



AUDIO ENGINEERING

PROJECT STUDIO DESIGN DEFINITIONS AND GLOSSARY BY UNIT

LESSON GUIDE

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AUDIO-153E

1 CREDIT

Unit 1: WELCOME!!!

Unit 2:

Flutter Echoes: Result when a sharp, transient sound is produced between parallel reflective surfaces that are separated by more than about eight meters. With surfaces separated by less distance, the result is a metallic ringing, "Boing" sound. Flutter echo, when made loud enough, can interfere with sonic intelligibility.

Live End/Dead End: In LEDE Control room design, the front or dead end of the room uses more absorption to control unwanted reflections and increase intelligibility around the listening position. The rear or live end of the control room is kept more live and reflective. The live end area could be used for recording in "all-in-one" room Project Studio Designs.

Reflection-Free Zone or RFZ: is created at the listening position where the first reflections of sound coming from the monitor speakers (that has bounced off nearby walls, floors and ceilings) is minimized to increase intelligibility, clarity and improve stereo imaging.

The listening position: is equidistant between the left and right monitor speakers for a balanced stereo image and a stable frequency response from the monitors.

Sweet Spot: the position between the stereo speakers with the best stereo image.

Symmetry: (as applied to monitor loudspeaker setup) when the speakers are placed exactly the same distance from each other, the same distance from the side walls, and the wall behind them.

Unit 3:

20/20 Rule: At the listening position, sound reflections occurring within the first 20 ms shall be 20 dB down in level compared to the initial sound coming from the loudspeaker monitors.

38% Rule: The 38-Percent Rule optimizes the listening position lengthwise in the room.

Active or Powered Monitors: These are self-powered monitor speakers with built-in power amplifiers for each driver. They are connected directly to the mixing console, DAW I/O or other line level signal sources without the need of an external power amplifier.

Magic Triangle: An equilateral triangle at which the positions of the left speaker, right speaker, and the optimal listening position are located at its three corners. The optimal listening position corner should be just located just behind the listener's head.

Passive Monitoring System: A passive monitoring speaker has an internal passive crossover installed inside of the enclosure and requires an external audio power amplifier. The connecting speaker cables must have low resistance and therefore be of a larger wire gauge (size). Yamaha's NS10Ms are an example of popular passive monitor speakers used in professional recording studios.

Pink Noise: Pink noise is filtered white noise—reduced or rolled off by 3 dB per octave.

Room Modes of Vibration or Room Modes: are specific types of standing waves caused by frequencies below 300Hz reflecting back and forth between parallel walls, floors, and ceilings (boundaries). Modal activity occurs at frequencies that are directly related to the dimensions of the room. Room modes cause both (in-phase) amplitude peaks and (out-of-phase) amplitude dips in frequency response when two or more waves meet and are the same frequency.

Standing or Stationary Waves: A phenomenon in which a wave remains in a constant and fixed position in physical space as the result of the interference between two sound waves of the same frequency and equal amplitude traveling in opposite directions.

Translates: This means your mix balance sounds, in a predictable way, about the same as it did inside of the control room outside of the control room—given the playback system and speakers it's played on outside.

White Noise: White noise is random noise signal containing all frequencies at equal energy.

Unit 4:

Absorption: The ability of a material to absorb sound energy.

Absorption coefficient: The absorption coefficient is a measurement of the efficiency of a material in absorbing sound at a specified frequency between 125 Hz and 4 kHz.

Bass Trap: A low frequency absorber—below 300Hz.

Diffuse Sound: Sound that no longer carries the coherency of reflected sound as the different wavelengths of sound exit a diffuser with different angles of reflection.

Diffuser (also spelled Diffusor): Diffusers reflect and redirect incoming sound at different angles in single and/or multiple planes.

Direct Sound: A sound that arrives at the listener directly from the speakers.

Indirect sound: A sound that arrives at the listener by some path other than directly from the speakers.

Reflected Sound: Sound that has bounced off at least one hard surface before it is heard.

Unit 5:

CAT 5 and CAT 5e, CAT 6: Category (5 or 6) cable that uses twisted pairs of wires for noise rejection and primarily used for Ethernet connections between computers, routers, servers, and modern networked digital audio and video systems.

