ACOUSTICS IN ‘HOSPITALS’

- **Subject: Building Services – III**
- **Topic: Acoustics In Hospitals**
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PURPOSE OF STUDY

- To examine how different aspects of sound— ***noise, speech privacy, speech intelligibility*, and music**— impact patient and staff outcomes in healthcare settings and the specific environmental design strategies that can be used to improve the acoustical environment of healthcare settings.

- Hospitals are ***extremely noisy***, and noise levels in most hospitals far exceed recommended guidelines. The high ambient and peak noise levels in hospitals have ***serious***

- ***impacts on patient*** and staff outcomes ranging from **sleep loss** and elevated **blood pressure** among patients to **emotional exhaustion** and **burnout** in staff.

- At the same time, a poor acoustical environment impedes effective ***communication between patients and staff*** and between staff members by rendering speech and auditory signals less intelligible or detectable.

NOISE

- Noise, which is widely defined as ***"unwanted sound***", can be harmful to patient and staff health.

- The World Health Organization **(WHO)** guideline values for continuous background noise in hospital patient rooms are **35 dB(A)** during the day and 30 dB(A) at night, with nighttime peaks in wards not to exceed 40 dB(A).

- Peak hospital noise levels often **exceed 85 dB(A) to 90 dB(A**).

- Noises from alarms and *certain equipment* that *exceed 90 dB(A) (e.g*. ***portable X-ray machine***) are comparable to walking next to a *busy highway* when a motorcycle or large truck passes.

SOURCES OF NOISE

Indoor source

- Mechanical equipment (hospital)
- Service trolleys for supplies,
- Sterilizing equipment
- Wheeled trolleys
- The handling of metal or glass equipment
- Vacuum cleaners, mechanical polishers
- HVAC
- Foot steps & other activities etc.

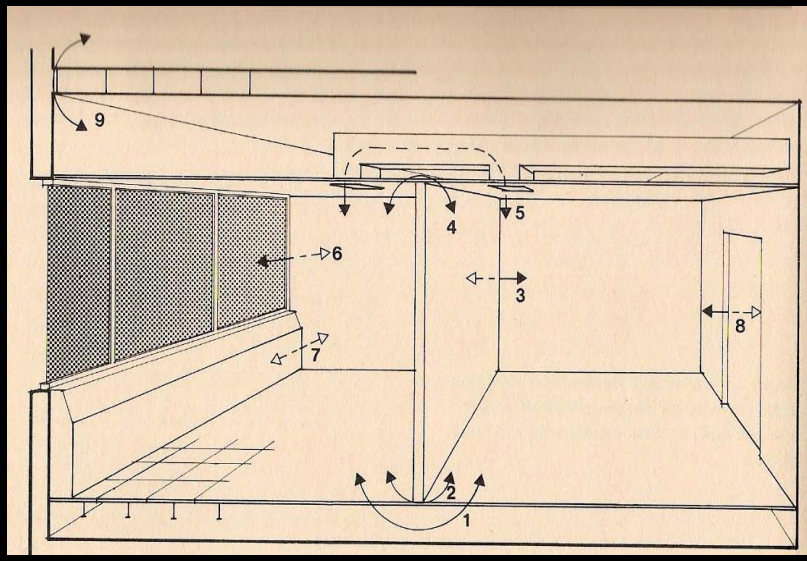
outdoor source

- Traffic (cars, buses, trucks, airplanes, ambulances)

- Industrial noises.

- Noise from sources outside the building but usually with in the control of the hospital authority. for example. Ambulances, motor-cars and service vehicles, fuel and stores deliveries, laundries, refuse collection, trucks and trolleys.

