Code of Practice

Control of Noise
in the
Music Entertainment Industry
in Trinidad and Tobago

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For the

Environmental Management Authority (EMA)

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AUTHORITY

This code of practice is the result of an Entertainment Industry Forum conducted in 2003 among the various stakeholders. It involved interviews of individuals and consultations held with the general public. The guidelines set out herein are to be followed in accordance with the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000.

SCOPE

This code applies to venues, both indoor and outdoor, where employees, self-employed persons or patrons are present. It relates to live (whether amplified or not) or recorded music being played for entertainment purposes at levels which are likely to exceed the established exposure standard for noise as detailed in the Noise Pollution Control Rules, 2001.

WHO SHOULD USE THIS CODE OF PRACTICE

This code should be used by:

- Venue Owners
- Venue Designers and Builders
- Venue Operators and Managers
- Promoters
- Suppliers of Sound Equipment
- Deejays
- Performers and Entertainers
- Steelband Managers
- Pan Players
- Employers of Technical and Service Staff
- Technical and Service Staff
- The General Public

INTRODUCTION

In Trinidad and Tobago, the music entertainment industry revolves around its main music festival, Carnival. Although the actual parade takes place on the Monday and Tuesday preceding the religious commencement of Lent on Ash Wednesday, the celebrations in the form of Calypso Tents, Indoor and Outdoor Parties (Fetes), Steelband Practice Sessions and Competitions begin from some two to three months before. In fact, band launchings by the "Mas" organisers can be experienced as early as September of the previous year.

Besides Carnival, several other events at Christmas time, Independence and Republic Holidays take place throughout the year. Communities now plan for Borough Day celebrations in Point Fortin, Siparia, Arima, St. James, and Laventille. That list keeps growing from year to year. Pan Trinbago, the body in charge of Pan, hosts an increasing number of events involving the instrument outside of Carnival. Tobago is unique in that folk festivals are year round as the tourist oriented island seeks to keep its visitors entertained. The preference is for open-air entertainment facilities as opposed to closed indoor ones in keeping with the style of the Caribbean.

The importance of music and entertainment in terms of the country's economy and as a form of relaxation and therapy is recognised. It provides income for several entertainment personnel including the venue owners, promoters, sound equipment personnel, and the performers. The entertainment provides an emotional release for patrons, which does a lot for their well-being.

The music entertainment industry in Trinidad and Tobago is exceptional, and as a result high sound levels have become the norm. In most cases, the success of an event is measured by the noise level of the music supplied. Coupled with this, there has been an increasing tendency to include a variety of special effects involving fireworks and other devices that are loud enough to cause serious harm to the hearing of those in the surrounding environment. Noise-induced hearing loss is of great concern and is the basis of this code of practice.

Noise is described as any loud, discordant or disagreeable sound. Recognise that noise is more that just a pain in the ear. It can be harmful to ones health. Continued exposure to noise damages ones hearing. The louder the noise, the less time it takes to cause hearing loss. Cells of the inner ear are destroyed, and hearing deteriorates each time one is exposed to prolonged intense sound. The cells do not regenerate: noise-induced hearing loss is permanent and incurable. Tinnitus, (ringing in the ears), is often suffered by those who have worked in noisy environs over many years. Hearing damage diminishes quality of life whatever the cause. It is however preventable.

The responsibility expressed in the Noise Pollution Control Rules, 2001 lies with employers, venue owners, performers and sound equipment personnel that produce or control those who produce the noise. They must therefore ensure that they themselves, their employees and the general public are not exposed to the hazards of prolonged excessive noise above the prescribed noise level in decibels (dBA) for appropriate locations.

When we talk of decibels (dBA), most people do not have a feel for the numbers. Following is a rough guide:

A quiet home	20
Normal talking	40
Ringing telephone	60
Air Conditioner	75
Shouting, train, honking horn, jack hammers	100
Loud music and a jet taking off	120

Note that sustained exposure to noise over 85 dBA decibels can cause permanent hearing loss.

The ear can respond to a wide range of sounds but exposure to sustained high-level sound over many years can cause permanent damage to the ear. Also short sharp loud impulse sounds can cause instant permanent damage. The effect is a muffled version of sound resulting in loss of enjoyment of speech and music. Hearing aids are of limited benefit to those affected.

The stakeholders in the entertainment industry need to develop strategies to reduce noise levels that exceed the recommended standard. Taking into consideration the special nature of the music entertainment industry in Trinidad and Tobago, this code of practice has been prepared to assist in the control of noise emanating from the persons involved. This code must be read in conjunction with the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000.

While this code mainly emphasises the duty of the persons responsible for the sounds reaching the public, the strategies presented here will also benefit the promoters, performers and the audience as well. Specific limits for music sound levels are provided in the Noise Pollution Control Rules, 2001. This code places an emphasis on providing sufficient information on music levels and venue acoustics so that all concerned with the performance can strive to achieve noise exposures that are as low as practicable for the type of entertainment required. Table 1 below shows the people who are affected by noise generated from some typical activities at a variety of venues in Trinidad and Tobago.

