



TEACHING PEDAGOGY

BUILDING SERVICES (FIRE FIGHTING AND ACOUSTICS)

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STRUCTURE OF THE PRESENTATION

- Pedagogy
- Pedagogical approach and teaching learning outcomes
- Sample outcomes to demonstrate effectiveness of pedagogy

COURSE OBJECTIVES

- To introduce aspects of Indoor Environmental Quality in terms of good hearing conditions.
- To make them understand fire safety's considerations by safe design and incorporation of safety norms the design of buildings

SPPU MARKING SCHEME

BUILDING SERVICES IV			
Subject Code		3201550 (SS) 3201551(PP)	
Teaching Scheme		Examination Scheme	
Total Contact Periods per week (Lectures = 2 Studio = 2)	4	Sessional (Internal)	25
		Sessional (External)	25
		Viva (Internal)	nil
		Viva (External)	nil
		In-Semester exam	30
		End-Semester exam	70
		Total Marks	150
		Total Credits	3

The credits assigned to this subject are really less. There is no viva but there is theory paper. Challenge was to make this technical subject interesting.

SYLLABUS AS PER SPPU

Unit I: Fire Fighting I

- 1.1. Fire triangle, Causes and spread of fire in buildings, fire resistance
- 1.2. Active control systems of fire: fixed and portable fire fighting equipment

Unit II: Fire Fighting II

- 2.1. Passive control of fire: fire safety codes, rules and regulations

Unit III: Acoustics I

- 3.1. Properties and defects of sound
- 3.2. Parameters for good acoustical condition of a room

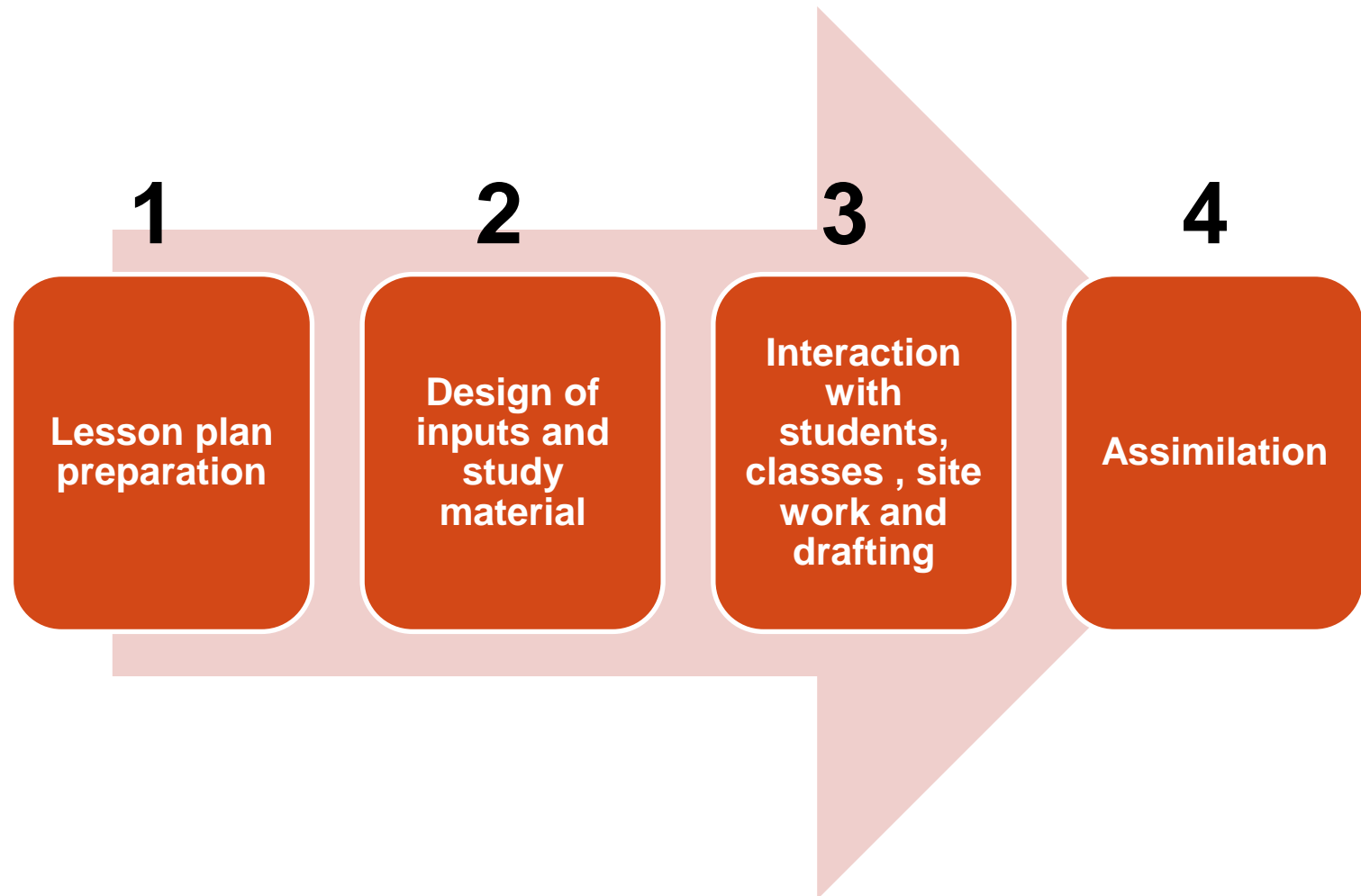
Unit IV: Acoustics II

- 4.1. Noise control methods for air-borne and structure-borne noises
- 4.2. Acoustical materials and construction
- 4.3. Sound amplification system

Unit V: Acoustics III

- 5.1. Reverberation time calculation and recommendations for acoustical treatment
- 5.2. Acoustical treatment Layout design

PEDAGOGY WAS GIVEN THOUGHT DURING



PEDAGOGY WAS FRAMED AROUND FOLLOWING POINTS

- Contextualization and Sensitizing about need of the subject in the area of architecture
- Use of modern teaching aids
- Challenging Activities
- Participative approach

CONTEXTUALIZATION AND SENSITIZING

- **Making Meaning: Connecting students to present environment and the places where they can contribute with their professional intellect**
- Students' own knowledge of experiences of spaces and their acoustical response to be revised as a foundation for new knowledge.
- Providing and discussing experiences that show abstract concepts are drawn from and applied to the everyday world.
- Developing 'understanding' by connecting new learning to previous knowledge of Building materials and technologies and building bye-laws.

CONTEXTUALIZATION AND SENSITIZING- THIS IS HOW IT WAS DONE IN THE FIRST CLASS

Week 1 of the acoustics was a discussion session on the experiential architecture. Students have memories of the spaces that connect to acoustical comfort or discomfort. To understand why it would have happened, there was a detailed discussion. Class happened in outdoor areas and students wrote their experiences in their book in 20 minutes and then they shared it with all. Faculty helped them understanding the key words of acoustics with these experiences. In every class and topic these experiences were taken as background of the principles.

Examples of key words that had come out of this discussion-

Transmission of sound, Structure borne sound, Air-borne sound, Sound masking, acoustical comfort, acoustical shadows



CONTEXTUALIZATION AND SENSITIZING- THIS IS HOW IT WAS DONE

All the students were asked to download the app “decibel meter” on their smart phone and then sensitization was done for all the various types of sound zone in urban context.

To begin with this, they were sent at different venues in campus and later they wrote the sound levels at these locations



CONTEXTUALIZATION AND SENSITIZING- THIS IS HOW IT WAS DONE IN THE BEGINNING

Week 1 of Fire-fighting was a discussion session on the parameters of architectural design that have role in fire-safety. The basic physics of spread of fire was introduced to them. Then they were asked to find the news regarding hazards that have happened because of fire. The discussion over these news happened to see where did architectural design go wrong and how architects can play role to make buildings fire-proof.

Later stage they were supposed to apply knowledge of this subject (acoustics and fire-fighting) to their present design.

CHALLENGING ACTIVITIES

- Cognitively challenges; i.e., instruction that requires thinking and analysis, not only rote, repetitive, detail-level drills.
- Giving them works that need careful leveling of tasks, so that students are motivated to stretch.
- Assisting students to accomplish more complex understanding by building from their previous success of the explorations.

CHALLENGING ACTIVITIES

THIS IS HOW IT WAS DONE

- **Connecting theory to practice-** The most challenging activity given was to correct the acoustics of their own classrooms with cost effective installation.
- They were asked to find out the sources of sound, make observations over the period of time (during morning, lunch break, post studio hours, festivals, etc, and then to see the role of building to achieve best possible environment for the purpose it has been designed.
- Market survey and its analysis were also the challenging task. As they were supposed to see the installation procedure with construction detail. Also, as the available materials in market for acoustics are generally expensive, they were made to think that what can make it.

CHALLENGING ACTIVITIES

THIS IS HOW IT WAS DONE



Students preparing installation to correct the acoustics

PARTICIPATIVE APPROACH

THIS IS HOW IT WAS DONE

- Teaching Through Conversation and working together
- Continuous connection with the class, and being with them even during site work and studio work
- Involving them in problem solving
- Making sure that student talk occurs at higher rates than teacher talking to them
- Ensuring that all students are included in the conversation according to their preferences.
- Listening carefully to assess levels of students' understanding.
- Assisting students' learning throughout the conversation by questioning, restating, praising, encouraging, etc.

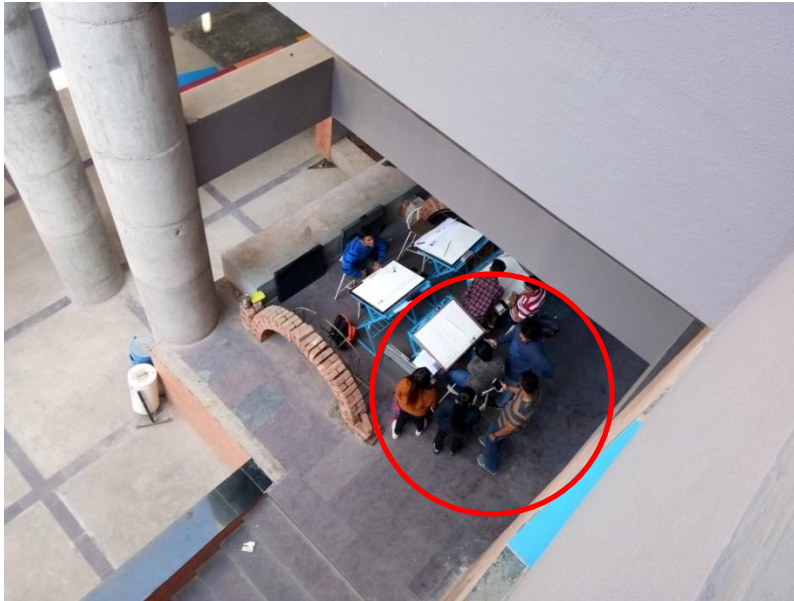
PARTICIPATIVE APPROACH

THIS IS HOW IT WAS DONE

- Two major explorations were designed for class group work, and faculty also acted like a mentor and team member.
- One was correction of studio acoustics, and the other was case studies for fire-fighting and acoustics.
- Every class had a discussion session, where, students' own experiences, thoughts were given priority and faculty just acted like a session chair.
- The individual works were two works, one small and one pertaining to their own design

PARTICIPATIVE APPROACH

THIS IS HOW IT WAS DONE



Students taking sound levels at different places

PARTICIPATIVE APPROACH

THIS IS HOW IT WAS DONE



Discussion time in outdoor classes

PARTICIPATIVE APPROACH

THIS IS HOW IT WAS DONE



Students preparing installations in class

PARTICIPATIVE APPROACH

THIS IS HOW IT WAS DONE



Students preparing installations in class

STRUCTURE OF LESSON PLAN

1. Understanding course objective and interpreting in pedagogy
2. Designing Weekly schedule
3. Interpretation of sessional works in the explorations
4. Defining work assessment parameters
5. Incorporating learning applied from the previous term

HOW THIS PEDAGOGICAL APPROACH IMPROVED TEACHING LEARNING OUTCOMES?