D-Sub: A compact, "D"-shaped multi-pin connector used by analog and digital outboard equipment. A DB25 connector would have 25-pins available.

Ground: The chosen common return point for all power supplies and circuits. It is also the braided-shield connection for analog and digital input and output connections.

Ground Loop(s): Unwanted signals, radio frequency, buzzes and noise injected whenever sensitive audio equipment detects two or more different paths to ground.

Inverter: A device that converts DC voltage (usually from a battery or rooftop solar panels) into 120-volt AC to power small household appliances.

IEC Cables: International Electrotechnical Commission standardized AC power connection cables are used for electronic gear throughout the world for AC line voltages ranging anywhere from 100 to 250-volts. All modern electronic equipment uses a single standardized "IEC" socket mounted on their chassis. The standardized mating IEC power cable has the proper plug on its end to connect to the particular country's wall socket type.

TRS: Tip-Ring-Sleeve plug—a 1/4-inch stereo plug—older patch bays use these.

TT: Tiny Telegraph—a 1/8-inch TRS plug/jack used in modern patch bays. Twice as many TT jacks will fit in the same space as the older 1/4-inch TRS jacks.

Step-Down and Step-Up Transformer: A "step-down" or 2:1 transformer is for changing 240VAC (Volts Alternating Current) into 120VAC. It is useful to power equipment in the U.S. that was built to operate only on the AC mains voltages of other countries. Typically the world is 240 volts AC whereas the U.S. and its territories are 120 Volts AC. A "step-up" 1:2 transformer will step up 120 VAC to 240 VAC. Usually these transformers are built to do both functions. They are rated in the total watts they are capable of handling.

UPS: An Uninterruptible Power Supply uses a small battery to power a DC-to-AC inverter to provide 120 volts AC power to your computer for a limited amount of time. This system allows you to save your DAW session and shut down properly and wait until normal power is restored.

Unit 6:

Contractor: Sometimes known as a general contractor, a person or company in charge of executing the construction plans as drawn by an architect or architectural acoustic designer.

Damped: (As used in the study of acoustics): A restraining or discouraging force. A highly damped structure would be resistant to vibration or movement by external forces such as loud sound sources.

Flanking Transmission: Air leakage around (“out-flanks”) doors, windows and gaps in a room that will defeat isolation.

Floating floor: A floor that is detached from the underlying subfloor or concrete foundation slab in order to increase the isolation from external vibration or acoustic sources.

Mass Law: If you double the mass of the wall, you get 6 dB more isolation. It takes four times the mass to get 10 dB more isolation.

MSM Wall: Mass-Spring-Mass—massive wall—air gap—massive wall. This is a proven wall design for sound isolation.

Resonance: In physics, the amplitude of vibration of any resonant system is maximum at its natural or resonance frequency and less so at frequencies above or below that frequency.

Resonance: (As used in the study of acoustics): The prolongation of sound by reflections or reverberation.

Room Within A Room: Floating the floor on rubber or springs and also building double or triple walls with air spaces between.

Sound Transmission Class: Sound Transmission Class or STC is the measurement of a partition's ability to block sound over a range of 16 frequencies spaced on 1/3-octave centers from 125 Hz to 4 kHz.

Unit 7:

Acoustic foam: Open-cell porous polyurethane that absorbs high frequencies.

Batt: A fluffy and smaller piece of fiberglass used for insulation and/or absorption.

Backing Board: Sold in similar sizes as sheets of plywood but is instead made of cement and used as waterproof backing walls for showers and bathrooms—it's denser and heavier than plywood, MDF or gypsum.

Drywall: A type of board made from plaster, wood, pulp, or other material used to form home/office interior walls. Comes in 4-ft by 8-ft sheets and in different thicknesses starting from 1/4-inch.

Gypsum board: It is drywall made from plaster between two sheets of heavy paper.

Mass Loaded Vinyl: A limp-mass material made of vinyl infused with heavy barium (atomic number 56). It is 6dB more effective than solid lead at stopping the transmission of sound when used in multi-layer constructions techniques.