Table 1
Music Venues, Activities and People Affected

Venues	Activities generating noise	People Affected
Outdoor Concert Venues	Bands playing loud music Disc Jockeys playing loud music Bands, Disc Jockeys and Performers playing loudly during rehearsals	Neighbours, Performers

	Loud special effects e.g. fireworks	
Restaurants ,Nightclubs ,Hotels & Bars	Receptions Floor Shows Concerts Live and recorded music for dancing	Neighbours, Audience, Staff & Performers
Pan Yards	Steelbands rehearsing	Neighbours & Pan Players
Performing Arts Venues	Rehearsals and Performances	Neighbours, Performers Audience & Staff
Education Establishments	School Concerts School Parties School brass or steel bands rehearsing	Neighbours, Performers, School Children

EXPLANATION OF TERMS

In addition to the definitions outlined in the Noise Pollution Control Rules, 2001 the following words and phrases that are used in this code shall have the meanings as listed hereunder.

"A-weighted Decibel" means the sound level, in decibels, measured with a sound level meter using the A-weighting network or scale as specified in the ANSI SI.4 - 1983 (specification for sound level meters). The level so read shall be postscripted dbA.

"Decibel" means a unit that describes the sound pressure level or intensity of sound. The sound pressure level in decibels is twenty (20) times the logarithm to the base 10 (10) of the ratio of the pressure of the sound in microbars to a reference of 0.0002 microbar; abbreviated dB.

"Competent Person" means a person, engaged to carry out a noise assessment, who is competent and has adequate experience and knowledge of:

- the objective of assessments
- the correct way of using testing instruments and their limitations
- the normal operating conditions of the area to be tested
- the relevant Trinidad and Tobago standards and statutory requirements.

"Noise" means any steady-state or impulsive sound occurring on either a continuous or intermittent basis that annoys or disturbs humans or that causes or tends to cause an adverse psychological or physiological effect on humans.

"Noise Disturbance" means any sound that results in any of the following:

1. Endangers or injures the safety or health of humans.
2. Annoys or disturbs a reasonable person of normal sensitivities.
3. Endangers or injures personal or real property.
4. Exceeds the applicable maximum permissible sound levels as outlined in the Noise Pollution Control Rules, 2001.

"music level" means the average noise level of a representative portion of a typical performance, measured at a nominated 'reference position' at a venue.

"received noise" means the average noise level measured at a person's ear during a representative portion of a performance.

"reference position" means a nominated measurement position within the venue sufficiently close to the stage area that the sound level is dominated by the music.

“8 hour exposure” means ‘received noise’ when averaged over an 8 hour period. This can be estimated by adjusting the ‘received noise’ according to the duration of the performance using Table 2 below.

Table 2

Estimation of ‘8 hour exposure’

Duration of Performance	**Decibels to be Subtracted from “Received Noise**
8 hours	0
6 hours	1
5 hours	2
4 hours	3
3 hours	4
2 ½ hours	5
2 hours	6
1 ½ hours	7
1 hour	9

Note: The assessment of ‘received noise’, ‘8 hour exposure’ and peak noise level should not take into account any protection that may be provided by personal hearing protectors.

THEORY OF SOUND

Pressure variations (sound energy) travel through air or other elastic media (such as water) in the form of **sound waves** from the sound source to the receptor (microphone, listener's ears). When a solid object hits the air and does so repeatedly - as a vibrating object does - the air alternately compresses and expands around it and waves of lower and higher pressure are sent out in all directions from the object. What we sometimes feel in our ears, and express as sound, is the change from the lower to higher pressure.

The **speed** at which sound travels varies with the medium. In air, a familiar rule applies. Count three (3) seconds per kilometre (five (5) seconds per mile) every time you see lightning to the time you hear thunder? The time lapse corresponds to the speed of sound in air of 1,238 kilometres (770 miles) per hour.

The number of pressure changes per second is called the **frequency** of the sound. Units of frequency used to be given in cycles per second, but now they are called **Hertz (Hz)**, to honour H.R. Hertz, the physicist who discovered electromagnetic waves. One cycle of pressure change is called the **period.** The period is also called the reciprocal of the frequency and is given as follows:

Period (T) = 1/Frequency

Knowing the speed and frequency of a sound allows the calculation of its **wavelength**. A wavelength is the distance a sound wave travels in the time it takes to complete one cycle or period.

When designing an acoustical solution to noise, it is important to know the wavelength of the different frequencies. **In general, the object in the sound path must be larger than one wavelength to significantly disturb the sound.** At 20 Hz, a wavelength is about 17 metres (56 feet), so an object must be larger than 17 metres wide and high to block the sound waves. At 20,000 Hz, the wavelength shortens to 1.7 centimetres (.7 inches). Low frequency noises have long wavelengths and high frequency noises have short ones. The longer wavelength of a low frequency sound allows it to slip easily around or over barriers.

