-demand regulator. Another point to remember is that for a few toxic chemicals, the IDLH level can actually be less than 1000 times the PEL.

Airline Respirator Advantages & Limitations

Advantages –

- ✓ continuous air supply,
- ✓ lightweight,
- ✓ less maintenance,
- ✓ don't need to buy tank air

Limitations-

- ✓ tied to a 300 ft. hose,
- ✓ depends on output of compressor,
- ✓ need an attached escape bottle in IDLH conditions



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Airline respirators provide more protection than air-purifying respirators, but less than SCBAs. They are also usually cooler than air-purifying respirators and make it easier to breathe since the user is not sucking air through a filter.

SCBA Advantages & Limitations

Advantages

- ✓ highest form of protection,
- ✓ can be used anywhere,
- ✓ allows unrestricted mobility

Limitations

- ✓ heavy & bulky,
- ✓ limited air supply(30 - 60 min.),
- ✓ extensive training required,
- ✓ high maintenance



21

SCBAs weigh about 20 - 30 pounds when full of air, depending on the brand and how much air they contain.

Using SCBAs – Special Notes

SCBAs are sophisticated respirator equipment used for possible or actual life-threatening situations.

SCBAs should not be used without extensive hands-on training and frequent re-training.

Most SCBA manufacturers or distributors provide this training.

If you have large chemical spill or leak, it may be safer to call professional emergency responders.



Air Quality For SCBAs

Air for breathing must be "Grade D" air

Grade D air for tanks is usually purchased from a specialized supplier.



Grade D air must meet strict requirements. [link to WISHA requirements](#)



Supplier must certify that tank air meets Grade D requirements.

23

AirGas is one company that sells Grade D air. [Name the company you purchase your air from.] Grade D air must not exceed certain minimum amounts of particulates, moisture, carbon dioxide, carbon monoxide and hydrocarbons (solvent-type chemicals)

Air Quality for Airline Respirators

Air compressors must deliver clean air

Locate pump intake in an area of clean, fresh air.

Filter air as needed.

Watch out for nearby running engines.

Be sure air intakes are located away from exhaust pipe of an engine compressor.



Small electric air pump



Small engine compressor

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These items must be addressed in order to assure clean air that is equivalent to Grade D quality is available for airline respirators.

Compressors for Airline Respirators

Three types of breathing air compressors



Electric low pressure compressor



Gasoline high pressure air compressor



25 Electric high-pressure air compressor

Low pressure compressors, sometimes called “ambient air pumps” must be able to provide at least 4 cubic feet per minute (cfm) of air (6 cfm of air if working with asbestos). Their capacity is limited and may not provide enough air in IDLH conditions. High-pressure compressors have the capacity to provide pressure-demand airflow to airline respirators. These photos show compressors specifically designed for respirators.

Construction & Plant Air Compressors

Use these compressors with caution

Be careful – these do not provide clean air without a filter system!!

Oil-lubricated compressor are especially hazardous. Must test for carbon monoxide or have high temperature alarm.

Engine exhaust can also contaminate breathing air.



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[optional slide, if you use these type of compressors.]

The use of these type of compressors is allowed, but must be used with caution. Oil-lubricated compressors are especially susceptible to contamination from the oil itself or from carbon monoxide from overheated oil. If these compressors are used, the air must be filtered before use and they must supply at least 4 cfm of air.

Compressor Air Filters

What air filters are needed on compressors?

Moisture trap

Dust filter

Hydrocarbons(oil, solvents)
absorbent

Carbon monoxide alarm or high-
temp. alarm for oil-lubricated
compressors



compressor filters



carbon monoxide alarm

27

The photos show examples of a newer filter unit. They come in a variety of makes and models.

Compressors We Use

[Discuss compressors you use here]

28

[Optional slide if you use compressors]Describe or show compressors used, and how to operate and maintain them to assure high quality breathing air.

Storage and Maintenance

Airline Respirators

Store facepiece and regulator in clean, dry place. [location]

Coil up hose and store in protected area to prevent damage.

Clean as needed before storage – especially the inside of the facepiece.

Inspect facepiece and hose for damage and replace as needed.



29

The user's manual will give additional details on storage, cleaning maintenance and repair.

Supplied air respirator repairs

Keep spare parts available.

Tag damaged respirators to prevent use.

Repair of SCBA valves, regulators or alarms can only be done by manufacturer's trained person.

30

Have necessary spare parts on hand

Tag respirators with missing or damaged parts to make sure not used until repaired or replaced

Repair of valves, regulators or alarms anyone? This is a special problem with more complex respirators like SCBAs, airline.

Only manufacturer can repair (or a technician trained by the manufacturer can do repairs)