



# NOISE EXPOSURE ASSESSMENTS 101 Part 3 Controlling Noise Exposures

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# Hierarchy of Controls:

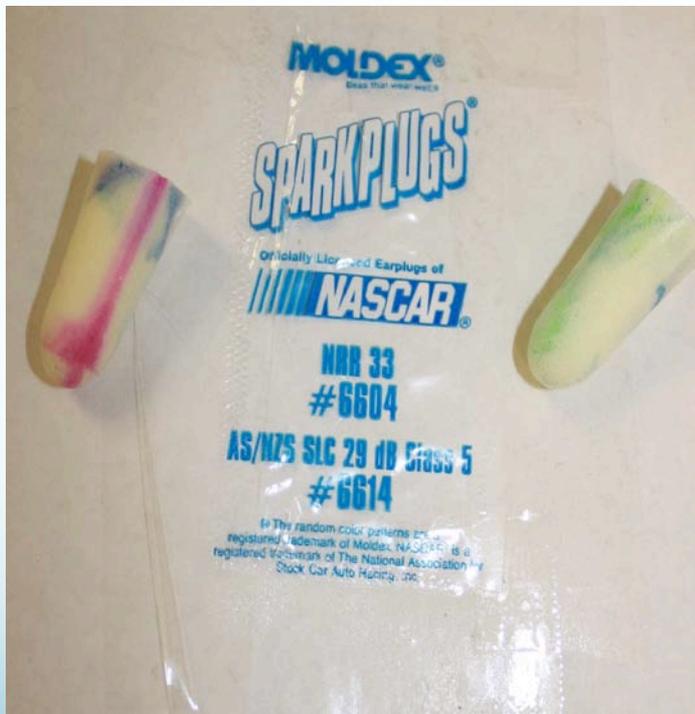
- Engineering Controls
- Administrative Controls
- Personal Protective Equipment (PPE)



# DoD 6055.12

DoD Components should assess the adequacy of hearing protection, using any generally accepted method for assessing attenuation ...

# Noise Reduction Rating (NRR)



Using NRR values you can  
Calculate the “Real World”  
Attenuation of Hearing Protective  
Devices (HPDs)





# Single hearing protection:

$$(NRR - 7) \quad 0.5$$

$$\text{NRR of 33 dB} = (33 - 7) \times 0.5 = 13 \text{ dBA}$$

NRR  
33 dB

Derated  
NRR  
13 dBA

Hearing protection  
adequate up to a  
TWA of 98 dBA

# Double hearing protection:

$$[(\text{NRR} - 7) \quad 0.5] + 5$$

(use the higher NRR of the two HPDs)

Plugs NRR = 33 dB and Muffs NRR = 25 dB

NRR of 33 dB =  $[(33 - 7) \times 0.5] + 5 = 18 \text{ dBA}$

Highest  
NRR  
33 dB

Derated  
NRR  
18 dBA  
(double  
HP)

Double hearing  
protection  
adequate up to a  
TWA of 103 dBA



# Items to consider when Selecting Hearing Protection

- Attenuation required
- Ease of use
- Fit
- Comfort
- Durability

Remember, some personnel will have to wear hearing protection for 8 hours.



# DoD 6055.12

Hearing protection must be capable of attenuating worker noise exposure below an 8-hour Time Weighted Average (TWA) of 85 dBA. If hearing protectors do not provide sufficient attenuation, **administrative controls** are required.



# Determining the adequacy of Hearing Protective Devices (HPDs) provided:

We will be using the following hearing protective devices for the slides that follow in verifying the adequacy of hearing protection:

Moldex Sparkplugs: NRR = 33 dB

Muffs: NRR = 25 dB



## Example 1: Woodworking operation:

95<sup>th</sup> percentile = 95 dBA

**Plugs NRR 33 dB**

**Muffs NRR 25dB**

Derated NRR Plugs =  $(33 - 7) \times 0.5 = 13$  dBA

Plugs adequate up to a TWA of 98 dBA – plugs are adequate

Derated NRR Muffs =  $(25 - 7) \times 0.5 = 9$  dBA

Muffs adequate up to a TWA of 94 dBA – muffs are NOT adequate for this operation



## Example 2: Metal Grinding Operation:

95<sup>th</sup> percentile of 102 dBA

Plugs NRR 33 dB

Muffs NRR 25dB

Derated NRR Plugs =  $(33 - 7) \times 0.5 = 13$  dBA

Plugs adequate up to a TWA of 98 dBA

Available NRR 33 dB is NOT adequate - use double hearing protection

Derated NRR for Double Hearing Protection – use highest NRR of the two HPDs (Plugs NRR 33 dB):

$$(33 - 7) \times 0.5 + 5 = 18 \text{ dBA}$$

Double hearing protection adequate up to 103 dBA – Double hearing protection provided is adequate.



## Example 3: Blasting Operation:

95<sup>th</sup> percentile = 113 dBA

Plugs NRR 33 dB

Muffs NRR 25dB

From a previous slide Plugs adequate up to a TWA of 98 dBA  
Use double hearing protection

Derated NRR for Double Hearing Protection – use highest NRR of the two HPDs (Plugs NRR 33 dB):

$$(33 - 7) \times 0.5 + 5 = 18 \text{ dBA}$$

Double hearing protection adequate up to 103 dBA – Double hearing protection provided is NOT adequate.

Administrative controls required



# Calculating Stay Time (Administrative Control)

Formula for calculating Stay Time:

$$480 \text{ (min)} \cdot 2^{-\left(\frac{[TWA_m - 85]}{3}\right)}$$

Previous slide: 95<sup>th</sup> percentile = 113 dBA and NRR for double hearing protection is 18 dBA

$$113 \text{ dBA} - 18 \text{ dBA} = 95 \text{ dBA (modified TWA, } TWA_m)$$

$$480 \text{ (min)} \cdot 2^{-\left(\frac{[95 - 85]}{3}\right)} = \mathbf{48 \text{ minutes}}$$

No exposure to noise for the remaining work shift



Or you can use an Excel  
program to make things  
simpler!



**If you have any questions or  
would like a copy of the  
EXCEL program...**

Call 757-953-8925

# References:

- AIHA “The Noise Manual”, 5<sup>th</sup> edition (2000)
- ANSI S3.19 (1974)
- DoD INST 6055.12, Hearing Conservation Program (12/03/10)
- OPNAV 5100.23G
- NIOSH “Hearing Protector Device Compendium”
- OSHA, 29CFR 1910.95 General Industry