FOLLOWING WERE THE LEARNING OUTPUTS

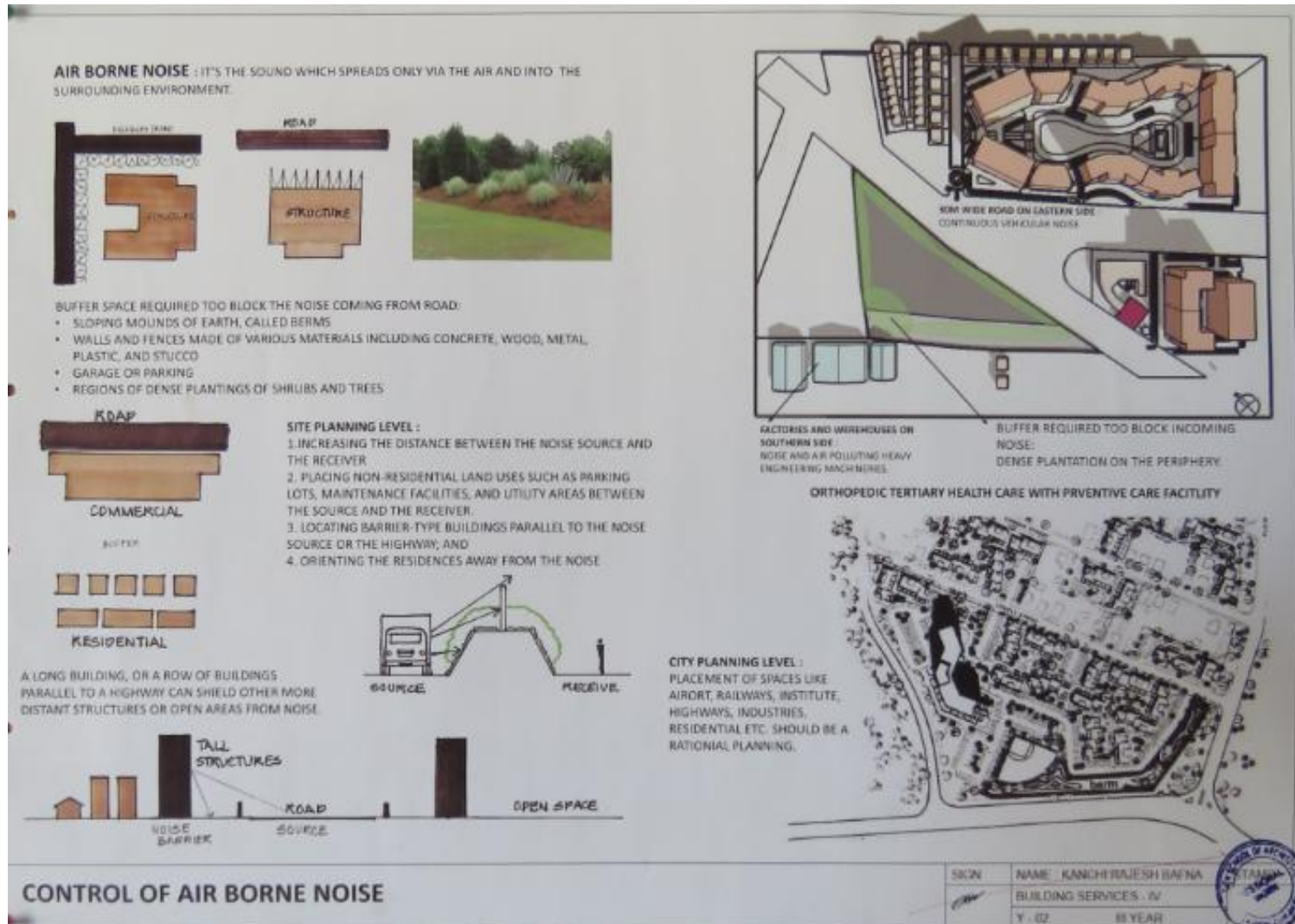
1. Students now are sensitized towards the passive design features that play major role in fire safety and acoustical comfort.
2. Concepts and Passive strategies adopted for acoustics and fire safe design are clear
3. Application base has been made stronger in Architectural Design
4. Enabling choice of appropriate system, materials and integration into Design

1. PEDAGOGY

2. PEDAGOGICAL APPROACH AND OUTPUT

3. EXAMPLES OF OUTPUT

Control of structure borne and Air borne noise in Architecture






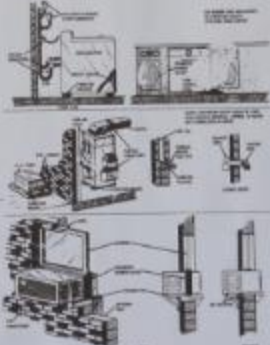


1. PEDAGOGY

2. PEDAGOGICAL APPROACH AND OUTPUT

3. EXAMPLES OF OUTPUT


Control of structure borne and Air borne noise in Architecture

STRUCTURE-BORNE NOISE

Site Planning & landscape Layout	Building Design	Treatment of building envelope	Interior
<ul style="list-style-type: none">• Trees act as sound absorbers.• Height of the plants also help in absorbing sound at different levels.• The building can be located on site such that the natural terrain adds to sound insulation.• Evergreen shrubs are good sound absorbers.  	<ul style="list-style-type: none">• Orienting the residences away from the noise.• Noise Compatible Land Uses as Buffers.• Noise impacts can be reduced by use of single story houses.• Solid Walls Noise can be reduced by eliminating windows and other openings from the walls of a building close to noise sources. The solid wall can then have the effect of a sound barrier for the rest of the building 	<ul style="list-style-type: none">• The denser the wall material, the more it will reduce noise.• Increase the width of the airspace in cavity walls.• Increase glass thickness in windows.• Increased sound insulation can be achieved with casketed door stops or drop bar threshold.• Sound transmission can be reduced by attaching each stud to only one panel and alternating between the two panels.  <p>Fig. 6.5. Proper installation of partitions.</p>	<ul style="list-style-type: none">• Interior noise levels can be reduced by the extensive use of thick, heavy carpeting, drapes, wall hangings, and acoustical ceiling tiles.• Using gypsum boards and other such absorptive materials• Add acoustical blankets. These can increase sound attenuation when placed in the airspace  

