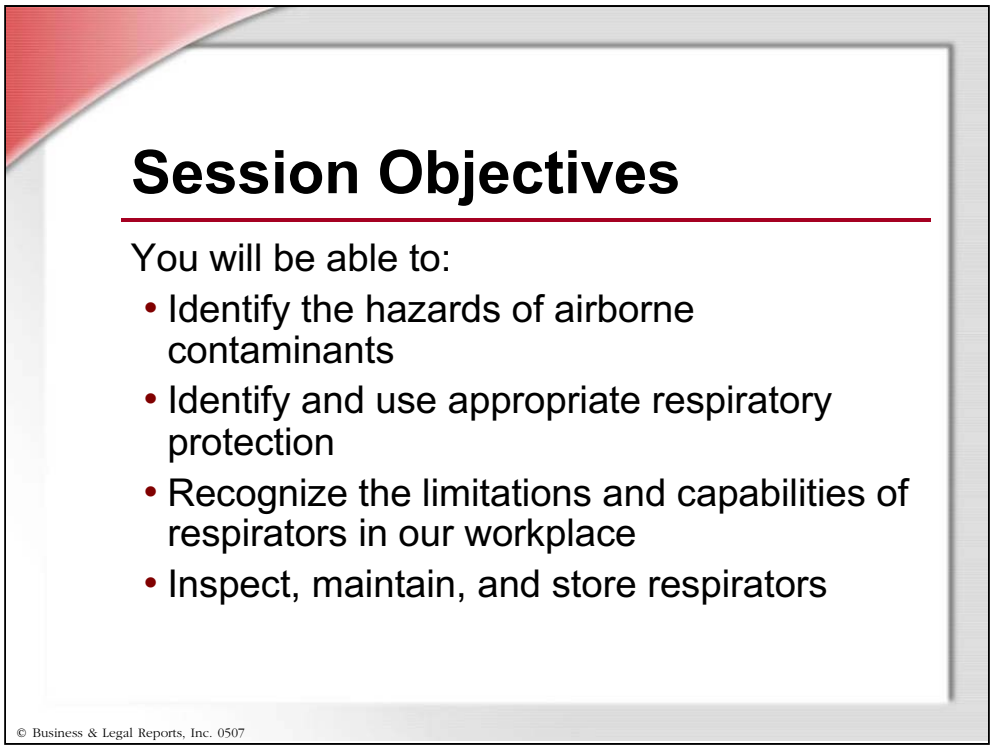
Respiratory Protection

BLR
BUSINESS & LEGAL REPORTS

Slide Show Notes

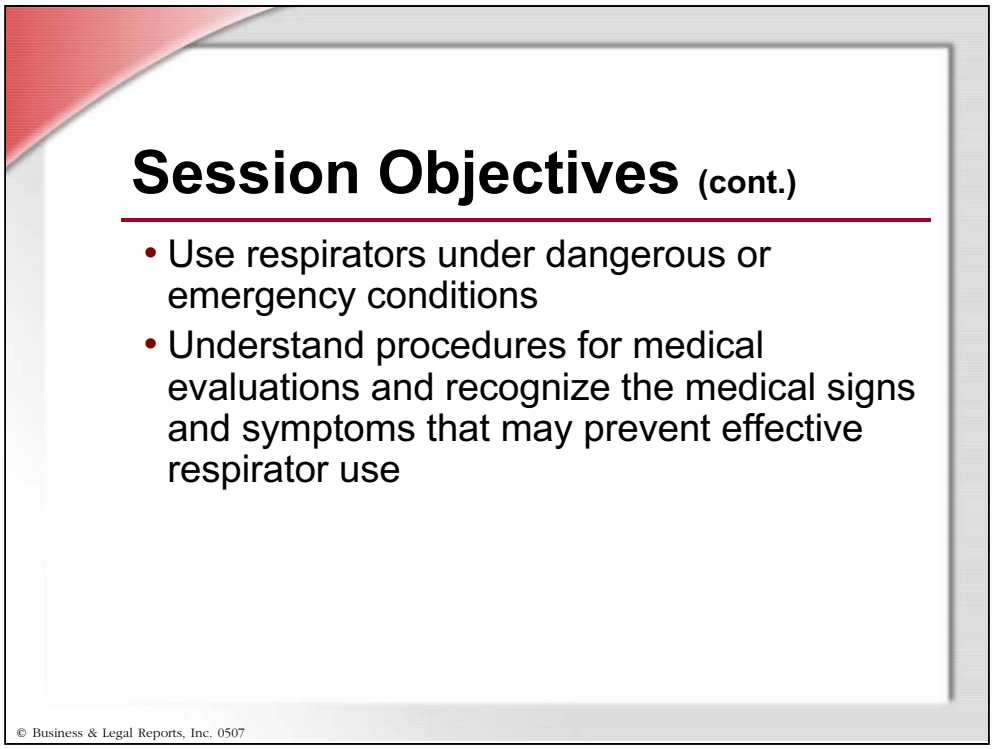
- Welcome to this training session about respiratory protection. It is designed to help protect you from the effects of airborne hazardous substances in the workplace.



Slide Show Notes

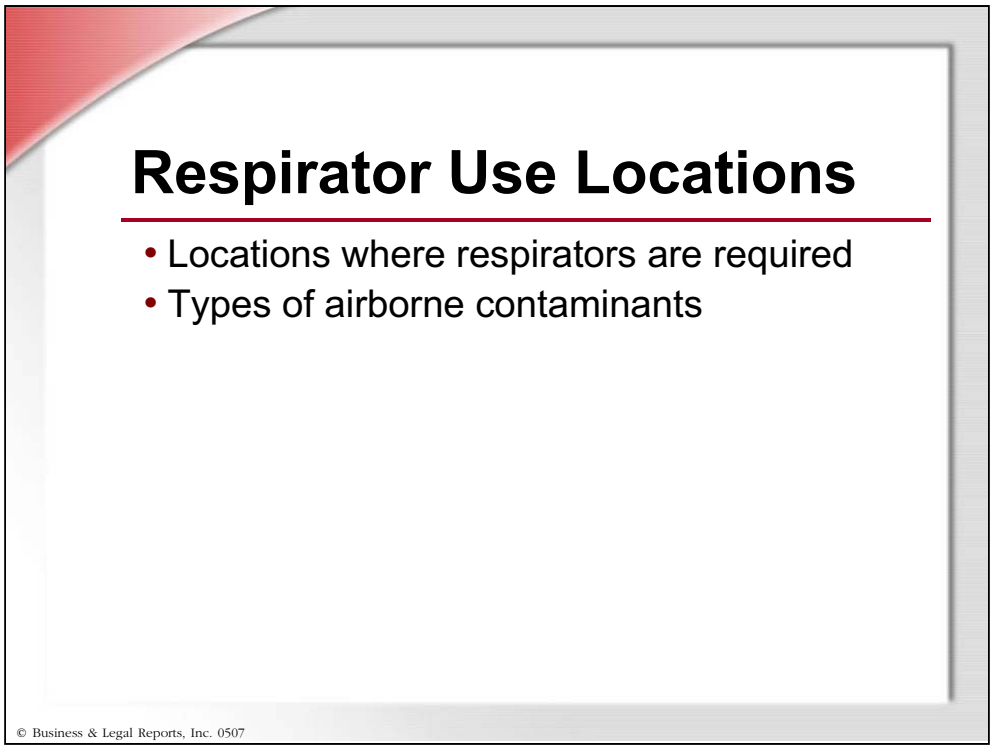
By the end of this training session, you will be able to:

- Identify the hazards of airborne contaminants.
- Identify and use appropriate respiratory protection.
- Recognize the limitations and capabilities of respirators in our workplace.
- Inspect, maintain, and store respirators.



Slide Show Notes

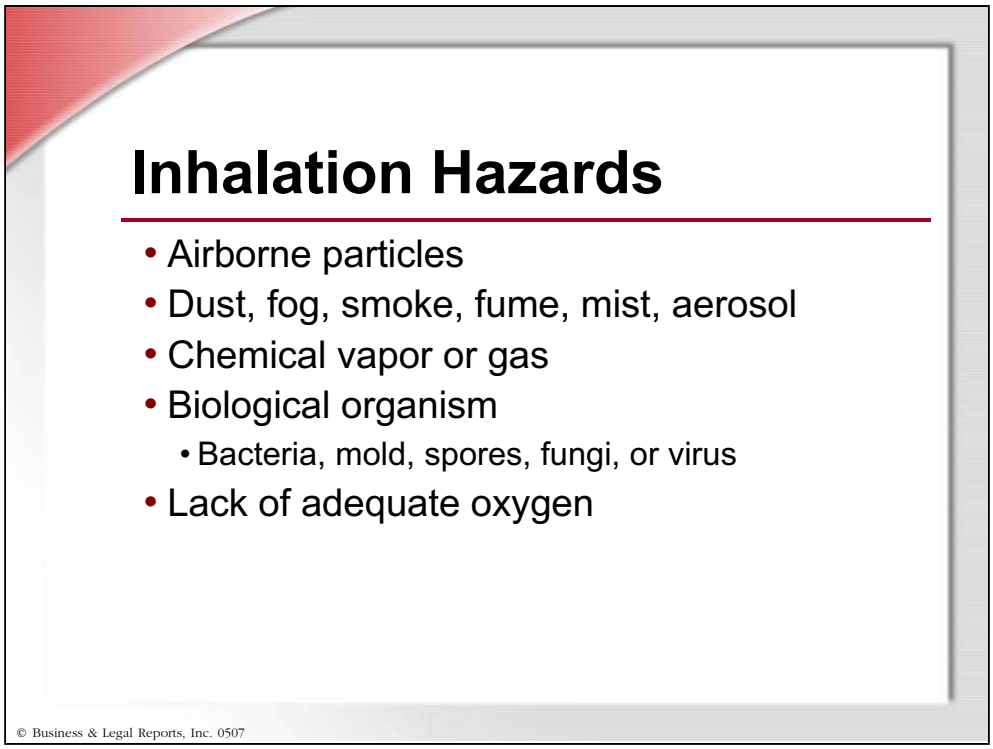
- Use respirators under dangerous or emergency conditions.
- Understand procedures for medical evaluations and recognize the medical signs and symptoms that may prevent effective respirator use.



Slide Show Notes

- Here are the locations in our facility where respirators are routinely or likely to be worn:
- Here are the types of airborne contaminants that occur at those locations:

Modify this slide to describe the locations in your facility where respirators are required, and describe the types of airborne contaminants that occur at those locations.



