



Dubai Municipality Health and Safety Department


Technical Guidelines for Personal Protective Equipment – Hearing Protection

DM-HSD-GU60-PPEHP2

 GOVERNMENT OF DUBAI	Organization Unit: Health & Safety Department		الوحدة التنظيمية:	 بلدية دبي DUBAI MUNICIPALITY
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1. INTRODUCTION

Hearing is very important to every individual to have an active and enjoyable life. Through the sense of hearing, people can interact to the world through conversations, perceive the sound coming from the environment, enjoy different forms of entertainment and give precaution on incoming danger. However, exposure of too much noise can cause hearing damage or noise induced hearing loss (NIHL) which is permanent and incurable. Millions of people are exposed to excessive noise many of which coming from the work sector. Hearing loss is usually gradual due to sustained exposure to noise and may be noticed only by the affected individual after several years when it is probably too late. Hearing damage can also be caused by sudden and/or extremely loud noise.

According to ILO, international safety and health conference on occupational diseases, noise induced hearing loss is one of the most common occupational diseases. Due to this, Dubai Municipality gives premium emphasis on safeguarding employees of the Emirate of Dubai from workplace hazards wherein the employer is required in Local Order 61/1991, Article 38.4 to “Take every precaution necessary for the protection of the worker and ensure his safety from occupational illness or potential work accident”.



2. PURPOSE

This technical guideline on hearing protection was specifically developed to protect the employees from foreseeable problems stemming from occupational hearing impairment such as:

- lower work efficiency performance and salary;
- decreased ability to monitor work environment and surrounding (warning signals, alarms,);
- misunderstanding due to impaired communication;
- social isolation;
- manifestation of negative emotions such as frustration, depression and anger;
- limitations in conducting activities;
- loss of intellectual acuity and difficulty to learn new tasks;
- decline in mental, emotional and physical wellness, etc.

Employer must ensure that the noise hazards within the work areas are properly identified and eliminated or minimized within or below the noise exposure limit values as specified in this technical guideline through strict implementation of hazard control methods such as safe systems of work, sound barrier arrangements, use of equipment with low noise, providing hearing protection, etc.

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3. SCOPE

This technical guideline, shall apply to all commercial and industrial establishments, public or government institutions, including construction-related project sites in the emirate of Dubai.

4. DEFINITION

Unless the context otherwise requires, the following terms shall be deemed to mean the definitions hereby assigned to them.

dB(A)

Abbreviated form for A-weighted decibels is the most commonly used standard for measuring general purpose sound pressure level using a sound level meter with an A-weighted filter. This type of noise measurement reflects the relative loudness of sound as perceived by the human ear.

dB(C)

Abbreviated form for C-weighted decibels is the standard frequency weighting designed to measure commonly used higher level measurements and peak sound pressure levels. This type of measurement correlates with the human ear's sensitivity to tones at high noise levels.

Exposure limit value

Is a limitation set on occupational noise exposure wherein the 8-hour time weighted average of 85 dB(A) and peak sound pressure level of 137 dB(C) as specified in this technical guideline shall not be exceeded at all times whether or not the worker is wearing an hearing protector.



Health surveillance

The assessment of workers' health through regular and planned medical examination checks to ensure the health and safety of workers exposed to noise and other high risk activities.

Hearing protection areas (HPA)

Any designated area of the workplace which is demarcated and provided with appropriate signage wherein mandatory use of hearing protectors are required since persons entering these areas are likely to be exposed to noise levels within or above the exposure limits as specified in this technical guideline.

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Hearing protectors

Type of personal protective devices used to protect the wearer's ear by reducing the level of noise reaching the eardrum.

Noise dosimeter

A type of portable and lightweight sound level meter designed specifically to measure and monitors a person's noise exposure over a period of time to be compared with the exposure limit values as specified in this technical guideline.