CONTROL OF STRUCTURE-BORNE NOISE IN ARCHITECTURE

ADNAN KASUBHAI
BUILDING SERVICES

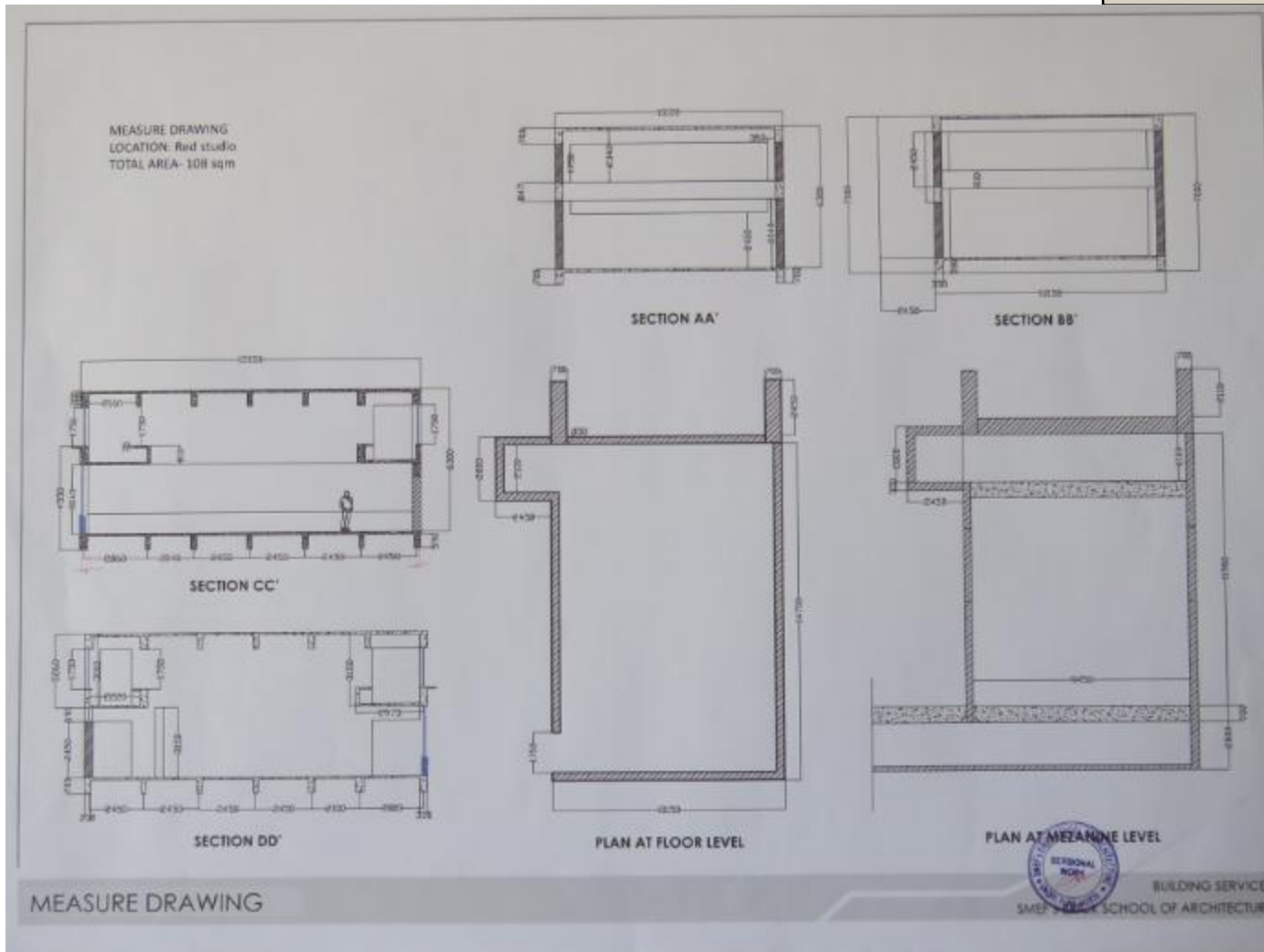


1. PEDAGOGY

2. PEDAGOGICAL APPROACH AND OUTPUT

3. EXAMPLES OF OUTPUT

Correction of studio acoustics














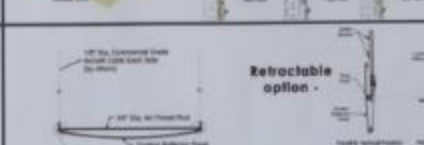


1. PEDAGOGY

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3. EXAMPLES OF OUTPUT

Correction of studio acoustics

REFLECTING MATERIALS						
 <p>When sound waves hit a medium, the reflection of that sound is dependent on dissimilarity of the surfaces it comes in contact with. Sound hitting a concrete surface will result in a much different reflection than if sound were to hit a softer medium such as fiber glass.</p>						
Material	Description	Application	Installation Process	Thickness	Size	Cost (Rs/sqm)
	Melamine, natural wood veneer, paint, etc.	gymnasium, hotels, exhibition centers, schools, studio	 <p>Installation System (with gap)</p>	12mm 15mm 18mm	600 x 600, 1200 x 600, 1200 x 1200, 2400 x 1200	Rs. 630 - 3000
	Melamine, Natural Wood, Veneer MDF, solid wood	wall acoustic, ceiling, hotel, bar, night club, office building, meeting room, office room, studio, air conditioning facilities, air compressor room, manufacture workshop.	 <p>Installation System (without gap)</p>	6mm 9mm 12mm 15 mm 18 mm	600 x 600, 1200 x 600, 1200 x 1200, 2400 x 1200	Rs. 1000 - 2000
	100 % Polyester Fiber panel	Auditorium, Hall, Theater, Hotel, Office, Meeting room, Studio, Music hall, Gymnasium, Entertainment venues, TV background wall, Recording room, KTV, etc.,		8.5 mm, 9 mm, 12 mm or customized	1220 x 2420 or customized	Rs. 1000 - 2500
	wood wool cement board	Auditorium		15mm 20mm 25mm	1220x 2440mm	Rs. 350- 750
	Fabric Acoustic Wall Panel	KTV, Meeting Room, Studio Room, Movie Theatre		25mm 50mm	600 x 1200 600 x 400mm	Rs. 1500 - 3500
	Kinetic Ovalon Reflector Panels	Auditoriums, Lecture Halls, Performing Arts Centres, Worship Spaces, Music Rehearsal Spaces	 <p>Retractable option -</p>	6 mm 12 mm	2700 x 3000mm	Rs. 1000 - 2500

MARKET SURVEY

BUILDING SERVICES
SARVODAYA SCHOOL OF ARCHITECTURE

1. PEDAGOGY

2. PEDAGOGICAL APPROACH AND OUTPUT

3. EXAMPLES OF OUTPUT

Correction of studio acoustics

TYPES OF CEILING APPLIED ACOUSTIC MATERIALS

MOST COMMON MATERIALS USED: POROUS GYPSUM BOARD, FIBREWOL, GLASSWOOL, MINERALWOOL, ACOUSTIC FOAM, FELT, PLUSH FABRICS, PVC SHEETS

CEILING TILES	CEILING CLOUDS	CEILING BUFFERS	CEILING BANNERS	CEILING DIFFUSERS
APPLICATION: COMMERCIAL SPACES, BOARD ROOMS, THEATRE AUDITORIUMS	APPLICATION: RESTAURANTS MALLS, ABOVE STAGE AREA, ARENAS, BROADCAST ROOM	APPLICATION: LARGE BOARD ROOMS, STADIUMS, INDOOR COURTS(SPORTS), FACTORIES	APPLICATION: RESTAURANTS OLYMPIC POOLS, THEATRES, ARENA, AUDITORIUMS	APPLICATIONS: BUNGALOWS RECORDING STUDIOS, THEATRES, LIBRARIES, CLASS
				
MANUFACTURER: SAINT GOBAIN SIZES: 600x600, 1200x600 COST: Rs.65/sq. ft.	MANUFACTURER: ACOUSTIC WORLD SIZES: 595x595, 1200x2400, CUSTOM SIZES AVAILABLE COST: Rs.500/sq. ft.	MANUFACTURER: ECOTONE INDIA, NOIDA SIZES: 250x1500, 250x1800 COST: Rs.145/sq. ft.	MANUFACTURER: ACOUSTICS FIRST SIZES: 600x600, 1200x600 COST: Rs.185/sq. ft.	MANUFACTURER: SANA ACOUSTICS, MUMBAI SIZES: 600x600, 1200x600 COST: Rs.2500/sq. ft.
MANUFACTURER: ARMSTRONG CEILINGS SIZES: 600x600, 1200x600 COST: Rs.78/sq. ft.	MANUFACTURER: ARMSTRONG CEILINGS SIZES: 600x600, 1200x2400 600-1500 DIA. CIRCULAR PANELS AVAILABLE COST: Rs.450/sq. ft.	MANUFACTURER: SNS ASSOCIATES SIZES: 250x1200, 250x2400 COST: Rs.145 /sq. ft.	MANUFACTURER: SAINT GOBAIN SIZES: 600x600, 1200x600 COST: Rs.290-340/sq. ft.	MANUFACTURER: PRIME ACOUSTICS, LUDHIYANA SIZES: 600x600, 1200x1200 COST: Rs.1600/sq. ft.
MANUFACTURER: VITERO TILES SIZES: 600x600, 1200x600 COST: Rs.75/sq. ft.	MANUFACTURER: SAINT GOBAIN GYPROC SIZES: 600x600, 1200x600 COST: Rs.650/sq. ft.	MANUFACTURER: ARMSTRONG CEILINGS SIZES: 400x1200, 400x1800 COST: Rs.165-180/sq. ft.	MANUFACTURER: ARMSTRONG CEILINGS SIZES: 200x1200, 500x1600, CURVED PANELS AVAILABLE. COST: Rs.225-245/sq. ft.	MANUFACTURER: SYMPHONY DESIGN GROUP, BANGALURU SIZES: 600x600, 1200x600 COST: Rs.1200/sq. ft.

MARKET SURVEY

BUILDING SERVICES
SMEF'S BRICK SCHOOL OF ARCHITECTURE

1. PEDAGOGY

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Correction of studio acoustics

ECOPHON
MANUFACTURER: SAINT GOBAIN GROUP
SIZE: 2400X1200 AND 40MM THK
COST:
THESE PANELS CAN BE INSTALLED IN A CEILING GRID OR AS INDEPENDENT UNITS, WALL PANELS, CLOUDS, BAFFLES.
A.B = 0.65Hz

SONEX AFS
MANUFACTURER: PINTA ACOUSTICS
SIZE:
COST:
THIS COMPRISES OF A MELAMINE FOAM PANEL WHICH IS LAMINATED TO A THIN FIBERGLASS MESH.
A.B = 0.54Hz

PYROK ACOUSTMENT
MANUFACTURER: A.B = 0.25Hz
SIZE:
COST:
IT IS A LINE OF ACOUSTICAL SPRAY-APPLIED PLASTERS, SIMILAR IN THEIR APPLICATION OS STUCCO AND TRADITIONAL 3 COAT PLASTER.

FELLERY
MANUFACTURER:
SIZE:
COST:
IT COMPRISES OF A HIGH DENSITY FIBERGLASS SUBSTRATE WITH A SPRAY-APPLIED AND HAND-TROWELLED TWO-COAT SOUND ABSORBING PLASTER, COMPOSED OF COTTON FIBRE AND PERLITE.
A.B = 0.7Hz

TECHSTYLE
MANUFACTURER:
SIZE:
COST:
IT IS A TENSIONED MEMBRANE COMPOSITE SYSTEM THAT IS USED FOR LIGHTWEIGHT, LONGSPAN ROOFING SYSTEMS SUCH AS ATHLETIC, FACILITIES AND STADIUMS.

MOSS
MANUFACTURER:
SIZE:
COST:
LONG LASTING AND MAINTAINENCE FREE.

GLASS WOOL
MANUFACTURER:
SIZE:
COST:
IT IS MADE FROM SOME PERCENTAGE OF RECYCLED GLASS CONTENT SUCH AS WINDOWS, AS WELL AS SAND, SODA ASH, LIMESTONE, AND OTHER MATERIALS.
A.B = 0.25Hz TO 0.7Hz

CEILING TILE
MANUFACTURER:
SIZE: 2FTX2FT OR 2FTX4FT
COST:
WHEN TILES LAY ON TOP OF THE T BAR, GRID IS VISUALLY EXPOSED. SOME TILE PROFILES ALLOW FOR A SEMI OR FULLY CONCEALED GRID, CREATING A MORE MONOLITHIC SURFACE.


FELT
MANUFACTURER:
SIZE:
COST:
THEY CAN BE MANUFACTURED TO BE SOFT & PLIABLE OR TOUGH AND RIGID.

CELLULOSE
MANUFACTURER:
SIZE:
COST:
IT IS AVAILABLE IN VARIETY OF THICKNESSES AND DENSITIES AND UTS ACOUSTIC ABSORPTION IS COMPABLE TO FIBERGLASS BOARD.
A.B = 1.05Hz

COTTON
A.B = 0.45Hz
MANUFACTURER:
SIZE:
COST:
ACOUSTICAL COTTON PANELS ARE READILY AVAILABLE IN THE MARKET, MANUFACTURED IN DIFF. THICKNESSES, DENSITIES AND COLOURS.

DENIM BATT
MANUFACTURER: A.B = 0.83Hz
SIZE:
COST:
ALTERNATIVE TO MINERAL WOOL FOR THERMAL INSULATION AND SOUND ABSORPTION.

MARKET SURVEY

 BUILDING SERVICES
SMD - BRICK SCHOOL OF ARCHITECTURE

1. PEDAGOGY

2. PEDAGOGICAL APPROACH AND OUTPUT

3. EXAMPLES OF OUTPUT

Correction of studio acoustics

SOUND ABSORBING MATERIAL

1. Acoustic Foam (Auralex Studiofoam Wedges)

Auralex Acoustics Studiofoam Wedges

Best Use: For improving the sound in small to medium rooms, like recording studios, control rooms, and even small home theaters.

NRD: 0.8

Size: 12"x12"x3"

Colors: Thermal, Burgundy

Auralex is a well known acoustic foam brand that has dozens of foam shapes and sizes that are perfect for studios, recording rooms, bedrooms, and home theater rooms. Studio foam is their most popular product, and the 2" wedges are the best sellers.

Studiofoam Wedges have an NRC rating of 0.8 and the wedge shape can significantly cut down reverberation, slap, and flutter. The 2" panels are Class A fire rated per ASTM E-84.

Use 48 Command strips, foam and tape strips, or spray adhesive to mount the foam to your room's walls and ceiling. If you ever plan on moving them, it's highly recommended to use the removable type of adhesive strips to make removal easier.



2. Sound Absorbing Foam (Pro Studio Acoustics Tiles)

Pro Studio Acoustics Wedge Foam Tiles

Best Use: Use as an alternative to the Auralex panels. They offer multiple attractive colors to break up with the channels that look great in any room.

NRD: 0.85

Size: 12"x12"x2"

Colors: Thermal with Blue, Red, Teal, and Purple

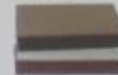
Pro Studio wedges are made in the USA from a high-quality acoustic foam. The wedges can be installed on walls where noise reflection is a problem, or on ceiling tiles to cut down echo and reverberation. Pro Studio foam is no comparison to the cheap 'egg crate' variety foam.

Most people use the Pro Studio Acoustics foam panels for absorbing sound in both home and professional use. The light colors turn up cleaner rooms, giving rooms more energy, and status while absorbing sound and killing echoes.



3. Acoustic Panels (ATS Acoustics)

ATS Acoustic Panels



Best Use: Acoustic panels are best for rooms where the appearance of wedge and pyramidal foam is undesirable. The wood framed panels look more like a decoration or large picture frame than a sound absorbing panel.

NRD: 1.0

Size: 24"x48"x2"

Colors: Black, White, Burgundy, Teal

For rooms where foam just won't cut it visually, acoustic panels are there to fill the void. ATS panels are constructed with fused 800 mineral wool and a solid wood frame. They finish off the panel with an all-jute fabric cover to make it a great looking piece.

