What is…..?

A brief guide to some of the more common terms and concepts used in industrial and environmental acoustics and the noise instruments used for measurements.


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These pages are intended to provide a simplified explanation to some of the more common (and not so common) terms that a new user of sound level meters or noise dosimeters might encounter when using CEL noise instruments for the first time. This text is not intended to be exhaustive. For strict definitions of the terms found in this document the user is directed to relevant ANSI, ASTM, ISO & IEC texts.

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Originally Started Saturday, November 03, 2001

Last updated Friday, February 12, 2010

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Topic	*Description of topic*
'A' weighting	One of the standard frequency correction curves (or weightings) applied to sounds in a measurement device to simulate the hearing capability of the human hearing mechanism. The A weighting is the most common frequency weighting used in sound level measurements and is found in virtually every sound level meter. It attenuates the lower frequencies found in general noises, passes the middle frequencies without too much attenuation and then slightly cuts the higher components.
Absorption	The property of all materials that allows a reduction in the amount of sound energy reflected from it. Incident sound energy is turned into heat inside the material during the absorption process. Absorbing materials are often used in spaces to bring down the reverberant sound level or control the echoes.
Absorption coefficient	A measure of the sound-absorbing ability of a surface. It is defined as the fraction of incident sound energy absorbed or otherwise not reflected by a surface. The value of the absorption coefficient varies in the range from about 0.01 for marble surfaces to 1.0 for a room covered in thick foam sound wedges.
Accuracy	The precision with which noise measurements are carried out when using a noise meter. The acceptable limits for the accuracy of an instrument are usually specified in national and international standards by independent national and international bodies and cover frequency response, effect of the direction of sound arriving at the instrument and other various environmental effects such as temperature and ambient air pressure. There are currently two main classifications for sound level meters that specify instruments into a lower general purpose grade or a higher precision grade of accuracy. Noise dosimeters are usually considered to be the equivalent to a type 2 general purpose sound level meter as far as their accuracy is concerned.
A.C.G.I.H.	The American Conference of Governmental Industrial Hygienists organization in the United States.
Acoustics	The science of sound, including the generation, transmission and effects of sound waves, both audible and inaudible.
Acoustic trauma	The damage to the hearing mechanism caused by a sudden burst of high-energy noise such as a blast. The term is usually considered to be caused by a single impulsive event such as an explosion.
Airborne sound	Sound energy that reaches the point of interest by propagation through air.
Ambient noise	The total amount of all noise present at a particular place and time in the environment at the point of investigation. It includes all noise sources both near and far and contains the "background" noise and any possible "specific" noise sources under investigation.
Amplitude	The "strength" or "volume" of a sound source as detected by the ear or as measured by a sound level meter or other measuring system.

Topic	Description of topic
Analog display	A form of readout device that uses a needle moving across a pre-marked scale to indicate the instantaneous sound level in decibels. Analog display movements are particularly prone to mechanical damage and are not typically used in higher quality instruments any more. Usually only a single parameter can be displayed on an analog display and so they are only fitted to simple instruments that show the current noise level. Analog displays are usually fitted to instruments that have a limited dynamic range perhaps only 20 or 30dB at the most. This means that the instruments will typically be useful only for measuring relatively steady continuous noises and not impulsive noise.
Anechoic chamber	An enclosed space or room that has walls and floors made from nearly perfect absorbing materials. In this case it is possible to obtain almost free field conditions indoors. Usually an anechoic chamber will have its walls covered with sound absorbing materials such as foam wedges on all surfaces including the floor. In some situations the floor may be made from hard material such as concrete and is now called a semi-anechoic chamber.
A.N.S.I.	The American National Standards Institute in the United States. This organization publishes a wide variety of documents covering the specifications of the instruments used to make physical measurements of noise under a wide variety of conditions.
Articulation index (AI)	A numerically calculated measurement of the intelligibility of transmitted or processed speech. It takes into account the limitations of the transmission path and the background noise at the point of interest. The index can range between 0 and 1.0. if it is less than about 0.1 speech intelligibility is generally low. If it is above about 0.6 speech intelligibility is generally high.
ASHRAE	The American Society of Heating, Refrigeration and Air-Conditioning Engineers in the United States.
A.S.T.M.	The American Society for Testing and Materials in the United States. This organization publishes a wide variety of standards outlining the methodologies to be adopted when carrying out noise measurements in practice.
Attenuation	The reduction of sound energy by a variety of means such as air, humidity, porous materials, distance etc.
Audio frequency	The frequency of oscillation of an audible sound wave usually considered being within the range from 20 Hz to 20 kHz.
Audiogram	A graphical representation of the hearing acuity of an individual as a function of level versus frequency for each ear separately.
Audiometer	A measuring instrument that is used to carry out audiometric testing of the hearing acuity of individuals. These instruments can be manually operated or can be completely automatic. Test sound levels are sent to the left and right headphone and the patient is asked to respond when the signals are no longer audible. The hearing ability of the individual is thereby defined in terms of the minimum sound levels that can be perceived.
Average noise level (Lavg)	The single number average value of the sound over a specified interval of time with a chosen exchange rate (or Q factor) that represents the noise energy when used with a Q factor of 3dB (or the risk factor when used with a Q factor of 4 or 5) of the noise as it actually varied with time.

Topic	Description of topic
'B' weighting	One of the standard frequency correction curves (or weightings) applied to sounds in a measurement device to simulate the hearing capability of the human hearing mechanism. The B weighting is hardly ever used for noise measurements nowadays.
Back erase	The technique used to "remove" unwanted noise levels from a measurement after an unwanted noise has occurred. The last x seconds of noise is held in a buffer memory location in the sound level meter and can be prevented from being added in with the rest of the recording if something occurs that is not representative of the rest of the run. This contrasts with the more usual Pause control that works "forward" in time.
Background noise level (dB)	The total noise level of all sources other than that caused by the specific noise of interest. The unit called the 90th percentile noise level, L90%, often identifies this.
Band	Any range of the frequency spectrum with a defined lower and upper limiting value. Typical examples include broad band, octave band or third octave band.
Band pass filter	A filter that has a single transmission band extending from a lower cutoff frequency greater than zero to some finite upper limit or cutoff frequency.
Barrier	A physical obstruction to the transmission of noise between a source and a receiver. Such barriers can be placed by the side of roads or rail lines to reduce the levels of unwanted noise exposure to local residents living close to such sources.
Baseline audiogram	An audiometric test taken at the start of a worker's employment that establishes a baseline or starting point as far as their hearing capability is concerned. All future audiometric tests are referred to this baseline test to measure how much loss of hearing occurs as a function of the exposure time.
Broadband noise	Noise with components over a wide range of frequencies, the overall noise without any noticeable tonality.
Broadband noise level (dB)	The single number overall measurement of all noise in the audible range measured with one of the standard broadband frequency weightings. This is typically carried out using the 'A' weighting network in a sound level meter.
Building acoustics	The science of the behavior of sound within enclosed spaces, such as the size, shape and amount of noise that determines the audibility and perception of speech and music within the room.
'C' weighting	One of the standard frequency correction curves (or weightings) applied to sounds in a measurement device to simulate the hearing capability of the human hearing mechanism. The C weighting is most often used for the measurement of transient or impulsive noise levels. It is specified in certain noise standards for the response of the meter to peak noise measurements since it has a defined characteristic unlike the linear (or un-weighted) frequency weighting.
Calibration	The process of checking a measurement instrument by applying a signal of known level and frequency to verify its operation in the field. Any drift from the nominal reading is usually corrected prior to measurements starting by means of a change to the displayed level displayed by the meter. Some standards require that the measurement instrument be also checked at the end of a measurement to verify that no significant drift has taken place during the measurement run.

