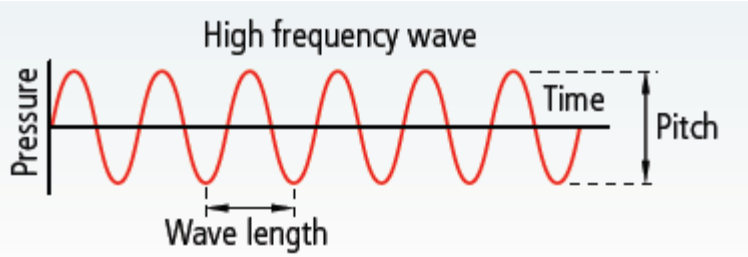
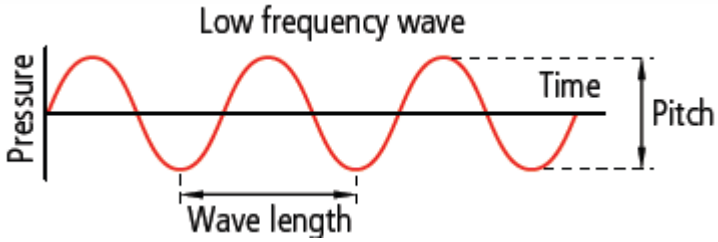
SECTION D

CHAPTER 21
SOUND

Introduction

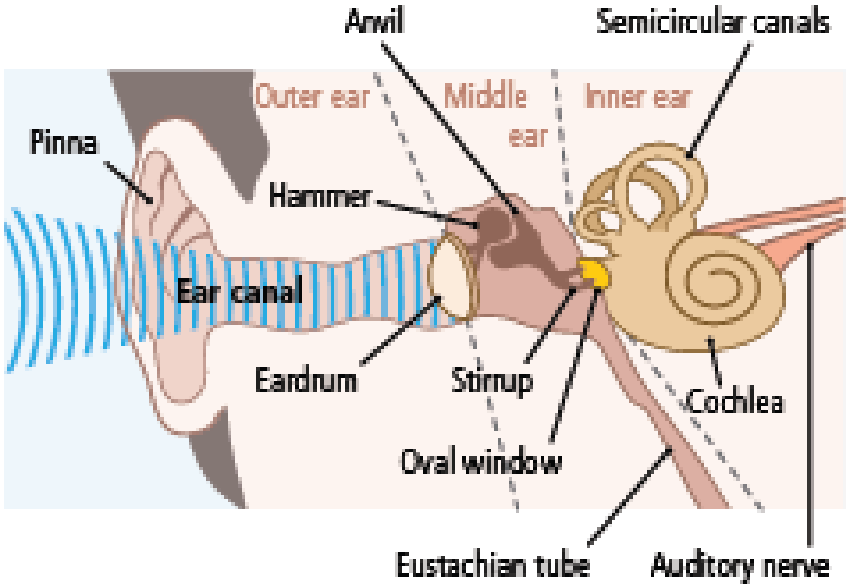
- Sound is a series of vibrations which travel through the air in waves
- It can travel through air, liquids and gasses but cannot travel through a vacuum
- Sound can have high and low frequencies or high and low pitches





How We Hear

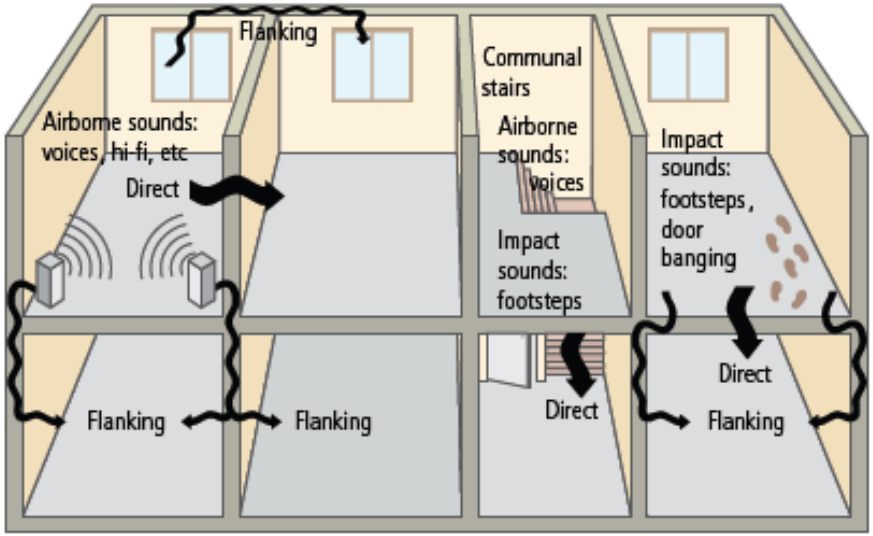
1. Sound reaches the eardrum
2. The eardrum vibrates when sound waves reach it
3. Vibrations transmit through the three small bones
4. Vibrations reach the cochlea, a tube containing thousands of fine, hair-like nerve endings. As the cochlea vibrates, these hairs move, sending a message to the brain
5. The brain translates the vibrations into sound



Human hearing converts sound waves into electrical signals which are interpreted by the brain.

