LEARNING THROUGH PLANETARIUM

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ABSTRACT

Science is a fundamental base and a vital component of the life in today's world. Being surrounded with the countries that are constantly improving and developing their skills in science and technology, Bangladesh needs to enhance theirs too. The first step of the country like Bangladesh to be aware of the science and technology possibilities is to create curiosity in the minds of the blooming ones. This project will be a source for such curiosity and to attract children and adults to the world of astronomical science and technology. The main goals of this study were to evaluate changes in students' attitudes towards astronomy, whether students learned and retained more knowledge due to planetarium-enriched instruction, and how the planetarium helped students think about astronomical concepts. This planetarium would portray the possibilities and the expression of astronomical science and technology generation and development. This would be a one stop roof to house all the astronomical science and technology fundaments and divisions so that a person can enrich his knowledge in whatever way he feels; let it be interactive exhibits or just some mute installations.

ACKOWLEDGEMENT

I would like to begin by thanking my parents for their unconditional faith on me throughout the past five years. They stood as my backbone through my highs and lows and have shaped me to who I am today. Along with my family, I had a few special people without whom past five years would not be possible. I would to like thank **Iffat Bahar Proma**, **Maria Afreen**, **Tasmia Ahmed**, **Aurini Tasnim**, **Kamruzzaman Raihan** for always believing that I had it in me and pushing me to my limits.

Secondly, I would like to appreciate my university instructors who have guided me throughout the whole time frame. Especially Ar. **Habib Reza** sir for encouraging and helping me for getting informations about my project. I have to thank my thesis instructors Ar. **Fuad Hassan Mallik**, Phd, Ar. **Iftekhar Ahmed**, Phd and Ar. **Abdul Fazal Mahmudun Nobi** sir without whom this project would not be completed.

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CHAPTER 1

Background of the project:

1.1 Project Brief:

Name of the project: Learning through Planetarium [Bangabandhu Sheikh Mujibur Rahman Novotheater]
Project type: Educational & Cultural
Client: PWD Barisal
Location: Barisal
Site Area: 418769.02sqft, 9.6 acres (approx.)

1.2 Introduction

The planetarium is a sophisticated instrument designed to duplicate the motions of the celestial bodies in an effort to render complicated concepts into a simpler form. Its development and acceptance 'into the educational scene has been a remarkable occurrence. Ever since its conception, it has been heralded as a marvelous aid for teaching astronomical concepts. Unfortunately, the bulk of praise for the planetarium represents purely subjective opinion. Although in 2004 one planetarium has been constructed in this country, there has been until rather recently little research conducted to determine if it is actually a valuable asset in the teaching of astronomy. In view of the large amount of money involved, this is an amazing circumstance. The instrument is certainly charismatic in its ability to attract followers and financial supporters.

Some aspects of planetarium research are still in their infancy period, others are at the adolescent stage and only a few are reaching maturity. This type of research needs much refinement before it can be considered as sophisticated as research in the natural sciences. Planetarium research has essentially been either of the descriptive survey or the comparative type. The descriptive survey has attempted to describe the status of planetarium procedures at various stages of planetarium development. The comparative study compares the effectiveness of the planetarium to the classroom situation.

'Unfortunately, in most comparative studies no single factor is isolated as the critical variable. Thus, comparative studies will usually conclude either in favor of or against the planetarium, but never provide information as to which of the multitude of factors operating in the planetarium, have assisted or retarded the learning process with respect to some behavioral objectives.

As a result of the vastness of the planetarium domain and the relatively few number of research studies in comparison, it has been extremely difficult to locate and summarize several articles pertaining to the same concept. While all the articles deal with the planetarium, their content was so varied that the only way to establish an as semblance of continuity was review the literature on a chronological basis. In this manner it was at least possible to show how the studies have contributed to the development of knowledge about the planetarium. The questions which needed answers most urgently were the topics of the initial studies. As the area became more advanced, the studies became increasingly specific and of better design.

Due to the planetarium's unusual development a variety of questions have arisen as to the exact role of the planetarium and in what direction its philosophy should evolve. It was the purpose of this paper to examine the related literature in an effort to describe the present status of planetarium research and to suggest questions for future research.

1.3 Aims and Objectives:

With the proper help of our creative way of teaching, we can provide a new world for the young minds of the generation to broaden their imaginative world. The aim of the project is to design to create a world of technology, so that the visitors are able to learn more about science and technology through exhibits, games and installations. The proposal of the project is to design a planetarium where the students and general people of Barisal can get the chance to enrich their knowledge with the astronomical studies; this could be a single place where people of all age group can learn about astronomical science and technology. Redesigning it in such a way that not only it can be of the same or almost the same level of equipped with the foreign science centers. This could be a one stop experience for any children who have and eye for science. In short, this could be a complete recreation and education package for a growing and curious mind for NASA and astronomy.

1.4 Given programmes:

The targeted number of visitors at peak hour s around 500. The proposal can be divided into the following main, according to the types of activity.

Administration

Lobby Space

Planetarium

Observatory

Operative Team

Exhibition Space

Seminar Hall

Workshop

Library

Cafeteria

Dormitory

Service & Maintenance

CHAPTER 2

Literature Review

2.1 Models of the Universe

The records of nearly every civilization contain evidence of a fascination for the beauty of the skies. This fascination has often led to an attempt to explain the complex and often confounding motions of the stars, planets, comets, and meteors that may be observed in the night sky. The efforts to recreate these motions in a fashion that appeared simple and immediately comprehensible led to the construction of a multitude of simulators of the heavens of which the planetarium is the most recent and sophisticated.

Of the many static models created to depict and explain the motions the celestial objects some have been preserved for their pure artistry, and most indicate a rather good comprehension of the planets, sun, and moon. Anaximander, who lived in the first half of the sixth century B. C. is credited with inventing a type of celestial globe on which the constellations were depicted. The Farnese Globe, dating back to 75 BF C., represents the best preserved example of this artistry. It is a white marble statue of Atlas supporting the world with the constellation figures and the path of the sun carved in relearn its surface. Other globes containing the Equator and the Tropics of Cancer and Capricorn can be found to represent nearly every century of the Christian era. 'These globes all give the reverse representation of the sky. The observer views the stars as if he were located in a position outside of the galaxy.

Various dynamic mechanical models showing the relative motions of the sun, moon, and planets-have been constructed since the seventeenth century. A device of this type was constructed in England for Charles Boyle, the fourth Earl of Orrery (1676- 1731), and the name "orrery" is still used to refer to this type of apparatus. This device consisted of a series of globes which represented the planets and the sun. Each globe was supported by a metal rod and interrelated by gears at-the central pedestal. Some later orreries contained planetary satellites and properly related their motions to those of the planets. Their complexity can readily be appreciated. (Calvert, 1967).

The most recent variation of the orrery was constructed in 1913 for the Deutsches Museum in Munich. Attached to the center of the ceiling of a room almost forty feet in diameter was a "sun" globe, ten inches in diameter which provided illumination for the entire room. Other spheres representing the planets moved around the sun with speeds proportionate to their nature velocities. A single-passenger carriage was attached to the sphere representing earth. An observer riding in the carriage would view through a periscope the planets as though lighted by the sun against a background of constellations painted on the walls of the room. Of course, all comparative sizes and distances were distorted, and unfortunately, only one observer at a time could ride in the earth carriage. A radical departure from the usual orrery models which positioned the observer outside of the universe can be seen in a device known as the Gottorp Globe. One of the oldest examples of this type and one which has been preserved almost in its entirety was, built in the years 1644-1664for Duke Frederick III of ‘Holstein. This instrument was a huge copper sphere almost twelve feet in diameter and weighing over three tons. It was large enough, to allow ten people to be seated inside. The audience would view the stars and constellations which were painted on the inner surface. The stars were illuminated by small oil lamps located near the center of the globe. In addition, the globe was rotated by water power to simulate the motion of the earth. About 1670, Erhardt Weigel of Jenamade a similar globe ten feet in diameter. Inside it there were many accessories with which it was possible to reproduce the phenomena of meteors, rain, hail, lightning, and thunder. In the eighteenth century, Roger Long, professor of astronomy at Cambridge, constructed an "Astronomical Machine" which was quite similar in basic design to the Gotiorp Globe. Its interior platform accommodated about 30 people and the stars were represented by holes punched into the18-foot sphere. The sphere was placed in a lighted room and the light entering the holes appeared to be stars shining. A light source representing the sun could be moved to simulate the sun's motion along the ecliptic. The last globe of this type was constructed in 1911 for the Chicago Academy of Sciences and is known as the Atwood Globe. It was 15-feet in diameter, electrically driven and could demonstrate the motions of both the sun and moon. (Calvert, 1967).

Shortly before World War I, Dr. Oskar von Miller, director of the Deutsches Museum of Munich, Germany, asked the Carl Zeiss optical firm at Jena to work out the most realistic way to bring the heavens indoors for hundreds of visitors at a time. The apparatus he envisioned was similar to a gigantic Atwood globe. The Zeiss engineers worked on the idea, but after a while concluded that it was impossible to physically construct. The company's Dr. Walter Bauersfeld then thought of a new approach. The idea of a great dome was retained but he suggested that it remain stationary and instead use a picture projector to cast an image of the sky on it. Then only the projector and not the dome would have to rotate. In August, 1924, after nearly five years of design and construction, the first modern planetarium instrument was produced. The illusion of reality surpassed the expectation of von Miller and even of the Zeiss people themselves. (Arthur Kraemer, 1954)

Although the prototype instrument was limited in latitude motion and had only one spherical star projector, these faults were soon corrected. The improved projection apparatus was about twelve feet long, with a large globe at each end. Each globe contains projectors for the fixed stars, one for the Northern Hemisphere of the sky and another for the Southern. The dumbell-shaped device has since become synonymous with popular astronomy-lecturing. Twenty-five of these later models were soon built; most of them were installed in Europe, but six were erected in the United States during the years 1930 to 1949.

2.2 Philosophy of Planetarium Usage

The European view of the planetarium which prevailed during the late twenties and early thirties portrayed it essentially as an educational tool; a marvelous teaching aid for the dissemination of astronomical knowledge. The planetarium lecture delivered in a classroom style by either a university professor or research astronomer was limited to demonstrations of the sky from an earth-centered view. Emphasis was placed upon star identification, planetarium motions, aspects of the sky from different latitudes, and what might be called spherical astronomy.

During the forties planetarium demonstrations were usually limited in the United Stated because of the war. In Europe and Japan, the only other places where planetariums had been constructed, the planetarium were used primarily for celestial navigation training for service personnel. Planetariums in the United States were also enlisted for this purpose one of the many areas in which the planetarium excels as a teaching device.

The planetarium began to feel its strength and potential during the fifties. The Carl Zeiss firm, now in West Germany, resumed production of planetarium instruments and several other manufacturers were also entering the business. New Zeiss planetariums were established in Chapel Hill, Sao Paulo, Tokyo, Hamburg, and London. Also during this period custom-made planetarium projectors were installed in San Francisco's A. F. Morrison Planetarium (the Academy projector); and in Boston's Charles Hayden Planetarium (The Korkosz projector). The planetarium enterprise was growing. (By June of 1968, there were to be at least eight companies manufacturing planetariums on a regular basis (Hagar, 1969).

