CLEMCO®
INDUSTRIES CORP.

How to Determine Level of Hearing Protection When Using Apollo Series Supplied-Air Respirators

Clemco is frequently asked how to figure the hearing protection rating of our helmets.

The Short Answer:
Clemco Supplied-Air Respirators have a noise reduction rating (NRR) of at least 8dB. The respirators by themselves do not provide adequate hearing protection. However, when used as secondary hearing protection, they may enable the wearer to perform blasting over an 8 hour shift. The following equation conforms to OSHA's **Minimum** recommendation of calculating hearing protection provided by Personal Hearing Protection Devices:

Calculation
B-scale reading of work environment − (NRR $_{\text{of Primary Hearing Protection}}$ −7dB) + 5dB $_{\text{from SAR}}$=dBa of employee exposure

Example:
- The time-weighted average employee is exposed to is 120 dBa
- Foam ear plugs have a 33 NRR
  - 1910.95b states: to calculate hearing protection on the "A" scale, subtract 7 from the NRR of the hearing protector.
- Clemco's Supplied-Air Respirators have an 8 NRR
  - OSHA's Technical manual, TED 01-00-015 [TED 1-0.15A], Section III, Chapter 5, section IV, Appendix C recommends the addition of 5dBs when using secondary hearing protection.

The calculated employee noise exposure in this example is:

120dBa-[(33-7)+5] = 89dBa

OSHA's Standard 1910.52(d) (1) provides the following guidelines for Noise exposure in the work place:

1926.52(d)(1) In all cases where the sound levels exceed the values shown herein, a continuing, effective hearing conservation program shall be administered.

Table D-2-Permissible Noise Exposures:

Duration Per Day	Sound Level dBa, Slow Response
8	90
6	92

4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
¼ or Less	115

The Long Answer:

Clemco's three Apollo Series Supplied-Air Respirators, the 20, the 60 and the 600 were sent to an independent third party testing agency and received Noise Reduction Ratings using the ANSI Z3.19, of a minimum of 8 dB. These results may be downloaded in their entirety from http://www.clemcoindustries.com/safety_categories.php.

The actual effectiveness of any individual hearing protector cannot be determined under workplace conditions. However, OSHA's noise standards (1910.95(j)(2) and 1926.52(b)) require that personal hearing protection be worn to attenuate the occupational noise exposure of employees to within the limits shown in Tables G-16, G-16a, and D-2, respectively. Hearing protectors are evaluated under laboratory conditions specified by the American National Standards Institute in ANSI S3.19-1974 (OSHA's experience and the published scientific literature indicate that laboratory-obtained real ear attenuation for hearing protectors can seldom be achieved in the workplace).

> Appendix B: Methods For Estimating the Adequacy of Hearing Protector Attenuation provides information on how to determine the adequacy of hearing protector attenuation using the noise reduction rating (NRR) of a given hearing protector.

> Use the following formulas to estimate the attenuation afforded to a noise-exposed employee in a work environment by plugs, in combination with Clemco Apollo Series Supplied Air Respirators.

> - A common method used for **single protection** is as follows
>   1. Determine the laboratory-based noise attenuation provided by the HPD. This is referred to as the Noise Reduction Rating (NRR) and is listed on the packaging.
>   2. Subtract the NRR from the C-weighted TWA workplace noise level, as follows:
>
>   **Estimated Exposure (dBA) = TWA (dBC) - NRR**
>   If C-weighted noise level data is not available, A-weighted data can be used by subtracting a 7 dB correction factor from the NRR, as follows:
>
>   **Estimated Exposure (dBA) = TWA (dBA) - (NRR - 7)**
>   *Example:*

TWA=120 dBA, Ear Plugs NRR=33
Estimated Exposure = 120 - (33-7) = 94 dBA

- For **dual protection** (plugs and Apollo SARs are used simultaneously) use the following:
  1. Determine the laboratory-based NRR for the **higher** rated protector (NRR_h).
  2. Subtract 7 dB from NRR_h if using A-weighted sound level data.
  3. Add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.
  4. Subtract the remainder from the TWA as follows:

  Estimated Exposure (dBA) = TWA (dBC) - (NRR_h + 5) , or

  Estimated Exposure (dBA) = TWA (dBA) - [(NRR_h- 7) + 5]

  Example:
  TWA=120 dBA, plug NRR=33, and Apollo SAR NRR=8 dB
  Estimated Exposure = 120 - [(33 - 7) + 5] = 89 dBA

- OSHA's experience and the published scientific literature have shown that laboratory-obtained real ear attenuation for HPDs can seldom be achieved in the workplace. To adjust for workplace conditions, **OSHA strongly recommends applying a 50% correction factor** when estimating field attenuation. This is especially important when considering whether engineering controls are to be implemented. The equations above would then be modified as follows:

  o Single Protection:
  Estimated Exposure (dBA) = TWA (dBC) - [NRR x 50%], or
  Estimated Exposure (dBA) = TWA (dBA) - [(NRR - 7) x 50%]

  o Dual Protection:
  Estimated Exposure (dBA) = TWA (dBC) - [(NRR_h x 50%) + 5] , or
  Estimated Exposure (dBA) = TWA (dBA) - {[(NRR_h - 7) x 50%] + 5}