

Noise

Noise - Occupational Exposure Limits for Extended Workshifts

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Are there guidelines for noise exposure on shifts longer than 8 hours?

Most standards and guidelines related to noise exposure limits are based on an 8-hour work shift and a 40-hour work week. Like other occupational exposure limits, the occupational exposure limit (OEL) or time-weighted average (TWA) can be modified for extended work shifts. When calculating exposure limits for an extended work shift, it is important to consider the health effects relating to noise exposure, and to working an extended work shift. For example, a change from an 8-hour shift to a 12-hour shift must consider the following issues:

- Eight-hour occupational exposure limit (OEL) or time-weighted noise exposure level in dB(A).
- Problems related to using hearing protectors for such a prolonged work shift.
- Combined effect of stress factors related to a 12-hour shift and noise exposure.
- Shorter rest period between shifts (shorter recovery period).

For more information on extended work shifts (in general), please see [Extended Workday: Health and Safety Issues](#).

How do I calculate the exposure limit?

Equal energy rule

As an example, the International Organization for Standardization standard ISO 1999:2013 Acoustics — Estimation of noise-induced hearing loss and the Ontario's A guide to the Noise Regulation under the Occupational Health and Safety Act recommend the use of the equal energy in calculating the time-weighted average (TWA) for a work shift:

$$\text{Adjusted exposure limit} = L_{\text{exposure limit}} - 10 \log (T/8)$$

where T = duration of work shift in hours. Results of such calculation for various extended work shifts are listed in Table 1.

Overall, OELs depend on two key factors to prepare exposure-duration tables - the [criterion level](#) and the [exchange rate](#).

- The criterion level is the occupational exposure limit for your jurisdiction
- The exchange rate is the number of decibel increases that leads to a doubling of sound energy (or halving the allowable exposure time).

Both the criterion level and the exchange rate are determined by the jurisdiction. For more information, please see [Noise - Occupational Exposure Limits in Canada](#).

Table 1 shows the adjusted noise exposure limit for extended shifts using the 85 dB and 90 dB criterion level

Table 1
Adjusted Noise Exposure Limits for Extended Work Shifts

Time (hours)	Noise limit (criterion level)	
	85 dB	90 dB
8	85.00	90.00
9	84.49	89.49
10	84.03	89.03
11	83.62	88.62
12	83.24	88.24
13	82.89	87.89
14	82.57	87.57
15	82.27	87.27
16	81.99	86.99

For example, from the table, a person working a 12-hour shift in a jurisdiction that has an occupational exposure limit of 85 dB(A) and exchange rate of 3 dB would have an adjusted exposure limit of 83.24 dB(A). This can be calculated:

$$\text{Adjusted exposure limit} = 85 \text{ dB(A)} - (10 \times \log (12/8))$$

$$\text{Adjusted exposure limit} = 85 \text{ dB(A)} - (10 \times (\log 1.5))$$

$$\text{Adjusted exposure limit} = 83.24 \text{ dB(A)}$$

In other words, if the noise level is kept below 83 dB(A) then, according to equal energy concept, the maximum permissible limit is not exceeded.

Please note that this information is intended as a guide only and may not apply to specific occupational sectors or jurisdictions. Further considerations may be needed when working with ototoxic products.

Consult the regulations in your jurisdiction for information on requirements for [hearing protective equipment](#) and other control measures that may be required to protect the hearing of workers. If you have further questions relating to regulatory requirements, please contact the [occupational health and safety authority for your jurisdiction](#).

For more information on noise, please consult our OSH Answers:

- [Noise - Audiometric Tests](#)
 - [Noise - Auditory Effects](#)
 - [Noise - Basic Information](#)
 - [Noise - Control Measures](#)
 - [Noise - Hearing Conservation Program](#)
 - [Noise - Measurement of Workplace Noise](#)
 - [Noise - Non-Auditory Effects](#)
 - [Noise - Occupational Exposure Limits in Canada](#)
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Fact sheet last revised: 2022-07-14

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