

Respiratory Protection



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Why Use Respirators?

- To protect worker health
- To comply with OSHA requirements
 - Substance specific standards
 - Permissible Exposure Limits (PELs)
 - Emergency Situations
- To increase worker comfort and/or morale

Class Outline

- Reasons for Developing a Respirator Program
- Who is required to have a program?
- Respirator Types & Definitions
- Elements of a Respirator Program
- Voluntary use of respirators
- Questions/Discussion/Resources

OSHA Respirator Standard

- In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases...the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures. When engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used

Hierarchy of Controls

- Engineering
- Administrative
- PPE



Protection Against Harmful:

- Dusts
- Fogs
- Fumes
- Mists
- Gases
- Sprays
- Smokes
- Vapors

Primary Objective = prevent atmospheric contamination

Who is required to have a respirator program?

- Required: In any workplace where respirators are necessary to protect worker health or required by the employer such as:
 - Insufficient levels of oxygen
 - Employees exposed to harmful exposure levels of airborne contaminants
 - Above the PEL

Occupational Exposure Limits

- OSHA Permissible Exposure Limits (PELs)
- PELs are found in 29 CFR 1910.1000
- ACGIH Threshold Limit Values (TLVs)
- Most common is 8 hr. Time Weighted Average
- PELs, TLVs **not** fine lines between safe/unsafe
- Particulate limits are generally in units of mg/m^3
- Gases/Vapors in units of ppm

How do we estimate airborne concentrations?

- Material Safety Data Sheets (MSDS)
- Conditions of chemical use
 - Chemical properties, job process, work area, amount used, duration, ventilation
- Air Monitoring
 - Direct Reading Instruments
 - Air sampling and lab analysis

Exposure Concentrations

- If employee exposures are below PEL concentrations, respirators are not required.
- PELs are not available for all chemicals used in the workplace.
- If concentrations are above the PEL and other controls are infeasible, respirators are required.

Written Program

- Select someone to administrate the program
- Worksite specific procedures
- Updated as needed

Program Elements

- Respirator selection procedures
- Medical evaluation
- Fit testing procedures
- Routine & emergency situations
- Cleaning, disinfecting, storage, inspecting, & repairs
- Employee training

Respirator Program:

- Program should be written
- Program should apply to specific work site
- Program should be evaluated and updated as necessary to reflect changes in conditions that affect respirator use

Program Elements - Cont.

- Adequate air quality, quantity, and flow of breathing air
- Training: respiratory hazards & proper use of respirators
- Regularly evaluating program effectiveness
- Voluntary use

Voluntary Respirator Use

- Allowable if airborne levels of contaminants are not harmful (i.e. below PEL)
- Employer must ensure that the respirator itself will not present a hazard to employee
- Employer OR employee may provide the respiratory protection
- Employer must provide information from Appendix D to employees

Voluntary Use

- **1910.134(c)(2)(i)** An employer may provide respirators at the request of employees or permit employees to use their own respirators, **if the employer determines that such respirator use will not in itself create a hazard**. If the employer determines that any voluntary respirator use is permissible, the employer shall provide the respirator users with the information contained in Appendix D to this section

Voluntary Use

- In addition, the employer **must establish and implement those elements of a written respiratory protection program** necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks).

Basic Respirator Types

- Air Purifying
 - Filtering Facepiece (dust masks)
 - Cartridge type APR
 - Half face
 - Full face
 - Powered Air Purifying Respirator (PAPR)
- Air Supplying
 - Airline
 - half face
 - full face
 - SCBA (Self Contained Breathing Apparatus)
 - Hoods
 - Helmets

Filtering Facepiece

- Is it a respirator?
- Requirements when it is considered a respirator
- Fit testing



APR Elastomeric Facepiece

- Half Face
- Full Face
- Use cartridges or canisters
 - Particulates
 - Gases/Vapors
 - Combination



