Design Of An Ecological Approach Towards The Socio-Cultural Development Of Rural/Urban/Ghats (Interactive Spaces)

by Ashutosh Pathak

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DESIGN OF
An Ecological Approach Towards The Socio – Cultural Development of a Rural/urban/Ghats (interactive spaces)

VIGYAAN DHAAM , JHAJRA , DHERADUN UTTARA KHAND

A DISSERTATION
Submitted in Fulfillment
of the Requirements for the Degree
Of
MASTER OF ARCHITECTURE

BY

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UNDER THE GUIDANCE OF

Ar.Shailesh Kumar Yadav

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I hereby recommend that the project under my supervision by Mr. ASHUTOSH PATHAK entitled " VIGYAAN DHAAM ,JHAJRA DHERADUN , UTTARA KHAND" be accepted in partial fulfillment of the requirements for the degree of Master of Architecture.

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Ar. Shailesh Kumar Yadav	**Ar. Mohit Agarwal Sir**	**Ar.Sangeeta Ma'am**
(THESIS GUIDE)	(Dean)	(HOD)
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Ar. Keshav Sir	----------	----------
(THESIS CO-ORDINATOR)	(EXTERNAL EXAMINER)	(EXTERNAL EXAMINER)

ACKNOWLEDGEMENT

The journey which started 3 years ago has culminated….as I step into the world a series of people flash in my memory without whose support and good will this journey wouldn't have been easy and free flowing…..

To start with. First and foremost gratitude towards almighty GOD for his blessings. Then I would like to thank all my faculty members who have supported and guided me all these memorable 3 years.

I would like to thank my thesis coordinator Ar. Keshav Sir who left no stone unturned to shape our thesis in the best possible way and also for his untimely help whenever required. Next in list is my thesis guide Ar.Urvashi Maam has been extremely co-operative since the very beginning and who helped me to utilize my skills and creativity to the utmost…

I would further like to show my gratitude to my family members mom and papa ….specially to my DR .PIYUSH KANT PATHAK (brother) and Ar.ANU PRIYA PATHAK (SISTER)… for giving full assistance whenever required and being there with me in all ups and downs. Their motivation and support helped me to be more dedicated and inclined towards my goal.

Last but not the least all friends and love one who give their all kind of support and concern .

I have put in my best of efforts and worked day and night to make this project a success .hope u too will appreciate my endeavor……

I wish to dedicate this work to my love ones…..Who are always their in my heart.

ASHUTOSH PATHAK

CONTENTS

INTRODUCTION

The development of a country and technology is the measure of the prosperity, progress and strength of a nation. It has brought about far reaching social changes. In India we are rapidly changing from a predominant agricultural community into an industrial one. India has witnessed the advent of the high systems of recreation. Science is the systematic study of word that can be seen & detected through knowledge that grows from it. It helps man to understand himself, his natural and social environment. It is helpfull in every aspect of life from ethics to politics, economics, social and many more it ensures human survival and process.

HISTORY OF SCIENCE MUSEUM TO SCIENCE CITY

The first science museum was the Museo de Ciencias Naturales, in Madrid, Spain. Opened in 1752.

In America, various Natural History Societies established collections in the early 1800s, which evolved into museums. Notable was the early New England Museum of Natural History, (now Museum of Science) opened in Boston in 1864. The modern interactive science museum appears to have been pioneered by Munich's Detaches Museum in the early 20th century. This museum had moving exhibits where visitors were encouraged to push buttons and work levers.

In the mid-twentieth century, Frank Oppenheimer included interactive science exhibits at San Francisco's Exploratorium This was first time when hands on pattern of exhibit were introduced Four years after the Exploratorium opened, the first **OMNIMAX** Theater opened as the Reuben H. The tilted-dome Space Theater doubled as a planetarium. The Science Center was an Exploratorium-style museum included as a small part of the complex. This combined interactive science museum, planetarium and **OMNIMAX** Theater are known Since then science museum & city are being popularized worldwide & it is gaining appreciation over all & widely serves for development of the community.

ELEMENT OF SCIENCE CITY: (SCIENCE)

The word science has been derived out of Latin word scientiat i.e. knowledge. Science is the effort to discover, and increase human understanding of how the physical world works. Through controlled methods (experimentation), evidence of natural phenomena to collect data, and analyzes this information to explain what and how things work. Knowledge in science is gained through research.

HISTORY OF SCIENCE

History of science is far bigger than history of science museum. In prehistoric times, advice and knowledge was passed from generation to generation in an oral tradition. The development of writing enabled knowledge to be stored and communicated across generations with much greater fidelity.

Many ancient civilizations collected astronomical information regarding stars, planets through simple observations and henceforth many theoretical explanations were proposed.

Most authorities regard the wheel as one of the oldest and most important inventions, which originated in ancient Mesopotamia in the 5th millennium BC originally in the function of potter's wheels.

The pre-Socratic philosopher Thales - the "father of science", was the first to postulate non-supernatural explanations for natural phenomena such as lightning and earthquakes. Pythagoras of Samos founded the Pythagorean School, which was the first to postulate that the Earth is spherical in shape.

This movement also marked foundation for modern sciences, with efforts from Albert Einstein & many young scientists. This led to extra-ordinary developments in field of physics, mechanics, astronomy .

By this time science witnessed a major boom & was completely decentralized into its various specialized disciplines. Computer, most dynamic breakthroughs

HISTORY OF SCIENCE IN INDIA

Indian philosophers in ancient India developed atomic theories, which included formulating ideas about the atom in a systematic manner and propounding ideas about the atomic constitution of the material world. The wootz, crucible and stainless steels were invented in India, and were widely exported, The Hindus excelled in the manufacturing of iron, and soft iron which is usually termed Indian steel (Hindiah).
Indian astronomer and mathematician Aryabhata, in his Aryabhatiya and Aryabhata Siddhanta, worked out an accurate heliocentric model of gravitation, including elliptical orbits, the circumference of the earth, and the longitudes of planets around the Sun. He also introduced a number of trigonometric functions (including sine, versine, cosine and inverse sine), trigonometric tables, and techniques and algorithms of algebra. In the 7th century, Brahmagupta recognized gravity as a force of attraction. He also lucidly explained the use of zero as both a placeholder and a decimal digit, along with the Hindu-Arabic numeral system now used universally throughout the world.

THE NEED

The common man is not aware of the concepts of science that are implemented to regular life. The knowledge of science is only limited to students teachers & related professionals. Students and teachers are also confined to bookish knowledge which is more or less incomplete. It is commonly accepted fact that **"I read I forget, I see I remember, I do I understand".** Hence only a partial knowledge is being delivered & partial knowledge proves harmful. We all know we retain things in memory for longer time, if we see & perform rather than what we read. centers & institute which can popularize science among common man & give students and teachers' opportunity to explore wonders of science by themselves & constant interaction among themselves as well as professionals. In order to ensure popularizing the concepts of science to common man institutes like science city is a vibrant step. The institute will try to develop scientific temper among the common man and many such small & big institutes which practice this methodology of imparting education "hands on, minds on" process. There is no science city in Uttrakhand region. Hence there is a strict necessity of building a science cit in dehradun.

WHY AS MY THESIS PROJECT

As an architecture student, unusual forms & shapes fascinating science city will be a great opportunity for designing unique structures with great elevations .
Such a city quests for usage of new technology & modern material.
This topic involves a comprehensive study of infrastructural requirements like planetarium, exhibitions, information centre, science laboratories, 3D theatres and other facilities. The centre is a high profile environment representing an good image and statement to visitor.
Topic consist of both in contexts to infrastructure as well as landscaping as per my interest

THE OBJECTIVES OF THE PROJECT

The aim is to create a perfect environment for promotion of scientific education among all classes of people which touches the various aspect and spheres of human life. Building should just not be home to various exhibits of science but it should itself be a model of science and A landmark to the place.

OBJECTIVES

To design perfect spaces for interaction of man & science
To design a modern form of the building, so that it marks a statement for science & technology
To design a campus that exhibit interaction between science, technology, energy, environment and human life
To design buildings to showcase the latest scientific & technological breakthroughs through different ways like dome theatre.
To design a campus where fun and learning go hand in hand in an interactive manner

REQUIRMENTS

Exhibition pavilions
Dome theatre
Administration block
Auditorium
Seminar halls
Amphitheatre
Workshops
Activity areas
Training program areas
Library
Residences
Cafeteria
Commercial area
Laboratories
Maintenance departments
Parking
Entrance plaza & ticket counters

COMPONENTS OF A SCIENCE CITY

A science city should demonstrate all types of live experiment latest achievements and experiments related to all elementary subjects. To demonstrate the above a science city must consist of the following.
Science city will be the shining model project with an international appeal. a place where science and society meet and interact."

SCOPE:

Design of science city involves a clear understanding of a science museum, site planning, display concepts, categorized circulation, structural trends, building services etc.
It involves design of dome theatre, hence scope for study of acoustics related to dome environment
It involves a futuristic approach towards design

Eligibility criteria and infrastructure

The location of the Science City should be either a State capital or a city of the State having a sizeable population of not less than 50 Lakhs. While deciding location for a Science City the primary concern shall be to ensure that it can draw at least 10 lakh visitors per year for self-sustainability.

i) The new Science Cities shall be set up preferably only in those places where no major Science Centre exists. However, in locations where footfall to the science centre is substantial i.e., it qualifies for a science city, the science centre could be upgraded to a Regional Science City or a separate Science City could be set up depending upon the importance of the place.

ii) The State Government will provide the following infrastructure facility free of cost:

(a) At least 25 acres of centrally located and easily accessible fully developed land without any encumbrances;

(Although to do justice to exhibits, facilities especially those requiring open spaces and future expansion

Exhibition area

A.Floor area for indoor exhibitions

(a) Science Exposition Hall - 10000sq.mt.

(b) Open laboratory and interactive exhibits hall - 2500sq.mt.

(c) Entrance Plaza and visitor's facilities - 1500sq.mt.

Total: 14,000 sq.mt.

B. Outdoor expositions

(a) Science Park 4,000 sq.mt.

While developing the permanent infrastructure care must be taken to maintain

a ratio of 25:75 for covered and open areas so that the visitors are not confined in a particular place and there is enough space to accommodate

PRELIMINARY AREA REQUIREMENT

GATE COMPLEX 370 sq. m

INFORMATION COUNTER	15 sq. m
TICKET COUNTER	30 sq. m
RECEPTION	200 sq. m
CLOAKROOM	30 sq. m
MUSEUM SHOP	30 sq. m
SECURITY OFFICER ROOM	15 sq. m
ANCILLARY FACILITIES	50 sq. m

ADMINISTRATIVE OFFICE 245 sq. m

DIRECTOR GENERAL	15 SQ. M
OFFICER 3 X 15 SM	45 SQ. M
STAFF	50 SQ. M

Curator Department

-CURATOR	15 sq. m
STAFF	40 sq. m
EXHIBIT DEPARTMENT	50 sq. m
ANCILLARY	50 sq.

EDUCATION DEPARTMENT 150 sq. m

Scientific + Technical Officer	10 sq. m
Sub- Ordinate Technical Officers	20 sq. m
Technical Trainees	20 sq. m
Security, Conservancy, Gardening Staff	20 sq. m
Business and Accounts	10 sq. m
External Communications	10 sq. m
Registrar's records	10 sq. m
Staff lounge/ toilet	50 sq. m

VISITORS
ACTIVITY AREA 1650 sq. m
AUDITORIUM 600 sq. m
(For 500 @ 1.2 sq. m. per person)
TEMPORARY
EXHIBITION HALL 400 sq. m
(Near the entrance with a small platform outside the building for loading and unloading of materials on and from the trucks)

CHILDREN
ACTIVITY HALL 200 sq. m.
(Space for playing with scientific toys

LIBRARY 100 sq. m.
(Comprises of stacks, - storage, small reading room and journal stand)

COMPUTER ROOM 50 sq. m.
Cafeteria (120 people) 300 sq. m.

(30% for kitchen, pantry, store and toilet)
EXHIBITION GALLERIES 24500 sq. m.
SMALL GALLERIES
(8 X 2000 sq. m.) 16000 sq. m.
LARGE GALLERY *6000 sq. m.*
(This section will house the various satellite launching systems like ASLV, PSLV, etc.)
Outdoor
Display Area *2500 sq. m.*
Work shops

RESTORATION SHEDS	2000 SQ. M.
MODEL MAKING	150 SQ. M
WELDING AND FABRICATION	200 SQ. M
CARPENTRY	150 SQ.
ANCILLARY	50 SQ.

WORLD OF THEATRES *1430 sq. m.*

SERVICES *350 sq. m.*

Electric substation *50 sq. m.*

Pump room for underground substation *50 sq. m.*

Storage for smaller exhibits *200 sq. m.*

A.C. plant

(50 sq. m. + 2.7 sq m. for every additional 100 sq. m.)

PARKING *5320 sq. m.*

200 CARS

@ 20 SQ .M. / CAR *4000 SQ. M.*

200 TWO WHEELERS

@ 5 SQ. M. / PER *1000 SQ. M.*

8 BUSSES

@ 40 SQ M. / BUS *320 SQ. M.*

TOTAL BUILT UP AREA

=37915+ 5% MISCELLANEOUS

= 37915 + 1895

= 39810 SQ. M. OR SAY 40000 APPROX.

DOMETHEATRE **FOR 500 @ 1.5 SQ. M. / PERSON**	**750 SQ. M**
3D THEATRE **FOR 100 @ 1.5 SQ. M. / PERSON**	150 SQ. M
SIMULATOR **FOR 40 @ 1.5 SQ. M. / PERSON**	60 SQ. M
EXHIBITION AND **WAITING AREA**	250 SQ. M.
EQUIPMENT ROOM	50 SQ. M.
OFFICE – **PROGRAM MAKING**	50 SQ. M.
TECHNICAL **OFFICERS, ASSISTANTS**	50 SQ. M
OBSERVATORY	70 SQ. M.

SITE ANALYSIS

Site analysis is carried out under the following subheadings:

Overview
About the site
Approach
Levels & contours
Slope of the site
Natural features
Man made features
Physical infrastructure
Climate

Month	Rainfall (mm)	Relative Humidity (%)	Temperature Max	Min	Ave.
January	46.9	91	19.3	3.6	10.9
February	54.9	83	22.4	5.6	13.3
March	52.4	69	26.2	9.1	17.5
April	21.2	53	32	13.3	22.7
May	54.2	49	35.3	16.8	25.4
June	230.2	65	34.4	29.4	27.1
July	630.7	86	30.5	22.6	25.1
August	627.4	89	29.7	22.3	25.3
September	261.4	83	29.8	19.7	24.2
October	32.0	74	28.5	13.3	20.5
November	10.9	82	24.8	7.6	15.7
December	2.8	89	21.9	4.0	12.0
Average Annual	2051.4	76	27.8	13.3	20.0

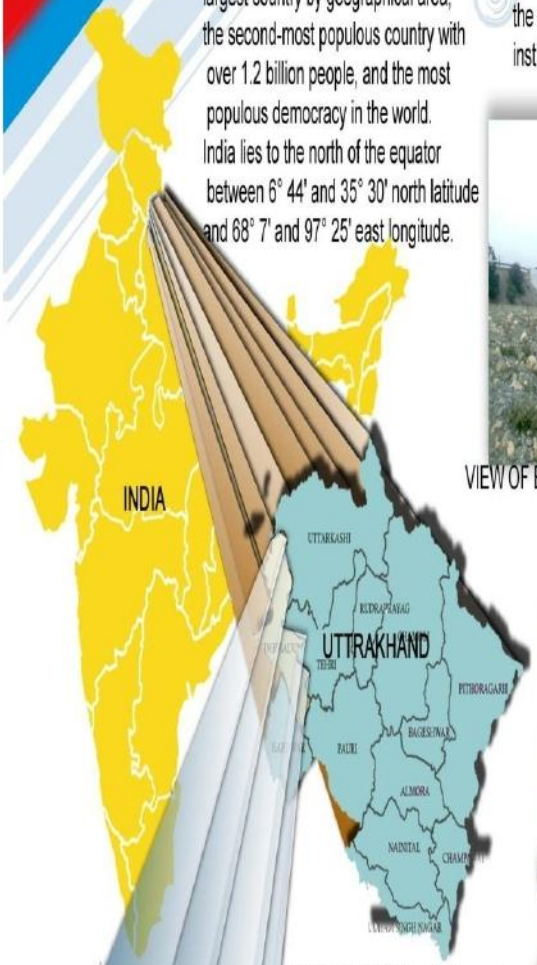
OVERVIEW: Science city has been proposed in state of Uttrakhand, which has got sufficient potential in case of education. City of Dehradun is capital of uttrakhand . Dehradun is renowned for its natural resources, publishing services, and for its prestigious educational institutions Dehradun is famous for its picturesque landscape and pleasant climate and provides a gateway to the surrounding region. It is well connected and in close proximity to popular Himalayan tourist destinations
suchas Mussoorie,Nainital and Auli and Hindu holy cities of Haridwar and Rishikesh along with the Himalayan pilgrimage circuit of Char Dham.

Geographical aspects of Dehradun are:
Longitude 78o02'01"E
Latitude 30o18'57"N
Altitude 450 mtrs.
Population : 601,965 (rural area) 677,118 (urban area)

APPROACH: Site is located at Jhajra approx 14 kms from from main ISBT Dehradun . connected by main NH72, and some other connecting roads within the city. Site is also well connected to railway station through NH 72 14 kms towards Dehradun, while nearest Airport Jolly grant airport which is 25 kms from Dehradu

ABOUTTHE SITE: Site for Science city is on Balaji dham road, Jhajra village of Dehradun. Site is around 12kms from city centre i.e. Bullawala chowk. There are approximately 40 small-big schools within 8 kms radius from site.

INDIA, officially the Republic of India is a country in South Asia. It is the seventh-largest country by geographical area, the second-most populous country with over 1.2 billion people, and the most populous democracy in the world. India lies to the north of the equator between 6° 44' and 35° 30' north latitude and 68° 7' and 97° 25' east longitude.



UTTRAKHAND state in the northern part of India.Uttarakhand has a total geographic area of 53,566 km², of which 93% is mountainous and 64% is covered by forest.It borders the Nepal on the east and the Indian states of Uttar Pradesh to the south, Haryana to the west and Himachal Pradesh to the north west.

APPROACH:

Site is located at Jhajra approx. 14 kms from froM main ISBT Dehradun, connected by main NH72, and some other connecting roads within the city. Site is also well connected to railway station through NH 72 14 kms towards Dehradun, while nearest Airport Jolly grant airport which is 25 kms from Dehradun.

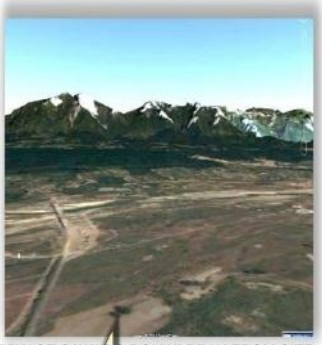
MAN MADE FEATURES:

There is a bridge about 100m across the stretch of River Tone. Training and institutional buildings built along the river.

VIEW OF BRIDR OVER RIVER TONS FROM SITE

WEATHER:

Uttarakhand mainly has two different climatic regions, namely, the hilly terrain and the smaller plain region. It varies greatly from tropical to severe cold depending upon the altitude of the area. So, the weather is also quite varied, depending on the particular place. The district being hilly, temperature variations due to difference in elevation are considerable.



VIEW OF SAWARG ROHINI PEAK FROM SITE

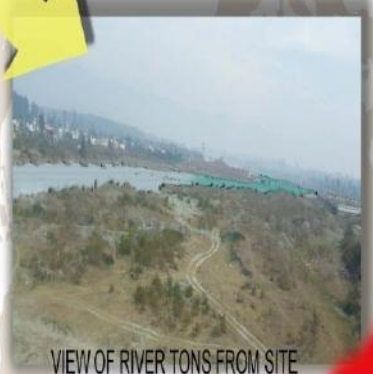
Dehradun is famous for its picturesque landscape and pleasant climate and provide a gateway to the surrounding region. It is well connected and in close proximity to popular Himalayan tourist destinations such as Mussoo Nainital and Auli and Hindu holy cities of Haridwar and Rishikesh along with the Himalayan pilgrimage circuit of Char Dham.

HYDROLOGY:

Water table depth is 6m belc the ground level. Drainage is along the slope.

