

Acoustics: Listening Environments

reflection, absorption, dispersion, diffraction, transmission

Isolation from external noise

sound barrier - massiveness, change in density, air leaks

air leaks

double walls

heat insulation vs acoustic insulation

paths of sound transmission

windows, doors, leaks, duct work, gaps around pipes etc

Open air sound

inverse square law

noise sources - distance from noise source - inverse square law

sound absorption in audience

reflecting surface (band shell)

electronic reinforcement

Sound in enclosures

design - sound is reflected, little is lost

diffusion is generally desirable

attenuate external noise

noise criterion

reverberation: direct sound, early sound, reverberant sound

speech -- little reverberation; orchestral music -- more reverberation

trade-off between reverberation and sound absorption

Sabine equation: $RT=0.16 \cdot V/TA$; TA is total absorption,

(surface area * absorption coefficient)

reflective surface in front, close to the sound source

combination of reflective and absorbing surfaces on other walls

irregular shaped surfaces to diffuse sound

“raking”

elevated stage

avoid: echoes, focusing of sound by concave surfaces, sound shadows

TERMS

Controlling the Environment

SOUND IN ENCLOSURES

absorption
diffraction
direct sound
early sound
reverberant sound

ISOLATION FROM EXTERNAL NOISE

sound barriers

DEFECTS TO AVOID

echoes
flutter
sound focusing
distortion
room resonances
sound shadow

classrooms

Recording Media

Digital Audio
Analog to digital conversion
Digital to analog conversion
sampling rate
aliasing
amplitude quantization

Auditoriums/Concert Halls

Basic Requirements

1. Free from exterior noises
2. Free from interior noises
3. Avoid specific defects
4. Uniform and optimum reverberation
5. Uniform distribution of sound energy throughout room
 1. room shaped so that the audience is as close as possible to sound source
 2. the floor of the auditorium should be raked (ramped)
 3. the stage should be rased to elevate the sound source.
 4. large sound-reflective surfaces should be located as close to the sound source as is feasible
 5. the ceilings and walls need to be designed for favorable sound reflection, especially for those seats farthest from the stage
 6. proper diffusion is important for uniform sound distribution in an auditorium