Noise

Implies to any audible unwanted sound

Noise Risk Assessment

Systematic process of evaluating the level of risk(s) arising from noise hazard(s), taking into consideration the adequacy of any existing control measures and determining if the risk(s) are acceptable or not.

Noise-induced hearing loss (NIHL)

Identified by ILO as one of the most common occupational illnesses and is caused by a one-time exposure to extremely loud burst of sound or continuous prolonged exposure from loud or high levels of noise usually in workplaces. People suffering from NIHL may have impaired cognitive perception of sound, sensitivity to sound, ringing or buzzing sound in the ears or other hearing impairment.

Ototoxic

Types of chemicals or substances that can cause or worsen hearing loss.



Peak sound pressure

The maximum instantaneous sound pressure to which a person is exposed in a given time period and expressed in dB(C).

Reasonably practicable

Doing which is, or was at a particular time, reasonably able to be done to ensure the health and safety of workers and others.

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Sound level meter

A type of instrument (commonly handheld equipped with microphone) used to measure level of sound pressure that travels through air into corresponding electronic signals wherein the signals are filtered to certain sound weightings expressed usually as dB(A) and/or dB(C).

Time Weighted Average (TWA)

The averaging of all sampled incoming sound levels that represents the daily 8-hour work shift average noise exposure of a person.

5. GUIDELINES

A. Noise Exposure Limit Values

The employer must ensure that the below noise exposure limit values to the worker shall not be exceeded at all times whether or not the worker is wearing an hearing protector:

- 8-hour time weighted average of 85 dB (A-weighted); and
- Peak sound pressure level of 137 dB (C-weighted).


Employer who conduct work which is liable to expose any worker to noise at or above specified exposure limit values in this technical guideline shall ensure that sufficient and suitable arrangements as indicated below are undertaken or provided:

- noise risk assessment;
- eliminate or control noise exposure at the workplace;
- compulsory use of hearing protection by workers;
- health surveillance;
- Training and information with regards the risks and control measures in place.

B. Noise Risk Assessment

Suitable and sufficient noise risk assessment shall be conducted by the employer who carries out work activities, which is liable to expose any workers to levels of noise exposure within or above the specified limits in this technical guideline. Conducted risk assessment shall identify the necessary measures to be undertaken in order to comply with the guideline and other related Dubai Municipality and UAE Federal regulations. Employer shall also consider other persons such as contractors and visitors that may be affected by the noise generated as a result of the employer's work activities.

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When conducting noise risk assessment, the employer shall evaluate the noise level exposure of workers through:

- observation of specific work activities being carried out;
- referring to related data on the likely levels of noise generated by any used equipment or machines in particular working conditions; and
- If needed, measurement of the level of noise wherein the workers are likely to be exposed.

Employer shall assess if there are workers that will be likely exposed to noise levels within or in exceedance of the limit values as specified in this guideline.

The factors to be considered in the noise risk assessment are:


- level, type and duration of noise exposure, including any exposure to peak sound pressure;
- effects of noise exposure to workers or groups of workers whose health is at particular risk from such level of exposure;
- so far as is practicable, any effects on the safety and health of workers resulting from the interaction between noise and vibration or noise and the use of ototoxic substances in the workplace;
- any indirect effects on the workers' safety and health due to the interaction between noise and audible cautionary signals or other sounds that is necessary to be easily heard in order to minimize work risk;
- any provided information by the work equipment manufacturer;
- availability of substitute equipment designed to reduce the generated level of noise;
- any additional workplace noise exposure in addition to the workers' noise exposure received during regular work hours. Additional exposure in the workplace shall include overtime work and/or exposure in rest facilities under supervision of the employer;
- appropriate information taken after carrying out health surveillance to the workers and other affected individuals, including, where possible published information; and
- availability of personal hearing protection devices equipped with sufficient attenuation characteristics.

Regular review of noise risk assessment shall be done by the employer at least annually and/or following any substantial changes within the workplace which may likely affect the noise level exposure of workers.

