Subject: Building Services – III

Topic: Educational Buildings

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INTRODUCTION

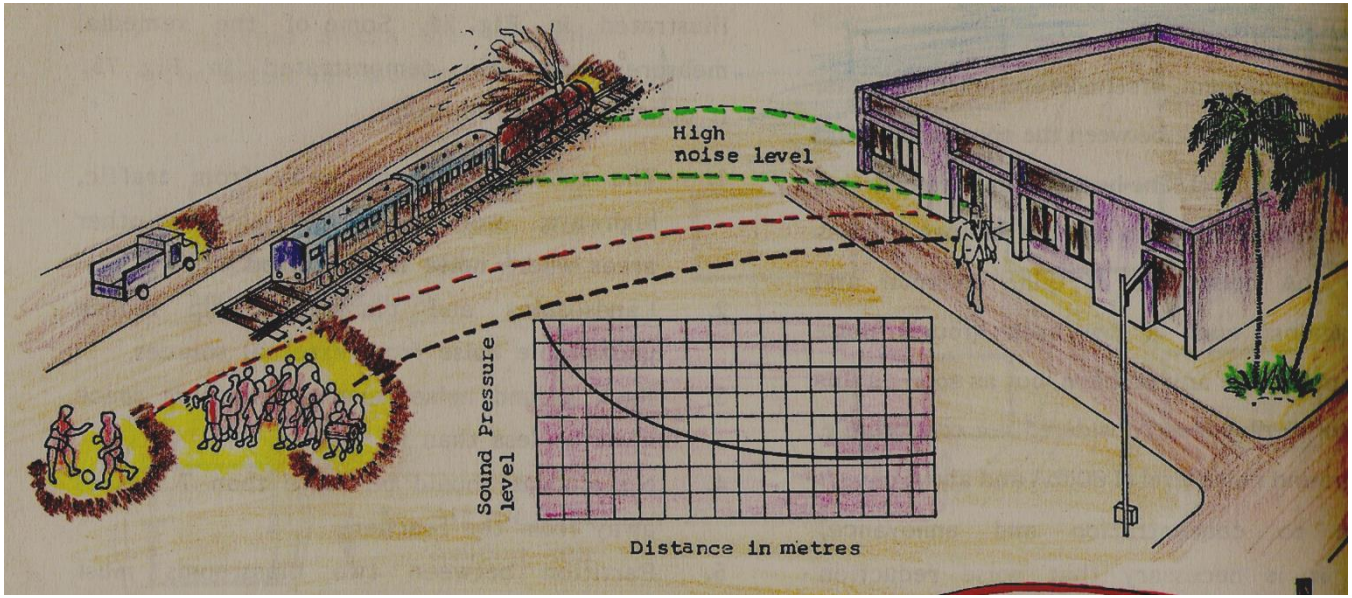
The effect of noise on man can be divided into two categories

-psychological and physiological and for most purposes can be considered under the following heads
-causing annoyance
-effecting communication
-causing damage to hearing
-effecting performance of task-causing permanent changes in the normal functioning of the human organism
-deterioration in mental or physical health.

SOURCES OF NOISE

OUTDOOR NOISE

- The outdoor sources of noise produced on school premises which constitute a nuisance within the school include the noise arising from playgrounds, playing fields and open air swimming baths and deliveries of fuel and stores to boiler house and kitchens.
- Though playgrounds are used mainly during break periods, they are also used at times of games and physical education when teaching is in progress in the rest of the school.



Sources of background noise in an unoccupied classroom

lighting ballasts

outdoor noise
(traffic, playground)

HVAC units

diffusers

duct-borne HVAC noise

electrical appliances

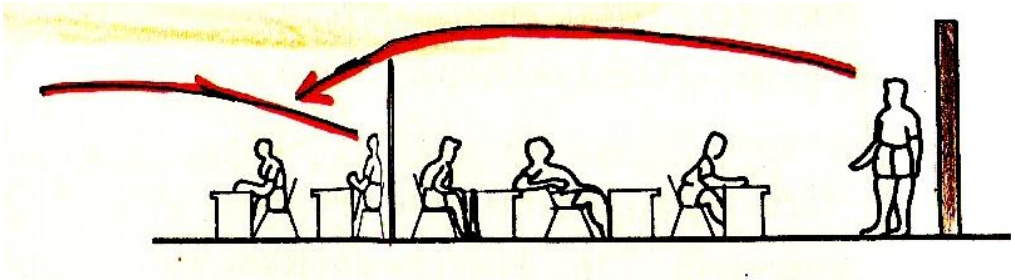
pass-through noise
(adjacent rooms, corridors)

