CONTENTS

1. DEFINITION OF NOISE

Noise may be defined as unwanted sound. Motor vehicles generate traffic noise from the motor, aerodynamics, exhaust and interaction of the tires with the roadway. Efforts should be made to minimize the radiation of noise into noise-sensitive areas along the highway. The designer should evaluate existing or potential noise levels and estimate the effectiveness of reducing highway noise through design considerations.

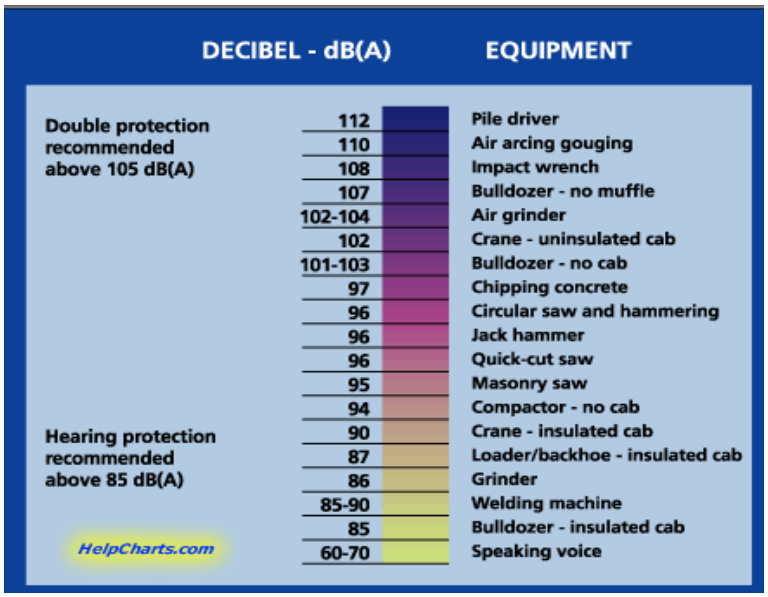
The physical measurement of human reaction to sound is difficult because there is no instrument that will measure this directly. A close correlation can be obtained by using the A-scale on a standard sound level meter. The meter yields a direct reading in effective decibels (dBA).

Table 1.1 shows the standard noise level (WHO)

Selected noise level standards	Noise level, L_{eq} dBA	
	Daytime	Night time
WHO recommended health criteria	55	45
Germany (noise level guidelines)	45	35
Australia (recommended outdoor background noise level)	45	35
Japan (environmental quality standards)	45	35
Korea (environmental quality goal)	50	45
Philippines (environmental quality noise standards)	50	40
Malaysia (planning guidelines for environmental noise limits and control)	65	60
WHO = World Health Organization		

Source : World Health Organization

Figure 1.1 Typical noise levels found in construction site



Source : American National Standards Institute (ANSI)

2. WHAT IS NOISE BARRIER

A noise barrier (also called a soundwall, noise wall, sound berm, sound barrier or acoustioc barrier) is an exterior structure designed to protect inhabitants in sensitive land use areas from noise pollution. Noise barriers are the most effective method of mitigating roadway, railway and industrial noise sources other than cessation of the source activity or use source controls

