

Meet today's webinar team



Presenter: Al Capps

Al is a professional engineer with over 5 years' experience in workplace safety. He holds a bachelor's in chemical engineering from The University of Texas. Al spent five years with the Department of Labor OSHA as an Industrial Hygienist. Today, he is a Texas Mutual safety consultant who provides safety and health services to our policyholders.



Presenter: Stacy Rose

Stacy is a certified safety professional with 16 years' experience in workplace safety. She holds a bachelor's in industrial engineering and a master's in safety engineering with a specialty in ergonomics. Stacy spent four years in the field as a Texas Mutual safety services consultant and two years supervising our safety services support center. Today, she is Regional Manager Safety Services-Austin.

Industrial Hygiene

What you can't see can hurt you

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Agenda

1 Overview of terminology

2 Evaluation options

3 Air contaminants

4 Occupational noise

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Overview of terminology

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Occupational exposure limits-terminology

- Permissible Exposure Limit (PEL)
 - the maximum amount or concentration of a chemical that a worker may be exposed to under OSHA regulations in relation to a time weighted average
- Time Weighted Average (TWA)
 - 8-hour time weighted average exposure
- Short Term Exposure Limit (STEL)
 - 15 minute time weighted exposure that should not be reached more than 4 times daily, separated by 60 minute intervals

Occupational exposure limits-terminology

- Ceiling Limit (C)
 - Limit that should never be exceeded regardless of exposure time
- Excursion Limit (EL)
 - Should not exceed 3 times the PEL for more than 30 minutes
- Action Level (AL)
 - Concentration that requires additional action (e.x- medical surveillance, personal exposure monitoring, training, etc)

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Evaluation options

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Evaluation options

- Workplace walkthrough
- Research industry/process
 - NIOSH Health Hazard Evaluations
 - OSHCON Evaluations
 - SDS Review
- Personal exposure monitoring

Evaluating employee exposure

- Air monitoring
- Noise monitoring
- Skin and surface sampling
- Biological monitoring/Biological Exposure Indices
 - Blood, urine, hearing, spirometry

Evaluating respiratory exposure

When you expose your employees to a respiratory hazard and/or require them to wear respirators.

Examples of when you should consider assessments may include but are not limited to:

- When OSHA has a substance specific standard (e.g., lead, methylene chloride).
- When employees notice symptoms (e.g., irritation, odor) or complain of respiratory health effects.
- When the workplace contains visible emissions (e.g., fumes, dust, aerosols).