Topic	Description of topic
Calibrator	A stand-alone instrument that is used to perform a field check of the sensitivity of a measurement device. These devices usually produce a single tone at a single frequency but can have multiple frequencies and levels to verify the meter.
Ceiling level	In noise dosimetry terminology this is a term related to the OSHA workplace noise regulations (29 CFR 1910-95) that show equivalent noise exposure values increasing from 90 dB for 8 hours, up to 115 dB at 15 minutes. Each time the noise level doubles (using the 5 dB exchange rate) the corresponding exposure time must be halved to keep the product of noise exposure multiplied by the exposure time a constant amount, called the permitted exposure level. The ceiling level is taken to be the highest value of noise in the table in the regulations, that is 115 dBA
Chart recorder	A hard copy device that is usually fitted with a continuous roll of preprinted paper on a roll graduated in scales that allow the noise level at a particular elapsed time to be determined from a pen trace recorded onto the paper. Typical chart recorders use the dc output from a noise meter to drive the pen mechanism backwards and forwards across the width of the paper roll in sympathy with the changing noise levels.
Cochlea	Part of the human hearing mechanism located within the inner ear that contains the receptor organs essential to the hearing process. It is shaped like a small snail and contains the hair cells that detect the sound vibrations and convert a mechanical motion into nerve impulses that are sent to the brain for interpretation as sound patterns and noise identification.
Community noise equivalent level (CNEL)	A twenty four hour single number equivalent noise level calculated from hourly equivalent levels where certain corrections have been added to the evening and night time noise levels to represent a penalty factor. The evening period defined from 1900 to 2200 has a penalty of 5 dB added to the measured levels while the nigh time period of 2200 to 0700 has a 10 dB penalty added. Thus a higher overall level is obtained for the 24 hours compared to the actual measured hourly levels obtained by normal logarithmic addition of the 24 separate Leqs.
Constant bandwidth filter	A band-pass filter whose bandwidth is independent of the band center frequency. FFT analyzers are typical examples of such filters used for the analysis of vibration sources.
Constant percentage bandwidth filter	A band-pass filter whose bandwidth is a constant percentage of the band center frequency. Whole octave or third octave filters are examples of such filters used for the analysis of acoustic sources.
Crest factor (CF)	This is the ratio between the peak level of an acoustic signal and its energy equivalent, or rms, level. For a continuous sine wave the peak level is 3 dB higher than the rms level. For an impulsive signal such as a blast or an impact sound the peak level can exceed the rms level by 25 or 30 dB.
Criterion level (dB)	The level of equivalent steady noise that lasts for exactly 8 hours that represents the allowable daily noise exposure. This level is usually taken to be 90 dB but other lower levels are also specified in certain regulations. The criterion level is the equivalent decibel level for the 100% noise dose value.
Cumulative	The total overall noise level for the whole of a measurement interval from the start to the stop time.

Topic	Description of topic
Cumulative distribution (%)	A distribution of samples of the instantaneous noise level taken at regular intervals during a measurement where the samples are arranged according to their percentage of occurrence. The distribution ranges from 100% to 0% as the dynamic range increases.
Cumulative distribution level (dB)	A distribution of samples of the instantaneous noise level taken at regular intervals during a measurement and classified according to occurrence at increments of amplitude. Typical increments of level are either 1 or 0.5 dB intervals across the measured dynamic range of the instrument plus an over range and under range counter. An instrument with a 70 dB dynamic range classifying samples at 0.5 dB intervals plus over and under range values will have 143 separate bins to store and classify the samples. At least 1000 samples are typically needed to produce reliable values for the percentile noise levels generated from such a distribution table.
Cutoff frequency	The frequencies that mark the end of a band or the point at which the characteristics change from a pass to a no-pass band.
Cutoff level (dB)	The sound level at which a noise dosimeter starts to accumulate sound into the calculations used to measure a personal noise dose reading. All levels of noise below the cutoff level will be excluded form the calculation of the noise dose value according to the requirements of the OSHA workplace noise standards.
Cycle	The complete sequence of values of a periodic quantity that occurs during one single period.
Cycles per second (cps)	A measure of the frequency of a tone and numerically equivalent to Hertz, the preferred unit of frequency according to international standards.
Daily personal noise exposure level (LEP,d)	The general name for the amount of noise exposure that an operator is subjected to measured at the workplace. Limits vary according to various national and international Health and Safety regulations for the amount of exposure that is considered allowable for an operator without hearing protection. Typical limit values are an equivalent steady level of 85 or 90 dB for an 8-hour working day.
Damping	The dissipation of noise energy with time or distance. The term is usually applied to the attenuation of sound in a structure owing to the internal sound-dissipative properties of the structure or to the addition of sound-dissipative materials.
Data logging	An instrument that can record the temporal variation in the amplitude of a signal as a function of time is said to be a data logging instrument. The benefit of such information is that it enables the user to investigate when a significant event occurred and what the effect of that event was on the underlying levels that were measured just before or just after the event took place. Data logging can use significant amounts of memory if the sampling interval is very short, for example, a recording that stores at a rate of once a second will need 28,800 samples to save an 8 hour measurement. A trade off between the available storage space in memory and the amount of time resolution that is needed must be determined before the measurement begins to ensure that enough storage space is ready to save the results.

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Day Night Noise Level (LDN)	The 24 hour average noise level of all hourly Leq measurements with a 10 dB penalty added to the levels between 2200 and 0700 hours to reflect people's extra sensitivity to noise during the night. No correction is added to the measured Leq levels taken between the hours of 0700 and 2200 in arriving at the overall single number.
Derate	The process of reducing the apparent effectiveness of a hearing protector due to variations of likely fit. It depends on the type of hearing protector and can vary from 25% for ear muffs, 50% for ear plugs to 75% for other types of the NRR value provided by the manufacturer. This definition is found in the NIOSH Occupational Noise Exposure guidelines published in 1998.
Digital audio tape (DAT)	A form of closed tape recording system using small tape cassettes with a fixed recording duration. The dynamic recording quality is approximately 75 dB from tape saturation to noise floor. This matches the output range from most current sound level meters. Up to 4 hours of continuous recording can be possible at half speed recording.
dB	The abbreviation of the decibel used to express the level of a noise or sound. It is a logarithmic quantity that represents the ratio of the sound pressure to a nominal reference sound pressure. The accepted reference sound pressure is taken to be 20 µPa (0.000,020 Pa).
Decibel (dB)	The unit of sound pressure level usually abbreviated to the dB. Any noise quantity that is expressed as a "level" is measured and quoted in decibels.
Digital signal processing (DSP)	A digital computation carried out on samples of the raw sound measured by certain sound level analyzers that can be used to derive the common units of instantaneous, maximum, minimum and average level etc. Typical DSP calculations are carried out many times a second to derive small packets of noise that can be recombined to obtain the more popular values found in more conventional sound level meters. The adoption of proprietary algorithms can yield the frequency contributions contained within the short samples. Rates as fast as sampling at 76,800 times per second are common in many analyzers generating small samples every 5 or 10 µseconds.
Diffraction	A modification which sound waves undergo in passing by the edges of solid obstacles in their path from source to receiver.
Directivity	Unless a noise source is completely omni-directional there will be some of the sound energy that is radiated more in certain directions than in others.
Directivity index (DI)	In a given direction from a sound source under consideration the directivity index is the difference in decibels between the sound pressure level produced by the source in that direction and the space averaged sound pressure level of that source measured at the same distance. This unit is often used in predicting noise levels away from a source of known output and directivity when performing noise control.
D.o.D.	The Department of Defense of the United States. A specific set of measurement settings in an instrument used to measure the exposure of certain military personnel to noise.