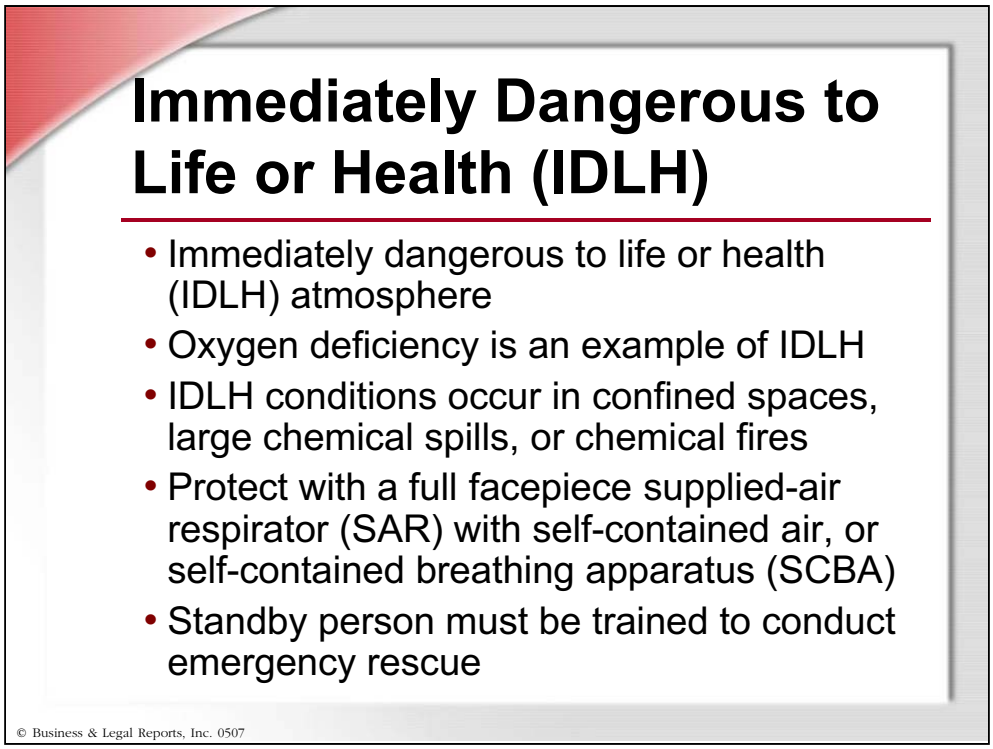
Slide Show Notes

There are several categories of inhalation hazards that can occur at a workplace:

- Airborne particles such as dust, fog, smoke, fume, mist, and aerosol
- Chemical vapors or gases
- Biological organisms
  - Bacteria, mold, spores, fungi, or a virus
- Lack of adequate oxygen

What are the inhalation hazards in our workplace for which respirators must be worn?

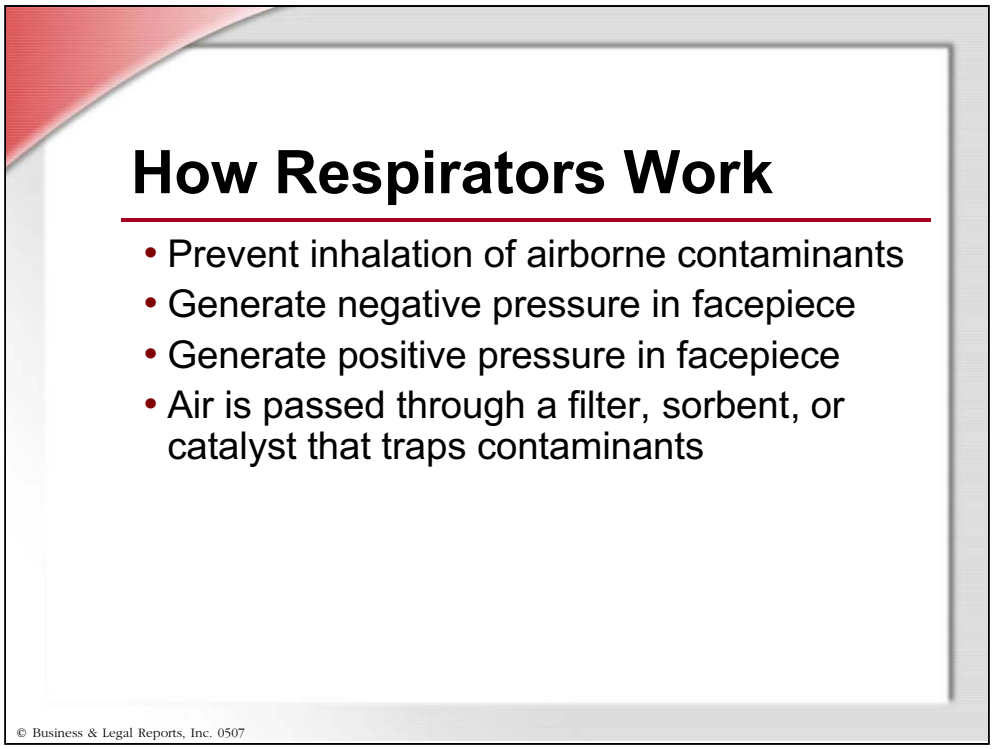
Ask trainees to identify inhalation hazards in their work areas. Modify this slide or add slides to describe the specific respiratory hazards in your facility.



Slide Show Notes

- IDLH means the atmosphere at a specific location is immediately dangerous to life or health. The amount of a chemical or chemicals in the air is so high, or oxygen levels are so low, it can cause death or permanent harm.
- An example of an IDLH atmosphere is where oxygen levels are below the permissible exposure limit of 19.5 percent of air volume.
- In addition to confined spaces (e.g., tanks, vaults, and sewers), IDLH conditions can occur in rooms or buildings with little or no ventilation, or where there has been a release of a highly toxic chemical.
- Only well-trained persons should 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.
- The standby person must be trained to conduct an emergency rescue.

Modify this slide or add slides that describe your company's procedures for working in IDLH atmospheres. Modify or add information about the responsibilities of the standby person.



Slide Show Notes

Here's how respirators work:

- They prevent inhalation of airborne particles, vapors, and other contaminants.
- With negative pressure respirators, when you inhale, the air pressure inside the facepiece is lower during inhalation than the ambient atmosphere outside the mask. The ambient air is pulled through an inlet, passes through a filter, trapping contaminants before the air enters your mouth. Exhaust air is pushed out through the exhalation valve.
- With positive pressure respirators, the air pressure inside the facepiece is greater than the air pressure outside the respirator. The respirator sends breathing air to the respiratory inlet covering when the positive pressure is reduced inside the facepiece by inhalation or leakage.
- Basically, for all types of respirators, air is passed through a filter, sorbent, or catalyst that traps contaminants.

Take apart a respirator and show trainees how the inhalation and exhalation process works, and how airborne contaminants are stopped from inhalation. Or, have trainees wear the respirators as you explain the process.

When Are Respirators Needed?

- When other controls are inadequate or not feasible
- During installation of engineering controls
- During maintenance operations
- While performing nonroutine tasks
- For emergency response

Slide Show Notes

Respirators should never be your first line of defense against exposure to airborne contaminants.

- They are to be used only after it is determined that effective engineering controls, such as special enclosures, ventilation, or use of less toxic chemicals, are not in place or are not feasible to prevent exposure.
- They must be used during the installation of engineering controls.
- They are routinely worn during maintenance operations where dusts, vapors, and other airborne contaminants are generated.
- Nonroutine tasks are those typically performed by maintenance, or another service organization. Nonroutine tasks vary, making it difficult to implement engineering controls; therefore, respirators are used extensively in maintenance operations.
- They are routinely worn during emergency response operations by first responders and rescue personnel. They are also often used by workers at hazardous waste site cleanup operations.

Modify this slide to describe the conditions when respirators are needed at your facility.

Types of Facepieces

Tight-fitting
- Straps or clamps
- Half face, full face, or mouthpiece

Loose-fitting
- Hood or helmet
- Dust mask (durable or single-use)

Slide Show Notes

Respirators have either tight-fitting or loose-fitting facepieces.

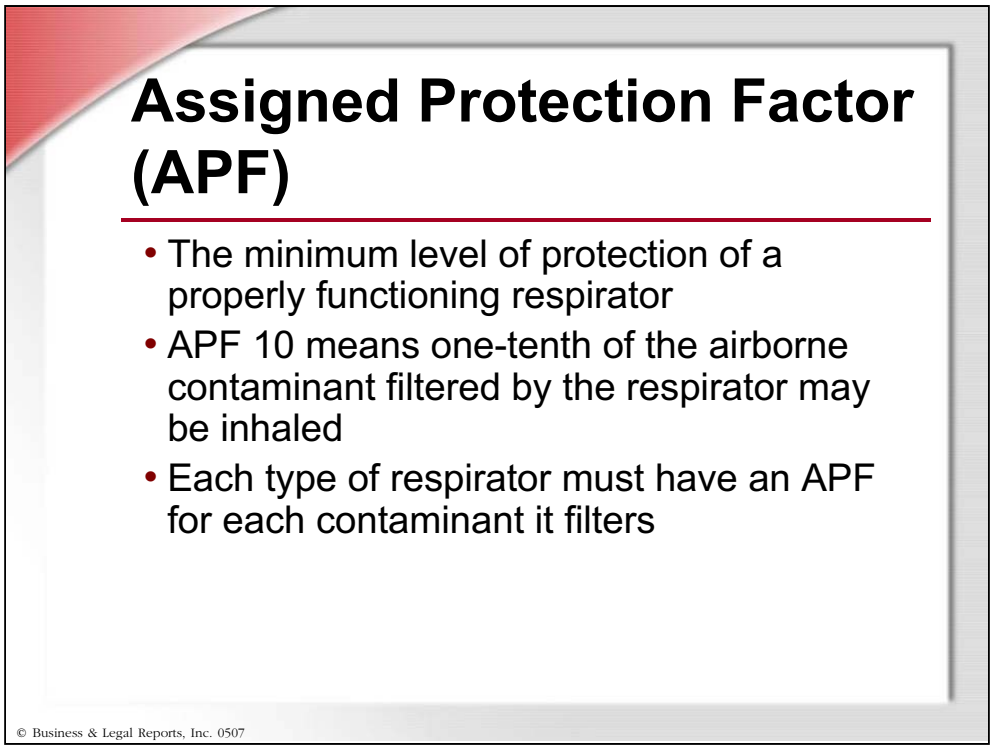
Tight-fitting, top picture

- Straps or clamps
- Half mask (covers the mouth and nose), full mask (covers the entire face, including the eyes), or mouthpiece (covers the mouth with a clamp for the nose). Both air-purifying and atmosphere-supplying respirators use both half-mask and full-face configurations.

Loose-fitting, pictured below

- Hood or helmet
- Dust mask (durable or single-use)

Modify or hide this or subsequent slides if they do not apply to your workplace.



Slide Show Notes

- The assigned protection factor (APF) of a respirator reflects the minimum level of protection that a properly functioning respirator would be expected to provide to a population of properly fitted and trained users.
- For example, an APF of 10 for a respirator means that a user could expect to inhale no more than one-tenth of the airborne contaminant present. An APF of 50 means one-fiftieth of the contaminant may be inhaled.
- Each type of respirator has an APF for each contaminant it filters. For example, a half-mask, air-purifying respirator must have an APF of 10 for cadmium, and a full-facepiece air-purifying respirator must have an APF of 50 for the same chemical.

