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MUM 2600

Chapter 3 – Studio Acoustics and Design

Acoustics – a science dealing with the production, effects, and transmission of sound waves; the transmission of sound waves through various mediums, including reflection, refraction, diffraction, absorption, and interference; the characteristics of auditoriums, theaters, and studios, as well as their design."

Basic requirements of studios:
1. Acoustic isolation – Prevents unwanted sound from entering or escaping recording.
2. Frequency balance – The acoustic environment should not affect the originally recorded or reproduced performance.
3. Acoustic separation – Acoustic environment should offer separation of sounds.
4. Reverberation – Room should control the amount of reverb.
5. Cost factors – know your budget.

Project studios
1. Born out of necessity due to budget constraints and/or physical space.

Music Studios
Large facilities: Hit-Factory Criteria, Middle-Ear, The Gallery, Circle House, Crescent Moon, Studio Center.
Medium Facilities: Spectrum, Big Dog, Audio-One.
Jingle Facilities: Music A La Carte, Sprockets.
Project Studios: Down Time, One-Take, Coconut Sound, Heavy Air.

Audio-for-Visual Production Environments (POST facilities)
Foley – replacement and creation of on-screen sound effects.
ADR – automatic dialog replacement
Mixdown – final mixing of all sounds, music and dialogue.

Acoustic Isolation
Transmission loss (TL) – reduction of sound pressure levels as they pass through an acoustic barrier of a physical mass. Measured in Decibels.

WALLS
Generally the same amount of isolation is required between the studio and control room as is between the studio's interior and exterior environment.
Use densest material you can afford. Speakers should be mounted on rubber pads to prevent wall resonance.

FLOORS
Since floors can amplify low frequencies, most studios float their floors. For floating, studio designers use neoprene "hockey pucks" or rubber matting.
Less expensive method is to use carpet with foam padding.
RISERS
Low frequencies travel through barriers much easier than high frequencies. This is why the drums are the biggest offender when it comes to leakage. By building a drum riser, you reduce the amplification effect of the floor on the drum set's low frequencies.
Risers are made from 2" x 6" or 2" x 8" beams covered with plywood and neoprene strips or coasters.

CEILINGS
Either carpet the floor of ceiling above where people walk to eliminate footsteps or use a "Z" channel to float a ceiling.

WINDOWS AND DOORS
Windows are a must for visibility unless you use video cameras. Windows are set at an angle to prevent sympathetic vibrations. The glass is usually between 3/8" and 3/4".

Doors going to and from the control room are almost always a double-door design in order to form a sound lock. Air offers a high TL value when sandwiched between two solid doors provided that the correct sealing techniques are used for each door.

ISO-ROOMS AND ISO-BOOTHS
Small rooms easily accessible from the control room used for singers and soloists. Provides an environment isolating the solo performance from the main room though both could occur simultaneously. This is very prevalent in jazz recordings or recordings in a "live' setting where the performance is dependant on the interaction of the musicians.

FREQUENCY BALANCE
A room providing a "flat" response is preferable. It is best that the room does not enhance one set of frequencies over another.

REFLECTIONS
We use nonparallel walls, bass traps (low frequencies) and wall treatments to prevent or diffuse reflections.

SYMMETRICAL REFLECTIONS
In order for true stereo response in the control room, all reflections must be symmetric. That means that the side and ceiling boundaries must be symmetrical with respect to each other.

Absorption is the inverse of reflection.
High-frequency absorption is achieved by the use of porous materials such as cloth, fiberglass and carpeting.
Low-frequency absorption is achieved using bass traps:

1. Quarter-wavelength trap – a trap, built into the rear wall, 1/4 the depth of the offending frequency.
2. Pressure zone trap – a surface boundary rigidly supported by a number of medium-density fiberglass boards.
3. Functional Trap – (Harry F. Olson c. 1950) Tube or half tube structure. Used in corners and free-standing spaces of a room.

ECHO CHAMBERS

A highly reflective isolated room where microphones and speakers are placed. These rooms can often have movable walls in order to change the reflection parameters.

In today's studios, most reverb and echo is created electronically.