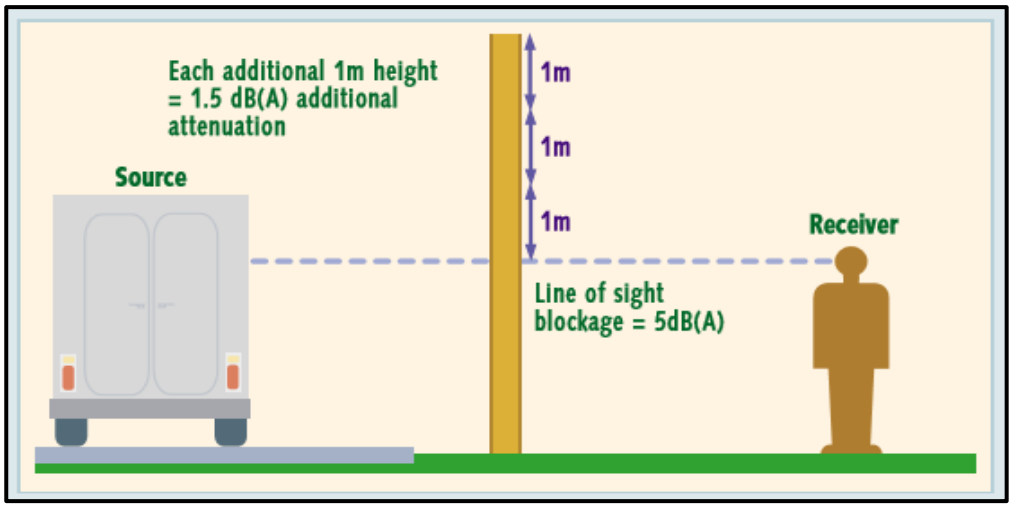
Noise barriers do not completely block all noise — they only reduce overall noise levels. Effective noise barriers typically reduce noise levels by 5 to 10 decibels (dB), cutting the loudness of traffic noise by as much as one half. For example, a barrier which achieves a 10-dB reduction can reduce the sound level of a typical tractor trailer pass-by to that of an automobile.

Noise barriers may reduce the near-road air pollution concentration levels. Within 15m - 50 m from the roadside, air pollution concentration levels at the lee side of the noise barriers may be reduced by up to 50% compared to open road values.

3. HOW DOES A NOISE BARRIER WORK

Noise barriers reduce the sound which enters a community from a busy highway by absorbing the sound, transmitting it, reflecting it back across the highway, or forcing it to take a longer path over and around the barrier. A noise barrier must be tall enough and long enough to block the view of a highway from the area that is to be protected, the "receiver." A noise barrier can achieve a 5 dB noise level reduction, when it is tall enough to break the line-of-sight from the highway to the home or receiver. After it breaks the line of-sight, it can achieve approximately 1.5 dB of additional noise level reduction for each meter of barrier height.

Figure 1.2: Noise Barrier Height



Source : Federal Highway Administration (FHWA)

4. BENEFIT OF NOISE BARRIER

Noise barriers provide benefit for lessened sleep disturbance, improved ability to enjoy outdoor life, reduced speech interference, stress reduction, reduced risk of hearing impairment and a reduction in the elevated blood pressure created by noise.