Air-Purifying Respirator (APR)

- APRs are negative pressure
- Simply filter the air, not supply oxygen
- Particulate
- Gas and vapor
- Combination
- Limited to non-IDLH atmospheres, maximum APF 50

Slide Show Notes

The most common type of respirator in use today is the APR.

- APRs are negative pressure respirators.
- The APR is fitted with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element. They do not supply oxygen to the facepiece.
- Particulate APRs remove dusts, fumes, and other airborne particles.
- Gas and vapor APRs, pictured here, remove chemical gases and vapors.
- A combination APR removes both particles and gases/vapors.
- APRs do not provide adequate protection in IDLH atmospheres. They offer a maximum APF of 50.

Show examples of the available types of respirators to the class. Allow trainees to put on and practice using the appropriate respirator for their specific work areas. Modify this slide to describe the APRs used at your facility. Delete the slide if it does not apply.

Half-Face APR

- Maximum APF of 10
- No protection for the face or eyes
- Sight is not impaired, and no need for corrective lenses
- Not as heavy as full face respirator

Slide Show Notes

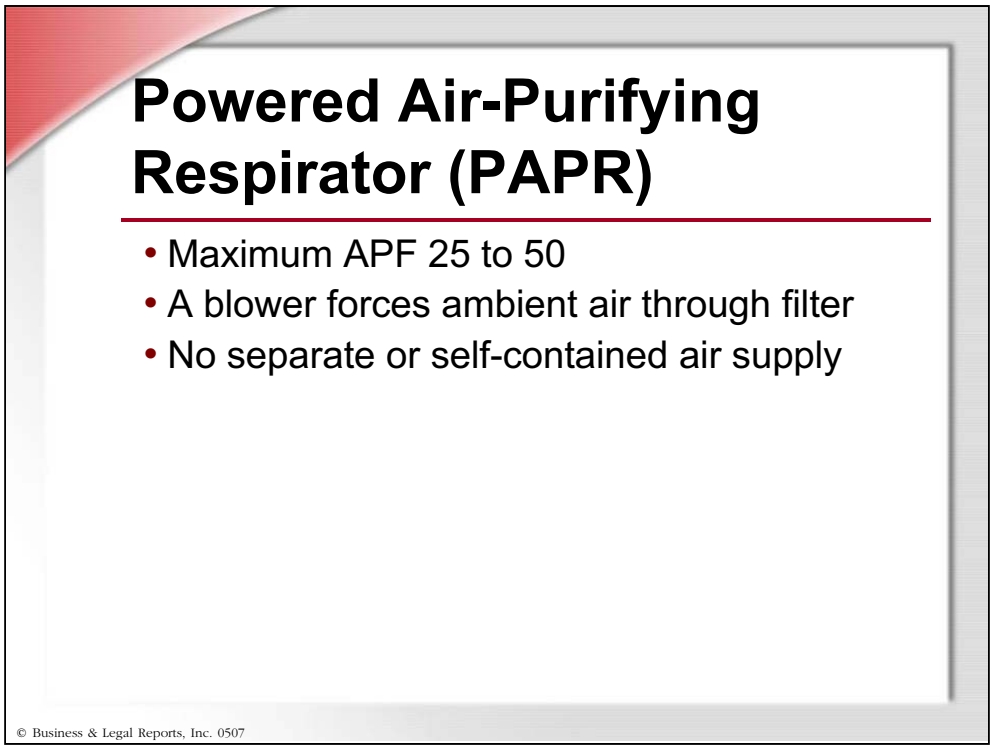
- The maximum APF for half-face APRs is 10, so its use is limited.
- There is no protection for the face or eyes.
- Your sight is not impaired, and there is no need for corrective lenses.
- They are not as heavy as a full-face respirator.

Full-Face APR

- Maximum APF of 50
- Protects the face and eyes
- Difficult to see when the facepiece fogs up
- Difficult to speak
- Requires lens correction

Slide Show Notes

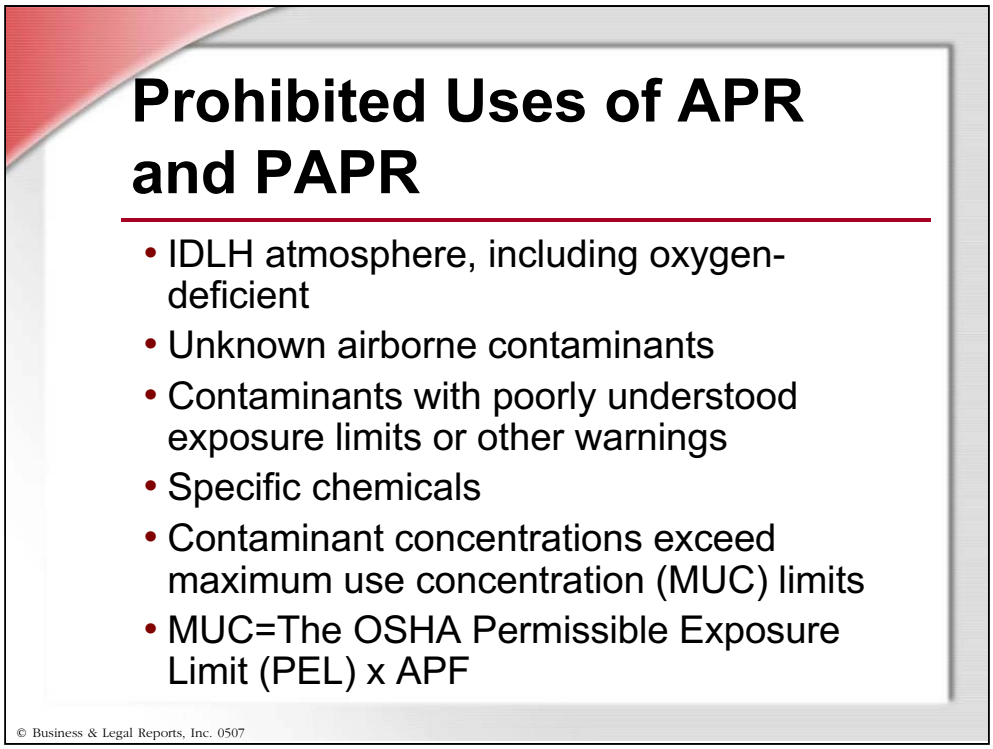
- The full-face APR has a maximum APF of 50.
- It protects the face and eyes as well as nose and mouth.
- It is difficult to see when the facepiece fogs up.
- It's also difficult to speak through the facepiece.
- It requires a lens correction kit.



Slide Show Notes

- The maximum APF is 25 for loose-fitting facepieces, and 50 for tight-fitting facepieces.
- An air-purifying respirator uses a blower to force the ambient air through air-purifying elements to the inlet covering or facepiece.
- There is no separate or self-contained air supply.

Show examples of the available types of respirators to the class. Allow trainees to put on and practice using the appropriate respirator for their specific work areas. Modify this slide to describe the PAPRs used at your facility. Delete the slide if it does not apply.



Slide Show Notes

Do not use APRs or PAPRs under the following conditions:

- In an IDLH atmosphere, including oxygen-deficient atmospheres.
- Where there are unknown airborne contaminants.
- Where contaminants with poorly understood exposure limits or other warnings exist.
- Where specific chemicals are present that the APR/PAPR is not specifically designed to filter.
- The contaminant concentrations exceed maximum use concentration (MUC) limits.
- The MUC is the OSHA Permissible Exposure Limit (PEL) x APF of the respirator.

Atmosphere-Supplying

- Provides a separate or self-contained air supply from outside the ambient atmosphere
  - SAR
  - SCBA
- Primary types are continuous flow, demand, and pressure demand

Slide Show Notes

Another type of respirator is an atmosphere-supplying respirator. It is commonly used by emergency responders and spill cleanup personnel.

- A type of respirator that supplies the user with breathing air from a source independent of the ambient atmosphere, including:
  - Supplied-air respirators (SARs), top picture
  - Self-contained breathing apparatus (SCBA) units, bottom picture, are used for possible or actual life-threatening situations
- There are three primary types of atmosphere-supplying respirators:
  - Continuous Flow provides a continuous flow of breathing air to the respirator.
  - Demand admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation. Because of this, almost no one uses it.
  - Pressure Demand admits breathing air to the facepiece when the positive pressure inside the facepiece is reduced by inhalation.

Show examples of the available types of respirators to the class. Allow trainees to put on and practice using the appropriate respirator for their specific work areas. Modify this slide to describe the atmosphere-supplying respirators used at your facility. Delete the slide if it does not apply.

Dust Mask (Filtering Facepiece)

- Negative pressure
- Filter removes particulates (dust)
  - The filter is an integral part of the mask
  - The entire mask is composed of the filter material
- Hazard protection is very limited

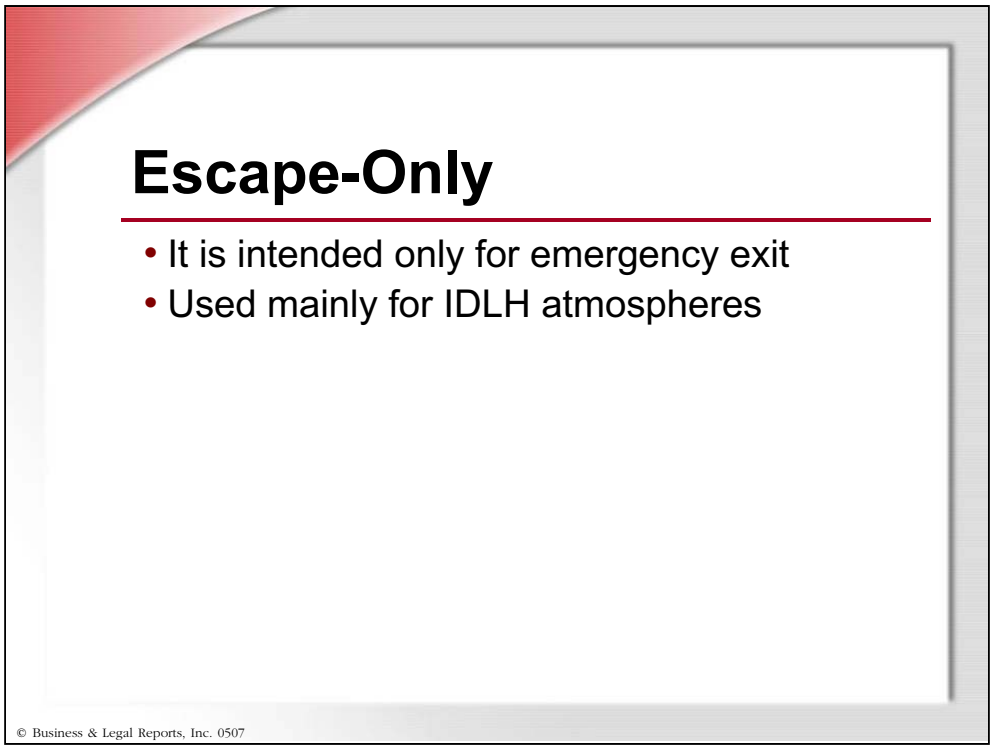
Image credit: OSHA

Slide Show Notes

The dust mask is otherwise known as a filtering facepiece.