Topic	*Description of topic*
Doppler effect	The apparent upward, or downward, shift in frequency of a sound as the relative positions of the source and receiver change with respect to each other. This is most noticeable for a passenger standing on a railway platform as a speeding train approaches and recedes the station. The apparent frequency increases quickly as the source approaches the receiver and decreases as the source moves away. The faster the source is moving the more noticeable will be the change of frequency. The Doppler effect is also heard when the source is stationary and the receiver is moving such as a car passing by a steam exhaust venting to atmosphere.
Dose (%)	A relative measurement of the noise in a workplace usually expressed as a percentage of some allowable total daily value. Noise dose is analogous to radiation dose as a hazard in the workplace.
Dosimeter	A measurement instrument capable of being worn by a mobile worker or operator during the day to measure the total exposure of that operator to noise in the workplace. Usually the dosimeter is supplied with a microphone on a cable that allows the measurements to be carried out in the hearing zone of the individual. The body of the dosimeter is worn on the belt or in a pocket or pouch. A noise dosimeter is essentially the same as a standard sound level meter except that it is normally designed to only measure the broadband noise levels without performing any sort of frequency analysis.
Dual hearing protection level (dB)	This is a TWA of 105 dB specifically referred to in the MSHA Occupational Noise Exposure Standard that is the value of noise exposure above which both ear plug and ear muffs must be worn by a worker. It should use the 90 dB Threshold level to integrate all noise levels from 90 to 140 dB in the calculation of the TWA using the 5 dB exchange rate.
Duration	The elapsed time from the start of a measurement to the end of the run. Measurement durations can be from a few seconds up to several hours or even days depending upon the application. The duration of the measurement can be specified in a standard or may be calculated by knowing the process under investigation. If noise is cyclical in nature then at least one or two complete cycles should be measured to be sure of correctly classifying the noise climate.
Echo	A wave that has been reflected or otherwise returned with sufficient magnitude and delay so as to be detected as being distinct from the direct wave at the point of interest. If the echo arrives too late after the direct wave then the intelligibility of the sound or speech will be adversely affected.
Enclosure	A complete box structure around a noise source for the purpose of keeping the noise levels at a certain point lower than they would otherwise be without the enclosure. Typical enclosures are constructed from wood, metal, brick depending upon how much attenuation of the source noise is required to be obtained.
Equal loudness curves	Lines of equal sensation of loudness plotted on a chart of decibels versus frequency to show the subjective impression of different sounds. The human hearing mechanism is less sensitive to sound at low and high frequencies and more sensitive to the range of frequencies between 250 to 5,000 Hz. The equal loudness curves vary in gradient depending upon the overall level of noise becoming more linear as the noise level rises.

Topic	Description of topic
Equivalent continuous noise level (Leq)	The single notional constant level that represents the same sound energy as the actual varying sound over a specified interval of time. The Leq is usually expressed as an 'A' weighted value unless the frequency response is specified otherwise, e.g. Lceq. The Leq can also be measured in individual octave or third octave bands during a frequency analysis of a noise source for noise control purposes.
Exchange rate (Q)	This is the number of decibels used in the calculation of the average noise level that is taken to represent the doubling (or halving) of the risk when used in personal noise dosimetry measurements. Possible values for the exchange rate are currently 3, 4 or 5 decibels. An exchange rate of 6 dB is very occasionally found in certain instruments but is not commonly used.
Far field	The far field is a notional volume around a noise source such that the inverse square law applies to the dissipation of the energy. In this region the measured sound level reduces at a rate of 6 dB every time the distance from the source doubles. In the far field region the particle velocity of the molecules is in phase with the sound pressure.
Fast response (F)	This is one of the standard responses in a sound level meter (or dosimeter).
Fast weighting	The fast weighting is the same as the fast response in a sound level meter and is part of the rms. Circuit controlling the response of the meter to the variability of the instantaneous levels of the noise. It has a value of 125 milli seconds and is a continuous function that is calculated all the time by the instrument.
Filter	A device for separating the different components of a signal on the basis of their frequency. It allows components in one or more frequency bands to pass relatively un-attenuated while it attenuates components in other frequency bands.
Firmware	The firmware in an instrument is the name given to the program that controls what functions it will perform and how it will measure, store and display them. It is the equivalent of a software program that runs on a computer. The firmware is needed to be loaded into the hardware of an instrument to get a fully functioning meter.
Flanking noise	Noise that is transmitted from one room into another by indirect means such as through sidewalls or floors rather than through the common partition that separates the rooms.
Free field	Sound fields in which the effects of walls or other obstacles or boundaries on sound propagation are negligible. As a measurement point moves away from a source the noise level will drop according to the inverse square law.
Frequency (Hz)	The number of times a second that a sine wave of sound repeats itself, or a vibrating object, repeats itself. The unit of frequency is Hertz, Hz, numerically equal to the earlier unit cycles per second, cps.
Frequency band	A range of frequency components in the audio bandwidth used to characterize different noise sources. Frequency bands can be expressed as whole octaves, third octaves, sixth octaves etc. For noise measurements to assess the affect on humans the step intervals for contiguous frequency bands are usually expressed on a logarithmic scale.
Hardware	The hardware of an instrument is the circuit board, power supply and body casing that go to actually make the form of the device that makes the measurement. It usually needs to have firmware fitted to it to give it the instructions on what to measure and how to measure and how to display the subsequent results.

Topic	Description of topic
Harmonic	A sinusoidal component whose frequency is a whole number multiple of the fundamental frequency of the wave. If a component has a frequency that is twice that of the fundamental it is referred to as the second harmonic.
Hearing	The subjective response of human beings to acoustic energy or sound waves. Typically the range of human hearing will extend over a range from about 20 Hz up to a maximum of 20 kHz in late teenage years. This range will narrow over time as the ears become exposed to noise levels in the workplace that may cause temporary or permanent irreversible damage.
Hearing conservation action level HCA (dB)	A noise exposure of greater than 50% of the permissible exposure level which corresponds to a time weighted average of 85 dB. For the purposes of calculating the HCA level all noises above a threshold of 80 dB must be integrated into the result. Workers that are found to be exposed to above the HCA level must be provided with hearing protectors and placed in a hearing conservation program top reduce their exposure below the level of 85 dB.
Hearing conservation program (HCP)	A planned program to document the noise exposure of employees with the purpose of ensuring that all are adequately protected form the harmful effects of high noise levels in the workplace. Possible outcomes of such a program could include the prescription of suitable hearing protectors, the attenuation of noisy machinery or the rotation of job functions between different workers during the day.
Hearing level (HL)	A measured threshold of hearing at a specified frequency, expressed in decibels, relative to a specified standard of normal hearing. The deviation of an individual's threshold from the zero reference level in the audiometer.
Hearing loss	The general term for the impairment of hearing acuity. The amount of this hearing acuity, in decibels, measured as a set of hearing threshold levels at specified frequencies. Hearing loss can be caused by a number of factors such as loss in the conductive mechanisms in the ear, loss originating in the sensori-neural parts of the auditory nerves or by excessive exposure to high noise levels at work.
Hearing protectors	Devices worn by an individual to protect against excessive exposure to high noise levels. These can be of the internal or external types. Internal types include ear plugs that are inserted into the ear canal while external types are mainly ear muffs that fit completely around the ear lobes.
Hearing threshold level (HTL)	The amount, in decibels, by which an individual's threshold of audibility differs from that of a normal standard audiometric threshold.
Hertz (Hz)	The international unit of frequency, numerically the same as cycles per second. Abbreviated as Hz.
HVAC	The general term for all acoustic measurements involving the subject of Heating, Ventilation and Air Conditioning.
I.E.C.	The International Electrotechnical Commission based in Switzerland that publishes numerous standards specifying the performance of sound level meters, noise dosimeters and frequency filters.
Immission level (dB)	A descriptor for noise exposure, in decibels, representing the total noise energy incident on the ear over a specified period of time that could be weeks, months or years.