All that's left is to hang them on the wall with the included hardware. It's important to note the ATS Acoustic panels are sold as single panels, but you can always buy multiple panels at one time to save on shipping costs.

4. Acoustic Curtains (Utopia Thermal Black-out Curtains)

Utopia Bedding Thermal Blackout Curtains

Best Use: Blackout curtains are good for reducing the noise coming in or going out from windows and doors. Use them in a bedroom, home theater, nursery, or wherever a little quiet is needed.

A typical acoustic curtain uses quality, heavyweight, shock fabric combined soundproofing materials like mass loaded vinyl to dampen sound and reduce echo. While there are many acoustic curtains on the market, the best alternative for home is to buy quality, heavyweight blackout curtains.

For the home, acoustic curtains are meant to improve the sound in a room, as opposed to blocking sound from leaving or entering. Our favorite acoustic curtains are the Utopia Bedding Blackout Curtains. For more info, check out our guide to acoustic curtains for home theaters.

Further Reading: Industrial noise can be controlled with the installation of sound curtains. These curtains are made of quilted fiberglass or Rayonated paper, sandwiched over mass loaded vinyl. These curtains are stiffer than most and hang as frames making them mobile and easy to surround a particularly noisy piece of equipment or area.



5. Floor Underlayment (Roberts Super Felt)

Roberts Super Felt Underlayment

Uses: Use a quality underlayment to reduce sound transmission of hardwood and engineered floors.

Size: 360 sq feet

Thickness: 6 mm

SR Rating: 85

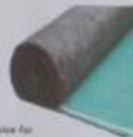
IR Rating: 67

Roberts Super Felt underlayment is an excellent choice for soundproofing.

A floor, especially with laminate, hardwood, and engineered wood. The felt is made from recycled fibers, compressed and heat treated to form a rich sound absorbing material.

The roll of material has adhesive strips on one side, you simply lay it down over the subfloor with an 1/8" overlap. There is a built in vapor barrier, so no need to worry about moisture or smells absorbing into the felt.

Roberts Super Felt is a great product to enhance the feel and sound reduction qualities of your new floor installation. It's tough, goes down easy, and is simply a great soundproofing product.



6. Door Sealing Gasket & Sweep Kit

Door Sealing Kit

Best Use: Foam gaskets are a great cheap material for filling in gaps on door frames where noise tries to leak in and out of rooms.



Gaps between the door jam and door are prime paths for unwanted noise to travel. Compressible foam gasket material helps seal up the gap and absorb some of the sounds. The door sweep portion is to seal up the floor section of the door, especially on hard floors.

It's just one piece of the puzzle when it comes to soundproofing doors, however. A cheap hollow door is still going to transmit sound even with a gasket and door sweep, so problem areas may need acoustic curtains or blankets added to be effective.

MARKET SURVEY



BUILDING SERVICES
SMET & BRICK SCHOOL OF ARCHITECTURE

1. PEDAGOGY

2. PEDAGOGICAL APPROACH AND OUTPUT

3. EXAMPLES OF OUTPUT

Correction of studio acoustics

NOISE BARRIER

1. MILD STEEL BARRIER
 - MANUFACTURER- INDIAMART
 - SIZES- AS PER DEMAND
 - COST- RS 11000/ SQ M
 - APPLICATION – HIGHWAYS , COMPOUND WALLS ,
 - AB = 0.82Hz



2. NOISE BARRIER
 - MANUFACTURER – SOLACE
 - SIZE – AS PER DEMAND
 - COST – RS 170 /SQ FT
 - APPLICATION – RESIDENTIAL AND COMMERCIAL BUILDINGS ,



3. FLEXIBLE NOISE BARRIER
 - MANUFACTURER – PYROTEK
 - SIZE – AS PER DEMAND
 - COST – 100/ SQ FT
 - APPLICATION – INDUSTRIAL BUILDINGS ,



SOUND REFLECTOR

1. RANDOM GROVED WOODEN PANEL
 - MANUFACTURER- HV ACOUSTIC
 - SIZES- AS PER DEMAND
 - COST- RS 800/ SQ M
 - APPLICATION – SOUND REFLECTOR



2. SOFT ACOUSTIC PANEL
 - MANUFACTURER – AUTONODE
 - SIZE –AS PER DEMAND.
 - COST – RS 360/SQ FT
 - APPLICATION – RESIDENTIAL BUILDINGS ,



3. FABRIC COVERED ACOUSTIC PANEL
 - MANUFACTURER – SOUND AND ABOUT
 - SIZE – AS PER DEMAND
 - COST – RS 140/ SQ FT
 - APPLICATION – RESIDENTIAL BUILDINGS ,



MARKET SURVEY



BUILDING SERVICES

SHRADDHA MAHORE MANJREKAR

Correction of studio acoustics

TYPES OF WALL APPLIED ACCUSTIC MATERIAL

SOUND ABSORBER

1. ACOUSTIC FOAM PANELS

- MANUFACTURER- E-PARK
- SIZES- AS PER DEMAND
- COST- RS 1250/ SQ.M
- APPLICATION – COMMERCIAL AND INDUSTRIAL SPACES



2. POLYSTER FIBRE ACOUSTIC PANEL

- MANUFACTURER – AMAZONE
- SIZE – 2400 X 1200 MM
- COST – RS 90/ SQ. FT
- APPLICATION – RESIDENTIAL BUILDINGS, SCHOOL, COLLEGES, THEATERS.



3. WOODEN ACOUSTIC PANEL

- MANUFACTURER – SOLACE GYNTECH
- SIZE – 15 X 128 X 2440 MM
- COST – 160/ SQ. FT
- APPLICATION – STUDIO, OFFICE, SCHOOL.



SOUND DIFFUSER

1. ACOUSTIC PANEL

- MANUFACTURER- SOLACE
- SIZE – 9MM
- COST – RS 100/ SQ. FT
- APPLICATION – CLASSROOM, GYM, MUSIC ROOM
- A.B = 0.95Hz



2. FABRIC WRAPPED ACOUSTIC PANEL

- MANUFACTURER – SOLACE
- SIZE – 2X2, 2X4 FEET
- COST – RS 175 / SQ. FT
- APPLICATION – PUBLIC BUILDINGS, SCHOOL, RESTAURANTS, OFFICE.
- A.B=1.0Hz



3. WOODEN SOUND DIFFUSER

- MANUFACTURER – INDIAMART
- SIZE – 15 X 15 INCH
- COST – RS 1000/ SQ. FT
- APPLICATION – PUBLIC BUILDINGS, CONTROL ROOMS.
- A.B=



MARKET SURVEY

BUILDING SERVICES
SME - BRICK SCHOOL OF ARCHITECTURE

1. PEDAGOGY

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Correction of studio acoustics

INTRODUCTION

Soundproofing is any means of reducing the sound pressure with respect to a specified sound source and receptor. There are several basic approaches to reducing sound: increasing the distance between source and receiver.

MARKET SURVEY

PARATHIN LEAD FOAM

Lead foam is an exceptionally good sound-insulating material. This acoustic property of the lead sheet is the result of its high superficial weight (weight per unit area of the surface) as well as its rapid imprint. This implies that a sound barrier incorporating lead can be lighter and thinner than other sound barriers offering a similar acoustic performance.

Construction Technique : Extremely easy to install and can be cut to shape with scissors or knife. Lead foam is an acoustic roll that can be molded, folded, creased or crimped to provide a sound-tight seal around any shape, or to fit any enclosure system.

Reflective Index = 0.95

Application & Uses : Sound Showrooms, Machinery Enclosures.

Sizes : 1000mmx1800mm Panels

Costing : 200 sqft

Manufacturer : H.M.S Metal Corporation, Bhavani Peth.

Graph displaying lead foam's ability in reducing sound levels in comparison with other materials.

OWENS CORNING FIBER GLASS

Fiber Glass is used as the core insulation absorber for acoustic wall and ceiling panels. These acoustic panels are usually made with wood/metal frames around the fiberglass board and wrapped with acoustical transparent cloth. The sound panels are then hung on the walls and ceilings of the room absorb unwanted sound reflections. Thicker fiberglass panels may be placed in the corners of the room to absorb lower sound frequencies (bass).

Application & Uses : Ceiling tile applications

Sizes : 2'x2', 2'x4', 4'x8'

Thickness 1" or 2"

Costing : Box 6 Panels Each Rs 5450

Manufacturer : H.M.S Metal Corporation, Bhavani Peth.

Construction Technique

GLASS MINERAL WOOL

A resin is used to bind the wool together to form a mat of material. The density of the product determines whether the insulation is a lightweight quilt supplied in rolls, a flexible slab or a rigid slab, and its thermal insulation value.

Application & Uses : Loft wall, insulation walls.

Sizes : A.B = 0.64Hz

Costing : Rs 160 Sqm

Manufacturer : H.M.S Metal Corporation, Bhavani Peth.

Construction Technique

ACOUSTIC WEDGE FOAM

Acoustic foam is often used to reduce echoes by attaching it to the walls of large rooms, like churches, synagogues and temples. ... Foam sheets are available either with or without self-adhesive backings and as laminates. Our self-adhesive acoustic foam sheets are easy to cut and fit to a clean surface.

Application & Uses : Residence, studio room, home theatres, schools, church, environmental protection, automotive.

Sizes : 300*300mm

Costing : 3 panels for Rs 1600

Manufacturer : H.M.S Metal Corporation, Bhavani Peth.

Construction Technique

ACOUSTIC WEDGE FOAM

Perforated gypsum panel, with the features of sound absorption, easy to installation and clean, fire proof, water proof, anti-moisture, and its long serving life, is popular in the construction fields. As technology advances, perforated gypsum panel now have various surface design to match different decorative styles.

Application & Uses : Roof Covering, Office, school, shopping mall, bedroom etc.

Sizes : 1200*2400mm

Costing : Rs 160 Sqm

Manufacturer : H.M.S Metal Corporation, Bhavani Peth.