The frequency of a sound produces its distinctive **tone.** The rumble of the lowest notes of the largest pipe organ has a low frequency, while a flute produces a high frequency tone. Some music instruments generate both low and high frequency sounds. Some sources don't cause various frequencies of sound. Instead, they generate a single frequency or **pure tone**.

The size or **amplitude** of pressure changes is measured in **decibels** or **dB**. The weakest sound the human ear can hear has an amplitude of around 20 millionths of a Pascal (20mPa) – the scale used to measure barometric pressure. A pressure change of 20mPa is equivalent to 5 billion times less than normal atmospheric pressure. Because the range of sound pressures in a typical room is so huge, using the Pascal scale to measure noise would be close to impossible. The decibel scale was devised to make calculations of noise levels manageable. The decibel (dB) is a unit of logarithmic measure, which uses 2×10^{-5} Pa as the starting point of zero (0) dB. Zero dB or 2×10^{-5} Pa is the lowest pressure a young adult can detect of a pure tone at 1000 Hz. Most continuous noise sources emit sound pressure levels between 0 to 150 dB. A level of 150 dB is equivalent to a jet aircraft at take off. Noise levels over 150 dB can occur.

To quantify the sensitivity of humans to sound the A-weighted decibel or dBA scale (also written dB(A)) was created. A correction factor was devised to change unweighted decibels (dB), also known as the **linear scale**, to A-weighted decibels (dBA). For purposes of noise control, both the dB and dBA scale can be used interchangeably. Sometimes it is necessary to convert from the dB to dBA scale and vice versa. For example, a manufacturer might provide the noise level of a machine in dB, whereas the community noise requirement is stated for dBA. In this case, initial calculations of the noise level might be made in dB, then converted to dBA.

Sound is defined as any pressure variation heard by the human ear. This translates into a range of frequencies from 20 Hz to 20,000 Hz for a healthy human ear. In terms of sound pressure, the human ear's range starts at the **threshold of hearing** (0 dB) and ends at the **threshold of pain** (around 140 dB). The human ear is less sensitive to sound pressure variations in the low frequencies compared to the higher frequencies. A 50 Hz tone must be 15 dB higher than a 1000 Hz tone at a level of 70 dB to be perceived as the same loudness by the listener. As a rule of thumb, a **doubling in the loudness** of the sound occurs with every **increase of 10 dB** in sound pressure. Similarly, for each 10 dB decrease in sound pressure, the loudness is cut in half. The 10 dB loudness rule is not the same as a common guideline used when decibels are added (or subtracted) together. In the latter guideline, a doubling in sound pressure results in a **3 dB increase in the noise level** (not a 10 dB increase as with loudness).

The human ear's ability to hear logarithmic changes in sound pressure explains why loudness increases 10 dB but the noise level from identical sources increases by only 3dB. In practice, loudness plays a small role in noise control because it is subjective and varies from person to person. What is interpreted as loud noise by one individual may not be loud or noise to another. Of note is that human beings do not hear sounds in the very low frequencies. However, you may recall "feeling" rather than "hearing" sound. Vibrations from very low frequency sounds can rattle dishes and shake home foundations even though they can't be heard.

NOISE CONTROL BARRIERS

All noise propagation can be broken into three parts:

1. The source
2. The path
3. The receiver

The **source** radiates sound based on its sound power (PWL). The **path** is how the sound travels through the air. The **receiver** is what the sound impinges upon (person, microphone, etc.).

In the music industry, the most common **noise sources** are described as a **point source**, like the sound from the speakers of a sound system. In the **free field**, sound propagates outward from point sources in uniform, concentric circles. Free field conditions exist when no obstacles block the sound path. Noise from a source can either be **air borne** or **structure borne**. Noise that travels through the air and through building walls and openings is called air borne noise. Structure borne noise is a term used to describe mechanical vibrations carried from machinery through to a building's structure.

When a sound wave encounters an obstacle, five phenomena can occur: absorption, reflection, transmission, diffraction and refraction.

Some of these conditions can occur at the same time. Part of a sound wave's energy is **absorbed** and part is **reflected** when it strikes a surface. This fact is important when considering how to attenuate noise. For example, the more porous a surface, the more sound is absorbed rather than reflected.

When an object is a certain thickness□□like a wall□□part of the sound wave's energy is **transmitted** through it. In general, more sound energy will pass through a thin wall than a thick one. If sound-absorbing material is also added inside of the wall, then the amount of noise that gets through to the other side will be less than if the wall were left "untreated". The amount of noise lost when sound waves pass through a wall or barrier is called **Transmission Loss (TL)**. This is the difference between the noise level measured on the source side of a noise barrier, and the level measured on the receiver side.

Diffraction is a change in the direction of travel of sound when the sound encounters an obstacle. **Objects** capable of diffracting (bending) sound **must be large compared to the wavelength of the sound**. For low frequency noise, with its long wavelength, a barrier must be **acoustically large** (larger than the wavelength of the sound) to change the sound path.