Examples of substantial changes may include the following:

- introduction or removal of machines, plant and/or work equipment;

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- modification in structure or building layout;
- changes in the equipment or machines' operating conditions;
- revision in work load and working arrangements in noisy areas.

Employer shall ensure that the person(s) that will be carrying out noise risk assessment have the necessary competence in relevant risk assessment methodologies and techniques and appropriate knowledge of the work activities.

C. Elimination or Control of Noise Exposure at the Workplace

The employer shall ensure that workers' risk from noise exposure is eliminated at source or minimized to a level so far as is reasonably practicable.



In the event that any worker is likely to be exposed within or above specified exposure limit values in this technical guideline, the employer shall ensure to reduce the level of exposure as low as is reasonably practicable by establishing and implementing safe system of work which includes safety policies, guidelines, safe operating procedures, job hazard analysis, etc.

Actions to be taken by the employer to reduce the level of exposure in conjunction with the implementation of safe system of work shall include the following considerations:

- other alternative work methods which reduces noise exposure;
- selection of appropriate equipment for the work activity which generates the least possible noise;
- reduction of noise through engineering controls such as adding silencers to equipment, isolation, acoustical shielding, partial or total enclosure, etc.;
- design and layout of workplaces including work stations and rest facilities;
- suitable and adequate training and information for workers which includes risks of noise exposure and adherence to safe work procedures and policies in order to minimize noise exposure;
- implementation of suitable program for the maintenance of workplace, equipment and related systems;
- control the duration and intensity of noise exposure; and
- appropriate work schedule with rest period arrangements.

The employer shall ensure the safety of the workers under his/her responsibility by not exposing the personnel from noise above the exposure limit value and adapt any measure to comply with the specified exposure limit taking into account any worker or group of workers whose health is at particular risk from such level of exposure.

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D. Hearing Protection

The employer, if unable to reduce by other means the level of exposure below the specified limit values, shall provide appropriate hearing protectors at no cost to all the workers likely to be exposed within or above the noise exposure limits in this technical guideline.

Employer should purchase hearing protectors from manufacturers or traders which has a valid conformity certificate for personal protective equipment products from Emirates Authority for Standardization and Metrology (ESMA) and/or conforms to international standards such as BS, EN, ISO, ANSI, ASTM, etc.

Employer shall ensure that all workers are correctly wearing suitable hearing protectors while working in areas having noise levels which are within or above the specified exposure limit values.

Employer shall ensure that the provided hearing protectors shall correctly fit the wearer and provide the necessary noise attenuation.

Employer shall ensure that all noise control equipment including hearing protectors are properly inspected, maintained, available and in good working condition at all times.



Employer shall consult the workers with their reasonable choice from a range of hearing protectors that will be selected to provide the necessary protection.

Employer shall ensure that the workers medical condition is considered prior selection of hearing protectors. Medical disorders may include irritation of the ear canal, hearing loss, discharge, any type of earache or any type of ear disease or skin disorder. Necessary medical advice shall be secured by the employer as to the suitability of hearing protector.

Workers shall ensure that provided hearing protectors and any noise control measures shall be properly used for the entire period that the worker is exposed to noise which is within or above exposure limits or as required by the employer.

Hearing protectors shall be properly selected to provide suitable protection and reasonably comfortable to the wearer on their type of work but should not result to overprotection (protectors providing noise attenuation below 70dB shall be avoided) that may result to safety risks due to acoustic isolation and impaired communication to the worker.

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Ensure that the selected hearing protectors are compatible and does not interfere with the other personal protective equipment worn by the worker.

Damaged or poorly maintained personal hearing protectors shall be reported, discontinued from use and shall be handed over to a responsible person for discarding and replacement.

Hearing protectors shall not be altered or modified and will therefore be no longer used since it will not provide the designed noise attenuation.

Adequate storage area for hearing protectors and other personal protective equipment shall be provided and should be kept clean, dry and protected from exposure to workplace contaminants when not in use. Reusable hearing protectors shall be provided with readily available facilities for its cleaning.

