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# PROTECTING WORKERS' HEALTH FROM OCCUPATIONAL NOISE POLLUTION IN THE MODERN TECHNOLOGICAL ERA: THE NEED OF THE HOUR

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**ABSTRACT**

Pollution is the result of the modern technology and machinery era, as well as human uncontrolled activities and unlimited aspirations. Any form of pollution negatively impacts human health, both physical and mental. Noise pollution is a form of environmental pollution, and deserves to be taken as seriously as other forms of pollution. Due to a lack of awareness about the serious adverse effects of noise pollution, it is often overlooked, even though it poses a threat to life and health as a silent killer. Loud and undesirable noise generated at the workplace also falls within the definition of noise pollution. Excessive noise at the workplace impacts the physical and mental health of workers. Noise pollution can lead to serious physical and mental health problems, such as hearing loss, heart disease, high blood pressure, insomnia, increased stress, emotional distress, and behavioural problems. Noise pollution at the workplace also negatively impacts workers' concentration, productivity, and work quality. In certain industries, this level exceeds the maximum threshold of severity. In the modern age of technology and machinery, the desire for greater and faster productivity in workplaces is fuelled by the use of newer and more advanced machinery. Noise pollution violates the fundamental human rights of the working class. Various international and national instruments have enshrined workers' rights, maximum workplace noise limits, and appropriate safety measures. In this modern era, workers' health can be protected from noise pollution through the use of the latest technologies, innovations, and safety equipment. This research paper outlines the health problems faced by workers due to workplace noise pollution and offers suggestions for addressing the problem.

**Key Words-** Occupational, Noise Pollution, Workers, Physical and Mental Health, Right to Life and Health, International Bodies.

## Introduction:-

Noise pollution is generally not seen as serious as other environmental pollutants, although its adverse effects are detrimental. Workplace noise pollution has serious adverse effects on the physical and mental health of workers. Workplace noise pollution, besides being a nuisance, also has serious long-term health consequences. The use of modern machinery and equipment has increased the level of noise pollution in workplaces. However, it is a well-established fact that workplaces have been exposed to excessive noise since ancient times. Excessive noise at the workplace also affects workers' concentration and productivity. Over time, various research studies have drawn society's attention to this serious problem, and efforts have been made at the international and national levels to address this issue. Access to a safe working environment and just working conditions is a human right of workers, guaranteed in various international human rights documents. Noise pollution at the workplace violates these human rights of workers. In the modern era, various countries have incorporated provisions in their national laws to ensure the safety of workers from undesirable noise and vibrations at the workplace. In India, such provisions have also been incorporated into laws, establishing consistency with relevant international laws, regulations, and provisions. In the current technological era, science and technology have made every aspect of human life easier and more convenient. Efforts using science and technology are needed to mitigate noise pollution at workplaces or mitigate the adverse effects of noise pollution on workers.

**Definition and Meaning of Occupational Noise Pollution:-**

The word "Noise" is derived from the Latin word *nausea*. Noise pollution is generally defined as an excess of unwanted sound. Sound is an essential part of life and the environment; life without it is unimaginable. However, when its volume exceeds a certain limit, it becomes unbearable and harmful. Noise pollution originates from various sources. Its unit of measurement is the decibel (dB). When noise levels in a workplace exceed a certain level and standard, the resulting noise pollution is known as occupational noise pollution.

According to the World Health Organization[1]- "Noise pollution is the excessive and unwanted sound that can harm human health, well-being and quality of life."

According to Oxford English Dictionary[2]– "*A sound, especially when it is loud, unpleasant or frightening, is noise.*"

The Hon'ble Supreme Court[3] defined the noise pollution as "*The disturbance produced in our environment by the undesirable, sound of various kinds is noise pollution.*"

"The term noise covers all sound which can result in hearing impairment or be harmful to health or otherwise dangerous"[4].

"Noise pollution, after air and water pollution is regarded as the third most dangerous sort of pollution, according to the World Health Organization"[5].

According to Robert Koch (Nobel Prize Winner, German Bacteriologist) – "*A day will come man will have to fight merciless noise as the worst enemy of health.*"[6]

"Occupational Noise is defined as all sound in the workplace, either wanted or unwanted, and is one of the most common occupational health and safety (OHS) hazards"[7].