Refraction changes the direction of travel of the sound by differences in the speed of propagation. Wind and temperature changes are most common causes of refraction. Sound travels faster in warmer air than in cooler air causing the tops of the wavefronts to go faster than the bottom parts. Under normal conditions, air temperatures decrease as altitude increases. This causes sound waves to refract upwards which decreases audibility along the ground. Sometimes, the temperature is higher above the ground than near the ground, a condition called a temperature inversion□□ causing sound waves to bend back toward the ground and increase audibility. Temperature inversions are especially common at dawn, dusk, and in cold conditions. Also, because winds aloft are usually faster than at ground level, the upper part of a sound wave travels faster than the lower part **when travelling with the wind.** The sound wave travels **slower when travelling against the wind. Refraction** of the noise toward the ground occurs in the first instance and refraction away from the ground in the latter case.

Acoustical materials are divided into the following basic types:

1. Sound absorbing materials
2. Transmission loss or barrier materials
3. Resonator-type materials

4. Damping materials
5. Vibration isolators

Sound absorbing materials are porous materials such as rock wool, mineral wool, glass fiber, and foam. The effectiveness of acoustical material to absorb sound depends on its thickness, amount of airspace, and density. For every inch of thickness of a porous material (e.g., rock wool) sound loss is about 1 dB at 100 Hz to 4 dB at 3000 Hz.

The amount of sound absorbed at the surface of a material is described by an **absorption coefficient (a)**. The absorption coefficient relates to sound reflection, where a high **a** equals low reflected energy and a low **a** equals high reflected energy. Marble slate has an absorption coefficient of 0.01 (almost no absorption and high reflection). Some specially constructed sound rooms score as high as 1.0 (total absorption and no reflected energy).

The absorption coefficient of a material typically increases with frequency. At low frequencies, porous materials absorb less sound, so that materials must be thicker to be effective. The overall performance of a sound-absorbing material is often described by the **Noise Reduction Coefficient (NRC)**. The NRC is the arithmetic average of the absorption coefficient at 250, 500, 1000, and 2000 Hz.

Sound absorption differs from sound insulation. Sound absorption relates to sound reflection, whereas sound insulation relates to the amount of acoustic energy able to pass through material. The sound absorption provided by a 10 centimeter-thick (4-inch thick) fiberglass acoustical blanket is high, but its insulation quality is low. Sound is able to travel through the material to the other side. By contrast, a lead wall absorbs almost no sound but it is a very good insulator.

Lead is an example of a **transmission loss or barrier material**. Barrier materials are dense and rigid and are defined in terms of their **Transmission Loss (TL).** Transmission Loss is defined as the logarithmic ratio of the sound power on one side of a barrier (wall or partition) to the sound power transmitted to the other side. The higher the TL, the better a barrier material is at limiting or **attenuating** the amount of sound travelling through it. For example, a wall or barrier having a **TL** of 45 dB reduces a 120dB interior noise level to 75 dB. A wall with a TL of 60 dB reduces the same amount of noise to 60 dB.

As a general rule, the heavier and thicker the wall the greater the **attenuation of the sound or higher the TL**. This is because it is difficult for sound waves in air to move or *excite* a dense, heavy wall. Sound transmission through walls, floors or ceilings varies with sound frequency, and the weight and stiffness of the construction. This gives rise to the effect known as the **mass law** in acoustics which states that for each doubling of the surface weight of the wall, there will be about 5 or 6 dB less transmitted sound. The mass law also states that for each doubling of the frequency (Hz) there will be about 5 or 6 dB less transmitted sound. Doubling of the frequency has about the same effect as doubling the surface weight.

Perforated metal wall liners or tiles are examples of resonator materials. The holes in the liner or tile act as **resonate types of sound absorbers.** When a metal perforated liner is applied, sound impinging on the holes is absorbed into the cavities, but a portion is reradiated back toward the sound source in the form of a hemisphere. Because the sound energy is bounced back toward the source in semi-circular waves, sound is actually diffused and noise levels are reduced. The holes of liners can be sized and aligned in such a way that sound is absorbed and diffused at
specific **frequencies.**

Once the noise sources are identified and measured, the next step is to **attenuate** the noise. Attenuation is defined as the difference in dB or dBA between two points in and along the path of sound propagation. The aim of attenuation is to reduce or divert the amount of sound energy reaching the receiver. The key to attenuation is to apply noise control materials and measures that are both effective and economical. Noise controls range from the simple to complex.

One of the simplest attenuation methods is to place enough distance between the noise source and the NSR so that noise is not a concern. Establishing a **buffer zone** is possible when land is readily available.

However, it usually takes a large amount of land to stop noise from affecting the surrounding environment. Recalling the 6 dB rule, it could take as much as 1,800 meters (approximately 5,900 feet) to reach 75 dB at the NSR when the source noise is a high as 140 dB.

Shrubs and trees are often used as natural noise blockers. For trees to be effective barriers, they must be in a continuous stand, 50 feet tall, 100 feet deep, have dense foliage down to the ground, and be evergreen.

