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A CASE STUDY ON NOISE POLLUTION FOR VEAVY TRAFFIC ZONE AT AKOLA CITY

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INTRODUCTION

Noise is an inevitable part of everyday life - the television, a plane flying overhead, a faulty muffler on the passing car, dogs barking, children laughing. Mild noise can be annoying; excessive noise can destroy a person's hearing. People do not easily become accustomed to noise. The slightest unwanted sound can become very annoying if it continues for any length of time. While some nearby residents may ignore the continuous hum of a busy freeway, others will never be able to ignore it and increasingly will find it irritating. Sound is a form of energy that is transmitted by pressure variations which the human ear can detect. When one plays a musical instrument, say a guitar, the vibrating chords set air particles into vibration and generate pressure waves in the air. People nearby may then hear the sound of the guitar when the pressure waves are perceived by the ear. Sound can also travel through other media, such as water or steel.

The Difference between Sound and Noise

Not all people are affected the same way by the same sounds. Often, we take for granted the sounds we hear every day. On different occasions and in varying situations, however, common everyday sounds can interfere with our routine task. When this happens, sounds become noise.

Traffic Noise

Noise is generally described as unwanted sound and wholly subject to personal tastes and tolerance levels. In addition, the sensitivity of the human ear to noise depends on a number of contextual factors which typically include wind factor, humidity, traffic density, etc. Nevertheless, it is generally accepted that a 55 dB(A) sound will be disturbing whereas a 65 dB(A) noise level will be deemed intolerable, causing severe sleep disturbance. Much of this is caused by traffic-related sound originating from all modes of transport. Operational noise from transportation system alone contributes about 70 % of total noise, whereas road traffic noise is responsible for 55 % of total noise. Ambient Air Quality Noise Standards (Aaqns)

Most of the countries, keeping in view the alarming increase in environmental noise pollution, have given the permissible noise standards. These are depending on the location and period of day. Industrial areas obviously have somewhat higher acceptable sound levels than those prescribed for residential areas. The collected night standards are stringent than the daytime standards.

Standards by Law in India

Noise has been recognized as ambient air pollutant. Standards in this regard are laid down under Environment (Protection) Rules, 1986 and under the Model Rules of the Factories Act, 1948.

The Central Pollution Control Board constituted a Committee on Noise Pollution Control. The Committee recommended noise standards for ambient air and for automobiles, domestic appliances and construction equipment, which were later notified in Environment (Protection) Rules, 1986 as given below in Table 1.2.

Table 1.2. Noise Standards for Different Category of Area

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

Ambient noise level standards as prescribed by World Health Organization (WHO)
 Recommended noise exposure limits are shown in Table 1.6.

Table 1.6. Recommended Noise Exposure Limits (WHO-1990)

1	Indoor/domestic night time	35 dB(A)	Increased awakening at higher levels
2	Indoor/domestic day time	45 dB(A)	Speech communication deteriorates at higher levels
3	Community /Urban night time	45 dB(A)	Difficulties in falling asleep at higher levels
4	Community /Urban day time	55 dB(A)	Annoyance increases at higher levels
5	Industrial occupational	75 dB(A)	Predictable risk of hearing impairment at higher level

Case Study for Heavy Traffic Zone

Heavy Traffic zone include the following location code and monitoring place.

Location Code	Place
13-H	Railway Station Square
14-H	Buss-Stand (Dhingra Square)
15-H	Shindi Camp
16-H	Akot –File

The observation reading are taken at a distance 1.2 meter from the edge of road and at right angle to the centerline of road.

- The average of these noise level reading as shown in Table 4.153 to Table 4.156.
- The Cumulative percentage of these noise level reading as shown in Table 4.173 to Table 4.176.
- The value of noise level Leq, L₁₀, L₅₀, L₉₀, TNI, LNP, NC, Lmax, and Lmin as shown in Table 4.181.

- The average value of noise level Leq , L_{10} , L_{50} , L_{90} , TNI , LNP , NC , L_{max} , and L_{min} as shown in Table 4.182.
- Histogram for Leq , TNI , LNP , NC , as shown in Fig. 5.33 to Fig. 5.36.
- Histogram for L_{max} , and L_{min} as shown in Fig. 5.41.