In ear monitors (IEMs), earbuds, full size headphones or other ear contraptions used for entertainment purposes are not considered as hearing protectors and should not be used as substitutes to protect against noise exposure.


Plain cotton wool plugs or other improvised hearing protectors are not suitable hearing protectors and should not be used since these may break when removed from the ear canal causing problems to the wearer.

Where the available hearing protectors are not capable to reduce the level of noise below the specified exposure limit values, the employer shall consider use of dual protection (earplugs and earmuffs used simultaneously) to attenuate worker exposure within or below the specified limit values in this technical guideline. Use of dual protection or hearing protectors shall be considered only after the employer was unable to reduce the noise levels within the acceptable limits after exhausting all control measures such as safe systems of work and engineering controls.

E. Hearing Protection Areas

Any area of the workplace under the supervision of the employer wherein the worker is likely to be exposed to noise levels within or above the exposure limits as specified in this technical guideline shall be designated as Hearing Protection Areas (HPA).

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Designated hearing protection areas shall be demarcated and provided with appropriate signage wherein compulsory use of hearing protectors is required. Signage in these areas shall be highly visible, easily understandable and should be located prior entry to HPA and at appropriate places within the workplace as necessary.

Example of hearing protection area signage that can be used by employer is shown below.



Employer shall ensure that these areas are restricted and workers are only allowed if it is necessary to carry out work and suitable hearing protector is worn prior entry and worn during the entire duration of work within the area.


Hearing protection areas shall be provided with adequate supervision to ensure that safe systems of work are carried out which includes adherence to safety instructions/procedures and workers are diligently wearing hearing protectors and other PPE's.

The extent or boundaries of HPA should be carefully considered wherein these shall not overlap workplace ingress and egress and does not extend any further than is required to ensure protection of workers conducting normal work activities or any foreseeable non-typical tasks.

In situations wherein the determination of HPA boundary is not reasonably practicable, for example, if the work activity requires the workers to move sources of noise frequently, the employer should provide adequate alternative arrangements to ensure and assist workers on when and where protectors should be worn. These may include:

- safety signage attached to tools being used to caution workers that wearing hearing protectors is a must;
- safety instructions shall be conveyed to workers to recognize when and where hearing protectors should be worn thru identifying specific work tasks or activities that needs its compulsory use.

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F. Health Surveillance

Employer shall place workers under suitable health surveillance whenever exposure levels as identified in noise risk assessment is within or above the specified limits in this technical guideline.

Employer shall ensure that Occupational Health Cards (OHC) for all the workers under suitable health surveillance are provided as defined above. OHC for workers exposed with high noise levels includes audiometric tests and is subject for renewal before the defined expiry date.

Where the results of health surveillance report disclose that the worker have identifiable hearing damage, the employer shall ensure that the worker is provided with appropriate medical treatment and actions should be taken in order to enhance the working conditions and environment with a view to prevent or minimize the noise exposure level of the concerned workers. Moreover, the employer shall also consider the following measures:



- concerned worker shall be properly and clearly informed of the health surveillance report by a suitably qualified person;
- reevaluation of the risk assessment and corresponding hazard control measures;
- review any measures taken to comply with the requirements stipulated in this technical guideline taking into account any advice given by the attending physician of the worker or occupational health professional or by Dubai Municipality and other UAE competent authorities;
- concerned worker shall be assigned to an alternative work where there is no risk from further exposure to noise taking into account any advice given by the attending physician or occupational health professional; and
- continuous health surveillance shall be ensured to review the health of all similarly exposed workers.

Health surveillance results shall be used in determining the current health status of the worker with respect to his/her noise exposure and should not be used in any way to discriminate the worker.

Workers' health surveillance records which include the method of communication or transfer of information should be kept confidential.

Workers should have access to their own health surveillance records, either personally or through their own physicians.

