Industrial Noise Exposure Evaluation

Course Rationale

Noise is the most common environmental pollutant and the most widely occurring health hazard in industrial workplaces. Even new manufacturing plants, unless designed with input from an occupational hygienist or noise specialist, are often constructed with substantial built in employee noise exposures. Evaluation of these exposures can identify employees at risk and workplace areas where noise control is required. Knowledge of noise monitoring and basic noise control strategies is necessary to run an effective noise control program.

A prerequisite for a hearing conservation plan is to identify plant operations that contribute to the noise exposure of employees and to quantify the contribution they make. Efforts can then be directed to reducing noise exposures through engineering controls and other measures in order to protect the hearing of all employees.

Assessing workplace noise exposure requires an understanding of basic acoustic principles and familiarity with the instrumentation and procedures used to characterize the acoustic environment of the workplace. This course introduces the basic theoretical principles and the practical skills required by the occupational health professional to evaluate potential noise exposures and formulate a noise exposure control program. With this knowledge, it is possible to accurately quantify worker exposures and use this data to develop noise control solutions.

Course Objective

The objective of this course is to provide each participant with a fundamental understanding of noise and its effects on human hearing, noise measurement techniques and basic noise control principles.

Topics Covered

Topics covered in the course include: the fundamental physics of sound; the physiology of hearing and hearing loss; non auditory effects of noise exposure; noise exposure standards and guidelines; the operation of sound level meters and noise dosimeters; octave band analysis; sound measurement calculations; the use of computer programs for noise exposure data analysis; sound measurement reporting. Special considerations relating to community noise evaluation will also be discussed.

The course includes hands-on experience with several simulated measurement scenarios to ensure that the participant can take valid noise measurements with confidence. Practical exercises in performing the more common calculations associated with computing noise exposures will also contribute to the participants understanding of noise monitoring and noise exposure evaluation.

In order to complete this course the participant should have a basic understanding of algebra and logarithmic notation. Each participant should bring a basic scientific calculator in order to perform the calculations required in the exercises. The calculator should have the ability to calculate basic logarithmic functions. More elaborate functions are not required.

During the course, several different techniques will be described for using computer spreadsheets to process noise data. Participants who have a laptop computer they can bring to the course will be able to

use it to advantage during some of the practical exercises. Some software programs and spreadsheet templates will be provided to participants. Although useful, a computer is not required in order to take the course. Our goal is to ensure that every course participant is comfortable with the measurement technology, techniques and strategies of sound level measurement for occupational noise exposure assessment.

Course Outline

Day 1

08:30	**Welcome and introductions**
08:45	**Characteristics of Sound And Noise** - the nature of a sound wave, mechanism of wave propagation, concepts of frequency, wavelength, amplitude, intensity. The description of industrial noise fields in terms of frequency, frequency distribution, octave and sub-octave bands. The nature of sound power, sound intensity and sound pressure level, decibel notation, continuous, intermittent, impulse noise and noise averaging. Demonstration of the ear's frequency response and perception of intensity differences.
10:00	**Break**
10:15	**Working with decibels** - decibel addition, concept of exchange rate, calculation of average sound pressure levels with different exchange rates (Lav, Leq) calculation of noise summation from multiple sources. Practical exercise in logarithmic calculations using calculators and computer spreadsheets.
11:15	**Health effects of noise** - anatomy of the ear, auditory effects of sound, hearing loss models, threshold shift, temporary and permanent threshold shift, recent research on hearing loss and hair cell damage, extra-auditory effects of noise.
12:00	**Lunch**
13:00	**Sound Measurement** - sound level meters, design and applications, slow and fast response, octave band filters, impact meters, personal dosimeters, measurement of fluctuating noise intensities, illustration of instrumental (logarithmic) averaging, exchange rate, calculation of Lav, Leq. Community noise monitors, frequency analyzers. Equipment demonstrations.
15:00	**Break**
15:15	**Practical Exercise 1** - Sound level meter measurements, instrument settings, octave band analysis, measurement of impulsive noise, sound pressure level mapping,
16:30	**Adjournment**

Day 2

08:30	**Standards and guidelines** - NIOSH criterion documentation. ACGIH recommended guidelines, Current Ontario legislation governing workplace noise, legislation in other jurisdictions. Community noise standards.
10:00	**Break**
10:15	**Conducting noise surveys** - types of surveys, noise exposure assessments, source assessment surveys, community noise surveys
11:15	**Practical Noise Dosimetry Exercise 1** - Choosing which workers to monitor, setting dosimeter parameters (exchange rate, criterion level, threshold), microphone placement, avoiding microphone artifacts, use of wind screen.
12:00	**Lunch**
13:00	**Practical Dosimetry Exercise 2** - Data Retrieval and Presentation - recovering data from the dosimeter, manual collection of summary data, transferring dosimeter data to computer, use of dosimeter specific software programs, use of Windows HyperTerminal program, importation and manipulation of data with generic spreadsheet and database programs. Data presentation.
15:00	**Break**
15:15	**Noise Measurements in Non-Industrial Settings -** Evaluating room noise in non-industrial workspaces. Investigating community noise problems.
16:15	**Course review and evaluation**
16:30	**Adjournment**

Registration:

Contact *ALARA* by phone at (416) 759-9579, or e-mail info@alaraihs.com if you wish further information. A registration form is available here. This form can be filled out and mailed to ALARA together with the course fee ($904 including H.S.T.), payable to *ALARA* Industrial Hygiene Services Ltd. by cheque or purchase order on company letterhead.

The registration fee includes course manual and materials. A $200 cancellation fee is payable for cancellation less than 10 business days before the course.