Barriers are free-standing walls or structures intended to block source noise. The barrier functions by absorbing a large amount of the sound energy and/or deflecting it away from the source. Barriers reduce sound levels, but work best at reducing high frequency noise. Barriers are most effective when they are at least three times larger than the wavelength of the major noise contributor. For best results, barriers should have a high transmission loss **and** be highly absorptive. Barriers made from a combination of sound-absorbing and transmission loss materials give highest acoustic performance. Concrete walls are often used as barriers. As a dense material, concrete is a better sound insulator than sound absorber, so barriers made from concrete reflect sound rather than absorb it.

When a barrier is wrapped around a noise source, it acts as a **partial enclosure**. Partial enclosures come in a variety of configurations: two-sided, three-sided with a roof, four-sided without a roof, and so on. Barriers and partial enclosures can be effective and economical noise reducers, lowering noise levels by up to 12 or 15 dB.

CAUSES AND EFFECTS OF HEARING LOSS

Stress from noise is a hazard to your health. Noise is any sound that bothers us. Stress is the body's response to outside disturbances. A barking dog or a dripping faucet may be enough to trigger your body's response. Heart rate increases, blood pressure rises, and blood cholesterol rises. Sustained stress reactions to noise can lead to high blood pressure, hardening of the arteries, and other adverse health conditions. If you have to raise your voice while speaking to someone three feet away from you, then your immediate environment could be hazardous to your health.

The leading causes of hearing loss in adults are:

- Excessive noise exposure
- Aging process
- Tumors and other space occupying lesions
- Vascular and circulatory disorders
- Heredity

The leading causes for children are:

- Middle ear problems (up to age six)
- Family history of hearing loss
- Congenital infections
- Bacterial Meningitis
- Childhood infectious diseases (mumps, measles)

Hearing Loss can have a great effect on the understanding of language and speech.

A person with normal hearing can discern sounds under 15 dB.

With mild loss, a person will be able to hear sounds down to 16 to 30 dB. That person may have trouble hearing faint or distant speech.

With moderate loss, the person would now be only able to pick up sounds in the range of 31 to 50 dB. Speech must be loud for to be understood. Persons will have increasing difficulty in group discussions and their speech becomes defective. Their language usage and comprehension will become deficient. Their vocabulary becomes limited.

With severe loss, (51 – 80 dB), the person involved may be able to hear loud voices about one foot from the ear and may be able to identify environmental sounds. The person may be able to discriminate vowels but not all consonants. Speech and language will be affected and will not develop spontaneously.

With profound loss, (81 dB or more), the person may be able to hear loud sounds but may be more aware of vibrations than of tonal patterns. May rely on vision rather than hearing as the primary sensory channel for communication; speech and language defective. Speech and language will not develop spontaneously if loss is present before one year of age unless amplification is provided.

STRATEGIES FOR THE ENTERTAINMENT INDUSTRY

Music noise is best managed by adopting a planned strategy. This code provides appropriate strategies for the different persons and activities generating noise. Principally persons generating noise must know when music levels become music noise. This way they will know when control measures need to be put in place. Measuring music noise is a complex operation and should be conducted by a competent person. The operators in music venues are not normally experienced in this field. The EMA has trained personnel and there are private companies competent in this field. However, music operators should have some knowledge of how noise is measured, so that they can understand the music noise control strategies outlined in this code. Interested parties should select the strategy that applies to their particular situation.

STRATEGY NO. 1 – FOR AN OWNER

You are a person who owns, but does not operate an entertainment venue. As an owner you may lease the venue to another person who operates the venue as an entertainment centre. In this case you are the owner and the other person is the operator. If you also perform as an operator then you are both the owner and operator and should follow Strategy No. 2.

As an owner you are responsible for ensuring all practicable building devices and modifications which may be needed to reduce principally the noise exposures of people beyond the boundaries of the venue, as well as the people within the venue. You should also bring to the attention of the operator of the venue:

- the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000.
- the contents of this code.

STRATEGY NO. 2 – FOR AN OPERATOR OF ENTERTAINMENT VENUES

You are the person who operates an entertainment venue listed in Table 1 (Page 5). You are the person who directly engages the services of an entertainment promoter or music performer. You can be a hotel licensee, nightclub or disco proprietor, restaurant manager, or similar person in charge of an entertainment facility. For example you may employ a music band to perform at a hotel function or a steelband at a poolside event or a group of performers for a large outdoor concert.

As the operator or person in control of the entertainment venue, you are expected to:

- ensure that all efforts have been made to prevent risks to the safety and health of all concerned from excessive music noise.

- communicate this information to employees, promoters and performers.
- be familiar with the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000, and in particular to ensure that any variations required under the said code are acquired by the promoter in accordance with the procedures established.
- be familiar with the contents of this code.