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Results of health surveillance records shall be made available to aid in preparing appropriate statistical data and studies on epidemiology and health, provided anonymity is maintained, where this may aid in the recognition and control of noise induced hearing loss or other related illnesses.

G. Information, Instruction and Training

Employer are required to provide suitable and sufficient training for workers and even visitors who are likely to be exposed to noise levels within or above the exposure limits as specified in this technical guideline.

The factors to be considered in the scope of information, instruction and training are:

- likely location of noise hazards and its associated risks if exposed;
- the control measures in place including safe systems of work and engineering control measure;
- noise exposure limit values as specified in this technical guideline;
- explanation of significant noise risk assessment findings including measurements taken;
- availability, proper use and maintenance of personal hearing protectors and any noise control measures provided by the employer;
- reporting arrangements on defective hearing protectors and noise control equipment;
- safe working procedures to reduce noise exposure levels;
- Health surveillance and occupational health card provisions for workers working in hazardous noise environment.
- Practical information on detecting hearing damage and reporting to the management; etc.



Employer shall update the scope of information, instruction and training taking into account any significant changes in the workplace and working methods, which may likely affect the noise level exposure of workers.

H. Record Keeping

The employer is required to provide and properly maintain records and shall be made readily available upon request to workers, management staff, Dubai Municipality health and safety inspectors and other regulatory agencies for review and demonstrate compliance with pertinent UAE and DM regulations. The following records that need to be maintained are:

- noise risk assessment and hazard control measures in place;
- any trainings including induction and tool box talks;
- exposure monitoring records (if any);

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- health surveillance reports;
- copies of occupational health cards issued for all classified personnel; and
- Other records as required by Dubai Municipality and other UAE regulatory authorities.

All the above mentioned records shall be kept for at least five (5) years except for health surveillance records that shall be maintained and kept for at least ten (10) years from the last working day of the worker in the company.


For other guidelines about the method and transfer of communication, confidentiality and other information on health surveillance records refer to section 5F of this technical guideline.

6. REFERENCES

Health and Safety Executive, United Kingdom: Controlling Noise at Work, The Control of Noise at Work Regulations 2005