Table 4.153. Computation for Noise Level Recorded For Location 13-H (Heavy Traffic Zone)

Noise Range dB(A)	Level in dB(A)	Average Noise Level dB(A)	No. of Noise (7-Days)							Total
			1	2	3	4	5	6	7	
60-64	62	62	00	00	00	00	00	00	00	00
64-68	66	66	00	00	00	00	00	00	00	00
68-72	70	70	00	00	00	00	00	00	00	00
72-76	74	74	01	00	01	00	00	00	00	02
76-80	78	78	09	10	11	13	12	11	10	76
80-84	82	82	13	13	15	10	11	12	11	85
84-88	86	86	13	13	12	14	14	11	16	93
88-92	90	90	04	04	01	03	03	06	03	24
92-96	94	94	00	00	00	00	00	00	00	00
96-100	98	98	00	00	00	00	00	00	00	00
Total			40	40	40	40	40	40	40	280

Table 4.154. Computation for Noise Level Recorded For Location 14-H (Heavy Traffic Zone)

Noise Range dB(A)	Level in dB(A)	Average Noise Level dB(A)	No. of Noise (7-Days)							Total
			1	2	3	4	5	6	7	
60-64	62	62	00	00	00	00	00	00	00	00
64-68	66	66	00	00	00	00	00	00	00	00
68-72	70	70	00	00	00	00	00	00	00	00
72-76	74	74	01	01	02	00	00	00	00	04
76-80	78	78	09	12	11	08	08	11	06	65
80-84	82	82	16	16	11	14	14	10	20	101
84-88	86	86	12	09	12	13	15	15	12	88
88-92	90	90	02	02	04	05	03	04	02	22
92-96	94	94	00	00	00	00	00	00	00	00
96-100	98	98	00	00	00	00	00	00	00	00

Total	40	40	40	40	40	40	40	40	280
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Table 4.155. Computation for Noise Level Recorded For Location 15-H (Heavy Traffic Zone)

Noise Range dB(A)	Level in Noise dB(A)	Average Noise Level dB(A)	No. of Noise (7-Days)							Total
			1	2	3	4	5	6	7	
60-64		62	00	00	00	00	00	00	00	00
64-68		66	00	00	00	00	00	00	00	00
68-72		70	00	00	00	00	00	00	00	00
72-76		74	00	00	00	02	02	01	01	06
76-80		78	11	11	09	09	10	14	11	75
80-84		82	18	10	13	12	12	12	11	88
84-88		86	07	17	16	15	12	08	13	88
88-92		90	03	02	02	02	04	05	04	22
92-96		94	01	00	00	00	00	00	01	02
96-100		98	00	00	00	00	00	00	00	00
Total			40	40	40	40	40	40	40	280

Table 4.156. Computation for Noise Level Recorded For Location 16-H (Heavy Traffic Zone)

Noise Range dB(A)	Level in Noise dB(A)	Average Noise Level dB(A)	No. of Noise (7-Days)							Total
			1	2	3	4	5	6	7	
60-64		62	00	00	00	00	00	00	00	00
64-68		66	00	00	00	00	00	00	00	00
68-72		70	00	00	00	00	00	00	00	00
72-76		74	00	00	00	00	00	01	00	01
76-80		78	08	12	08	19	08	07	09	71
80-84		82	11	12	14	15	14	14	14	94
84-88		86	14	13	13	06	15	11	12	84
88-92		90	07	03	05	00	03	07	05	30
92-96		94	00	00	00	00	00	00	00	00
96-100		98	00	00	00	00	00	00	00	00
Total			40	40	40	40	40	40	40	280