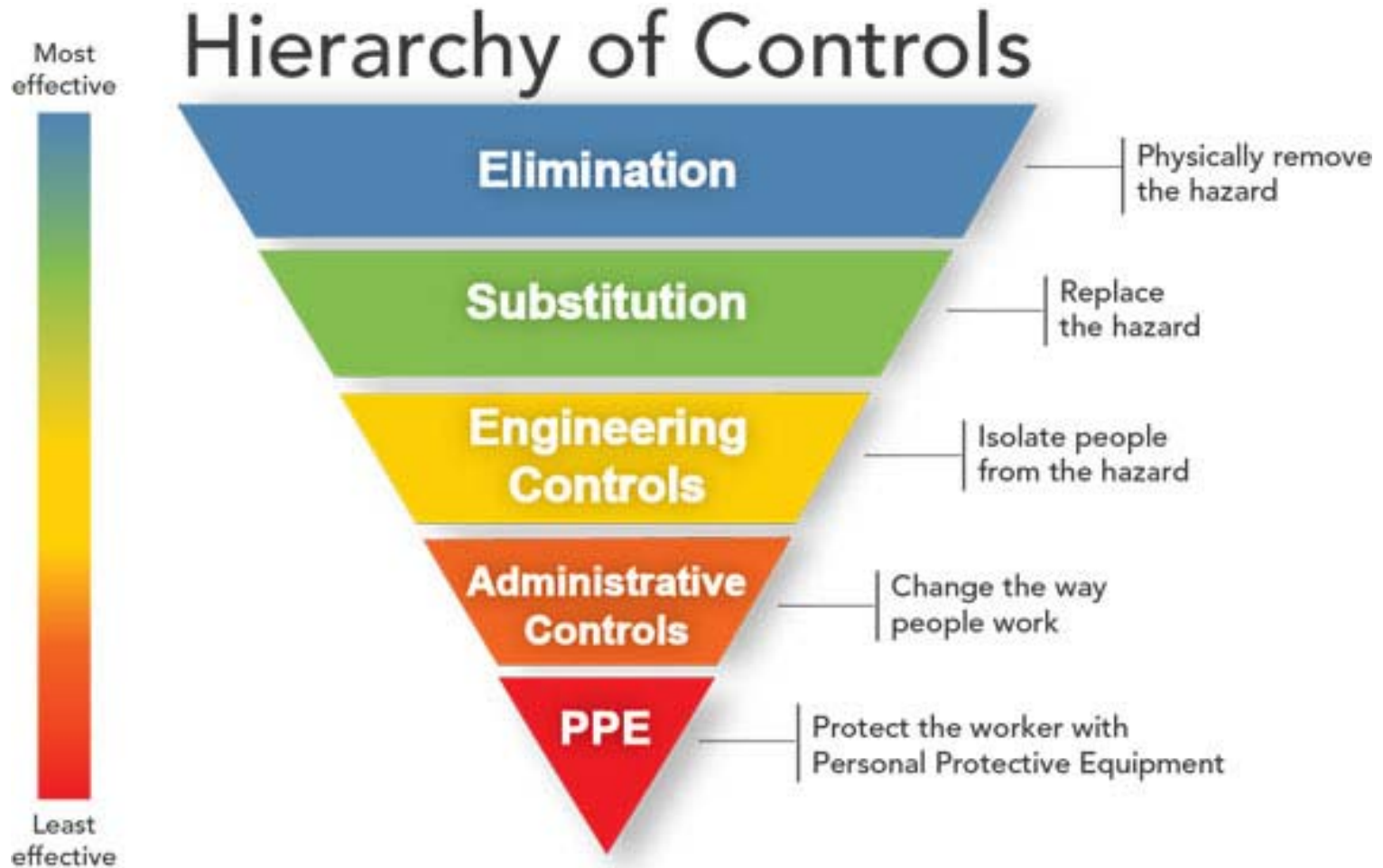
Exposure monitoring

- Personal Exposure Monitoring
 - Personal breathing zone for air monitoring (mouth and nose area that is a 10 inch radius from employees nose) and near the ear for noise monitoring
 - Employee wears sampling media for duration of work shift to compare exposure to TWA, STEL or Ceiling Limits.
- Area Monitoring
 - Sampling at specific areas in the operation.
 - Worst case scenario sampling

Personal exposure monitoring

- Employee must wear sampling device for the duration of the work shift
- Observe employees during sampling period and record specific tasks that may contribute to exposure
- Sampling equipment must be pre and post calibrated with sampling media in line with pump

Controls



3

Air contaminants

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Types of air contaminants

- Organic Vapors & Gases
- Metals
- Crystalline Silica
- Dust
 - Respirable
 - Total
 - Combustible
- Mold



Types of air contaminants

- Vapor
 - Mix of gaseous and liquid form of a substance.
- Fume
 - Very fine solid particles that become suspended in the air. Metals released into the air from welding are an example.



OSHA regulated air contaminants

- 29 CFR 1910 Subpart Z
- Tables Z-1, Z-2, & Z-3
 - Most air contaminants
- Specific Standards
 - Asbestos
 - Vinyl Chloride
 - Lead
 - Chromium (VI)
 - Formaldehyde



Welding fumes

- Includes 13 metals: Cobalt, Beryllium, Molybdenum, Cadmium, Chromium, Copper, Iron, Manganese, Nickel, Lead, Antimony, Vanadium, and Zinc.
- OEL
 - Each metal has its own PEL
 - Review Z Tables and chemical specific sections of 1910



Volatile organic compounds (VOCs)

- Sources
 - Solvents
 - Strippers
 - Paints/Varnishes
- Health Effects
 - Central nervous system depressants
 - Blood disorders
 - Carcinogens
- OEL
 - See OEL for individual contaminants
 - Benzene: PEL TWA= 1 ppm; STEL= 5 ppm;
 - Note: Additive exposure calculations if similar toxicological effect ($C1/T1 + C2/T2 + C3/T3 + \dots$ should not exceed 1)