- As explained earlier, negative pressure means the air pressure inside the mask is lower during inhalation than the ambient atmosphere outside the mask, pulling air through the filter.
- The filter removes particulates (dust).
  - The filter is an integral part of the mask.
  - The entire mask is made of the filter material.
- Protection from most hazards is very limited or not available at all. They are generally used for blocking larger dust particles, but do not block very small particles, fumes, gases, or most other airborne contaminants.

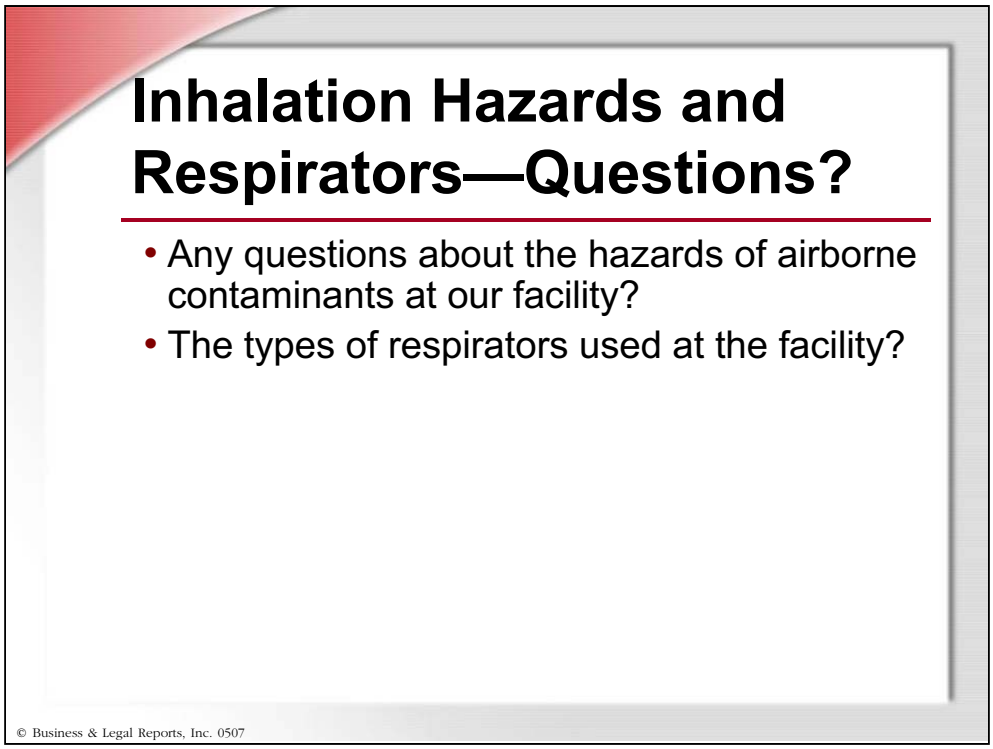
Show examples of the available types of respirators to the class. Allow trainees to put on and practice using the appropriate respirator for their specific work areas. Modify this slide to describe the APRs used at your facility. Delete the slide if it does not apply.



Slide Show Notes

- An escape-only respirator is intended to be used only for emergency exit.
- It is used mainly for escaping IDLH atmospheres.

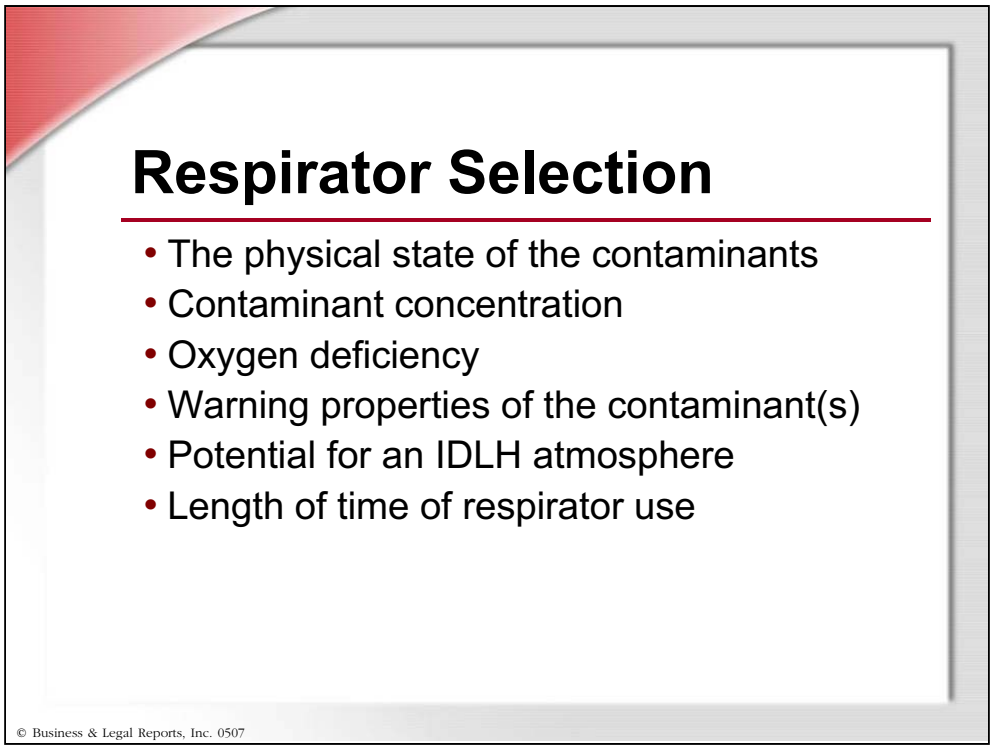
Show examples of the available types of respirators to the class. Allow trainees to put on and practice using the appropriate respirator for their specific work areas. Modify this slide to describe the escape-only respirators used at your facility. Delete the slide if it does not apply.



Slide Show Notes

- Do you have any questions about the inhalation hazards of airborne contaminants at our facility?
- Any questions about the types of respirators used at the facility?

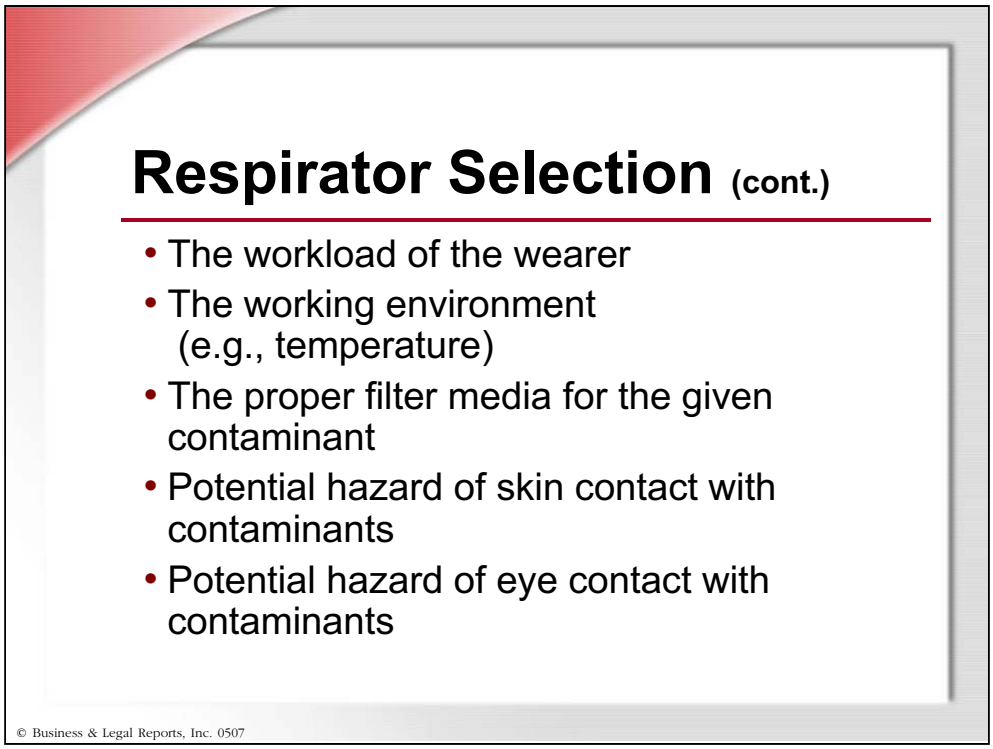
Conduct an exercise that illustrates the inhalation hazards at the facility, and ask trainees to identify the appropriate respirator for the hazard.



Slide Show Notes

It is our company's responsibility to select the appropriate respirator for the right job. For your information, these criteria should be taken into account when choosing a respirator:

- The physical state of the contaminants (vapor, gas, or solid)
- The contaminant concentration in the atmosphere
- Whether there is an oxygen deficiency
- How easy is it to detect the contaminant with the human senses (e.g., smell)
- The risk that we may encounter an IDLH atmosphere
- The length of time the respirator will be used



Slide Show Notes

Some additional criteria to consider when choosing a respirator include:

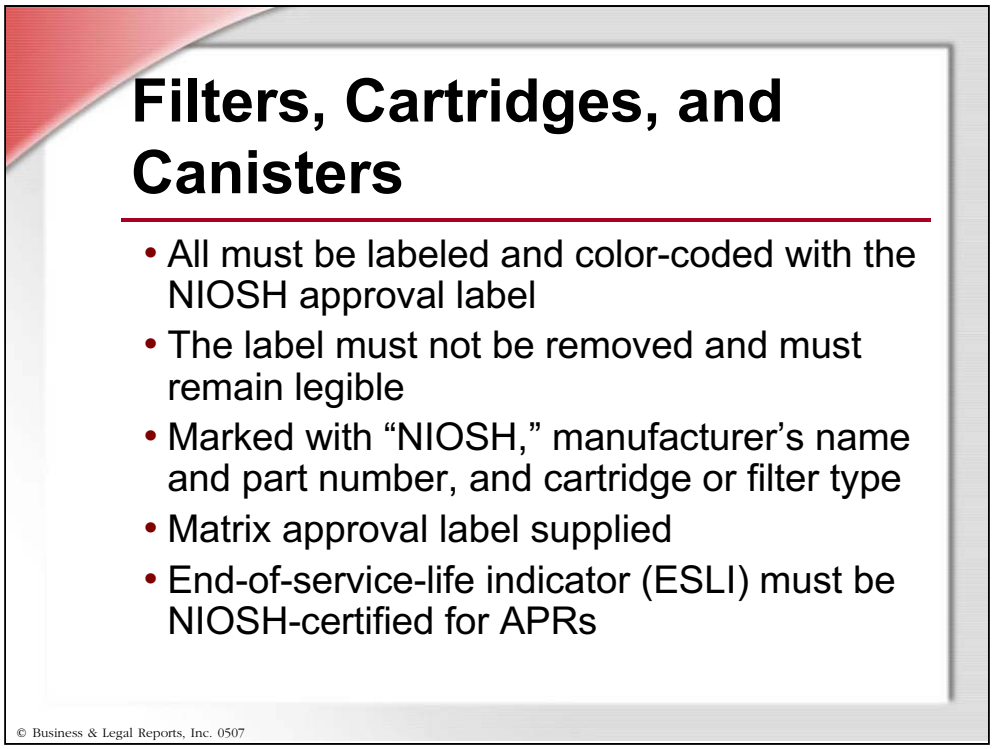
- The workload of the wearer
- Other environmental factors, including room temperature and relative humidity
- The proper filter media for the given contaminant (e.g., high-efficiency particulate air [HEPA] cartridge for dusts)
- Potential hazard of skin contact with contaminants
- Potential hazard of eye contact with contaminants