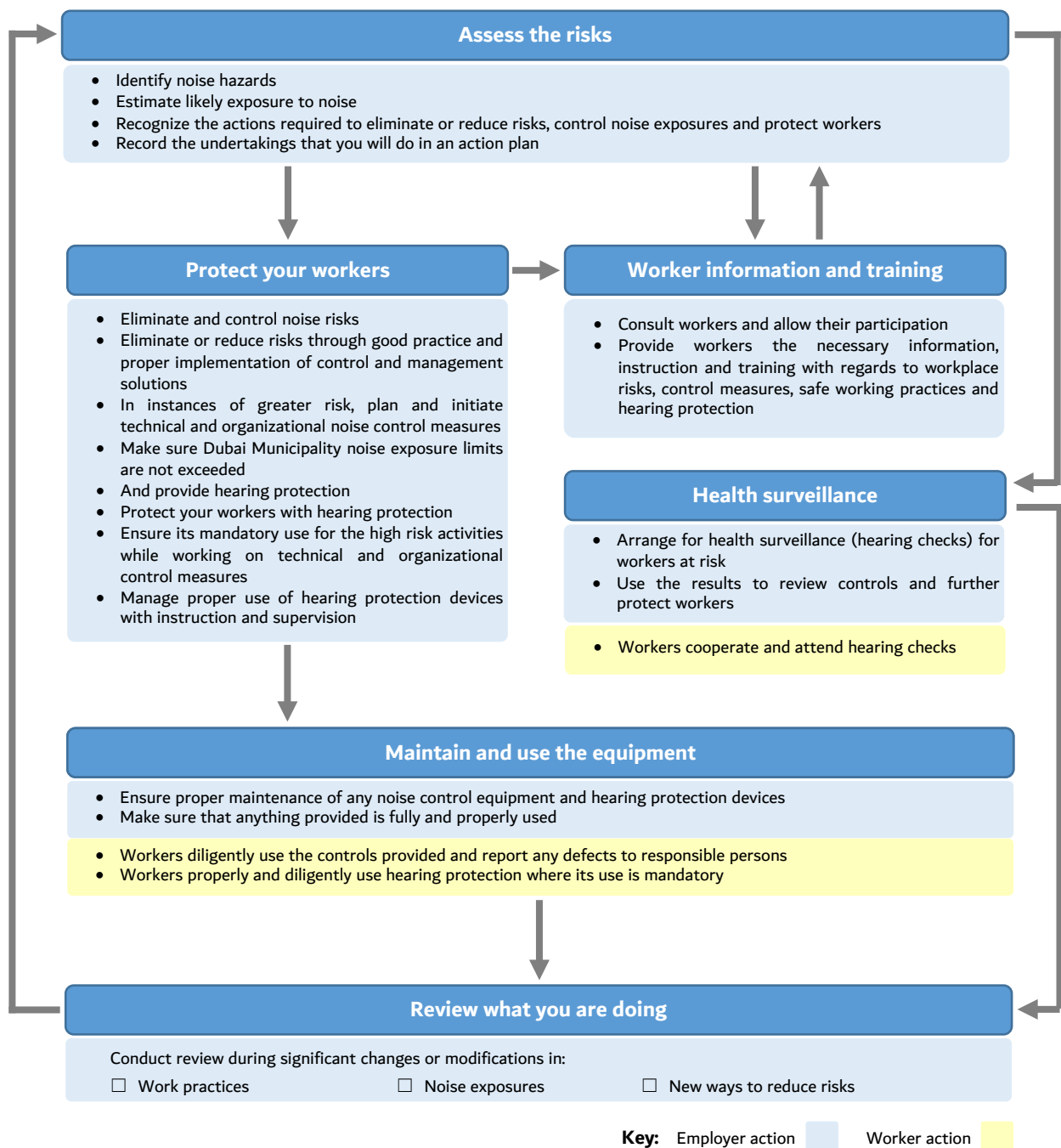
U.S. Department of Labor, Occupational Health and Safety Administration (OSHA): Technical Manual – Noise


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ANNEX A: NOISE RISK MANAGEMENT FLOWCHART




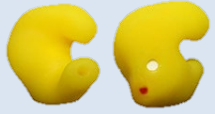
The flowchart below is intended to guide the employer in managing noise risks in their respective workplace. This flowchart can also be used as a basis in the development of the company's noise management program or to complement, if there is any noise risk management currently in place.




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ANNEX B: TYPES OF HEARING PROTECTIVE DEVICES



The table below shows the different types of hearing protective devices that employer may select depending on its suitability on the level of attenuation needed, compatibility with other personal protective equipment, comfort, fit, maintenance, etc. The images shown represent the protective devices available at the time of the preparation of this technical guideline. Hearing protectors do not need to take the forms shown but must meet the requirements as specified in this document.