Particulates not otherwise regulated (PNOR)

- Acceptable use of the PNOR/PNOS exposure limits
 - Only use if no contaminant specific limit exists
 - Low toxicity particulates only
 - Poorly soluble in water
- OEL
 - Particulate Not Otherwise Regulated (PNOR)
 - OSHA PEL= 15 mg/m³ (total dust)
 - OSHA PEL= 5 mg/m³ (respirable dust)

Natural ventilation



- Wind sometimes provides enough ventilation
- Often used for infrequent welding jobs

Local exhaust ventilation

- Captures contaminants at the point of generation and removes them from the work environment to prevent exposure
- Usually used for larger-diameter particulates, i.e. welding fumes
- Comprised of a hood, duct system, air cleaning device, and a fan.



Dilution ventilation

- Dilution systems are used for contaminant control when local exhaust is impractical.
- Usually used for vapors, gases, or small respirable-sized aerosols



Poor



Fair



Good



Best

Respiratory protection

- Respiratory protection should be considered a last resort to protect employees from air contaminants
- Respiratory protection program requirements (29 CFR 1910.134)
- Respirator selection and use
- Cartridge service life
- Fit testing
- Medical evaluation

Personal protective equipment



half-face



filtering facepiece (N-95 mask)



full-face mask

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Occupational noise exposure

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Occupational noise exposure



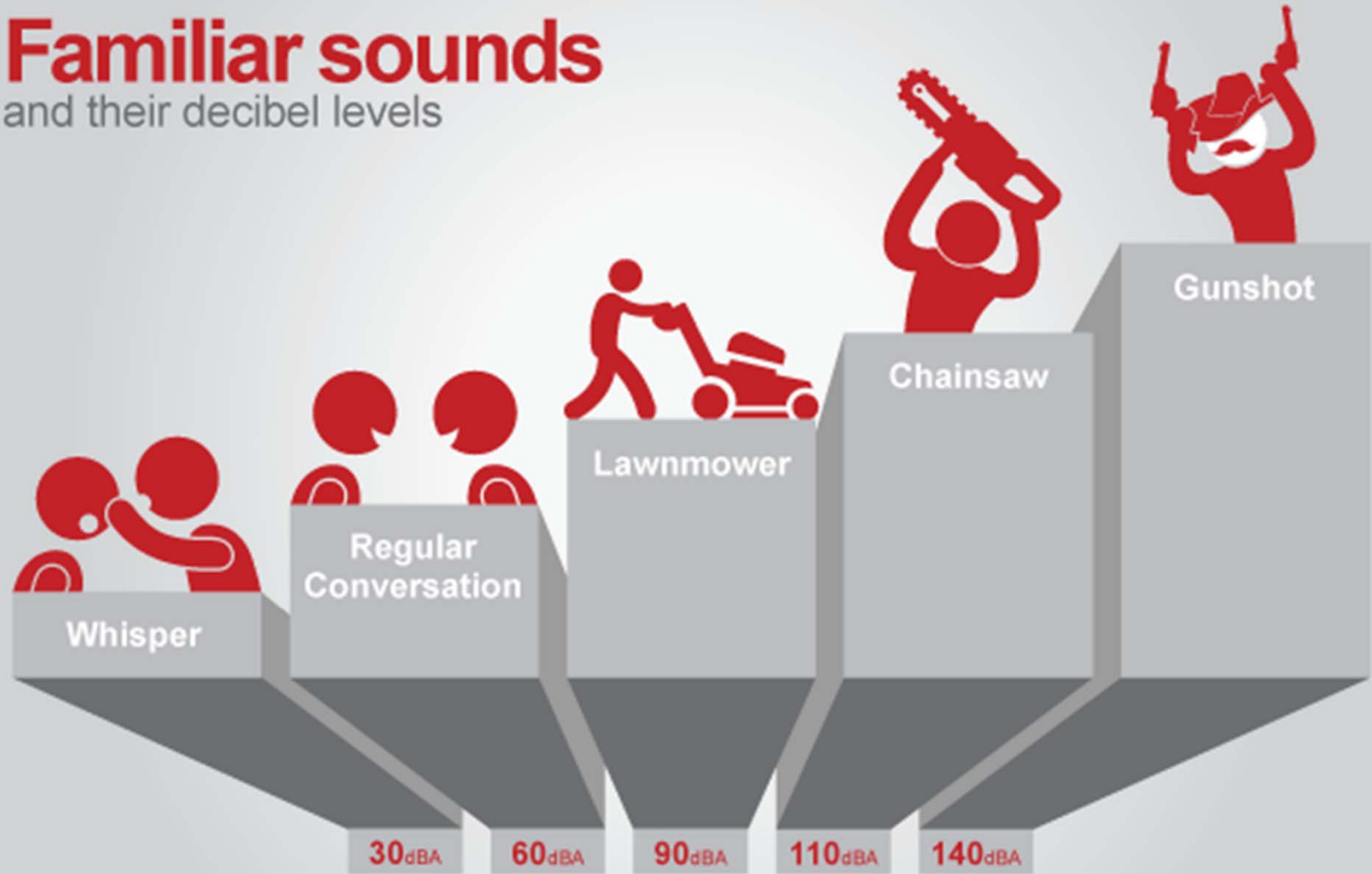
- 30 million workers are exposed to hazardous levels of noise per year
- Exposure may cause temporary or permanent hearing loss
- High-Frequency hearing is the most effected by noise exposure

