UNIVERSITAS INDONESIA

FACULTY OF PUBLIC HEALTH

Environmental Health in the Industry

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Definition of Industrial Hygiene

Industrial hygiene is the science of anticipating, recognizing, evaluating and controlling workplace conditions that may cause workers' injury or illness.

Utah State University Office of Research (2019). *Industrial Hygiene* [online]. Available at: https://research.usu.edu/ehs/industrial_hygeine/

Physical Hazard in Industry

Physical hazards represent potential for accident or injury or illness due to repetitive exposure to mechanical action or work activity.

Rotating and Moving Equipment	Vibration
Noise	Lighting

International Finance Corporation (2007). *Environmental, Health, and Safety General Guidelines* [online]. Available at: https://www.ifc.org/wps/wcm/connect/29f5137d-6e17-4660-b1f9-02bf561935e5/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES&CVID=jOWim3p

Physical Hazard in Industry

Rotating and Moving Equipment

Cases that might happen:

- Trapped,
- Entangled, or
- Struck by machinery parts

Recommended protective measures include:

- Designing machines to eliminate trap hazards Turning off, disconnecting, isolating machine

Picture Credit: https://www.bilfinger.com/leistungen/engineering-maintenance/bre-bilfinger-rotating-equipment/

International Finance Corporation (2007). *Environmental, Health, and Safety General Guidelines* [online]. Available at: https://www.ifc.org/wps/wcm/connect/29f5137d-6e17-4660-b1f9-02bf561935e5/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES&CVID=jOWim3p

Physical Hazard in Industry

Vibration

- Lower back pain
- Motion sickness and
- Bone damage

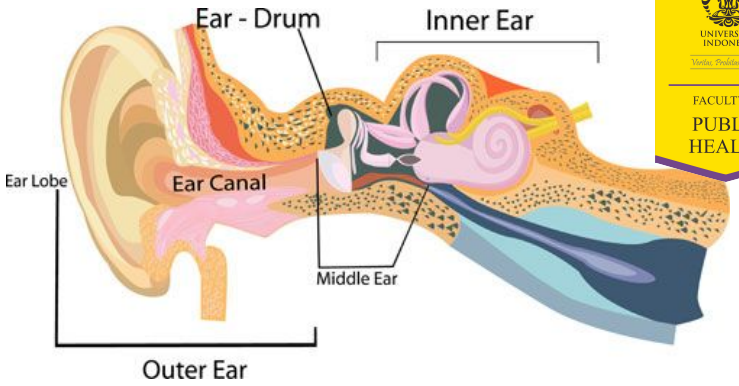
Whole-Body vibration (WBV)

Hand-arm vibration (HAV)

- White finger
- Carpal tunnel syndrome
- Sensory nerve damage and
- Muscle and joint damage in the hands and arms

WHO (n.d). *Occupational Exposure to Vibration from Hand-held Tools* [online]. Available at: https://www.who.int/occupational_health/pwh_guidance_no.10_teaching_materials.pdf
Victorian Trades Hall Council (2015). *Effects of Vibration* [online]. Available at: https://www.ohsrep.org.au/effects_of_vibration

Physical Hazard in Industry



Noise

Auditory Effects

- Conductive hearing loss
- Sensorineural hearing loss
- Mixed hearing loss
- Auditory neuropathy spectrum disorder