Topic	Description of topic
Impact insulation class (IIC)	A single figure rating that compares the impact sound insulating capabilities of floor-ceiling assemblies to a reference contour.
Impact sound	The sound produced by the collision of two or more solid objects. Typical sources are footsteps on a floor or on an interior surface. Other sources can include drop forges or other metalwork processes.
Impulsive noise	Either a single pressure peak with a rise time of less than about 200 milli seconds (or total duration of less than 200 milli seconds) spaced by at least 200 milli seconds or a sound pressure occurring in a short interval of time usually taken to be less than 1 second in duration.
Impulse response (I)	This is one of the standard responses in a sound level meter (or dosimeter).
Impulse weighting	The impulse weighting is the same as the impulse response in a sound level meter and is part of the rms. Circuit controlling the response of the meter to the variability of the instantaneous levels of the noise. It has a rise time value of 35 milli seconds and a decay time of 1500 milli seconds. The asymmetric nature of the impulse weighting means that any average sound level calculated based on samples of the instantaneous will be biased towards the higher noise events than will the average calculated from either the fast or slow response. It is a continuous function that is calculated all the time by the instrument.
Infrasonic	Sounds with frequencies lower than 20 Hz.
Inner ear	The part of the hearing mechanism that transfers the mechanical vibrations into electrical impulses that are then sent to the brain to be interpreted as sounds. Also associated with the balance mechanism.
Insulation	The ability of a material to keep out sound from a given source on the other side of the material. The performance of the material depends on its composition and density, the higher the density the better the material is as a sound insulation product.
Integrated sound level (Leq)	The average sound level (with the 3 dB exchange rate) over a period of time that represents the energy contained in the noise. The integrated level will be the same whether the Fast or Slow time weightings are used in the measuring instrument since these weightings are symmetrical for both rising and falling sound levels. Use of the Impulse time weighting will produce a higher average sound level compared to the true energy level computed from Fast or Slow sampled levels.
Integrating sound level meter	A measuring instrument that can calculate the time average noise level over a specified period of time in addition to measuring and displaying the simple instantaneous level. Sometimes called Leq meters when the exchange rate is fixed at Q = 3 dB. It is also possible to obtain the integrated sound level with the exchange rates of 4, 5 or 6 dB.
Intensity	The sound energy flow through unit area (1 m^2) in unit time (1 second).
Intermittent noise	Noise levels that are interrupted by intervals of relatively low sounds levels.

Topic	Description of topic
Inverse-square law	A description of the acoustic wave behavior in which the mean-square pressure varies inversely with the square of the distance from the source. This behavior in free field situations where the sound pressure level decreases 6 dB with each doubling of distance from the source.
I.S.O.	The International Standards Organization based in Switzerland that publishes numerous standards outlining how different measurements may be carried out.
Isolation	The physical separation of one item from another to prevent the flow of energy through a structure. This can be for both the control of sound or vibration energy.
KiloHertz (kHz)	The unit of frequency measurement for signals over 1,000 Hz. 1 kHz = 1,000 Hz.
Lavg (dB)	The logarithmic time average level with an exchange rate of 3, 4, 5 or 6 dB that represents the amount of noise as a single number compared to the actual varying sound level over a specified period of time. When Q = 3 the average level is called the Leq. When Q = 4 the average level is called the LdoD. When Q = 5 the average level is called the LOSHA. For a perfectly steady instantaneous noise level the values of the average levels with different Q factors will be the same.
Level	A descriptor applied to a unit of measurement of sound (or vibration) that denotes the physical quantity is a logarithmic representation of the underlying phenomenon. The decibel is normally used to denote that the value should be referred to as a level rather than the true physical quantity. The most used such value is the 'A' weighted sound pressure level expressed as a dB value.
Lep,d (dB)	The daily personal noise exposure level in decibels as required by the European workplace noise regulations. It is measured with the 3 dB exchange rate and no threshold level. All of the noise is integrated into the overall average noise level and then expressed as a standard 8 hour average value. It is analogous to the TWA in US measurement terms.
Leq (dB)	The equivalent continuous noise level over a specified period of time that represents the same energy as the actual time varying noise signal. This is a specific form of the time average level when the exchange rate Q is set at a value of 3 dB.
Liquid crystal display (LCD)	A type of readout for the display of a sound level meter or noise dosimeter in which the values are shown on a matrix composed of a series of segments. The segments can be custom designed for a particular instrument such as the CEL noise dosimeters or it can be made up of a rows and columns of small dots that are used to form the characters such as in the CEL sound level meters. It is possible to mimic the characteristics of traditional analog displays to indicate the instantaneous level with the advantage that more than a single level can be shown in a small screen area. LCD screens can be monochromatic or can be in full color where more information can be clearly seen and presented to the user.

Topic	Description of topic
Ln% (dB)	The notional noise level in dB exceeded for a given percentage of the measurement duration. Usually expressed as Ln% where n represents the percentile value from 0 to 100 %. The L0% is equivalent to the maximum noise level since it is the level exceeded for 0% of the time, i.e. no readings are higher than the L0%. The L100% is equivalent to the minimum noise level since it is the level exceeded for 100% of the time and so is exceeded all of the measurement time. The L10% is often taken as a measure of the noise produced by highway traffic while the L90% is often taken as a measure of the background noise level. The L50% is the mean sound pressure level but it is not the same as the time average level, which is called the Leq.
Logarithm	The exponent that indicates the power to which a number must be raised to produce a given number. For the base 10 logarithms as used in acoustics and the study of sound the logarithm of 100 is 2, the logarithm of 1000 is 3 etc.
Loudness	The subjective judgment of the intensity of sound by the human hearing mechanism. Loudness depends on the sound pressure and frequency of the stimulus signal. Over the normal audio range it takes about a three fold increase in sound pressure (a ten fold increase of the energy level) to produce a doubling of the impression of loudness.
Loudness level	This is the measured level in phons and is numerically equivalent to the median sound pressure level of a free progressive 1,000 Hz wave presented to listeners facing the source, which in a number of trials is judged by the listeners to be equally loud.
Ltm3	The taktmaximal-3 level is a time average value calculated every 3 seconds based on taking the highest level occurring during the preceding three seconds and assuming that it was present for the whole of the 3 second interval. This is repeated every 3 seconds to produce a long term average level that will be higher than the equivalent continuous noise level, or Leq, depending on the impulsiveness of the sound under investigation. Comparison of the Ltm3 and the Leq will therefore give an objective measure of the impulsive nature of the noise when assessing nuisance or risk to hearing from high noise levels.
Ltm5	The taktmaximal-5 level is a time average value calculated every 5 seconds based on taking the highest level occurring during the preceding five seconds and assuming that it was present for the whole of the 5 second interval. This is repeated every 5 seconds to produce a long term average level that will be higher than the equivalent continuous noise level, or Leq, depending on the impulsiveness of the sound under investigation. Comparison of the Ltm5 and the Leq will therefore give an objective measure of the impulsive nature of the noise when assessing nuisance or risk to hearing from high noise levels.
Masking	The process by which the threshold of audibility for a sound is raised by the presence of another masking sound.
Masking noise	A noise that is intense enough to render inaudible or un-intelligible another sound that is also present. Typical uses of masking noise are between doctor's surgeries and waiting rooms to prevent those in the waiting room from hearing the intimate conversations of the patient currently talking to the doctor. Water fountains or background music are examples of masking noises for this purpose.

Topic	Description of topic
Mass law	The amount of sound insulation afforded by a wall is proportional to the mass of the material in the wall. Broadly speaking doubling the mass (per unit area) increases the sound attenuation by 6 dB and a doubling of the frequency increases the attenuation by 6 dB. These figures are theoretical limits and in practice a 5 dB reduction is more often found.
Maximum noise level (Lmx)	The highest instantaneous sound pressure level over a given interval of time with a selected frequency weighting and specified time weighting. For example, an A weighted fast maximum level of 96 dB in a workshop.
Medium	Any solid substance carrying a sound wave. Sound will not travel through a vacuum since there are no particles to transfer the energy from one point to another.
Microphone	A transducer that changes the physical motion of air molecules into an equivalent electrical signal that can be processed by a sound measurement system such as a sound level meter. Different devices have different frequency responses and sensitivities. All other things being equal a smaller diameter microphone diaphragm produces a lower electrical output signal for a given sound pressure. The sensitivity of a microphone is given as the number of Volts obtained for a reference sound pressure. Typical examples are 10 mV/Pa for a general-purpose microphone capsule.
Microprocessor	An electrical component that is able to rapidly process samples of an input signal obtained from an analog to digital converter and produce an output signal proportional to the time average level, the highest level or other computed values. Typically these calculations are performed many times a second in order that none of the input signal is missed.
Middle ear	Part of the hearing mechanism comprising the three smallest bones in the human body. The “hammer, anvil and stirrup” bones form a mechanical lever with a mechanical advantage of about 1.5 between the ear drum and the oval window of the cochlea.
Minimum noise level	The lowest instantaneous sound pressure level over a given interval of time with a selected frequency weighting and specified time weighting. For example, an A weighted slow minimum level of 36 dB in an office.
Natural frequency	The frequency at which a system tends to vibrate with large amplitude for very small input energy. It falls at the point where a system changes from being stiffness controlled at low frequencies to being mass controlled at higher frequencies.
Near field	The sound field close to a noise source where the sound pressure does not obey the inverse square law and the particle velocity is not in phase with the sound pressure. Measurements made in the near field can vary greatly for small changes of microphone position. This can sometimes account for the differences found in noise measurements obtained with a personal noise dosimeter and those obtained from a hand-held sound level meter when an operator stands very close to a noisy machine.
N.I.O.S.H.	The National Institute for Occupational Safety and Hygiene in the United States. An organization dedicated to investigating the harmful effects of varied industrial hazards on the working population and promulgating regulations to control their harmful effects.
Noise	Unwanted sounds at a particular place at a particular time.