Air Supplying Respirators

- Airline Respirators

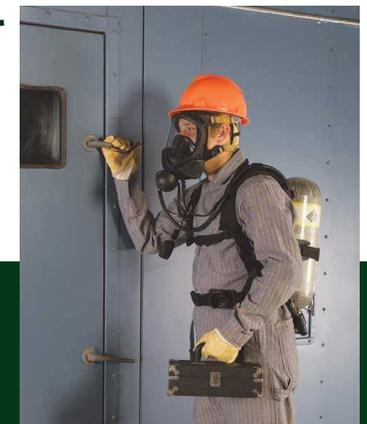
- bottled air
- air compressor



- Self Contained Breathing Apparatus (SCBA)

- Pos. pressure demand mode = best protection

- Hoods, helmets



Respiratory Protection Program Employer Responsibilities

- Designate a Program Administrator (qualified)
- Provide Respirators at no charge



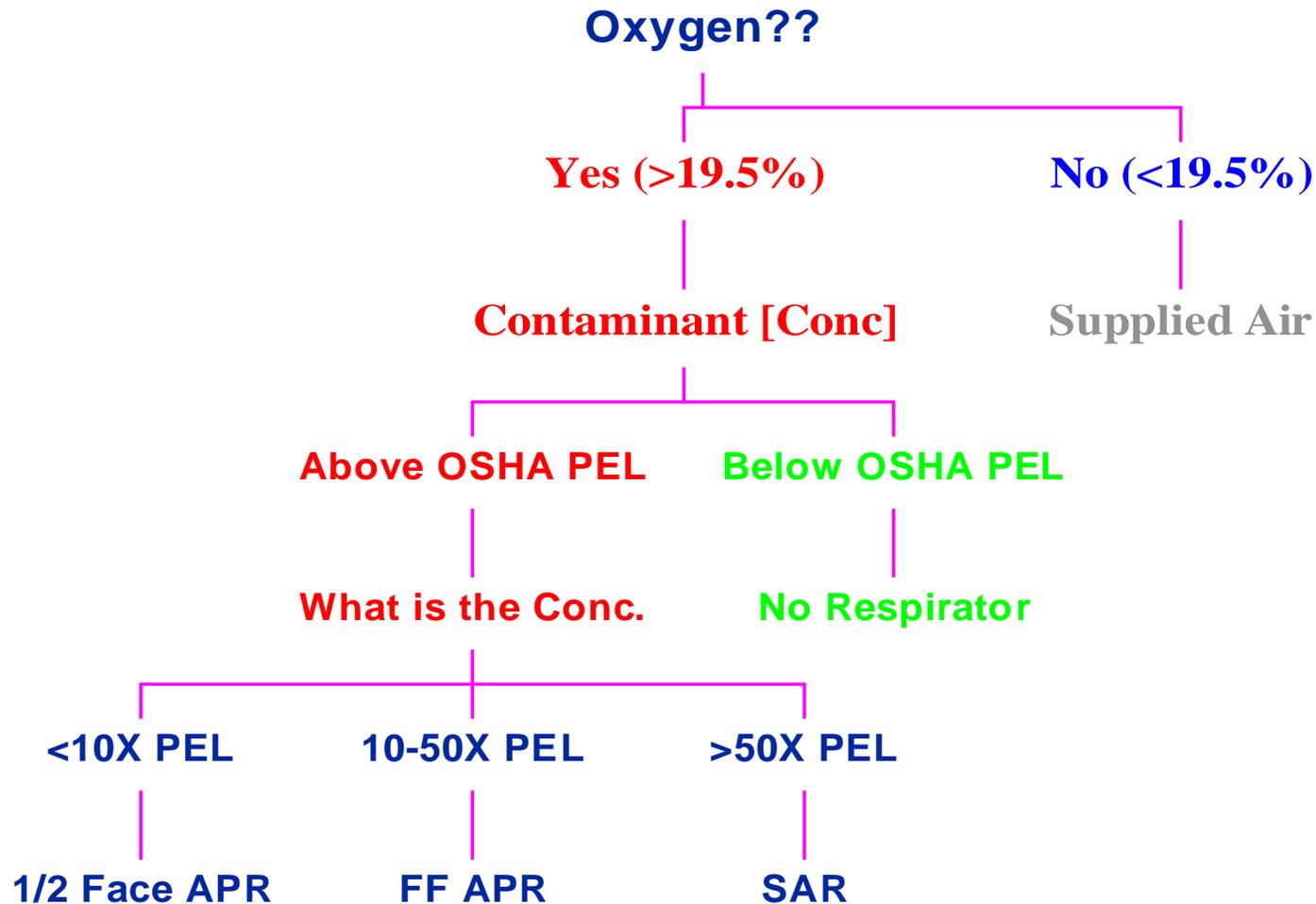
Respirator Selection

- Appropriate for hazard & worker
- NIOSH certified respirator
- Identify & Evaluate Hazard (Estimate Exposure)
- Must select correct respirator and attachments (cartridges, hoses)

Respirator Selection Information

- OSHA website (www.osha.gov)
 - Substance specific standards
 - Respirator and Cartridge selection
 - Cartridge change schedule information
- Manufacturer information
 - Respirator and cartridge charts
 - Cartridge change schedules

Respirator Selection Guide:



Immediately Dangerous to Life and Health (IDLH) Atmospheres

- IDLH - Full face-piece, pressure demand, SCBA (30 min)
 - Or - Combo Full face, pressure demand SAR with auxiliary self-contained air supply

Respirators for Non-IDLH Environments

- Adequate to protect health
- Assigned Protection Factors & Maximum Use Concentrations (Reserved by OSHA)