Also during this period, the educational planetarium came into being as a result of the Armand Spitz pin-hole projection planetarium. The educational possibilities of a classroom sized planetarium were being realized and in the classroom setting the planetarium became more versatile than ever. The planetarium was used as a teaching aid in astronomy, geography, mathematics, and other physical sciences. Imaginative teachers even found uses for the planetarium in illustrating concepts of art, literature, history, philosophy, and psychology.

In communities without a major planetarium, the small planetarium came to have two roles: one as a classroom of space, and the other as a community planetarium. In some instances the small planetarium put on public shows which rivaled large installations in showmanship and entertainment value and, of course, with the usual educational "fringe benefits."

Most planetariums associated with museums and other educational or scientific institutions were not in the business primarily for profit. Nevertheless, it was soon discovered that when the planetarium put on shows that were interesting to the public the attendance increased and good planetarium attendance yielded monetary gain--at least to the extent of offsetting expenditures. Therefore, a new philosophy of planetarium programming emerged: make it a show rather than a lecture. Dr. Dinsmore Alter, director of Griffith Planetarium at the time, was at the vanguard of the movement to change the image of the planetarium demonstration fromthat of a musty lecture-hall environment. Alter (1941) stated that it is necessary that the demonstration give a strictly scientific account of the celestial phenomena, dramatized, however, in order that it may appeal to people who know no astronomy at all and thus cause them to come to an entertainment from which they will profit.

Some planetariums, however, found it difficult to achieve the proper blend of science and entertainment, or education and dramatic effect. In attempting to avoid the pedantic lecture-hall stigma of previous years, some planetariums went-too far in the other direction. There was often too much of the "spectacular" without the necessary educational substance. Special effect projections often conveyed the impression of effect for the sake of effect or gadgetry for the sake of gadgets. Those directors fortunate enough to have good shop facilities were able to design and fabricate special projectors which gave realistic presentations of a trip to the moon, the earth as seen from the moon, lunar landscapes, and so forth. Others, with limited shop facilities, sometimes were able to create good effects. More often though, the effects were poor, artificial, and in no Why matched the realism or accuracy of the planetarium projector and its motions (Hagar, 1969).

This was a period-of experimentation. It meant abandoning the traditions of the past and trying new techniques and daring concepts. Planetarium personnel were reaching out to grasp the full potential of their medium. There was a growing realization among planetarium lecturers that what they really sought was a bit of what they already had. It was the blend that was important. The scientific integrity of the lecture hall, the realism and accuracy of the planetarium projector, and one more ingredient, the theater, represented the planetarium environment.

Armand N. Spitz (1959) sensed this broader significance of thepl6netarium when he stated that the concept "planetarium" connotes a multi-dimensional experience and in this light must be differently planned and executed than any single facet operation. It is more or less like the “theater" including every detail that goes to make up the experience.

Hagar (1969) suggested that the planetarium as-theater is not drama merely for the effect of drama; not entertainment for the sake of entertainment; not even science for the sake of science, but it is an elucidation of the scientific endeavors of man in his quest for an understanding of the worlds of space and time in a planetarium setting which is interesting, inspiring, and educational.

The planetarium of the sixties was much broader in concept and vision than was ever realized in the twenties and thirties. The planetarium was more than a machine; it became a theater of space. In a larger sense, it functioned as an astronomical information center; a communication agency 'between the astronomer on the mountaintop and the man in the street.

To remain abreast of today's world, the planetarium staff may be required to put greater emphasis upon the investigative process of the scientific enterprise in their planetarium programming. The "what" of space may have been the legitimate presentation for planetarium's clientele in past decades; but for the student of today it may not suffice. There is nothing wrong with a spectacular planetarium program but in the past very little lecture time was devoted to clarifying why and how astronomers can arrive at different interpretations of the same observations.

Looking toward the future, the planetarium may have a potential for education which is far beyond the dreams of its inventor, Walter Bauersfeld. The success of the planetarium of tomorrow lies in the long-range goals which those in the planetarium trade set today (Bennett, 1969; Lovi, 1969). In order to properly establish realistic goals it is necessary to conduct research on planetarium education in an effort to determine this potential. Only then will it be possible to decide under which conditions the planetarium can be best utilized.

The material in the preceding chapter on the historical development which was not specifically referenced was drawn from the following sources: Bennett, 1969; Berland, 1961; Chamberlain, 1958, 1960, 1962; Chamberlain, 1967; Christian, 1968; and Hagar, 1969.

2.3 Science and technology in Bangladesh:

In Bangladesh, the cultivation of modern science started during the British rule when the first modern educational institutions, focused on scientific fields, were established in the country. The University of Dhaka, established in 1921, acted as the driving force in producing many renowned scientists in Bangladesh. Since its independence in 1971, Bangladesh has been plagued with many social issues like poverty, illiteracy etc. Hence, science and technology have lagged behind in the priority list of the successive governments. However, induced by the recent economic progress, science and technology has been witnessing intense growth in the country after a period of stagnation, most notably in the information technology and biotechnology sectors. The national policies for science and technology is planned and developed by the National Council for Science and Technology which is controlled by the ministry of science and technology.

2.4 Branches of science and technology:

The branches of science (also referred to as "sciences", "scientific fields", or "scientific disciplines") are commonly divided into three major groups: physical science, earth science and life science. The natural sciences and social sciences are empirical sciences, meaning that the knowledge must be based on observable phenomena and must be capable of being verified by other researchers working under the same conditions. These three categories make up the fundamental sciences, which form the basis of interdisciplinary and applied sciences such as engineering and medicine. Specialized scientific disciplines that exist in multiples categories may include parts of other scientific disciplines but often possess their own terminologies and expertise. The fields of the specialized scientific disciplines are as follows:

The Physical Sciences

• Physics: The study of matter and energy and the interactions between them. Physicists study such subjects as gravity, light, and time. Albert Einstein, a famous physicist, developed the Theory of Relativity.

• Chemistry: The science that deals with the composition, properties, reactions, and the structure of matter. The chemist Louis Pasteur, for example, discovered pasteurization, which is the process of heating liquids such as milk and orange juice to kill harmful germs.

• Astronomy: The study of the universe beyond the Earth's atmosphere.

The Earth Sciences

• Geology: The science of the origin, history, and structure of the Earth, and the physical, chemical, and biological changes that it has experienced or is experiencing.

• Oceanography: The exploration and study of the ocean.

• Paleontology: The science of the forms of life that existed in prehistoric or geologic periods.

• Meteorology: The science that deals with the atmosphere and its phenomena, such as weather and climate.

The Life Sciences (Biology)

• Botany: The study of plants.

• Zoology: The science that covers animals and animal life.

• Genetics: The study of heredity.

• Medicine: The science of diagnosing, treating, and preventing illness, disease, and injury.

2.5 Astronomy science

In the year 2004 our country has also stepped into the world of astronomy science and technology by inaugurating The Bangabandhu Sheikh Mujibur Rahman Novo Theatre.

There are students in our country who dream about becoming astronauts, going to the moon and galaxy. This planetarium has opened a new era for the people especially the students who are very much enthusiastic about astronomy and NASA. Even recently our country is doing really impressive works on astronomy and rocket science. The students of BRAC University has invented **BRAC Onnesha** which is the first nanosatellite built in Bangladesh to be launched into space on 3 June 2017. Then again The **BangabandhuSatellite-1** is the first Bangladeshi geostationary communications and Broadcasting Satellite. It was manufactured by Thales Alenia Space and launched on 11 May 2018.The project is being implemented by Bangladesh Telecommunication Regulatory Commission (BTRC) and was the first payload launched by a Falcon 9 Block 5 rocket of SpaceX(The Daily Star. 2018). All these inventions and technologies are upholding the name of our country and also really making the students more enthusiastic and interested about astronomy education.

2.6 Planetarium Design

Planetarium is a perfect representation of **the starry sky inside a room**. A dominant feature of most planetarium is the large dome-shaped projection screen onto which scenes of stars, planets and other celestial objects can be made to appear and move realistically to simulate the complex 'motions of the planets'.

- A planetarium dome is a screen for viewing images created by a planetarium projector. A **hemispherical shape** is preferred, because **it represents the appearance of the sky, and the projector in the center mimics the rotating star.**
- **The heart of a planetarium is the star projector.** Traditionally, this was also the most expensive part of the installation.
- Planetarium range in size from **3 to 35 m in diameter,** accommodating from **1 to 500 people**. They can be **permanent or portable,** depending on the application. Portable domes are often used for touring planetarium visiting, for example, schools and community centers.

Fig: 2.6.1: Portable Planetarium (source: singarinflatables.com)

- A Planetarium **consists of** a: 1. Dome,
  2. A star projector,
  3. Digital projectors,
  4. Sound systems,
  5. Seating for the audience,
  6. Other mechanisms for the control
- Modern planetarium domes are often not painted white but rather a mid grey color, reducing reflection to perhaps**35-50%.**

Fig: 2.6.2: Canopus Portable Planetarium Projector

Source: 365astronomy.com

- Older planetarium domes were built using **traditional construction materials and surfaced with plaster.** Most modern domes are built from **thin aluminum sections with ribs** providing a supporting structure behind. The use of aluminum makes it easy to perforate the dome with thousands of tiny holes. This reduces the **reflectivity of sound** back to the audience.
- The configuration requires highly inclined chairs for comfortable viewing "straight up", increasingly domes are being built **tilted** from the horizontal by between **5 and 30 degrees** to provide **greater comfort.** Tilted domes generally have seating arranged **'stadium-style'** in straight, tiered rows; **horizontal domes** usually have seats in **circular rows,** arranged in **concentric (facing center) or epicanthic**

(facing front) arrays.

- The celestial scenes can be created using a wide variety of technologies,

For example,

(i) 'Star balls' that combine optical and electro-mechanical technology
(ii) slide projector,
(iii) video and full dome projector systems, and
(iv) Laser

- Some planetariums have movement features that help **simulate the movement and complexity of different objects in the galaxy.** Some planetariums also use lasers and other means to enhance the show.
- A Planetarium is a **dome** shaped ceiling and at the center of the room is a star projector which projects points of lights representing the stars and planets on the dome to simulate the night sky for any day of the year.
- **The most obvious feature of a planetarium is the dome, usually but not always hemispherica**l. A hemisphere is the traditional dome shape, but any shape could be used, and modern telescope domes are often not "domes" at all.
- Planetariums have been established for a variety of reasons. A few have been built solely as useful tools for teaching celestial navigation.
- Perhaps the best primary reason to establish a planetarium is to provide a community, a place where people can enjoy a guided journey of exploration through the vast cosmos to which we all belong.

2.6.1 Observatory

An **observatory** is a location used for observing

- celestial events
- Astronomy
- Climatology/meteorology
- Oceanography and
- Volcanology

Historically, observatories were as simple as containing an astronomical sextant (for measuring the distance between stars) or Stonehenge (which has some alignments on astronomical phenomena). (Wikipedia)

2.6.2 Astronomical observatories

Astronomical observatories are mainly divided into four categories.