NATURAL FEATURES:

Site has a river called Tone river on its north side. To the north the view c Swargarohini peaks. There is not enough vegetation, though site is surrounded by some local trees like



VIEW OF RIVER TONS FROM SITE

VIGYAAN DHAAM

JHAJRA , DHERDUN , UTTARA KHAND

SUBMITTED BY - ASHUTOSH PATHAK

- ✓ HYDROLOGY: Water table depth is 6m below the ground level. Drainage is along the slope.
- ✓ NATURAL FEAURES: Site has a river called Tone river on its north side. To the north the view of swargarohini peaks. There is not enough vegetation, though site is surrounded by some local trees like Babul, Peepal, Mango etc
- ✓ MAN MADE FEATURES: There is a bridge about 100mtr across the stretch of River Tone. Training and institutional buildings built along the river

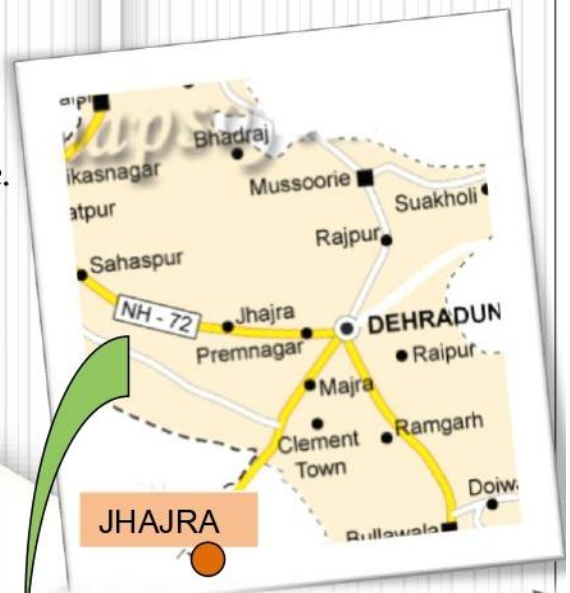
PART OF DEHRADUN, SHOWING VILLAGE JHAJRA

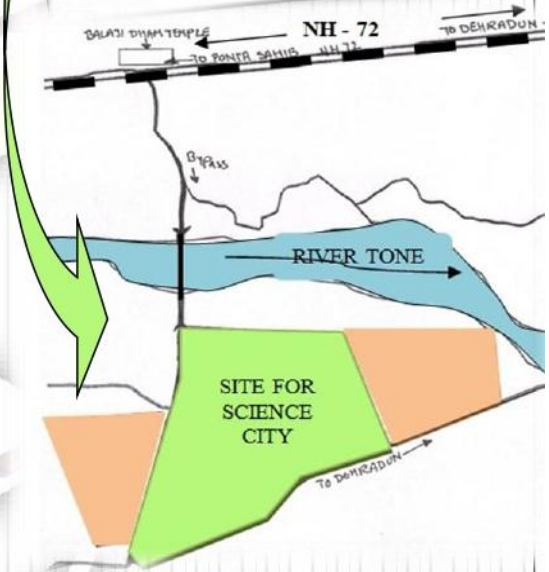
- ✓ **WEATHER:**

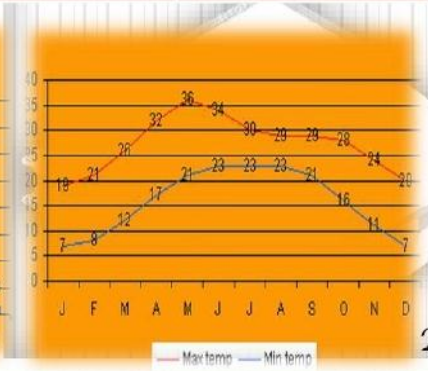
Uttarakhand mainly has two different climatic regions, namely, the hilly terrain and the smaller plain region. It varies greatly from tropical to severe cold depending upon the altitude of the area. So, the weather is also quite varied, depending on the particular place.

East	Driving institute	Reflected & perforated light	Adds activity energy to the site
West	Air force apartments	Deep penetrating light	Adds activity energy to the site
North	Flowing River Tone basin, elongated bridge over river	North light reflected from river surface	Promotes activities for scenic beauty of river and over going bridge
South	connecting road, barren land	Glared light, low penetration at noon	Support activities

SITE FOR SCIENCE CITY AND SURROUNDING

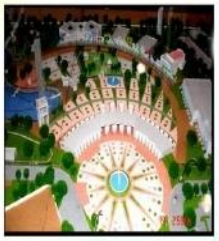






PLAIN SITE WITH SOME TREES

CASE STUDY --PHUSPA GUJRAL SCIENCE CITY JALANDHAR



INTRODUCTION

- The Science city was conceived as the joint venture of Govt. of india and Govt. of Punjab.
- Built over an area of 72 Acres the project aims at popularizing science through entertainment.
- The whole surrounding is yet to be developed.

1. ENTRY
2. GATE COMPLEX
3. ENTRANCE PLAZA
4. DOME THEATRE
5. SCIENCE VOYAGE HALL
6. HEALTH GALLERY
7. DINOSAURS
8. ADMINSTRATION BUILDING
9. WORKSHOP = UTILITY
10. TANK
11. FOUTAIN
12. KIDS PARK
13. ENERGY PARK
14. HYDEL ENERGY CENTRE
15. CACTUS GARDEN
16. BOAT CLUB
17. BOATING
18. BUS PARKING
19. SEWERAGE TREATMENT PLANT
20. CAR/ TWO WHEELER PARKING
21. GREEN
22. HERBAL GARDEN
23. SOUVENIR SHOP
24. TICKETING BOOTH

TICKETING BOOTH

PROJECT BRIEF

- Name of the Project: Pushpa Gujral Science city, Jalandhar Kapurthala road.
- Architect: Amir Aftab, Director of Development Consultant Limited, Kolkata.
- Completition: Construction started 1997.
- Cost: 100 crores.
- Land area: 49.7 acres or 20,1136 sqm.

GATE COMPLEX

SCIENCE VOYAGE HALL

TOILET

SOUVENIR SHOP

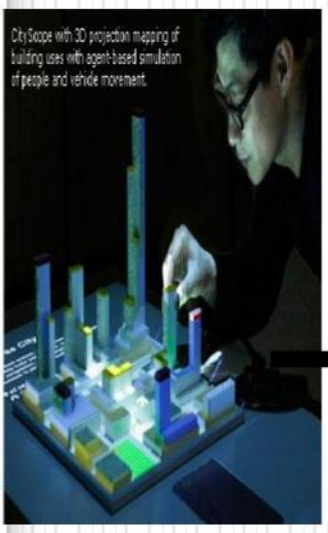
LOCATION

- Located in the state of Punjab, India on Jalandar-
- Kapurthala road close to national highway NH-1.
- Distance from Jalandhar- 15 kms.
- Distance from Kapurthala- 5 kms.
- Distance from Raja Sansi Airport Amritsar- 80 kms.
- Distance from Chandigrah Airport- 160 kms.

ENTRANCE

CASE STUDY

PLANNING & CONCEPT:
WHOLE OF THE SITE IS TAKEN IN CONCERN BY PROPER PLACEMENT OF BLOCK AND PROPER USE OF SITE. THE LONG STRETCH OF THE SITE IS VERY INTELLIGENTLY DEALT BY BRINGING THE MAIN ENTRY IN THE CENTER. CONNECTIVITY WITH ALL THE BLOCKS ALONG WITH THE PATHWAY PROVIDING SHELTER AND A GOOD LANDSCAPING DONE ALONG ROAD SIDE



PHASE-1
*TITLED DOME THEATRE OF 328 SITTING CAPACITY
*A FLIGHT SIMULATOR OF 30 PERSONS.
*3D CINEMA HALL
*SPACE GALLERY.
*SCIENCE VOYAGE HALL.
*GATE COMPLEX.
*WATER BODY PARK

PHASE-2
*DEFENSE GALLERY
*FUN SCIENCE GALLERY
*HERITAGE GALLERY
*DINOSAURS PARKS
*EARTHQUAKE SIMULATOR
*CYBER SPACE GALLERY
*BIO-TECHNOLOGY GALLERY

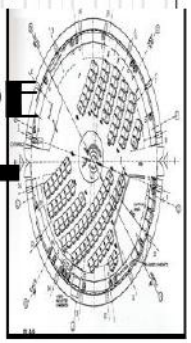
THE PROJECT PRIMARILY AIMS AT POPULARIZING SCIENCE THROUGH EDUTAINMENT

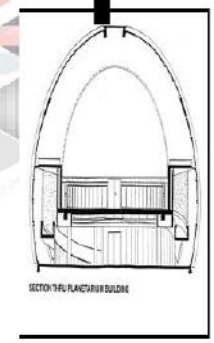
PUSHPA GUJRAL SCIENCE CITY JALANDHAR

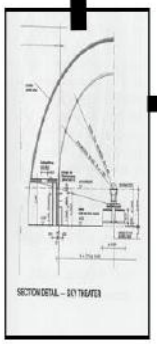
SCIENCE VOYAGE BUILDING
6900 SQ M.
GATE COMPLEX
1259 SQ M.
YARD TOILETS
3551SQ M.
OFFICE BUILDINGS 255 SQ M.
DRIVER'S REST ROOM 62 SQ M.
DORMITORY 267 SQ M.
SUBSTATION-2 325 SQ M.
SOLAR RESTAURANT 171 SQ
BATTERY CHARGING STATION
111 SQ M.
SOLAR PARK STATION 250 SQM.

PROGRAMS RUN UNDER PGSC

3D SHOW THEATRE

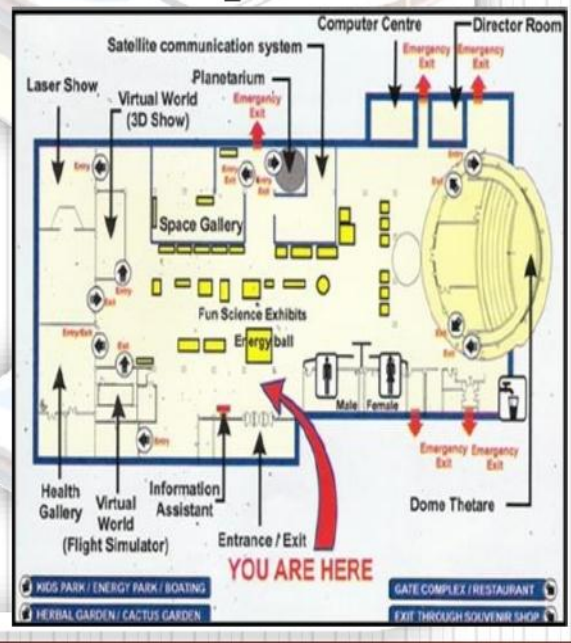


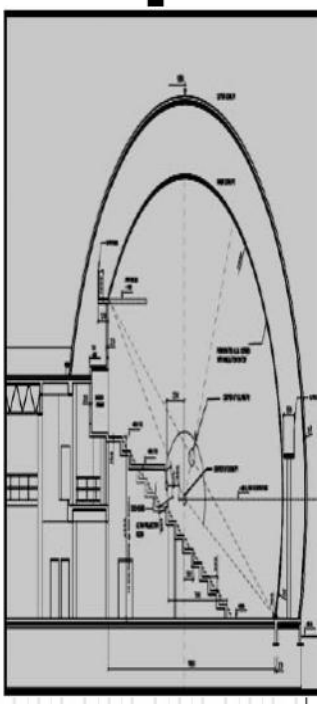




SCIENCE VOYAGE HALL:

. THE HALL IS MADE OUT OF INCLINED SURFACES, CLEVERLY CUT WITH SPHERICAL BAYS FOR THE VENTILATORS ABOVE AND A MODERN CLOISTERED GALLERY RUNNING AT THE PERIPHERY OF THE STRUCTURE. THE STRUCTURE IS INTERPENETRATED WITH A HUGE GLOBE (SPACE THEATRE) AT ONE END WHICH IS VISIBLE AS A MAJOR LANDMARK FROM ALL THE SIDES I.E





ZONING

The whole complex is divided into two zones namely the Public zone and Private zones.

Public Zone

- Gate complex.
- Science Voyage hall comprises of
  - Tilted dome theatre of 325 capacity with 30 degree tilt.
  - Exhibition gallery.
  - Flight Simulator.
  - Health gallery.
- Souveenoir shop.
- Restaurent.
- Energy park.
- Kids park.
- Bank

Private Zone

- Adminstration Block.
- Utility Building comprises of :
  - Fire Pump.
  - A. C Plnt Room.

Parking

Parking space of 400 cars and 26 taxi is provided using an area of 11190 sqm. & 35 bus parking occupying 3250 sqm. is provided near the main entry.

Proposal of another 225 cars with an area of 6000 sqm. and 27 bus parking with an area of 3400 sqm. is made which will be constructed with the completetion of phase 2

Architectural Form

- Almost curvilinar form (which acts as an inviting nature) is used as a major built up area except for the science hall.
- Overhanging shells with the similar base and wide bulge at the top brings out a monumental from for the science city.
- Gate complex is spanned by a space frame over ticketing counter at a ht. of 7.5 Mtr.
- The Science Voyage hall is interpenetrated by huge globe (planetarium) which is visible from the main entrance.

Circulation

Acess within the site is provided by:

- A continious pedestrain spines running infront of the building.
- Bridges connect the huge water channel.
- The internal plaza with vast unshaded hard surface serves it purpose of enclosure and acess and radiates heat in sunny days making it uncomfortable.
- Proposed Rope way.

- Vehicular

  The main entrance and exits to the site is from the main road double road drive way from the state highway.

  The service entry from the side road.

  The official entrance to the site is through a double road 7.5m each leading to the entrane plaza which has water jet predominant feature.

  A 15m wide internal road forms a loop around the site.

VIGYAAN DHAAM

JHAJRA , DHERDUN , UTTARA KHAND

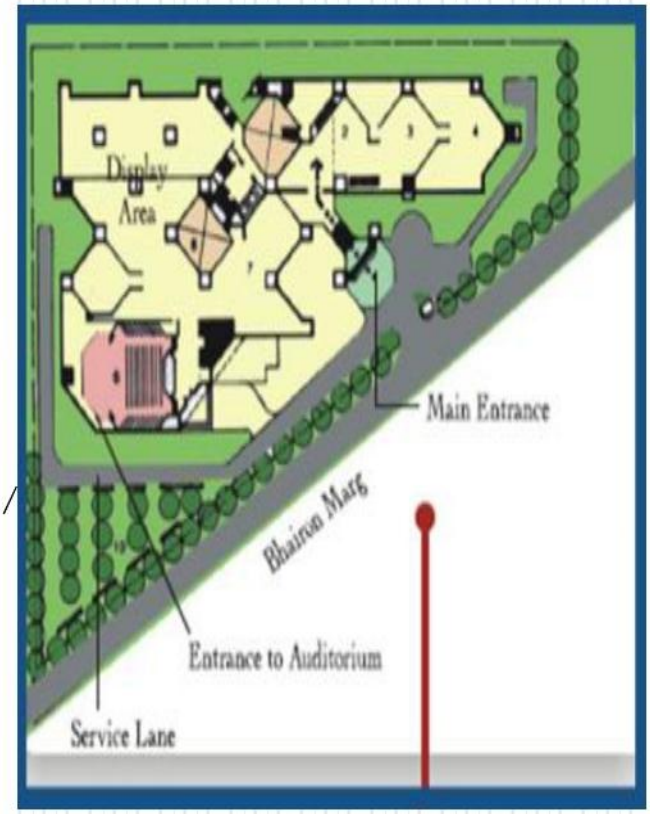
NATIONAL SCIENCE CENTRE , DELHI

COMPLETION:2005
ARCHITECT:
DEVELOPMENT CONSULTANTS PVT.LTD.
AREA: 1. 72 ACRES
COST OF THE PROJECT: 74 CRORES

PLANNING & CONCEPT:
PLAYING WITH LEVELS AND HEIGHTS OF THE BUILDING. GIVING A GREAT FORM WITH RELATION TO INDOOR AND OUT DOOR SPACES
VISITORS PER DAY: 650
VISITORS:
48% SCHOOL CHILDREN
62% GENERAL VISITORS
LOCATION
5 KM - DISTANCE FROM NIZAMUDDIN RAILWAY STATION TO NATIONAL SCIENCE CENTRE
THE MAP COVERS A DISTANCE OF 17 KM
FROM I.G.I AIRPORT

SELECTION CRITERIA:
IN THIS PROJECT A VARIETY OF DISPLAY METHODS HAVE BEEN USED FOR DIFFERENT KINDS OF DISPLAY. THEREFORE STUDYING ALL THIS CAN HELP ME PICK THE KIND OF DISPLAYING TECHNIQUES I WOULD NEED FOR MY PROJECT

NATIONAL SCIENCE CENTRE , DELHI



MALE/ FEMALE TOILET

CAFÉ TERIA

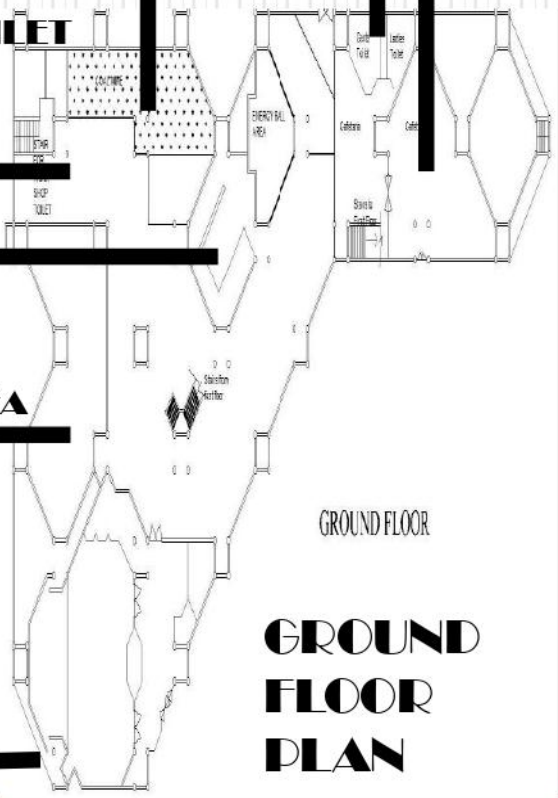
COAL MINE

STAIR FOR WORKSHOP TOILET

2 PASSENGER + 1 GOODS

EXHIBITION AREA

DISPLAY AREA



GROUND FLOOR PLAN

VIGYAAN DHAAM

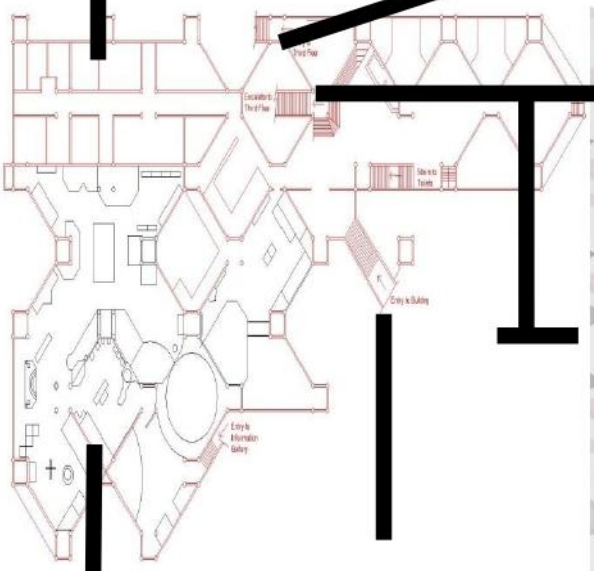
JHAJRA , DHERDUN , UTTARA KHAND

Case study 02

NATIONAL SCIENCE CENTRE , DELHI

ENERGY BALL AREA

ADMINISTRATION



ESCALATORS

LIBRARY AREA

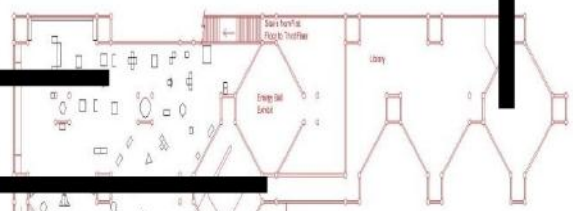
RESIDENCIAL UNIT

COAL MINE

ENERGY BALL AREA

FIRSTFLOOR PLAN

STAIR FOR WORKSHOP TOILET



EXHIBITION DISPLAY ZONE

STAIRCASE FROM 3RD FLOOR

TEACHER PLANNING PROGRAM

CHILDREN PLAY CORNER

SECOND FLOOR PLAN

TARAMANDAL

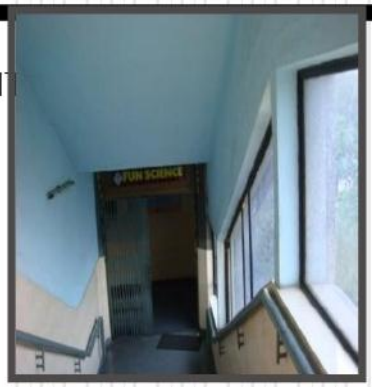
MIRROR MAZE

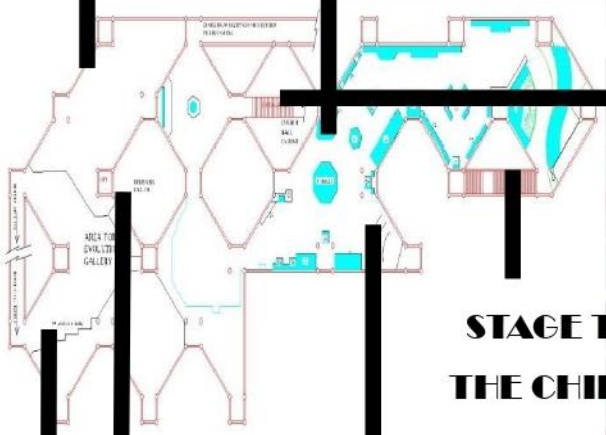
NATIONAL SCIENCE CENTRE , DELHI

DISPLAYING AREA

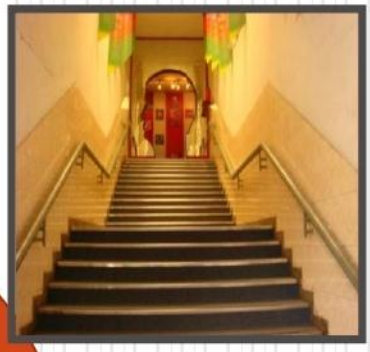
ENERY BALL EXHIBIT

ESCALATORS





STAGE TO ADRESS THE CHILDREN



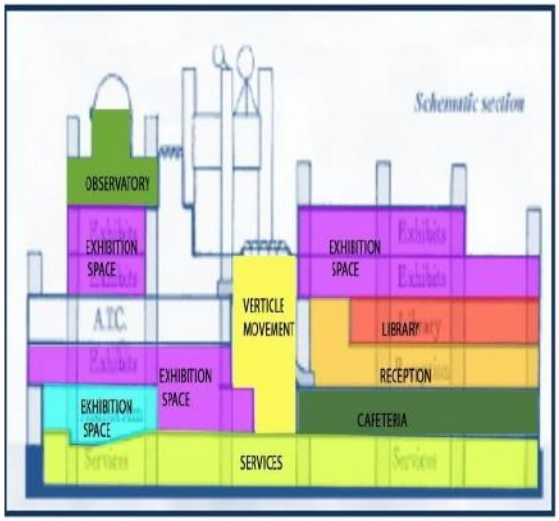
ENTRANCE FROM GL.