Topic	Description of topic
Noise dose (Dose%)	The amount of noise received by a worker during the workday expressed as a percentage of a certain reference level for a given duration. The usual allowable noise dose is typically set at 100% dose equivalent to an equivalent continuous noise level of 90 A weighted dB over a standard 8-hour working day. Other noise levels exist that are considered to represent the 100% noise dose but the time interval is almost always the 8 hour day.
Noise Dosimeter	A form of sound measurement instrument designed to be worn by an individual in the workplace to accumulate all of the noise exposure during the work day. See also Personal Noise Dosimeter.
Noise event	The increase in the current sound level that exceeds a selected threshold value and thereby identifies a significant change in the acoustic climate. Noise events are typically considered to be significant when the instantaneous level exceeds the underlying background level by more than about 15 dB. Events may be transient and last less than a second, such as a single explosive blast or may last for 20 to 30 seconds such as a passing train or an aircraft taking off at an airport.
Noise exposure (E)	The absolute measure of the amount of noise experienced by an operator at work. It is proportional to the square of the sound pressure and the duration. It is different from noise dose in that it is an absolute measurement rather than a percentage of some chosen combination of noise level and time. Typically specified in European Noise at Work legislation and expressed in Pa^2h or Pa^2s. 1 Pa^2h = 3600 Pa^2s. a continuous noise level of 90 dB lasting for 8 hours is approximately equivalent to a sound exposure of 3.2 Pa^2h.
Noise exposure level (LEP,d)	The expression of noise exposure as a logarithmic term in dB. In European Noise at Work legislation it is expressed as the Daily Personal Noise Exposure level LEP,d.
Noise floor	The lower limit of accurate measurement capability in a sound level meter where the effect of the inherent electrical noise is superimposed on the actual signal. It is normally quoted as the minimum level in dB that can be measured by the meter on the lowest dynamic range setting. Only results of 10 or more dB than the noise floor should be considered to be accurate in a typical sound level meter specification.
Noise isolation class (NIC)	A single number rating derived in a prescribed manner from the measured values of noise reduction between two areas or rooms. It provides an evaluation of the sound isolation between two enclosed spaces that are acoustically connected by one or more paths.
Noise level (dB)	For sound transmitted primarily through the air it is usually taken to be the A weighted sound pressure level in dB.
Noise ordinance	A document that sets out how noise in a community is to be treated in terms of limits of level, duration, times of occurrence etc during the day. Different limits may apply to day times that to night times and between residential, industrial or commercial zones. Limits may be written in terms of absolute maximum levels not to be exceeded or in terms of the difference between the background level and the offending level. A person appointed to make such measurements makes measurements with an approved sound-measuring device usually on a property boundary line.

Topic	Description of topic
Noise reduction (NR)	The numerical difference in decibels of the average sound pressure in two areas or rooms. A complete measurement of the reduction in noise consists of the simple level difference between the two rooms due to the common partition and also takes into account the background level in the receiving room and the amount of sound absorption in the receiving room. The noise reduction is a function of frequency typically increasing with increasing frequency and is measured in third octave bands from at least 100 Hz to 3150 Hz.
Noise reduction coefficient (NRC)	A measure of the acoustical absorption performance of a material calculated by averaging its sound absorption coefficients at 250, 500, 10000 and 2000 Hz and expressed to the nearest multiple of 0.05.
Noise reduction rating (NRR)	A single number rating value based on the difference between the A and the C weighted overall noise levels. The difference in the readings obtained with a suitably equipped sound level meter will vary depending upon the frequency distribution of the subject noise and its spectrum particularly in the lower frequency bands. For a sound with a lot of low frequency components the C weighted level will be higher than the A weighted sound level. An increase in the A weighted level over the C weighted level indicates significant noise in the middle range of frequencies.
Nuisance	A legal definition of a noise that offends or upsets the receiver because it is occurring at the wrong time in the wrong place or is of a character that annoys due to excessive tonal components or impulses.
Occupational deafness	The reduction in hearing acuity caused by excessive exposure to high noise levels at work. This is in addition to recreational noise exposure caused by factors outside of the workplace which may be additive.
Octave	An interval between two sounds having a ratio of two to one in terms of their frequency span. There are 8 octaves on a piano and the audio range can be covered by 10 octaves in the range 20 Hz to 20 kHz.
Octave band	A single band of frequencies where the upper limit is twice the lower limit. Octave bands are classified according to their geometric center frequency based on the internationally standardized 1000 starting point. The 1000 Hz or 1 kHz band has limits of about 707 and 1414 Hz.
Octave band analysis	The analysis of a complex or simple sound into its constituent parts based on the interval of octave bands across the audio range. A full octave band analysis will contain 9 or 10 readings from 32 Hz to 8 kHz or 16 kHz.
Octave band level (dB)	The sound pressure level usually integrated over a time interval containing only the sounds with frequency components within the pass band of each octave band filter.
Oscillation	A simple vibration that varies with time alternatively increasing and decreasing sound pressure at a receiver position due to the movement of an object.
O.S.H.A.	The Occupational Safety and Health Administration in the United States. A division of the Department of Labor charged with dealing with the health and welfare of the working population that issues guidelines and legislation to control the hazards at work.

Topic	Description of topic
Outer ear	The only visible part of the human hearing mechanism consisting of the pinna, or ear lobe. The purpose of the pinna is to direct the sound down the ear canal to the eardrum and the interface to the middle ear when the sound waves are converted to mechanical vibrations of the tympanic membrane.
Overall noise level (dB)	The total broadband noise level containing all the frequencies that are present in the sound. This is usually expressed as the A weighted noise level in dB, but can also be a C weighted level for specific measurement purposes.
Pause	The pause control on many sound level meters allows the user to temporarily remove any unwanted noises from being included in the current measurement. It is usually manually controlled and works “forward” in time as opposed to “back erase” which removes noise “backwards”. Pausing prevents unwanted noises from adding to a measurement when a user is present to see what is happening.
Peak	The absolute highest positive or negative pressure of a sound wave at a given point in time and space.
Peak response	This is one of the standard responses in a sound level meter (or dosimeter).
Peak noise level (Lpk)	The noise level measured with a sound level meter set to the peak response in dB usually with no frequency weighting, i.e. a linear peak, or with the C weighting, i.e. a C weighted peak level.
Peak sound pressure	The maximum absolute value of the instantaneous sound pressure in a specific interval of time. In the case of a sine wave produced by a steady noise source such as an acoustic calibrator the peak sound pressure level is 1.4 times the rms pressure level. This is equivalent to the peak level being 3 dB higher than that rms steady level.
Percentile noise level (LN%)	The notional noise level in dB exceeded for a given percentage of the measurement duration. Usually expressed as Ln% where n represents the percentile value from 0 to 100 %. The L0% is equivalent to the maximum noise level since it is the level exceeded for 0% of the time, i.e. no readings are higher than the L0%. The L100% is equivalent to the minimum noise level since it is the level exceeded for 100% of the time and so is exceeded all of the measurement time. The L10% is often taken as a measure of the noise produced by highway traffic while the L90% is often taken as a measure of the background noise level. The L50% is the mean sound pressure level but it is not the same as the time average level, which is called the Leq.
Period	The duration in time that it takes an oscillation to repeat itself. For example a frequency of 1 kHz repeats itself with a period of 1/1000 = 0.001 seconds. A period can also mean the shorter measurement interval during a long run such as a 10-minute period (interval) in an 8-hour day measurement at a specific monitoring site.
Permanent threshold shift (PTS)	A permanent decrease of the hearing acuity of the ear at a specific frequency as compared to a previously established reference level. The amount of permanent threshold shift is commonly expressed in decibels and is unrecoverable by the individual who will not regain his or her hearing even by halting any exposure to excessive noise levels. It is an irreversible condition of the inner ear caused by damage to the individual hair cells in the cochlea.