TYPE	DESCRIPTION	SUITABILITY AND USE	CARE AND MAINTENANCE
Earplugs - Inserted to the ear to cover the ear canal to form a seal. This type of hearing protector is available in various forms such as disposable, reusable, corded, banded.			
Disposable Earplugs 	Usually made from elastic material such as foam and is rolled and inserted by the user's finger to the ear canal.	Suitable to be used with safety glasses and other personal protective equipment. Effectiveness of noise attenuation depends if the earplug is properly inserted and fitted to the user's ear.	Ensure that earplugs are clean and free from any material that may cause irritation to the user's ear canal. Disposable earplugs shall only be used once and be discarded after use.
Reusable Earplugs 	This type of earplug is either corded or separate, usually made of the same material as the above and can be used for a relatively limited number of times.	Determination of correct fit through observation is difficult. Earplug may become loose over time and needs to be refitted hourly in a quiet area.	Reusable and banded earplugs may be cleaned through washing with warm soapy water and should be replaced if it is damaged or there is noticeable change in firmness. Worker shall ensure that hands are clean when fitting earplugs.
Banded Earplugs 	Earplugs which are mounted or connected together with a band. Ideal to be used when there is a need for temporary hearing protection and other intermittent noise situation.	May not be suitable for use if it will be removed frequently particularly in dirty or dusty work areas. Use of earplugs may not be suitable for workers with medical conditions.	Earplugs shall be issued individually and not shared. Hearing protectors shall not be tampered or modified since the designed protection of the device may be reduced. Manufacturer's instructions on proper use, care and maintenance to be followed.
Custom Moulded Earplugs 	Hearing protection inserts made from materials such as soft silicon which individually prepared to fit the exact impression of the user's ear.	Moulded earplugs provide better fit and seal to the user's ear canal and therefore more likely to provide good protection. Comfortable and easier to fit for some users. Poor performance may result if initial fitting and manufacturing is not properly done. Fit test shall be conducted prior use of this type of earplug.	


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Continuation of Annex B


TYPE	DESCRIPTION	SUITABILITY AND USE	CARE AND MAINTENANCE
Earmuffs – sound attenuating hearing protectors which fully encloses the ears to seal against the wearers head.			
<p>Earmuffs</p> 	<p>Made from thermoplastic or hard plastic cups which cover the entire ears and are sealed to the head by soft ear cushions which are connected by a headband.</p>	<p>Easy to use and fits most people.</p> <p>Monitoring of its use is easy since it is clearly visible when worn.</p> <p>Not suitable to be used with a hard hat due to the presence of headband and/or interfere with safety glasses and other personal protective devices. Check manufacturer for compatibility with other PPE's.</p> <p>May be uncomfortable to be used in warm work conditions.</p> <p>Presence of beards, long hair and jewelry may reduce protection due to interference with the seal.</p>	<p>Cushions can be cleaned through washing with warm soapy water and rinsed thoroughly. Use of alcohols or solvents is not recommended since it may damage the materials of the earmuff.</p> <p>Check cups and seals prior use for cleanliness, misshape and damages such as cracks, hardness, tearing and holes.</p> <p>Earmuffs shall not be modified in any way.</p> <p>Headband shall not be stretched, twisted or abused as this will reduce protection performance.</p> <p>Store in a secure and clean place.</p> <p>Manufacturer's instructions on proper use, care and maintenance to be followed.</p>
<p>Helmet Mounted Earmuffs</p> 	<p>Individual cups provided with adjustable arms which are designed to be attached to safety head gear such as a visor or a hard hat.</p> <p>Information on noise protection shall be obtained for the specific combination of hard hat and earmuff.</p>	<p>Overcomes compatibility issues with hard hats.</p> <p>May not be suitable to be used with safety glasses and other personal protective devices. Check manufacturer for compatibility with other PPE's.</p> <p>May be uncomfortable to be used in warm work conditions.</p> <p>Presence of beards, long hair and jewelry may reduce protection due to interference with the seal.</p>	<p>Same as earmuffs.</p> <p>Seals shall not sit on the side of the helmet for extended period of time since it may damage the seals therefore reducing protection performance.</p>

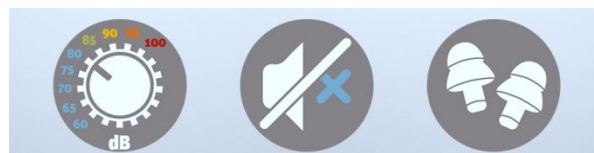
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ANNEX C: TYPICAL OCCUPATIONAL NOISE LEVELS

	Average Noise Level dB(A)	Sound source		
	140	Jet engine	DANGER	Threshold of pain
	130	Rivet hammer		
	120	Angle grinding		
	116	Working near generator		Noise exposure limit (85 dBA)
	110	Chain saw		
	108	Impact wrench		
	103	Chipping hammer		
	100	Grinding		
	99	Welding		
	97	Screw gun, drill, hand power saw		
	93	Cutting wood		
	85	Front end loader		
	81	Lathe machine		
	70	Typical office		
	60	Normal conversation		
	30	Whispering		
	15	Pin falling		
	0			



The employer must ensure that the 8-hour time weighted average of 85 dB(A) shall not be exceeded at all times whether or not the worker is wearing a hearing protector.