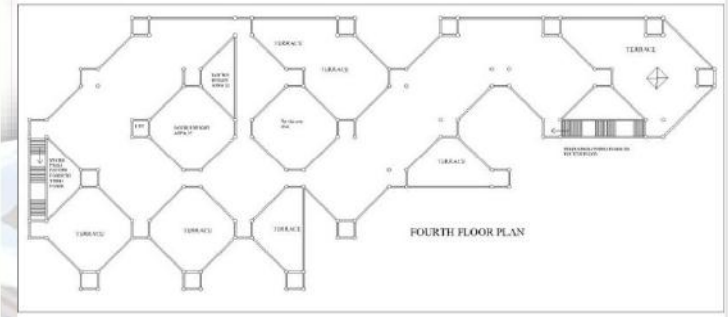
THIRD FLOOR PLAN

1 HERITAGE GALLERY
2LIFE SCIENCE GALLERY
3 PRE HISTORIC GALLERY
4FUN SCIENCE GALLERY

DINOSAURS ENCLAVE

AREA FOR EVOLUTION GALLERY





FOURTH FLOOR PLAN

- It has an ancient architecture with symmetrical planning.
- The composition of the structure is a circle embedded into a rectangle.
- The circle is that of the planetarium and the rectangle consists of all the exhibition spaces, offices and services.
- The elevational features are completely based on the historical context of kurukshetra.

The structure has a 12-metre dome with a seating capacity of 120 people

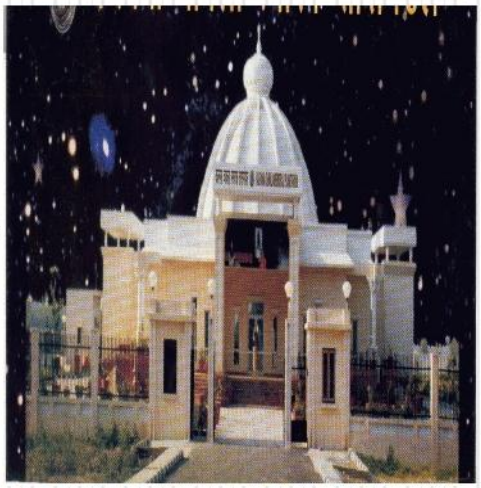


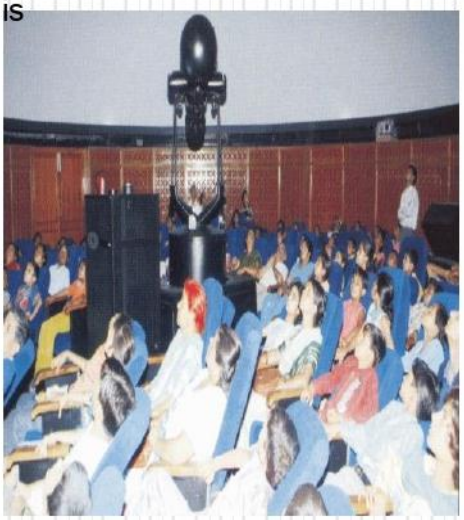
fig 4.3.2.1 2 view of planetarium

•Wooden panels are provided on the inside of the hall for acoustic purposes.
•The seating is of unidirectional type.
•The seats can bend upto an angle of 60° for proper viewing of the screen above.
•The sound system is fitted all around the circular walls.
•There is a walkway of 1.5 mts all around the circular planetarium hall.
•This walkway is used for services like air conditioning.
•The a.c ducts are all around the walkway for proper ventilation in the hall.
•There are 3 exits on 3 sides of the hall.

Structure of planetarium dome. The diameter of the dome is 12 mts.
•It is a horizontal type of dome.
•The seating in the hall is unidirectional.
•It is an aluminum dome.
•The insulation on the back of dome is of feltspar.
•It is supported by hanging supports.

Slide projection.

There are 2 types of projectors used in the planetarium.
-Opto mechanical system.
-Sci-dome.
•The opto mechanical system is generally used for the children shows. It uses a 3mts pit to be stored when not in use. When it is to be used it emerges out of the pit and projects on screen.



view of the opto mechanical projector inside the planetarium.

Figure 4.4 kalpana chawla gallery

1.Outdoor exhibition area.

There is an astro park with science games in the park.

Figure 4.5 science games in astro park.

Electricity sub station.

There is an electricity room on the left side of the main block. There is a power genset outside this room.

A.C. plant.

The a.c plant is placed directly on the back of the hall.

Water pumps are placed along with the plant.

Figure 4.6 sun dial in astro park.

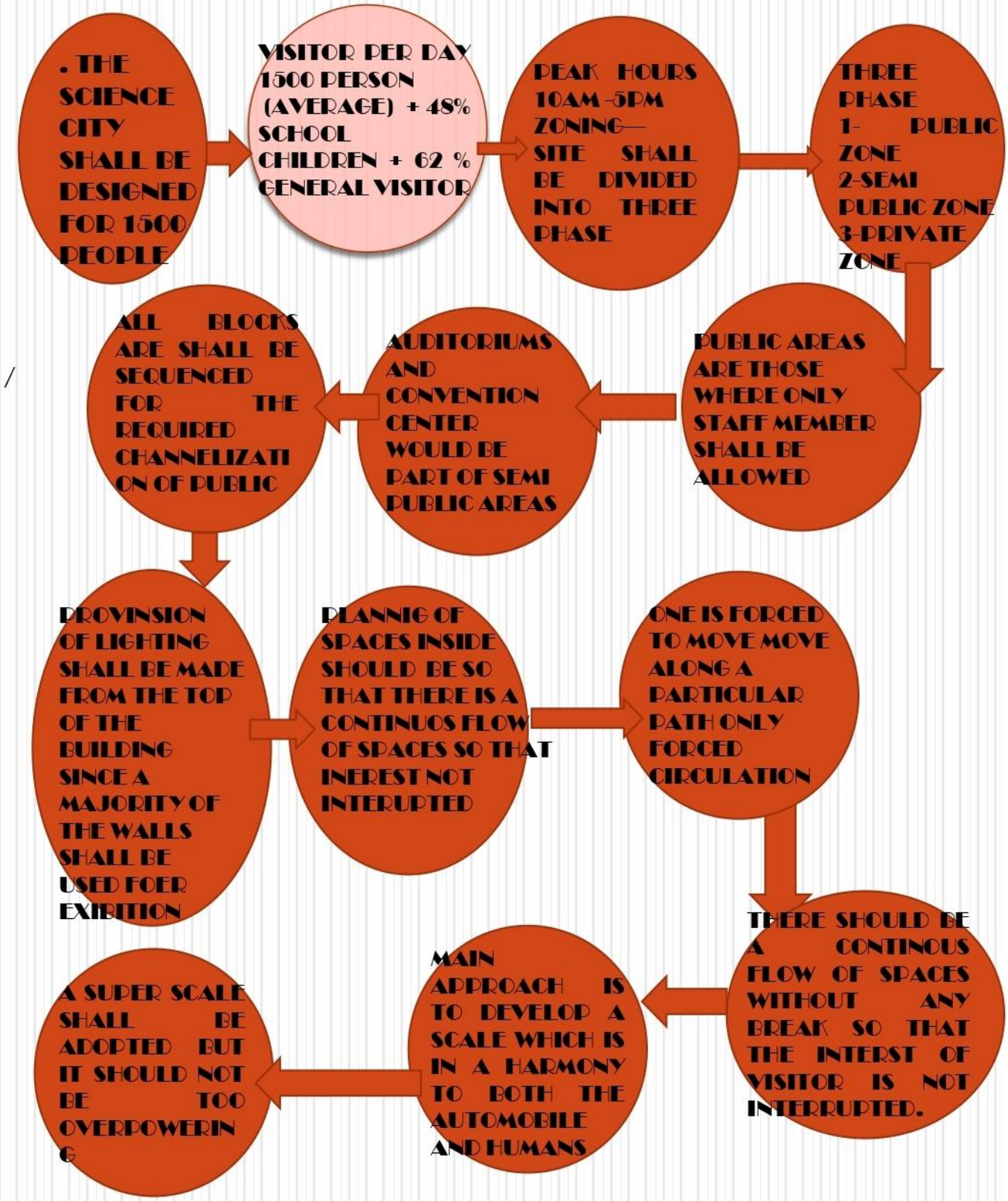
- It is a corridor 2 mts wide on back and sides and 3 mts in front which is around the planetarium hall.
- It contains the various exhibits of science, astronomy and a kalpana chawala gallery which is dedicated to the astronaut in whose memory the structure is made.
- There are offices, electric , a.h.u room and toilets on the outer periphery of the block

Figure 4.7 jantar mantar

Parking

There is adequate parking area on the left hand side of the block.

OBSERVATION AND CONCLUSION



COMPARISON SHEET

NATIONAL SCIENCE CENTRE

AREA: 1.72 ACRES

/ SINGLE MASS COMPOSED OF MASS

PLANING BASED ON RIGHT ANGLED PRINCIPLE

CENTRAL SERVICE CORE CONSISTING OF LIFT AND TOILET VENTILATION THROUGH DUCTS BASEMENT ACTS AS MAIN SERVICE CORE CONTAINING WORKSHOP AND STORAGE FACILITY

5500MMX2750 IS TAKEN AT INTERSECTION OF ALTERNATE GRIDS 4 COLUMN ARE PLACED THESE COLUMN HAVE LESS MOMENT OF INERTIA AND HENCE ARE BETTER

PUSHPA GUJRAL SCIENCE CITY

AREA: 47.9ACRE

SCATTERED PLANNING

US E OF PERMANET EXHIBITON DISPLAY

USE OF CURVILINEAR SHELLS AND OVER HANGING FRAME STRUCTURE

BUILDING HAS ITS OWN SERVICE CORE

VARIOUS TRENDS HAVE ADOPTED FRAME STRUCTURE WITH TILE CLADDING HAS BEEN USED FOR DOME WHILE HUGE FREE FLOWING CONCREATE STRUCTURE FOR GATE COMPLEX

SINGAPORE SCIENCE CITY

AREA: 6 HECTARES.

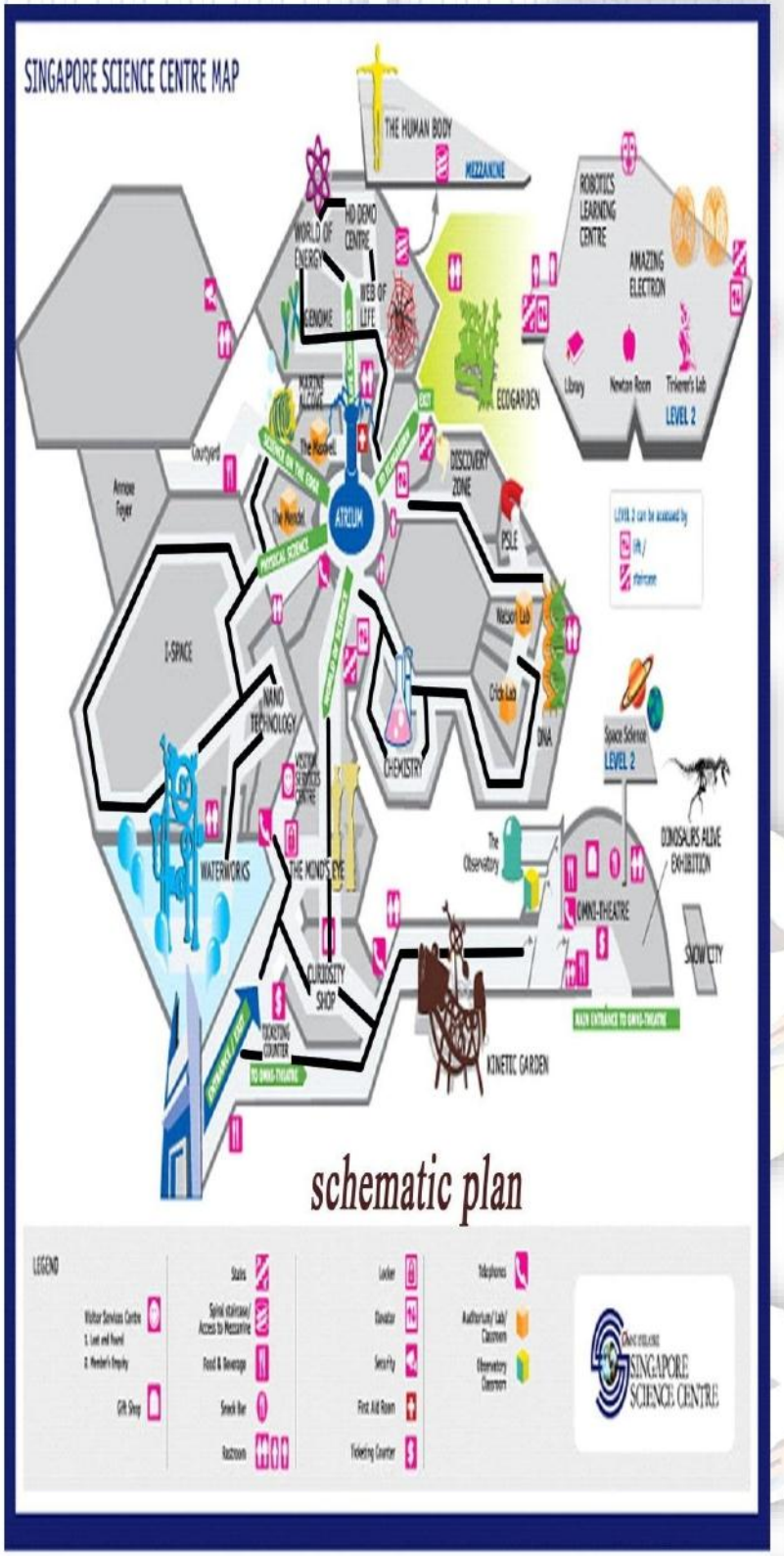
SCATTERED PLANNING WITH CONNECTING LINKWAYS

USE OF PERMANENTEXHIBIT ON DISPLAY

USE OF CIRCLES AND TRIANGLES

A NEW , FULLY ENCLOSED AIR – CONDITIONED PEDESTRIAN LINK WAY HAS ALSO BEEN BUILT

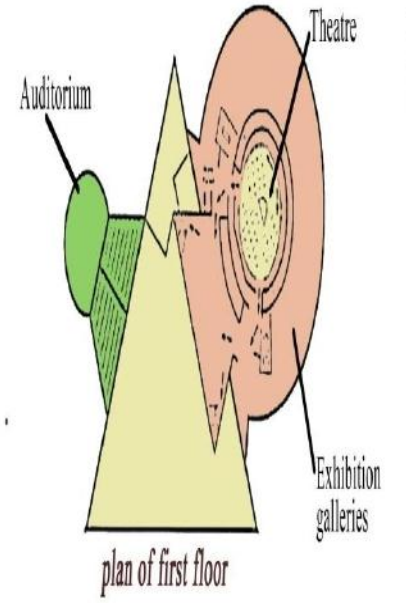
STRUCTURE POSSES GRID STRUCTURE R.C.C FRAMED STRUCTURE



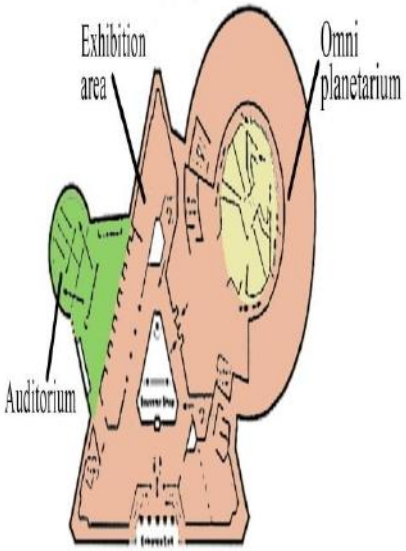
THE PLANETARIUM

THE OMNI PLANETARIUM IS ONE OF THE MOST TECHNOLOGICALLY ADVANCED THEATRES IN THE WORLD.
SPACE SCIENCE LOCATED ON THE 2ND FLOOR OF THE OMNI PLANETARIUM, IS THE SPACE SCIENCE EXHIBITION
THROUGH THE WIDE DISPLAY OF VARIOUS INTERACTIVE EXHIBITS AND SCRIPT PANELS, VISITORS ARE ENGAGED IN A FUN AND INTERESTING LEARNING JOURNEY INTO OUR SOLAR SYSTEM AND THE MANY AMAZING
CELESTIAL OBJECTS MAKING UP THE UNIVERSE. THE THEATRE'S SCREEN IS A 23M DOME, 5 STOREYS HIGH, TILTED AT A 300 ANGLE TO THE ORIZON.