On a long-term basis, you should identify situations and areas of the venue where noise is likely to be above the exposure standard. Arrange for a noise assessment to be carried out by a competent person during a typical louder than normal performance. If the assessment indicates that the exposure standard as outlined in the Noise Pollution Control Rules, 2001 was exceeded then you should consider the following:

- reducing the noise at source i.e. reduction of the music level. This has to be achieved through consultation with the entertainment providers.
- relocation or reorientation of stage and/or speakers to reduce sound transmitted to affected persons.
- use of sound barriers.
- use of multiple speakers distributed throughout a venue as opposed to a single bank of speakers.
- employ the assistance of professional acoustic consultants and sound engineers to achieve the most cost effective options.

STRATEGY NO. 3 – FOR ENTERTAINMENT PROVIDERS

You will most likely be a self-employed person who:

- is engaged by an operator or person in control of an entertainment venue to supply or provide music entertainment.
- promotes musical performances and engages the services of performers and/or technical staff.
- leads a band and or orchestra or other musical performing group and employs the musicians who perform in that group.

As a promoter or performer in this situation you should:

- ensure that all efforts have been made to prevent risks to the safety and health of all concerned from excessive music noise.
- communicate this information to the performers and technical staff you engage.
- be familiar with the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000, and in particular to ensure that any variations required under the said code are acquired by you in accordance with the procedures established.
- be familiar with the contents of this code.

If you employ workers such as sound mixer/engineer, lighting crews or musicians you will need to ensure that the terms and conditions of any variations supplied by the EMA are strictly adhered to throughout the time span of the function.

STRATEGY NO. 4 – FOR SOUND EQUIPMENT PERSONNEL

You will most likely be a supplier and/or installer of sound systems for indoor and outdoor events. You may also be the operator of the system at the venue. You may be self-employed and/or employ other people to do this work. You should:

- be familiar with the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000, and in particular to ensure that any variations obtained for an event at a particular venue are adhered to as detailed by the EMA.
- be familiar with the contents of this code.
- arrange the placement and orientation of the loudspeakers to minimise as far as practicable the sound directed to nearby residential buildings.
- arrange the placement of loudspeakers to enable restriction of access to a reference position where peak noise levels are likely to exceed 140 decibels.
- provide employees with appropriate personal hearing protectors where exposures exceed the exposure standard for noise.

STRATEGY NO. 5 – FOR STEELBAND PERSONNEL

You will most likely be steelband manager, captain, or arranger responsible for practice sessions of the band. You may also be the person who negotiates with promoters for the performance of the band at various venues. You should:

- be familiar with the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000 and adhere to the terms and conditions of any variations obtained from the EMA by the promoter of an event.
- be familiar with the contents of this code.
- plan the times of practice to minimise the disturbance to neighbours.
- engage neighbours in discussion before practise sessions and functions to establish good relations.
- arrange for suitable breaks in playing time to minimise the continuous exposure of loud sounds to players.
- provide players with appropriate personal hearing protectors where exposures exceed the exposure standard for noise.

STRATEGY NO. 6 – GENERAL GUIDELINES FOR OPEN AIR ACTIVITIES

Large scale open air activities offer the biggest concern for noise control in the entertainment industry. They are now a major part of the music scene in Trinidad and Tobago. Especially at Carnival time, they provide new opportunities for the promotion of artistes. Extensive sound amplification is employed and usually causes disturbances to nearby residents. Noise level from various activities including set up, rehearsal, main event and even dismantling can exceed stipulated maximum noise levels.

Most staging systems are designed with speaker banks to the left and right of a stage. The sound companies that are hired usually provide the stage as well, so they have the power to control the location and orientation of the stage and the speaker banks.

Sound engineers tend to place most of the high-energy content of the mix in mono (i.e., bass instruments, most low-mid information and vocals) because they are concerned about maximizing power and coverage. The two speaker bank positions are effectively operating as mono loudspeakers reproducing identical simultaneous sounds, developing a low frequency energy source.

The standard left/right configuration is designed primarily to address the sound engineer and has little to do with presenting a well-resolved sound field to the audience. The solution to this basic geometric problem is for the main loudspeaker stacks to be placed far enough offstage to provide effective stereo imaging for the audience. There is a further advantage here in that the control of sound levels placed upon the mix engineer relates mainly to the near field system because the main speaker banks are out of his hearing. In this way higher sound pressure levels can be allowed at the mixer without compromising off-site noise levels.

There are two very distinct processes that are necessary to achieve good environmental noise control. They are informed sound design at an early stage in planning of the event and implementation of effective monitoring and control during the event.
The key is to design for the lowest energy input to the system in order to achieve the required sound pressure level in the audience area. If the total energy dissipated can be reduced, then it is clear that the total energy leaving the site will be reduced and therefore more readily controlled.

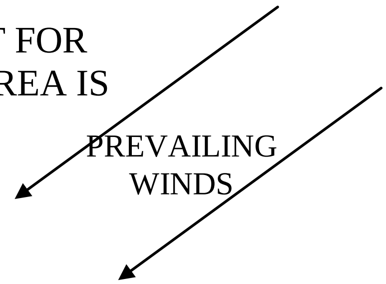
Promoters of these events should apply to the EMA for variations in accordance with the Noise Pollution Control Rules, 2001. Advance notices should be distributed to nearby residential buildings, hospitals or other noise sensitive users to alert people of the date, time, venue and programme of the activity.