Table 4.173. Computation for noise level recorded for heavy traffic zone 13-H

Noise Level Range in dB(A)	Average Noise Level dB(A)	No. of Noise	Percentage of Noise Level Exist	Time	Cumulative Percentage
48-52	50	00	00.00		100.00
52-56	54	00	00.00		100.00
56-60	58	00	00.00		100.00
60-64	62	00	00.00		100.00
64-68	66	00	00.00		100.00
68-72	70	00	00.00		100.00
72-76	74	02	00.72		99.28
76-80	78	76	27.14		72.14
80-84	82	85	30.36		41.78
84-88	86	93	33.21		08.57
88-92	90	24	08.57		00.00
92-96	94	00	00.00		00.00
96-100	98	00	00.00		00.00
100-104	102	00	00.00		00.00

Table 4.174. Computation for noise level recorded for heavy traffic zone 14-H

Noise Level Range in dB(A)	Average Noise Level dB(A)	No. of Noise	Percentage of Noise Level Exist	Time	Cumulative Percentage
48-52	50	00	00.00		100.00
52-56	54	00	00.00		100.00
56-60	58	00	00.00		100.00
60-64	62	00	00.00		100.00
64-68	66	00	00.00		100.00
68-72	70	00	00.00		100.00
72-76	74	04	01.43		98.57
76-80	78	65	23.21		75.36
80-84	82	101	36.07		39.29
84-88	86	88	31.43		07.86
88-92	90	22	07.86		00.00
92-96	94	00	00.00		00.00

96-100	98	00	00.00	00.00
100-104	102	00	00.00	00.00

Table 4.175. Computation for noise level recorded for heavy traffic zone 15-H

Noise Level Range in dB(A)	Average Noise Level dB(A)	No. of Noise	Percentage of Noise Level Exist	Cumulative %
48-52	50	00	00.00	100.00
52-56	54	00	00.00	100.00
56-60	58	00	00.00	100.00
60-64	62	00	00.00	100.00
64-68	66	00	00.00	100.00
68-72	70	00	00.00	100.00
72-76	74	06	02.14	97.86
76-80	78	75	26.78	71.08
80-84	82	88	31.43	39.65
84-88	86	88	31.43	08.22
88-92	90	22	07.86	00.36
92-96	94	01	00.36	00.00
96-100	98	00	00.00	00.00
100-104	102	00	00.00	00.00

Table 4.176. Computation for noise level recorded for heavy traffic zone 16-H

Noise Level Range in dB(A)	Average Noise Level dB(A)	No. of Noise	Percentage of Noise Level Exist	Cumulative Percentage
48-52	50	00	00.00	100.00
52-56	54	00	00.00	100.00
56-60	58	00	00.00	100.00
60-64	62	00	00.00	100.00
64-68	66	00	00.00	100.00
68-72	70	00	00.00	100.00
72-76	74	01	00.36	99.64
76-80	78	71	25.36	74.28
80-84	82	94	33.57	40.71
84-88	86	84	30.00	10.71

88-92	90	30	10.71	00.00
92-96	94	00	00.00	00.00
96-100	98	00	00.00	00.00
100-104	102	00	00.00	00.00

Noise Climate (NC)

It is the range over which the sound levels are fluctuating in an interval of time

Noise parameter like Leq, TNI, LNP and NC are calculated using the formulae as given below (R.G.White,1986)

- i) Equivalent Sound Energy Level (Leq) = $Leq = L_{50} + [(L_{10} - L_{90})^2 / 56]$ dB(A)
- ii) Noise pollution level (LNP) = $LNP = Leq + (L_{10} - L_{90})$ dB(A)
- iii) Traffic Noise Index (TNI) = $TNI = 4(L_{10} - L_{90}) + L_{90} - 30$ dB(A)
- iv) Noise Climate (NC) = $NC = L_{10} - L_{90}$ dB(A)

Table 4.181. Noise Parameter for

Types of Zone	Location Code	L ₁₀	L ₅₀	L ₉₀	TNI	LNP	Leq	NC	Lmax (Avg)	Lmin (Avg)
Heavy Traffic Zone	13-H	85.83	80.92	75.37	87.21	93.33	82.87	10.46	90.1	76.5
	14-H	85.73	80.81	75.48	86.48	92.94	82.69	10.25	89.9	77.0
	15-H	85.77	80.68	75.17	87.57	93.29	82.69	10.60	89.7	76.5
	16-H	86.27	80.89	75.52	88.52	93.70	82.95	10.75	89.9	76.4

