N.C. Department of Labor
OSH Division

- ***OSHA 125: Respiratory Protection***

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Objectives

- Understand basic respirator principles, including air purifying and atmosphere supplying respirators
- Understand requirements outlined in 1910.134 and other expanded health standards
- Apply this knowledge to case studies

Course Outline

- Respirator principles
  - Types (APRS, ASRS)
  - Selection
  - Fit testing
  - Protection factors

- Respiratory protection standard
- Case studies/examples/interpretations
- Q and A

Respirator Principles

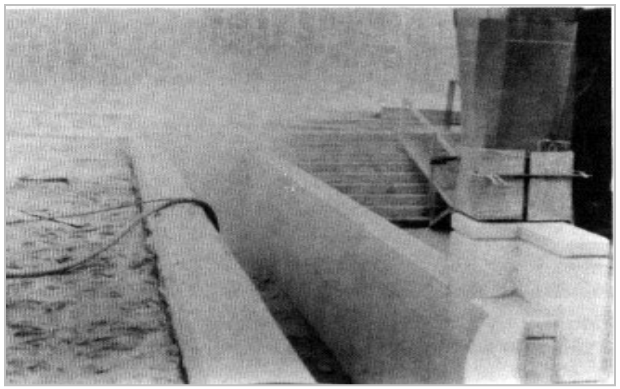
- Air purifying respirators (APRs)
  - Removes contaminant from the ambient air
- Atmosphere supplying respirators
  - Supplied air respirators (SARs)
  - Self-contained breathing apparatus (SCBA)
- Negative vs. positive pressure

Air Purifying Respirators

- Provides protection against:
  - Particles
  - Gases/vapors
  - Combination of the above

APR - Particles

- Provides protection against:
  - Dusts, sprays, fumes, mists
- Media removes contaminants through:
  - Interception, sedimentation, inertial impaction, diffusion capture, and electrostatic capture



APR - Particles

- Filters regulated under **42 CFR 84**
  - Designated by N, R, or P regarding oil resistance
  - Efficiencies of 95, 99, and 100% (99.97%)

- Filter efficiency <u>lowest when new</u>
  - Increases with use
  - Pressure drop becomes limiting factor

APR - Particles

- Common types:
  - Filtering face-pieces (dust masks)
    - » Single strapped
    - » Double strapped
  - Filter cartridges for elastomeric respirators
  - Pre-filters for chemical cartridges


1 9:42AM

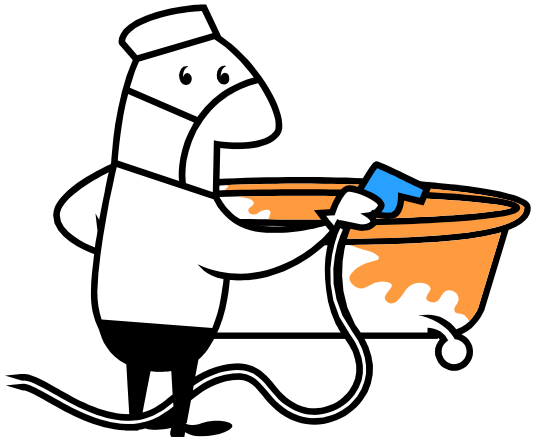

A-SAFE
RESPIRATOR
RESPIRATEUR
RESPIRADOR
1730
20
NIOSH:
TC-84A-160
TYPE N95

APR - Gases and Vapors

- Uses a type of media to remove gas-phase chemicals from the air stream by:
  - Adsorption
  - Absorption
  - Chemical reaction
- Gas masks

