Environmental Engineering – Module 4: Noise

1. Basic Concept of Noise

- **Noise** is defined as unwanted or disturbing sound that adversely affects the health, comfort, and well-being of humans and animals.
- Sound is measured in **decibels (dB)**. Sounds above 65dB are considered noise pollution by international standards, with levels above 75dB being harmful and anything above 120dB being painful[1].
- **Types of Noise Pollution:**
  - **Transport Noise:** From traffic, railways, aircraft.
  - **Industrial Noise:** From machines and manufacturing processes.
  - **Neighborhood Noise:** From household gadgets, loudspeakers, music systems, etc.[2]

Effects of Noise Pollution

- Hearing loss, stress, hypertension, sleep disturbances
- Reduced productivity and cognitive impairment
- Disturbance to wildlife and ecological systems[3] [4]

2. Measurement of Noise

- **Sound Level Meter (SLM):** The primary instrument for measuring noise; it captures sound pressure levels and displays them in decibels (dB)[4] [5].
- **Integrating Sound Level Meter (ISLM):** Measures variable or fluctuating noise by calculating the equivalent continuous sound level (Leq) over a period[6] [5].
- **Noise Dosimeter:** Worn by individuals to measure personal exposure to noise levels, particularly in occupational settings[5].
- **Measurement Parameters:**
  - **Sound Pressure Level (SPL):** The most common, measured in dB.
  - **Frequency (Hz):** Determines the pitch of noise.
  - **Duration:** Exposure time is critical for assessing risks.
  - **A-weighting:** Adjusts readings to reflect human ear sensitivity, used for most environmental and occupational measurements.

Typical Noise Levels

Source	Typical dB Level
Library	35
Urban Traffic	75–85
Construction Site	90–105
Aircraft Takeoff	130

3. Noise Control Methods

3.1 At the Source

- Use of quieter equipment and advanced design
- Proper equipment maintenance and lubrication
- Installation of silencers, mufflers, and vibration dampers on machinery[7] [8]

3.2 Along the Path

- Erection of **acoustic barriers** (walls, earth berms, enclosures) to block noise transmission[9] [7]
- Use of **sound-absorbing materials** (acoustic panels, foam, fiberglass) in walls and ceilings[9] [10]
- Landscaping with dense tree strips to intercept noise[2]

3.3 At the Receiver

- Construction of **sound-insulated buildings** (sealed windows, double glazing)
- Design of rooms with absorptive internal surfaces (carpets, curtains)
- Use of **personal protective equipment**, such as earplugs or earmuffs for workers[7] [9]

3.4 Administrative Controls

- Limiting exposure time to high noise areas
- Scheduling noisy operations at less sensitive times
- Establishing **quiet zones** (around hospitals, schools)[2]

3.5 Advanced Techniques

- **Active Noise Control (ANC):** Uses anti-phase sound waves to cancel harmful noise in specific environments[10]
- **Vibration Isolation:** Use of springs or rubber mounts to separate machinery from building structures

4. Summary Table: Noise Control Approaches

Control Stage	Example Measures
Source	Equipment design, silencers, maintenance
Path	Acoustic barriers, absorption, landscaping, enclosures
Receiver	Building insulation, PPE, absorptive room surfaces
Admin	Limit exposure, schedule, designate quiet zones

Key Points:

- Noise is measured in decibels (dB) with sound level meters, integrating meters, and dosimeters as the main tools.
- Control methods target the noise source, the path, and the receiver through engineering and administrative interventions.
- Reducing noise pollution is vital for public health, comfort, and environmental quality [2] [11] [10].

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2. https://byjus.com/physics/noise-pollution-prevention/
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