SINGAPORE SCIENCE CENTRE

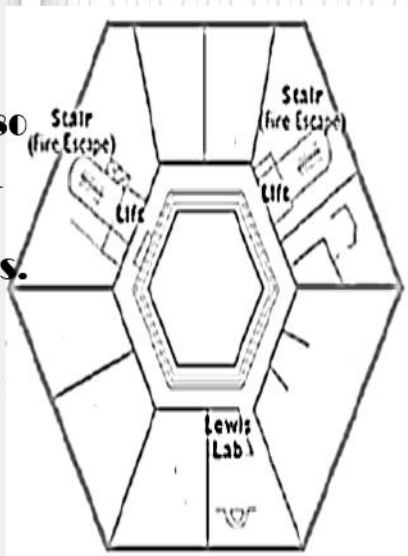


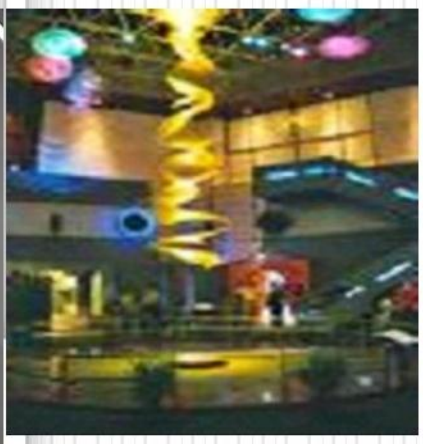
plan of first floor



plan of second floor

ATRIUM:
EXHIBITION GALLERIES. OCCUPYING A SPACE OF 280 SQUARE METERS, THE ATRIUM FEATURES ABOUT 20 PIECES OF EXHIBITS SPREAD OVER TWO LEVELS.
• AND SERVES AS AN ORIENTATION ZONE TO OTHER MAJOR GALLERIES FOR THE VISITORS

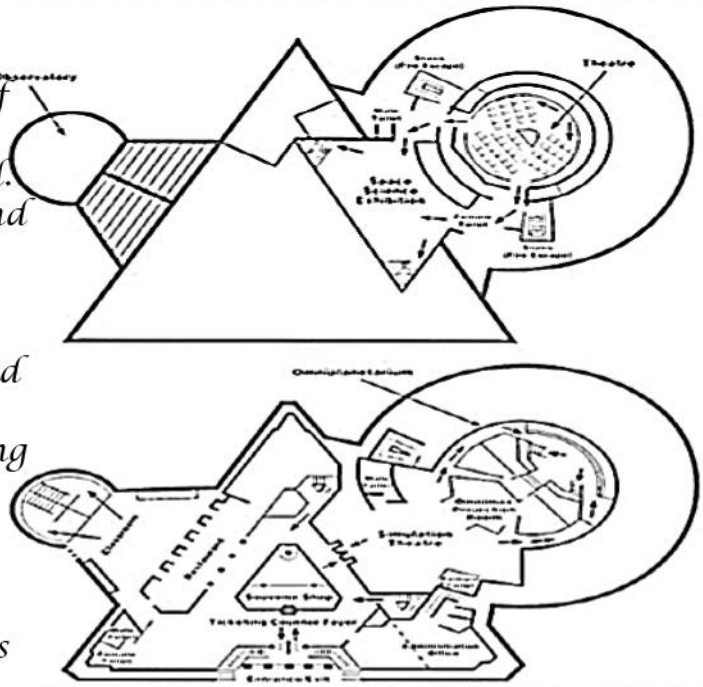




PLAN AND VIEW OF ATRIUM

KINETIC GARDEN
THERE IS A 200 SEATER AMPHITHEATRE WITHIN THE GARDEN WITH A PAVILION ALLOWS VISITORS TO APPRECIATE VARIOUS ASPECTS OF SCIENCE THROUGH OUTDOOR SCIENCE DEMONSTRATIONS AND PERFORMANCES SERVING AS AN INITIAL FRONTAGE TO ATTRACT VISITORS INTO THE EXHIBITION HALLS. THIS 7,000 SQUARE METRE KINETIC GARDEN DEMONSTRATES THE INTER-RELATIONSHIPS BETWEEN THE DIFFERENT FORMS OF ENERGY INNOVATIVELY THROUGH SUCH INTERACTIVE AND INTERESTING EXHIBITS AS THE ENERGY MACHINE, THE WATER MAZE, THE SUNDIAL AND THE SOLAR FOUNTAIN.

The Omni planetarium is one of the most technologically advanced theatres in the world. Space science Located on the 2nd floor of the Omni planetarium, is the Space Science exhibition Through the wide display of various interactive exhibits and script panels, visitors are engaged in a fun and interesting learning journey into our solar system and the many amazing celestial objects making up the universe. The theatre's screen is a 23m dome, 5 storeys high, tilted at a 300 angle to the orizon.

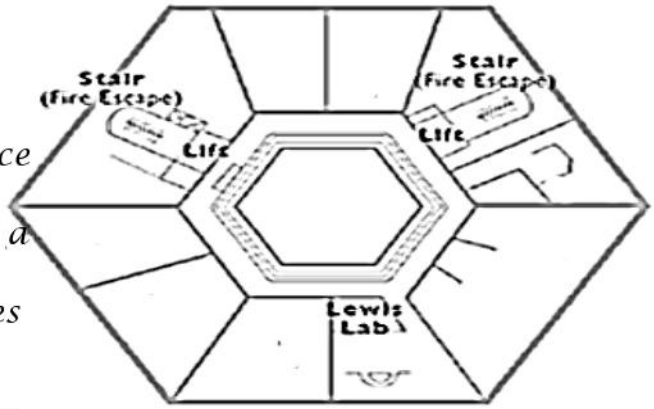


ATRIUM:

·The Atrium is the central space within the Science Center's exhibition galleries. Occupying a space of 280 square meters, the Atrium features about 20 pieces of exhibits spread over two levels.

·The newly Atrium is designed to be visually stunning and serves as an orientation zone to other major galleries for the visitors

·It also showcases the impressive and interactive exhibits at the Centre, providing a glimpse of what the visitor can expect to find in the theme galleries. Subsequently, new exhibits to the Centre will be placed in the Atrium before being moved into the respective exhibitions galleries.



Exhibition:
The themes of exhibitions are generally pertinent to educational, economic, social or technological developments in Singapore. There are more than 7,500 sq. m of exhibition space devoted to the exploration of various topics in science and technology.

MIND'S EYE
Prepare to be amazed and mesmerized at this exhibition! occupying 350 sqm at the Singapore Science Center's main entrance lobby, this mind boggling and eye-opening exhibition on optical illusions features 28 highly interactive exhibits and 50 illusion posters that will challenge and tease your senses

INETIC GARDEN:
There is a 200 seater amphitheatre within the Garden with a pavilion allows visitors to appreciate various aspects of science through outdoor science demonstrations and performances Serving as an initial frontage to attract visitors into the exhibition halls, this 7,000 square metre Kinetic Garden demonstrates the inter-relationships between the different forms of energy innovatively through such interactive and interesting exhibits as the Energy Machine, the Water Maze, the Sundial and the Solar Fountain.

kinetic garden

ECO GARDEN:
The Ecogarden, short for Ecology Garden, is not an ordinary garden or public park. It is a place unadulterated by the urban environment and is packed with nature's very own action.

FEATURES ON SITE
·The Singapore Science Centre now features new
permanent exhibitions and laboratories as well as a
new Main Entrance, an Outdoor Interactive Garden, an
Annex Building and an air-conditioned, enclosed
Linkway connecting the Science Centre with the Omni-Theatre.
·More parking lots have also been added. Construction
for the external developments

TECHNICAL SERVICES:

SERVICES:

•Sufficient RWPs have been provided to effectively drain out the roof water. The site has six rain water harvesting percolation wells dug up to 20 M depth to conserve the ground water.

•The building towers have four huge cutouts on four corners of the buildings to take care of any vertical services at any point of time.

•The flooring has a thickness of 75 mm to accommodate data and power raceways.

•Extra provision of shafts for expansion of services.

VERTICAL SHAFT

ELECTRICAL ROOM

ELECTRICAL:

•Areas have been allocated on all floors for electrical rooms, ups rooms, server rooms and data rooms.

•The electrical rooms have vertical shafts for the cables.

Tower A consists one DG set of 500 KVA and one set of 250 KVA. And Tower B consists DG sets having a capacity of 1250 KVA

• Tower –D consists two DG Sets having capacity 1250 KVA and 320 KVA. Tower C consists three DG sets having capacity of of 500 KVA and two sets of 320 KVA.

•The Main HT cable and individual L T cables are put in water proof trenches with open able panels to avoid any digging in future. The lighting is provided by the Noida Electricity board through HT cables running overhead on the site periphery.

SERVER ROOM

DG SETS

Plumbing:

•Toilets have been provided with vertical shafts and affluent removal vertical stacks.

•Provisions for rainwater harvesting and water recycling have been catered to.

Fire protection:

•The fire escape staircases are positioned in the basement in a manner so as to restrict the travel distance to 18 m from any point.

• The floor staircases are located in a manner so as to restrict the travel distance to 22.5 M from any point.

Sufficient capacities of UG and overhead fire tanks have been provided for.

•All sprinkler systems and fire alarm systems have been provided as per the byelaws.

FIRE STAIRCASE

FIRE PROTECTION ACCESSORIES

• The site planning facilitates freeway of 6 meters all around the building complex for free fire tender movement and fire hydrant ring.

•The basement staircase has been partitioned off from the staircase on ground upwards so as not to allow smoke to spread from the basement to the upper floors. `

The fire hose cabinets have been provided next to all the staircases.

•A fire control room has been catered to on ground floors of all buildings.

•Hydrants run in red colors pipes concealed on office floor but visible in basement.

SMOKE DETECTORS

•Refuge areas have been planned on the upper floors of the towers

•All staircases and the lift shafts are pressurized and isolated with smoke tight fire doors.

EXTERIOR:

Facades having a combination of Aluco Bond and Glass.

•All the towers have vacuum sealed doubled glazing.

•Sides have water proof texture paint and pleasant colours.

•The frontage of the buildings has structural glazing with the side fenestrations (5X5) fixed glazing to reduce the heat loads.

•Building gives a clean look of office building.

INTERIOR:

•A Grand double heighted entrance lobby is provided in each block.

•Double heighted lobby creates more volume and impressive look.

•Glass facade lightens the lobby with natural light.

•Facilitate impressive environment for working.

Light colors are used in entrance lobby.

•Impressive and contrasting colors are used for work spaces, which gives a cool environment for working.

•White granite flooring is provided in entrance.

•Board color has been used on reception which was beautifully complementing with composite panels.

5.2.16. STRUCTURE:

•Beam and column System has been followed.

•Grid interval 8.0 m x 8.0 m

SPECIFICATION

Structure	Structure Earth Quake resistant RCC framed structure.
Entrance Hall	Spaciously designed large lobbies with excellent aesthetics.
Elevators	OTIS/ Kone High Speed Elevators (including service lift in each Tower).
Power	Regular private power supply. New connections available promptly as per Noida Power Corp. Ltd. (NPCL) policy.
Power Back up	100% Generator supply will be provided.
AHU & Electrical Rooms	Space on each floor for services covering electrical, AHU, etc.
Water Supply	24 Hrs. water supply from Greater Noida Industrial Development Authority.
Communication	Greater Noida is directly integrated with Delhi Telephone Exchange and is connected to the National Telecom Network.
Fire Safety	Proper fire safety arrangements will be made as per government rules & regulations.
Parking	Proper car parking will be provided.
Rain water Harvesting	Proper arrangement for rain water harvesting will be made.
Land Scaping	Large open spaces, Landscaping and water fountains etc. will be provided.
	Provisions of space on the terrace of each tower will be provided.
Security	Common security for the building at the ground floor and at the main gate of the building will be provided.
Floor to Floor Height	4.2 meters
Clear Height	3.9 meters
Coloumn to coloumn spacing	8.1 meters
No. of Floors	B+G + 5 Floors
Floor Plate	48,000 sq.ft. Approx.
Total Built up area	3,00,000 sq.ft. Approx.

, will be managed & maintained by the professional facility management agency.

promises to hold the spotlight on elevating your business while you engross yourself in other attractive options. This business park is simply going to be a congregation of progressive technology solutions that is about empowering commerce sector as well as creating a self-contained commercial domain.

INFERENCES:

•The Clear Unobstructed Floor Plate preferred for flexibility in layout and sub-division.

•Construction of tall buildings is of foremost importance. The column and beam sections should be well calculated on the basis of load coming on the structure. The planning grid for such buildings plays an important role and should be decided on the bases of space requirements and structural considerations.

•The foundation will certainly depend on the bearing capacity of the soil and sub-soil water.

•The next thing to be taken care of is the façade construction details. Because of its official use, the materials thus used are Glass and Aluminum etc. So the glass used should be insulated and break resistant and also properly fitted.

•The services like staircases, elevators and their shaft should be centralized at one place and provided keeping in mind the convenience of the users. The buildings like these should be fully air conditioned and have 100% power back up.

•The fire protection norms should be satisfied and all possible measures for security should be taken for a prestigious building like this one. Equipments like smoke and fire detectors, fire sprinklers, fire extinguishers etc.should be provided wherever possible.

•The A.C plants and DG rooms etc should be provided in basements as these make noise and creates disturbance .A.H.U'S should be provided on each floor and capacity that fulfills the need of that floor.

•Parking should be provided in the site in form of basement or surface parking.

•Landscaping also plays an important role in I.T. Parks. It helps to break the dreary work space with refreshing and rejuvenating landscape feature, bringing the outside into the workspace.

BASIC FEATURES

- The concept of ENERGY EFFICIENT BUILDING is in an infant stage .The development of Energy efficient buildings in India will have to be a combination of locally available materials and economically viable technologies. Some of the typical ideas applicable in the Indian context are

- **a) Building Materials**
  - Fly ash cement and Fly ash bricks for construction
  - Steel salvaged from old buildings
  - Recycled glass & ceramics for tiles and sanitary ware
  - Harvested or recycled wood from old buildings
  - Recycled glass for windows & doors

- **b) Electrical equipment**
  - Energy efficient amorphous core transformer. Alternatively environmentally friendly Dry type transformer with On-load Voltage correction facility.
  - Oil free environmentally friendly Vacuum circuit breakers / Air circuit breakers
  - As far as possible, copper bus bars with minimum bends and joints
  - Flameproof copper cables for power distribution.
  - Automatic power factor correction relay for power factor correction (APFCR).

- **c) Lighting Feeder**
  - Maximum utilization of natural light during daytime.
  - Energy efficient light fittings and accessories.
  - Limit switch / key tag system for lighting control, wherever there is no occupancy
  - Energy efficient High Pressure Sodium Vapour (HPSV) lamps for street and outdoor lighting.

d) Air Conditioning

Energy efficient screw chiller compressor with a built-in variable frequency drive.

Non-CFC Refrigerant for refrigeration system

Variable Frequency Drives (VFD) for chiller pumps, condenser water pumps and AHU fans for energy saving.

Temperature Indicating Controller (TIC)/ VFD for cooling tower fans, Alternatively, Natural Draft Cooling towers can also be used.

Double-glazed glasses in air-conditioning environment to minimize heat gain. .

High efficiency pumps and motors.

e) Building Management System (BMS)

Computerized Building Management System (BMS) to help in monitoring & controlling electrical energy and water consumption.

Automatic Temperature sensors & controllers to maintain the required temperature.

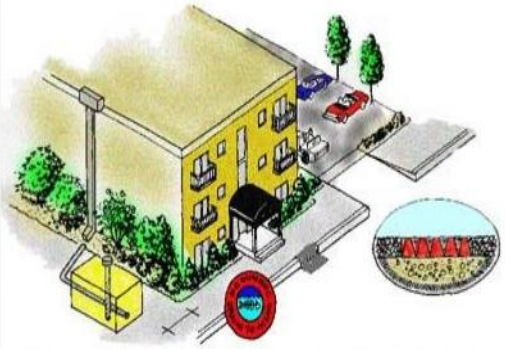
MS for rooms to control the lighting and air conditioning load.

Fire fighting & fire alarm systems to avoid fire hazardous.

Soundproof enclosure for the Generator room to control sound pollution

Energy efficient and environmental friendly white goods viz., Refrigerator, water cooler, etc.,

SITING & FORM INTRODUCTION



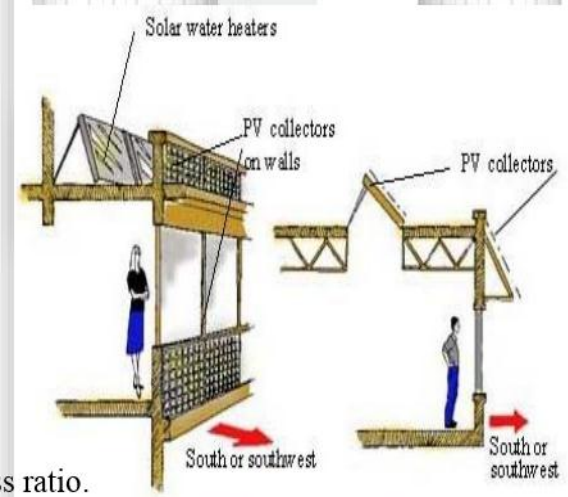
% IMPERVIOUS AREA = TOTAL IMPERVIOUS AREA/ TOTAL PROJECTED SIZE

Most of the location, orientation and massing decisions made in the early stages of design have a profound effect on the energy and environmental impacts of buildings. This is particularly the case for, where early decisions establish the potential for passive renewable energy use.

i. Runoff mitigation plan
ii. Control solar cooling loads
iii. Design for solar heating
iv. Shape and orient the building for exposure to prevailing winds
v. Daylight, views, and natural cooling
vi. Induce buoyancy airflow into & out of interior spaces
vii. Solar energy collection

RUNOFF MITIGATION PLAN

- It insures that each new development maximizes permeable surface area and minimizes the amount of runoff that is directed to impermeable areas. Its implementation reduces least 20%.
- design elements and principles outlined by the Urban Runoff Pollution Control Ordinance.
- Limiting the impervious area of the total surface area using imperviousness ratio.
- Long-term stabilization
- Incorporate structural Best Management Practices (BMPs)



> electric lighting and mechanical air-conditioning for cooling are the largest energy consumers in commercial buildings with high internal loads. Where site conditions permit, landscaping or other shade structures to reduce the amount of sun on the building is the most effective method of solar control.

SOLAR ENERGY COLLECTION

Orientation and tilt are forgiving; annual energy performance drops ~15% for collectors oriented up to 45° from due south; and by less than 10% if collectors are tilted 15° from the latitude angle, i.e., between 19° and 49°.

1 sq.ft. of flat plate collector area with optimal slope and tilt provides slightly less than 1 U.S. gallon of hot water per day, on average over the year.

East-west plans generate approximately 88% of the optimum; square plans approximately 75% relatively consistently throughout the year.

Tilting south-facing walls increases both the collection area exposed to the sun and annual electrical energy generated. A 20° tilt from vertical produces a 21% increase; 30° increases generation by 46%.

DESIGN FOR SOLAR HEATING

- Direct gain through south-facing windows, clerestory windows and roof monitors is the most common method of passive solar heating
- Greatest wall & roof exposure-north & east side
- Higher Winter & lowest summer gains- east –west facade

SHAPE AND ORIENT THE BUILDING FOR EXPOSURE TO PREVAILING WINDS

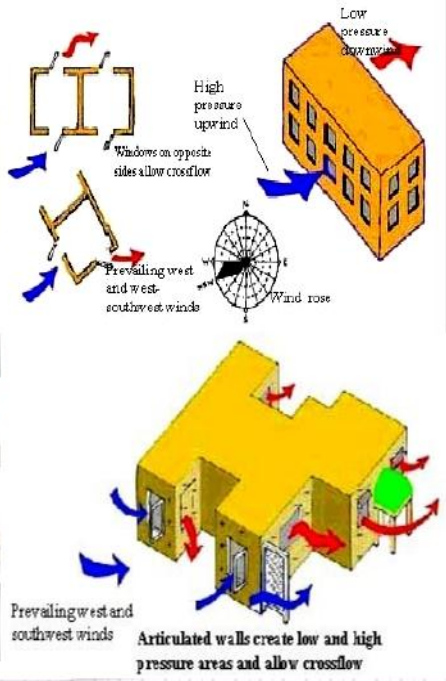
> Wind induced natural ventilation is the best as a combination of 2-principles

> Wind inducing high pressure (on upwind faces & low pressure at downwind faces)

> Stack effect (hot air rises due to buoyancy)

> Walls angled at 30 create enough pressure for natural cooling

> Building oriented south-west has greatest pressure difference between the windward & leeward. Irregularities create pressure differences along the elevation that can airflow.



DAYLIGHT, VIEWS, AND NATURAL COOLING

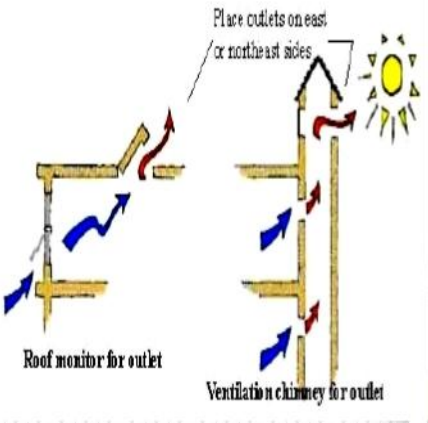
> Floor plan depth is the most important consideration affecting the potential for day lighting, exterior views and natural ventilation.