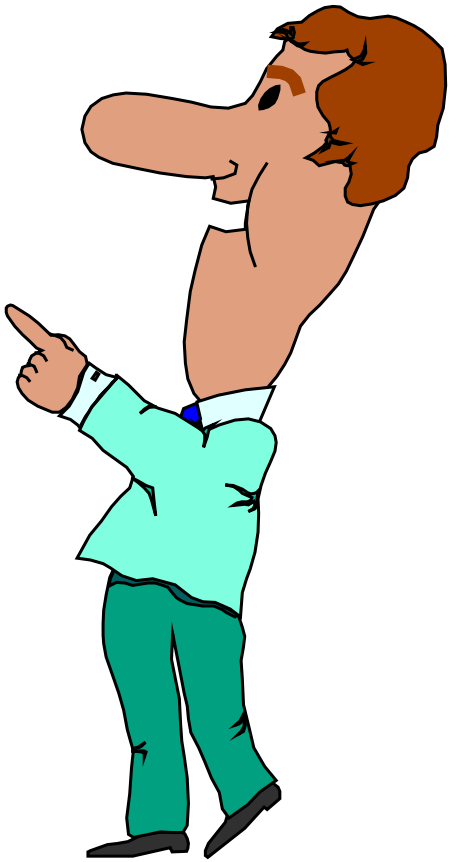
Powered APRs

- Usually work under positive pressure
- Can over-breath - then act as a negative pressure respirator
- Motor/filters can be belt or chin mounted



APR - Advantages

- Inexpensive
- Easy to use
- Light-weight



APR - Disadvantages

- Limited to certain exposure concentrations (usually up to 50 times the PEL)
- Not for use in IDLH environments
- Not for use in oxygen deficient atmospheres (< 19.5% oxygen)
- Must change out cartridges or filters regularly

Supplied Air Respirators

- Type A (hose mask with blower)
- Type B (hose mask without blower)
- Type C (airline respirator)
  - Pressurized cylinder
  - Air compressor


KEEP OUT
KEEP OUT
KEEP OUT

Supplied Air Respirators

- Types of SAR/SCBA regulators
  - Constant flow
  - Demand flow
  - Pressure-demand flow

SAR - Advantages

- Operates under positive pressure - supplying fresh air to the user

- Provides a high level of protection

SAR - Disadvantages

- Not approved for use in IDLH
  - Unless accompanied by an escape SCBA

- Air hoses can present a trip hazard
- May overestimate useful life of air cylinders
- Must monitor CO levels, moisture content, other parameters to ensure Grade D breathing air is maintained

SCBAs

- Closed circuit (rebreathing)
  - Cylinder of compressed oxygen
  - Solid oxygen generating source
- Open circuit
  - 5 to 45+ minutes
- SCBA safety devices
  - Low air warning, Personal Alert Safety System (PASS)

SCBAs

- Advantages
  - Can be used in unknown situations, including IDLH or oxygen deficient environments
- Disadvantages
  - Expensive
  - Air supply is limited
  - May weigh 20 - 30 pounds - ergonomic hazard

Fit Testing

- Qualitative (QLFT)
  - Irritant smoke
  - Isoamyl acetate (banana oil)
  - Bitrex
  - Saccharin

- Quantitative (QNFT)

Protection Factors

- PF = $\frac{\text{Concentration outside}}{\text{Concentration inside}}$

- Fit factor is generally the PF x 10

Protection Factors

Type of Respirator	Quarter Mask	Half Mask	Full Facepiece	Helmet/ Hood	Loose-Fitting Facepiece
APR	5	10	50	.....	.....
PAPR	.....	50	1,000	25/1,000	25
SAR or Airline					
Demand mode	.....	10	50	.....	.....
Continuous flow mode	.....	50	1,000	25/1,000	25
Pressure demand/Positive pressure mode	.....	50	1,000		.....
SCBA					
Demand mode	.....	10	50	50	.....
Pressure demand/Positive pressure mode	.....	.....	10,000	10,000	.....

Table 1. – Assigned Protection Factors

Respiratory Protection Standard

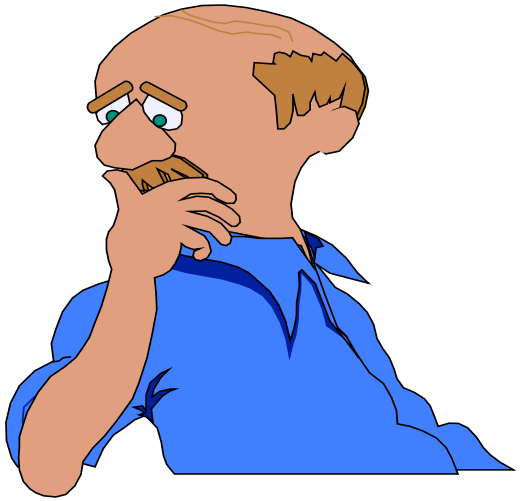
- **29 CFR 1910.134**
  - Originally promulgated in April, 1971
    - » Based on ANSI Z88.2-1969, ANSI K13.1-1969
  - New standard been in the works since the mid-80's

