3M Science. Applied to Life.™

Wear time: Get the most out of your protective equipment

PPE can only do its job when it is worn properly, 100% of the time.

What does wear time mean?

Wear time is the percentage of time a worker actually wears their required PPE vs. the amount of time they should wear it to achieve the *Assigned Protection Factor (APF).* Used to help select respiratory PPE, APF assumes that workers use their required PPE properly 100% of the time they may be exposed while on the job. *Effective Protection Factor (EPF)* is the actual protection rate factor according to the wear time for each worker.

Impact on respiratory protection EPF

Respirator Type	APF	Percent of Time Respirator Worn & Associated EPF		
		100%	95%	80%
Half-face respirator	10	10	7	3.6
Full-face respirator	50	50	14.5	4.6
Powered & Supplied Air	1000	1000	20	5
SCBA	10,000	10,000	20	5

1. Colton, Craig. "Respiratory Protection." *Fundamentals of Industrial Hygiene.* Ed. Barbara Plog. Itasca: National Safety Council, 2012. 678-679.I

Impact on hearing protection

Effective protection drops when hearing protectors are not worn.

Even when noise seems to be at a reasonable level, noise above 85 dBA can still lead to long-term damage. Noise-induced hearing loss is caused by the damage and eventual death of sensory cells in your ears, called hair cells. Unlike some other cells, human ear hair cells never grow back.[1]

[1] Based on 95 dBA TWA exposure and using NIOSH Recommended Exposure Limit of 85 dBA and 3 dB exchange rate.

Potential reasons why workers may not wear their PPE

- **Discomfort:** heat, humidity, lack of breathability
- **Performance:** fogging eyewear, inability to communicate clearly
- **Compatibility:** eye protection worn under earmuffs may impact hearing protection
- **Communication:** workers may remove PPE to communicate

Potential result: **lower wear time** and negative impact on worker health and safety.

The potential impact of low wear time

- Increased instances of occupational illness, e.g. silicosis/pneumoconiosis
- Increased instances of noise-induced hearing loss
- Increase in workplace accident rates
- Increase in Lifetime Injury Frequency Rate (LTIFR)
- Increase in worker fatalities
- Negative impact on welfare of workers and their communities
- Negative impact on business reputation
- Negative impact on Total Cost of Operation (TCO)

What can improved wear time do for you?

- Maximize Effective Protection Factor (EPF)
- Reduce time of exposure
- Reduce probability of accidents and occupational diseases
- Improve Lifetime Injury Frequency Rate (LTIFR)
- Improve health and social welfare of mining communities

Three keys to improving wear time

- Fit: select PPE optimized for wearability, validate with fit testing
- Communication: make it easier to speak and hear without removing PPE
- Compatibility: choose integrated and compatible PPE designed to be worn together

The impacts of everyday work hazards

Mine workers that are unprotected from the hazards encountered today, can often lead to significant long-term injuries and illness. Understanding the near- and long-term risks of common mining tasks—and how the proper use of PPE can help reduce them—is essential to keeping workers safe today and tomorrow.

Respiratory Hazards

- Some fatal occupational respiratory diseases can take up to **20 years or longer** to develop. As consequences of breathing hazardous substances are often not immediate.

Silicosis: a devastating and life altering illness

- **USA:** more than **23%** of reported silicosis deaths attributable to mining.[1]
- **Latin America:** silicosis prevalence rate of **37%** among miners, and up to **50%** among miners over age 50.[2]
- **Australia:** silicosis **350** cases rose to 350 in 2019.[3]
- **Worldwide:** one of the most common work-related injuries is pneumoconiosis, specifically caused by exposure to Respirable Crystalline Silica (RCS)[4]

1. NIOSH. 2022. Mining Topic: Respiratory Diseases. (https://www.cdc.gov/niosh/mining/topics/respiratorydiseases.html)
2. CODELCO. Fight against silicosis: A battle that Codelco is determined to win. (https://www.codelco.com/sustentabilidad/publicaciones/informe-sustentable/una-batalla-que-codelco-esta-decidida-a-ganar)
3. NCBI. 2021. Early Detection Methods for Silicosis in Australia and Internationally. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8345652/)
4. NCBI. 2010. Silicosis due to Denim Sandblasting in Young People: MDCT Findings. (https://pubmed.ncbi.nlm.nih.gov/25610113/)

Hearing Loss

- More than **120 million** workers in the world are exposed to noise levels above 85 dB. (WHO)
- The annual cost of unprevented hearing loss is in the range of **$750–790 billion** globally. (WHO, 2017)
- Noise-induced hearing loss is one of the most common occupational injuries, and the second most self-reported occupational disorder. (NIOSH)

Occupational hearing loss: is permanent and 100% preventable

- **USA:** estimated **90%** of miners have developed hearing impairment by age 50.[1]
- **Peru: 48.4%** of workers suffer some illness due to noise exposure.[2]

1. Kan Sun and A. S. Azman. Evaluating hearing loss risks in the mining industry through MSHA citations. J. Occup Environ Hyg. 2018 Mar; 15(3):246-262.
2. Sub-bulletin Feb. 28, 2019. Energy & Mines Ministry. Government of Peru.

Work at Heights

- **68%** of accidents occur at heights of less than 2 meters. This occurs because, at low height, we have a lower perception of risk. (UK HSE)
- Falls are the **second leading** cause of unintentional injury and death worldwide. (WHO)

Falls from height: can cause disabling injury or death

- **Chile:** falls are the **second leading** cause of death in the mining industry.[1]
- **USA:** Falls are the **second leading** cause of workplace injuries in 2020, responsible for **18%** of all injuries.[2]

1. https://www.susesu.cl/607/articles-580749_archive_01.pdf
2. https://www.cdc.gov/niosh/injury/fastfacts.html

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