computers

INDOOR NOISE

A) MUSIC ROOMS AND PLAY AREAS
B) SHIFTING OF FURNITURE
C) SHUTTING OR OPENING OF DOORS
D) AUDIO VISUAL CLASSES

- LECTURE GIVEN BY TEACHER IN THE NEXT CLASS



- WORKSHOPS AND LABORATORIES
- PRACTICAL WORK CARRIED OUT IN GENERAL TEACHING AREAS
- GYMNASIUM AND SWIMMING BATHS;
- SCHOOL KITCHENS AND DINING SPACES
- CORRIDORS AND OTHER CIRCULATION SPACES
- PLUMBING AND MECHANICAL SERVICES

CLASSIFICATION OF AREAS AS PER NEED OF SOUND INSULATION

NOISE PRODUCING AREAS

WORKSHOPS , KITCHENS, DINING ROOMS , PLAY AREAS, BOILER ROOMS

NOISE PRODUCING AREAS BUT QUIET AT TIMES

Assembly halls,Lecture halls,Music rooms,Typing rooms

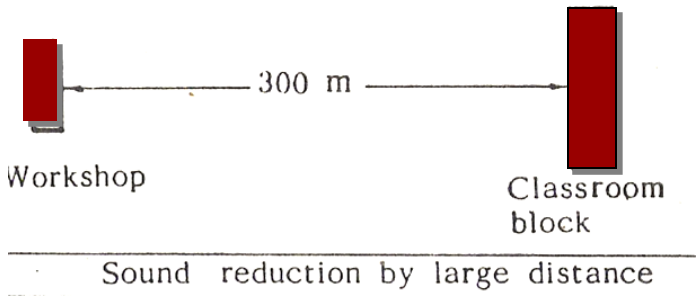
AVERAGE NOISE PRODUCING

General classrooms, Practical rooms, Laboratories, Offices

NOISE CONTROL IN BUILDING DESIGN

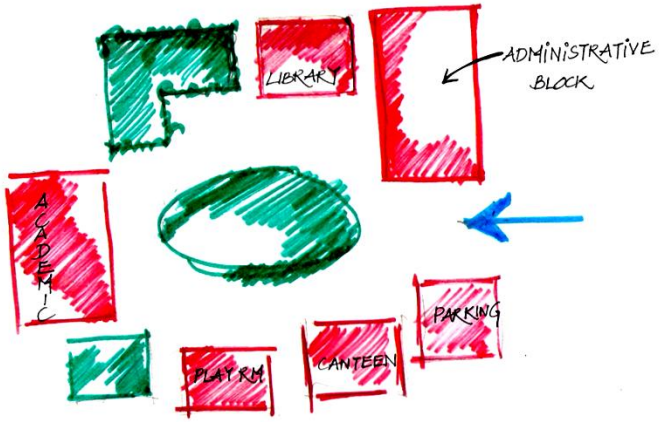
DESIGN CONSIDERATIONS

- IN CASE OF EXTERNAL SOURCES WHICH ARE NOT UNDER CONTROL OF SCHOOL AUTHORITIES , SCHOOL BUILDING SHOULD BE AS FAR AS POSSIBLE FROM THE NOISE SOURCES.

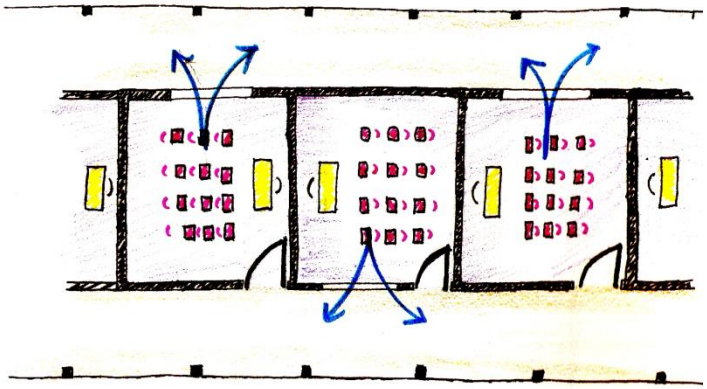


- MINIMUM AMOUNT OF GLAZING IS PLACED ON THE SIDE FACING THE EXTERNAL NOISE
- NOISES ARISING FROM THE ACTIVITIES OF A SCHOOL AND FROM THE USE OF THE BUILDINGS AFTER SCHOOL HOURS MAY CONSTITUTE A NUISANCE TO OCCUPANTS OF SURROUNDING PROPERTY; THEREFORE IT IS DESIRABLE TO PLACE PLAYGROUNDS, WORKSHOPS SWIMMING BATHS, MUSIC ROOMS, ASSEMBLY HALLS AND GYMNASIUMS AS FAR AWAY AS POSSIBLE FROM BUILDINGS WHICH REQUIRE A QUIET ENVIRONMENT.