- Appropriate for physical state and chemical form of contaminant

Assigned Protection Factors

- APFs have been proposed by OSHA, NIOSH, ANSI
- OSHA is currently developing a regulation to address assigned protection factors
- NIOSH APFs are commonly used
- Assigned Protection Factors vs. Fit Factors

APR Cartridge Selection

- Types of cartridges/canisters for APRs
 - gases or vapors
 - particulates
 - combination cartridges
- Cartridges are approved by NIOSH
- 20-30 types of cartridges (color coded)
- Many different manufacturers

APR Cartridge Selection

- NO single cartridge/canister provides protection against all contaminants
- There are many chemicals for which a NIOSH approved cartridge is not available or not recommended (see mfr. info)
- There are many chemicals for which PELs have not been established

Cartridge Life & Changing Schedules For Gas/Vapor Cartridges

- Has End-of-Service-Life Indicator (ESLI)
-or-
- Changing Schedule based on data determining end-of-service-life



Cartridge service life estimation

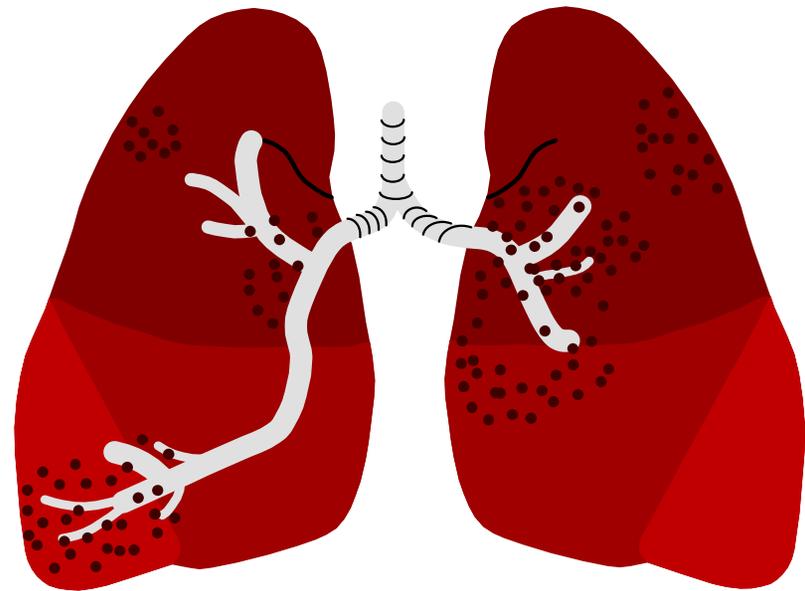
- Use the Manufacturer's Recommendation
- Conduct Experimental Tests
- Use a model such as found at OSHA website
- Note: Odor thresholds and other warning properties should not be used as the primary basis for determining cartridge service life