Topic	Description of topic
Permissible exposure level PEL (dB)	This is the 8 hour time weighted average noise level that includes all noises integrated from 90 to 140 dB. Any noise exposure above the PEL of 90 dB must be controlled by engineering methods to reduce such exposures below the 90 dB limit and hearing protectors must be provided as a short term means of noise reduction for the worker.
Personal noise dosimeter (NDM)	A small portable noise meter especially developed to be worn by an individual during the working day. Its purpose is to accumulate all the different noise exposure suffered by the individual whether it comes as steady noise exposure or whether it is in the form of sudden impulses of noise. The microphone is usually clipped to the collar close to the hearing zone and the body of the dosimeter is worn on the belt or in a pocket for safety. Traditionally noise dosimeters readout the results in dose based on a percentage of the allowed daily maximum. More modern noise dosimeters also produce the results in dB form for the average level plus maximum and minimum levels.
Phon	The logarithmic unit of measurement of the loudness level of a sound.
Pink noise	Noise with a constant energy per octave (or third octave) bandwidth. A spectrum analysis of a pink noise source with a real time third octave band analyzer would reveal a flat response across the frequencies of interest. Pink noise is often used as a stimulus signal in measurements of the characteristics of buildings and rooms.
Pitch	The attribute of auditory sensation that orders sounds on a scale extending from low to high. Pitch depends primarily on the frequency of the sound stimulus, but it also depends on the sound pressure and waveform of the stimulus.
Plane wave	A sound wave whose wave fronts are parallel and perpendicular to the direction of propagation that the wave is traveling in.
Preamplifier	An electrical device that acts as the interface between the microphone (or accelerometer) on a sound level meter (or vibration meter) that is used to match the high impedance of the transducer to the following electrical circuits of the measuring instrument. The preamplifier comes before any extension cable, where the microphone is remotely mounted from the meter, to prevent any significant signal loss down the extension cable caused by capacitive effects. Some preamplifiers are equipped with heater elements to minimize the harmful effects of moisture around the microphone capsule.
Presbycusis	The reduction in human hearing acuity that is attributed simply to the normal aging process. This will occur irrespective of any exposure to high noise levels in the workplace.
Probability distribution	A distribution of samples of the instantaneous noise level taken at regular intervals during a measurement where the samples are arranged according to their percentage of occurrence. The distribution ranges from 0% to a maximum % as the dynamic range increases. Each sample is allocated a place in the distribution according to its sampled level.

Topic	Description of topic
Probability distribution level (%)	The distribution of noise samples across the dynamic range of an instrument arranged at regular class widths such as every 0.5 dB. For an instrument with a 70 dB dynamic range there will be 143 class widths if the sampling is carried out at 0.5 dB steps. This will include an under and over range bin. The total number of samples to produce the percentage probability level divides the number of samples in each bin. For a random noise the distribution will have a Gaussian distribution.
Projected noise dose (Proj%)	This is the projection of the actual measured noise dose to what it would be if the measurement were to continue for a full 8 hours. This value is usually used to predict what the eventual outcome would be at the end of a standard working day when a representative period of time has been used to carry out the measurement. If the actual measurement lasted for 1 hour 30 minutes. And a measured noise dose was found to be 27% then the 8 hour projected value would be calculated as 27(8/1.5) = 144%.
Pulse range (dB)	The difference in decibels of the peak level of an impulsive signal and the rms level of a continuous noise.
Pure tone	A sound for which the sound pressure is a simple sinusoidal function of time, and characterized by a singleness of pitch (or frequency). Such examples are acoustic calibrators that generate a pure tone as the reference level.
'Q' factor	The number of decibels considered to double (or half) the risk of hearing damage in the workplace. A Q factor of 3 dB represents the equal energy principle and is based on the measured Leq value. A Q factor of 4 dB is mandated in certain US Department of Defense noise exposure regulations. The US OSHA regulations require a Q factor (or doubling rate) of 5 dB such that a noise is considered to be twice as risky (if the exposure time remains the same) if it increases by 5 dB.
Random noise	An oscillation whose instantaneous magnitude is not specified for any given instant of time. It can be described statistically by the probability distribution function giving the fraction of the total time that the magnitude of the noise lies within a specified range.
Real time analysis	The process of analyzing the frequency components of a complex sound into octave or third octave bands when all of the band levels are obtained at the same time. This is sometimes referred to as simultaneous frequency analysis and is a feature usually found on the more sophisticated models in a manufacturer's range of instruments due to the complexity of the signal processing involved. This type of analysis is required for the correct determination of transient sounds such as aircraft flyovers or impulsive signals from blasts. Since all of the bands are calculated simultaneously no energy is lost or missed when performing this type of analysis.
Recommended exposure limit (REL)	The limit of noise exposure recommended by NIOSH for a worker over a standard 8 hour time period. The limit is currently 85 dB expressed as an A weighted time weighted average noise level for 8 hours using the 3 dB exchange rate criterion. This is not quite the same value as that specified by OSHA for the PEL or for the action level for implementing a hearing conservation program since they are based on the 5 dB exchange rate for the time weighted average level instead.
Reflection	The return of a sound wave from a hard surface.

Topic	Description of topic
Refraction	The bending of a sound wave from its original path, either because it is passing from one medium to another or by changes in the physical properties of the medium. Examples of this are temperature or wind gradients in the atmosphere.
Reportable hearing loss	A change in the baseline audiogram test of an average of at least 25 dB measured at 2,000, 3,000 and 4,000 Hz measured in either of a worker's ears.
Resolution	The ability to be able to see the detail contained in something such as the closeness of the dots in a liquid crystal display. The more dots there are for a given area then the greater the resolution will be and the clearer the presentation of the information.
Resonance	The relatively large amplitude of sound (or vibration) when the frequency of some source of sound matches the natural frequency of some object or component of the system.
Resonator	A device that responds or resounds in sympathy with a source of sound or vibration.
Reverberant field	The region in an enclosed space or room where the reflected sound dominates, as opposed to the region close to the noise source where the direct sound dominates.
Reverberation	The persistence of a sound in an enclosed space as a result of multiple reflections after the source of the noise has stopped.
Reverberation room	A specially designed room having a long reverberation time, usually used to make the sound field inside it as diffuse as possible. The walls are usually constructed from hard material such as smoothly plastered concrete blocks and the opposing walls are made non-parallel to prevent the buildup of standing waves with the space.
Reverberation time (RT or T60)	The reverberation time of a room is the time taken for the sound to decay by 60 dB from its steady state value when the source of the sound energy is suddenly stopped. It is a measure of the persistence of an impulsive sound in a room as well as the amount of acoustical absorption present inside the room. Rooms with long reverberation times are said to be "live" rooms while rooms with short RT's are said to be "dead" rooms. If a room has an RT that is too long, speech will be difficult to follow and absorption material may have to be placed in the room to reduce the RT value to acceptable limits.
R.M.S. sound pressure	The root mean square (rms) value of a time varying signal is obtained by squaring the function at each instant, obtaining the average of the squared values over the interval of interest, and then taking the square root of the average value. The purpose of this is to convert an a.c. waveform into its equivalent d.c. value such that the variations can be read on a sound-measuring instrument. The rms value represents the effective energy value and is the best measure of steady continuous sounds. The period of interest, or averaging time, in sound measuring instruments is sometimes called the time weighting and is standardized in international regulations to specific values called the Slow, Fast and Impulse responses.
R.M.S. level (dB)	The rms level is the slowly varying sound level in decibels read from the display of a sound level meter (or other equivalent device) that shows the instantaneous sound pressure level with a selected time weighting applied to the signal. This is usually referred to as the Slow or Fast sound pressure level depending upon the selection of the time weighting in the instrument.