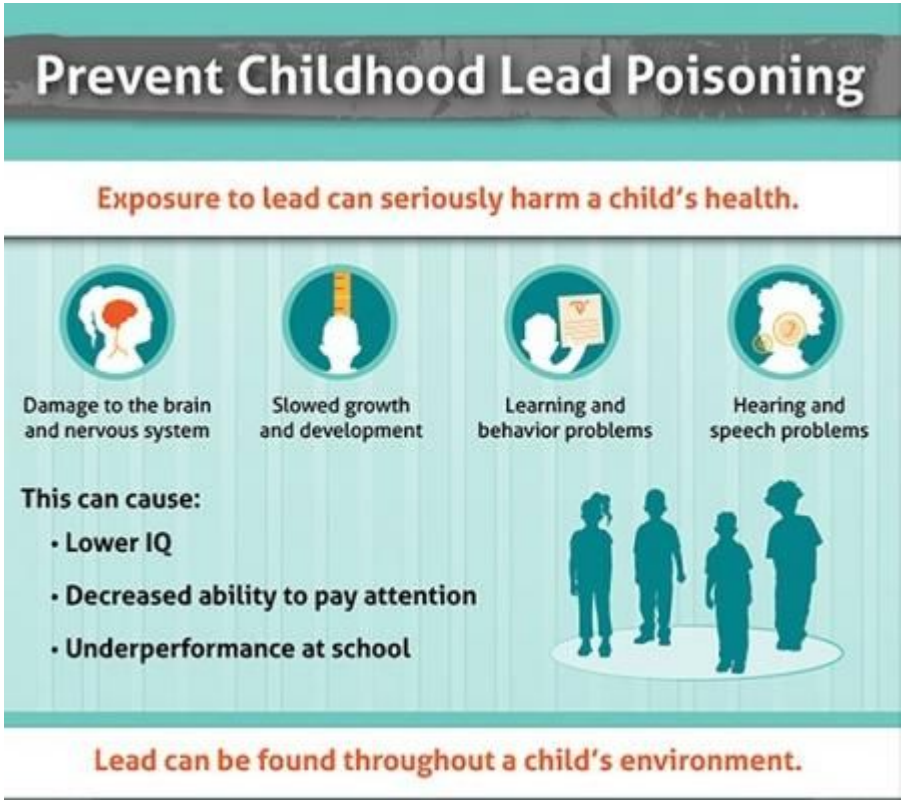
Non Auditory Effects

- Psychological disorders
- Physiological Disorders
- Communication interruption

Center for Disease Control and Prevention (2020). *Type of Hearing Loss* [online]. Available at: https://www.cdc.gov/ncbddd/hearingloss/types.html

Chemical Hazard in Industry

Chemical	Hazard	GHS symbol
HF	Corrosive, Acute toxicity	
TBP	Harmful, Health Hazard, Corrosive	
Kerosene	Flammable Liquid, Health hazard	
Hydrogen	Explosive	
Potassium Cyanide	Acute Toxic health hazard, corrosive	
Toxic elements like Se, Te	Acute toxicity	
Zirconium powder	Pyrophoric Solid	



Biological Hazard in Industry

Biological agents should be classified into six groups:

- **Contact with infected living animals**
- **Contact with contaminated animal products**
- **Tick, flea, or mite bite**
- **Contact with human or animal waste**
- **Contact with infected patient or blood**
- **Raising dust containing pathogens**

Rim, KT & Lim, CH. (2014). *Biologically Hazardous Agents at Work and Efforts to Protect Workers' Health: A Review of Recent Reports* [online]. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4147232/#:~:text=Two%20main%20groups%20of%20biological,that%20could%20be%20spread%20by

Biological Hazard in Industry

Occupations	Contact with contaminated animal products	Diseases
Animal Breeder, animal caretaker, animal scientist, butcher, farmer and rancher, farmworker, hunter and trapper, laboratory animal worker, meat packer, slaughterer, veterinarian	Handling of infected animal carcasses or placental tissues	Anthrax, brucellosis, Crimean Congo hemorrhagic fever, glanders, Hendra and Nipah virus infection, leptospirosis, Newcastle disease, plague, psittacosis, Q fever, Rift valley fever, *S. suis* infection, tularemia
Grader and sorter, freight handler, packer	Handling of raw goat hair, wool, or hides from endemic areas	Anthrax

Example of biological hazard from raising dust containing pathogens

Rim, KT & Lim, CH. (2014). *Biologically Hazardous Agents at Work and Efforts to Protect Workers' Health: A Review of Recent Reports* [online]. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4147232/#:~:text=Two%20main%20groups%20of%20biological,that%20could%20be%20spread%20by