- Space based
- Airborne
- Ground based and
- Underground based

- Ground-based observatories, located on the surface of Earth, are used to make observations in the radio and visible light portions of the electromagnetic spectrum.
- Most optical telescopes are housed within a dome or similar structure, to protect the delicate instruments from the elements.
- Telescope domes have a slit or other opening in the roof that can be opened during observing, and closed when the telescope is not in use.
- In most cases, the entire upper portion of the telescope dome can be rotated to allow the instrument to observe different sections of the night sky. Radio telescopes usually do not have domes.(Steve,2002)

2.6.3 Planetarium & Observatory:

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2.7 Slandered Analysis

The table below will give you a very rough idea of typical seating capacities of various dome sizes.

Dome Diameter Range	Approximate Seating Capacity
Less than 7 meters	10 – 50*
7 to 11 meters	20 – 130
11 to 13 meters	40 – 200
13 to 16 meters	140 – 250
16 to 19 meters	200 – 270
19 meters and greater	250 - 680

* Audiences larger than 50 have been accommodated under special circumstances in which the audience is an unusually far distance from the dome with extreme dome tilt or height.

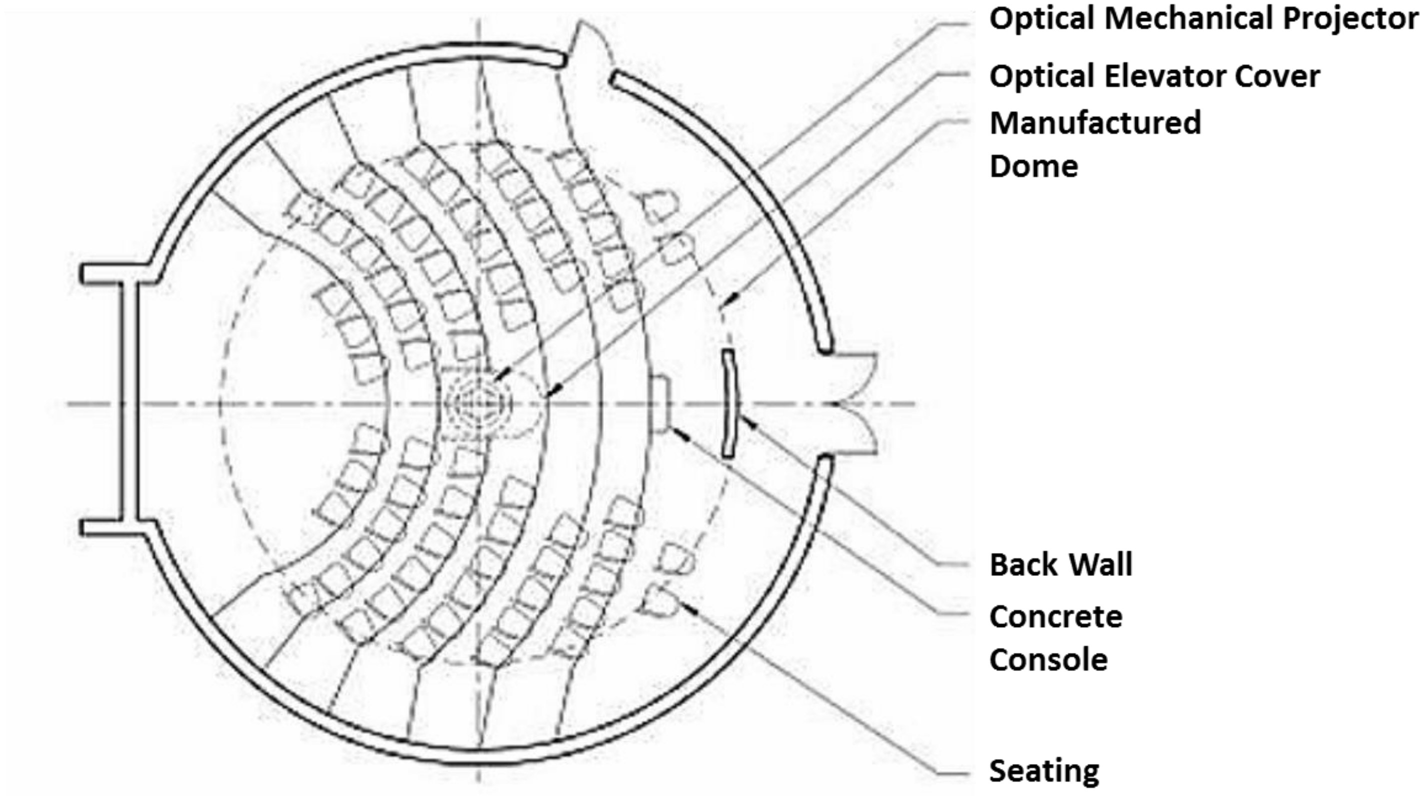

Fig: 2.7.1: Basic Zoning

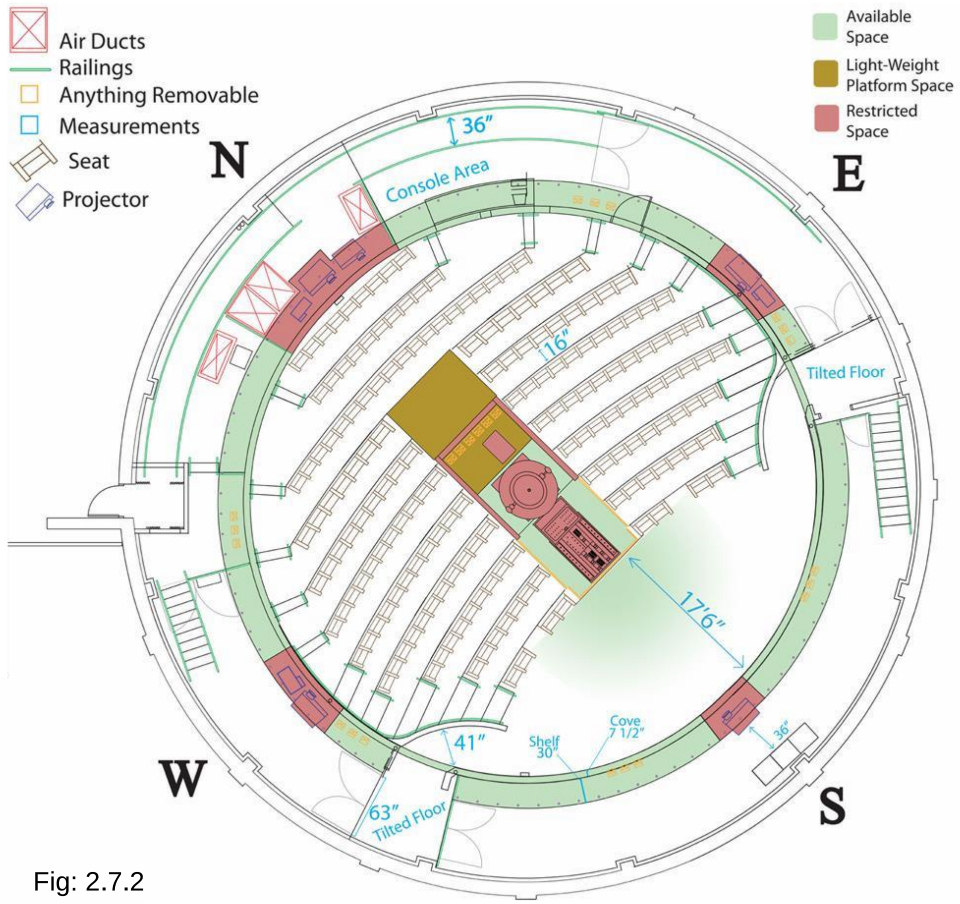

Fig: 2.7.2

Basic Plan of a Planetarium

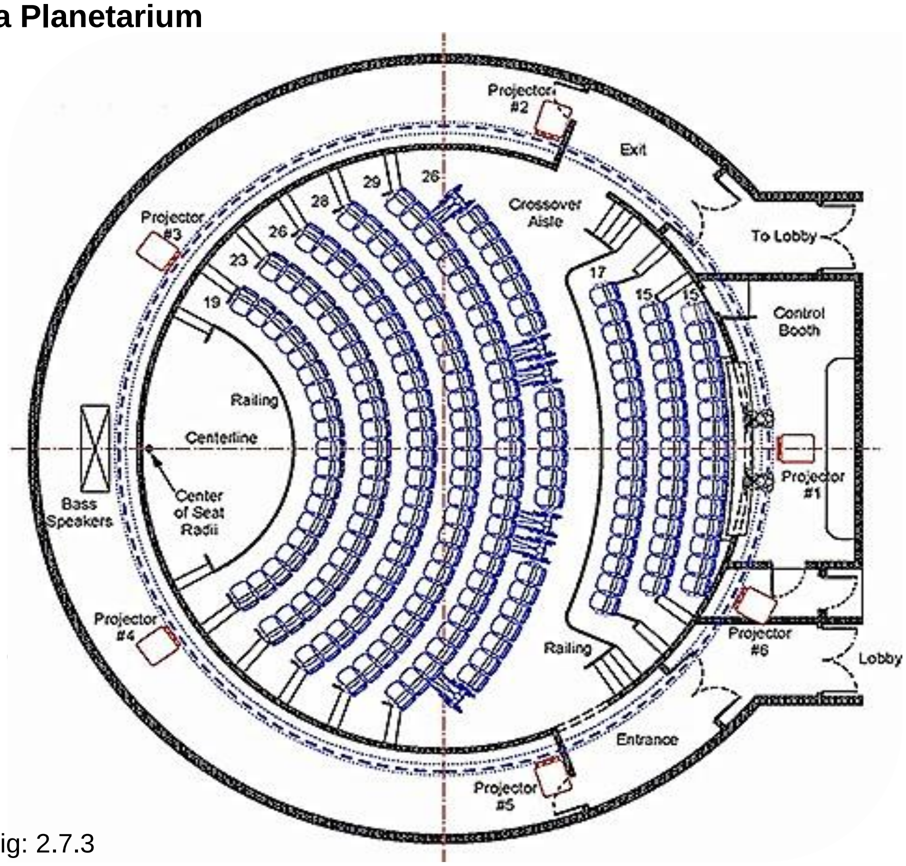

Fig: 2.7.3

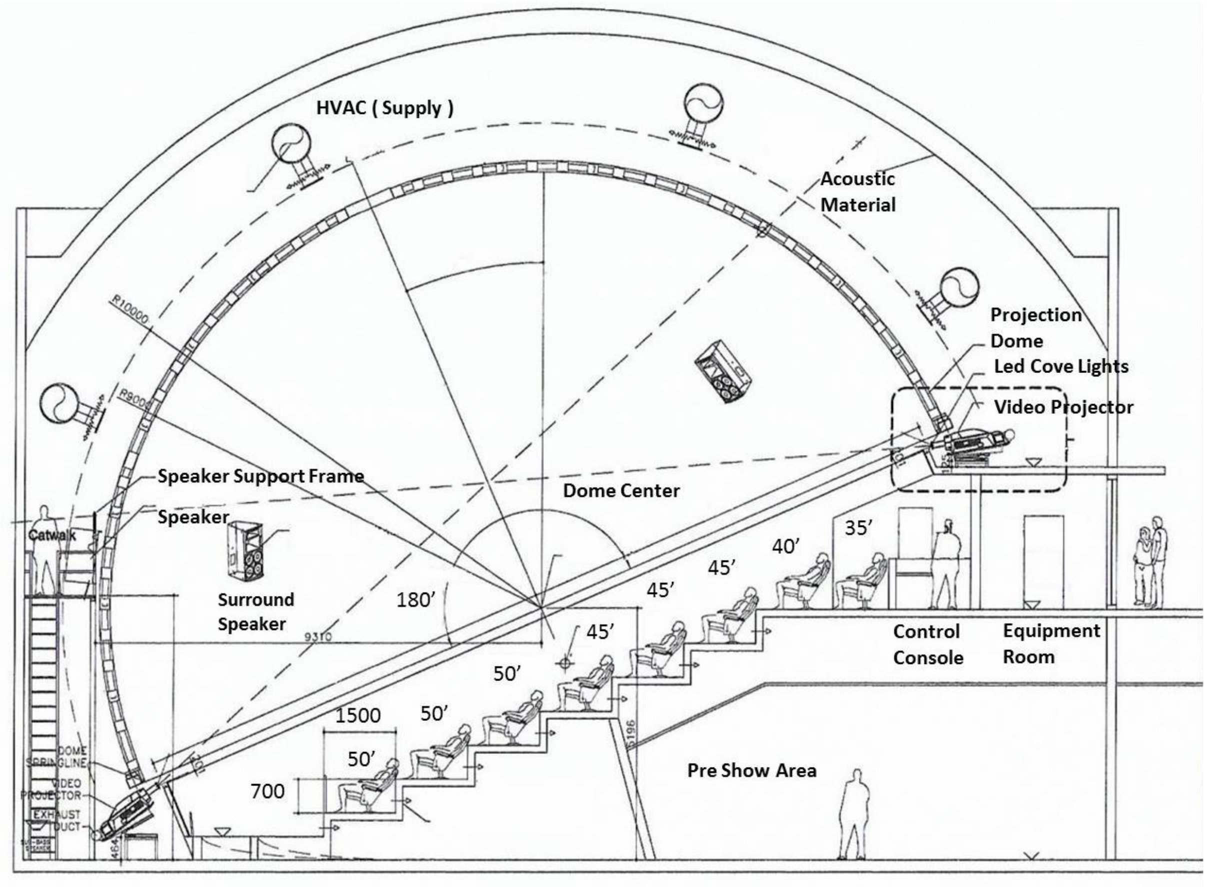

Fig: 2.7.4

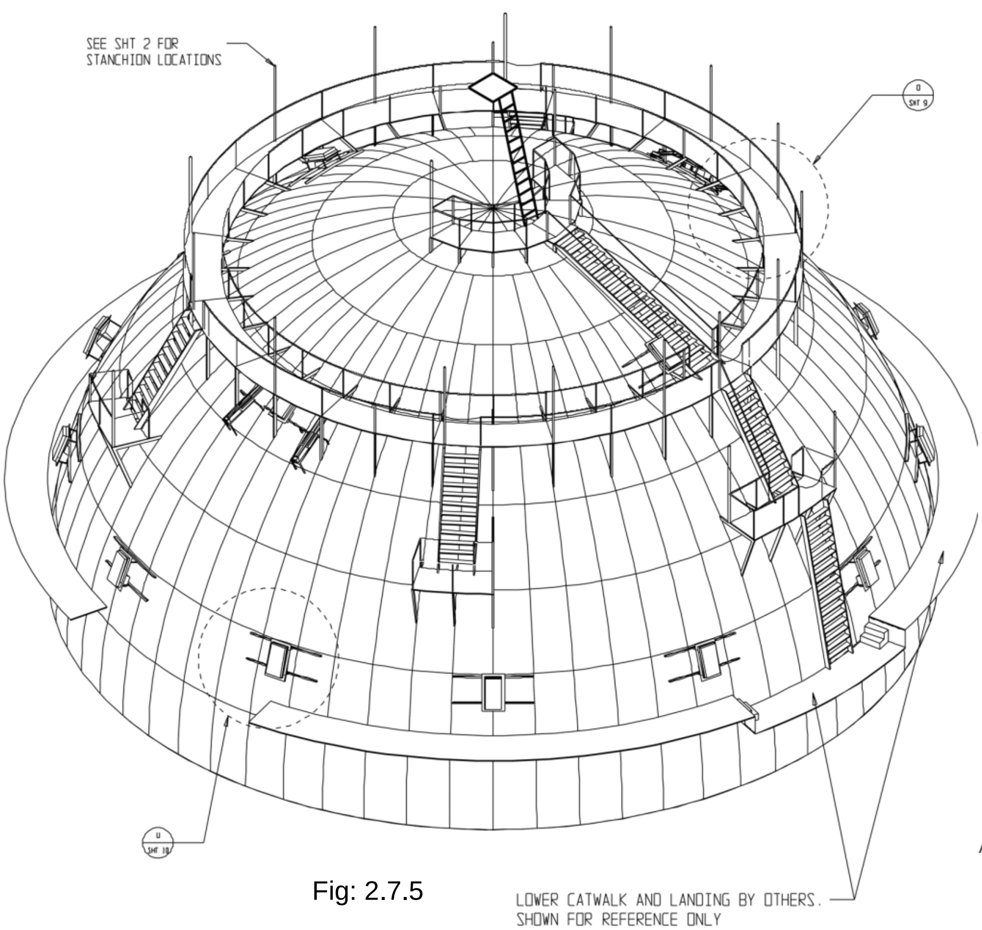

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Fig: 2.7.5

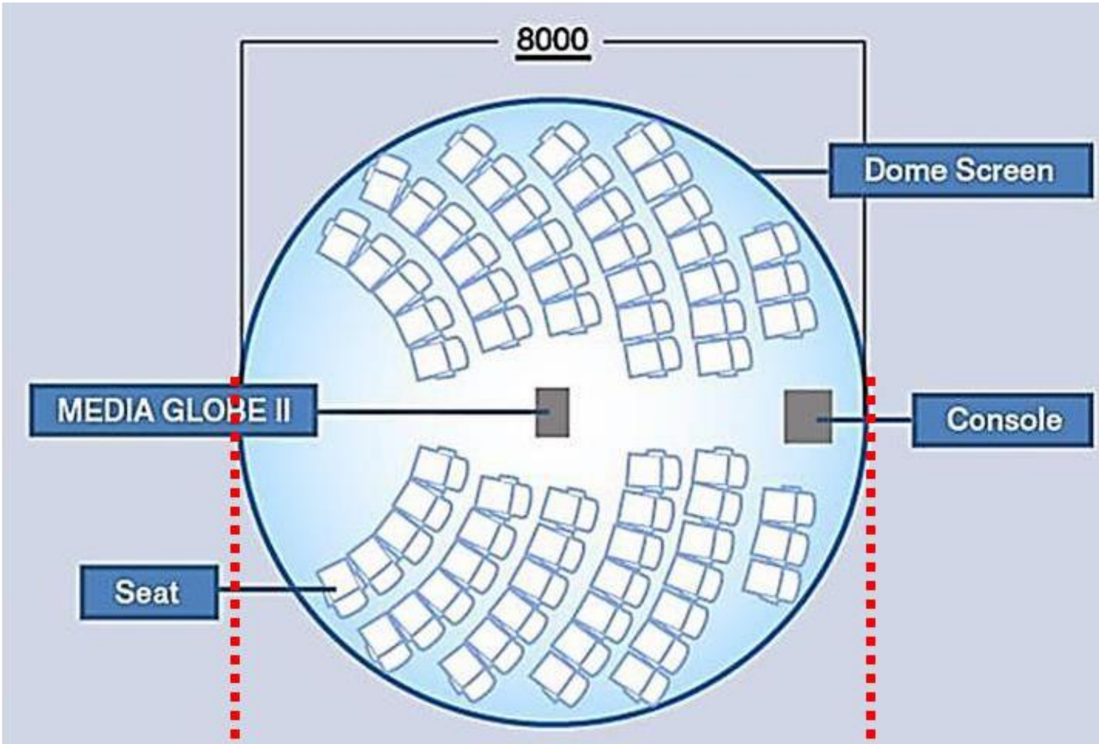


Fig: 2.7.6

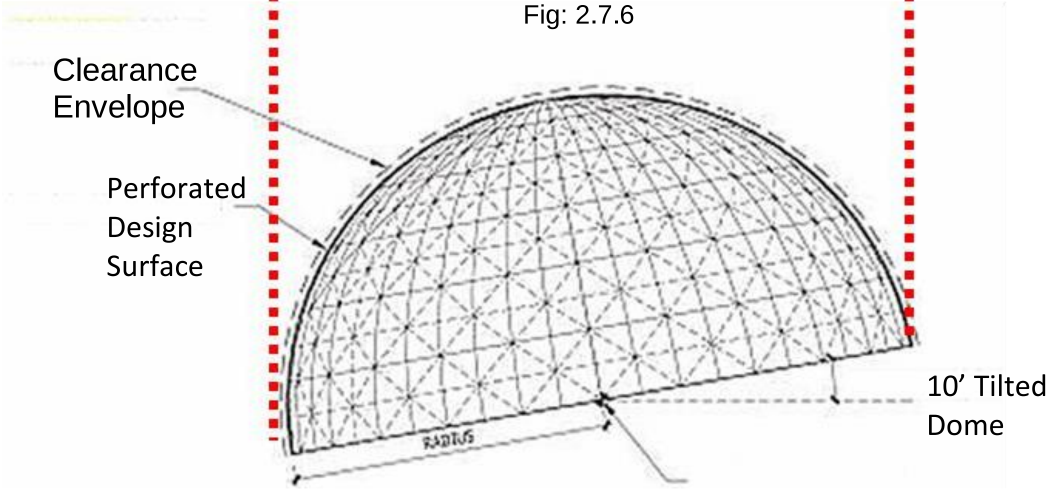


Fig: 2.7.7

Domes are being built tilted from the horizontal by between 5 and 30 degrees to provide greater comfort.