Sound Transmission

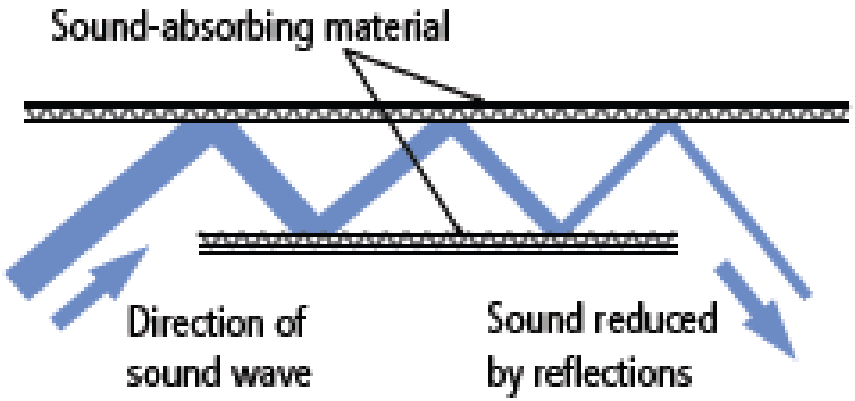
- Sound is transmitted directly and indirectly
- Directly: sound travels in straight lines e.g. directly from a speaker
- Indirectly: Sound travels around a material or from one material to another e.g. sound from a next door television



Direct and indirect transmission of sound in the home.

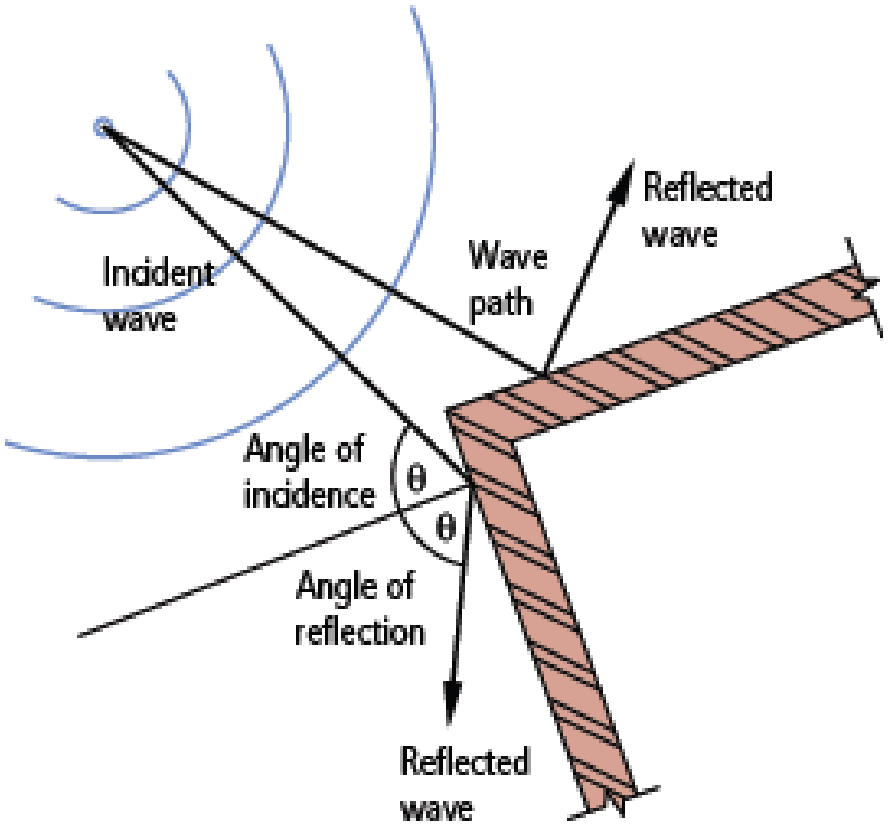
How Sound Waves React

- **Sound absorption:** This is the amount of sound soaked up by the surfaces and materials in a room. Hard surfaces absorb very little sound, while soft surfaces absorb sound rather than reflecting it. As sound waves bounce off a material, they grow less and less intense.



How Sound Waves React

- **Sound reflection**: Sound reacts in the same way as light in the sense that the angle of reflection and the angle of incidence to a surface are equal. Sound reflection is used to alter the acoustics in a room, to ensure that the distribution of sound is even.
- **Reverberation time:** This is the amount of time it takes for a sound to decline by 60dB. The time will vary from room to room, depending on both the size of the room and the furnishings in it.



