Noise Reduction Rating (NRR)

Theresa Y. Schulz, PhD, LtCol, USAF (ret.)
How much noise is reaching the ear of the worker?

That is completely unknown …

Noise Level = 100 dB

Noise Reduction Rating = 30 dB

(55 – 104 dB)
Noise Reduction Rating

- A laboratory estimate of the amount of attenuation achievable by 98% of users when properly fit
- A population-based rating — some users will get more attenuation, some will get less

The NRR is only a population estimate, not a predictor of individual attenuation.
Noise Reduction Rating – Determining an NRR

- 10 human subjects tested in a simulated industrial room
- Tested with ears open / occluded at nine frequencies
- Each subject tested 3x
- NRR calculated to be population average
Noise Reduction Rating – Determining an NRR

Number of test subjects

NRR

Attenuation

14 18 20 22 23 24 25 26 27 28 30 32
## De-Rating Methods

<table>
<thead>
<tr>
<th>OSHA</th>
<th>NIOSH</th>
<th>CSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRR ÷ 2 (feasibility of engineering controls)</td>
<td><strong>Fit Test</strong></td>
<td>Class</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A up to 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B up to 95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C up to 90</td>
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Noise Reduction Rating

• The EPA recently made an announcement about a proposed change to the Noise Reduction Rating [NRR]

• This is the first change in hearing protector regulation in nearly 30 years
**Noise Reduction Rating**

Current NRR Label

Mock-up of New Label

80th % Minimally-trained

20th % Proficient Users

80th %

20th %

Users
## Noise Reduction Rating

### Three New Labels

<table>
<thead>
<tr>
<th>LABEL</th>
<th>DESCRIPTION</th>
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</table>
| **Conventional HPD**          | • Perform lab test with subjects who fit the protector after brief training  
                                | • Estimates the range of protection achieved by 20% and 80% of users                                                                           |
| **Active Noise Reduction [ANR]** | • Uses a Microphone-in-Real-Ear [MIRE] method to estimate protection  
                                 | • Measured with ANR turned OFF and ON to show the additional attenuation from the ANR                                                          |
| **Level Dependent/Impulse Noise Reduction** | • Testing will occur over a range of impulse noise levels. Multiple tests to determine lower and upper ranges of impulse noise reduction  
                                 | • Will include two ranges to identify attenuation for passive and active modes                                                                 |
20 human subjects tested in a simulated industrial room
Subject trained then fits their own earplugs
Tested with ears open / occluded at 9 frequencies
Each subject tested 2x
NRR calculated to be population average
New NRR (NR_{sa})

80% achieved > 20 dB

20% achieved > 26 dB

Number of test subjects

Attenuation

20% achieved > 26 dB
Noise Reduction Rating

How to Apply the New Label

Two-number range displays the estimated protection achievable by minimally-trained users [80%] versus proficient users [20%].

A wider range indicates greater variability in the fit of that HPD. Smaller ranges indicate more consistency of fit. For example, earmuffs will usually have a tighter fitting range than earplugs, and may have a smaller NRR range.
## EPA’s Published Timetable

<table>
<thead>
<tr>
<th>Action</th>
<th>Date</th>
<th>CFR Cite</th>
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<tbody>
<tr>
<td>NPRM</td>
<td>08/05/09</td>
<td>74 FR 39150</td>
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<tr>
<td>NPRM Comment Period Extended</td>
<td>08/21/09</td>
<td>74 FR 42223</td>
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<tr>
<td>NPRM Comment Period End</td>
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<tr>
<td>Final Action</td>
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What Can I Do Now?

Although the new labeling regulation takes effect whenever the final rule is published by the EPA, there are a number of actions you can take now to prepare your Hearing Conservation Program for the change.

- **Evaluate Noise Spectra**
  to determine if spectral balance corrections will be necessary

- **Upgrade to One-on-one Training**
  research studies confirm that one-on-one training is superior to group training

![Variability of Noise Reduction as a Function of Noise Spectra](image)
What Can I Do Now?

• **Evaluate Current HPD Selection** to determine whether they are appropriate for your noise environment. Use the [Howard Leight Hearing Protector Selector](#) for recommendations.

• **Update Hearing Conservation Training Program** on proper fit of hearing protectors. Hold a “Toolbox Training” and hold a refresher fit training session.
What Can I Do Now?

Earplug Fit-Testing
- Train how to properly fit HPDs
- Select appropriate HPDs
- Document adequate protection

Continuous Monitoring
- In-ear dosimetry measures and documents the noise dose employee is exposed to during their work shift
Make Hearing Conservation Part of Your Everyday Life