Particulate Respirator Classification

Minimum Efficiency	Non-oil aerosols	Includes Oil Aerosols	Includes Oil Aerosols >8 hours
95%	N95	R95	P95
99%	N99	R99	P99
99.97%	N100	R100	P100

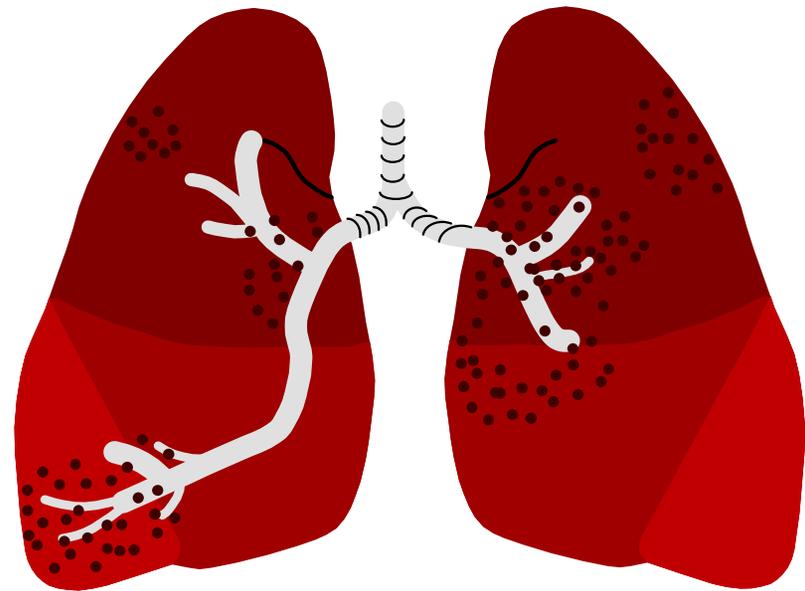
Medical Evaluations

- 1) MD or PLHCP must Administer Questionnaire
- 2) Medical Exam if Positive Responses to Questionnaire (See Appendix C)



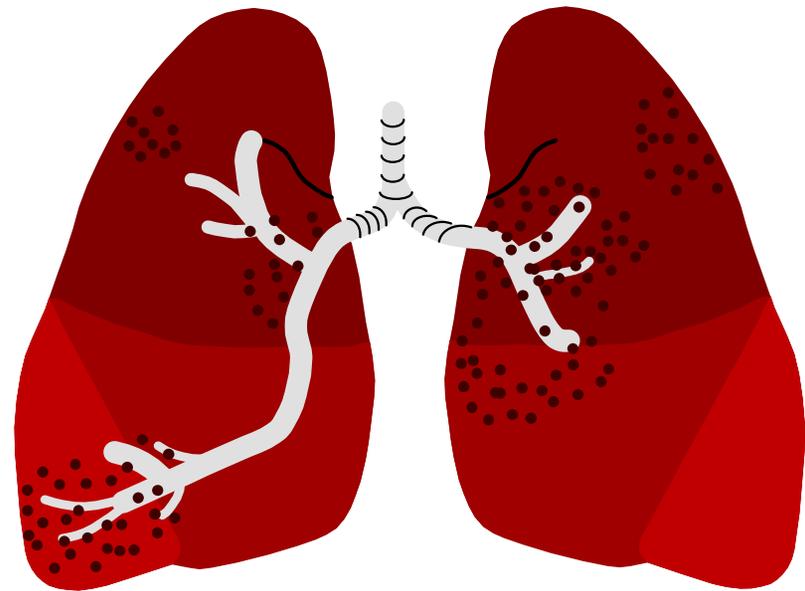
Medical Evaluations

- Administration of Questionnaire
 - Confidentially
 - During Work Hours or
 - Convenient
 - Opportunity to discuss results with PLHCP



Medical Evaluations

- Supplemental Info for PLHCP
 - type/weight of resp.
 - duration/frequency of use
 - physical work effort
 - additional protective clothing/equipment
 - temperature & humidity extremes



Medical Evaluations

PLHCP must provide written recommendation including

- ability to wear respirator (yes or no?)
- any limitations
- need for follow-up exam
- verify information to employee

