SCOPE OF PRESENTATION

• BACKGROUND & RATIONALE
• WHAT IS NOISE
• NOISE REGULATIONS
• ASSESSMENT OF EXPOSURE TO NOISE
• NOISE CONTROL
• OCCUPATIONAL HEARING CONSERVATION PROGRAMME (HCP) AND AUDIOMETRY
• AUDIOMETRIC TESTING
• INFORMATION, INSTRUCTION AND TRAINING TO EMPLOYEES
• RECORD KEEPING
BACKGROUND

- POTENTIAL HEARING IMPAIRMENT GOVERNED BY
  - LEVEL OF NOISE
  - THE DURATION OF EXPOSURE
- STUDIES HAVE SHOWN EXPOSURE AT 90 dB (A) OVER 30-40 YEARS WILL PROTECT ONLY ABOUT 80% OF WORKING POPULATION
- LOCAL STUDIES CONDUCTED 1983-1990
- 302 FACTORIES; 45,974 WORKERS
- ABOUT 50% AT RISK OF IMPAIRMENT
- 22% WORKERS HAD IMPAIRMENT
- 70% EXPOSED TO LEVELS > 90dBA
- MEDIAN AGE 28 YEARS
NOISY INDUSTRIES:
% WORKERS AT RISK

- TEXTILE MILLS (59.2 %)
- STEEL MILLS (54.9 %)
- CHEMICAL INDUSTRY (52.9 %)
- BEVERAGE MFG. (52.1 %)
- MINERAL PRODUCTS MFG. (51.8 %)
- FOOD MANUFACTURING (49.4 %)
- METAL PRODUCT MFG. (48.9 %)
- PALM OIL MILL (48.9 %)
No of NIHL Cases Reported to DOSH (2003-2015)

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<tr>
<th>Year</th>
<th>Cases Reported</th>
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<td>2003</td>
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<td>2014</td>
<td>2047</td>
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<td>2015</td>
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RATIONALE OF NOISE LEGISLATION AND ENFORCEMENT

TO PROTECT & PRESERVE THE HEARING OF WORKERS EXPOSED TO EXCESSIVE NOISE LEVEL IN WORKPLACES
What is noise?

- Unpleasant or unwanted sound
- When unwanted noise gets loud enough
  - It is unpleasant
  - It is distracting
  - It is tiring & stressful
  - Higher levels cause permanent hearing damage
Likelihood of Damage

• Depends mainly on:
  • Volume (loudness)
  • Frequency (pitch)
  • Exposure time

• Can be work exposure, social exposure or both
Damage can include:

• Temporary hearing loss
  – hearing returns after a short period away from noise

• Permanent hearing loss
  – Permanent damage or destruction of hair cells in the ears.
  – Hearing cannot be restored
How Hearing is Damaged

- Hairlike cells are flattened.
- You do not get used to noise; you gradually lose your hearing.
- Once hearing is damaged, it cannot be repaired or replaced.

Loss of cilia as a result of Noise

The cilia (sensory hairs) appear normal
• Difficulty hearing people speak.
• Inability to hear certain high-pitched or soft sounds.
• Noise or ringing in ears.
• Getting complaints that the radio or television is too loud.
• Trouble understanding conversation at a distance or in a crowd
• Others can hear something you can’t
Types of Hearing Loss

- **Conductive**
  - Sound is not conducted from outer ear to inner ear
  - Reduction in sound level
  - Condition results from fluid in middle ear, foreign bodies, infection in ear canal, impacted ear wax, malformation of ear

- **Sensorineural**
  - Results from damage to the inner ear or nerve pathways from ear to brain
  - Corrected through surgery
  - Caused by birth injury, diseases, noise exposure, head trauma, aging

- **Mixed**
  - Hearing loss resulting from both conductive and sensorineural
There is no cure for hearing damage!

• Normal hearing can never be restored
• Hearing aids do not restore noise-damaged hearing
• Best, preventions program at earliest/beginning stage
• Ear is most sensitive to normal frequency sound
• The dB(A) scale takes this into account when measuring noise levels
Measurement of Noise
Loudness is measured in decibels

- 170 dB  Jet airliner
- 120 dB  Riveting hammer
- 110 dB  Shouting loudly
- 70  dB  Street sounds
- 38  dB  Quiet bedroom

This is a logarithmic scale – an increase of 1dB means about 30% more noise.
# Recognizing Occupational Hazardous Noise