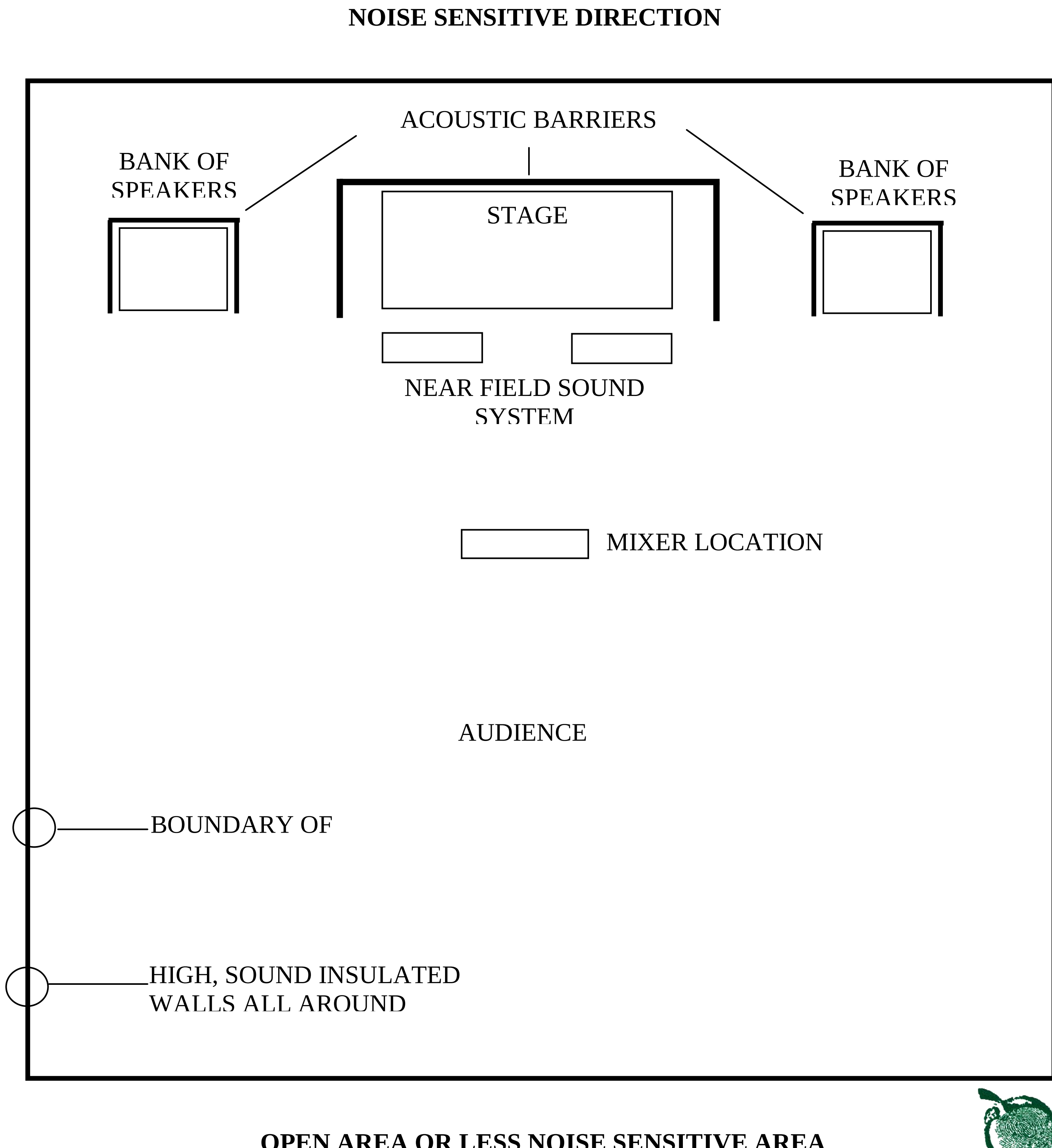
All practical noise mitigation measures should be employed (see figure 1 on Page 15) including but not limited to the following:

- orient the stage to point away from nearby sensitive areas.
- enclose the stage and speakers on three sides with sound absorbing or reflecting barriers to reduce the sound levels to sensitive areas.
- where practical, use a cluster of small power loudspeakers instead of a few large power loudspeakers.
- use directional loudspeakers and orient them to point towards the audience and away from nearby sensitive areas.

