

Noise measurements

Toolbox Talk



- Sound is one of the parameters that shape the physical environment in which a work is performed.
- By the term “noise” we describe any unwanted sound. Noise is usually annoying and disruptive. In some cases, exposure to noise can damage our health and cause from fatigue to deafness.
- In order to identify the levels above which the great majority of people will be harmed if exposed, we need to measure certain sound parameters.

Noise negative impacts to health

- Acoustic Fatigue

reversible phenomenon, that is to say, after a certain period of time in a quiet environment, the hearing returns to the previous levels

- Deafness

permanent hearing loss, partial (for sounds around certain frequencies), or total (for the whole spectrum of listeners)

The parameters that must be measured to determine the employee health risk are the following:

- The sound levels that the workers are exposed to
- The time exposure in the specific sound levels
- The composition of the frequency spectrum of sounds to which workers are exposed

Preparation

Preparation is of outmost importance in order to get reliable results. This phase includes:

- Collection of information
 - previous measurements
 - employee hearing impairment data
- Preliminary measurements
 - Choice of factors to be measured
 - Detection of the proper methodology and measuring instruments
- Discussion with the appropriate consultants about the exact determination of time and measurement points
- Choice of the appropriate type of employees to facilitate the measurement process

Conducting the measurement

During this phase:

- The environmental conditions are recorded
 - Temperature
 - Humidity
- The measuring instruments are laid out according to the plan decided at the previous phase
- In case of dosimetry, the appropriate personnel selected during the previous phase is briefed
- Data is collected after the specified time interval

Important note: Sound measurements are behavior-sensitive, thus employees must be informed not to interfere with the instrumentation or act abnormally to affect the sound levels

Processing the results

Obtaining the results is not enough but in this phase these results should be processed which means:

- Registration and Evaluation of results
- Comparison of results with exposure limit values
- Conclusions
- Proposals to reduce the exposure

Important note: If the results seem inconsistent or unreliable or in case of any doubt measurements should be repeated and the new results compared to the previous ones.

Documentation of technical information

The documentation of the appropriate technical information is necessary in order to exhibit that the measurement process produced reliable results; this information should include:

- Choice of the approved methods
- Instrument maintenance and calibration
- Comparison of results with the specified legislative exposure limits and recommendations based on relevant directives

- A- sound level

Each pressure wave has an energy content distributed across the different frequencies. The human ear selectively perceives a spectrum by rejecting (filtering) the very high or the very low frequencies. For this reason, the sound level measurements are made with sound level meters that have human ear simulation filters and measure the A-sound level.

- Equivalent sound level (LA_{eq} ή $LA_{eq,T}$)
 LA_{eq} : the total average of the sound level at the time period of measurement T.
- Average 8 hour sound level ($LA_{eq,D}$)
It is the reduction of the sound exposure of an employee $LA_{eq,T}$ during his 8h shift with the condition of continuous exposure.

- Sound exposure level (LAE ή LE ή SEL)

It is a hypothetical stable one-second sound, that has the same energy with a sound that is measured in sound level A and is used for the comparison of the energy of different duration sounds.

- Maximum and Minimum sound levels (Lmax, Lmin)

The maximum and minimum recorder sound levels at a time period of measurement that are marked as Lmax & Lmin.

- Peak

It is the peak of the sound level (without frequency filters) that is received by the human ear during the measurement.

- Dose

It is a sound exposure measurement similar is the equivalent sound level. The best type to describe this dimension is the following:

100%DOSE = 90 Db (A) for 8 hours

- Projected Dose

The dimension of Dose during an 8-hour shift under the condition that the exposure is continuous and it is similar to the 8-hour equivalent sound level.

- Instantaneous sound measurements
- Weighted sound levels in 8-hour exposure.



Usually 1.5m far from reflective surfaces (in front of buildings 1-2m), 1.2-1.5m height from the ground

Integrating sound level meter

- Real sound dose at 8-hour exposure



Sound dosimeter

- Sound level meter and sound dosimeter calibration.

Sound level meters, due to their sensitivity, must be calibrated before and after each measurement with a special calibrator which is a production generator of a certified sound signal.

At regular intervals, they must be calibrated to certified laboratories.



Acoustical calibrator