



## EARMUFFS & SAFETY EYEWEAR

### ***In our facility, several noisy work areas require safety eyewear as well as hearing protection. Can earmuffs be worn over safety eyewear without affecting attenuation?***

The attenuation of an earmuff obviously depends upon a tight seal between the ear cushion and the head. Gaps provide an easy path for sound to penetrate the earcup, thus reducing the amount of attenuation provided by the earmuff. Several factors contribute to the size of those gaps:

- Band pressure of the earmuff, head shape and head size
- Compliance of the ear cushion material (stiffer material creates more gaps)
- Thickness of the eyewear frames
- Compliance of the eyewear frames

In a study conducted at the Howard Leight Acoustical Lab, five models of safety eyewear were tested in combination with two popular earmuff models, Bilsom® Thunder® T3 and Bilsom® Leightning® L3. Hearing tests were administered to listeners while they wore the earmuffs alone, and then in combination with the safety eyewear, to determine if there was any change in earmuff attenuation with the addition of the eyewear frames.

The results show that for safety eyewear with a thin frame (a width of 2mm or less at the temples where the earmuff cushion meets the frame), the eyewear caused no significant decline in attenuation – the mean attenuation was nearly equivalent to earmuff alone, or within one standard deviation. However, safety eyewear with wider frames caused noticeable gaps in the cushion seal, resulting in lower attenuation particularly in the low frequencies. One pair of safety eyewear with an unusually wide frame of 6mm at the temples caused a drop of 9 to 12 dB in the low and high frequencies. The typical reduction in attenuation for each frame style is shown in table 1.



Table 1.

Reduction in Mean Attenuation When Safety Eyewear is Worn with Earmuffs (in dB)									
Frequency in Hz	125	250	500	1000	2000	3150	4000	6300	8000
Thin Frame (2mm)	1	0	0	0	1	1	0	2	1
Medium Frame (3mm)	5	3	2	1	2	2	2	3	3
Thick Frame (6mm)	12	9	5	4	3	4	6	10	12

If we apply these corrections to the NRR, we find that the effective NRR for earmuffs remains the same when worn with a thin frame (2mm), but is reduced by about 2 dB when worn with a medium-width frame (3mm), and is reduced by about 5 dB when worn with a thick frame (6mm).

These results highlight that with the right selection of safety eyewear, the attenuation value of an earmuff is not compromised. This information is valuable for those environments where earmuffs are preferred over earplugs, or for earmuff users who wear prescription eyeglasses or safety eyewear in hazardous noise.

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 Bacou-Dalloz™ Hearing Safety Group

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