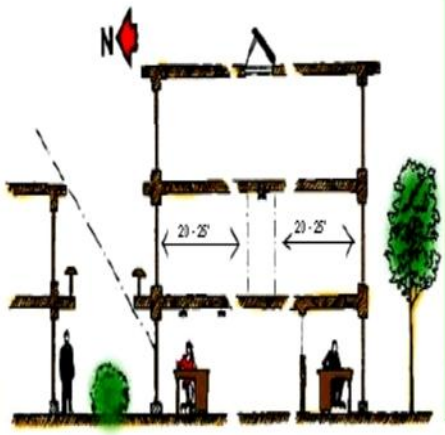
> The area of interior space that can be day lit using windows depends on both building depth and floor-to-ceiling height.

> useful daylight from typical windows can only reach 15 to 25 ft. into spaces with 8 or 9 ft. floor-to-ceiling heights, floor plans deeper than ~ 56 ft. (two rooms flanking a double-loaded corridor) will require constant electric lighting.

> Natural ventilation is effective to a depth of approximately 2X(ceiling height). This implies a maximum room depth of approximately 18- 20 ft., for 9-10 foot ceiling height with a window approximately five foot high.

> Where separate high and low openings are used with the vertical separation between approximately 5 ft., ventilation is effective for up to 2.5X(ceiling height)=max. room depth of 23-25 ft.



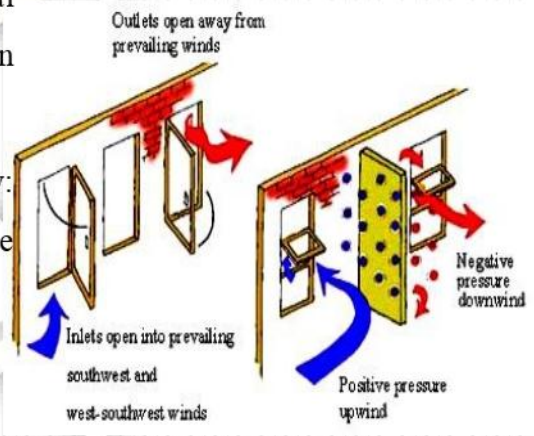


Narrow floor plans increase the potential for effective cross-ventilation:. moving air effectively over deep floor plans, but air temperature increases and air quality drops as it moves across the room.

> Pressure differences due to buoyancy are directly proportional to both height and the temperature difference between incoming and outgoing air.

>There are two ways to increase buoyancy-driven flow: increasing the height of spaces, and heating air within the building.

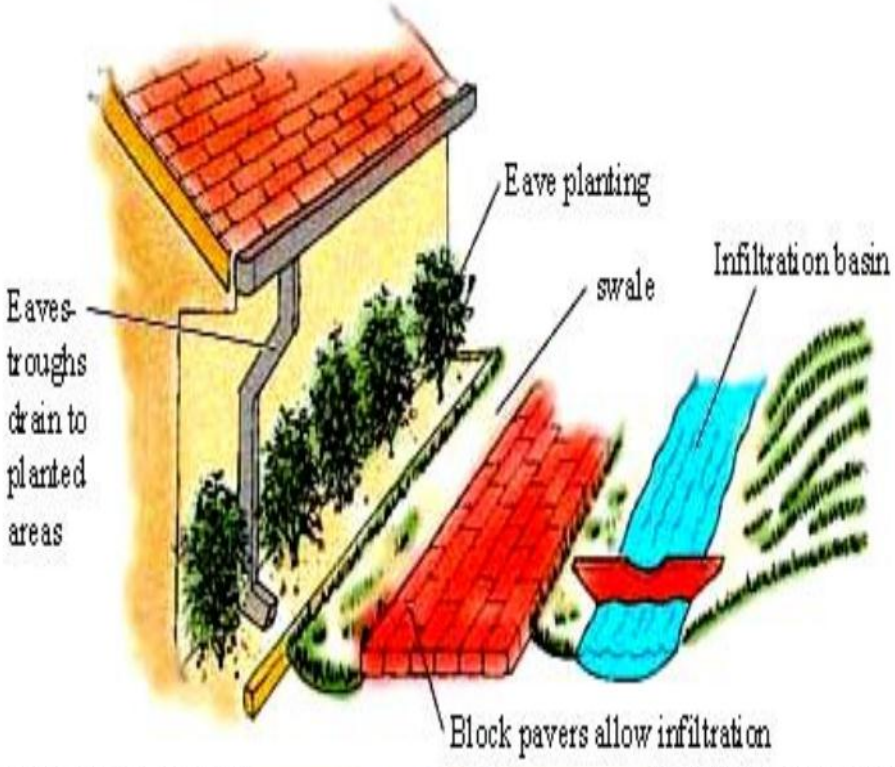
> Stack ventilation is especially useful for deep core spaces.



LANDSCAPE INTRODUCTION

MINIMIZE STORM RUNOFF

- By diverting storm water from impervious areas and by reusing it, urban runoff can be greatly reduced.
- Directing rain gutters to landscaped areas, drywells and infiltration basins where water can seep into the ground.
- Placing landscaped areas directly below eaves allows roof runoff to percolate into the sub-soil.
- Landscaped infiltration basins should have curbs, or slightly concave to retain surface water until it infiltrates.



ENVIRONMENTAL LANDSCAPING

- landscape based on a site's microclimate characteristics - exposure, wind, moisture, soil types and existing native vegetation.

  mulch and compost to soils to continuously add nutrients to the soil. Mulching reduces water use by reducing evaporation and runoff by 75% to 90% over unmulched planting areas.
- efficient drip irrigation systems that deliver water directly to the root zone in measured amounts to reduce water consumption by 50% to 70%.

WATER EFFICIENT IRRIGATION

>Appropriate planting and efficient irrigation systems can reduce irrigation water use by 50% to 70% overall water consumption by up to 25%.

> Use drip irrigation for trees, shrub beds and areas of groundcover to eliminate evaporation losses.

> Where possible, use gray water for irrigation.

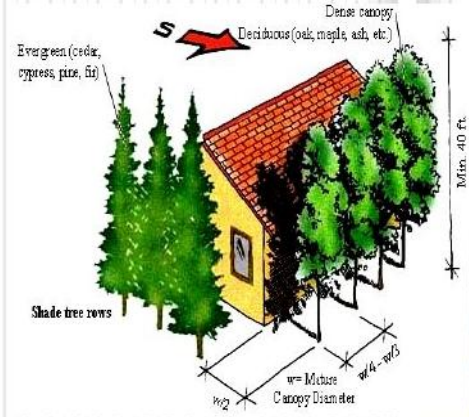
> 3 to 5 in. of mulch on planting beds minimize evaporation.

SHADING BUILDINGS

> For buildings with high cooling loads, landscaping can reduce solar heat gain, cooling energy and increase the attractiveness of outdoor spaces.

> Plants can reduce ambient air temperatures by up to 10°F and surface temperatures by 20°F.

ENHANCE BUILDING VENTILATION



Microclimate Modifications

> Microclimate modification deflects local wind flow toward or away from building inlets and outlets strategically.

> Dense foliage adjacent to building, capture & direct airflow into a building.

> dense planting of trees, shrubs, at the base of building facades dissipate and redirect downdrafts away from building entrances, patios and sidewalks.

Windbreaks

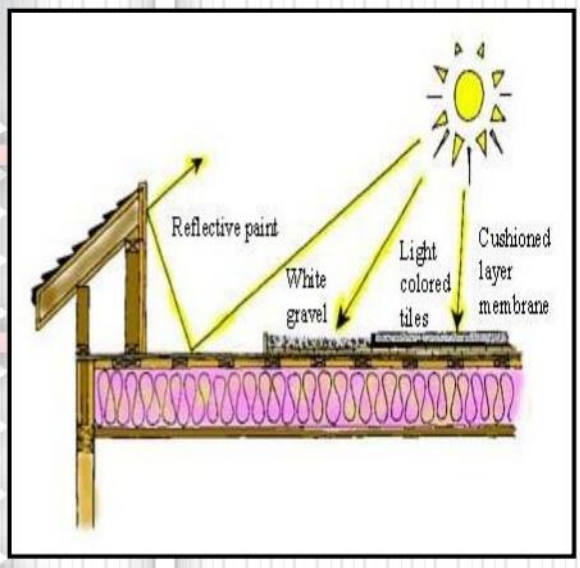
> Windbreaks moderate wind flows on a neighborhood or site scale. Trees are planted close together, across the path of prevailing winds to redirect and slow the wind

> Windbreaks intended to dissipate wind for outdoor spaces are set perpendicular to the prevailing winds. The depth of the protected area will be approximately five times the height of the windbreak. (A 10-ft. high hedge will effectively calm wind flow in the 50 ft. behind it).

ENVELOPE & SPACE PLANNING

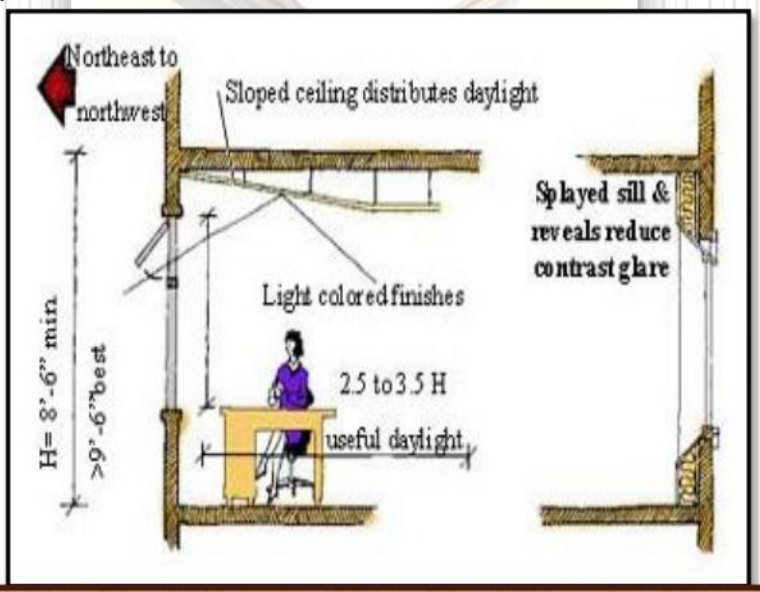
COLORS FOR EXTERIOR FINISHES

- Solar heat gains conducted through roofs can considerably increase cooling loads.
- Increasing the roof reflectivity to 0.7 or more can reduce solar heat gains by 80% compared to typical dark roofs.
- Solar gains through roofs can also be reduced using reflective foil radiant barriers located in attic spaces of cavity roof systems, e.g., gable roofs.



DAYLIGHT AND NATURAL AIR FLOW

- The layout and shape of the interior determine the effectiveness of day lighting and natural ventilation.
- The depth of daylight distribution is a function of window height relative to the working plane. Increased ceiling height gives more flexibility,
- ceiling heights 9 ft. 6 in. or greater permit the use of taller windows.
- Separating window into upper and lower portions, to independently control daylight, natural ventilation and view.

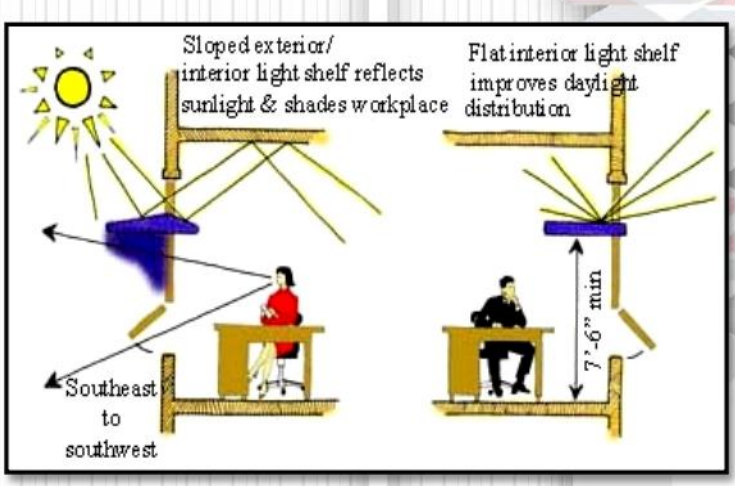


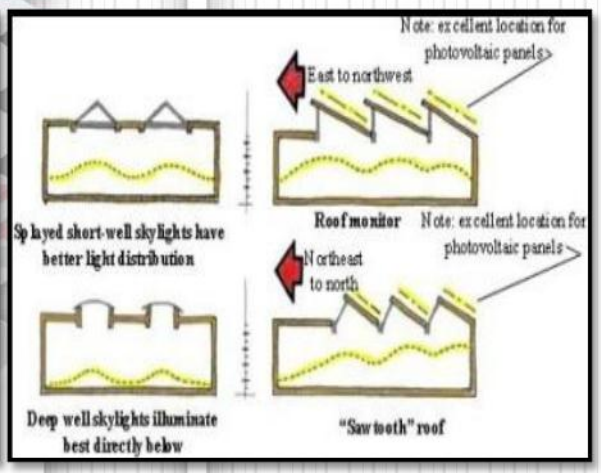
MAXIMIZING DAYLIGHTING AND VIEWS

> Window design is the most important building envelope consideration for energy conservation

> Specify high-performance low-emissive glazing with visible transmissivity greater than 0.6 and solar transmissivity less than 0.4. This can reduce annual operating energy by 20% compared to a Title 24 compliant building. A further 20% reduction can be achieved if high-performance glazing is combined with daylight controls.

> The glazing used to admit winter solar gains has high solar transmission (>0.8) and high thermal resistance (R-value >2.0 sq.ft.hour/Btu).





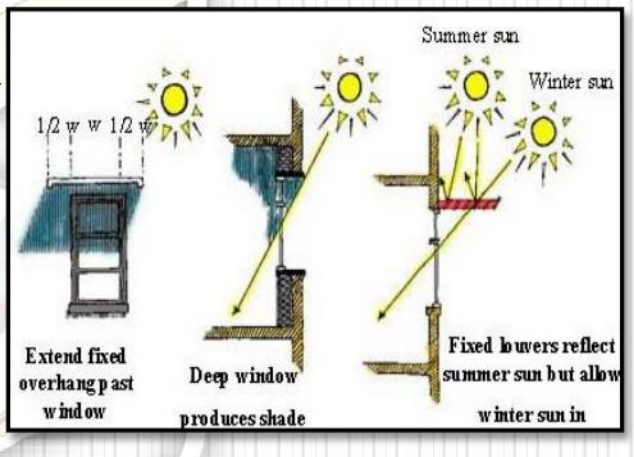
> Top-lighting provides interior light that is significantly different from that provided by windows.

> Roof monitors can be designed to admit daylight and sunlight

SHADING AND COOLING PERIODS

> Solar heat gain is reduced by recessing windows into the wall. The reduction depends on the size of the window and tends to be modest for recesses less than 6 in. Deeper recesses provide additional shade and control glare, but may reduce day lighting.

> Properly sized overhang on southwest and southeast oriented windows can reduce energy use by up to 6%.



ENERGY EFFICIENCY STRATEGIES

•**Passive solar building design** involves the modeling, selection and use of appropriate passive solar technologies to maintain the building environment at a desired temp. range

•Increase spatial vitality & Accrue energy benefits with low maintenance risks over the life of building

•minimizes the use of active solar, renewable energy and especially fossil fuel technologies.

PASSIVE SOLAR DESIGN

- Optimize the site, design, & orientation
- Landscape to provide natural shade
- Natural daylight natural heating & ventilation

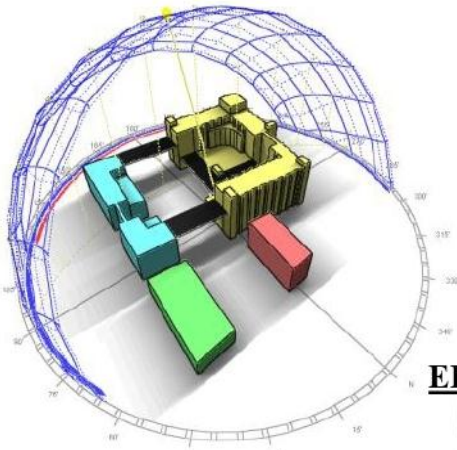
ENERGY EFFICIENT PRODUCTS

High-performance thermal insulation, roofing, glazing, lighting, heating, ventilation & air-conditioning systems.

ENERGY MANAGEMENT PLAN

- Evaluated tradeoffs & min. projected energy costs
- Optimize performance overtime
- Energy management system & commissioning

PASSIVE SOLAR DESIGN



DESIGN TECHNIQUES

ELEMENTS OF PASSIVE SOLAR DESIGN, SHOWN IN A DIRECT GAIN APPLICATION

1-DIRECT GAIN: Direct gain involves using the positioning of windows, skylights and shutters to control the penetration of solar radiation reaching & stored in interior spaces, and to warm the air and surfaces within the building.

2-INDIRECT GAIN: solar radiation is captured by a part of the building envelope designed with an appropriate thermal mass The heat is transmitted indirectly to the building through conduction and convection. Examples of this are Trombe walls, water walls and roof ponds .

3-ISOLATED GAIN: involves passively capturing solar heat and then moving it passively into or out of the building using a liquid (for example using a thermo siphon solar space heating system) or air (perhaps using a solar chimney), either directly or using a thermal store.

Sun-spaces, greenhouses, and "solar closets" are alternative ways of capturing isolated heat gain from which warmed air can be taken. In practice it has been found that some owners use these structures as living spaces.

POWER GENERATION STRATEGIES

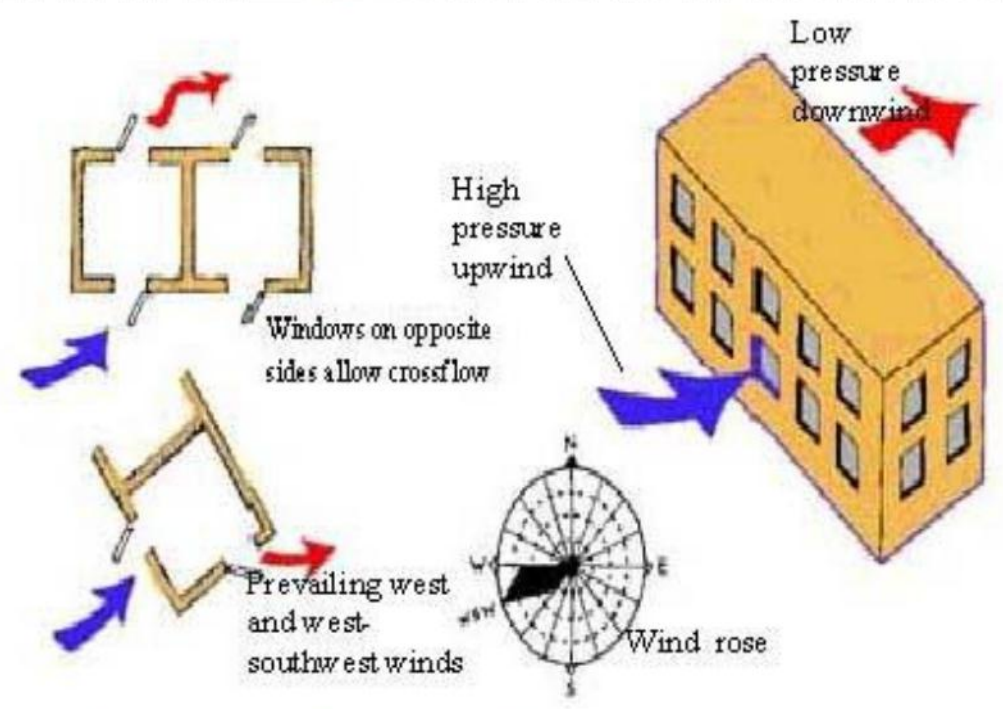
- MAX. ENERGY EFFICIENCY
- RENEWABLES BASED POWER GENERATION, INCLUDING
  - Photovoltaic
  - Wind-turbines
  - Micro-hydro systems
  - Solar thermal
  - Biomass
  - Fuel cells

BENEFITS

•Passive solar design saves energy by maximizing the natural heating, cooling, ventilation, and lighting options.