Respirators for Non-IDLH Use

- If cartridges have no “end of service life indicator,” a change schedule must be used
- Added table for oxygen-deficient atmospheres based on altitude

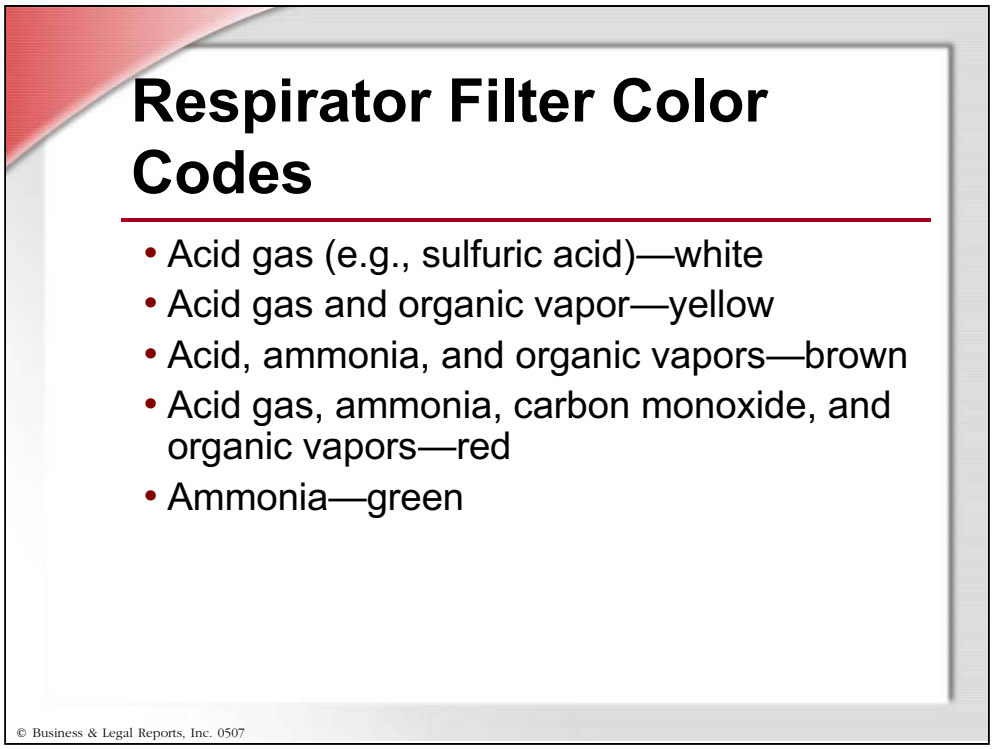
Slide Show Notes

- If cartridges have no “end-of- service-life indicator,” employers must come up with their own schedule for cartridge change out. It is recommended that employers obtain information from various manufacturers to assist in developing the change schedule.
- The oxygen-deficiency table will be of value in areas of high altitude; otherwise, differences are negligible.



Slide Show Notes

- All respirator filters, cartridges and canisters used in the workplace must be labeled and color coded with the NIOSH approval label.
- The label must not be removed and must remain legible.
- All filters, cartridges, or canisters must be marked with "National Institute of Occupational Safety and Health" (NIOSH), the manufacturer's name and part number, and an abbreviation to indicate cartridge or filter type (e.g., N95 or P100).
- A matrix approval label must be supplied, usually as an insert in the shipping box.
- Air-purifying respirators should be equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant. You must implement a change schedule for canisters and cartridges.

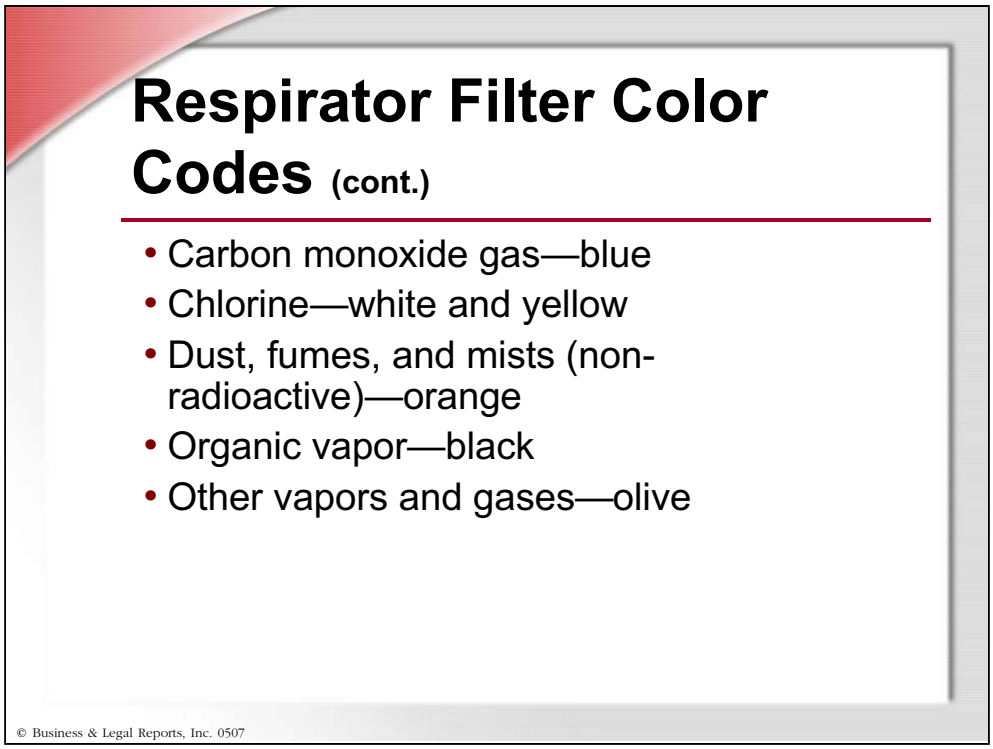


Slide Show Notes

This chart illustrates the NIOSH-approved color-coded labels used on respirator filters, cartridges, or canisters.

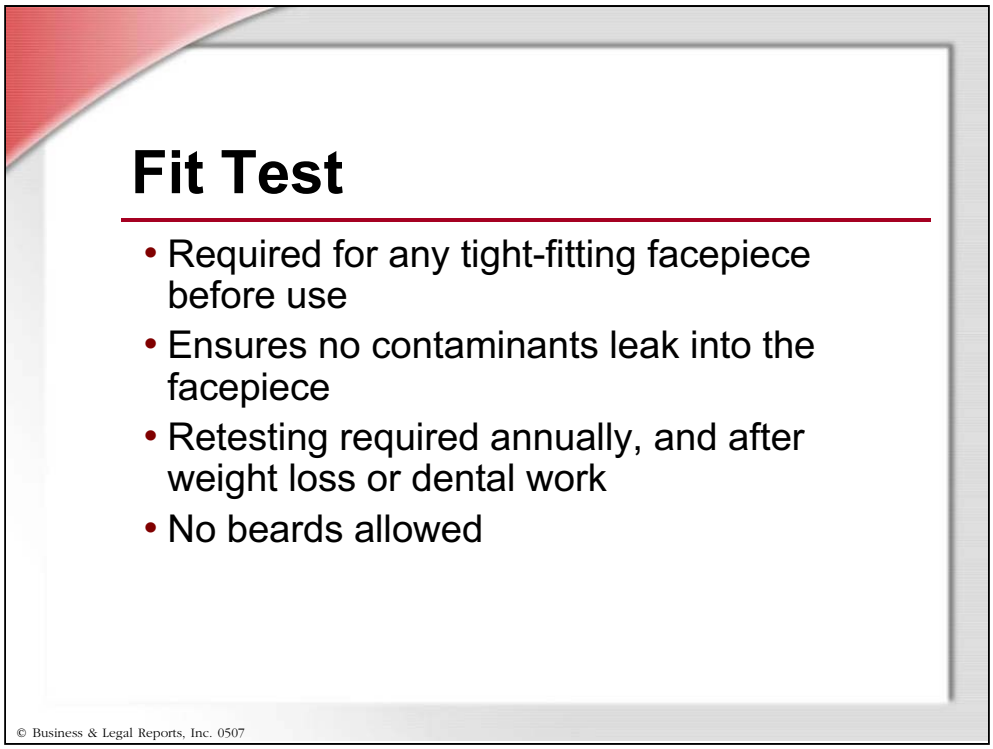
- Acid gas (e.g., sulfuric acid)—white
- Acid gas and organic vapor—yellow
- Acid, ammonia, and organic vapors—brown
- Acid gas, ammonia, carbon monoxide, and organic vapors—red
- Ammonia—green

Show trainees examples of respirator filters or cartridges with the appropriate color-coded labels.



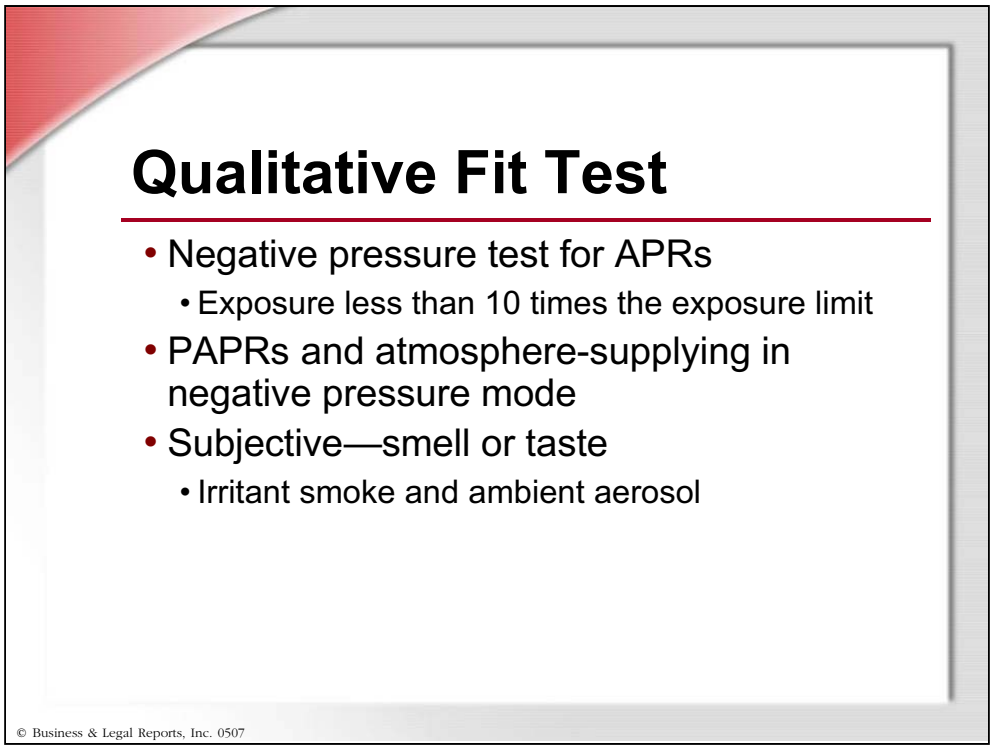
Slide Show Notes

- Carbon monoxide gas—blue
- Chlorine—white and yellow
- Dust, fumes, and mists (non-radioactive)—orange
- Organic vapor—black
- Other vapors and gases—olive



Slide Show Notes

- Before an employee uses any respirator with a negative- or positive-pressure tight-fitting facepiece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used during work activities.
- The fit test ensures there are no contaminants leaking into the facepiece.
- Retesting required annually, and after weight loss or dental work.
- Beards are not allowed when wearing a respirator.