A safe working environment

Physical hazard

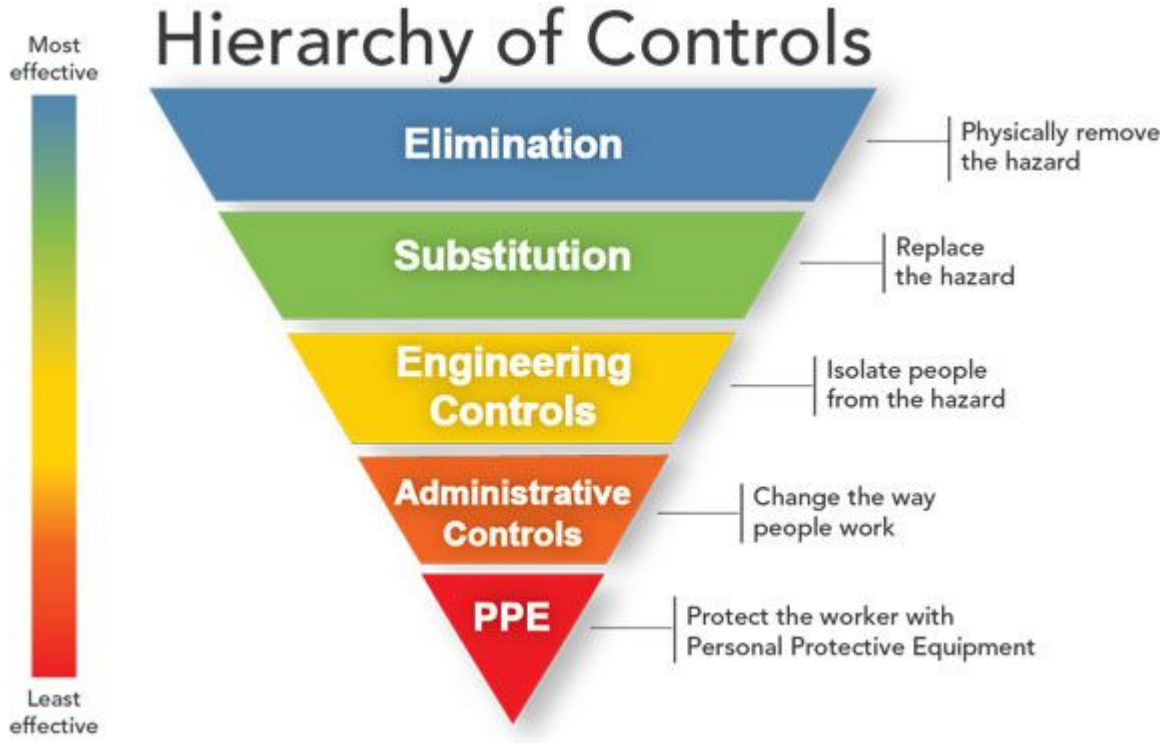
Period of Exposure per day	Noise Level (dB)
(hour)	
8	0,1
4	0,2
2	0,4
1	0,8

Chemical hazard

Table 1.1.1: WHO Ambient Air Quality Guidelines[7,8]

	Averaging Period	Guideline value in µg/m³
Sulfur dioxide (SO_2)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO_2)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM_{10}	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

International Finance Corporation (2007). *Environmental, Health, and Safety General Guidelines* [online]. Available at: https://www.ifc.org/wps/wcm/connect/29f5137d-6e17-4660-b1f9-02bf561935e5/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES&CVID=jOWim3p
Keputusan Menteri Tenaga Kerja Nomor KEP-51/MEN/1999 Tentang Nilai Ambang Batas Faktor Fisika di Tempat Kerja



Hierarchy of Control for Hazards

Center for Disease Control and Prevention (2015). *Hierarchy of Controls* [online]. Available at: https://www.cdc.gov/niosh/topics/hierarchy/default.html

Personal Protective Equipment

To reduce noise for 25-30 dB

To reduce noise for 30-40 dB

Picture Credit: https://mardohar.com/en/personal-protective-equipment/
Shutske, J & Shermann, M. (2012). *Personal Protective Equipment (PPE) for Hearing, Health and Safety* [online]. Available at: http://porkgateway.org/resource/personal-protective-equipment-ppe-for-hearing-health-and-safety/