Seating arrangements according the size of dome

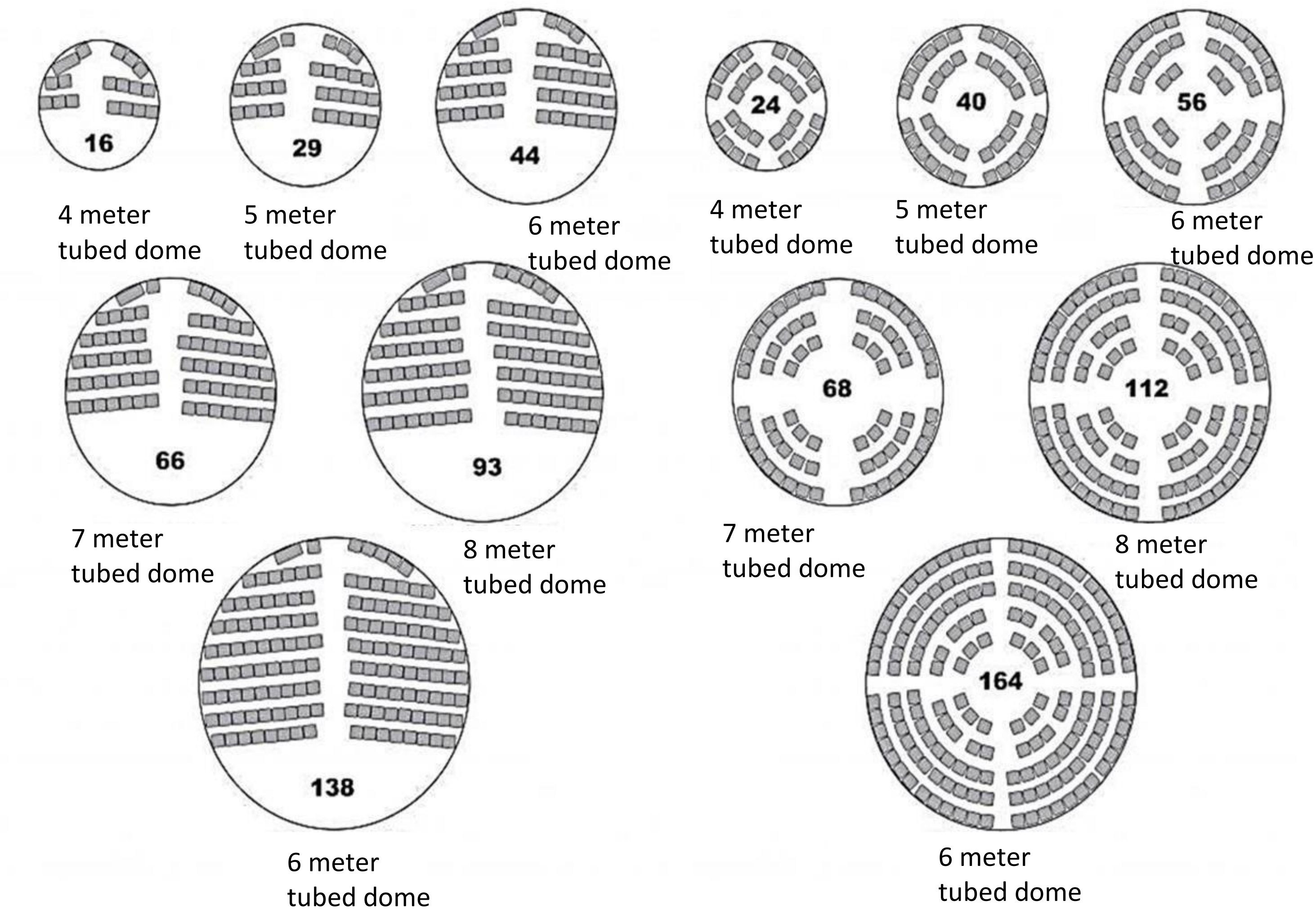
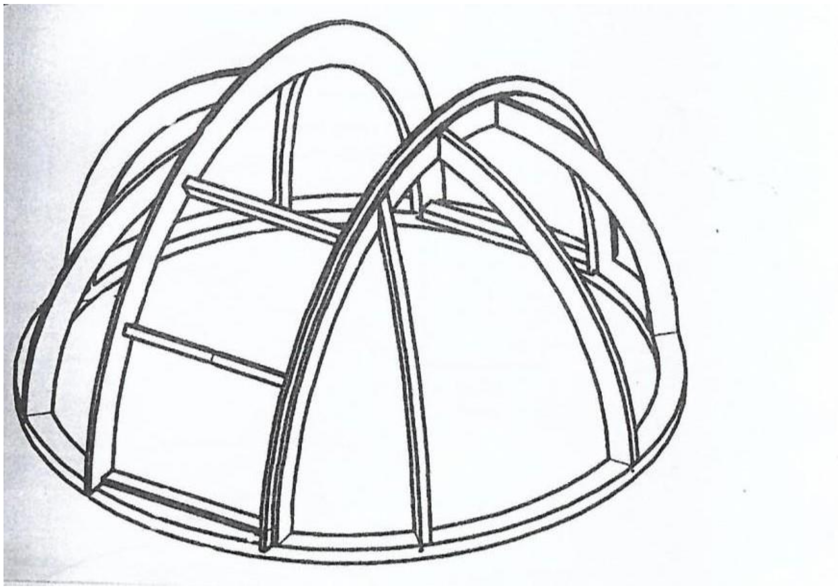


Fig: 2.7.8



The shutter opens and closes from where the stars can be seen

The dome can be rotated according to see the stars from whichever angle is required.

