


CENTRAL ENVIRONMENTAL AUTHORITY
Pollution Control Division

**PROPOSED AIR-BLAST OVER PRESSURE AND GROUND
VIBRATION STANDARDS FOR SRI LANKA**

1. Building Classification

Before introducing the vibration standards for the operation of machinery blasting activities, construction activities & vehicle movements, it is necessary to classify the building structure as the vibration affects in accordance with the nature of the nearby structure. Buildings that have been built-up in Sri Lanka could be categorized into the following categories in accordance with the ISO 4866:1990 (E) standards. Please note that the following categorization of buildings has been adopted in introducing the vibration standards for all cases. However, it is noteworthy to mention here that even though the classification of buildings given by the International Standards are almost the same, the same categories have been divided into sub-categories to suit the Sri Lankan situation.

**Table 1.1: Categorization of structures according to the type of building
(from ISO-4966: 1990E)**

Category of the structure of the building		Description
Resistance to the vibration decreasing 	Type 1	Multi storey buildings of reinforced concrete or structural steel, with in filling panels of block work, brick work or precast units not designed to resist earthquakes
	Type 2	Two-storey domestic houses & buildings constructed of reinforced block work, precast units, and with reinforced floor & roof construction, or wholly of reinforced concepts or similar, not designed to resist earthquakes.
	Type 3	Single and two-storey houses & buildings made of lighter construction, using lightweight materials such as bricks, cement blocks etc, not designed to resist earthquakes
	Type 4	Structures that, because of their sensitivity to vibration, do not correspond to those listed above 1,2 & 3, & declared as archeologically preserved structures by the Department of Archaeology

CENTRAL ENVIRONMENTAL AUTHORITY
Pollution Control Division

2. Interim Standards for Vibration Control

Table 2.1: Interim Standards for vibration of the Operation of Machinery, Construction Activities and Vehicle Movements Traffic

Category of the structure as given in Table 1.1	Type of Vibration	Frequency of Vibration (Hz)	Vibration in PPV (mm/Sec.)
Type 1	Continuous	0 –10	5.0
		10-50	7.5
		Over 50	15.0
	Intermittent	0 –10	10.0
		10 –50	15.0
		Over 50	30.0
Type 2	Continuous	0 -10	2.0
		10-50	4.0
		Over 50	8.0
	Intermittent	0 –10	4.0
		10 –50	8.0
		Over 50	16.0
Type 3	Continuous	0 -10	1.0
		10 - 50	2.0
		Over 50	4.0
	Intermittent	0 - 10	2.0
		10 – 50	4.0
		Over 50	8.0
Type 4	Continuous	0 - 10	0.25
		10 – 50	0.5
		Over 50	1.0
	Intermittent	0 – 10	0.5
		10 - 50	1.0
		Over 50	2.0

Notes

1. Please see separate measurement methods
2. The values given above are in such a way that minor damage is unlikely as the nearby house/building

CENTRAL ENVIRONMENTAL AUTHORITY
Pollution Control Division

Table 2.2: Interim Standards on Air Blast Over Pressure and Ground Vibration for Blasting Activities

Category of the structure as given in Table 1.1	Type of Vibration	Type of Blasting	Ground Vibration in PPV (mm/sec.)	Air blast over Pressure (dB (L))
Type 1	Impulsive	Single bore hole	8.0	105
		Multi bore hole with delay detonators	10.0	115
Type 2	Impulsive	Single bore hole	6.0	105
		Multi bore hole with delay detonators	7.0	11.5
Type 3	Impulsive	Single bore hole	4.0	115
		Multi bore hole with delay detonators	5.0	120
Type 4	Impulsive	Single bore hole	0.5	95
		Multi bore hole with delay detonators	0.75	100

Note

- 1 Please see separate measuring methods
- 2 The values given above in such a way that minor damage to unlikely to occur at the nearby house/building

CENTRAL ENVIRONMENTAL AUTHORITY
Pollution Control Division

3. Standards for the inconvenience of the occupants in buildings

The frequency response of vibration of the human body is complex as explained in chapter 6. However, approximate response curves (basic curve) for Z axis are given in BS 6472: 1992. These are given in terms of base curves, which may be close to the threshold of perception for majority of people.

Table3.1: Base curve in relation to preparing of interim vibration for the in convenience of the occupants in building taken from BS 6472: 1992

Frequency Hz	PPV (mm/sec)
1	2.25
1.25	1.61
1.6	1.11
2.0	0.296
2.5	0.569
3.15	0.402
4.00	0.281
5.00	0.225
6.30	0.179
8.00	
10.00	
12.50	
16.00	
20.00	
25.00	
31.00	
40.00	
50.00	
63.00	

CENTRAL ENVIRONMENTAL AUTHORITY
Pollution Control Division

Table 3.2 Multiplying factors use to specify magnitudes of building vibration with respect to human resource using the base curve in Table 3.1

Place	Time	Multiplying factors		
		Continuous vibration (day time and night time)*	Impulsive vibration (max. of three occurrence per day)	Intermittent vibration
Critical working areas (e.g. hospital operating theatres, precision laboratories)	Day	1	1	1
	Night	1	1	1
Residential	Day	6	40	20
	Night	2	10	5
Office	Day	6	80	30
	Night	6	80	30
Workshop	Day	8	100	50
	Night	8	100	50

Note: * "day time" from 0600h to 1800h
"night time" from 1800h to 0600h

Table 3.3: Interim standards on vibration for the inconvenience of the occupants in buildings

Place	Time	Multiplying factors		
		Continuous vibration (day time and night time)*	Impulsive vibration (max. of three occurrences per day)	Intermitted vibration
Critical working areas	Day & Night	0.141	0.141	0.141
Residential	Day	0.705	5.640	2.820
	Night	0.282	1.410	0.705
Office	Day & Night	0.846	11.280	4.230
Workshop	Day & Night	1.41	1.41	7.05

Note * "day time" from 0600 to 1800h
"night time" from 1800h to 0600h

All values are frequency weighted to vertical axis