MDF: Medium Density Fiberboard. Engineered wood made of compressed wood fibers used in the construction of walls, floors and roofs.

Mineral Wool: A substance resembling matted wool that's made from basalt (rock) and spun into fibers for both insulation and sound isolation.

OSB: Oriented Strand Board. Engineered wood formed by layering strands of flakes of wood in a specific orientation. It comes in both 4 X 8-foot sheets or as framing lumber—2 X 4 or 2 X 6.

Resilient Channel: A specially formed metal strip used to hang drywall—it provides an air space and isolation. It is used to provide attachment points for sheets of flat drywall on top of irregular or rough outer walls such as cinder block or stone.

Rigid Fiberglass: Made from glass silicate, this is a porous absorber material. Owens Corning 703 two-inch thick panels are the #1 material used to build acoustic panels and bass traps. It's stiff enough to be easily wrapped without requiring to be framed yet easy to cut into any shape.

Stud: An upright metal or wood framing member on which drywall is attached to form a wall. They come in common sizes for construction such as 2 X 4 and 2 X 6-inches.

Unit 8:

Discrete Absorber: Can be anything in a room's space. The two most ubiquitous discrete absorbers are people and furnishings.

Harman Room Mode Calculator: An Excel spread sheet (.xls file) analysis that will output the frequencies of the 1st, 2nd, 3rd, and 4th axial room modes just by typing in the room's three dimensions in feet. The default value for the speed of sound is 1,130 feet/second.

Helmholtz resonator: A tuned, narrow band resonant cavity bass trap used in architectural acoustics to reduce undesirable low frequency sounds—i.e. standing waves

Pliable materials: Materials that bend and flex with the incoming wave front energy. They work best for low frequencies.

Porous absorbers: Materials such as rigid fiberglass and foam that absorb more strongly at frequencies whose quarter wavelengths are less than the thickness of the material itself OR

equals the distance the material is spaced off the wall. These absorbers work better at middle and high frequencies.

Pressure absorbers: Pressure absorbers use an absorptive or pliable material and placed right on the boundary. Resonant absorbers are pressure absorbers that use the resonant properties of a material or cavity to provide absorption.

Soffit: A heavily constructed and very rigid cavity built into a wall where a speaker cabinet is mounted.

Three types of room modes: Axial, tangential and oblique. Axial modes involve two parallel boundaries and are the most problematic. Tangential and oblique modes are more numerous but have less energy than axial modes.

Velocity Absorbers: Typically porous absorbers that use dense fibrous materials to slow the velocity (speed) of sound by causing the air particles of sound waves to vibrate porous materials such as natural fibers (cotton), mineral wool fibers (basalt), foam (polyurethane), carpet, acoustical tiles etc. The frictional loss is converted to heat. They work best at high frequencies.

Unit 9:

1D diffusers: These diffusers spread the sound out on a single plane.

2D diffusers: These diffusers spread the sound out on two planes.

Cloud or Ceiling Clouds: An acoustic treatment panel mounted slightly off the ceiling. A ceiling cloud is hung over the listening position and can consist of a diffuser and absorber combination. They will also provide some bass trapping when spaced off the ceiling at least twice its thickness.

Diffusers: Diffusers scatters sound arriving from any direction to reduce the problem of direct reflections. Diffusers create a more even musical sound without reducing reverb time significantly and can make a room feel larger than it actually is.

Quadratic Residue Diffusers (QRD): QRD diffusers spread sound out in time, phase and space.

Unit 10:

Electronic Room Correction: a software and/or hardware system that measures the monitoring system's performance at the listening position and electronically corrects and compensates for it and the effects of the room's poor frequency response. However there is no real substitute for fixing acoustic problems of the entire room with the proper application of acoustic treatments.

HVAC: a single system that does heating, ventilation, and air conditioning.

Mini-Split: A two-piece air conditioner system where the noisy compressor machinery is separated from the head unit placed on the room's wall. Popular in Europe and Asia, they do not require extensive ducting work and, in the US, no need for 220-240 VAC and special wiring to be installed.