<table>
<thead>
<tr>
<th>Task</th>
<th>Avg. Noise Level (dB-A)</th>
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<tbody>
<tr>
<td>Operating forklift</td>
<td>87</td>
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<tr>
<td>Cutting Wood</td>
<td>93</td>
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<tr>
<td>Cutting lawn</td>
<td>94</td>
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<td>Installing trench conduit</td>
<td>95.8</td>
</tr>
<tr>
<td>Welding</td>
<td>98.4</td>
</tr>
<tr>
<td>Grinding</td>
<td>99.7</td>
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<tr>
<td>Chipping Concrete</td>
<td>102.9</td>
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<tr>
<td>Working near Generator</td>
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<table>
<thead>
<tr>
<th>Tools</th>
<th>Avg. Noise Level (dB-A)</th>
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</thead>
<tbody>
<tr>
<td>Lathe</td>
<td>81</td>
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<tr>
<td>Welding Equipment</td>
<td>94.9</td>
</tr>
<tr>
<td>Hand Power Saw</td>
<td>97.2</td>
</tr>
<tr>
<td>Screw Gun, Drill</td>
<td>97.7</td>
</tr>
<tr>
<td>Rotohammer</td>
<td>97.8</td>
</tr>
<tr>
<td>Chop saw</td>
<td>98.4</td>
</tr>
<tr>
<td>Stationary Power tool</td>
<td>101.8</td>
</tr>
<tr>
<td>Chipping Gun</td>
<td>103.0</td>
</tr>
</tbody>
</table>
Measuring Instruments

Sound Level Meter

Dosimeter
Factories & Machinery (Noise Exposure) Regulations, 1989

• MADE UNDER THE FACTORIES & MACHINERY ACT, 1967

• COME INTO FORCE ON 1 FEBRUARY, 1989

OBJECTIVES OF NOISE REGULATIONS

• TO PREVENT THE OCCURANCES OF NOISE INDUCE DEAFNESS

• LEGAL GUIDANCE (STIPULATING MINIMUM STANDARD AND PROCEDURE) TO PRESERVE WORKER’S HEARING
• NOISE SOURCES NOT TO EMIT NOISE LEVEL > PERMISSIBLE EXPOSURE LIMITS (P.E.L)
  – 90 dBA for 8 hours exposure
  – Dose of unity or limits specified in the First Schedule
    • Exchange rate adopted 5 dB
    • Every increase of 5 dB means halving of dose
• WORKERS NOISE EXPOSURE NOT TO EXCEED CERTAIN LEVEL
  – 115 dB(A) maximum not to be exceeded at any time
  – 140 dB peak
• ACTION LEVEL IS DOSE OF 0.5
Assessment of exposure to noise

• Employer to conduct assessment when employee are likely to exposure at Action level or above PEL.
• Assessment to be review when assessment no more valid and changes in the work.
• Assessment conducted by Competent Person using equipment of IEC standard.
• EXPOSURE MONITORING
  ▪ INITIAL MONITORING
  ▪ POSITIVE INITIAL EXPOSURE MONITORING
  ▪ NEGATIVE INITIAL EXPOSURE MONITORING
  ▪ ADDITIONAL MONITORING WHENEVER CHANGES IN Production, Process, Equipment, Control measures, Personnel
• EMPLOYEE NOTIFICATION -Within 2 weeks
EMPLOYER

Reduction of risk of hearing damage

Reduction of noise exposure

• Employer to reduce the risk of damage to hearing of employees to the lowest level practicable

• Employer to reduce noise exposure, when assessment result show exposure greater than PEL

• Means of reducing noise exposure by engineering control as far as practicable, administrative or others effective means

• To provide hearing protectors when evidence of other means are not practicable.
Noise Control

SOURCE
PATH
WORKER
Noise Control

Source → Path → Receiver
Control Noise Source

- Replace noisy equipment
- Replace / adjust worn parts
- Lubrication of noise parts
- Use vibration mounts
- Enclosure
- Use noise control mufflers on vents (noise absorbent)
- Noise barriers
Control of Noise Path

- Acoustic Treatment of Ceilings, Walls, Floors
  - Reduce reverberation
  - Absorb sound
- Increase Distance Between Source and Receiver
Worker Exposure Control

- Control Rooms
- Personal Protection
  - Ear plugs
  - Ear muffs

- Rotate personnel to reduce exposure time
Concept - Noise Control

- Engineering Control
- Administrative Control
- Personal Protective Equipment (hearing protective devices)
• **Reduce noise at the source.**
  – The noise source can be selected, redesigned or modified to operate more quietly, resiliently supported to prevent the transmission of vibration

• **Interrupt the noise path.**
  – Sound energy can be absorbed by
    • a porous acoustic material
    • blocked along its path
  – Sound energy can be confined to, or excluded from, an enclosure
Engineering Controls

• **Reduce reverberation and structural vibration.**
  – *Vibration isolation/dumping*
    • those that reduce radiated sound
    • reduces intensity of a sound source
    • vibration isolation prevents the vibration of one object from being transferred to another. (e.g., springs and resilient mount.)