Fig: 2.7.9: Frame of an observatory

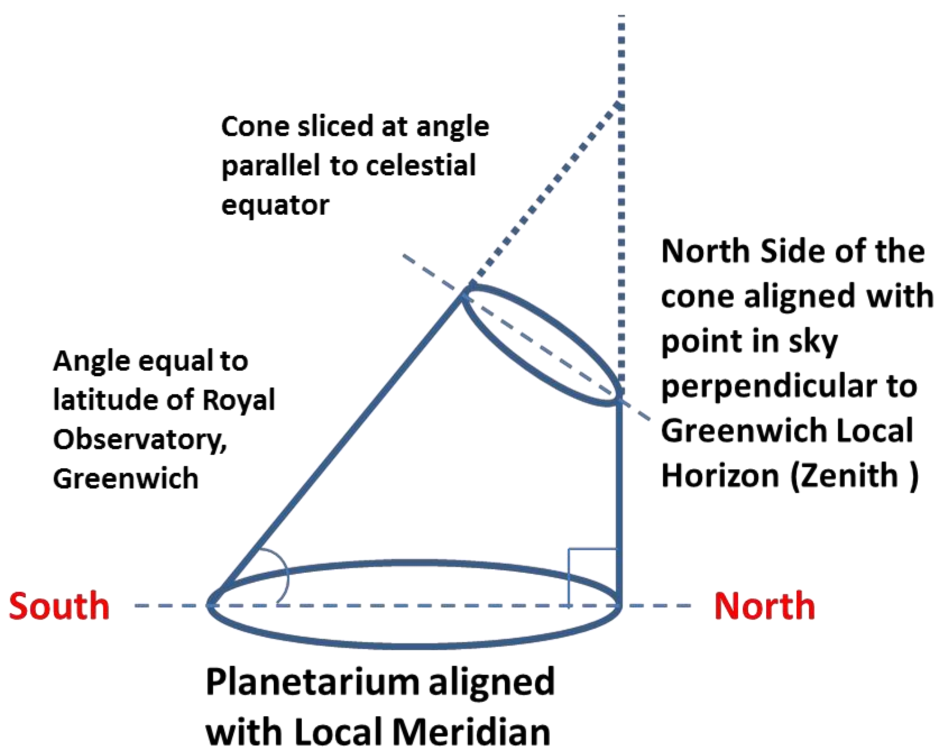


Fig: 2.7.10

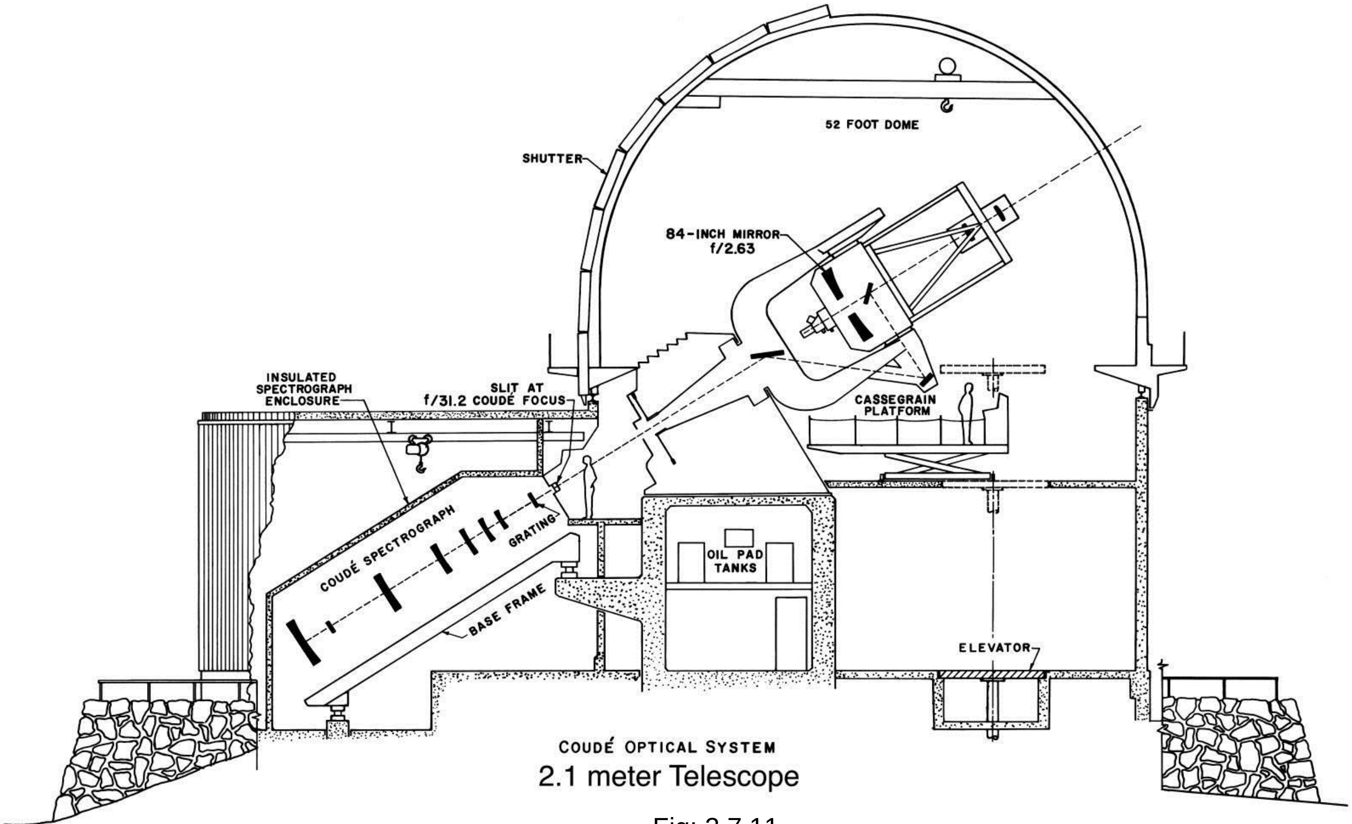


Fig: 2.7.11

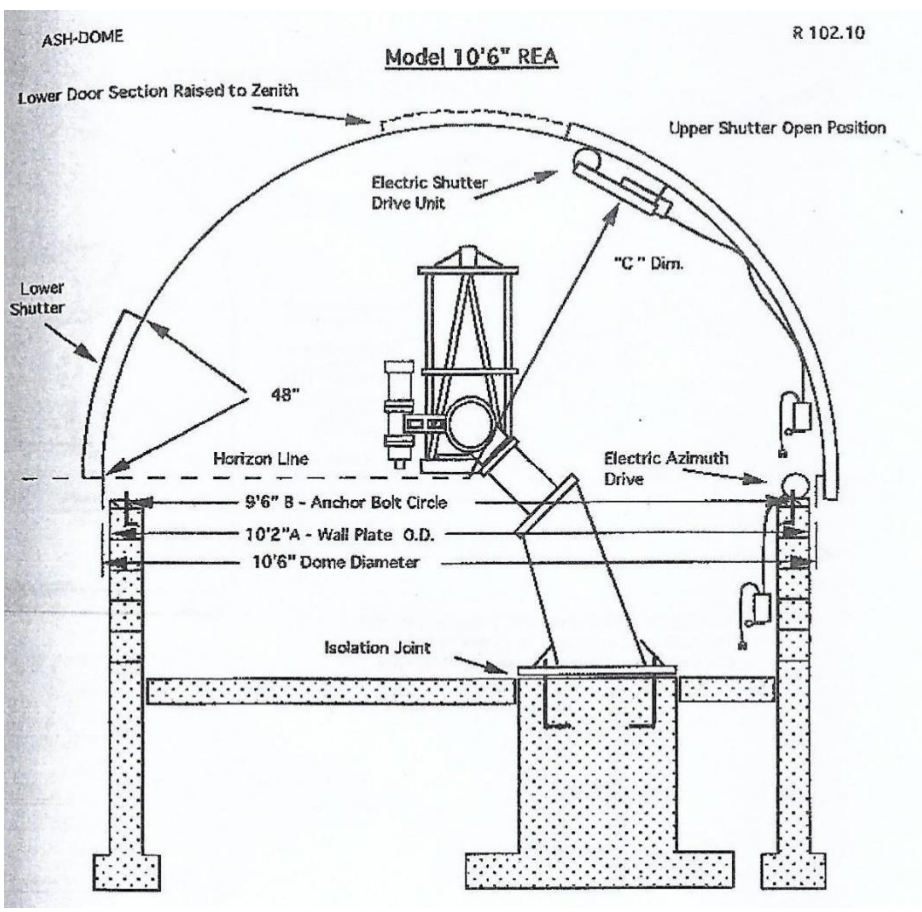


Fig: 2.7.12

CHAPTER 3

Site Analysis

Context Analysis

District: Barisal
District
Division:
Barisal Division
Area: 58 sq.km

Population:
328,278people
Density:
10,524/sq.km

Ethnicity: 89.3%
Muslim, 9.3 % Hindu,
1% of others

Literacy Rate: **78%**

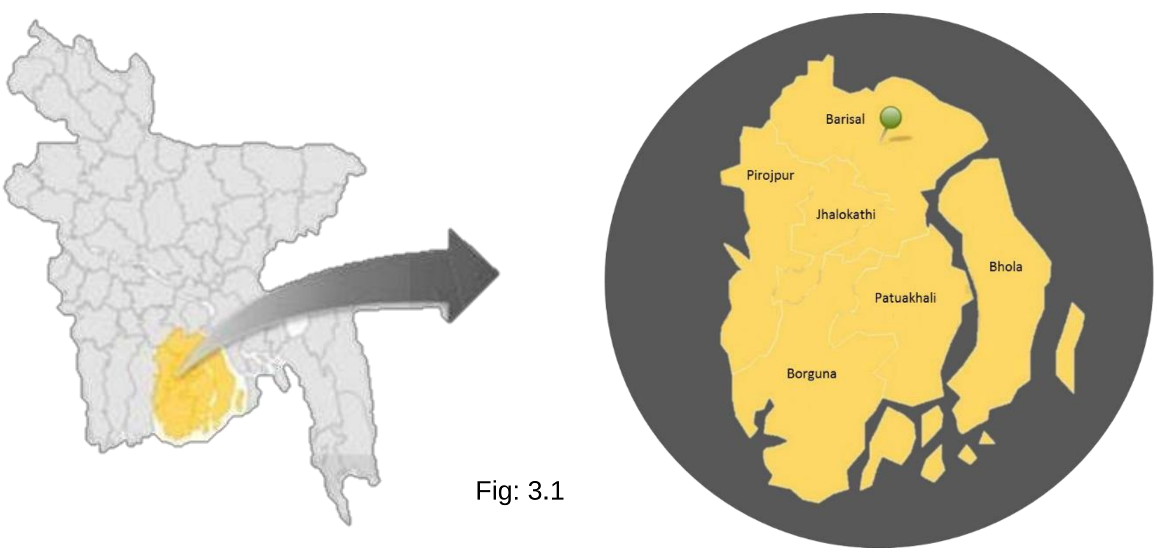


Fig: 3.1

Demographics:

According to provisional results of the 2011 national census, the population of Barisal (areas under the jurisdiction of the Barisal city corporation) stands at 328,278. By gender, the population was 51.63 male and 48.37 percent female. The literacy rate among the urban people of Barisal is 75.3%.

Most of the people in Barisal are the Bengali people, as is the case in most of Bangladesh. The long-standing inhabitants of the city are known as Barisaliya and they have a distinctive dialect apart from them. The city population is composed of people from neighboring Upazilas and districts (Patuakhali, Bhola, Pirojpur, Jhalakati, Barguna). In the next 10 years, there will be a lot of development work in this city. The work of Payra Port is going on in Patuakhali, 70 km away, along with the hub of electricity. The work of one power plant is completed, the remaining 3 works are in the pipeline. There are many educational institutions, medical colleges, universities, engineering colleges in this divisional city. Cantonment is 35 km away and the greater river port is also here. The possibility of massive industrialization has been created with the construction of four lane roads. After the construction of Padma Bridge Barisal will be the hub for the development of the southern part of Bangladesh. 15 km away there is an airport and also it is 180 km away from the capital city of Dhaka.

Language:

There are four major languages spoken in Barisal:

- Standard Bengali
- Barisal dialect
- English
- Marginalized Bengali

Architecture:

Barisal's buildings are diverse and have been built over a long period of time.

Some well-known heritage buildings are:

- •Guthia Baitul Aman Jame Mashjid Complex
- •Rammohan Samadhi Mandir
- •Sujabad Kella
- •Sangram Kella
- •Sharkal Fort
- •Girja Mahalla
- •Bangabondhu Uddyan
- •Ebadullah Mosque
- •Kasai Mosque
- •Oxford MissionChurch/ ShankarMath
- •Kali Bari of Mukunda Das
- •Joint Mosque at Bhati khana
- •Aswinikumar townhall
- •Charkella
- •Durgasagar Dighi
- •One domed Mosque(Kasba)
- •Fakir Bari jamee Mosjid
- •Housing Estate Jame Mosjid

Topography:

- Barisal is located at 22° 40' 00" N , 90° 21' 00"E
- Barisal has a tropical wet and dry climate
- Average highest and lowest temperatures are

Fig: 3.2

Climate data for Barisal [hide]													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	25.6 (78.1)	28.2 (82.8)	32.2 (90)	33.3 (91.9)	33.0 (91.4)	31.7 (89.1)	30.9 (87.6)	30.9 (87.6)	31.5 (88.7)	31.5 (88.7)	29.6 (85.3)	26.5 (79.7)	30.4 (86.7)
Average low °C (°F)	11.9 (53.4)	14.9 (58.8)	20.2 (68.4)	23.6 (74.5)	24.7 (76.5)	25.6 (78.1)	25.5 (77.9)	25.5 (77.9)	25.3 (77.5)	23.6 (74.5)	18.8 (65.8)	13.3 (55.9)	21.1 (70)
Average precipitation mm (inches)	8 (0.31)	27 (1.06)	56 (2.2)	128 (5.04)	230 (9.06)	409 (16.1)	408 (16.06)	370 (14.57)	258 (10.16)	162 (6.38)	53 (2.09)	15 (0.59)	2,124 (83.62)
Average precipitation days (≥ 0.1 mm)	1	3	3	7	11	18	23	22	16	8	2	0	114

Fig: 3.3

Road Network

- Dhaka-Barishal Highway
- Barishal-Pirojpur Highway
- Dapdapia Bridge
- Dhaka-Patuakhali Highway
- Barishal-Bhola Highway

Fig: 3.4

Transportation Access

- Natullah Bus Station
- Launch Terminal
- Site

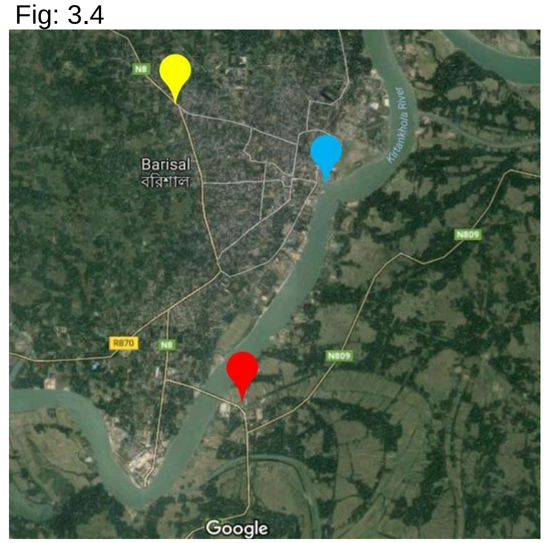
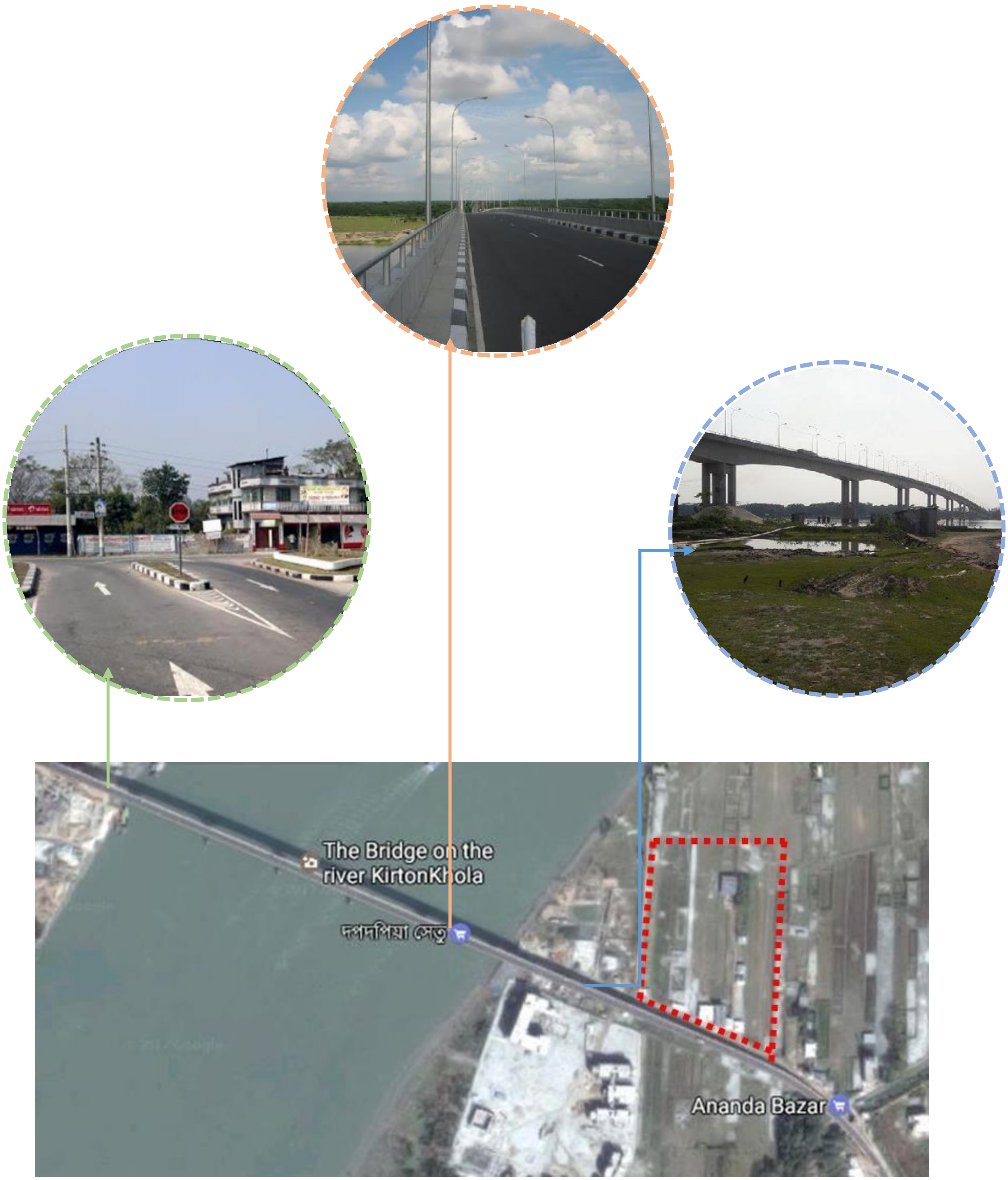