- Planning should be carried out in zones ; such that the noise making zones are segregated from the quiet areas.

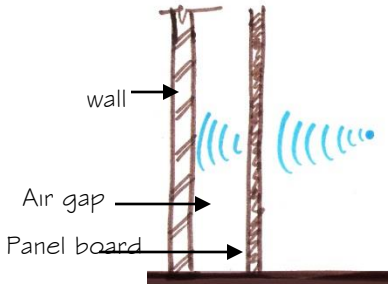


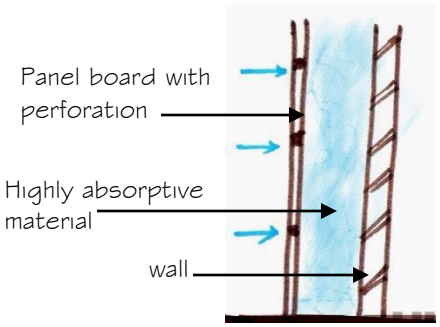
- windows of noisy and quiet rooms should not open to the same courtyard
- windows can be given on alternate walls of two consecutive classes ; such that noise from one doesn't enter the other



- WOODEN FURNITURE SHOULD BE PROVIDED AS FAR AS POSSIBLE. RUBBER BUFFERS SHOULD BE PROVIDED TO THE LEGS OF THE FURNITURE.
- IN CASE OF PRIMARY SCHOOLS, FURNITURE SHOULD BE FIXED TO AVOID ABERRATION

- CAVITY WALLS SHOULD BE PROVIDED IN BETWEEN TWO ROOMS TO PROVIDE COMPLETE SOUND INSULATION.
- THE INNER SURFACES OF WALLS OF CLASSROOMS SHOULD BE PROVIDED WITH SOFT BOARD PANELLING.THESE SOFT BOARDS CAN ALSO BE IN THE FORM OF RESONANT PANELS AND COMPOSITE PANELS.

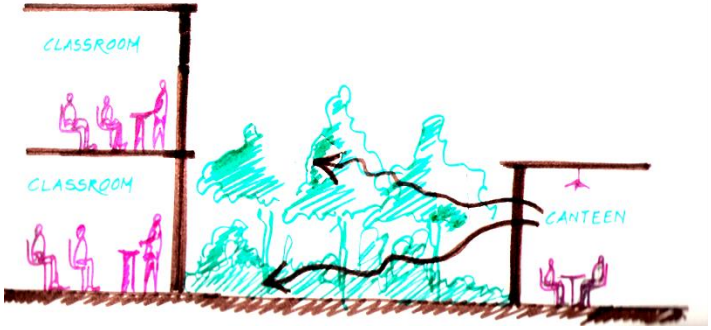




- the two zones of different sound quality can be separated by introducing a buffer strip in between them. This buffer strip strip can be a landscaped area , a corridor, or even some store.

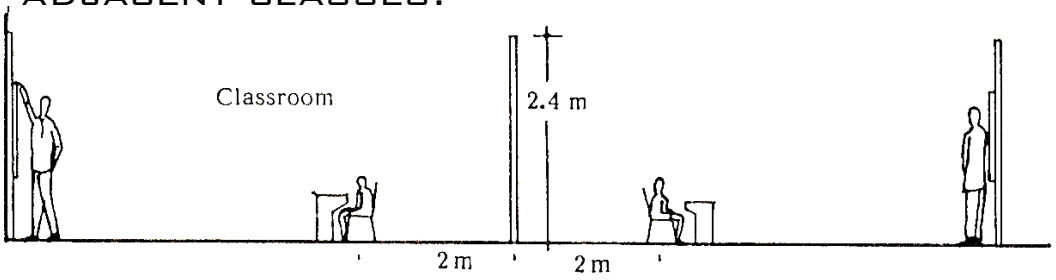
- Trees play an important part in acting as sound barriers.if the classrooms are facing towards high traffic area, then trees can be provided in between to absorb sound waves.