Other noises



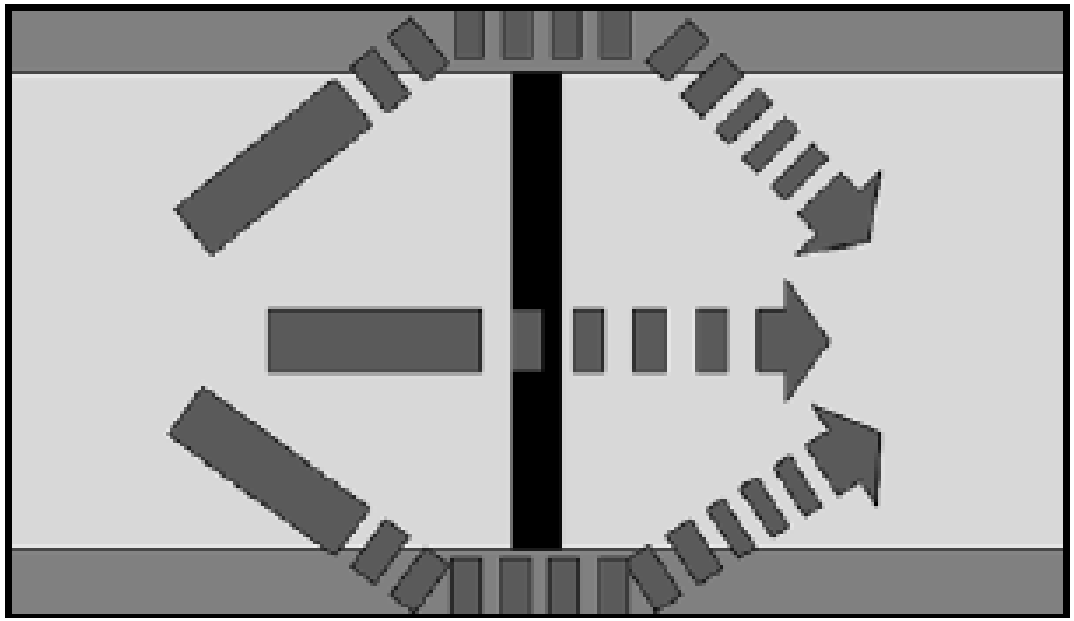
Overhearing by flanking transmission of sound over partitions is a frequent complaint, for example between waiting areas and consultants' offices.

FLANKING TRANSMISSION:

The transmission of sound energy via paths which bypass the partition is known as, **flanking transmission**.

It can occur because,

- the sealing of the panel around its perimeter is inadequate or small gaps have been left.
- Flanking transmission means that the partition fails to give the performance that laboratory measurements would indicate it is capable of..



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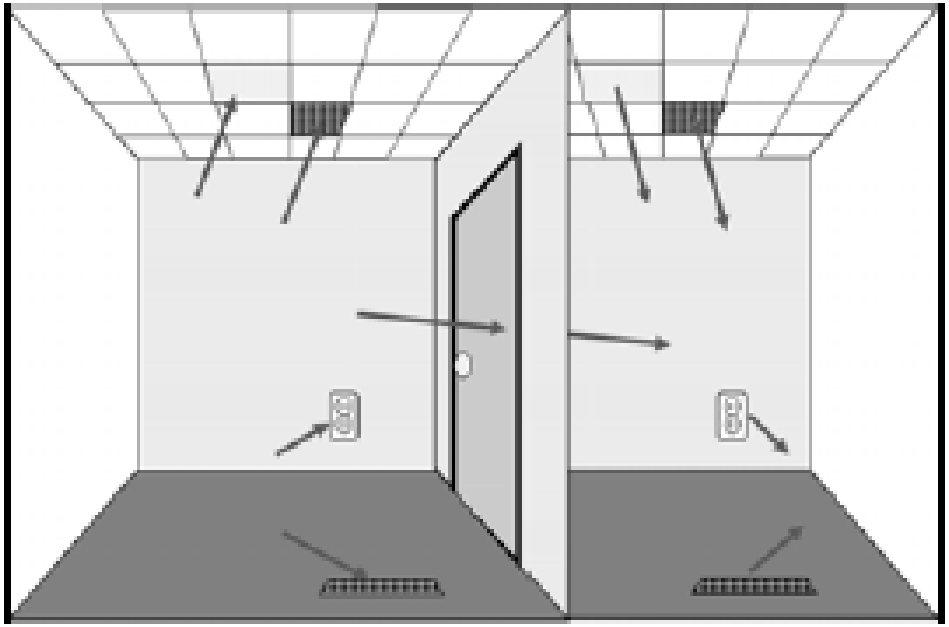


MAJOR FACTORS OF NOISE

- IN hospital premises there are many noise sources present. **Staff conversation** in particular is a major source of loud noises in the hospital unit.

- Environmental surfaces in hospitals—**walls**, **floor, and ceiling**—tend to be **sound-reflecting rather than sound-absorbing**. This aggravates the noise problem in hospitals. Sound-reflecting surfaces cause noise to propagate considerable distances, traveling down corridors and into patient rooms and adversely affecting patients and staff over larger areas