Construction Technique

MARKET SURVEY

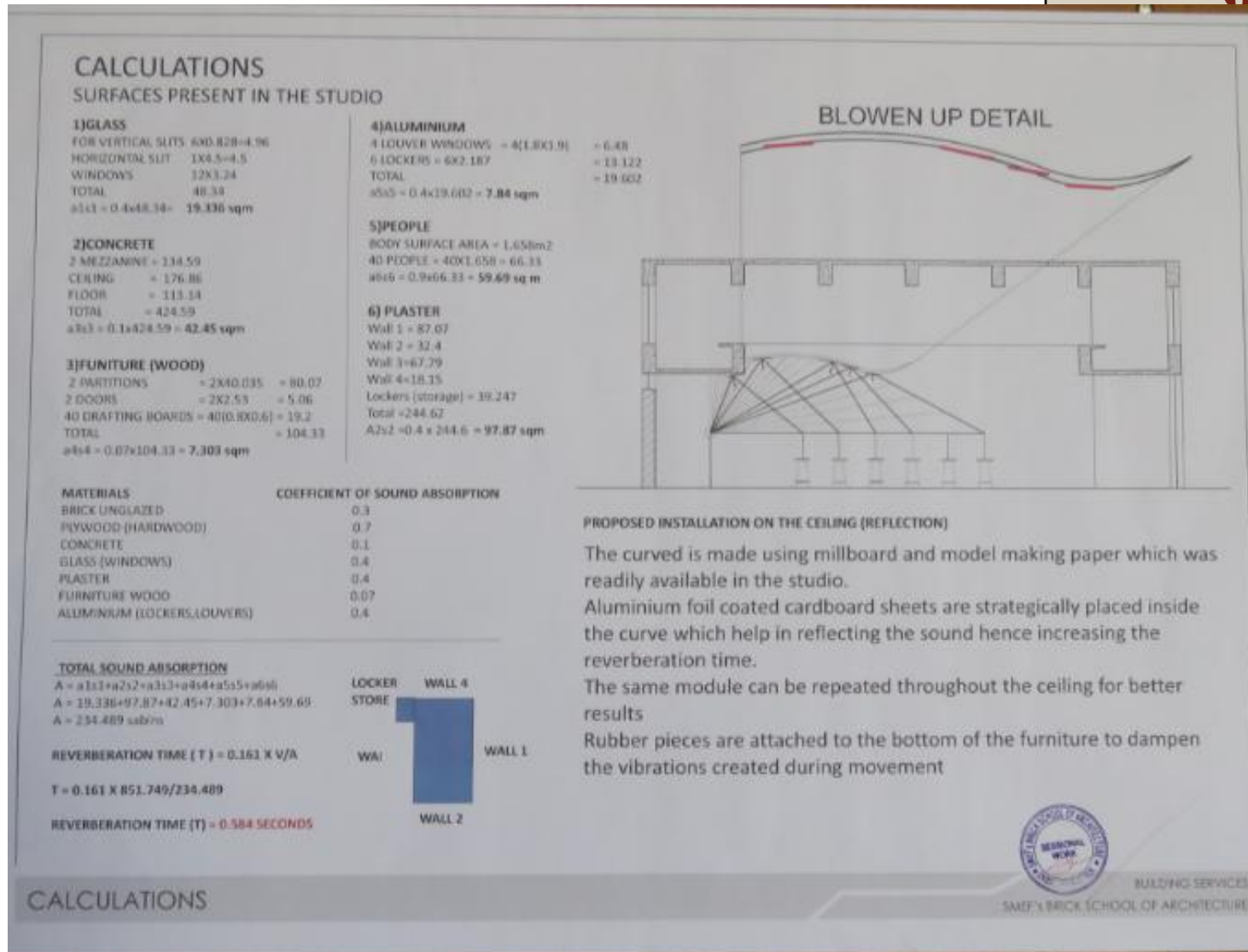
BUILDING SERVICES
SMEP'S BRICK SCHOOL OF ARCHITECTURE

1. PEDAGOGY

2. PEDAGOGICAL APPROACH AND OUTPUT

3. EXAMPLES OF OUTPUT

Correction of studio acoustics



1. PEDAGOGY

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ACOUSTIC DEFECTS IN STUDIO

REVERBERATION

It is the persistence of sound in the enclosed space, after the source of sound has stopped. Reverberation time is, time taken for the sound to drop by 60db.

FORMATION OF ECHOS

An echo is produced when the reflected sound wave reaches the ear just when the original sound from the same source has been already heard. An echo must reach after one-tenth second of the direct sound.

SOUND FOCI

Sometimes the shape of the hall makes sound waves to concentrate in some particular areas of the hall creating a sound of large quality. These spots are called sound foci.

DEAD SPOTS

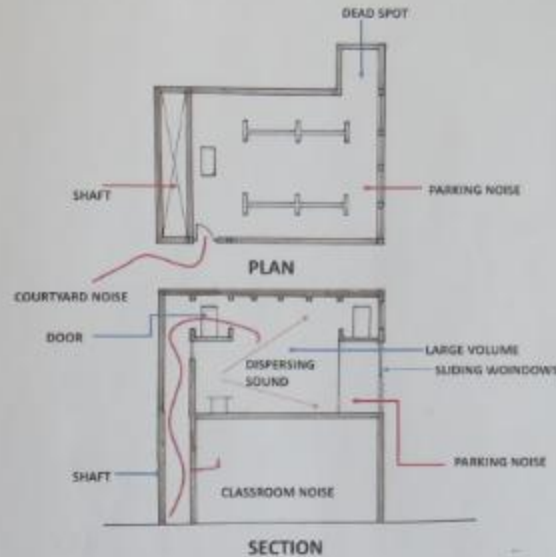
This defect is the outcome of formation of sound foci. Because of high concentration of reflected sound at sound foci, there is deficiency of related sound at some other points. These spots are known as dead spots where sound intensity is so low that it is insufficient for hearing.

EXTERNAL NOISE

External noises from vehicles, traffic engines, surrounding buildings, construction machines etc. may enter the studio either through openings or even through walls and other structural elements having improper sound insulation.

INSUFFICIENT LOUDNESS

Insufficient loudness is a factor affected by planning. The loss of sound as it travels across the studio due to the volumes and the materials of the space.



INFERENCES

- 1) The initial sound from the source should be of adequate intensity so that it can be heard throughout the hall.
- 2) The boundary surface should be so designed that there are no echoes or near echoes.
- 3) The sound produced should be evenly distributed so that there is no dead spots and sound foci.
- 4) Dead spots can be removed by suitably placing diffusers and reflectors and with right proportions of internal spaces.
- 5) External noises can be removed by proper planning of the studio with respect to its surroundings and by proper sound insulation of external walls.



Richa Aung, Prathima Kapur, Varsha Kulkarni, Swarni Kapadia, Rishi Senf

SOURCE	ACTIVITY	LOUDNESS(dB)
Courtyard	Playing + Breaktime	65-70
Shaft	Lectures	55-60
Mezzanine Door	Banging due to wind	45
Parking	Dispersal	30
Parking	Car horn	68-70

Note: All openings closed causes loudness to decrease by 10-15dB

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TYPES	INSULATIVE WALL COVERINGS		ABSORPTIVE WALL COVERINGS		REFLECTIVE
COMPANY NAME	Nankarrow GeoWool Premium Acoustic Panels	Nankarrow QuadraFuse Premium Acoustic Diffuser	Nankarrow IsoBoard High Density Soundproofing Panel Board	Nankarrow GeoHive Wood Panels	Nankarrow NeoWave Wedge Acoustic Panel
IMAGES					
MATERIAL	PREMIUM ROCK WOOL	PREMIUM TAIGA SPRUCE WOOD	CEMENT - BONDED PARTICLE BOARD	NATURAL PINE WOOD	FUSED FOAM SHEETS
SIZES	4ft x 2ft & 12mm thk	2ft x 2ft & 6mm thk	8ft x 4ft & 10mm thk	1ft x 1ft & 2mm thk	2ft x 2ft & 4mm thk
COST	Rs.655/- per panel	Rs.1438/- per panel	Rs.1084/- per panel	Rs.410/- per piece	Rs.2980/- per panel
FEATURES	<ol style="list-style-type: none"> 1. SUPERB ACOUSTIC PERFORMANCE. 2. DENSITY - 120 KG/CUBIC METER. 3. EXCELLENT LOW FREQUENCY ABSORPTION. 4. HIGH INSULATION EFFICIENCY FOR MAXIMUM THERMAL COMFORT. 5. NON-COMBUSTIBLE. 6. HIGH FIRE RESISTANCE. 	<ol style="list-style-type: none"> 1. FULLY CNC CUT WITH NO IMPERFECTIONS. 2. 2-D GRID DIFFUSER WITH HEMISPHERICAL SOUND SCATTERING. 3. EASY TO INSTALL. 4. COLOUR - NATURAL. 	<ol style="list-style-type: none"> 1. EXCELLENT SOUND ANNEUTATION PROPERTIES. 2. HIGH FIRE RESISTANCE. 3. EXCELLENT LOAD CARRYING CAPACITIES. 4. HIGHLY MOISTURE RESISTANT. 5. RESISTANT TO FUNGUS, TERMITE/VERMIN, IMPACT. 6. NON-TOXIC AND ENVIRONMENT FRIENDLY. 	<ol style="list-style-type: none"> 1. NATURAL PINE WOOD PRODUCT. 2. ENSURES OUTSTANDING ACOUSTIC PROPERTIES DUE TO OPEN SURFACE STRUCTURE. 3. NOT AFFECTED BY HUMIDITY. 4. PAINTABLE SURFACE. 	<ol style="list-style-type: none"> 1. FULLY CNC (LASER CUT) WITH NO IMPERFECTIONS. 2. ABSORBS MID AND HIGH FREQUENCY REFLECTIONS TO CONTROL AMBIENCE. 3. ALLEVIATES FLUTTER ECHO AND SLAP BACK.

MARKET STUDY - WALL COVERINGS FOR ACOUSTICS

B.S.O.A. T.Y.B.Arch
BUILDING SERVICES 6

ANGH S (24)
HEENAL S (27)
SHREYA S (38)
SMERA O (29)
VIVEK J (17)
SACHIN K (20)
FATEMA K (21)
SIDDHANT P (31)
KRINJAL J (14)
RASHNEET C (8)

1. PEDAGOGY

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Correction of studio acoustics

ACOUSTIC FLOOR MAT



COST : RS. 5000/SQ.M
LOCATION : BELOW THE SCREED
THICKNESS : 8-15 MM
MATERIAL : MIXED CELLULAR POLYURETHANE
USAGE : AT CONCERT HALLS, GYMS & FOR INDUSTRIAL USE.
LOAD RANGE : 5000 KG/SQ.M
PURPOSE : REDUCE IMPACT OF NOISE

ACOUSTIC FLOOR BLOCKS



COST : RS. 400/PIECE
MATERIAL : MIXED CELLULAR POLYURETHANE
SHAPE : RECTANGLE, SQUARE
USAGE : DANCE STUDIOS, CONCERT HALLS, RECORDING STUDIOS
PURPOSE : NOISE INSULATION
BRAND : GETZNER

EPDM BLACK ACOUSTIC FLOOR UNDERLAY



COST : RS. 300/PIECE
MATERIAL : EPDM
DIMENSIONS : 1M x 1M
COLOUR : BLACK
THICKNESS : 5, 10, 15, 20 MM
USAGE : NOISE BARRIER, SOUND REFLECTORS USED INDOOR
BRAND : ALP AEROFLEX

KEY BENEFITS OF A.F.M :-

ABSORPTION COEFFICIENT IS 0.65
A+ CLASSIFICATION FOR INDOOR AIR QUALITY
CONSISTENT HIGH IMPACT NOISE INSULATION THROUGHOUT THE ENTIRETY OF ITS SERVICE LIFE
EXTREMELY LOW DEFLECTION EVEN UNDER HIGH LOADS

KEY BENEFITS OF A.F.B :-

ABSORPTION COEFFICIENT IS 0.5
NEUTRAL FREQUENCIES OF UPTO 8 HZ
FLEXIBLE FLOOR INSTALLATIONS FROM 80 MM - 500 MM
IMPACT NOISE REDUCTION EVEN IN LOW FREQUENCY RANGE

KEY BENEFITS OF EPDM UNDERLAY:-

SUITABLE FOR ALL FLOOR FINISHES INCLUDING GRANITE, CERAMIC, STONE & MARBLE
RESISTANT TO AGEING & DEFORMATION
QUICK & EASY TO INSTALL. SIMPLY BOND THE SUB-FLOOR BENEATH FINAL FLOOR FINISH
100 % RECYCLABLE MATERIAL WITH ZERO GLOBAL WARMING POTENTIAL & ZERO OZONE DEPLETION POTENTIAL



MARKET SURVEY - ACOUSTIC MATERIALS

B.S.O.A. T.Y.B.Arch
BUILDING SERVICES 6

ANISH S (34)
HEENAL S (37)
SHREYA S (38)
SMERA O (29)
VIVEK J (17)