Topic	Description of topic
Run	The complete measurement process from the start time to the stop time encompassing all of the noise during that interval. A run can have just a single value attributed to the total noise level or it can be comprised of a number of regular shorter intervals that show how the noise level changed over time.
Sabin	A measure of the sound absorption of a surface. It is equivalent to a unit area of perfectly absorbing material.
Sequential analysis	The process of carrying out a frequency analysis of a sound in which the component octave or third octave bands are determined using a single filter and scanning across the range of frequencies of interest. At the lower frequency bands more time will be required to allow the energy in the filter band to stabilize. As the analysis proceeds through the frequency bands the noise level will stabilize much quicker since a wider and wider range of frequencies are being included. Some sound analyzers will perform the scan under automatic control governed by the instrument in order to minimize the time needed to obtain a statistically reliable answer in every band. Carrying out third octave band sequential analysis will take longer than for an octave band analysis since more bands are involved. The noise source must be stationary during the sequential analysis so this type of measurement technique is best suited to noise sources that are continuous such as fan or pump noise.
Shielding	The attenuation of a sound that is achieved by placing barriers in between the source and the receiver.
Slow response	This is one of the standard responses in a sound level meter (or dosimeter).
Slow weighting	The slow weighting is the same as the slow response in a sound level meter and is part of the rms. Circuit controlling the response of the meter to the variability of the instantaneous levels of the noise. It has a value of 1000 milli seconds (1 second) and is a continuous function that is calculated all the time by the instrument.
Sociocusis	The loss of hearing caused by noise exposures that are part of everyday social life, exclusive of any occupational noise exposure, physiological changes with age or disease.
Sone	The unit of measurement of loudness. 1 sone is the loudness of a sound whose loudness level is 40 phons. Loudness is proportional to the sounds loudness rating and has a linear scale in sones. For example 2 sones are twice as loud as 1 sone.
Sound	An oscillation in air pressure in an elastic medium. It is also an auditory sensation evoked by these oscillations. Not all sound waves will evoke an auditory response, for example, ultrasonic waves.
Sound intensity (Watt)	The average rate of sound energy transmitted in a specified direction at a point through a unit area normal to this direction at the point considered.
Sound intensity level (dB)	10 times the logarithm to the base 10 of the ratio of the intensity of a given sound in a stated direction to a reference sound intensity of 1 picoWatt per square meter

Topic	Description of topic
Sound level (dB)	The frequency and time weighted sound pressure obtained by the use of a sound level meter (or other equivalent device) as specified by the relevant ANSI standards for sound level meters. The level is expressed in decibels relative to the reference pressure level and unless specified to the contrary is normally taken to be the A weighted level.
Sound level meter	A measuring instrument comprising a transducer (the microphone), a frequency weighting circuit (the A, B or C responses), an rms circuit (the slow, fast or impulse weighting) some data processing (the microprocessor, if fitted) and an output device (the analog needle display or digital LCD) for the accurate measurement of noise and sound. Sound level meters can be battery operated for field use or can be powered from external power sources depending upon their power consumption and the length of time required for autonomous operation.
Sound power	The inherent quantity of a sound source irrespective of its local position in the environment. It is the total sound energy radiated by a noise source in unit time. The unit of sound power is the watt.
Sound power level (LW)	Ten times the logarithm to the base 10 of the actual weighted sound power to the reference sound power. The reference sound power is taken to be 1 µW (or 0.000,001 Watt). This result is a logarithmic quantity called the decibel or dB.
Sound pressure	The instantaneous difference between the actual pressure produced by a sound wave and the current atmospheric barometric air pressure at a given point in space.
Sound pressure level (LP)	Twenty times the logarithm to the base 10 of the actual weighted sound pressure to the reference sound pressure. The reference sound pressure is taken to be 20 µPa (or 0.000,020 Pa). This result is a logarithmic quantity called the decibel or dB.
Sound transmission	The study of the passage of sound through structures to determine the effectiveness of the insulation of different materials used for the construction of walls, floors ceilings etc.
Sound transmission class (STC)	The preferred single figure rating system designed to give an estimate of the sound insulation properties of a structure or a rank ordering of a series of structures.
Sound transmission loss (TL)	A measure of the sound insulation provided by a structure of specific design and construction. Expressed in dB, it is 10 times the logarithm to the base 10 of the reciprocal of the sound transmission coefficient of the configuration.
Spectrum	The description of a sound wave's resolution into its components of frequency and amplitude.
Spectrum analysis	The measurement and determination of the contribution of the various frequencies that go to make up the overall sound level measured with a sound level meter.
Speech interference level (SIL)	A calculated quantity providing a guide to the interference of a noise with the reception of speech. The speech interference level is the average of the octave band levels of the interfering noise in the most important part of the spectrum. The levels in the 500, 1000 and 2000 Hz bands are averaged together to give the speech interference level in dB.

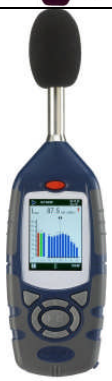
Topic	Description of topic
Speed of sound	Sound waves travel through different media at different speeds depending upon the composition of the material. For sound waves traveling in air at normal temperature (21ºC, 70ºF) and pressure (1013 mB) the speed of sound is 344 m/s (1128 f/s, 770 miles per hour). Sound waves traveling through steel have a faster speed of transmission.
Spherical wave	A sound wave in which the surfaces of constant phase are concentric spheres. A small point source radiating into an open space produces a free sound field of spherical waves.
Standard threshold shift (STS)	A deterioration in hearing sensitivity relative to the worker/miner's baseline audiogram, or relative to the most recent revised baseline audiogram where one has been established, of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.
Statistical noise level (Ln%)	The notional noise level in dB exceeded for a given percentage of the measurement duration. Usually expressed as Ln% where n represents the percentile value from 0 to 100 %. The L0% is equivalent to the maximum noise level since it is the level exceeded for 0% of the time, i.e. no readings are higher than the L0%. The L100% is equivalent to the minimum noise level since it is the level exceeded for 100% of the time and so is exceeded all of the measurement time. The L10% is often taken as a measure of the noise produced by highway traffic while the L90% is often taken as a measure of the background noise level. The L50% is the mean sound pressure level but it is not the same as the time average level, which is called the Leq.
Standing waves	The condition within enclosed spaces, such as rooms, in which sound reflects off opposing surfaces, such as the floor and ceiling, and produces noticeable “hot spots” of higher energy sound. The effect is frequency dependant and highs and lows of sound will occur at integer multiples of half wavelengths as the waves add or cancel out in the space between the reflective surfaces.
Steady noise	Noise that remains constant within a typical limit of ± 2 dB measured on the Slow response and without large fluctuations over extended periods of time.
Steady state noise	Sounds whose average characteristics remain relatively constant over time. Typical examples of steady state noises are fans, air conditioning units and compressors or pumps.
Tape recorder	A mechanical recording device utilizing a medium such as audiotape to store the original ac-varying signal from the microphone output of a sound level meter. Tape recorders can use reel-to-reel open tapes of various sizes or can be of the closed types such as a cassette of a certain size. The audiotape can be used to verify the source of a nuisance noise or for archiving purposes to show before and after sound quality.
Temporary threshold shift	A temporary impairment of hearing acuity as indicated by a change in the threshold of audibility. Such temporary shifts may occur after brief exposure to high noise levels at rock concerts or gun fire and will usually return to normal after a few days. High noise levels at work may also result in temporary threshold shift when the noises are not typically that high. When the high noise exposure is removed the audiometric threshold returns to normal again.