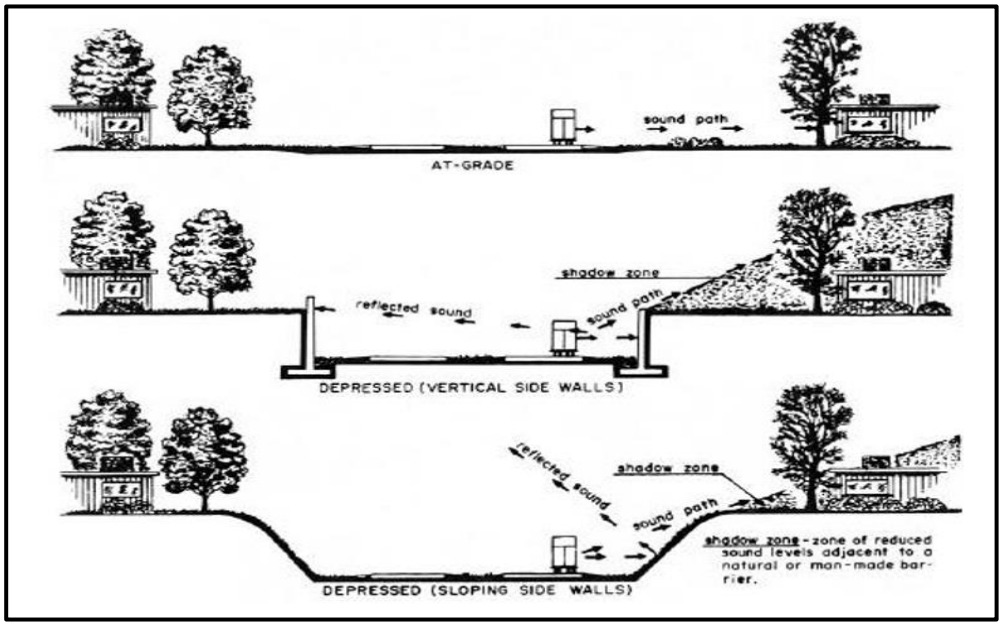
5. NOISE REDUCTION DESIGNS

Potential noise problems should be identified early in the design process. Line, grade, earthwork balance, and right-of-way should all be worked out with noise in mind. Noise attenuation may be inexpensive and practical if built in the design and expensive if not considered until the end of the design process. An effective method of reducing traffic noise from adjacent areas is to design the highway so

that some form of solid material blocks the line of sight between the noise source and the receptors. Advantage should be taken of the terrain in forming a natural barrier so that the appearance remains aesthetically pleasing.

In terms of noise considerations, a depressed highway section is the most desirable. Depressing the roadway below ground level has the same general effect as erecting barriers Where a highway is constructed on an embankment, the embankment beyond the shoulders will sometimes block the line of sight to receptors near the highway, thus reducing the potential noise impacts. Special sound barriers may be justified at certain locations, particularly along ground-level or elevated highways through noise-sensitive areas. Concrete, wood, metal, or masonry walls are very effective. One of the more aesthetically pleasing barriers is the earth berm that has been graded to achieve a natural form blending with the surrounding topography. The practicality of berm construction should be considered as part of the overall grading plan for the highway. There will be instances where an effective earth berm can be constructed within normal right-of-way or with a minimal additional right-of-way purchase. If right-of-way is insufficient to accommodate a full-height earth berm, a lower earth berm can be constructed in combination with a wall or screen to achieve the desired height.

Figure 1.3: Effects of Depressing the Highway



Source : American Association of State Highway and Transportation Officials (Asshto)

6. TYPES OF MATERIAL SUITABLE OF A NOISE BARRIER

Noise barriers can be categorized into three (3) types. There are Noise Absorptive Type, Noise Reflective Type and Noise Diffraction Type ;

a) Sound Absorptive Type - Sound Absorbent Steel Panel filled with sound absorbing materials such as cotton fiberglass, 'rock wool' and sponge. This type of sound absorber is more efficient and provides guaranteed results. Sound absorption noise absorbs the sound waves through the walls, but once the sound waves are through the sound absorbing material, the sound wave direction will diverge through the longer medium. Each direction change will reduce the energy of the sound wave. After the sound wave through the sound barrier is complete, only a small amount of sound wave energy will go out to the environment.

b) Noise Reflective Type - Fixed concrete panel, Transparent Polycarbonate Panel, 'acrylic' / transparent glass panel and Concrete stone block.

c) Noise Diffraction Type - The sound barrier of this type works to propagate or distort the sound waves around it. The spread of sound waves can occur at the top or at the bottom of the barrier wall. This spread occurs as the phenomenon of other waves when blocked as light waves and water waves

Noise barriers can be constructed from earth or different types of materials widely used such as concrete, masonry, wood, metal, and other materials. To effectively reduce sound transmission through the barrier, the material chosen must be rigid and sufficiently dense (at least 20 kilograms/square meter). All noise barrier material types are equally effective, acoustically, if they have this density.

One of the more aesthetically pleasing barriers is the earth berm that has been graded to achieve a natural form blending with the surrounding topography. Practically of berm construction should be considered as part of the overall grading plan for the highway. There will be instances where an effective earth berm can be constructed within normal right-of-way or a minimal additional right-of-way purchase. If right-of-way is insufficient to accommodate a full height earth berm, a lower earth berm can be constructed in combination with a wall or screen to achieved desired height.

Figure 1.4: Masonry Noise Barrier at Federal Highway

Figure 1.5: Masonry Noise Barrier

Figure 1.6: Metal Noise Barrier at Duta-Ulu Kelang Expressway Phase 2 (DUKE)

Figure 1.7: Metal Noise Barrier

Figure 1.8: Wood Noise Barrier

7. REFERENCES

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