Table 4.182. Average of Noise Levels

Types of Zone	L ₁₀	L ₅₀	L ₉₀	TNI	LNP	Leq	NC	Lmax	Lmin
Heavy Traffic Zone	85.90	80.83	75.39	87.45	93.32	82.80	10.52	89.9	76.6

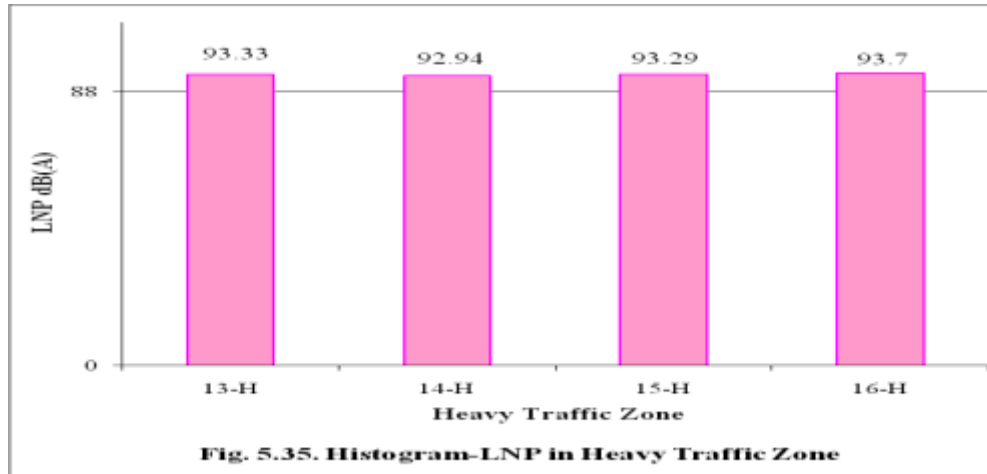


Fig. 5.35. Histogram-LNP in Heavy Traffic Zone

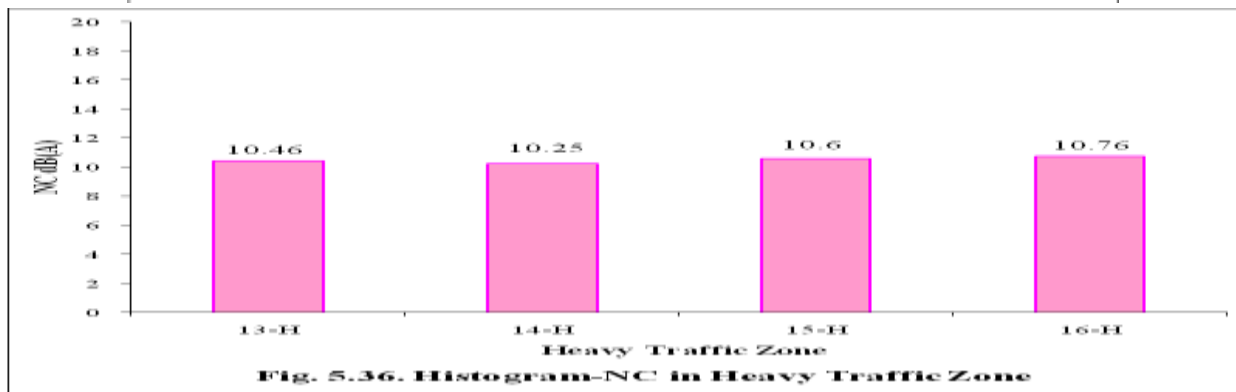


Fig. 5.36. Histogram-NC in Heavy Traffic Zone

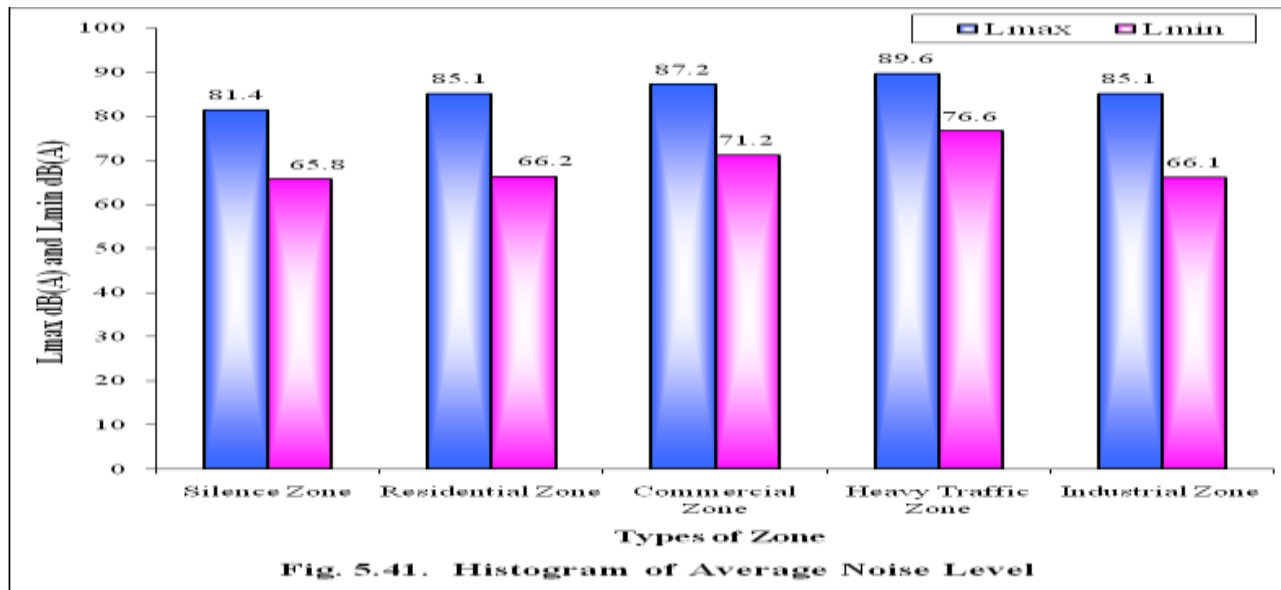


Fig. 5.41. Histogram of Average Noise Level

RESULT

Sound level meter placed at a distance (d=1.2 meter) from the pavement edge and a height of 1.2 meter from the ground level .Its microphone was right angle to the direction of traffic flow. In the present study, a noise sample size f 10 minute in each hour at a particular selected distance from the edge of the pavement was taken. Noise samples were collected in dB(A) scale at every interval (4 counts per minute) or total 40 reading in one sample size.

The average of noise level Leq, L₁₀, L₅₀, L₉₀, TNI, LNP, NC, Lmax, and Lmin for Silence zone. Residential zone, Commercial zone, Heavy Traffic zone and Industrial zone are as follows

Heavy Traffic Zone

It has been found that in the Heavy Traffic Zone, the average of noise level (Leq) was found to be 82.80 dB(A). The average of L₁₀, L₅₀, L₉₀, TNI, LNP, NC, Lmax, and Lmin values were found to be 85.90 dB(A), 80.83 dB(A), 75.39 dB(A), 87.45 dB(A), 93.32 dB(A), 10.52 dB(A), 89.9 dB(A), and 76.6 dB(A), respectively.

CONCLUSION

The various parameter of noise level were recorded in the selected areas and noise parameters in different areas are compared with acceptable limits using histogram as in Fig. and its comparison as shown in Table 4.183

Table 4.183. Comparisation between Observed Value and Acceptable value

Types of Zone	Location Code	Observed Value dB(A)			Acceptable Limits Value dB(A)		
		TNI	LNP	Leq	TNI	LNP	Leq
Heavy Traffic Zone	13-H	87.21	93.33	82.87	74	74	75
	14-H	86.48	92.94	82.69	74	74	75
	15-H	87.57	93.29	82.69	74	74	75
	16-H	88.52	93.70	82.95	74	74	75

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