OSHA requirements

- 29 CFR 1910.95
- A Hearing Conservation program is required if there is an exposure that equals or exceeds an 8-hour time weighted average of 85 dBA (Action Level)
- Baseline and Annual Audiometric Testing
- At least two forms of hearing protection must be provided
- Training program and annual refresher

Familiar sounds

and their decibel levels



Evaluate noise exposures

Time per day (hours)	Sound level (dBA)
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

When to sample?

- Do you have to speak loudly, shout, or get very close to talk?
- Do you have difficulty concentrating?
- Do your ears hurt or tingle?
- Spot check with sound level meter and ask about duration of exposure

Noise sampling equipment

- Sound level meters



- Are cellphone applications accurate?

Noise sampling equipment



Dosimeter

Worst case scenario

8 hour Time Weighted Average

Noise controls

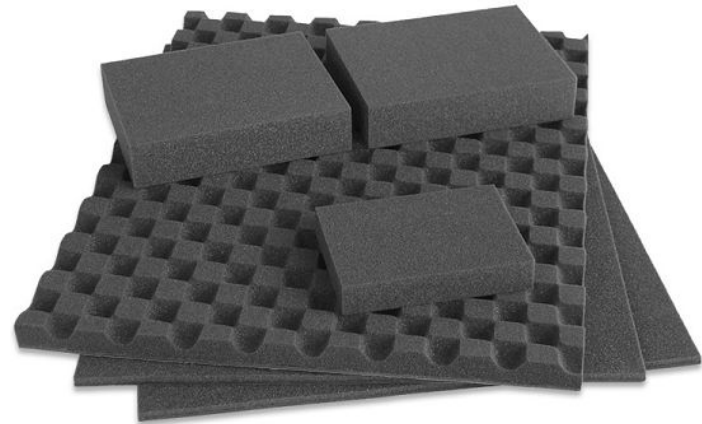
- Noise must be controlled at one of the following points to minimize employee exposure:
 - Source
 - Administrative Controls
 - PPE
 - Path
 - Receiver