Additional Medical Evaluations

- Employee reports medical signs or symptoms related to respirator use
- PLHCP, supervisor, or program administrator inform employer of need for reevaluation
- Fit testing or program evaluation indicate need
- Change in workplace conditions increasing burden

Fitting and Fit Testing

- Tight-fitting respirators
- QLFT or QNFT
 - prior to initial use
 - different resp.
 - minimum annually
 - observed changes in physical condition



Fit Testing

- QUALITATIVE

- Test if worker can smell or taste substance inside respirator

- QUANTITATIVE

- Measure air inside and outside face-piece and compare concentration to determine leakage
- Fit-factor 100X for half face
- 500X for full face-pieces

Qualitative Fit Testing

- Qualitative FT allowed for APRs use in environments less than 10 times PEL
- Allowable test for +pressure SARs
- Must follow OSHA protocol (App A)
 - isoamyl acetate (banana oil)
 - saccharin
 - irritant smoke
 - bitrex

Respirator Fit Testing

- Tight fitting respirators should have a complete face-piece to skin seal
- Possible interferences include:
 - Facial Hair
 - Glasses
 - Jewelry
 - Protective Clothing
 - Facial Irregularities (scars, missing dentures)
- For some individuals it may be very difficult, if not impossible, to achieve a good fit

Fit Testing Exercises

- Normal breathing
- Deep breathing
- Turning head side to side
- Moving head up and down
- Talking (rainbow passage)
- Grimace
- Bending over or jogging in place
- Normal breathing

Respirator Use

- Procedures for proper use
 - conditions resulting in seal leakage
 - non-removal in hazardous environments
 - actions to ensure continued effective operation during shift
 - procedures for IDLH or
 - fire fighting

Respirator Use

- Seal check must be performed each time respirator is put on
- Users must wear the same brand, type, size they were fit tested for
- Interchanging of respirator parts from different brands is not allowed

Continuing Respirator Effectiveness

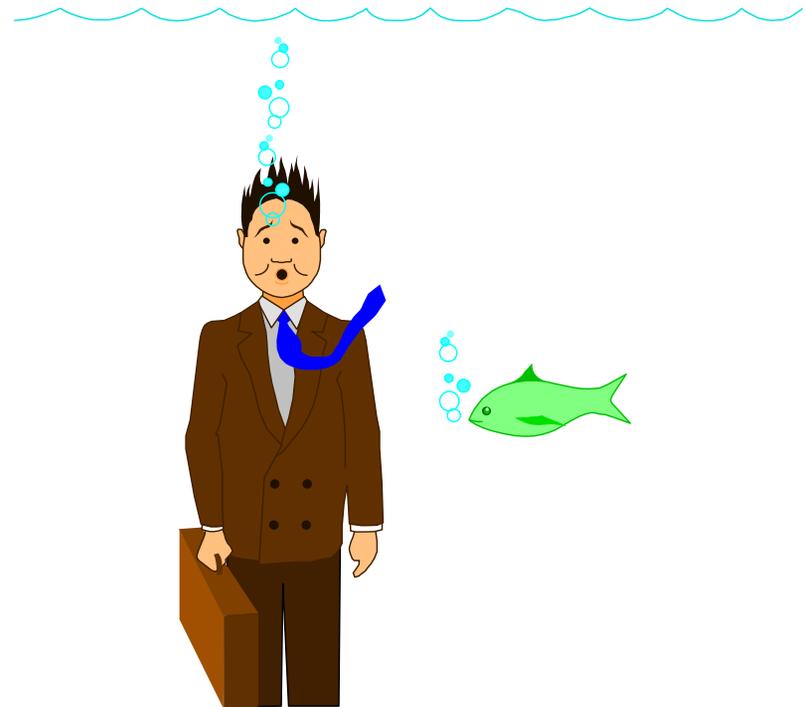
- Surveillance
- Reevaluate when changes may affect respirator effectiveness

Employees must leave area:

- To wash face/respirator to prevent eye/skin irritation
- detect vapor, change in breathing resistance, leakage of face piece
- replace respirator or filter, cartridge, or canister elements
- **MUST REPLACE OR REPAIR BEFORE RETURNING TO WORK AREA**

IDLH Atmospheres

- Employee outside & maintain communication
- Outside employee trained in rescue procedures, has SCBA, appropriate retrieval equipment
- Fire fighters - two must enter together with SCBAs



Inspection, Cleaning, Maintenance, & Storage

- Inspection - check each time they are used, SCBA and emergency use respirators-- inspect monthly
- Cleaning - clean & sanitize per mnfr. instr.
- Maintenance - change filters/cartridges, worn pieces
- Storing - Very Important - store in airtight container
- MOST FREQUENT OSHA VIOLATION

Air Quality Standards

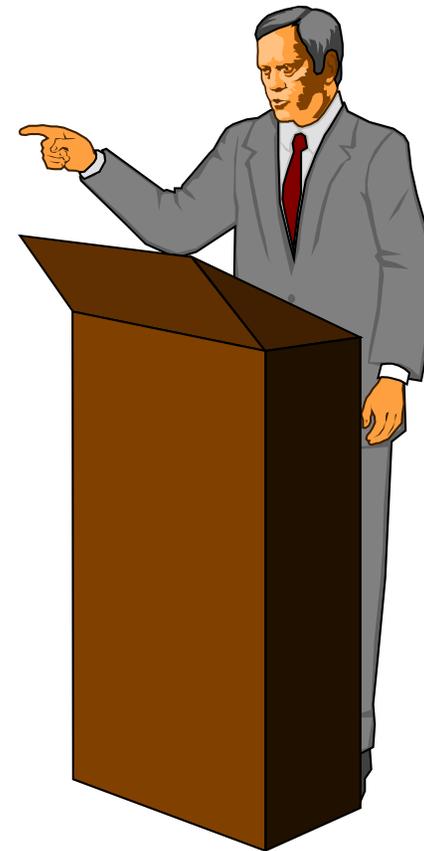
- Breathable Air - minimum Grade D:
 - CO - max 10 ppm
 - CO₂- max 1000 ppm
 - O₂ - 19.5-23.5%
 - Hydrocarbon - max 5 mg/m³
 - Lack of odor

Air Compressors

- Location of air source is critical
- Compressor should have suitable in-line air purifying sorbent beds and filters
- Oil lubricated compressors need a high temperature alarm or CO alarm
- If only high temp alarm is used, need to check the CO levels on a regular basis
- Breathing air couplings must be incompatible with outlets for non-breathing air or other

Training

- How to wear respirator & fit checks
- Nature of hazard and possible harmful effects
- Engineering/Admin Controls in place
- Reasons for respiratory selection

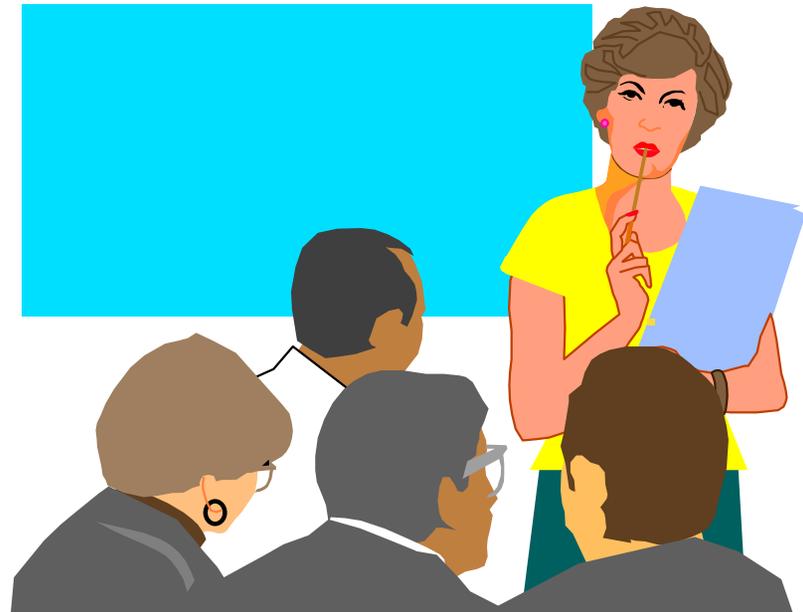


Training (cont.)