• Reduced energy consumption reduces utility bills for the owner or occupant, reduces air pollution from power plants, and reduces the environmental impacts of resource extraction associated with fossil fuels

- Cutting losses
- Site orientation
- Window selection
- Sun tempering
- Shading
- Heat storage
- Natural cooling
- Natural lighting



SOLAR

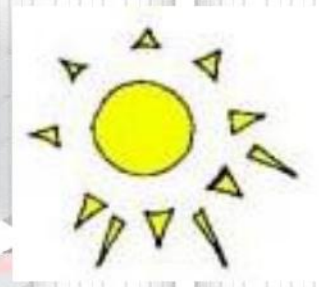
Shape

Orientation

Location

Aperture

Roof overhangs



S is for Shape:

An important factor in determining thermal performance is floor area-to-surface area (F/S) ratio. The more living space enclosed/unit of exterior surface area the less heat gain and loss will occur through the building envelope. A home with F/S ratio is a more efficient design than one with F/S ratio.

- In cold climate F/S ratio & more cubical shape= the ratio of length to width is 1.0.
- in a hot, humid climate F/S ratio and more narrow and rectangular shape to facilitate passive options such as day lighting and natural ventilation year-round.

Building elongated in the east-west direction increase the surface area of north and south walls reducing the surface area of east and west walls.
will also increase the wall area and potential window area for facilitating natural ventilation.

O is for Orientation:

NORTH: is the coolest side because it receives very little direct sun

SOUTH: is the sunniest side allowing direct transmission of sunlight through south windows for passive solar heating

EAST: is exposed to solar heat gain in summer mornings.

WEST: bear the brunt of the sun's heat. Therefore, min. window & total wall area facing west.

L is for Location:

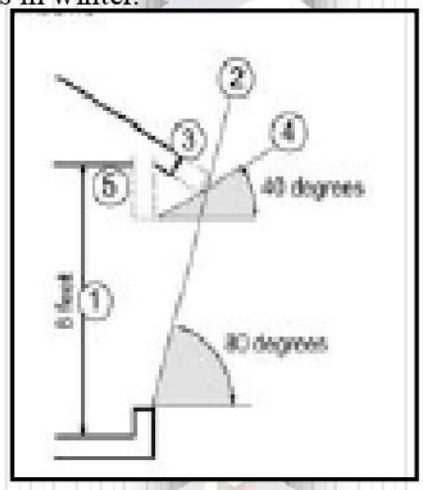
Location of major spaces on the south perimeter is most effective for implementing passive solar heating with enough daylight to enter the room for adequate illumination

A is for Aperture:

Design south-facing windows for solar gain and ventilation. South facing windows that are a net energy gain are called the home's solar aperture.

R is for Roof Overhangs:

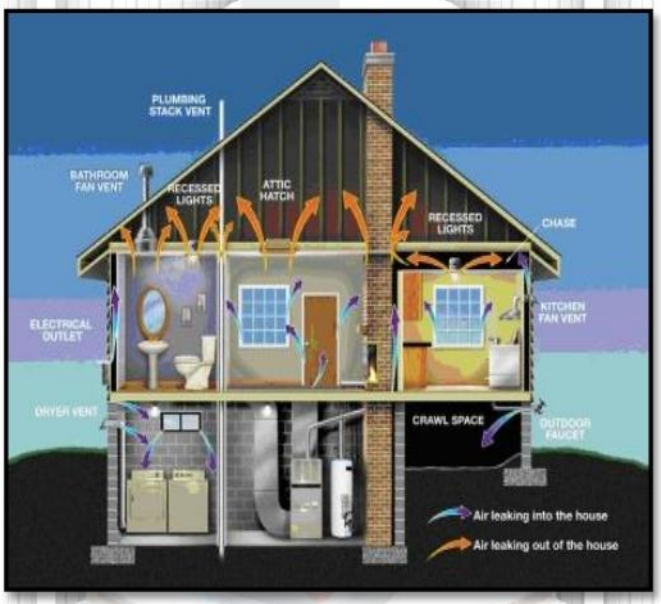
Sizing of overhang plenty of shade for south-facing windows all summer while allowing solar gain to be transmitted through the windows in winter.



ENERGY MANAGEMENT PLAN

PRE-COMMISSIONING ENERGY OPTIONS

- •Solar Passive design
- • Whole building Energy Simulation
- • Design and load evaluation
- • Ventilation System and Micro climate design
- •BAS System Specification
- •Envelope Performance Factor Method
- •Compliance with local energy code



POST-COMMISSIONING ENERGY OPTIONS

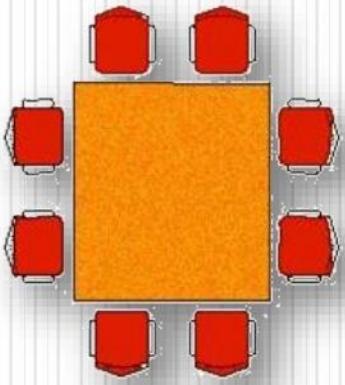
- •Energy Auditing
- • Energy Efficiency Monitoring Systems
- •Annual Energy Budgeting & Targeting
- • Energy Efficiency Measure and Retrofits

Meeting Rooms:

Max. Area per person = 2m2

Min. Area per person = 1.5m2

Each person must have 60cm (2′-0″) long surface of table and at least 37.5cm (1′-3″) wide.



Meeting Rooms:

•They are used for holding comparatively small size meetings, group discussions parallel to different sessions of conventions held in auditorium.

•The arrangement of furniture is variable.

•For e.g. for a capacity of 60 seats a fixed table for 45 seats can be provided rest being observers. Or auditorium style stepped seating may be provided.

•Each person should at least .6 m (2)' wide table surface.

STANDARDS:

Exit requirements:

•Every building shall be provided with exits sufficient to permit safe escape of occupants in case of fire or any other emergency.

•All exits shall be free from obstructions

•Exits shall be clearly marked and sigh posted to guide the population of floor concerned.

•All exits way shall be properly illuminated.

SANITARY APPLIANCES FOR ANY GROUP OF STAFF		
Number of person at work Stations	**Number of WCs**	**Number of washing**
1-5	1	1
6-25	2	2
26-50	3	3
51-75	4	4
76-100	5	5
Above 100	One additional WC for every unit or fraction of a unit of 25 persons	One additional washing station for every unit or fraction of a unit of 25 persons

•Firefighting equipment where provided along shall be suitably located and clearly marked but must not obstruct the exit way and yet there should be clear indication about its location from either side of the exit way.

•All exits shall provide continuous means of egress to the exterior of a building or to and exterior open space leading to a street.

•Exit shall be so arranged that they may be reached without passing through another occupied unit.

•Exit shall be so located that the travel distance on floor shall not exceed 30m from a shopping mall.

SANITATION REQUIREMENTS:

Alternative scale of provision of sanitary appliances for use by male staff only		
NUMBER OF MEN AT WORK STATIONS	Number of WCs	Number of urinals
1-15	1	1
16-30	2	1
31-45	2	2
46-60	3	2
61-75	3	3
76-90	4	3
90-100	4	4
Above 100	One additional WC for every unit or fraction of a unit of 50 men	One additional washing station for every unit or fraction of a unit of 50 men
If public also use staff toilets, add 1 to each number of conveniences above.		

Drinking water fountain:

➢One for every 100 persons with a min. of one on each floor.

PARKING STANDARDS:

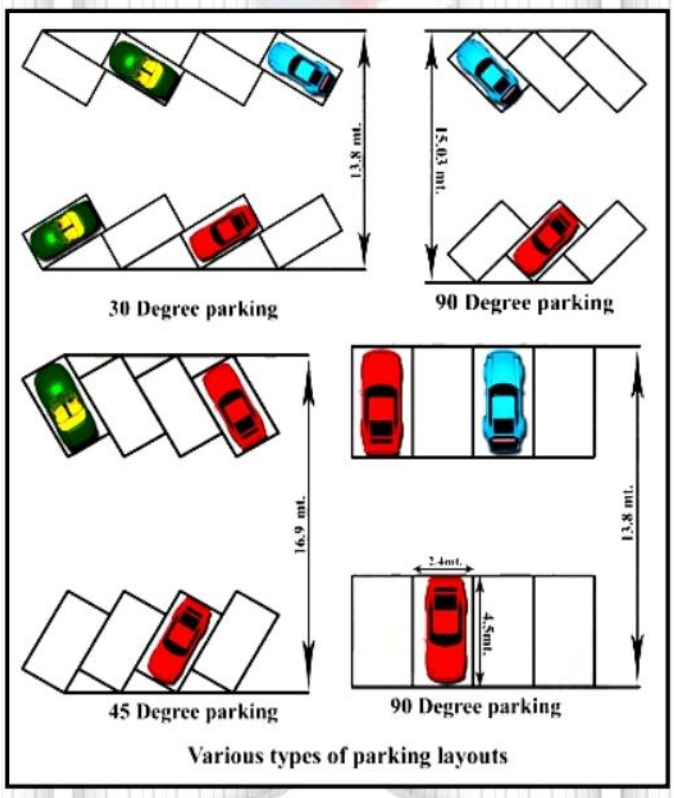
Parking ratio:

•Parking ratio is the relationship between the area devoted to parking and the area devoted to building and is expressed in terms of gross floor area.

•It is best to allow 50-sqm areas per car.

Parking index:

It is the number of cars parking space per 100-sqm of gross feasible area



Various types of parking layouts

Recommended parking standards:

•50-sqm should be allotted for each car it includes space for moving lane, access drives, pedestrian walks etc.

•Storey height for parking height is approx 3 mt.

•Passages and driveways on ground floor must be designed to carry 6 tones vehicles.

FACILITIES FOR DISABLED PEOPLE:

Approach to plinth level:

•Ramp shall be provided with non-slip material to enter the building with a minimum clear width of ramp as 1800 mm and maximum gradient of 1:12, between top and bottom of the ramp.

•Length of the ramp shall not exceed 9000mm having 800 mm height handrail on both sides extending 300mm beyond the ramp.

•Minimum gap from adjacent wall to the handrail shall be 50mm.minimum clear opening for the entrance shall be 1000 mm.

Corridor connecting the entrance /exit for the disabled:

The corridor connecting the entrance or exit for handicapped leading directly outdoors, information shall be provided as follows:

•Guiding floor material shall be provided or devices that emit sound to guide visually impaired persons.

•The minimum width shall be 1500mm.

•In case there is a difference of level, slope ways shall be provided with a slope of 1:12

•Handrails shall be provided for ramps or slope ways.

Toilets:

•One special WC in a set of toilet shall be provided for the use of handicapped with essential provision of washbasin near the entrance for the handicapped.

•Minimum size of one unit shall be 1500 x 750 mm.

•Minimum clear opening of the door shall be 900 mm and swing out or sliding type.

•Suitable arrangement for vertical or horizontal handrails with 50 mm clearance from wall shall be made in the toilet.

•The WC seat shall be 500 mm from floor.

SERVICES:

FIRE PROTECTION REQUIREMENTS:

STRUCTURE:

•The structure framework can be in RCC or steel .in case of steel structure, it will be necessary to encase the structure components by tiles, concrete or bricks.

•The fire resistant of load bearing walls, columns and beams shall not be less than two hours.

•Internal wall could be in brick, hollow concrete blocks, tiles or timber.

•The material of the wall should, however, be treated in such a manner that they should have fire resistance of not less than one hour.

FIRE DETECTION AND EXTINGUISHING SYSTEMS:

•All multi-storied buildings should have adequate provision for fire detection and fire extinguishing.

FIRE ESCAPE AND EXTERNAL STAIRS:

•In addition to the main staircase it is necessary to make suitable provision of fire escape in the form of external stairs.

• All fire escapes should be directly connected to ground floor and their entrance should be away from the internal staircase of the building.

BASEMENT:

•The basement should be properly ventilated.

•The staircase of basement should be of enclosed type and should have a fire resistance of not less than two hours.

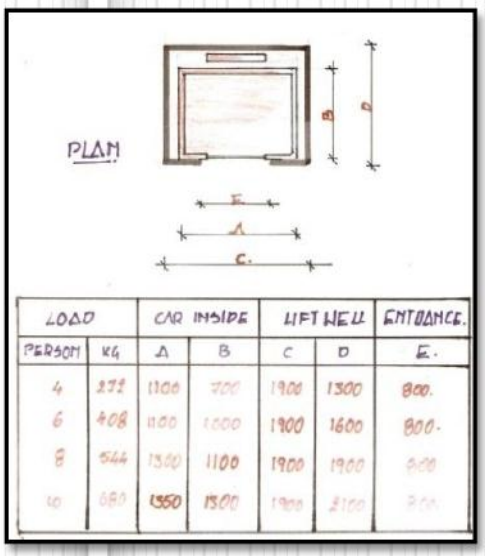
•In case the basement is to be used for car parking, it is necessary to install sprinkler system for extinguishing fire.

WATER STORAGE TANK:

•There should be a provision of an underground storage tank of one to two lakhs liters capacity exclusively for firefighting purposes.

LIFTS:

- The lift lobby shall be of minimum 1800 x 2000 mm.
- Dimension of the lift
- Clear internal depth – 1100 mm.
- Clear internal width – 2000 mm
- Entrance door width –9110 mm



LOAD		CAR INSIDE		LIFT WELL		ENTRANCE.
PERSON	KG	A	B	C	D	E.
4	272	1100	700	1900	1300	800.
6	408	1100	1000	1900	1600	800.
8	544	1350	1100	1900	1900	900
10	680	1350	1500	1900	2100	900.

AIR CONDITIONING REQUIREMENTS:

The process of treating air to control simultaneously its temperature humidity, purity and distribution and meet the requirement of the conditioned space is known as air conditioning. Generally adopted system for air conditioning of multiplexes is the central system.

Central system is of two types:

1.Direct expansion system

2.Chilled water system.

A.C. LOAD CALCULATIONS:

LOAD CALCULATIONS ARE BASED ON THE FOLLOWING ASSUMPTIONS:

•Human load -- 1ton per 25 persons

•Volumetric load –1 ton per 50-mt cube

•Equipment load – 1 ton per K.W.

•AHU area – 0.35 sqmt/ton + 5

•AC plant room area – 0.5 sqmt/ton +5

•Height (AHU and Plant room) – 4mt

LANDSCAPING:

IMPORTANCE OF LANDSCAPING:

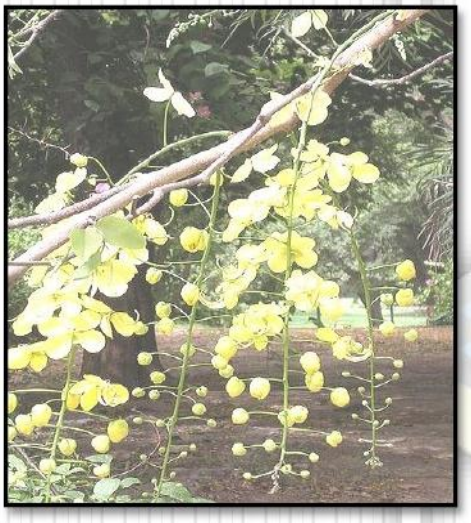
As the buildings are made for the usage of the public, hence an important aspect is to maintain a comfortable and environment atmosphere. Even In all kind of building, this consideration should always be made so that the building is just not internally comfortable but so has an ambiguous environment and incorporate work with recreation for a better work input and development of the corporate world.

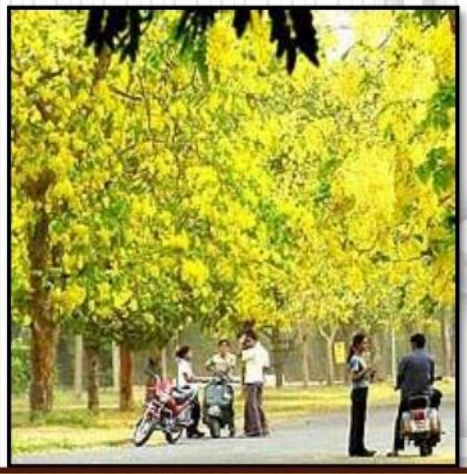
FOLLOWING ARE THE MEASURES USED TO CREATE A HEALTH AND COMFORTABLE ENVIRONMENT :

- Trees
- Plants
- Water bodies
- Green pavers

TREES:

• CASSIA FISTULA





Common name: Amaltas, Golden shower tree, Indian Laburnum

Botanical name: Cassia fistula

Family: Caesalpiniaceae (Gulmohar family)

• One of the most beautiful of all tropical trees when it sheds its leaves and bursts into a mass of long, grape-bunches like yellow gold flowers.

• A tropical ornamental tree with a trunk consisting of hard reddish wood, growing up to 40 feet tall.

• The wood is hard and heavy; it is used for cabinet, inlay work, etc. It has showy racemes, up to 2" long, with bright, yellow, fragrant flowers.

• These flowers are attractive to bees and butterflies.

• The fruits are dark-brown cylindrical pods, also 2' long, which also hold the flattish, brown seeds (up to 100 in one pod).

Medicinal uses: The sweet blackish pulp of the seedpod is used as a mild laxative.

•GULMOHAR

Common name: Gulmohar

Botanical name: Delonix regia

Family: Fabaceae

• its ornamental value

• it is also a useful shade tree in tropical conditions, because it usually grows to a modest height but spreads widely, and its dense foliage provides full shade.

•In areas with a marked dry season, it sheds its leaves during the drought, but in other areas it is virtually evergreen.

• The flowers are large, with four spreading scarlet or orange-red petals up to 8 cm long, and a fifth upright petal called the standard, which is slightly larger and spotted with yellow and white.

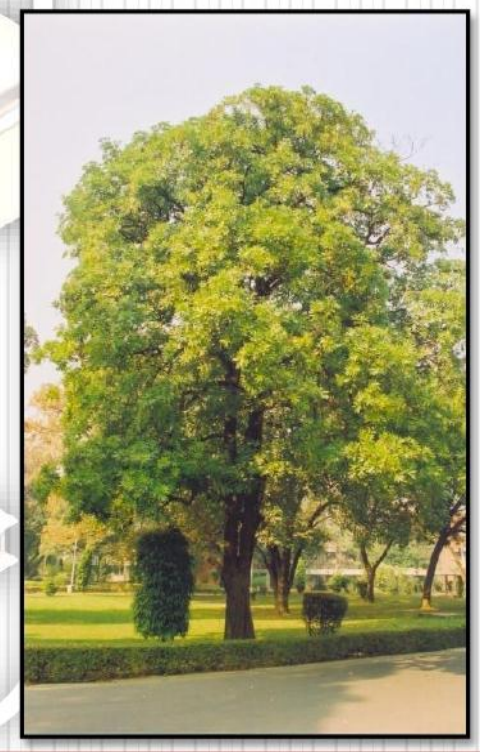
•The naturally occurring variety *flavida* has yellow flowers. Seed pods are dark brown and can be up to 60 cm long and 5 cm wide; the individual seeds, however, are small, weighing around 0.4 g on average.

• ALSTONIA SCHOLARIS

Common name: Gulmohar

Botanical name: Delonix regia

Family: Fabaceae



• *Alstonia scholaris* is a small tree that grows up to 40 m tall and is glabrous. The bark is greyish;branchlets are copiously lenticellate.

• The upperside of the leaves are glossy, while the underside is greyish.

• Leaves occur in whorls of 3-10; petioles are 1-3 cm; the leathery leaves are narrowly obovate to very narrowly spathulate, base cuneate, apex usually rounded; lateral veins occur in 25-50 pairs, at 80-90° to midvein. Cymes are dense and pubescent; peduncle is 4-7 cm long. Pedicels are usually as long as or shorter thancalyx.

• **FICUS BENJAMIA**

Ficus benjamina, commonly known as the **Weeping Fig** or **Benjamin's Fig** and often sold in stores as just a **"Ficus"**, is a species of tree, native to south and southeast Asia and Australia. It is the official tree of Bangkok, Thailand. It is a topiary tree reaching 30 metres (98 ft) tall in natural conditions, with gracefully drooping branchlets and glossy leaves 6–13 cm (2–5 in) long, oval with an acuminate tip. In its native range,

WATER BODIES:

Water bodies are so very important as it not only has the aesthetic value but as has its functional value. The water bodies generate a micro-climate around its and create a cool space. placed along the wind direction to generate an ambiguous environment. it decrease the temperature by about 5 c.