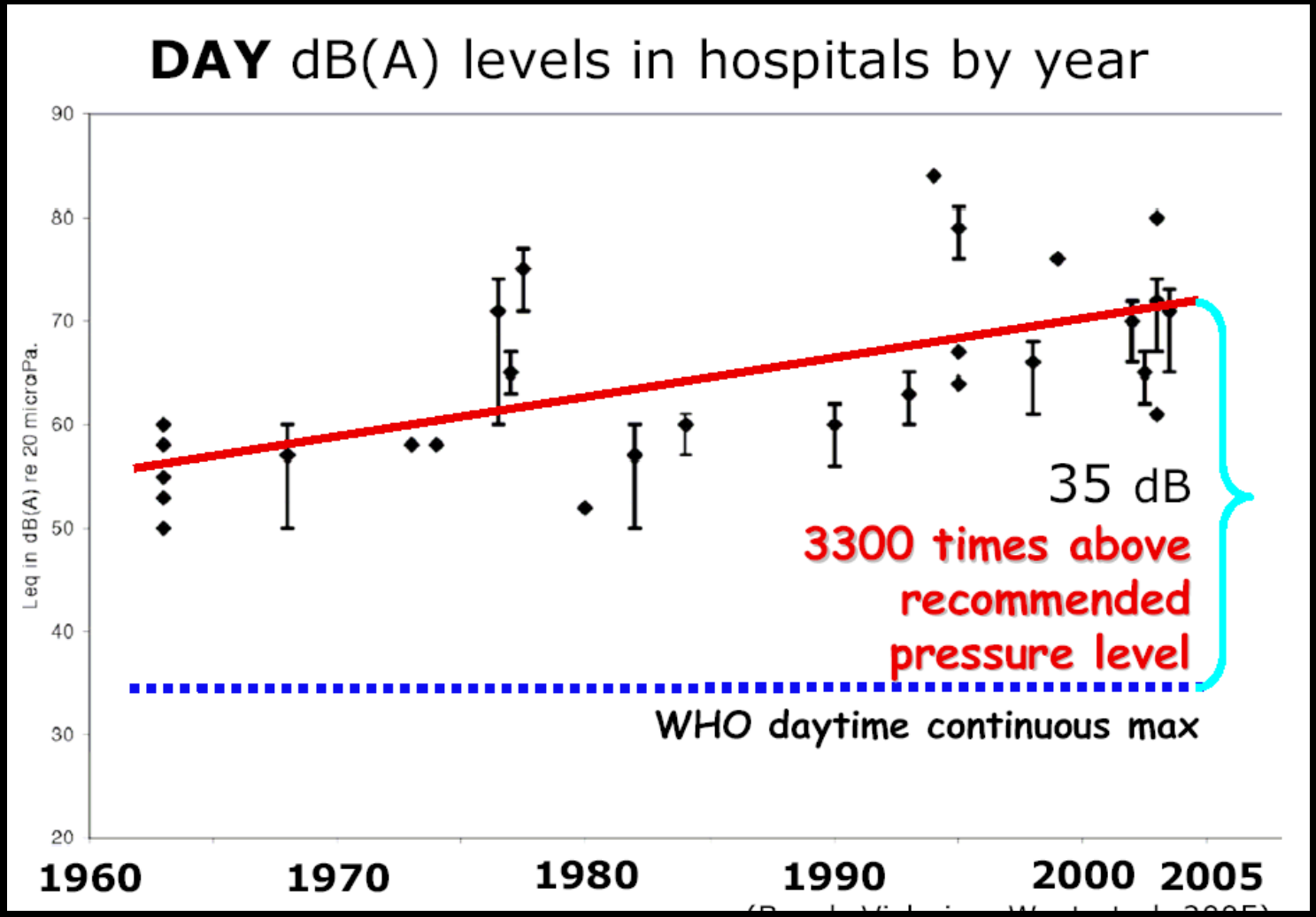
- When acoustic conditions are characterized by long reverberation times, echoes cause blending and overlapping of sounds, resulting in reduced speech intelligibility. To make themselves heard, staff members raise their voices, thereby increasing the noise problem even further.

EFFECT OF NOISE

- Quiet time is especially important in ICU environments where *loud noise levels decrease oxygen saturation* (increasing need for oxygen support therapy), *elevate blood pressure*, ***increase heart and respiration rate***, and worsen sleep.

- During the bad acoustical conditions pulse amplitudes may be higher among patients.

PRESENT EXTENT OF NOISE IN HOSPITALS



REDUCTION OF NOISE

- Site planning
- Building planning
- Reduction at source
- Reduction by structural means
  - Insulation
  - Absorption

Site planning

- Hospital sites with, their high degree of sensitivity to outside noise should be as far away from outside **sources** as may be compatible with other considerations, such as accessibility and availability of services.

- The building should be so arranged on the site that sensitive areas like **wards, consulting and treatment rooms, operating theatres** and staff bedrooms are placed away from outdoor sources of noise, if possible, with their windows overlooking areas of acoustic shadow.