BADR K (20)
FATEMA K (21)
SIDDHANT P (31)
KRISHAL J (14)
RASHNEET C (38)

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ACOUSTIC CEILING PANELS



FEATURES:

- ATTRACTIVE DESIGN
- WATER PROOF
- LONGER SERVICE LIFE
- HIGH ACOUSTICAL PERFORMANCE
- GOOD LIGHT REFLECTANCE
- COST EFFECTIVE - TO REDUCE REVERBERATION

APPLICATION:

- OFFICES
- CAFETERIAS
- RAILWAY STATIONS
- AIRPORTS

PRICE: RS 225 / SQUARE FEET
ABSORPTION COEFFICIENT: 0.5
SIZE: 2'x2', 2'x4' OR CUSTOM SIZES.
INSTALLATION: LAY-IN GRID

EDGE OPTIONS



STANDARD REVEAL EDGE (OPTIONAL)



SQUARE EDGE (STANDARD)

ECOSONIC POLYESTER FIBER ACOUSTIC PANELS



FEATURES:

- FORMALDEHYDE FREE
- NO BINDING AGENTS
- ODOR AND DUST FREE
- NO RISK OF SKIN IRRITATION OR RESPIRATORY PROBLEMS
- 60% PET-RECYCLED CONTENT
- 100% RECYCLABLE
- CLASS A FIRE RATED

ADVANTAGES:

- A HIGHER TACKABILITY
- ABUSE RESISTANT
- A HIGHER DEGREE OF RESILIENCY FOR THE BOARD ITSELF
- THE PANELS CAN BE PUT UP WITHOUT A FABRIC COVERING

PRICE: RS. 175 / SQUARE FEET
ABSORPTION COEFFICIENT: 1.0
NOISE REDUCTION COEFFICIENT: 0.45
SIZES: 4' X 8'
THICKNESS: 9MM
EDGE DETAIL: SQUARE

MOUNTING OPTIONS: IMPALING PINS AND CONSTRUCTION ADHESIVE OR MECHANICAL FASTENERS.



FABRIC WRAPPED CEILING CLOUDS



FEATURES:


- REDUCE REFLECTIVE SOUNDS IN LARGE OPEN AREAS
- CUSTOM SIZES AND SHAPES ARE AVAILABLE
- ARCHITECTURALLY DECORATIVE
- LARGE SIZED CLOUDS REINFORCED WITH TEE BAR STIFFENER/HANDERS.

APPLICATIONS:

- HOME THEATERS
- SHOPPING MALLS
- CONVENTION CENTERS
- ARENAS

PRICE: RS 100 / SQUARE FEET
THICKNESS: 1" OR 2"
ABSORPTION COEFFICIENT: 0.6

MOUNTING OPTIONS
EASY TO INSTALL. THE CEILING CLOUD IS SUSPENDED HORIZONTALLY WITH A CLIP/EYELET COMBINATION



BUILT FOR MAXIMUM SOUND REDUCTION, GLASS FIBER CORES WITH FACES AND EDGES WRAPPED IN FABRIC OR PERFORATED VINYL



MARKET STUDY- ACOUSTIC MATERIAL

B.S.O.A. T.Y.B.ARCH
BUILDING SERVICES 6

HEENAL S (37) SMERA D (29) SHREYA S (38) ANISH S (34)

BADR K (20) SIDDHANT P (31) FATEMA K (21) KRINJAL J (14)

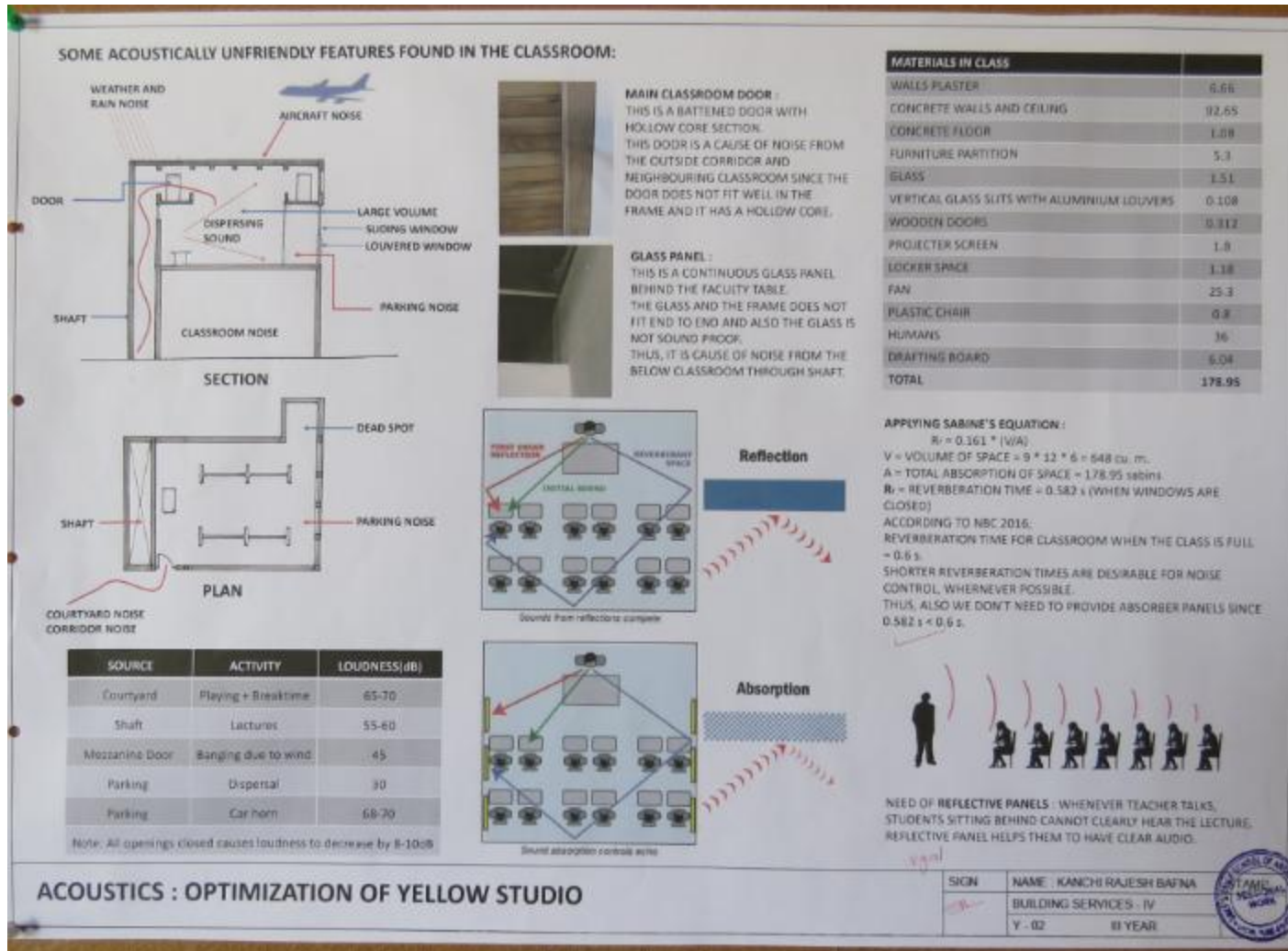
20/05/24 # 06

1. PEDAGOGY

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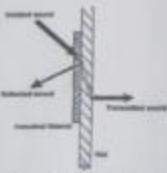
SOME BETTER ALTERNATIVES WHICH WOULD MAKE THE CLASSROOM ACOUSTICALLY FRIENDLY:




INSTALL HYPO-ALLERGENIC CARPETS OR AREA RUGS ON THE FLOOR:
OVERALL INTERIOR NOISE LEVELS CAN BE REDUCED BY THE EXTENSIVE USE OF THICK, HEAVY CARPETING. THEY CAN REDUCE OVERALL SOUND LEVELS BY REDUCING SOUND REVERBERATIONS.



SOFT TEXTURED, SOUND-DEADENING WALL COVERINGS




BY PROPER SOUND INSULATION OF EXTERNAL WALLS MATERIAL SUCH AS GYPSUM BOARD (DRYWALL) OR WOOD PANNELLING ARE HIGHLY EFFECTIVE.




GYPWALL STAGGERED STUD ACOUSTICAL PARTITION SYSTEM:

BLOCKING THE NOISE COMING IN THE CLASSROOM FROM THE BELOW CLASSROOM THROUGH SHAFT; PROVIDING PARTITIONS AT MEZZANINE.




SEALING ANY PARTITION OR OTHER LEAKS WITH A GASKET OR CAULKING COMPOUND CAN SOLVE THIS PROBLEM.

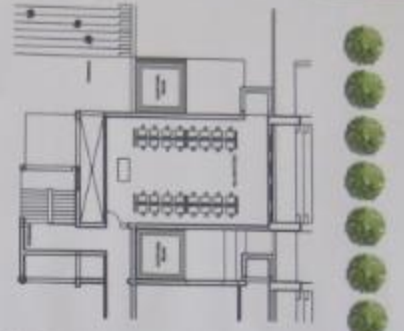


ACOUSTICAL WINDOWS AND DOORS:


1. WINDOW CAN BE SIMPLY GASKETED WITH FOAM SEAL.
2. IF GLASS IS THIN, INSTALLING OF SECOND LAYER MUCH LIKE A STORM WINDOW OR SCREEN MIGHT BE HELPFUL.
3. EVEN THE DOOR FRAME CAN BE GASKETED IF SOUND IS COMING THROUGH DOOR.
4. APPLYING DROP SEAL TO THE BOTTOM WILL HELP, WHICH DROPS DOWN WHEN DOOR IS CLOSED.



EXTERNAL NOISES CAN BE REMOVED BY PROPER PLANNING OF THE STUDIO WITH RESPECT TO ITS SURROUNDINGS: PLANTING TREES WHICH BLOCK NOISE, LIKE NEEM, JAMUN, TAMARIND ETC MAY BE HELPFUL.



STRETCHED CEILING ACOUSTIC PANELS:
THEY ARE ABSORBERS. THE STRETCHED MATERIAL IS MADE FROM A 0.2mm THICK PVC BASED RECYCLABLE STRETCH MEMBRANE. AVAILABLE IN SATIN, MATTE AND HIGH GLOSS FINISHES. THESE ARE WASHABLE, WATERPROOF, THEY CAN BE CUSTOM PRINTED AS DESIRED.



ACOUSTICS : OPTIMIZATION OF YELLOW STUDIO

SHOW	NAME: KANCHI RAJESH BAFNA	STAMP SCHOOL OF ARCHITECTURE
	BUILDING SERVICES - IV	
V - 02	III YEAR	

Application of acoustics and fire-fighting principles in Architectural Design project of the current semester

Acoustical design- following points were expected in this exploration.

- Mapping of audible experiences within every space that is part of the design
- Listing down the design criteria as per students' concept and also w.r.t. the NBC 2005.
- Taking any two spaces from their building and making it fit for the given reverberation time.

Fire Safe design- Following points were expected in this exploration.