AESTHETIC FACTORS-

- Auditory
- Psychological
- Sensory effects
- Visual

AESTHETIC REASON

+

FUNCTIONAL REASON

FUNCTIONAL FACTORS-

- Recreational
- Circulation control
- Utilitarian

GREEN PAVERS:

BIBLOGRAPHY

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• Passive & low energy architecture – by Plea Association
• Planning the new office – Michael Saphier
• Eco- friendly home – by Paul Hymers
• Energy Management Systems for Commercial Buildings - EPRI

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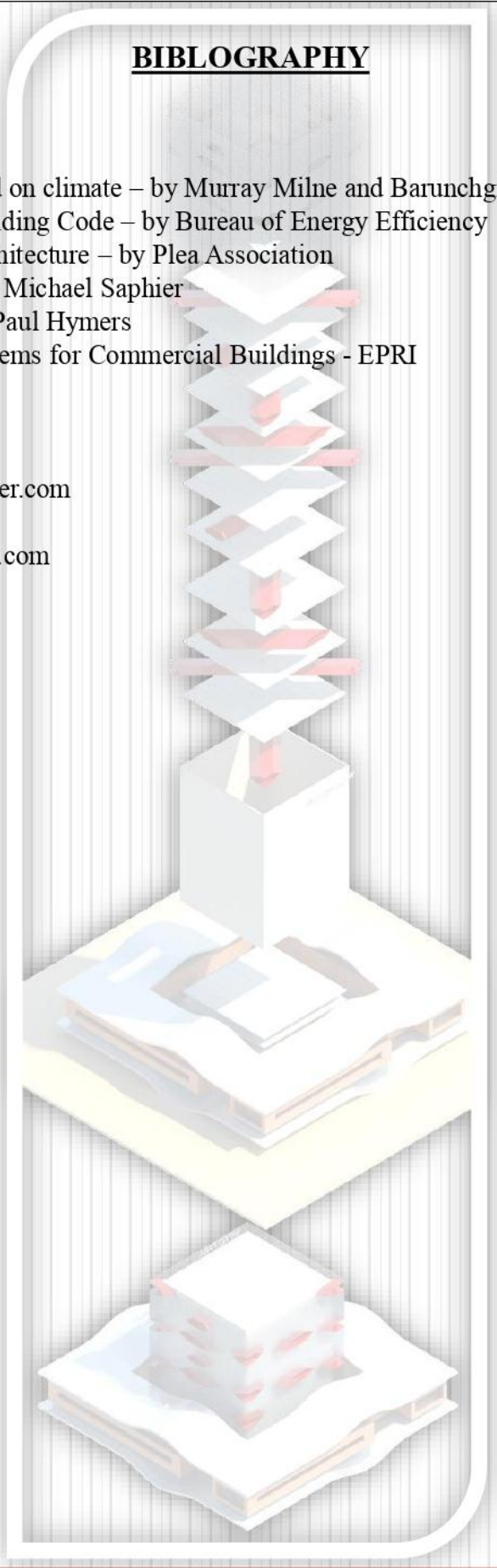
• WWW. Energy efficiency.com
• WWW. RKA.com
• WWW. IGBC.com
• WWW. Ashrae.com
• WWW. Solar living.org
• WWW. teri.org

MAGAZINES:

• **A+D**



AREA STATEMENT

A. SITE DETAILS:

1. Area of site – 1,618400 sqm , i.e. approx. 41 acres
2. Permissible FAR – 1.5 or 20 mt in a hilly regions
3. Permissible height – restriction 20 mt
4. Permissible ground coverage – 35 %
5. Setbacks :

   Front side 18mt.

   All other side 9mt.

6 Parking Norms – one car/100 sqm. Of built up area

B. AREAS AS PER BY LAWS:

4. No of building blocks – 8
6. No of floors – science exploration blk- G+3, art gallery – planetarium ((350 per) – auditorium 350 person -3d simulator room 250 person staff quarter g+3 x 2
7. Total number of car parks –325car (permissible) Total number of car parks –352car
8. 10 bus facility and amphitheature
9. 7.1 acre for future expansion
10. 25 % covered and 75 % open as per the nsc norms

(achieved)

S.N.		Area /person	No.	Total area
1.	Science exploration block	10 sqmt per floor	G+3	20000sqmt
2.	Art gallery block	10 sqmt per floor	G+1	4000 sqmt
3.	Auditorium	15sq.mt	1	1200sqmt
4.	3d simulator dome planetarium	9 sqmt	1+1	850 sqmt+ 600 sqmt
5.	Toilets	20sq.mt for men 15 sq.mt for women	1 1	20 15

DRAWINGS

VIGYAAN DHAAM

JHAJRA , DHERDUN , UTTARA KHAND

SUBMITTED BY - ASHUTOSH PATHAK

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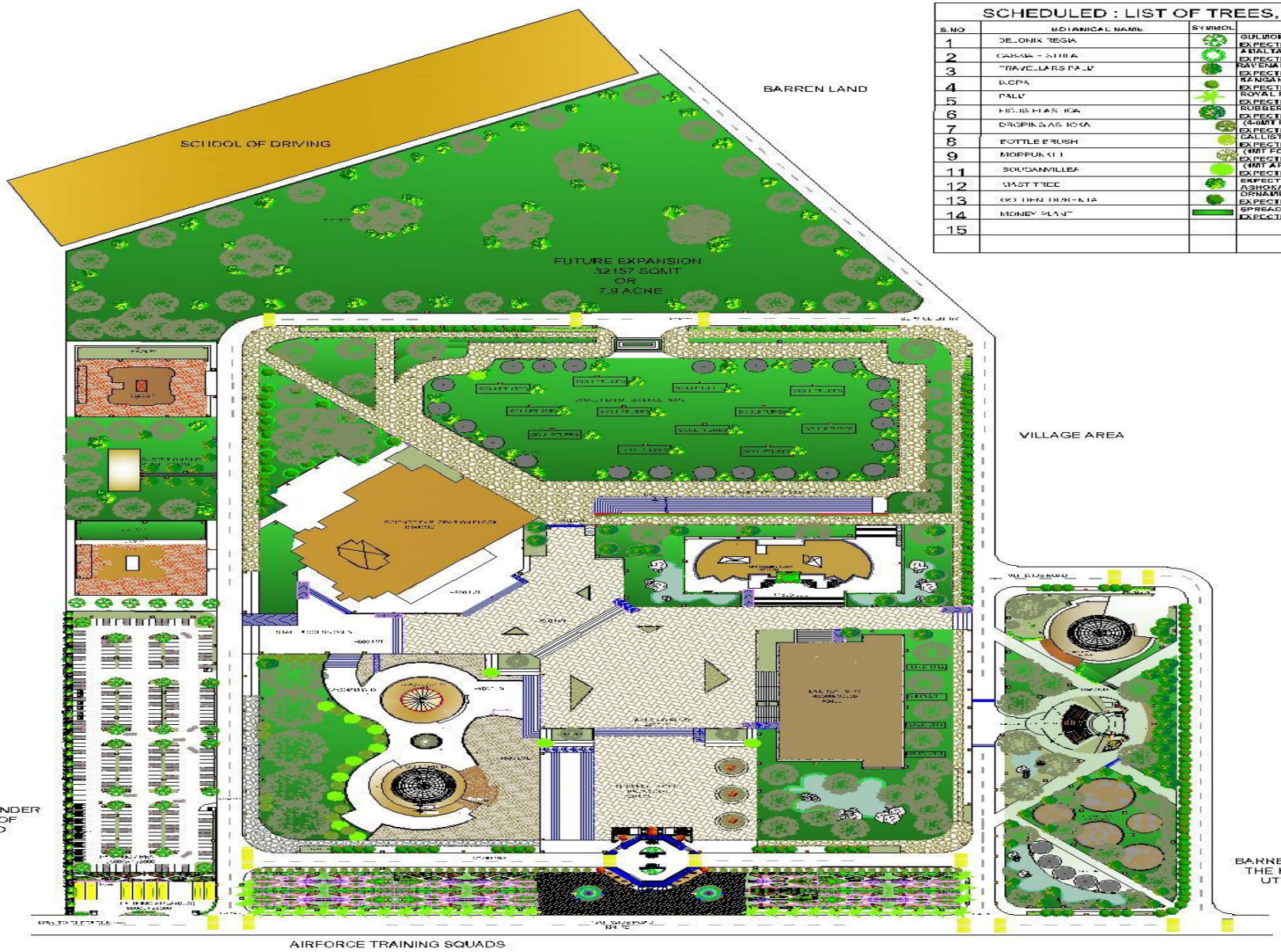

DESIGN OF
An Ecological Approach Towards The Socio - Cultural Development of a Rural/urban/Ghats (interactive spaces)

VIGYAAN DHAM

JHAJRA , DHERADUN , UTTARA KHAND

ASHUTOSH PATHAK
MASTER OF ARCHITECTURE

SESSION 2019-22 SEMESTER VI

SITE PLAN (LANDSCAPE)
SCALE : 1:1000

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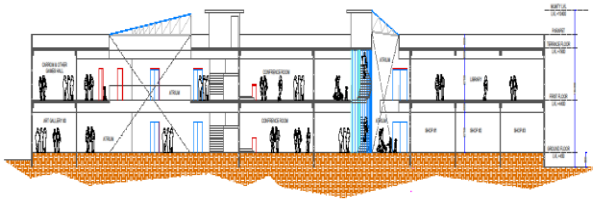

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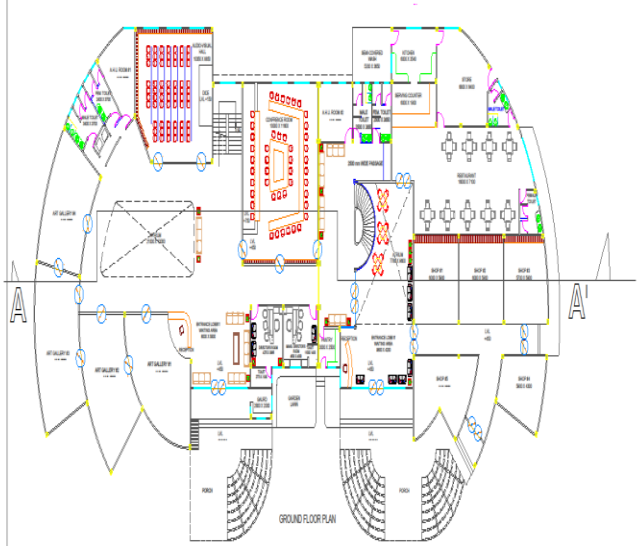

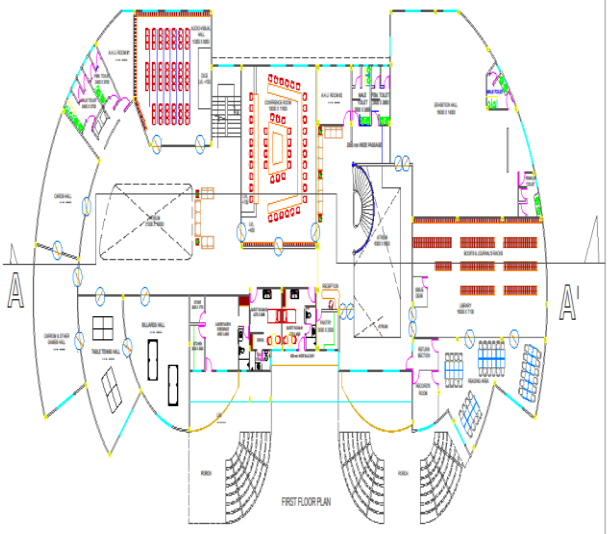

ART GALLERY BLOCK

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GROUND FLOOR+FIRST FLOOR PLAN

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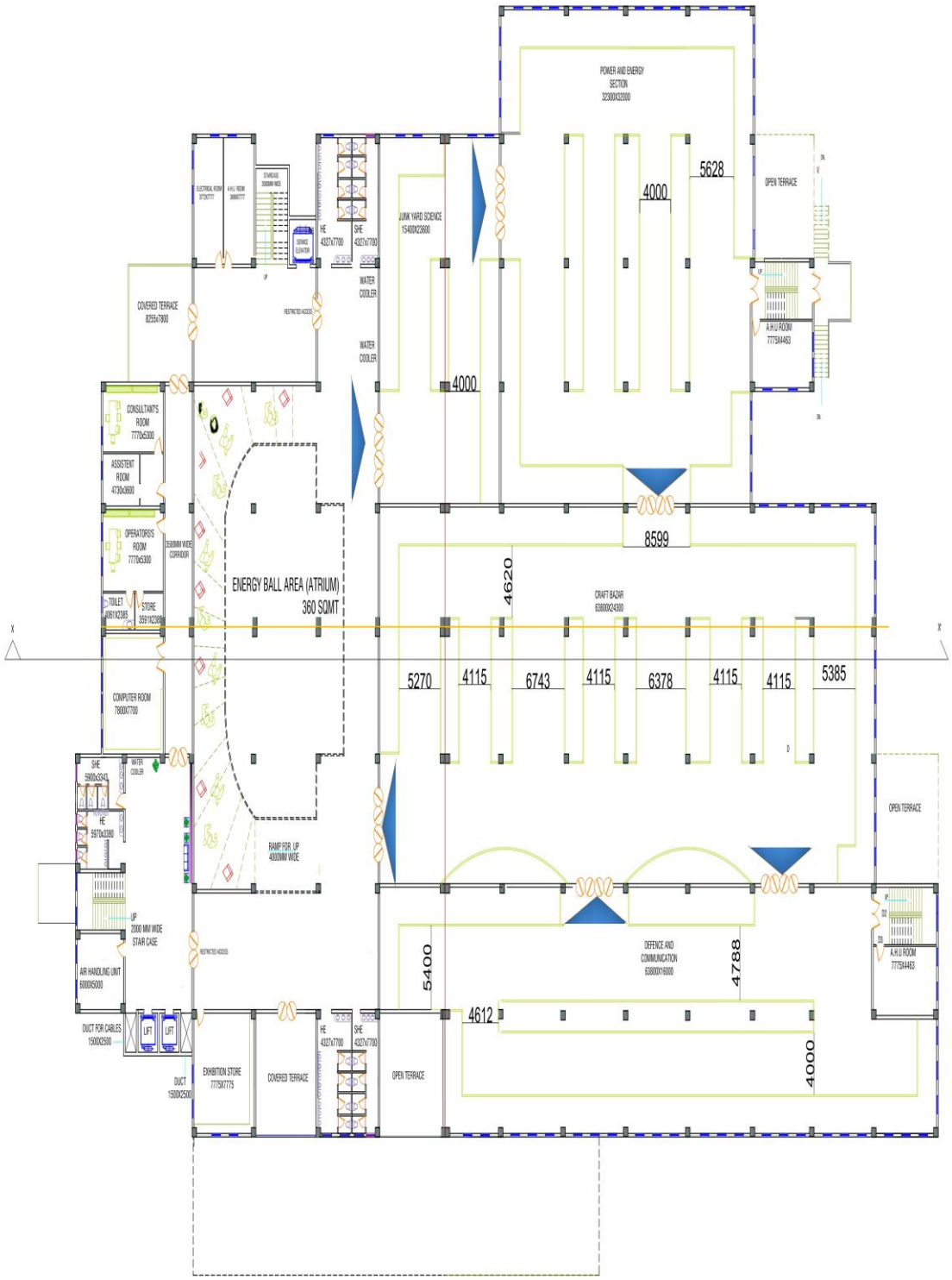

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SECOND FLOOR PLAN
SCALE : 1:250

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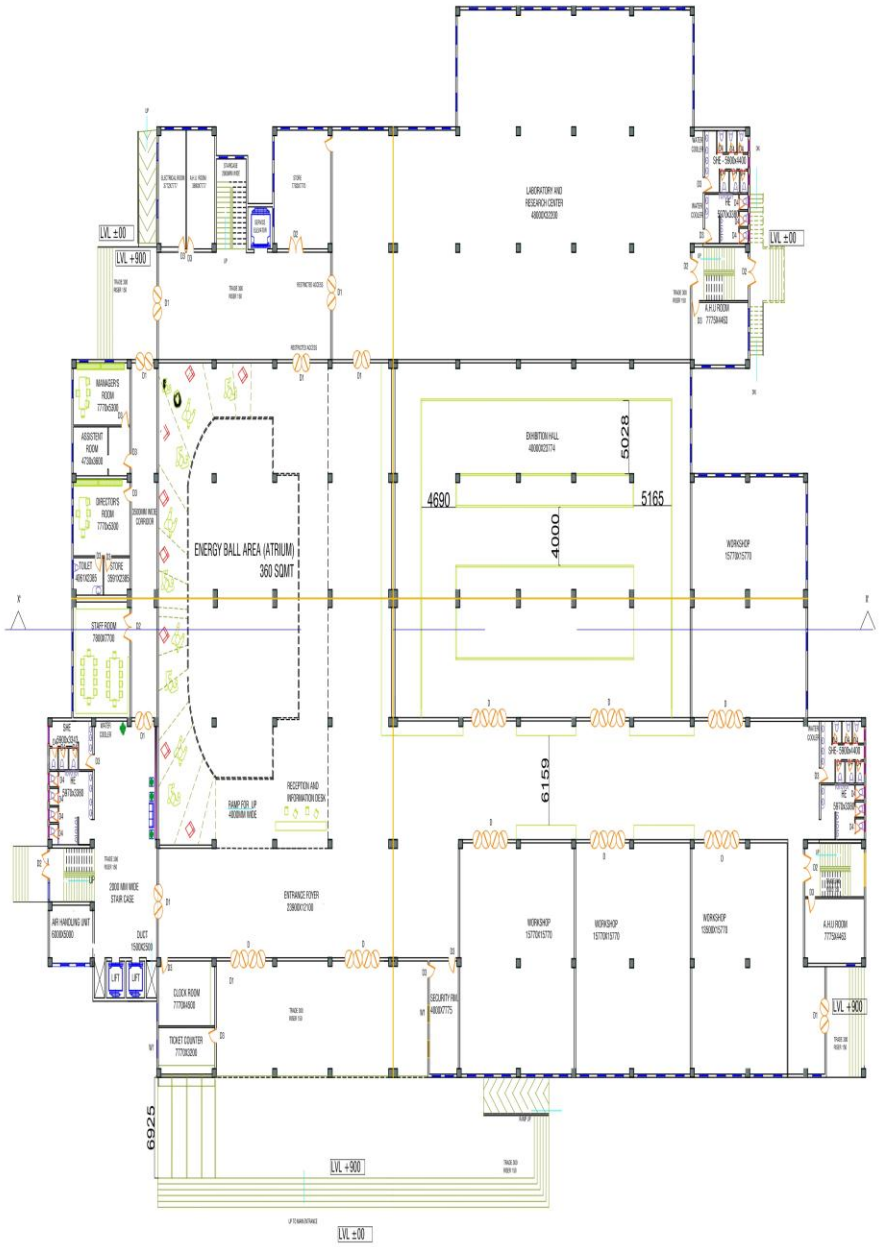

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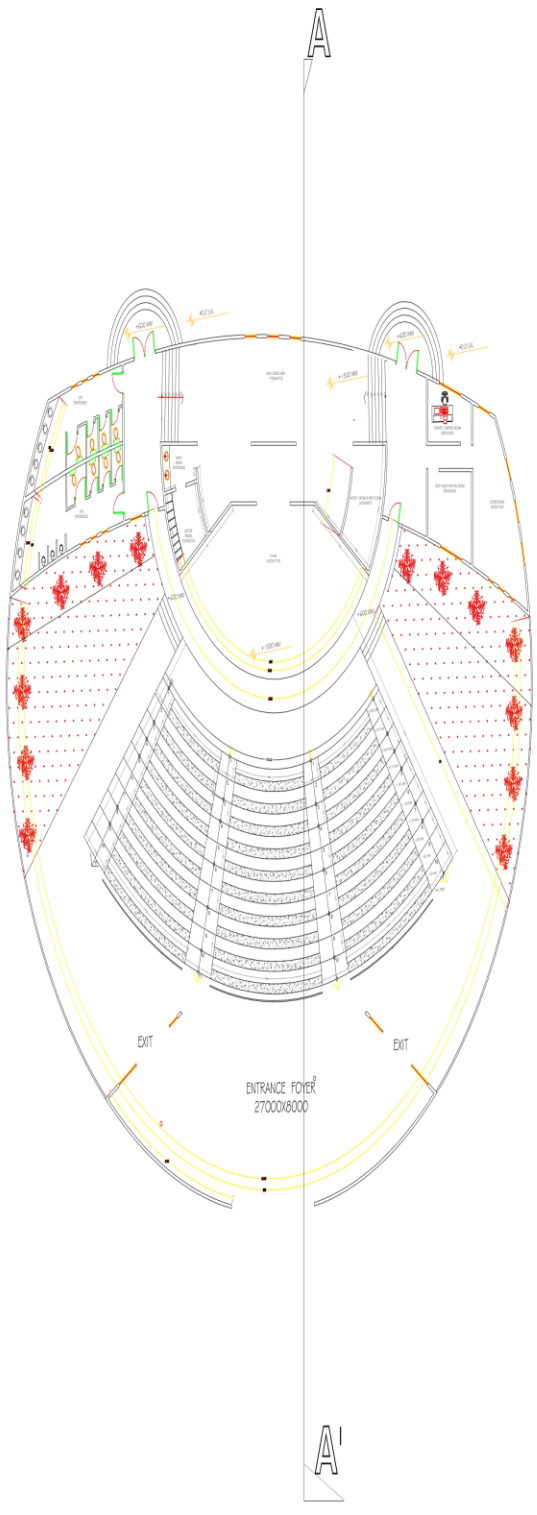
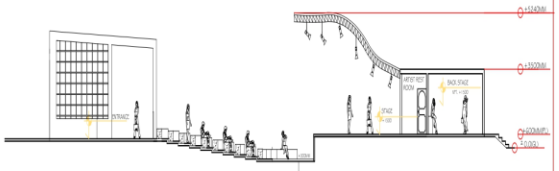
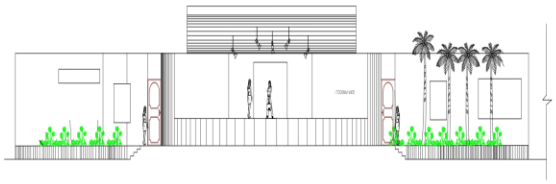
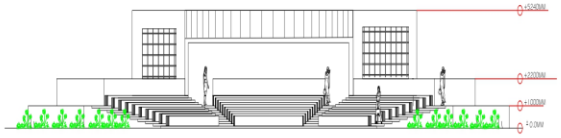