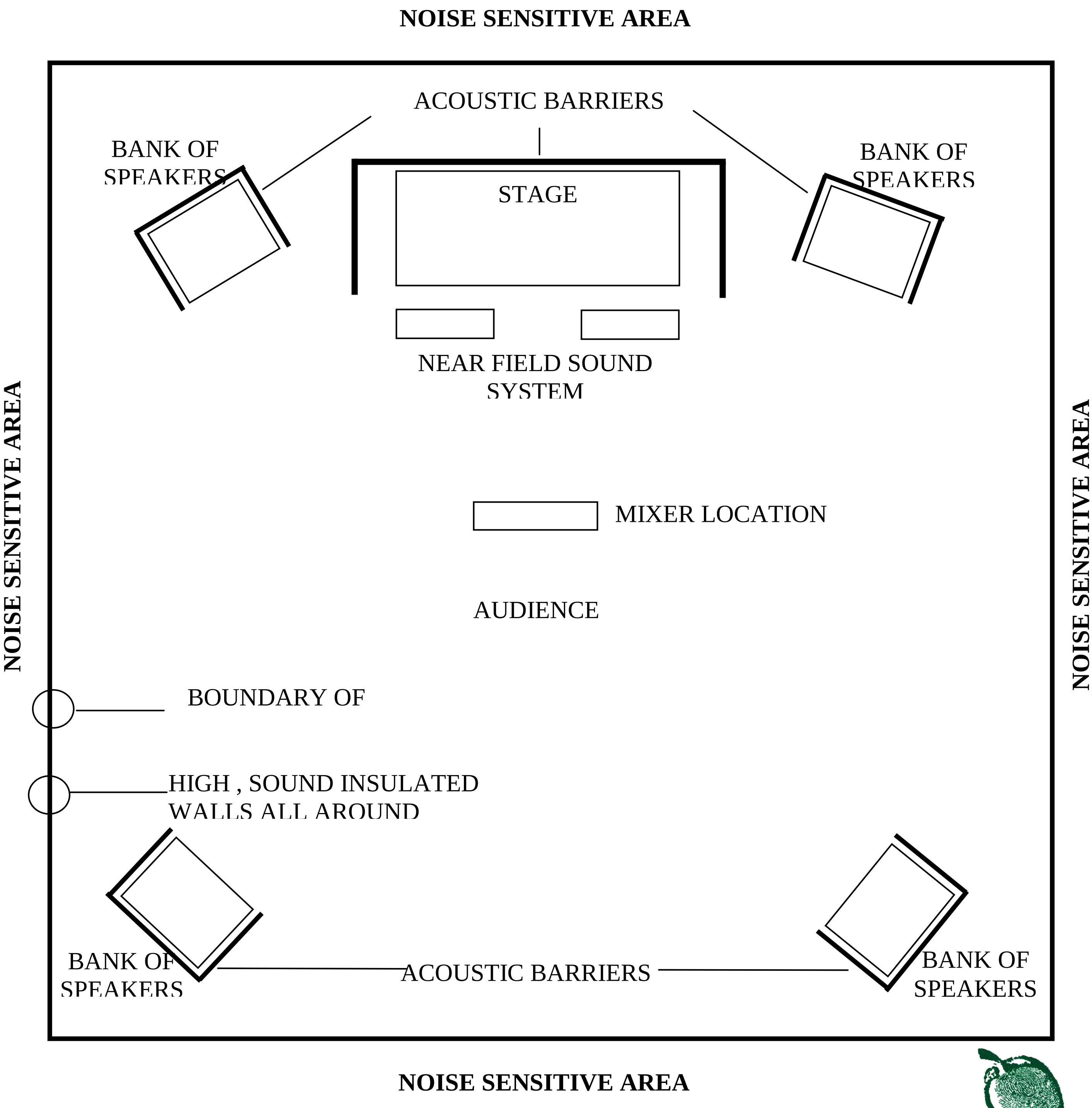
- where possible, orient speakers so that the prevailing winds blow away from sensitive areas.
- orient speakers so that the sound travels towards large open land areas or the sea.
- testing of sound system should be kept as short as practical and full blown rehearsals also kept to a minimum. These activities should be performed during the period 9:00 a.m. to 7:00 p.m.

RECOMMENDED SPEAKER ARRANGEMENT FOR OPEN AIR EVENTS WHERE AT LEAST ONE AREA IS NOT BOUNDED BY SENSITIVE NOISE RECEPTORS.





RECOMMENDED SPEAKER ARRANGEMENT FOR OPEN AIR EVENTS WHERE EVENT SITE IS BOUNDED BY NOISE SENSITIVE RECEPTORS



Speakers should be lower power than traditionally used in speaker 'walls'

CONCLUSION

The Environmental Management Authority (EMA) is not the enemy. They seek to protect the public at large from the damaging effects of noise and the resulting stress and trauma that may lead to hearing loss. The EMA recognises the importance of entertainment to the economy of the country and as a form of relaxation for many.

The EMA encourages dialogue with the stakeholders in the entertainment industry and welcomes suggestions that will lead to amicable solutions for both those responsible for creating noise as well as those who are affected by it.

This code is intended to be a working guideline to the entertainment industry and must be used in conjunction with the Noise Pollution Control Rules, 2001 enacted under the Environmental Management Act, 2000.