ENVIRONMENT, HEALTH AND SAFETY UPDATES

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SPECIAL ISSUE ON

NOISE POLLUTION

1.0 DEFINITION OF NOISE POLLUTION

Noise by definition is unwanted sound, what is pleasant to some cars it may be extremely unpleasant to other, depending on a number of physiological factors the sweetest music, if it disturbs person who is trying to concentrate or sleep is a noise to him. Just as the sound of pneumatic reverting hammer is noise to nearly everyone (1).

2.0 MEASUREMENT OF NOISE

The two most important measurement of noise are, sound pressure and sound intensity, these are measured in different units, and the scale of the magnitude id different and very large in relation to noise.

The unit of measurement of sound is decibel (dB). It is ratio expressed as logarithmic scale relative to a reference sound pressure level .

$$\text{Sound Intensity Level} = 10 \log 10 \frac{\text{Intensity measured (I)}}{\text{Reference intensity (Io)}}$$

$$\text{Decibel} = 10 \log 10 \frac{(I)}{(Io)}$$

The reference intensity used is the "threshold of hearing" which is a sound that can be first heard at sound pressure of $2X10^5$ N / M^2 of a sound intensity of 10 – 12 W / M^2 .

It is quite important to note that doubling of sound pressure produces an increase of 6 dB and doubling of sound intensity produces an increase of 3 decibels, which is implicit in the logarithmic scale for sound measurement.

3.0 EFFECT OF NOISE POLLUTION

Noise is one of the main pollution of the environment causing various hazardous consequences for human life. Noise not only impairs sensibility to auditory stimuli by masking effects, it has other consequence too.

Studies have proved that a loud noise during peak hours creates tiredness, irritation and impairs brain activities, so as to reduce thinking and working abilities.

Its general effects on human being is that it covers disturbance in sleep which lead to other side effects. The effects of noise pollution can be categorized in to following.

Physiological Effects

This form of environmental degradation has implication for health as serious as air or water pollution. Noise can change mans physiological state by speeding up pulse and respiratory rates. It can impair hearing either permanently or temporarily millions of industrial workers are threatened with hearing damage.

- Medical evidence suggests – that noise can cause heart attacks.
- Noise can cause chronic effects as hypertension or ulcers.
- Noise can cause deafness.

Some empirical research conducted on pregnant female mice reveals that air craft taking off which bring 120 to 160 dB caused miscarriages in them, if the findings on mice are made applicable on human being.

The effects of this categories includes, annoyance, tensions in muscles, nervous irritability and strain.

Behavioral Effects

It has been reported that performance of school going children is poor in comprehension, when schools are in the busy / traffic prone area. Noise can cause irritation, which results in learning disabilities.

Personological Effects

If the injurious effects of noise tend to persist for longer duration they may cause maladaptive reactions in the individuals, disturbing his total personality make – up.

Insomnia, fatigue, hypertension, blood pressure and deafness are the symptoms shown by the people living in the noise polluted area (3).

Noise Pollution Effects on Wildlife

It has been reported that noise pollution has serious adverse effects on wildlife too.

- There is decline in migratory birds to a habitat if it becomes noisy.
- Deers and lions affected from the traffic noise as observed in some Zoo. physiological and environmental consequences of noise could be serious to the survival of wild life.

Effects Of Noise On Non-Living Things

The high intensity of noise such as vibrations emanating from heavy machinery cause shattering of window glasses, loosing the plaster of house walls, cracks in walls, cracks in household crockery and breaking down the hanging in the house (4).

4.0 CONTROL TECHNOLOGIES AVAILABLE FOR NOISE POLLLUTION

There are various options available to control the noise pollution. The options of noise pollution can be selected as per the particular needs.

To Isolate Noise at Source

The first and simple way to control the noise pollution is insulation. By insulation noise can be reduced at source. Department for the maintenance should have a routine checkup

to observe the noise generated by every machine of the plant and restrict to its original noise level by replacing bearings, tighting of all loose parts that can vibrate.

Machines should be placed on vibration isolators or mounts. Since these mounts are relatively inexpensive square pads of felts, cork and rubber.

Isolation of Noise Sources

Controlling the noise along its transmission path can do the isolation of every source of noise. Wall partitions and doors possess good insulation properties only a small portion of sound energy from source goes to the individual. Most sound waves are reflected bouncing back and forth from wall and other obstacles in an enclosed space with each impact the noise gets weaker.

Acoustic material lined on walls and ceilings can reduce noise levels within a room for a small area. This is not usually the best method for large rooms because acoustic absorption is most effective when it is located near the source. IT is therefore most suitable to enclose the individual machines or so setup acoustic barriers close to them.