Slide Show Notes

- Qualitative fit testing is done for negative pressure air-purifying respirators (APRs).
  - Users may rely on either a qualitative or a quantitative fit test procedure for exposure levels less than 10 times the occupational exposure limit.
- Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators can be performed using either quantitative or qualitative testing in the negative pressure mode.
- Qualitative fit testing is pass-fail, is very subjective and relies on the wearer to identify whether or not they smell or taste the challenge agent.
  - Irritant smoke is an example of a qualitative test to determine if the wearer can detect it.
  - Ambient aerosols are also used for qualitative testing.

Discuss the fit test procedures used at your facility. Modify this slide or add slides that describe the fit testing requirements for respirators used at your facility. Some qualitative fit tests include: isoamyl acetate, irritant smoke, saccharin solution aerosol, or Bitrex™ aerosol. Consult with the regulation at 29 CFR 1910.134, Appendix A for fit test requirements.

Quantitative Fit Test

- Numeric measurement—fit factor—of leakage into the respirator
  - Controlled negative pressure
  - Portacount™
- For negative-pressure APRs, exposure levels greater than 10 times the occupational exposure limit

Slide Show Notes

- Quantitative fit testing is an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator. It provides a number called a fit factor, which can identify the quality of the fit and document compliance with the OSHA standards. Some quantitative tests include:
  - Controlled negative pressure
  - Ambient atmosphere (Portacount™)
- It is used on negative-pressure APRs for exposure levels greater than 10 times the occupational exposure limit. Remember that fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators can be performed using either quantitative or qualitative testing in the negative pressure mode.

Check the Seal

- No facial hair or glasses are allowed that prevent a tight seal
- The facepiece seal is paramount
- Perform a seal check each time you put on the respirator
- Conduct a positive and negative pressure check

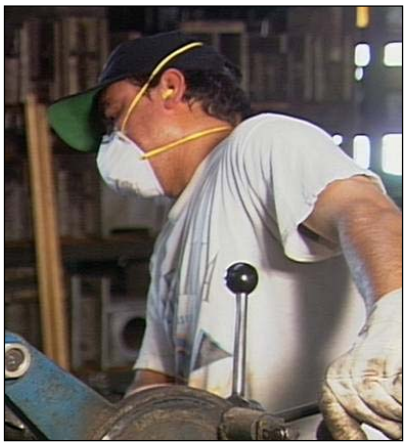
Slide Show Notes

- Employees who have facial hair or any condition that interferes with the face-to-facepiece seal or valve function are not allowed to wear tight-fitting facepieces.
- Corrective glasses or goggles or other PPE must be worn in a manner that does not interfere with the face-to-facepiece seal.
- Employees wearing tight-fitting respirators must perform a user seal check each time they put on the respirator using the procedures in Appendix B-1 of 29CFR 1910.134 or equally effective manufacturer's procedures
- Conduct both a positive and negative pressure check. Hold your hand over the air intake valve to test the positive pressure, and your hands over the filters or cartridge components to check negative pressure, as pictured here.

Modify this slide to describe any other seal protection procedures required at your facility.

Voluntary Use of Respirators

- You can use your own respirator if it does not create a hazard
- Read the information for voluntary users of respirators
- Program for nonrequired users
- No program required if only dust masks are used

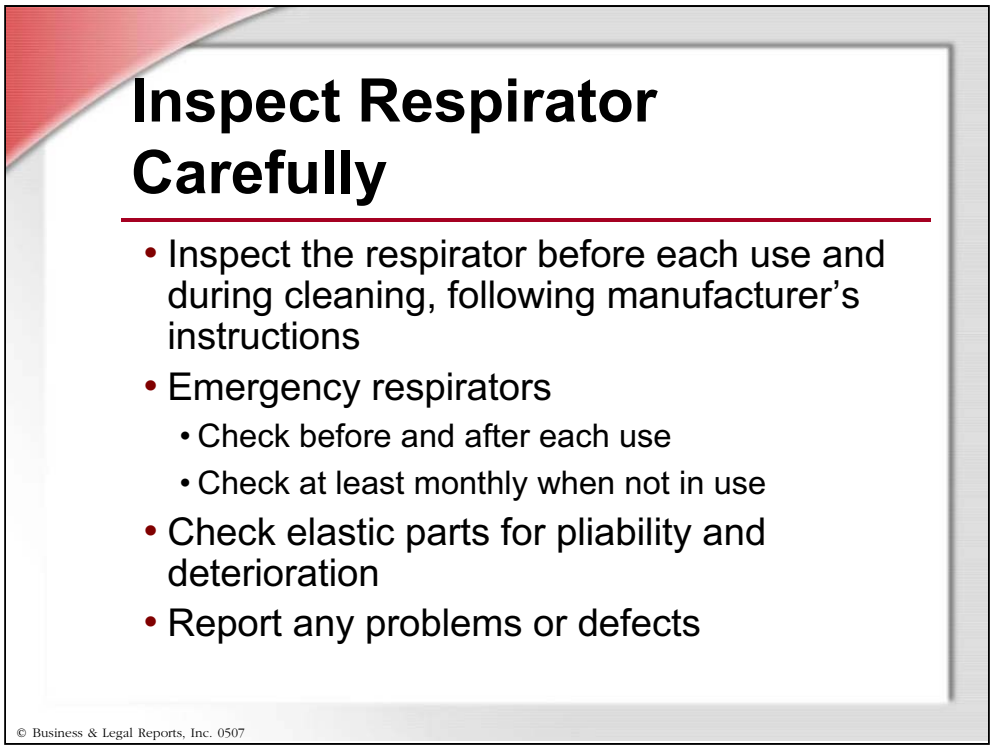


Slide Show Notes

- You can now use your own respiratory protection as long as it does not create an additional hazard. We (the employer) still have the fundamental responsibility to ensure that the respirator in use is appropriate for the job.
- If you use a respirator when it is not required, read the information given to you about non-regulated respirator use provided by our company.
- We have a program to ensure voluntary use of respirators is done effectively.
- There is no voluntary use program if the only respirator used is a dust mask.

Describe your company's program for voluntary respirator users, if applicable.

Provide voluntary users of respirators with the information contained in 29 CFR 1910.134, Appendix D, "Information for Employees Using Respirators When Not Required Under the Standard."



Slide Show Notes

Now we'll talk about the inspection, maintenance, and storage procedures for respirators.

- Inspect all respirators used in routine situations before each use and during cleaning, making sure to follow manufacturer's instructions. Check all components of respirator function, tightness of connections, and the condition of the various parts.
- All respirators maintained for use in emergency situations shall be inspected
  - At least monthly and in accordance with the manufacturer's recommendations
  - For proper function before and after each use
- Check elastic parts for pliability and signs of deterioration
- Report any problems or defects to your supervisor. Do not attempt to repair any respirator components unless you are certified and authorized to do it.

Modify this slide or add slides to describe the specific inspection procedures for respirators at your facility. Show trainees the respirator inspection sheet. Have trainees conduct inspections of the sample respirators.

APRs—Maintain and Clean Components

- Toss out dust masks
- Remove filters
- Wash and rinse
- Carefully replace valves
- Dry with cloth or air dry
- Reassemble, then test

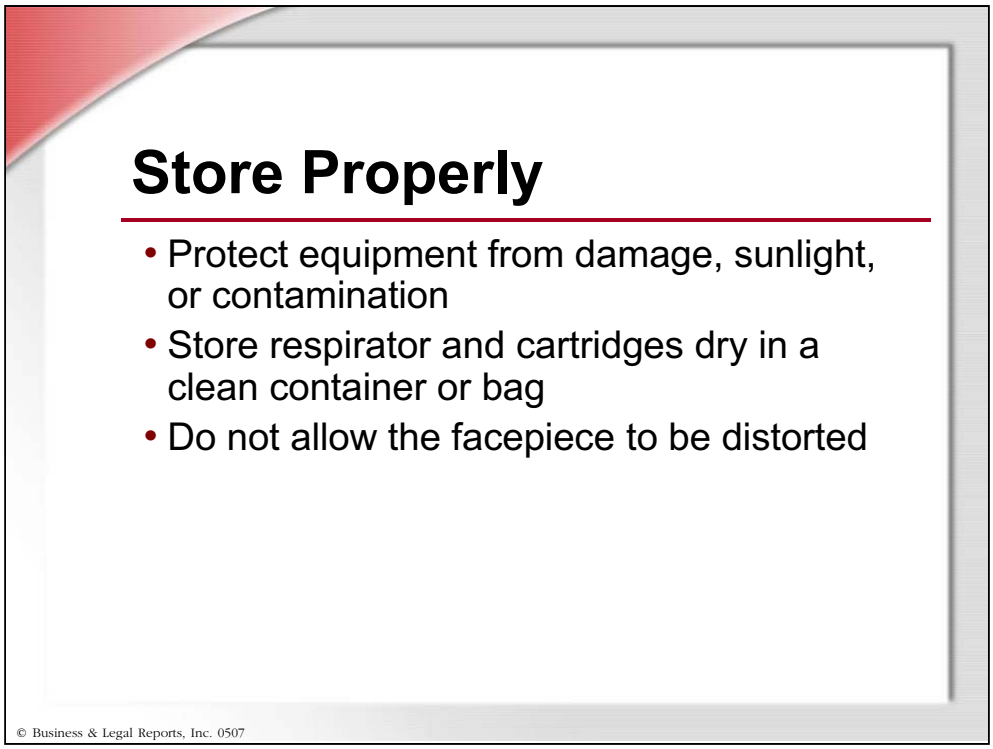
Image credit: OSHA

Slide Show Notes

Now we'll discuss the cleaning procedures for APRs.