Respiratory Protection Standard

- Why did they promulgate a new standard?
  - 215 deaths in 1994 from exposure to harmful substances and environments (5% of all fatalities)
- Proposed rule published 11/15/94

20 CFR 1910.134 Final Rule

- Published January 8, 1998
- Effective date - April 8, 1998
- Compliance Dates
  - September 8, 1998 for paragraph (a)
  - October 5, 1998 for all other provisions

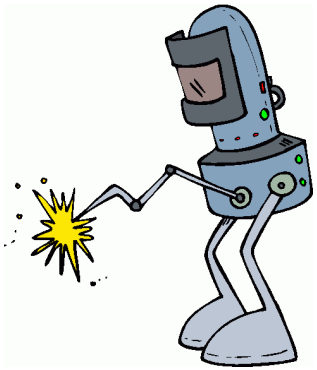


- Old 29 CFR 1910.134 standard re-designated as 29 CFR 1910.139 for TB respiratory protection

The Final Rule

29 CFR 1910.134

- Amendments to other standards as well, including:
  - **29 CFR 1910.94** - Ventilation
  - **29 CFR 1910.111** - Anhydrous ammonia
  - **29 CFR 1910.156** - Fire brigades
  - **29 CFR 1910.252** - Welding (general requirements)
  - **29 CFR 1910.1xxx** - Expanded health standards
  - **29 CFR 1926.xxxx** - Construction standards



Permissible Practice

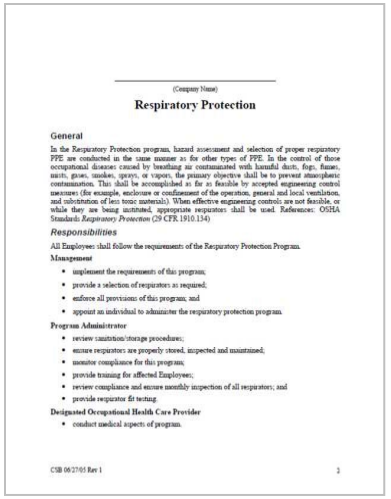
29 CFR 1910.134(a)

- Respirators are to be used:
  - If/when engineering controls are not feasible
  - While they are being implemented
- Employer shall establish and maintain a respiratory protection program
  - Shall include the requirements in paragraph (c)

Respirator Program

29 CFR 1910.134(c)

- Where respirators are required to protect the health of employees or they are required by the employer:
  - The employer must develop a site-specific written respiratory protection program, including procedures for:
    - » Selection, medical evaluation, fit testing, use, training, etc.



(Company Name)

Respiratory Protection

General

In the Respiratory Protection program, hazard assessment and selection of proper respiratory PPE are conducted in the same manner as for other types of PPE. In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, vapors, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used. References: OSHA Standards *Respiratory Protection* (29 CFR 1910.134)

Responsibilities

All Employees: shall follow the requirements of the Respiratory Protection Program.

Management

- implement the requirements of this program;
- provide a selection of respirators as required;
- enforce all provisions of this program; and
- appoint an individual to administer the respiratory protection program.

Program Administrator

- review sanitation/storage procedures;
- ensure respirators are properly stored, inspected and maintained;
- monitor compliance for this program;
- provide training for affected Employees;
- review compliance and ensure monthly inspection of all respirators; and
- provide respirator fit testing.

Designated Occupational Health Care Provider

- conduct medical aspects of program.

CSB 06/27/05 Rev 1

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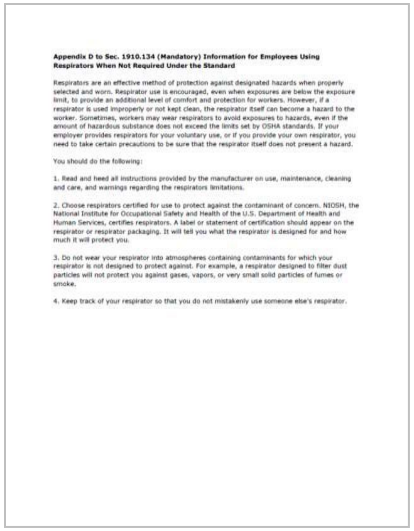
Respirator Program

29 CFR 1910.134(c)

- Where respirator use is <u>not required</u>:
  - May provide them or allow employees to use their own respirators
    - » Must not in itself create a hazard
    - » Employer must provide users with information from mandatory appendix D
    - » Employer must develop a written program including <u>only</u> those elements related to medical evaluations and respirator cleaning/storage (dust masks excluded)



Appendix D to Sec. 1910.134 (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.