• **Silencers, passive or active**
  – those that suppress sound (mufflers)

• **Maintenance and use of equipment**
  – anything provided is fully and properly used and maintain in efficient working order and good condition.
Administrative Controls

- Operate noisy equipment on second or third shifts.
- Rotate employees through high-noise areas.
- Modify existing machinery.
- Place noise limit specs. on new equip.
- Maintain equip. in good condition.
- Use noise control when installed.
- Reporting noisy equip. to supervisor for repair.
• Employer shall provide hearing protection when other means fail to reduce the levels of noise
• The hearing protection provided be able to attenuate below the PEL
• The hearing protection provided must satisfy such standard and specifications of manufacturer an may be approved by the Director General

Rule of Thumb

When you feel the need to shout in order to be heard 3 feet away, the noise levels are probably 85 dB or more and hearing protectors are recommended.
METHODS OF COMPLIANCE:

• HEARING PROTECTIVE DEVICES
  – Correct fit
  – Compatible with job
  – Not prejudice the health
  – Attenuate below PEL or AL
  – Approved type
EAR PLUGS
An Example of Reducing the NRR

8-hour TWA noise exposure: 93 dBA
NRR of hearing protectors: 29 dB

Subtract 7 dB from the NRR: 29 dB - 7 dB = 22 dBA
Multiply by 50% Safety Factor : 22 x 50% = 11 dBA
Subtract 11 dB from the 8-hour TWA noise exposure: 93 dBA - 11 dBA = 82dBA
Decide if 82 dBA (known as the “Protected Exposure”) is below the PEL for noise
Purpose of Hearing Protectors

- Reduction of sound waves traveling to the inner ear
Personal Protective Equipment (Hearing Protection Devices - HPD)

- Employers shall provide HPD to employees at no cost.
- Employers shall ensure HPD being worn:
  - by employees exposed to 8 hr Leq of 90dB or greater
  - by employees exposed to 8 hr Leq of 85dB or greater
  and:
    - Whose baseline audiogram has not been established
    - Who have experienced a Standard Threshold Shift
- HPD must reduce employee noise exposure below PEL e.g. below 8 hr Leq of 90 dB.
- Employees with STS, HPD must reduce employees exposure below an 8 hr Leq of 85 dB.
Employer and Employee Responsibility

**Employer**
- Provide occupational noise training.
- Provide hearing protection devices.
- Demonstrate commitment – wear HPDs.
- Enforce the use of HPDs.
- Keep up to date with HPD selection and use.
- Encourage questions and resolve problems.

**Employee**
- Understand the need for hearing protection devices.
- Wear HPDs and seek replacements.
- Encourage co-workers to wear HPDs.
- Communicate problems to supervisors.
<table>
<thead>
<tr>
<th>Kind of Protector</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| **Ear Plug**      | • Free head movements  
                    • Good for tight work spaces  
                    • Worn with any hairstyle  
                    • Worn with hats, eye protection, respirators  
                    • Good protection against high frequency sounds | • Can work loose during the work day  
                                                          • Must be replaced periodically  
                                                          • Small and can easily be lost |
| **Ear Muff**      | • Headband can be adjusted for comfort  
                    • Seldom come loose during the work day  
                    • Free head movements | • Difficult to wear with eye, head and breathing protection |
Instructions on Selection, Fitting, Use, and Care of Hearing Protectors

• Ear plugs
  – Keep clean and free of materials
    • Wash in mild liquid detergent and warm water
    • Squeeze excess water and air dry
  – Discard plugs when hardened or do not re-expand
Instructions on Selection, Fitting, Use, and Care of Hearing Protectors

- Ear Muffs
  - Reduce noise by as much as 15-30 decibels
  - Use in conjunction with ear plugs when exposed to high noise levels (105+ decibels)

- Ear Muffs
  - Keep clean and free of debris
    - Clean cushions with warm soapy water
  - Do not tamper with the acoustic seal between the cushions and the headband
  - Do not modify the ear muffs in any way
  - Do not stretch or abuse the headband
Hearing protection zones

• Means any part of the premises where any employee is likely to be exposed to PEL
• To be properly demarcated and identified by proper signage in any Malaysian or International standard and an employee needs to wear hearing protection when enter such zone
Audiometric Testing