SECTION AT AA'



VIEW FROM THE AUDIENCE



VIEW FROM THE STAGE

AMPHITHEATURE (350PERSON)

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FLOOR PLAN
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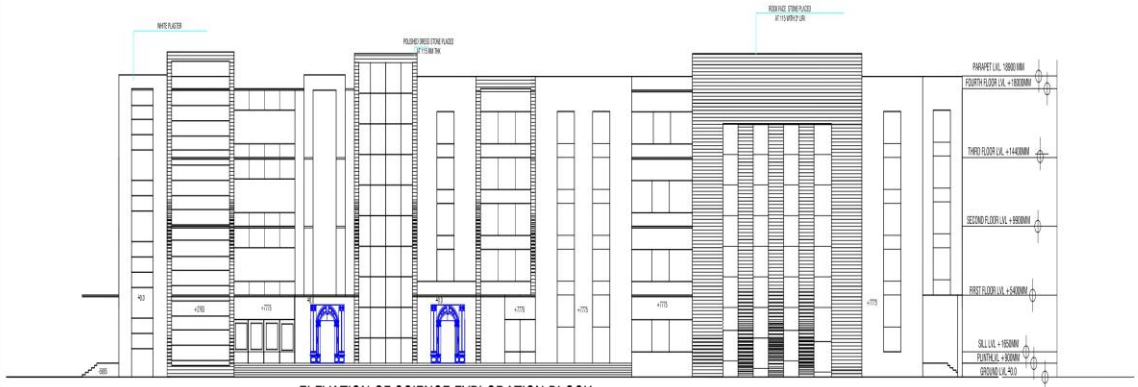
SECTION AT XX' OF SCIENCE EXPLORATION BLOCK



ELEVATION OF SCIENCE EXPLORATION BLOCK

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ELEVATION + SEC
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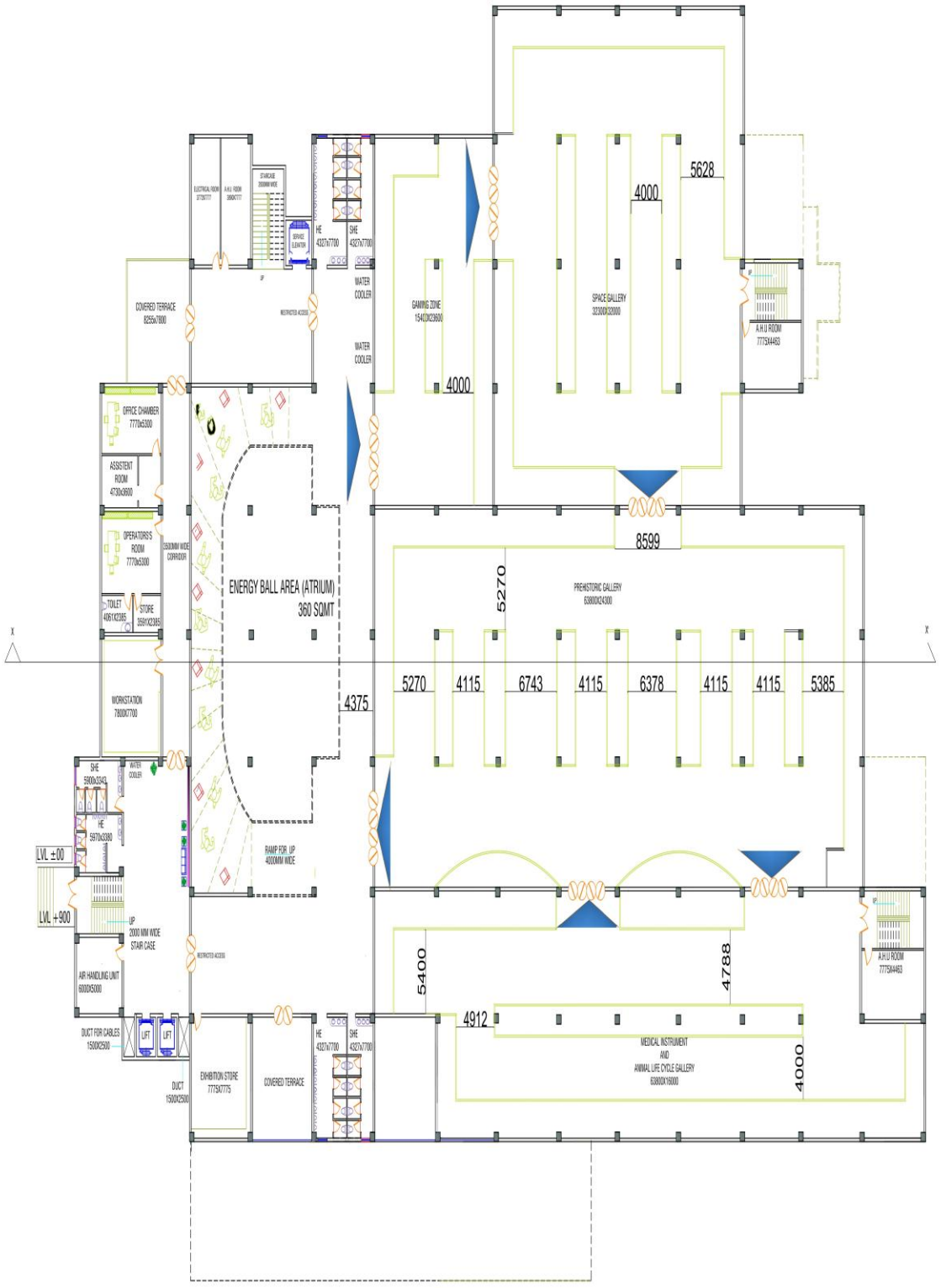

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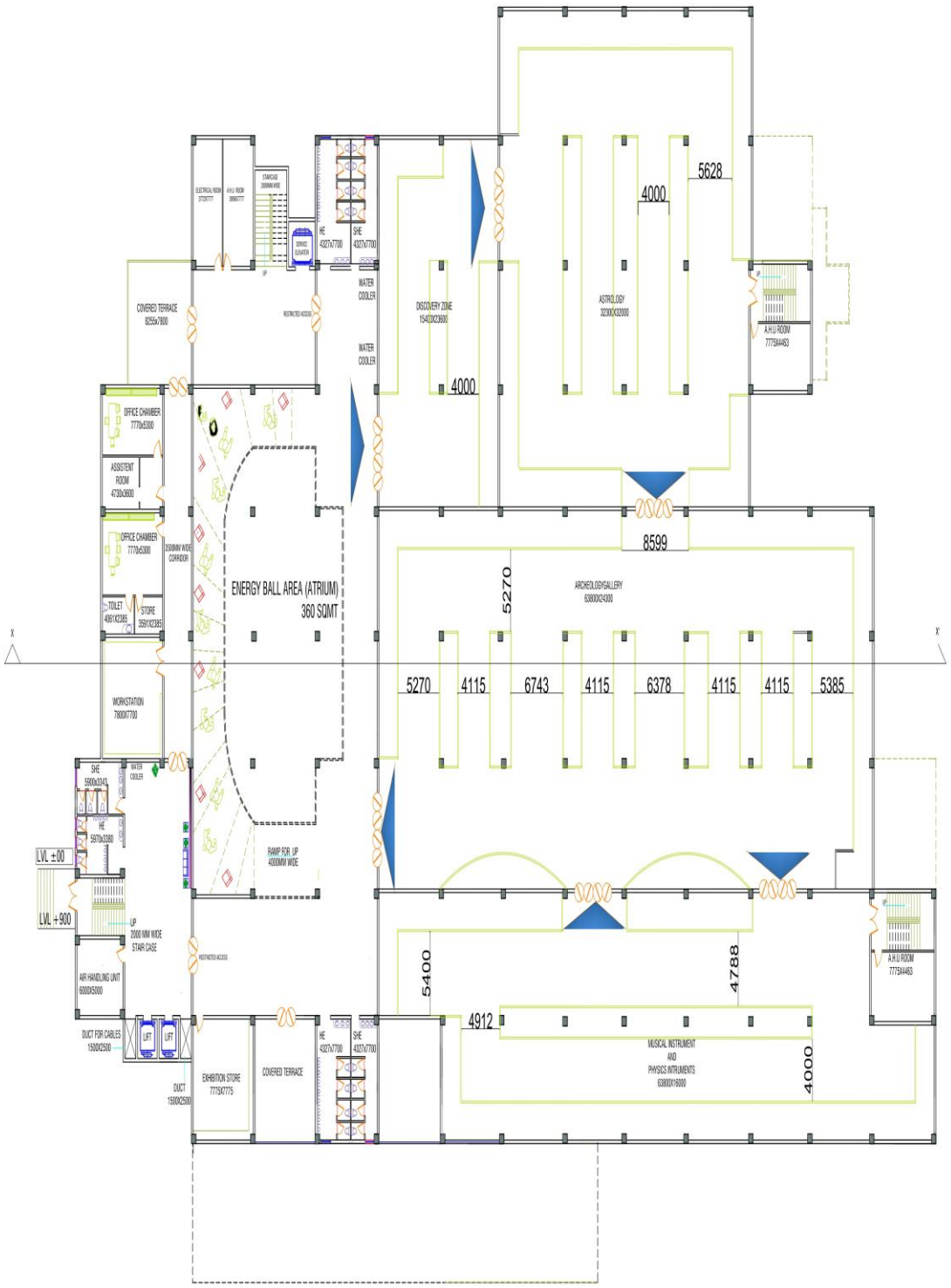

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THIRD FLOOR PLAN
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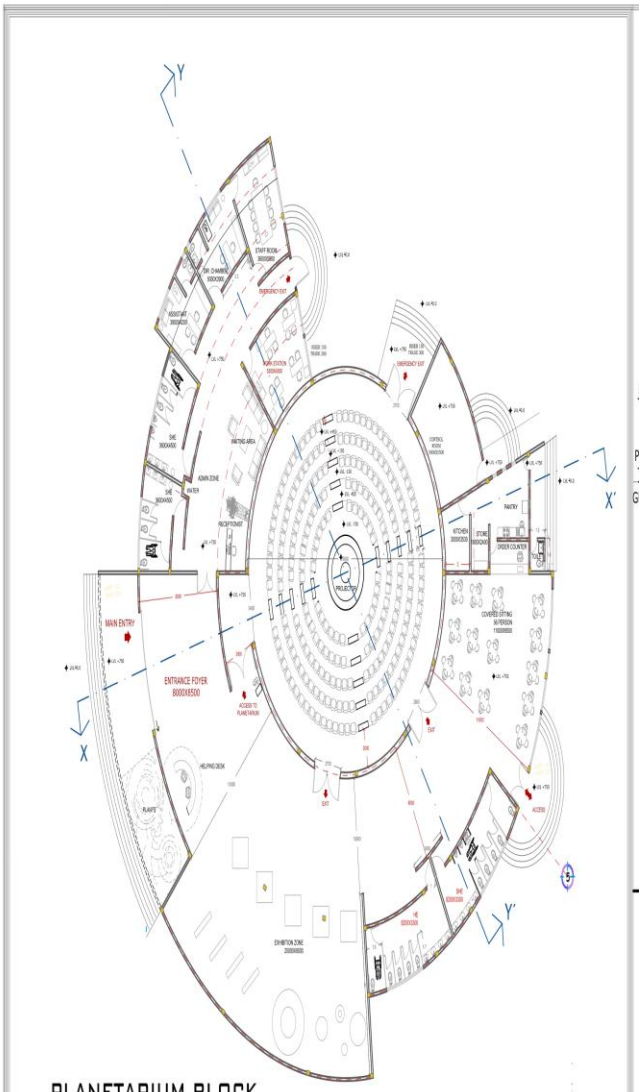
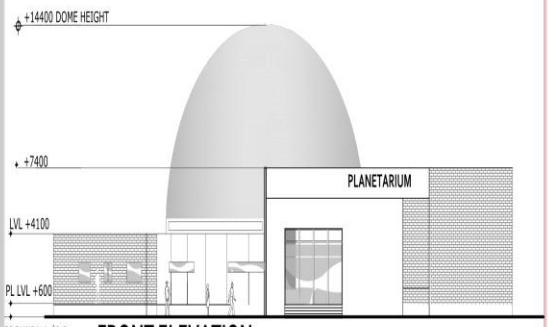
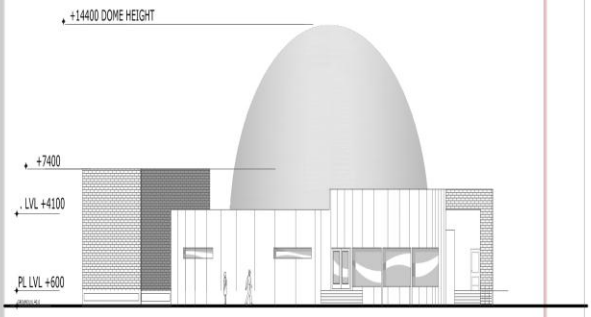
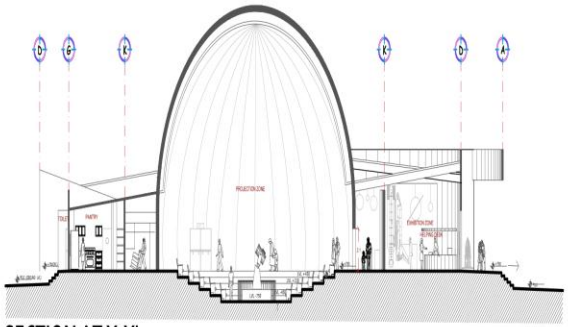




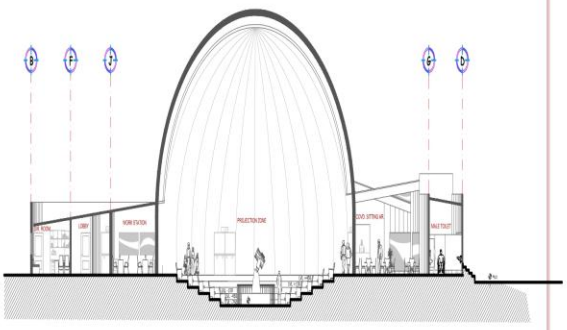
FRONT ELEVATION



SIDE ELEVATION



SECTION AT X-X'



SECTION ATY-Y'

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WORKING DRAWING FLR .PLAN

FLOOR PLAN
SCALE : 1:200

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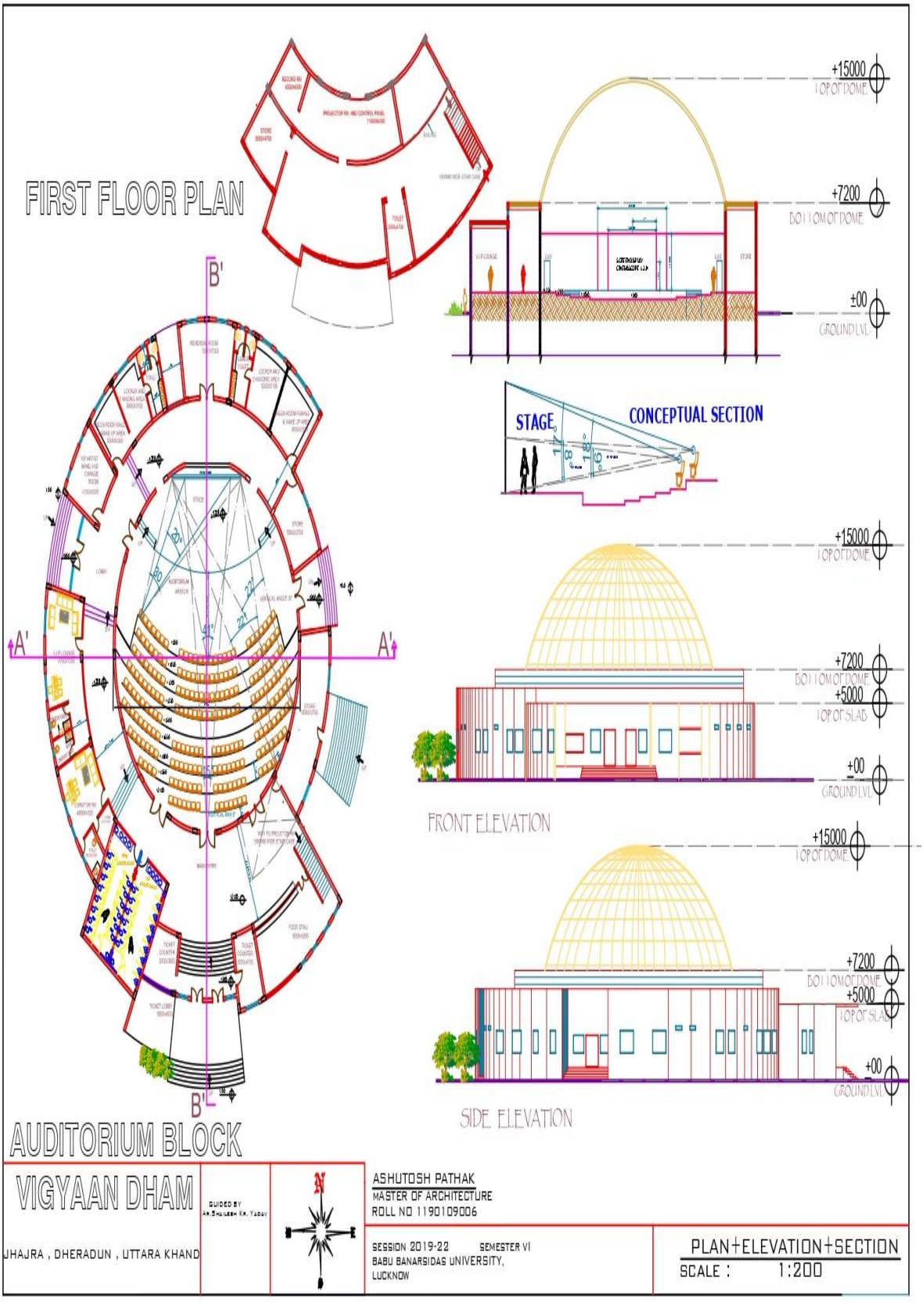
FIRST FLOOR PLAN
B'
A'
A'
B'
+15000
TOP OF DOME
+7200
BOTTOM OF DOME
±00
GROUND LVL
STAGE
CONCEPTUAL SECTION
+15000
TOP OF DOME
+7200
BOTTOM OF DOME
+5000
TOP OF SLAB
±00
GROUND LVL
FRONT ELEVATION
+15000
TOP OF DOME
+7200
BOTTOM OF DOME
+5000
TOP OF SLAB
±00
GROUND LVL
SIDE ELEVATION
AUDITORIUM BLOCK
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JHAJRA , DHERADUN , UTTARA KHAND
GUIDED BY
Ar.Shailesh Kr. Yadav
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MASTER OF ARCHITECTURE
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PLAN+ELEVATION+SECTION
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Design Of An Ecological Approach Towards The Socio-Cultural Development Of Rural / Urban / Ghats (Interactive Spaces)

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