2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.

3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

Respirator Selection

29 CFR 1910.134(d)

- Based on the respiratory hazard(s) to which the worker is exposed
- Must be a NIOSH-certified respirator
- Employer shall identify and evaluate respiratory hazards in the workplace
  - Reasonable estimate of employee exposure
  - ID of contaminant's chemical state/form
  - Must assume IDLH if evaluation not done

Respirator Selection

29 CFR 1910.134(d)

- APRs for gases/vapors
  - End of service life indicator
  - Change schedule
- APRs for particulates
  - HEPA per 30 CFR 11
  - Particulate filter certified under 42 CFR 84
  - Any filter if MMAD > 2 microns

Medical Evaluations

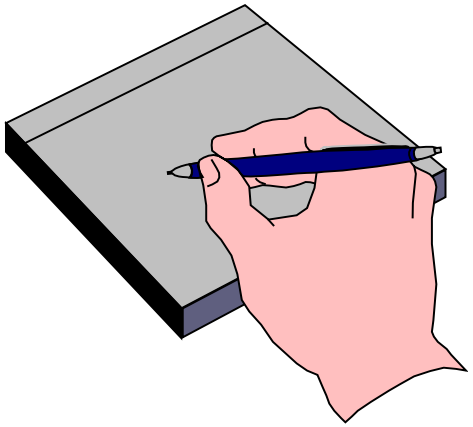
29 CFR 1910.134(e)

- Employer must provide a **medical evaluation** to determine employee's ability to use the respirator
  - Questionnaire/follow-up exam (if a + response to any question)
- Before fit testing or the employee is required to use the respirator

Medical Evaluations

29 CFR 1910.134(e)

- Written recommendation regarding the employee's ability to use the respirator must be obtained from PLHCP
- Medical evaluations may be discontinued when respirator use is no longer required



Fit Testing

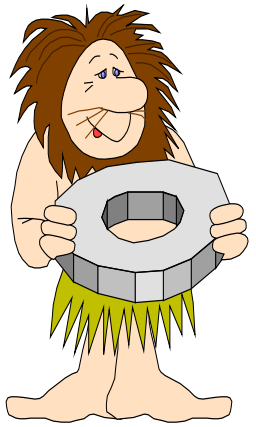
29 CFR 1910.134(f)

- Employees who (may be required to) use any **tight-fitting facepiece** respirator shall be fit tested:
  - Prior to initial use
  - Whenever a different facepiece is used
  - At least annually thereafter
- Also includes positive pressure respirators (PAPRs, SARs, SCBAs)

Use of Respirators

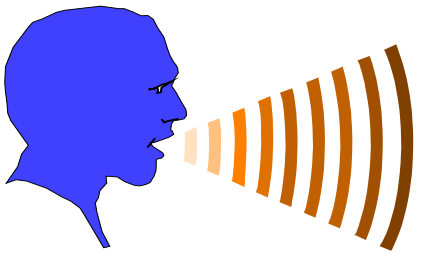
29 CFR 1910.134(g)

- Facial hair or other conditions interfering with the seal are not permitted
- User seal check required each time the respirator is donned
- Surveillance of work area conditions shall be maintained