• To measure hearing by sending tones to each ear through headphones.
• To show how one’s hearing compares to normal hearing based on age.
• To determine whether hearing is being conserved.
• To alert employee and employer for noise, age or medical related hearing loss.
Audiometric Silent Booth

Audiometric Silent Booth
Evaluation of Audiogram

Normal Audiogram and Degree of Hearing Loss

-10
0
10
20
30
40
50
60
70
80
90
100

500 1000 2000 3000 4000 6000

Frequency, Hz (low pitched to high pitched sounds)

Hearing Threshold Level dB

-10
10
20
30
40
50
60
70
80
90
100

Normal Hearing
Mild Hearing Loss
Moderate Hearing Loss
Severe Hearing Loss
Profound Hearing Loss
Audiometric Testing

• Conducted by a qualified technician.
• Baseline Audiogram/Test
  – Shows initial hearing status
  – For comparison to future audiograms
• Periodic (Annual) Audiogram/Test
  – To determine if HCP is effective and if non-noise factors affects hearing
  – Recheck audiogram or professional referral necessary if significant hearing change occurs
• FREQUENCY
  – Every year for those at/above PEL
  – Every year if hearing impairment or standard threshold shift
  – Every 2 years for those at/above AL but less than PEL
Audiometric Testing (Continue..)

- Annual audiogram compared to baseline audiogram to determine threshold shift
- If threshold shift
  - Employee must be notified in writing.
- If threshold shift from occ. noise exp.
  - Employee fitted with hearing protectors, trained in use and care, required to use them.
  - Employee refitted with better attenuation hearing protectors and retrained in hearing protector use
  - Refer employee to eval/exam if add. testing necessary or if medical pathology is caused by hearing protectors
  - Inform employee of need to eval/exam if medical pathology unrelated to hearing protectors is suspected
Explanation of Test Procedures

• Audiometer sends tones to each ear through headphones.
• Listen carefully and respond each time you hear a tone.
• Levels at which you can barely hear the tones is your hearing threshold levels.
• Audiogram records threshold (dB) for different pitches or frequencies (Hertz).
• Test shall be pure tone, air conduction, hearing threshold exam.
• Test frequencies from 500 to 6000 Hz in each ear.
Standard Threshold Shift

- Hearing ability changed by an average of 10 decibels.
- Employee notification.
- Revised hearing protection required.
- Further medical evaluation.
- Allowance may be made for the contribution of aging.
Training and instruction for employees exposed above action level or PEL by employer covers:

- Provision of regulations
- Effect of Noise
- The risk of damage
- Steps taken for improvement to minimize the risk
- The functions and procedure for selection of hearing protection
- Procedure to acquire hearing protection
- The purpose and procedure of HCP and audiometric testing
- Training and instruction to be carried-out at least once in Every 2 years and recorded.
Elements of Hearing Conservation Program (HCP)

- Noise Monitoring
- Hearing Protectors
- Audiometric Testing
- Evaluation of Audiogram
- Audiometric Test Requirements
- Approved Audiometric Testing Facility
- Training
- Record Keeping
Employer to establish and maintain HCP and Audiometric Program

Applied to all employees exposed to Action Level or above

The cost of audiometric testing shall be borne by employer

The HCP and audiometric testing carried-out to be supervised by Occupational Hearing Conservation Administrator

Audiometric testing results to be interpreted by OHD
COMPARISON WITH PROPOSE NEW REGULATION

NOISE EXPOSURE (1989)
• Under FMA 1967
  • "Action Level" = 85 dB(A) or daily noise dose equal to 0.5;
  • “P.E.L” = 90 dB(A) eight-hour;
• Exchange Rate = 5 dB
• Penalty – RM1,000 (Apply to all provisions)

Under OSHA 1994
• "Action Level" = 82 dB(A) or daily personal noise exposure dose of 50%;
• “P.E.L” = 85 dB(A) eight-hour;
• Penalty
• Exchange Rate = 3 dB
• - RM 50,000 and / or 2 years jailed (Failed to conduct noise assessment)
• RM 1,000 and / or 3 months jailed (Employees)
• RM 10,000 and / or 1 year jailed (other provisions)
ADDITIONAL PROVISIONS FOR NEW NOISE EXPOSURE REGULATION 201X

• Have an ICOP – for details
• Duties of employer, employee and self employed person
• Reduction of Noise Exposure – To provide evidences if only Personal Hearing Protectors can be used.
• Duties of designer, manufacturer, importer and supplier of plant for use at work
ANY QUESTIONS?