- First, a note about dust masks—throw it away after use. Once it is coated with dust, replace it. Don't try to clean it.
- For APRs, remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running, water. Drain. Remove the cartridges.
- Be careful replacing any inhalation and exhalation valves.
- Dry with a clean, dust-free cloth or air dry in a clean room.
- Reassemble the respirator components, and test to make sure it is fully functional for use.

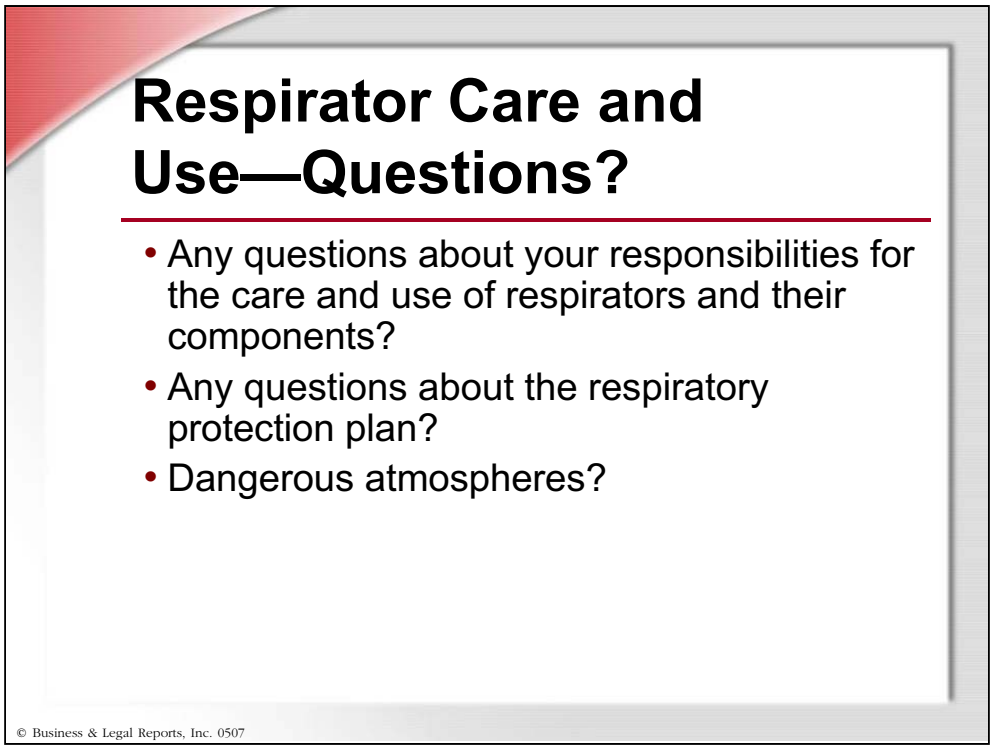
Modify this slide to describe additional respirator maintenance and cleaning requirements at your facility. Show trainees a copy of the manufacturer's cleaning instructions. Have trainees perform the cleaning procedures using a sample respirator.



Slide Show Notes

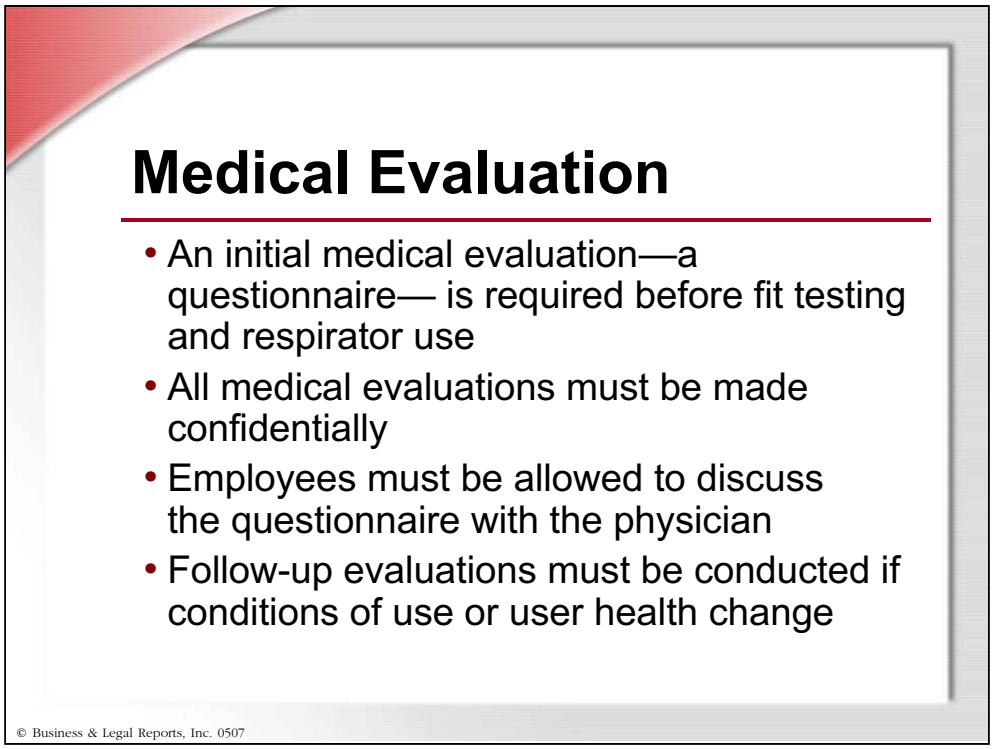
- Protect all respirators and other protective equipment from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals when they are stored.
- Store the respirator and cartridges dry in a clean container or bag.
- Do not allow the respirator to be stored in a way that will allow the facepiece to become distorted.

Modify this slide to describe or show additional respirator storage requirements at your facility. Show trainees where and how respirators are stored at your facility.



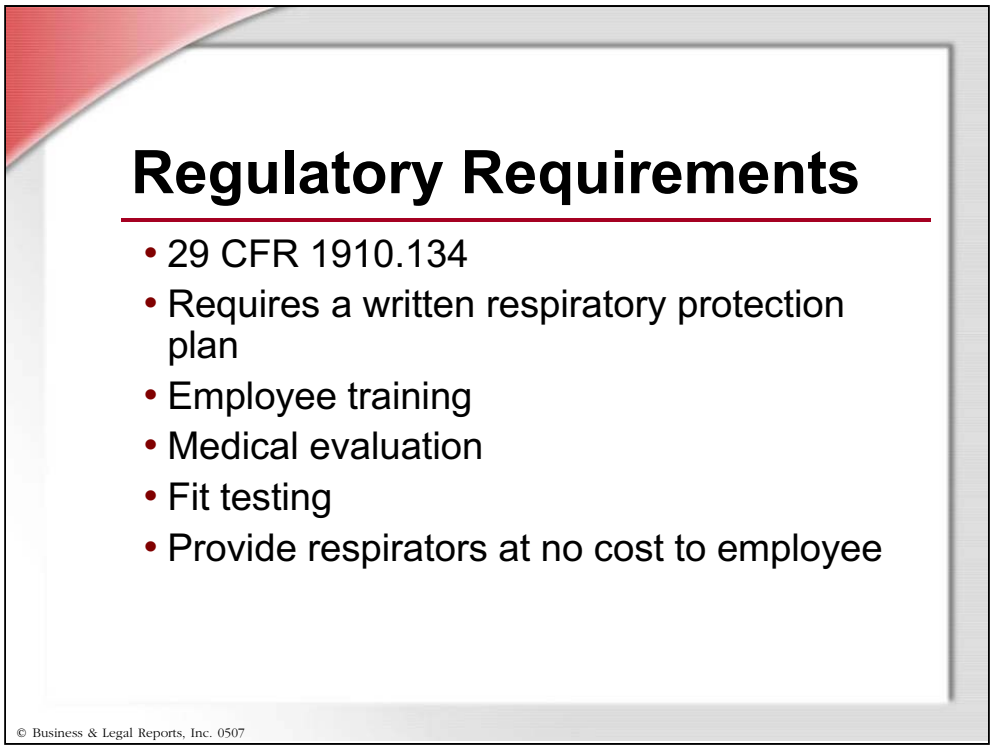
Slide Show Notes

- Are there any questions about your responsibilities for the care and use of respirators and their components?
- Any questions about the respiratory protection plan?
- Questions about IDLH atmospheres?



Slide Show Notes

- A medical evaluation is required before fit testing and respirator use. The initial evaluation is a questionnaire.
- All medical evaluations must be made confidentially.
- You may discuss your questionnaire with the licensed health care professional.
- Follow-up evaluations must be conducted if conditions of use or user health change.

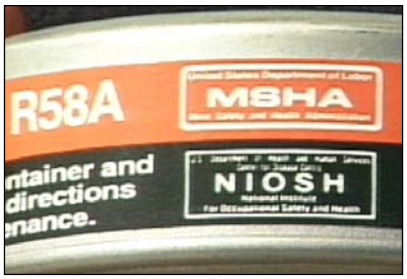


Slide Show Notes

- If you use respiratory protection, it is important that all the following regulatory elements (Code of Federal Regulations Title 29, Section 1910.134) be in place:
- A written respiratory protection plan
- Employee training
- Medical evaluation
- fit testing
- Provide respirators at no cost to employee

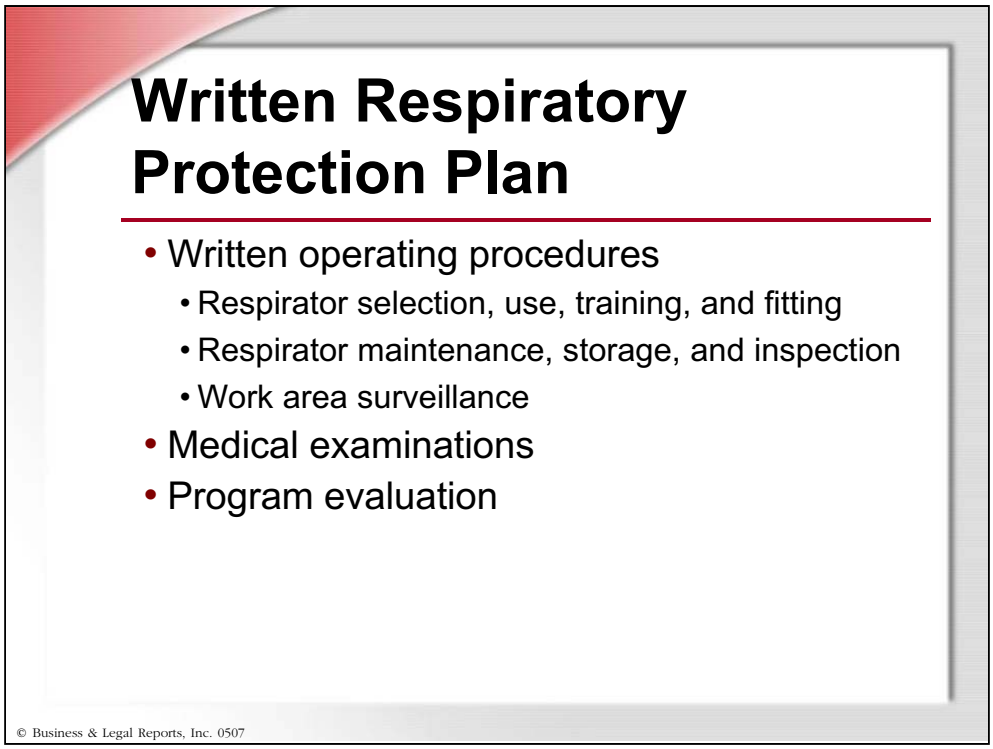
Employer's General Requirements

- Use NIOSH-approved respirators only
- Evaluate the workplace hazards
- Select respirators from multiple models and sizes
- Where exposure to hazards can't be estimated, consider it as IDLH