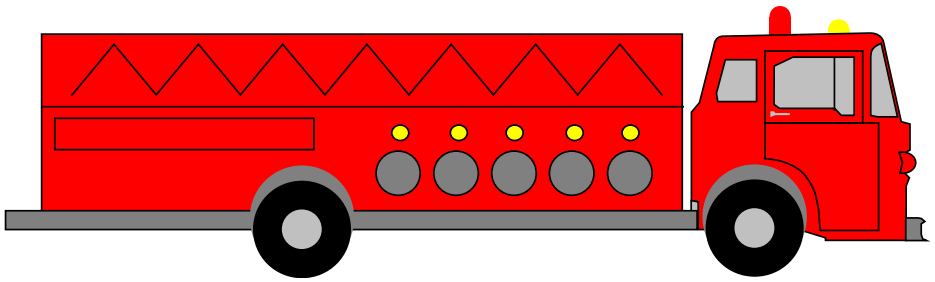
Procedures for IDLH Atmosphere

- One (+) employee outside the IDLH atmosphere
- Communication maintained between inside and outside personnel
  - Visual, voice, or signal line
- Stand-by personnel are trained and equipped to provide rescue
  - SCBAs, retrieval equipment or equivalent means



Interior Structural Firefighting

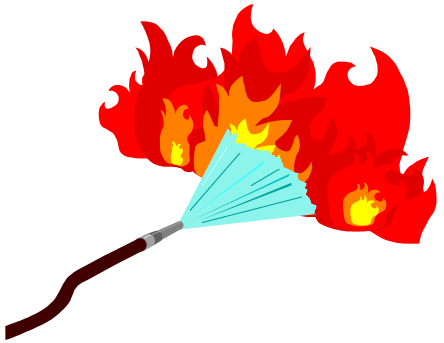
- Must initially meet the requirements for IDLH atmospheres
- At least two employees enter the structure (buddy system)
  - *And* remain in visual or voice contact with each other at all times



Interior Structural Firefighting

- At least two employees are located outside the structure (2 in/2 out)
  - One of these stand-by individuals may be assigned an additional role (e.g. IC, safety officer, etc.)

- All employees must use SCBAs when engaged in interior structural firefighting



Interior Structural Firefighting

- 20 CFR 1910.134 regulations are not meant to preclude firefighters from performing rescue activities before an entire team has been assembled.
  - NFPA 1500 describes this as an “imminent life-threatening situation”
    - » In situations where this occurs, a thorough investigation shall be conducted

Maintenance/Care

29 CFR 1910.134(h)

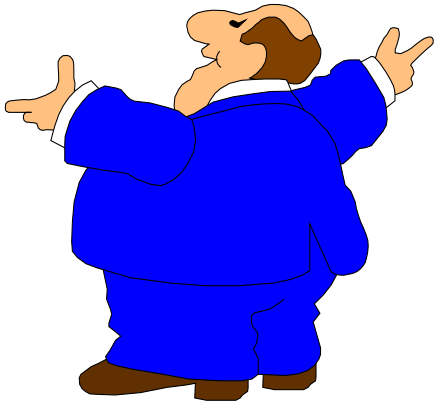
- Respirators must be clean, sanitary, and in good working order
  - Cleaning procedures outlined in **Appendix B-2**

- Specific requirements for storage and inspection of respirator

Breathing Air Quality

29 CFR 1910.134(i)

- Compressed breathing air shall meet the requirements for Type I-Grade D breathing air:
  - Oxygen, hydrocarbons, CO, carbon dioxide, odor
- Cylinders are tested and maintained according to DOT regulations



Respirator Training

29 CFR 1910.134(k)

- Respirator training shall be conducted:
  - In a manner understandable to the employee
  - Prior to initial respirator use
  - Annually
  - When workplace/respirator changes make it necessary

Respirator Training

29 CFR 1910.134(k)

- Employer must ensure that each employee can demonstrate knowledge of the training material
  - Why is the respirator necessary?
  - Limitations and capabilities
  - Use in emergencies
  - Procedures for donning, inspecting, maintenance and storage

Compliance Considerations

- Most sections of 29 CFR 1910.134 apply only if respirator use is required
  - Overexposure
  - Required by another standard
  - Required by the employer

Compliance Considerations

- CSHO must document a hazard prior to issuing a citation for a respiratory protection violation
  - Often involves air sampling
  - Symptomology

Compliance Considerations

- If respirators are not required, but are used voluntarily by employees, the employer still must comply with certain provisions:
  - Some training
  - Ensuring users are medically able
  - Proper cleaning and storage

Case Studies

- For each of the following case studies, please identify:
  - Potential violations of respiratory protection requirements in general industry and construction (be specific)
  - Assessed severity of the violations
  - Other standards that may apply

Case Study #1a – Group 1

- Employees at an automotive repair/body shop perform approximately six hours of spray painting each day.
- Two fully operational spray finishing booths are used for this operation.
- For those painters that want one, the company provides a half-mask APR with organic vapor cartridges and pre-filters (3M #5201, TC-23C-860) to use while working in the booth.
- The company has no respiratory protection program and one of the painters has a full beard.
- Air sampling reveals organic vapor concentrations below the PEL.