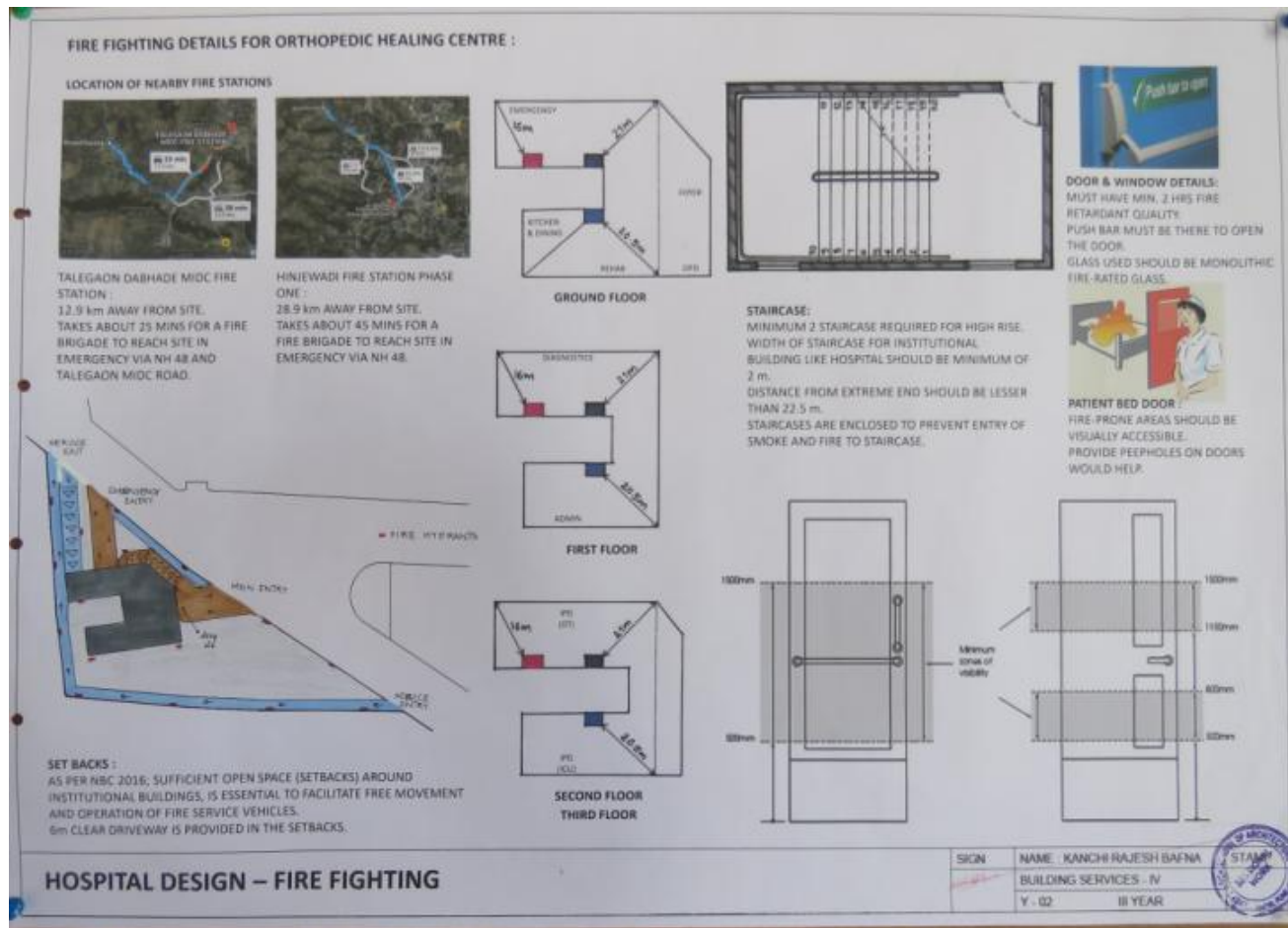
- Listing of the standards given in NBC in terms of the capacity of water tanks required, design of the sprinkler system, location of smoke detectors, fire alarms etc
- Site plan with the basic infrastructure required for fire safety.
- Layout of sprinkler system on typical floor plates

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Application of acoustics and fire-fighting principles in Architectural Design project of the current semester



1. PEDAGOGY

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FIRE FIGHTING DETAILS FOR ORTHOPEDIC HEALING CENTRE :

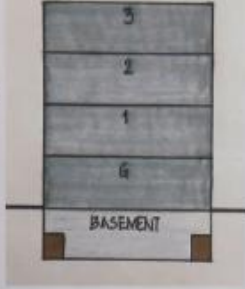
CAUSES OF FIRE :
HAVING MANY HEAT-DISSIPATING EQUIPMENTS, COMBUSTIBLE GASES AND CHEMICALS, A LOT OF ELECTRICAL WIRING AND HIGH VOLTAGE CONNECTIONS, ARTICLES LIKE COTTON ETC.

REFUGE AREA :
THE BUILDING IS 15m HIGH, THERE IS NO NEED OF ANY REFUGE FLOOR, TERRACE IS THE PLACE WHICH ACTS LIKE REFUGE AREA.

BASEMENT :
ACCORDING TO NBC,
CAR PARKING IS DONE IN BASEMENT WITH PROVISION OF 2 RAMPS FOR EXIT.

TYPES OF INSTALLATIONS REQUIRED :

1. FIRE EXTINGUISHER,
2. FIRE AID HOSE REEL,
3. WET RISER,
4. YARD HYDRANT,
5. AUTOMATIC SPRINKLER SYSTEM,
6. MANUALLY OPERATED ELECTRONIC FIRE ALARM SYSTEMS,
7. AUTOMATIC DETECTION AND ALARM SYSTEM.




TYPES OF FIRE FIGHTING SYSTEMS

TYPES OF FIRE FIGHTING SYSTEMS	SPRINKLER SYSTEMS	FIRE DETECTION SYSTEM	FOAM FLOODED SYSTEM
PUBLIC AREAS	R	R	NR
PATIENTS ROOM	R	R	NR
NURSES ROOM	R	R	NR
LABORATORIES	NR	R	R
OT/TREATMENT ROOMS	NR	R	NR
CABLE ROOMS	NR	R	NR
TRANSFORMERS	NR	R	NR
TECHNICAL CENTRES	R	R	NR
EMERGENCY POWER UNIT	R	R	NR
KITCHENS	NR	R	NR
WASTE MANAGEMENT	R	R	NR

PUBLIC AREAS : ENTRANCE, CORRIDOR, CHANGING, BASEMENT PARKING, LOUNGE, WAITING ROOMS, ADMINISTRATION

PATHOLOGY LABS : FOAM FLOODING SYSTEMS, SINCE THERE ARE SO MANY LIQUIDS AND CHEMICALS, WATER CANNOT BE USED. FOAM FLOODING SYSTEM CREATES A BLANKETING ABOVE THE LIQUID AND BREAKS THE SUPPLY OF OXYGEN.

SIGNAGES :
MAIN PURPOSE IS TO PROVIDE A CLEAR DESTINATIONS OF PLACES, WARNINGS AND ROUTING INFORMATION.
ZONAL MAPS MUST GUIDE THE PUBLIC FROM ONE POINT TO THEIR DESTINY.
SIGNS SHOULD BE ILLUMINATED.



DO NOT BLOCK FIRE EXIT

WATER TANK CAPACITY :
AS PER NBC 2016;
FOR BUILDING OF HEIGHT LESS THAN 15m WITH PLOT AREA MORE THAN 1000m²;
UNDER-GROUND STATIC WATER STORAGE TANK (combined capacity for wet riser, yard hydrant and sprinklers per set of pumps) = 1,00,000 litres.
TERRACE TANK = 10,000 litres.

HOSPITAL DESIGN – FIRE FIGHTING

SIGN: NAME: KANCHI RAJESH BAFNA
BUILDING SERVICES - IV
Y - 02 III YEAR

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3. EXAMPLES OF OUTPUT

Application of acoustics and fire-fighting principles in Architectural Design project of the current semester