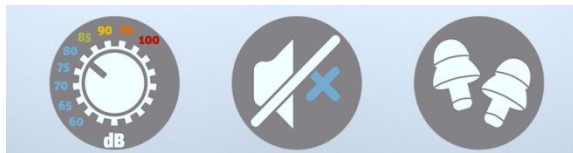
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ANNEX D: NOISE EXPOSURE TIME EQUIVALENT

85	8 hours	109	1.9 minutes
88	4 hours	112	56 seconds
91	2 hours	115	28 seconds
94	1 hour	118	14 seconds
97	30 minutes	121	7 seconds
100	15 minutes	124	3 seconds
103	7.5 minutes	127	1 second
106	3.75 minutes	130 - 140	No exposure



The employer must ensure that the 8-hour time weighted average of 85 dB(A) shall not be exceeded at all times whether or not the worker is wearing a hearing protector.

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ANNEX E: HEARING PROTECTION ATTENUATION CALCULATION

If it is not possible to reduce the noise exposure within or below the 8-hour time weighted average of 85 dB(A) despite implementation of sound engineering measures and other noise reduction control measures, the employer shall select a suitable hearing protector that can attenuate generated noise from the workplace to ensure compliance with the noise exposure limit set in this technical guideline. In selecting hearing protectors to be used in conjunction with other noise hazard control measures, the employer shall consider the guidelines stipulated in section 5D and determine the Noise Reduction Rating (NRR) from the hearing protectors' manufacturer/supplier to ascertain suitability of the protective device and if single or double hearing protection shall be used.

In determining the attenuation rendered by the hearing protector the following shall be observed:

a. Calculating Attenuation using Single Hearing Protection

- Determine the hearing protectors' Noise Reduction Rating (NRR) from the manufacturer or supplier and subtract 7 dB(A) correction factor from the rating; and
- Subtract the above calculated hearing protection attenuation from the measured worksite 8-hour time weighted average noise exposure from a sound level meter or noise dosimeter using the A-weighted scale. If the difference is below the noise exposure limit value of 85 dB(A), the hearing protection shall be deemed acceptable.

Example Calculation:

- 8-hour time weighted average noise exposure - 97 dB(A)
- Earplug NRR - 29 dB(A)



$$\text{Worker Noise Exposure with Hearing Protector} = 97 - (29 - 7) = 75 \text{ dB(A)}$$

b. Calculating Attenuation using Double Hearing Protection

When it is not sufficient to reduce the noise exposure of worker below 85 dB(A) thru single hearing protection, the employer may require the use of double protection (use of two forms of hearing protectors simultaneously e.g. earplugs and earmuffs). Hearing protection shall be calculated as directed below.

- Determine the NRR for the higher rated protector and subtract 7 dB(A) correction factor from the rating; then
- Add 5 dB(A) to account for the use of the second hearing protector; and

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- iii. Subtract the above calculated hearing protection attenuation from the measured worksite 8-hour time weighted average noise exposure from a sound level meter or noise dosimeter using the A-weighted scale.

Example Calculation:

- 8-hour time weighted average noise exposure - 110 dB(A)
- Earplug NRR - 29 dB(A) and Earmuff NRR - 27 dB(A)

Worker Noise Exposure with Double Hearing Protector = $110 - [(29 - 7) + 5] = 83 \text{ dB(A)}$

Note: Using double hearing protection will only add 5 dB(A) of attenuation.

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