Case Study #1 - Answers

- 1910.134(c)(2)(i) - Appendix D training
- 1910.134(c)(2)(ii) - Written resp. protection program, covering medical evaluation and maintenance/storage.
- Non-serious violations
- 1910.107 - Spray finishing

- 1910.106 - Storage of flammables and combustibles

Case Study #1b – Group 2

- How do the answers for Case Study #1 change if the employer requires employees to utilize the provided respirators while working in the spray booths?

Case Study #1b - Answers

- 1910.134(c)(1) - Written respirator program
- 1910.134(e)(1) - Medical evaluation
- 1910.134(f)(1) - Fit testing
- 1910.134(g)(1)(i)(A) - Facial hair interfering with seal
- 1910.134(k)(1) - Training
- 1910.134(d)(3)(iii)(B) - ESLI or change out schedule
- 1910.134(h)(1) - Maintenance/care of respirator
- Non-serious violations

Case Study #1c – Group 3

- How do the answers for Case Study #1 change if an overexposure to organic vapors is documented by the compliance officer?

Case Study #1c - Answers

- Same violations as in case study #1b
- Serious violations
- 1910.1000(a)(2) - Overexposure
- 1910.1000(e) - Engineering controls

Case Study #2 – Group 4

- Employees at a furniture cushion manufacturing plant spray an adhesive containing methylene chloride for 6 - 8 hours each day.
- They use half-mask respirators with organic vapor cartridges.
- The employees have been fit-tested (at initial hire - about two years ago) and change cartridges every week or whenever they can smell the chemical break through.
- Air sampling for these employees showed an 8-hour TWA exposure of 618 PPM.

Case Study #2 - Answers

- 1910.1052(g)(3) - Respirator selection
- 1910.1052(g)(2)(i) - Respirator program (in accordance with 1910.134)
- Serious violations
- 1910.1052(c) - Exposure >PEL for 8 hour TWA
- 1910.1052(f)(1) - Engineering controls
- Other violations of 1910.1052

Case Study #3 – All Groups

- At a county hospital in Western North Carolina, a patient is admitted with the signs and symptoms of a respiratory infection.
- After the initial evaluation, one of the physicians makes a preliminary diagnosis of “pulmonary tuberculosis in the left upper lobe,” and the patient is moved into a negative pressure isolation room.
- During the initial treatment stages, all nurses and doctors don standard surgical masks before entering the isolation room.
- The next day, sputum smear samples results are negative for acid fast bacilli (AFB) bacteria.
- Culture samples results obtained a week later are also negative, providing definitive proof that the infection was not tuberculosis.

Case Study #3 - Answers

- 1910.134(a)(2) - Failure to provide appropriate respiratory protection.
- Serious violation
- 95-129(1) - General Duty Clause
  - Training
  - TB skin tests
  - Negative pressure isolation room

Case Study #4 – All Groups

- A chemical manufacturing plant maintains a few SCBA respirators for use in an emergency.
- One day, liquid in a reaction vessel gets too hot and chlorine gas is released into the plant.
- One designated employee (the plant manager) dons an SCBA and enters the affected area to stop the chlorine release.
- All other employees follow the emergency action plan and evacuate, meeting outside in the parking lot.
- The company has a written respirator program, and this employee has been qualitatively fit tested.
- No other employees have been trained nor fit tested on the SCBA respirators.

Case Study #4 - Answers

- No violations
- CPL 2-0.120 states paragraph (g)(3) does not apply to IDLH atmospheres in permit required confined space or where there is an uncontrolled release of a hazardous substance.
- 1910.120(q) - Emergency response (HAZWOPER)
  - ICS, back-up personnel (properly equipped), advanced first aid
  - Technician-level training
- 1910.119 - Process safety management

Thank You For Attending!

Final Questions?

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