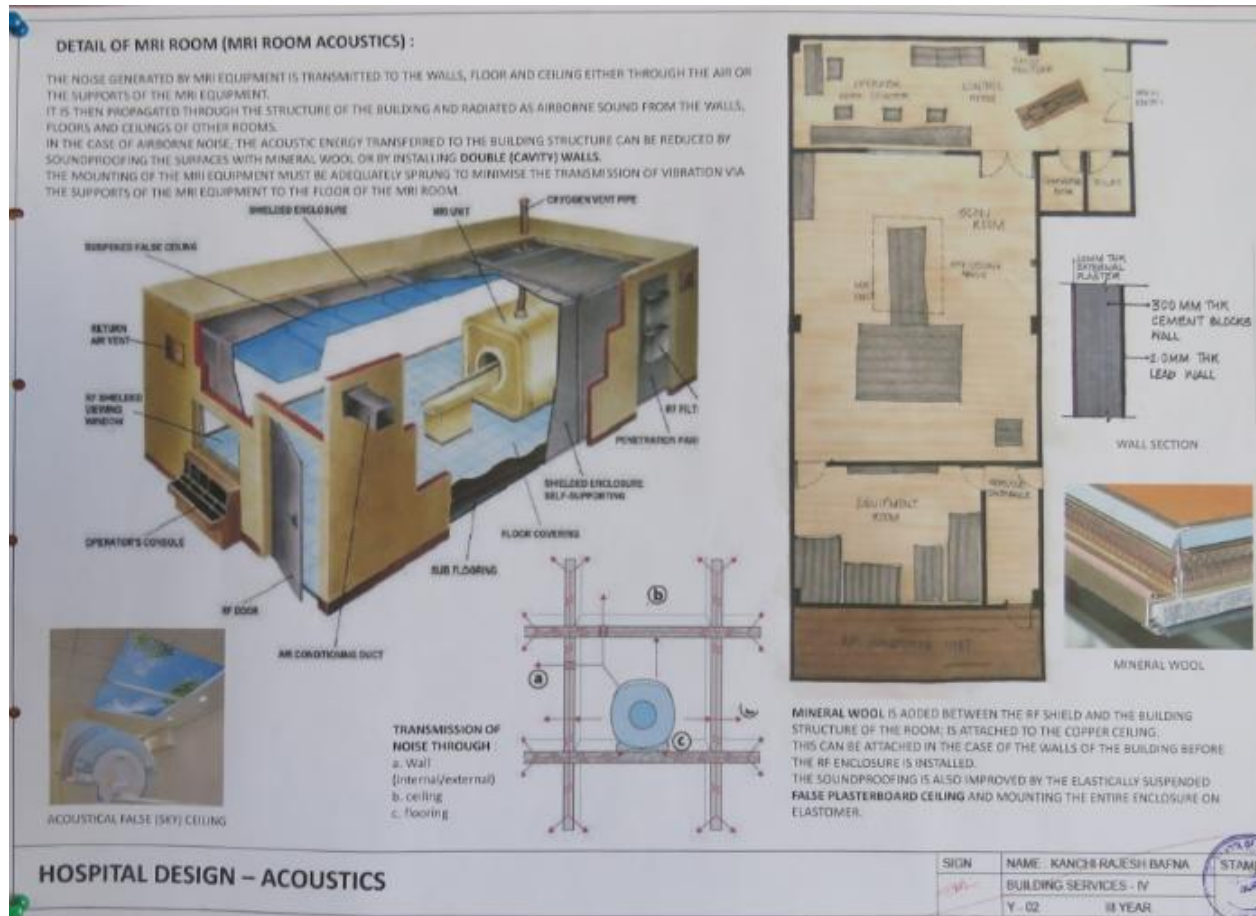


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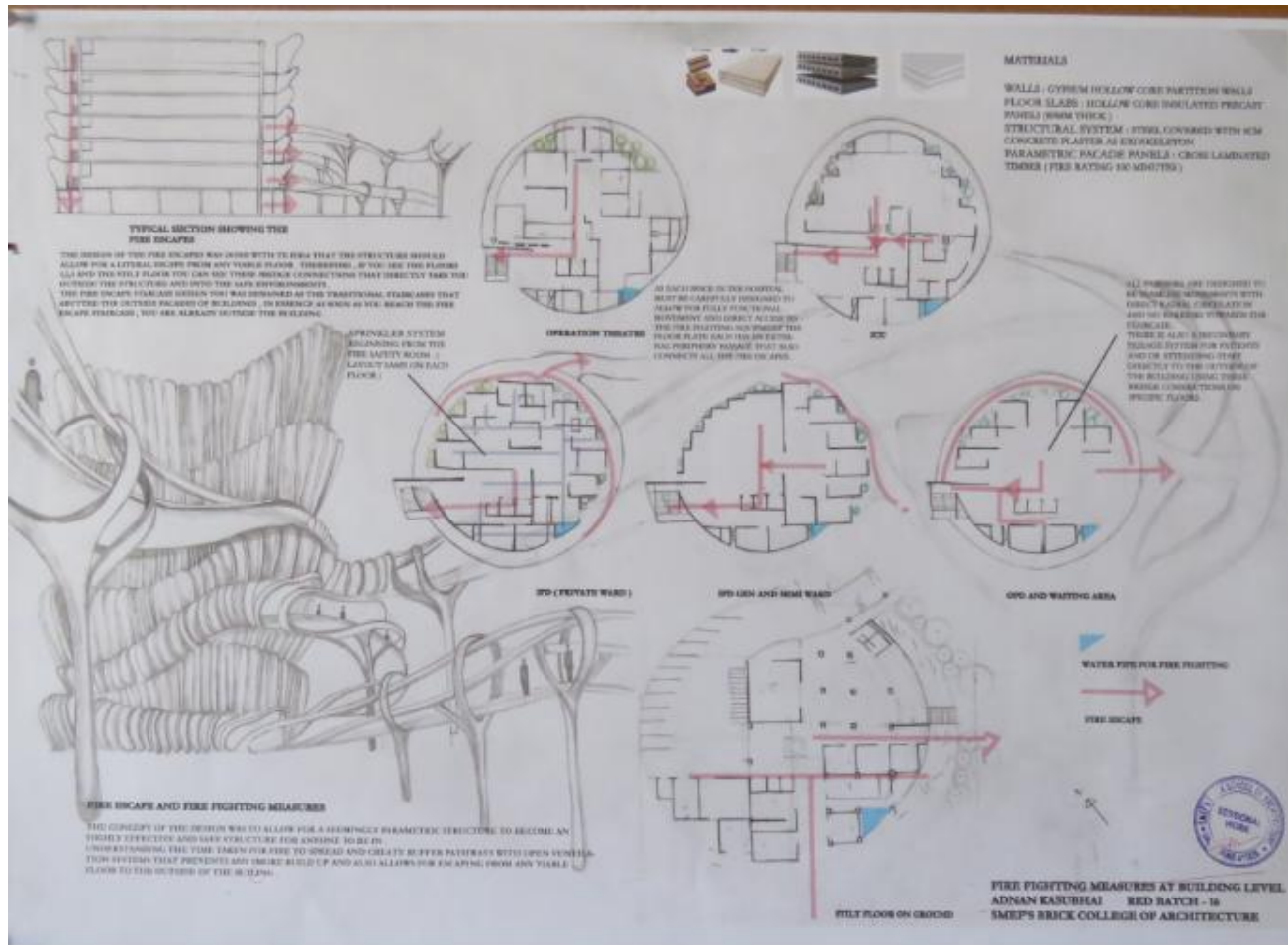


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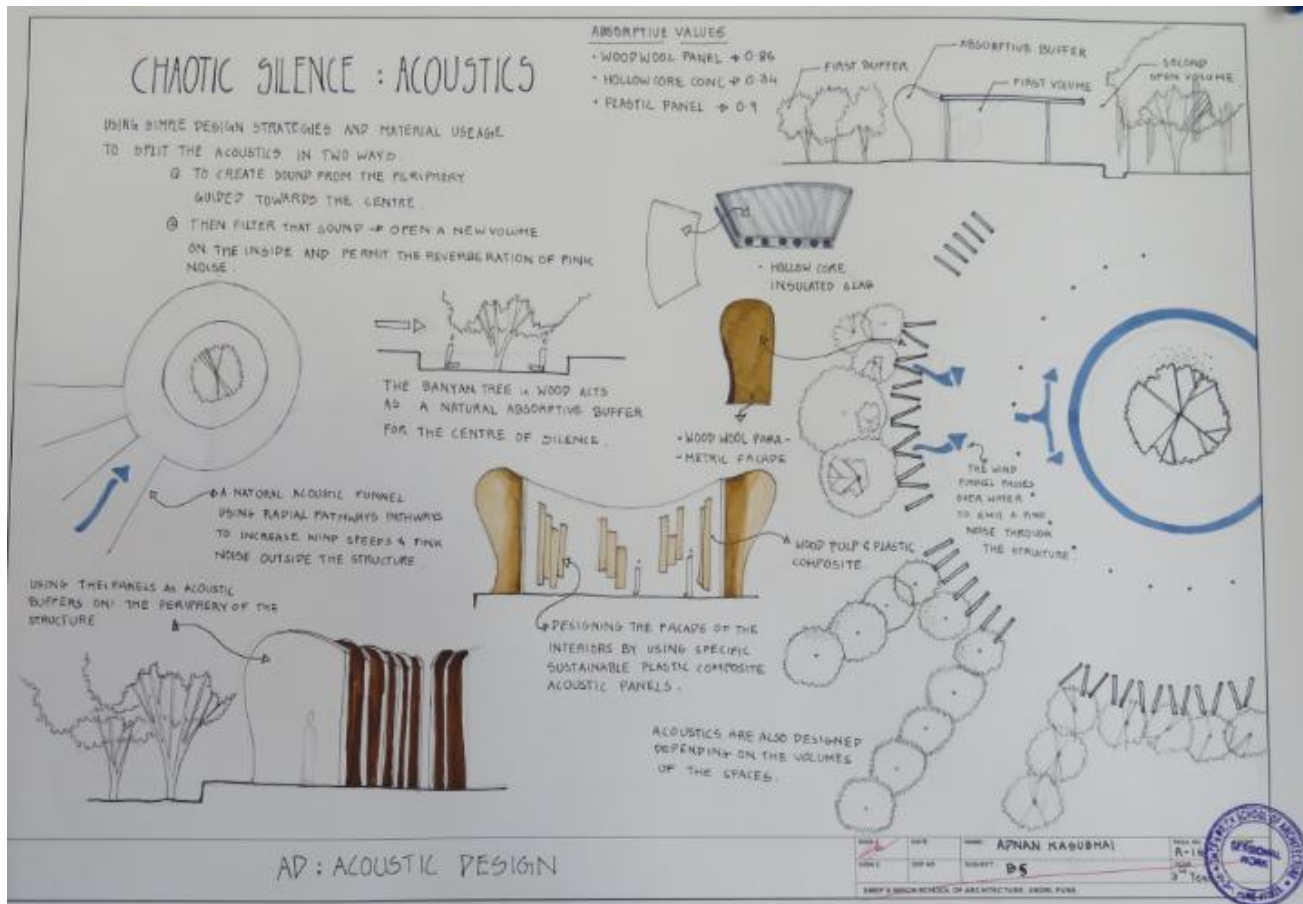


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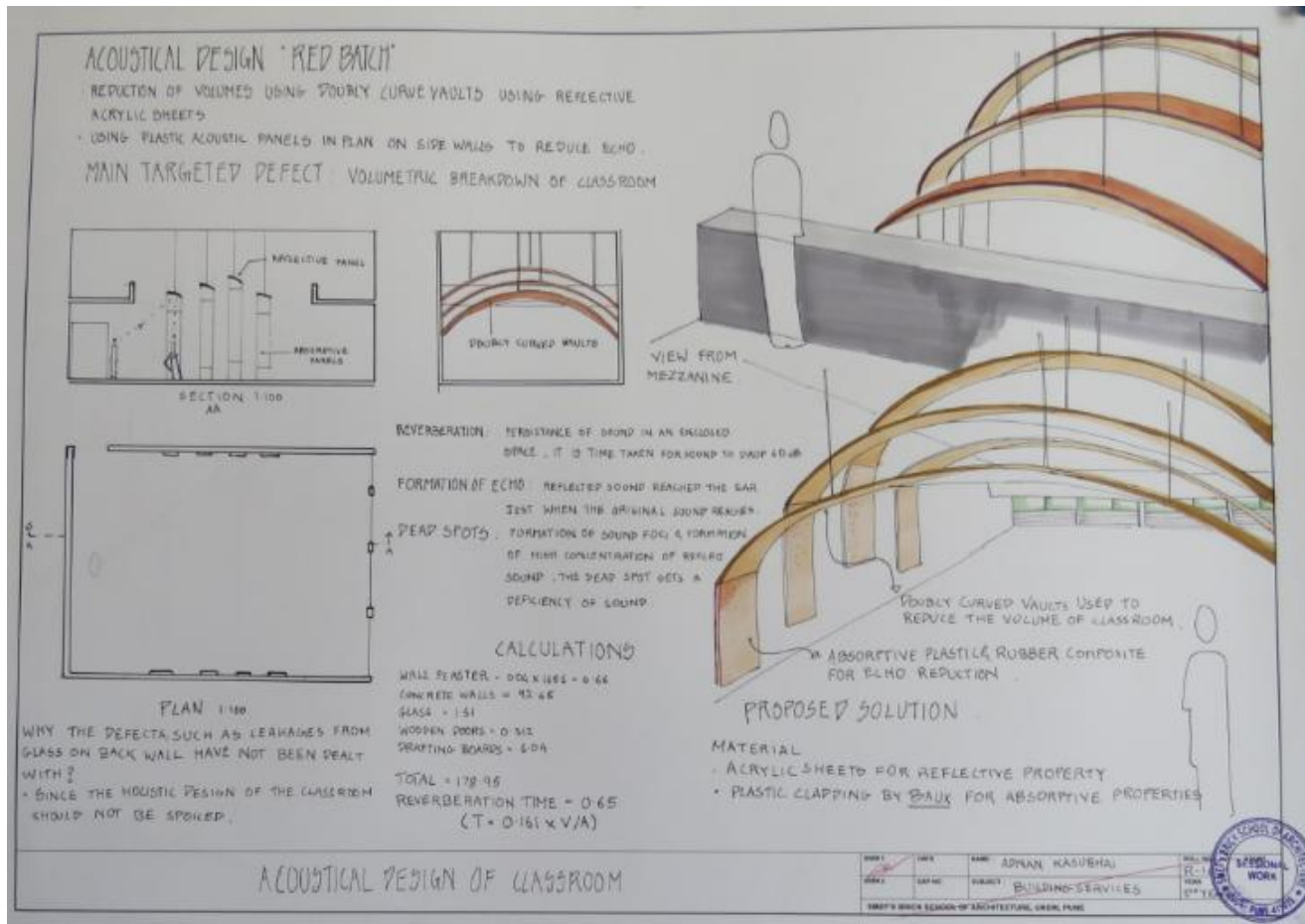


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Students' front

1. The attendance always remained more than 75%
2. Students remained enthusiastic and curious. Working with smart phone apps remained a joyful event for students
3. Drawings and calculations were co-ordinated.
4. Results remained more than 80% for last four years



THANK YOU