Topic	Description of topic
Third octave band	A frequency pass band whose cutoff frequencies have a ratio of 2 to the third power (about 1.25). The third octave band centered at 1000 Hz has a lower cutoff frequency of 891 Hz and a higher cutoff frequency of 1112 Hz. These are the frequencies at which the response of the filter has dropped to half, sometimes called the 3dB down points.
Third octave band analysis	The process of performing a frequency analysis of a noise by breaking up the sound into a series of contiguous bands whose bandwidth is a third of an octave. 31 third octave frequency bands cover the typical audio range from 20 Hz to 20 kHz.
Threshold level	The sound level in dB below which an instrument will ignore any quieter noise levels for the purpose of measuring a noise dose in the workplace. Typical threshold levels are 80 and 90 dB used in personal noise dosimeters to comply with measurement techniques specified by the OSHA/MSHA organizations.
Threshold of audibility	The minimum sound pressure level at which an average person can hear a specified frequency of sound over a specified number of tests carried out in acoustically controlled conditions.
Threshold of pain	The minimum sound pressure level of sound outside the ear that will produce a change from discomfort to definite pain. Typically taken to be at about a level of 130 A weighted dB.
Threshold shift	A change in the threshold of audibility at a specified frequency from a threshold previously established for that individual. The amount of the threshold shift is normally expressed as a dB value relative to the previous value measured earlier.
Timbre	An attribute of auditory sensation allowing a subject to judge that two sounds similarly presented and having the same loudness and pitch are dissimilar. Effectively, the ability of an individual to be able to tell the difference between the two sounds even though they both appear to be equally as loud and of the same pitch.
Time	One of the three fundamental variables of noise measurement along with amplitude and frequency.
Time history	The resultant set of values produced by an instrument to record (or data log) the changing noise levels during a run. The measured changes indicate the time history variations of the noise.
Time history profile	The regular short values of certain noise levels that are recorded during a measurement run to be able to visualize the temporal changes in that noise climate at a chosen resolution. Typical time history profiles may be at 1 minute intervals for a work day of 8 hours or at 1 second intervals for a shorter duration train pass by. For the investigation of rapidly changing temporal subjects such as reverberation times or gun shots then sampling intervals may need to be as fast as 100 times per second.
Time average noise level (Lavg)	A single number equivalent value in decibels that represents the average level of the actual changing noise levels. When the exchange rate is chosen as 3 dB the average noise level is called the Leq. When the exchange rate is chosen as 4 dB the average noise level is called the LDoD. When the exchange rate is chosen as 5 dB the average noise level is called the LOSHA. This value is usually measured directly by the sound level meter or noise dosimeter and is used to calculate the standardized TWA for exactly 8 hours. It is not the same as the TWA unless the measurement duration is also 8 hours.

Topic	Description of topic
Time weighted average noise level (TWA)	This is the total noise level of the normal work day expressed as an equivalent or computed value for a work day of exactly 8 hours duration. It does not matter whether the work day is 7:30 or 10:00 or even 12:00 long the calculation of the TWA from the average noise level will normalize the result to a standard time of 8:00. This is the value specified in many national noise exposure standards including OSHA and ACGIH. If the work day is exactly 8:00 then the Lavg = TWA. If the workday is less than 8:00 then the Lavg > TWA. If the work day is longer than 8:00 then Lavg < TWA.
Tinnitus	A ringing in the ears or noise sensed in the head. The onset may be due to an acoustic trauma and still persist in the absence of the stimulus. A person suffering from tinnitus will complain of being able to hear noises even in very quiet surroundings. This condition is very difficult to prove or to treat.
Tone	A sound with a definite pitch. A pure tone from a device like an acoustic calibrator will produce a sinusoidal waveform when viewed on a suitable display.
Transducer	A device capable of being stimulated by waves from one or more transmission systems or media and supplying related waves to one or more other transmission systems or media. Typical examples are microphones that convert (or transduce) sound waves into an equivalent electrical signal or accelerometers that convert vibrations into useful electrical signals.
Type 1	A grade of overall accuracy taking into account the physical response of the complete measurement system that has tolerances in terms of frequency, direction, temperature, humidity, ambient air pressure etc. A sound measurement device having a claimed accuracy of type 1 according to ANSI (or other equivalent international standards) is sometimes called a precision instrument. Type 1 instruments are usually specified where the best accuracy is mandated.
Type 2	A grade of overall accuracy taking into account the physical response of the complete measurement system that has tolerances in terms of frequency, direction, temperature, humidity, ambient air pressure etc. A sound measurement device having a claimed accuracy of type 2 according to ANSI (or other equivalent international standards) is sometimes called a general-purpose instrument. Type 2 instruments are usually specified where the absolute accuracy is not critical or where cost is a compelling factor.
Ultrasonic sound	Sound waves with frequencies higher than 20 kHz beyond the audible range for a normal human being. Dog whistles operate at frequencies around the 30 kHz region.
Vibration	An oscillatory motion of solid bodies described by displacement, velocity and acceleration with respect to a fixed reference position.
Vibration isolation	The process reducing the amount of motion passed through a system by the introduction of suitable materials.
Vibration isolator	A material specifically designed to reduce the level of vibration transmitted from one part of a structure to another part.

Topic	Description of topic
Wave	A disturbance that travels through a medium such as air by virtue of the elastic properties of that medium. A typical example is a sound wave that is created by a moving machine that excites the layers of air immediately next to the moving surface. This movement is transmitted throughout the air all around the machine and spread out as spherical waves until they are detected by a listener or by a measuring instrument with a microphone.
Wavelength (λ)	When considering periodic waves (such as the passage of sound in air) it is the distance between similar points on any two successive wave fronts.
Wavelength of sound	The wavelength of a sound is inversely proportional to the frequency of that sound such that the lower the frequency, the longer the wavelength of that sound will be. The wavelength and the frequency of a noise are related by the speed of sound in air. The wavelength of a sound wave is proportional to the frequency of the disturbance and the speed of sound by the relationship; $\lambda = c/f$ Where c = speed of sound in air (approx 344 m/s) and f is the frequency in Hz. For a sound wave at 1 kHz the equivalent wavelength is about 1 foot (0.344 m).
Weighting	An internationally prescribed frequency filter shape provided in sound measuring devices such as sound level meters to try and characterize the overall effect of certain sounds on a typical listener. Typical weightings are the A, C and Lin or Z correction weightings.
White noise	Sound or noise whose energy is uniformly distributed over a wide range of frequencies such that there is constant energy per Hertz. When measured with an octave or third octave band filter set the power spectrum of a white noise source will be seen to drop off at 3 dB per octave as the frequency increases.
Windscreen	A foam ball fitted over the microphone of a sound level meter to reduce the effects of wind induced noise on the readings being carried out. Windscreens are often manufactured from open cell design foams to allow free passage to the sounds of interest without unduly affecting the frequency response of the system beyond acceptable limits. Foam windscreens should always be used when performing outdoor measurements but will not be effective if allowed to become waterlogged or when used in high wind speeds in excess about 30 f/s (or 10 m/s). Foam windscreens can also be of benefit when measuring indoors when strong turbulence may be encountered from ventilation system ducting or other similar sources.
'Z' weighting	One of the standard frequency correction curves (or weightings) applied to sounds in a measurement device to simulate the hearing capability of the human hearing mechanism. The Z pre-weighting is most often used for the measurement of octave band noise levels. The Z weighting response is specified in newer acoustic standards since it has a defined characteristic unlike the linear (flat or un-weighted) frequency weighting found in earlier noise meters. It is essentially flat from 10Hz to 35kHz at the -3dB down points.

Typical examples of current noise measurement equipment

CEL-240 Series ANSI Type 2 meters 4 Simple-to-use models with optional data logging A and C weightings Slow, Fast and Impulse responses Instantaneous, max and average noise levels Low battery and overload indicators Large graphic display showing time history trend Ac and USB outputs to recorders and computers Real time output to computer via USB interface	
CEL-300 Series Convertible between dosimeter and sound level meter ANSI Type 2 accuracy Micro sized badge style dosimeter available too 6 main models in range Pre-configured Setups to start recording straight away Logging and non-logging versions Store results from separate measurement runs Comprehensive delay timers in some models	
CEL-400 Series 12 models in range ANSI Type 1 & 2 accuracy available Logging and non-logging versions available Sequential frequency analysis, manual or automatic Broadband only, broadband and octave and broadband, octave and third octave band models Direct printing to standard printers Comprehensive download software with all models Customizable by user to select measured parameters Store cumulative, interval and time history data in logging models	
CEL-600 Series ANSI Type 1 models available for accurate results 18 different variants of the hardware 3 variants of the firmware Full color high resolution LCD display All measurements made simultaneously so no setup required Real time frequency analysis in octaves or third octaves Upgradeable to enhance measurement options such as environmental monitoring and full data logging All models provided with USB interface as standard Wide range of accessories and software to expand possibilities	

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