"The noise levels in some production areas, such as in the cement mill, air compressor, blower or crusher, in the cement grinding station ranged between 89 and 105 dBA and exceeded the permissible exposure limit"[8].

**Effects of Occupational Noise on Workers:-**

Noise pollution generally has adverse effects on all individuals exposed to it. Hearing loss is the most common adverse effect. The effects of noise pollution depend on both the intensity of the sound and the time period of exposure. "It has been suggested that 12% or more of the global population is at risk of hearing loss from noise"[9].

[1] https://www.who.int/europe/news-room/fact-sheets/item/noise
[2] https://www.oed.com/dictionary/noise-pollution_n
[3] *In Re: Noise Pollution- Implementation of the Laws for Restricting Voice of Loud Speakers and High Volume Producing Sound System*, AIR 2005 SC 3136.
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"The World Health Organization estimated that one-third of all cases of hearing loss can be attributed to noise exposure"[10]. "The WHO has documented seven categories of adverse health effects of noise pollution on humans- (i) Hearing Impairment, (ii) Negative Social Behavior, (iii) Interference with Spoken Communication, (iv) Sleep Disturbance, (v) Cardiovascular Diseases, (vi) Disturbance in Mental Health, and (vii) Annoyance"[11]. Occupational noise pollution also causes various adverse effects on workers within its range. These adverse effects have been highlighted in various research studies and reports. Occupational noise pollution has adverse effects on the physical and mental health of workers and endangers their lives by causing serious diseases.

"Noise-induced hearing loss (NIHL) has long been recognized as an occupational disease, amongst copper workers from hammering on metal, blacksmiths in the 18th century, and shipbuilders or boil makers after the Industrial Revolution"[12]. "Noise is typically one of the most hazardous factors, has the potential to lead to occupational deafness"[13], and "workers who are daily expose to such excessive noise levels for a prolonged period will face considerable social and physiological impacts, including NIHL"[14]. "A study in Ghana showed that the noise levels in corn mills exceeded the PEL (85dBA, WHO, 1999) and 23% of workers in corn mills presented with evidence of NIHL"[15]. "Workers who are under long-term exposure to excessive noise level can develop noise-induced hearing loss (NIHL)"[16]. "Noise can disrupt sleep cycles; reduce sleep quality, and lead to fatigue, which has downstream effects on both physical and mental health"[17]. "The high level of noise reduces the quality of work and thus reduces the concentration level"[18]. "The National Institute for Occupational Safety and Health (NIOSH) stated hundred-thousands of construction workers are at risk of developing hypertension due to exposure to high levels of noise emission"[19].

"The most prevalent irreversible occupational hazard due to construction industry is identified as noise-induced hearing impairment, which has caused hearing difficulties to

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over 120 million people worldwide"[20]. "Occupational noise leads to irreversible hearing impairment and other health effects including cardiovascular disease, cognitive impairment, and increased injury risk"[21].

"Noise exposure reduces hearing ability and causes cardiovascular problems such as hypertension, mental fatigue, and increased risk of work accidents"[22]. "About half of industrial workers in noisy settings suffer from noise-induced hearing loss, impacting health and productivity"[23]. "High noise levels on construction sites cause auditory fatigue, lowered concentration, and heightened accident risk, highlighting the need for hearing protection"[24]. "High occupational noise exposure poses risks for some adverse pregnancy outcomes in women"[25]. "Noise impairs task management skills like attention and working memory, reducing workers' productivity"[26]. "Noise causes mechanical and biochemical damage to the ear leading to permanent hearing loss; non-auditory effects include mental and cardiovascular health problems"[27]. "Exposure to industrial noise above safety standards is strongly linked to hearing loss among workers"[28]. "Environmental and occupational noise negatively impact quality of life, cognitive function, and mental health"[29]. "Prolonged noise exposure causes permanent hearing loss, stress, reduced concentration, and increased accidents in workplaces"[30]. "Industrial noise exposure in China causes significant hearing loss and impaired communication among workers"[31].

"Noise annoyance affects workers' mental health and job satisfaction contributing to stress and reduced productivity"[32]. "Noise exposure interferes with cognitive processing, leading to errors and reduced work efficiency"[33]. "Mining noise causes hearing

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loss and cardiovascular issues among workers and adversely affects quality of life"[34]. "Evidence suggests a dose-response relationship between noise exposure and increased injury risk at work"[35]. "Occupational noise activates stress responses that may promote hypertension and cardiovascular disease in workers"[36].