Principles of Sound Insulation

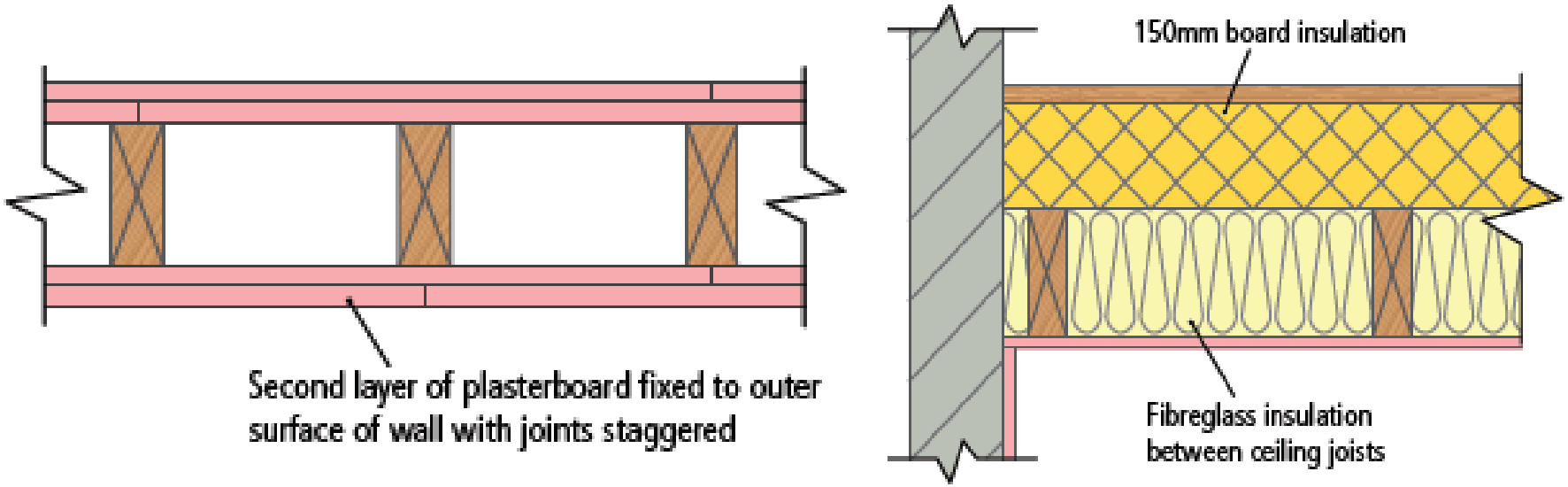
- There are four principles of sound insulation which ensure that the transmission of sound is minimised
  1. Heaviness
  2. Isolation
  3. Flexibility
  4. Completeness

Noise Control in Buildings

- The transmission of sound is reduced by making use of three of the principles outlined earlier, under the following headings:
  1. Mass
  2. Isolation
  3. Completeness

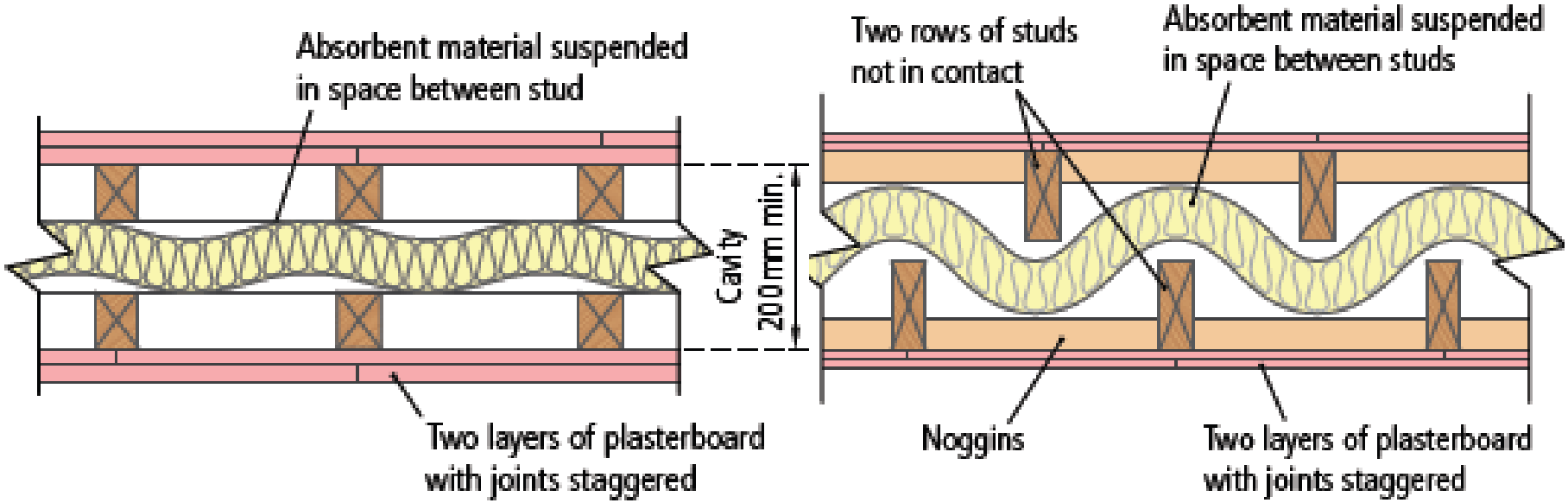
Mass

- Mass is the amount of matter a material contains. The greater the density of a material, the greater its mass.



Isolation

- Isolation reduces sound transmission by leaving voids or cavities between building materials.



Completeness

- The completeness of a material refers to the lack of voids or gaps inside it.