Slide Show Notes

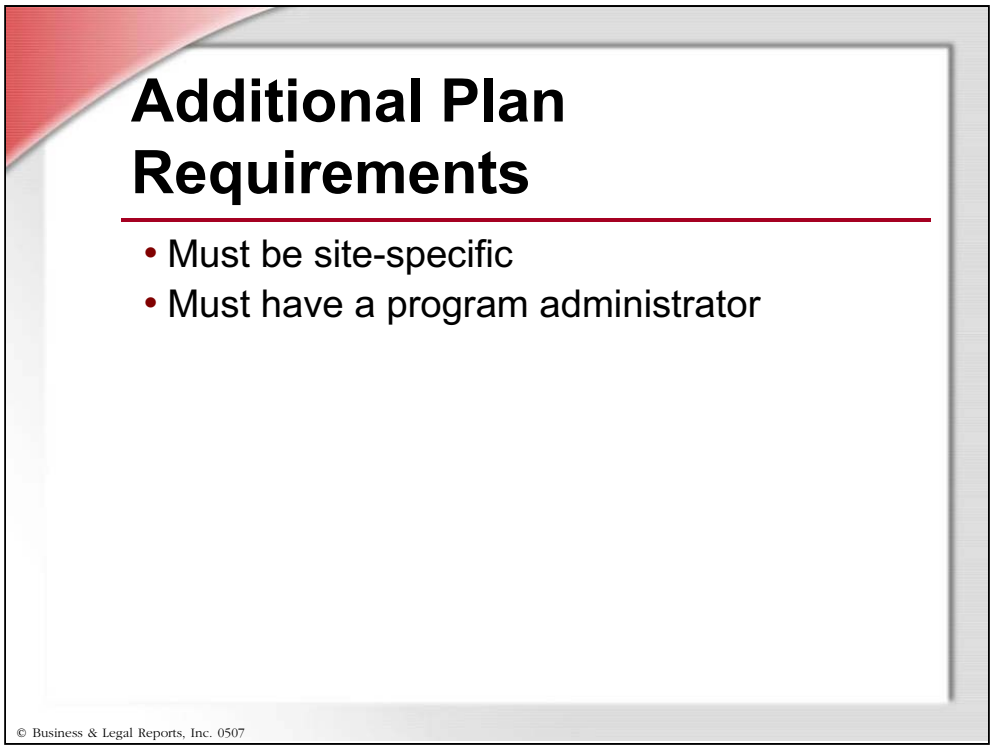
- All of our respirators must be NIOSH-certified.
- We must complete a thorough evaluation of the workplace respiratory hazards and provide respirators that will protect you from any identified hazards.
- Our company must select respirators from a sufficient number of models and sizes so that the respirator is acceptable to, and correctly fits, the user.
- Where exposure to respiratory hazards can't be identified or reasonably estimated, the atmosphere must be considered IDLH.



Slide Show Notes

- If you or co-workers are required to wear respirators, the law says our company must have an adequate written respiratory protection program that describes the procedures for:
  - Respirator selection, use, training, and fitting
  - Respirator maintenance, storage, and inspection
  - Work area surveillance
- The plan must also describe the process for medical examinations.
- It must also describe procedures for evaluating the effectiveness of the respirator protection program.

Bring a copy of the written respiratory protection plan and describe its basic elements.



Slide Show Notes

- Companies not only have to have a written program, but it must be site-specific. No boilerplate programs will be accepted by OSHA. The program must state how our company will meet the requirements.
- The respiratory protection program coordinator is _____.

What's Wrong Here?

- Worker applying trichloroethane in a confined space
- Half-face respirator
- Becomes unconscious
- List the hazards

Slide Show Notes

Now we'll conduct an exercise.

This training session presents a case study of an actual accident, which was inspected and documented by OSHA. The OSHA case is: Accident: 170702674, Report ID 0950614, and Inspection: 111816161

- The employee was applying 1,1,1-trichloroethane primer inside 5' x 5' planter boxes.
- He was wearing a half-face cartridge respirator.
- After a short while, he became unconscious. Not shown here, a second employee attempted a rescue without a respirator. He also became unconscious. Thankfully, in this case, the local fire department rescued both employees. When the atmosphere around the employees was tested, the concentration of 1,1,1-trichloroethane measured 80,000 ppm.
- What are some of the hazards in this situation?
  - Working in a confined space with a dangerous atmosphere
  - Exposure to a hazardous substance
  - Poor air circulation, especially for a heavier-than-air chemical
  - Explosion or fire

What Can Be Done?

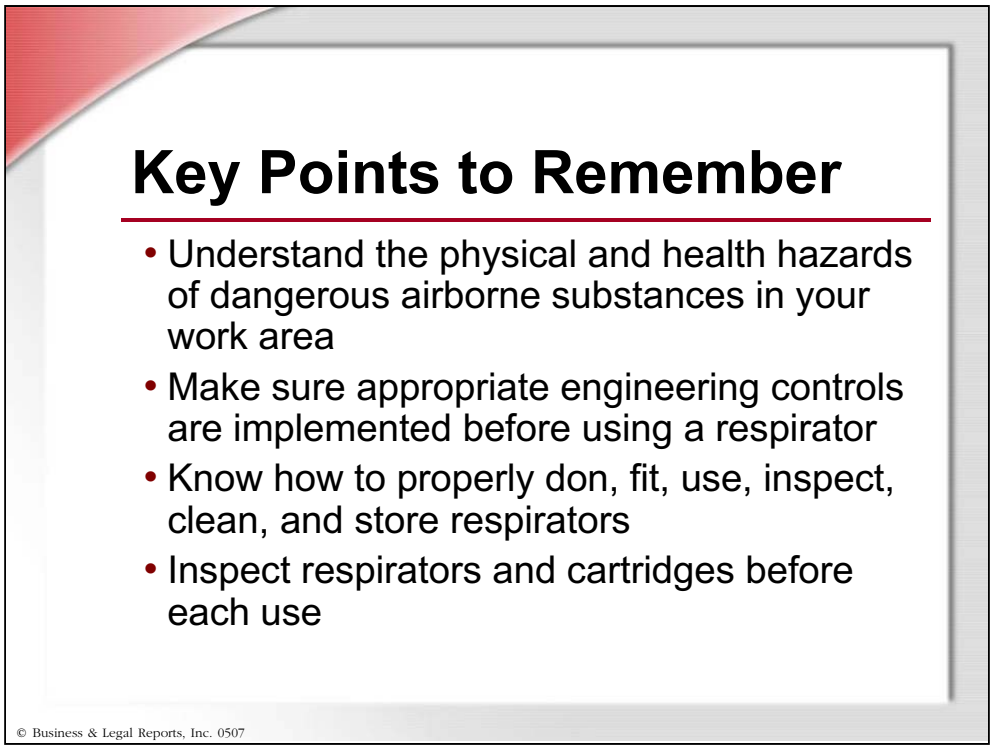
- What are the proper safety procedures to prevent exposure?

Slide Show Notes

What appropriate safety measures are missing and should be implemented?

- Proper engineering controls such as ventilation or substitution of less toxic chemicals
- Proper monitoring of concentrations of contaminants
- IDLH training for the worker and confined space attendant and rescuer
- Hazard communication information and training, such as the requirement to make sure the most up-to-date manufacturer safety data sheet (MSDS) is available to the worker
- Appropriate PPE for trichloroethane
- Appropriate confined space and hazard communication training for the attendant and/or rescuer

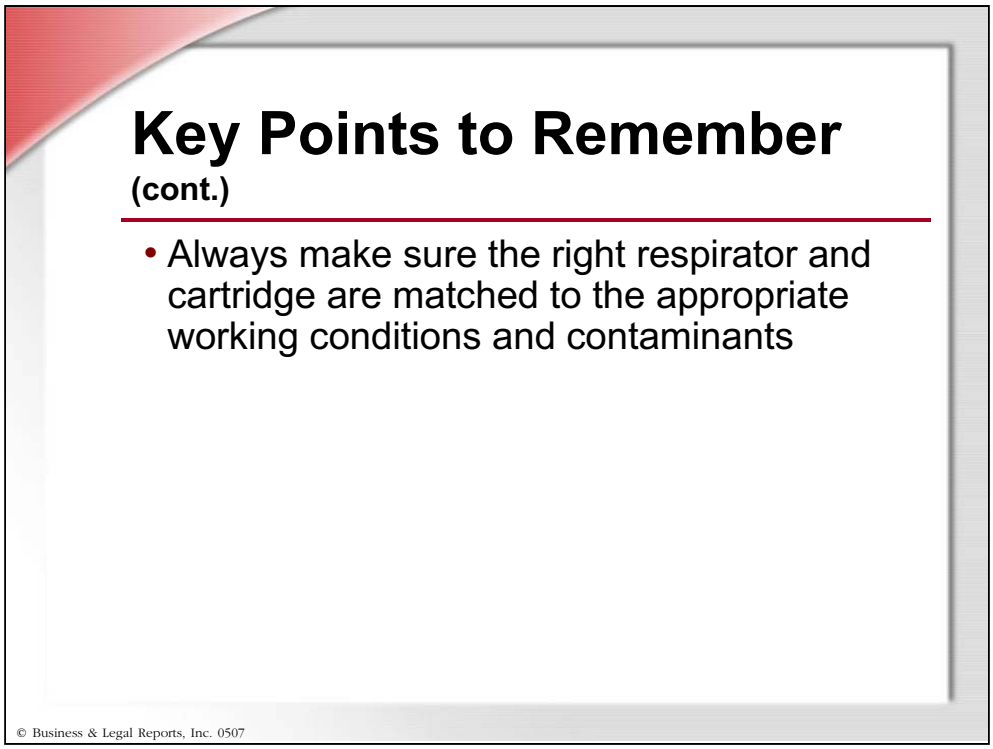
Describe other safety measures that would be implemented at your facility.



Slide Show Notes

Here are some key points to remember about the information presented during this session:

- Understand the physical and health hazards of dangerous airborne substances in your work area.
- Make sure appropriate engineering controls are implemented before using a respirator.
- Know how to properly don, fit, use, inspect, clean, and store respirators.
- Inspect respirators and cartridges before each use.



Slide Show Notes

- Always make sure the right respirator and cartridge are matched for the appropriate working conditions and contaminants.