"Noise exposure contributes to mental health issues, sleep disturbances, and metabolic disorders beyond hearing loss"[37]. "Occupational noise exposure increases risk of adverse birth outcomes in pregnant workers"[38]. "Noise pollution is a critical occupational hazard contributing to hearing loss, cardiovascular disease, and decreased quality of life"[39].

**The Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No. 148) (C148)-**

This Convention was adopted by the International Labour Organization on 20 June 1977 with the objective of protecting workers from the hazards of air pollution, noise and vibration in their workplaces and to implement measures for the effective control of these hazards. This convention lays down certain norms for member states and employers to follow in the workplace to protect workers from air pollution, noise pollution and vibration. Article 8[40] of this Convention provides that- "The competent authority shall establish criteria for determining the hazards of exposure to air pollution, noise and vibration in the working environment and where appropriate, shall specify exposure limits on the basis of these criteria." Article 9[41] provides that, "As far as possible, the working environment shall be kept free from any hazard due to air pollution, noise or vibration- (a) by technical measures applied to new plant or processes in design or installation, or added to existing plant or processes; or, where this is not possible, (b) by supplementary organisational measures."

**The Occupational Safety, Health and Working Conditions Code, 2020-**

In India, *'The Occupational Safety, Health and Working Conditions Code, 2020'* has been implemented regarding occupational safety, workers health protection, and working conditions at the work place. The preamble of this code reflects its objectives- "An Act to consolidate and amend the laws regulating the occupational safety, health and working conditions of the persons employed in an establishment and for matters connected therewith or incidental thereto.' One of the main objectives of this Code is to ensure safety measures in respect of conditions affecting the health of workers at the workplace and to lay down responsibilities in this regard.

**Section 2** of the Code defines various terms, including-

**Hazardous[42]-** *"Hazardous means involving danger or potential danger."*

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[41] *ibid*

[42] Section 2 (z), The Occupational Safety, Health and Working Conditions Code, 2020

**Hazardous Process**[43]**-** *"Hazardous Process means any process or activity in relation to an industry or plantation specified in the First Schedule where, unless special care is taken, raw materials used therein or the intermediate or finished products, bye-products, hazardous substances, wastes or effluents thereof or spraying of any pesticides, insecticides or chemicals used therein, as the case may be, would-*

*(i) cause material impairment to the health of the persons engaged in or connected therewith, or*
*(ii) result in the pollution of the general environment."*
**Industrial Premises**[44]**-** *"Industrial premises means any place or premises (not being a private dwelling house), including the precincts thereof, in which or in any part of* ***which*** *any industry, trade, business, occupation or manufacturing is being ordinarily carried on with or without the aid of power and includes a godown attached thereto"*
**Serious Bodily Injury**[45]**-** *"Serious bodily injury means any injury which involves, or in all probability will involve, the permanent loss of any part or section of a body or the use of any part or section of a body, or the permanent loss of or injury to the sight or hearing, or any permanent physical incapacity or the fracture of any bone or one or more joints or bones of any phalanges of hand or foot"*
**Worker**[46]**-** *"Worker means any person employed in any establishment to do any manual, unskilled, skilled, technical, operational, clerical or supervisory work for hire or reward, whether the terms of employment be express or implied, and includes working journalists and sales promotion employees, but does not include any such person-*
*(i) who is subject to the Air Force Act, 1950, or the Army Act, 1950, or the Navy Act, 1957; or*
*(ii) who is employed in the police service or as an officer or other employee of a prison; or*
*(iii) who is employed mainly in a managerial or administrative capacity; or*
*(iv) who is employed in a supervisory capacity drawing wage exceeding eighteen thousand rupees per month or an amount as may be notified by the Central Government from time to time."*

**Section 6** of the Code lays down the duties of an employer-
**Section 6: Duties of Employer-** *"Every employer shall,-*
*(a) ensure that workplace is free from hazards which cause or are likely to cause injury or occupational disease to the employees; …….(d) provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of the employees; ……."*
**Section 102** of the Code provides for penalties for failure to comply with the employer's duties specified in Section 6. According to Section 102, the person responsible for such failure or contravention shall be punishable with imprisonment for a term which may extend to two years and with a fine which may extend to five lakh rupees, and with a fine which may extend to twenty-five rupees per day for a continuing offence.
**Section 13** of the Code also outlines the duties to be performed by employees at the workplace.
Section 13: Duties of Employee- *"Every employee at workplace shall,- (a) take reasonable care for the health and safety of himself and of other persons who may be affected by his*