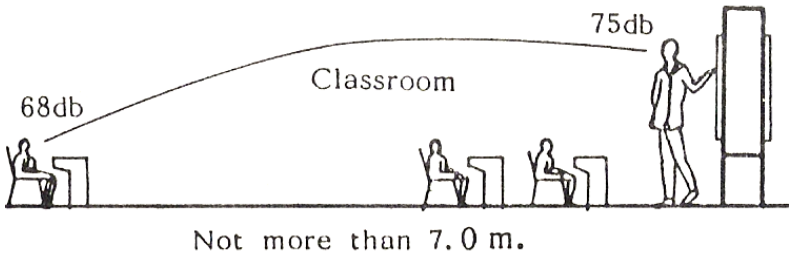
Trees as buffer for external noise



Trees as buffer for internal noise

- If the rooms are being provided with panelled partition ,it should be a minimum of 2.4m high and the maximum distance between the teacher and student should be 7m such that a minimum of 68dB reaches . A minimum buffer of 2m should be given in between the students of two adjacent classes.

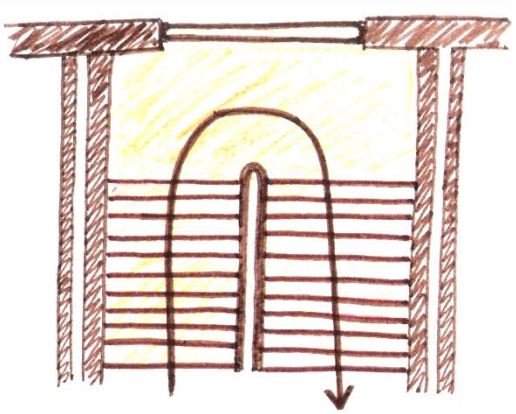




- libraries should be provided with carpets , rugs and other porous materials for absorption of sound. And it should be segregated from the noisy areas.
- Thick slabs should be provided to avoid vibrations and noise from upper floors.
- sound proof glasses , resonant panels , cavity resonators, and other panels can be used for acoustical treatment.

Stairs

walls of the staircase well should be provided with cavity walls.they can even be provided with rat trap bond except on the exteriors.on te exteriors , one can provide sound proof glass which serves both the purpose of light and acoustical material too.



REVERBERATION TIME IN SCHOOLS

ROOMS	FULL	EMPTY
Assembly halls	1.0-1.25	1.5 - 2.5
music teaching rooms	0.75 - 1.25	1.5
Indoor sport areas	----	1.5
Dining areas	----	1.25
classrooms	0.75	1.25
Headmaster's room & staff room	0.5 - 1.00	1.0

- Special attention should be given to noise reduction in schools for the deaf and schools for the blind. Deaf children are taught by means of hearing aids, which cannot be used satisfactorily in high noise levels or in reverberant conditions.

- Blind children depend upon good hearing for understanding speech and for detecting changes in environment. In both these types of school, noise levels should be kept low and reverberation times short. As an example, the reverberation times in empty class-rooms should not exceed one second in schools for the blind or 0.5 seconds in schools for the deaf.

- In schools or institutes, where noisy activities, such as sheet metal work, plumbing and woodwork are likely to be practiced extensively in normal hours, workshops should be regarded as a special category requiring more than 45dB insulation from rooms of any other class.

Proper control of sound in a learning and teaching facility is of critical importance for allowing good aural communication between teachers and students. The following guidelines should be used:

Room acoustic issues:

When selecting finishes for teaching spaces, a proper balance between sound-absorptive and sound-reflective materials is necessary to produce an environment that is not overly reverberant (reducing intelligibility of speech) nor excessively "dry" (results in an unnatural, uncomfortable feeling for most occupants).

- Typical classrooms and meeting rooms should have a lay-in acoustic tile ceiling with the specified tile having a minimum Noise Reduction Coefficient (NRC) rating of 0.65.

- Carpet on floors will absorb some sound, but should mainly be considered for control of footfall noise.

- Walls typically should be a hard, sound-reflective material, such as gypsum board or masonry, Shaping and diffusion on walls in larger rooms should be considered to improve speech reflection patterns and eliminate flutter echoes.

- Corridors should have the same requirements for the ceiling tile. Carpet is a very effective means of reducing footfall noise in the corridors, and should be considered when possible.

Sound isolation issues:

Walls separating classrooms, laboratories, and meeting rooms should be a minimum construction of two layers of 5/8 in. (1.6 cm) gypsum board on one side of a metal stud and one layer of 5/8 in. (1.6 cm) gypsum board on the other

Doors should typically not be located between two classrooms or other sound-critical spaces. Also avoid facing two doors directly across from each other in a corridor.