Personal Isolation Form Noise Source

It would mean wearing of noise protectors could protect to reduce noise levels. Personal hearing protectors (earplugs and earmuffs) should be properly selected and carefully fitted.

Volume Reduction

In case of noise produced by a machine volume reduction can be achieved by the reduction of its speed.

Suppression of Noise By State Plasma Shield

The important property of solid-state plasma is that it retains its own properties and yet retains it sown properties and yet attains the plasma state (at room temperature) due to the presence of free carriers inside the medium. The elastic properties of solid-state plasma medium determine the mode of propagation and speed of sound through it, the suppression of noise is possible by using solid state plasma medium

6.0 NOISE RELATED LAWS IN INDIA

Control of noise has been covered in three major legislations
1) Factories Act 1948
2) Motor Vehicles Act 1988

3) Environment Protection Act 1986 (Environment Protection Rules 1986 and Noise Pollution and Noise Pollution (Regulation and Control) Rules 2000)

The Factories Act, 1948:

Surprisingly, no central industrial law provides any protection to workers from noise pollution. Section 11 (I) of the Act stipulates that every factory shall be kept clean, without having any nuisance; the word 'nuisance' may include noise, but statutory provisions in industrial law to provide this protection specifically are overdue. It is also noteworthy that under section 35 of the Act, protection is given for the eyes of an employee but no such protection is provided to ears. Some of the states have provided limits for noise as suggested by model factories rules

The permissible levels for noise exposure for work zone area have been prescribed under the Model Rules of the Factories Act, 1948, as given in the tables below.

Peak sound pressure level in dB	Permitted number of impulses or impact/day
140	100
135	315
130	1000
125	3160
120	10000

Notes:

1. No exposure in excess of 140 dB peak sound pressure level is permitted.
2. For any peak sound pressure level falling in between any figure and the next higher or lower figure as indicated in column 1, the permitted number of impulses or impacts per day is to be determined by extrapolation on a proportionate basis.

Total time of exposure (continuous or a number of short term exposures) per day, in hrs	Sound pressure level in dB (A)
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	107
1/4	110
1/8	115

Notes:

1. No exposure in excess of 115 dB (A) is to be permitted. 2. For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column 1, the permissible sound presssurelevel is to be determined by extrapolation on a proportionate basis.

The Motor Vehicles Act, 1988

Vehicles are among the chief noise producers in modern times. The Motor Vehicles Act, 1988 through sections 20, 21 (j), 41, 68, 68 I, 70, 91 and 111 empowers a state government to frame rules for the upkeep of motor vehicles and control of noise produced by them.

1. Environment (Protection) Rules, 1986 defined ambient noise level to be maintained as given below:

Area Code	Category of Area	Limits in dB (A)	
		Day time	Night time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence Zone	50	40

❖ *Note:*

1. Day time is reckoned in between 6 a.m. and 9 p.m.
2. Night time is reckoned in between 9 p.m. and 6 a.m.
3. Silence zone is referred as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The Silence zones are to be declared by the Competent Authority. *Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.*

4. Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.

2. Noise limits for Generator Sets with diesel. (94 of the Environmental Protection Rules 1986)
    1. The maximum permissible sound pressure level for new diesel generator with rated capacity upto 1000 kVA Manufactured after july 2004 shall be 75 DB(A) at meter from enclosure surface.
    2. Other DG sets shall be provided with acoustic enclosure or the acoustic treatment of the room to have an insertion loss of minimum 25 DB(A) at 0.5 m from the acoustic enclosure.
    3. DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 DB(A).

3. Noise standards for automobiles, domestic appliances and construction equipments have been notified in Part 'E', Schedule-VI of Environment (Protection) Rules, 1986,

Category of Vehicle	Noise limit in dB(A)
(a) Motorcycle,scooters and three wheelers.	75-80
(b) Passenger Cars	75
(c) Passenger or commercial vehicles upto 4 MT	77
(d) Passenger or commercial vehicles above 4 MT and upto 12 MT	80
(e) Passenger or commercial vehicles exceeding 12 MT	82

4.

Category of Domestic Appliances/Construction Equipments	Noise limits in dB(A)
(a) Window air conditioners of 1 tonne to 1.5 tonne	68
(b) Air Coolers	60
(c) Refrigerators	46
(d) omitted	
(e) Compactors(rollers),Front loaders, Concrete mixers,Cranes(movable), Vibrators and Saws	75

Noise Pollution (Regulation and Control) Rules 2000 under Environmental Protection Act 1986

reasserted the ambient noise standards stipulated in the environmental protection rules 1986.

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