[43] Section 2 (za), *ibid*
[44] Section 2 (zc), *ibid*
[45] Section 2 (zzg), *ibid*
[46] Section 2 (zzl), *ibid*

*acts or omission at the workplace; (b) comply with the safety and health requirements specified in the standards; ……. (e) not wilfully interfere with or misuse or neglect any appliance, convenience or other thing provided ay workplace for the purpose of securing the health, safety and welfare of workers; ……."*

Any violation of these duties by an employee is punishable with penalty which may extend to ten thousand rupees under Section 106. Section 23 of the Code mentions the duties of the employer regarding maintenance of health, safety and working conditions of the employees[47]. Occupational Health and Safety Association v/s Union of India and Others,[48] for protection of health of workers, the Supreme Court held that when workers are engaged in hazardous and risky jobs/occupations, the responsibility and duty, regarding protection of health of workers, on the state becomes double fold. National laws or regulations shall prescribe that measures be taken for the prevention and control of, and protection against occupational hazards in the working environment due to air pollution, noise and vibration[49].

**Technical, Mechanical, and Safety Measures to Protect Workers from Occupational Noise Pollution-**

Taking occupational noise pollution seriously, there is a need to work on various technical, mechanical and safety measures to control it. Under which the following measures can be included-

- Use quieter machines, tools, and equipment when selecting or replacing workplace devices.
- Install acoustic enclosures around noisy machinery to contain and absorb sound.
- Isolate operators in soundproofed control rooms, in-plant offices, or cabins.
- Construct barriers between noise sources and employees, ideally with dense and absorptive materials.
- Use absorbent materials on ceilings and walls in noisy areas to reduce reverberation.
- Dampen vibrating surfaces with viscoelastic materials like plastics or elastomeric polymers.
- Seal enclosures for low-frequency noise sources, ensuring all openings close tightly.
- Replace chain and gear drives with quieter belt drives.
- Substitute metal gears or parts with plastic to lower noise from mechanical movements.
- Install silencers or mufflers in ducts and pneumatic exhausts to attenuate sound at its source.
- Isolate vibrating machinery with springs, cork, elastomeric, or foam rubber supports.
- Design walls, floors, windows, and doors for optimal sound transmission loss.
- Use gears with tooth patterns that provide a quiet run, like chevron or helical patterns.

[47] Section 23(1), The Occupational Safety, Health and Working Conditions Code, 2020- *"The employer shall be responsible to maintain in his establishment such health, safety and working conditions for the employees as may be prescribed by the Central Government"*
[48] AIR 2014 SC 1469
[49] Article 4(1), C-148- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977.

- Design and maintain equipment for smooth operation, avoiding unnecessary impact or intermittence.
- Establish quiet post or break rooms where employees can recover from noise exposure.
- Implement job rotation or limit exposure time, so workers spend less time in high-noise areas.
- Schedule noisy tasks during shifts with fewer people present to minimize exposure.
- Perform regular maintenance on equipment to prevent excessive noise caused by wear or malfunction.
- Require and provide personal protective equipment (PPE) such as earplugs or earmuffs in noisy environments.

**Conclusion-**

In the modern technological era, protecting workers' health from occupational noise pollution has become an urgent and essential priority. As industries advance and machinery becomes more sophisticated, noise levels in workplaces continue to pose significant risks to workers' auditory and overall health, contributing to hearing loss, cardiovascular issues, cognitive impairments, and increased stress. Effective protection requires a comprehensive approach involving engineering controls, such as using quieter machines, sound barriers, and maintenance; administrative controls, including scheduling and limiting exposure time; and providing personal protective equipment like earplugs and earmuffs. Embracing emerging technologies like smart noise sensors and sustainable noise control materials can further enhance these efforts. Prioritizing noise pollution reduction not only safeguards workers' physical and mental well-being but also improves communication, productivity, and workplace safety. Therefore, adopting stringent regulatory compliance and innovative noise management strategies is the need of the hour to create healthier, more sustainable work environments in today's rapidly evolving industrial landscape.

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