Engineering controls



Enclosure
to reduce
noise levels



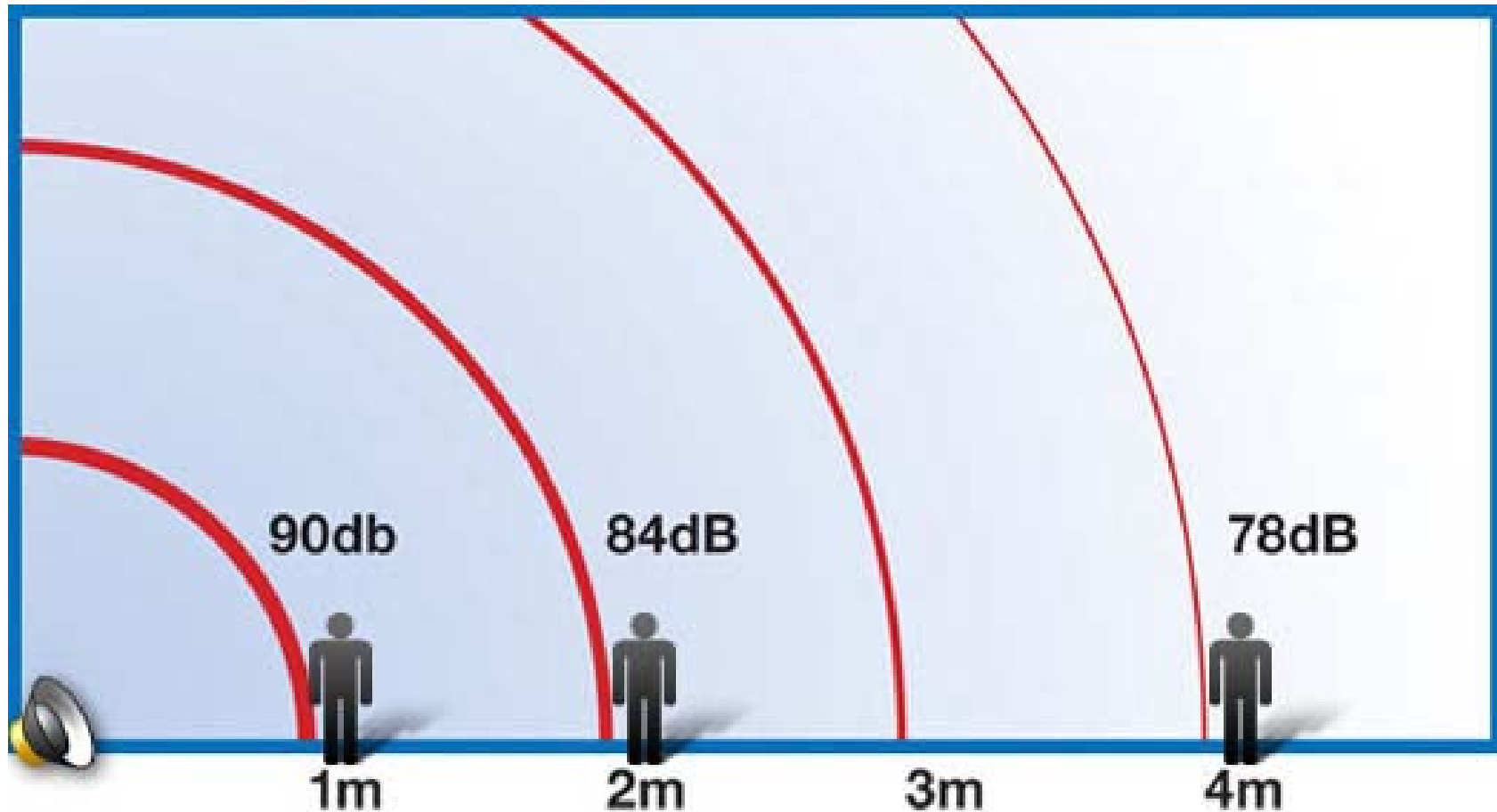
Sound damping
materials



Vibration isolation



Noise reduction over distance



$$dBA2 = dBA1 - 20\text{Log}(D2/D1)$$

Noise reduction rating

- All hearing protection has a noise reduction rating (NRR)

- Estimates of attenuation:

- Single form of PPE

$$(dBA) = TWA(dBA) - (NRR - 7)$$

- Dual protection

$$(dBA) = TWA(dBA) - [(NRR - 7) + 5]$$



Essential hearing conservation program components

- Management Support
- Exposure Assessment
- Engineering Controls
- PPE
- Training
- Testing & Data Mgmt.

Lend me your Ears!



Hearing test options

- Onsite Testing
- Mobile Van Testing
- Clinic Testing
- Some Combination of the above?



Recap

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**ANY
QUESTIONS?**

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