- Limitation of the Respirator
- Proper Maintenance and Storage
- Emergency Situations

Re-Training

- Annually
- Changes in workplace
- Inadequacy in employee knowledge
- Other situation arises to maintain safe respirator use





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Photo By Henry Gaudru



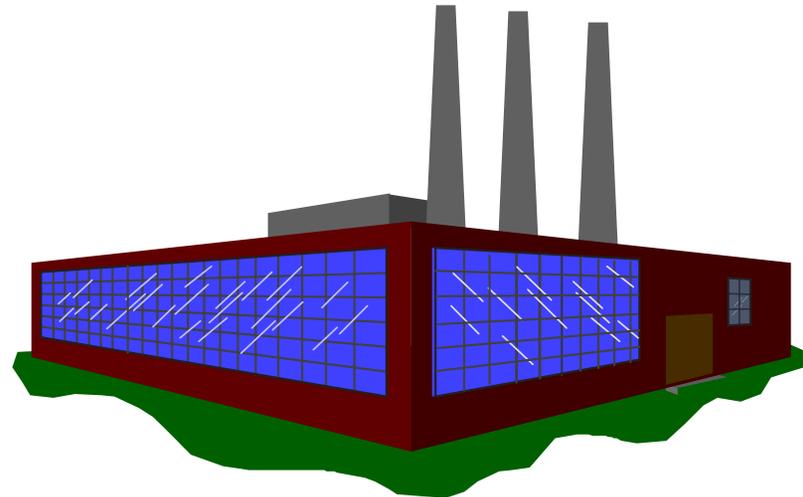
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Work Area Evaluation

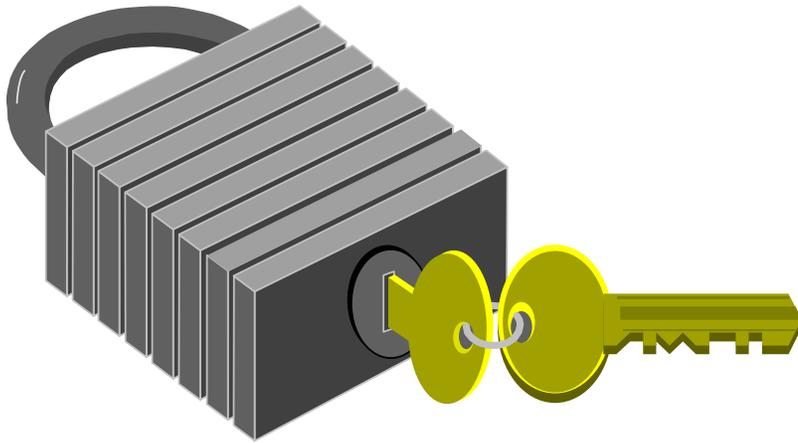
- Changes in work area or operation
- IH Sampling to provide periodic monitoring of contaminant levels
- Purpose - Ensure Effectiveness of Program



Program Evaluation

- Must be performed regularly (annual minimum)
- Modify the program based on results of evaluation

RECORD KEEPING



- Medical evaluations
- Fit testing
 - name or ID
 - type of test
 - specific respirator used
 - date of test
 - results
 - maintained until next test performed

Resources

- OSHA (www.osha.gov)
 - Respirator standard and appendices, letters of interpretation
 - Respirator selection information
 - Small Entity Compliance Guide
 - Questions and Answers
 - Safety/Health Topics

Resources

- Utah OSHA
 - www.uosh.utah.gov
 - Consultation (801) 530-6855

Resources

- NIOSH
 - www.cdc.gov/niosh
 - General information
 - Certified Equipment List
 - NIOSH research reports
 - Fact sheets

Major Respirator Manufacturers

- 3M www.3m.com
- North www.northsafety.com
- MSA www.msanorthamerica.com
- Survivair www.survivair.com
- Scott www.scotthealthsafety.com

Any Questions?



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