Fig: 3.5

Fig: 3.6

Source: Google Map



Source: Google Map

Fig: 3.7

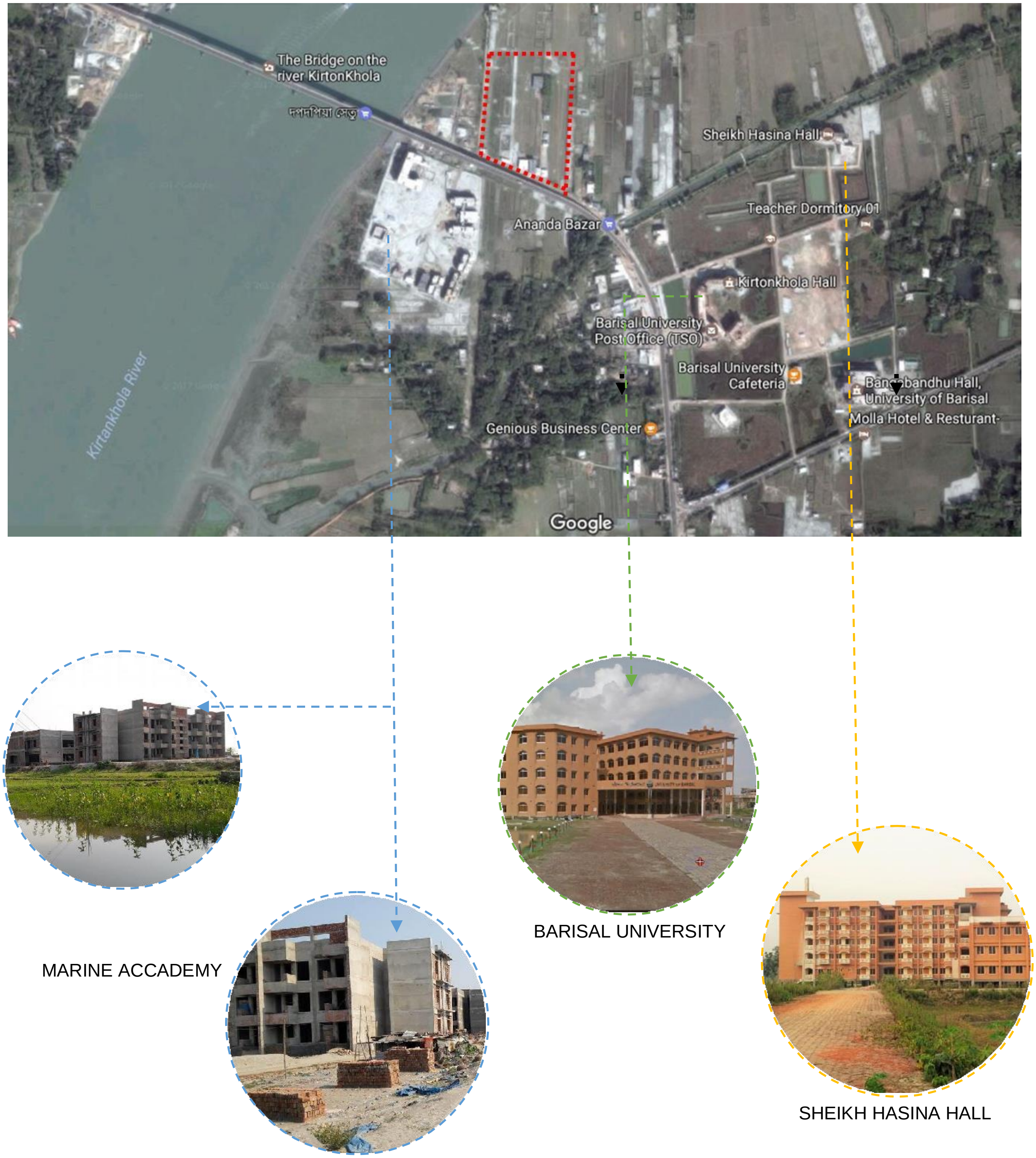


Fig: 3.8

Source: Google Map

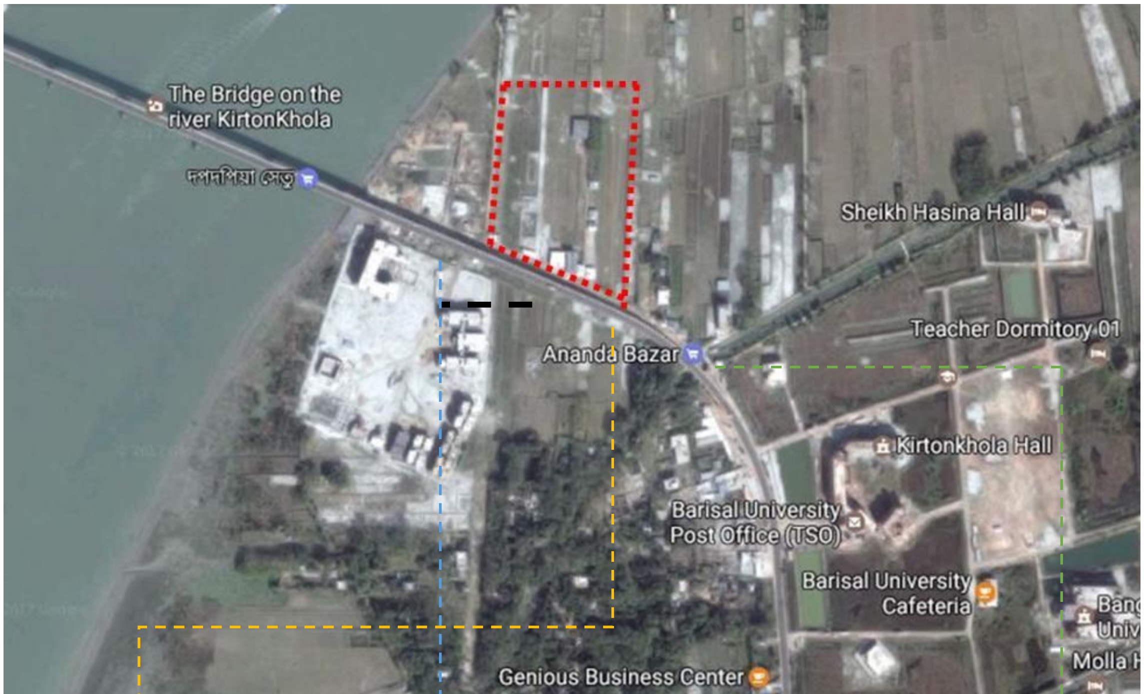


Fig: 3.9

Source: Google Map

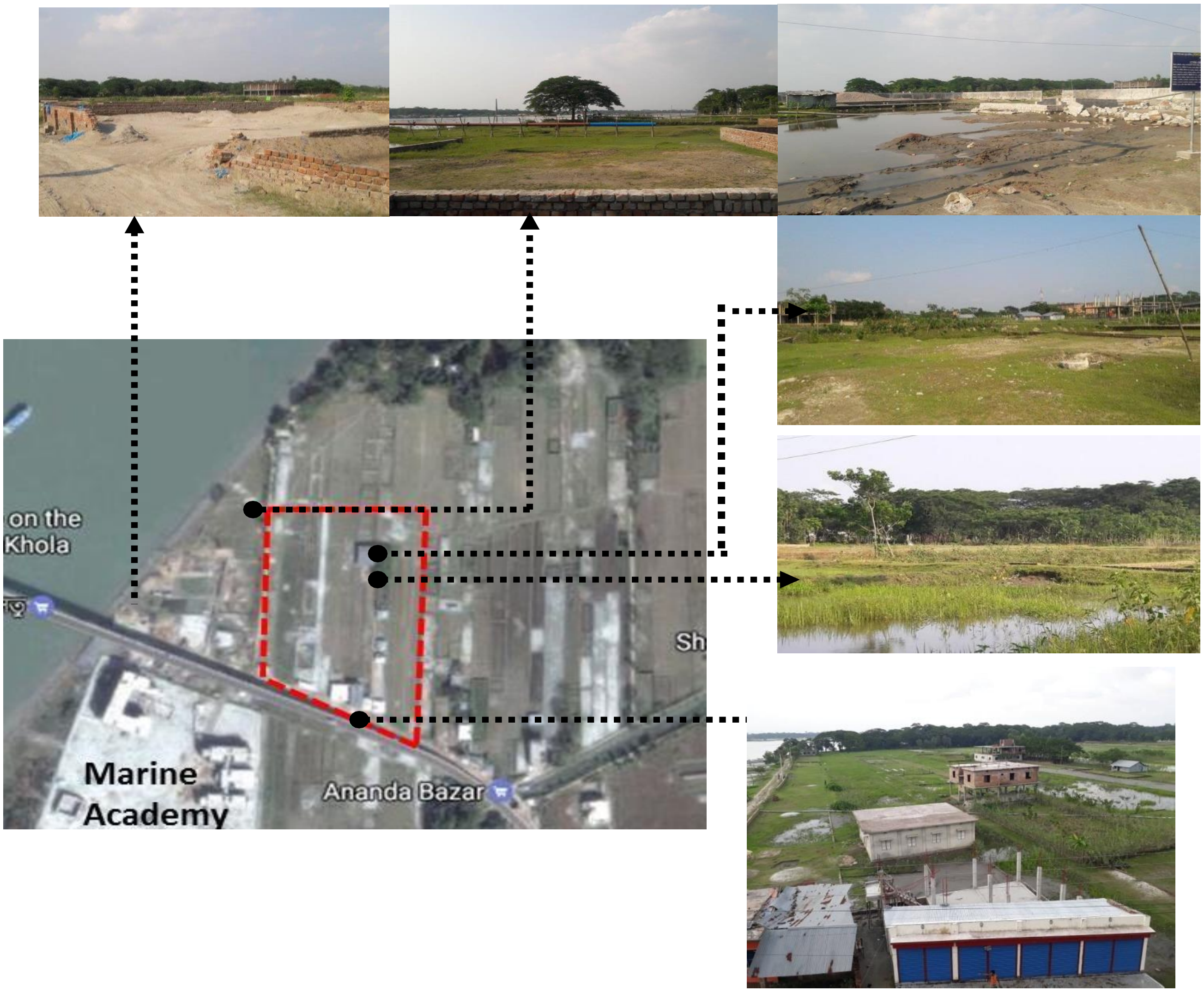


Fig: 3.10

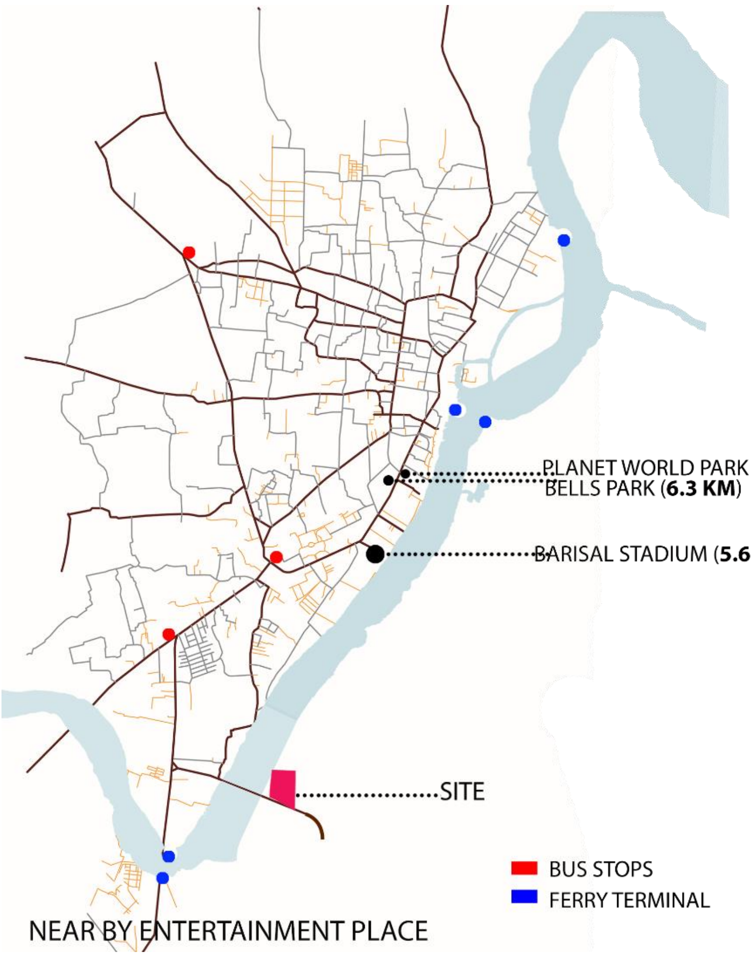


Fig: 3.11 (Author)

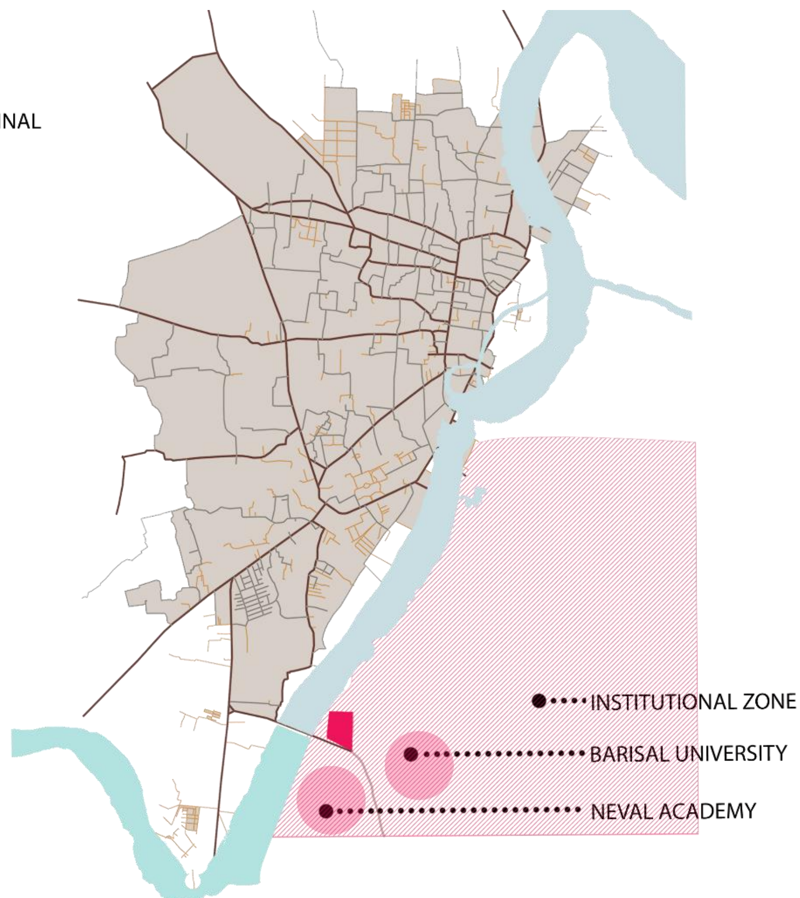
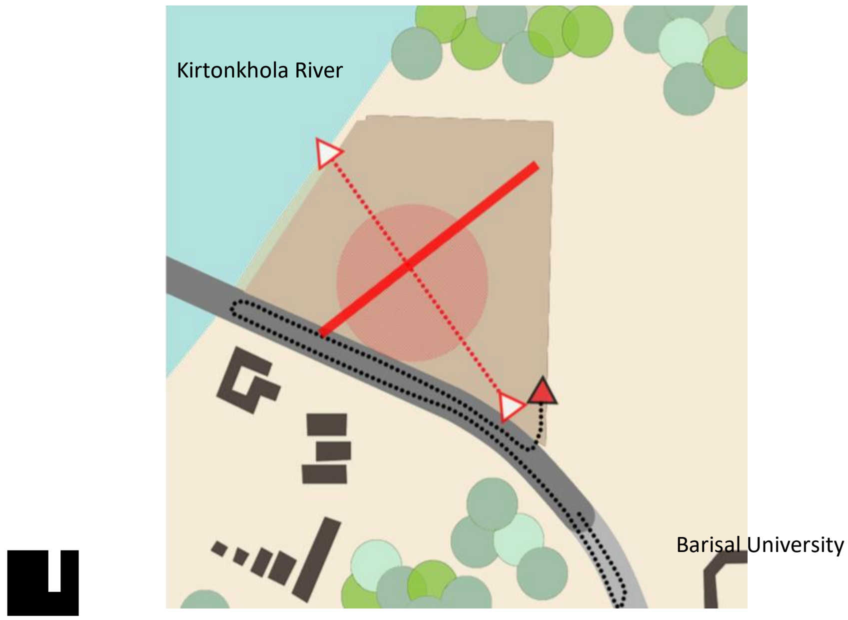
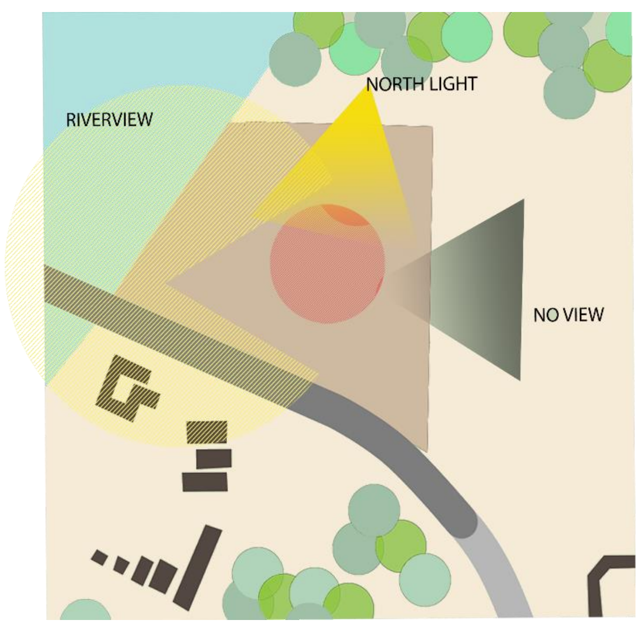


Fig: 3.12 (Author) PROPOSAL FOR THE EXTENTED CITY



Site Access

Fig: 3.13 (Author)



Site consideration

Fig: 3.14 (Author)

Barisal Flood Map

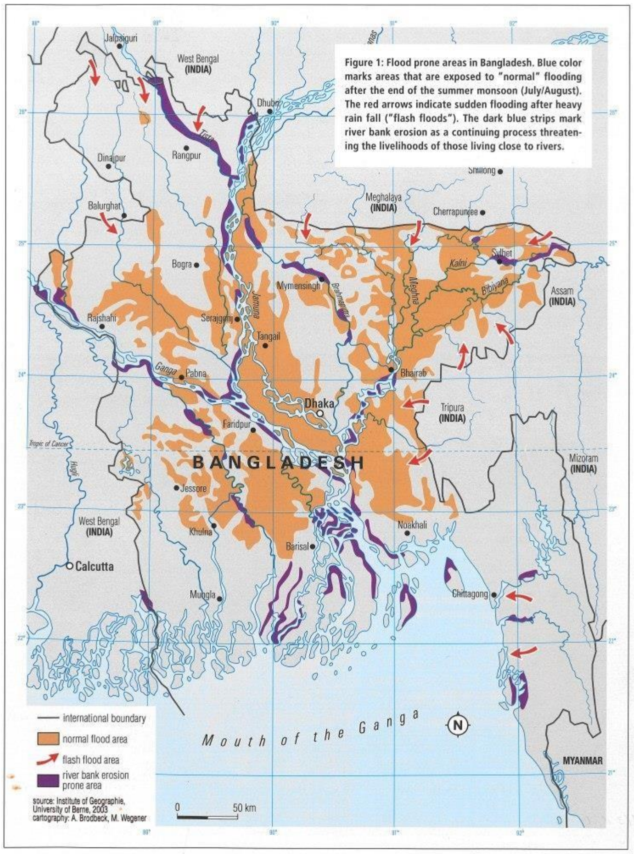


Fig: 3.15

Fig: 3.16

SWOT Analysis

Strength

- The site has a river view
- The surroundings are open spaces
- Is situated in a planned and developed zone
- the access to the site is still not built yet so there is the chance to build it accordingly
- The site is clearly seen from the bridge
- Site is accessible from both land and water
- The surrounding structures of the site are quite impressive

Weakness

- The site is in low lands but the ground level will be elevated
- The Abdur Rob Serniabad bridge
- The access to the site is not permanently built yet
- The riverside is constantly being filled

Opportunity

- Has an opportunity of being a landmark once built
- Has a great role to play in the urbanization of the surrounding area
- the surrounding area is a planned zone has an opportunity of being another center of Barisal city

Threats

- Though Kirtonkhola river is not in the regular flood zone still in monsoon season there is a chance of overflowing in the site
- Possible River erosion is also a threat to the site

Findings

- The project has a chance of being one of the landmarks of Barisal City
- The project is being built in a zone that is quite promising
- The site is currently in a comparatively low land but will be filled and elevated during construction
- The surrounding structures of the site are quite impressive
- The locality around is not quite build yet and depends on the construction of the structure being built
- The project has a great role to play in the urbanization of the surrounding area

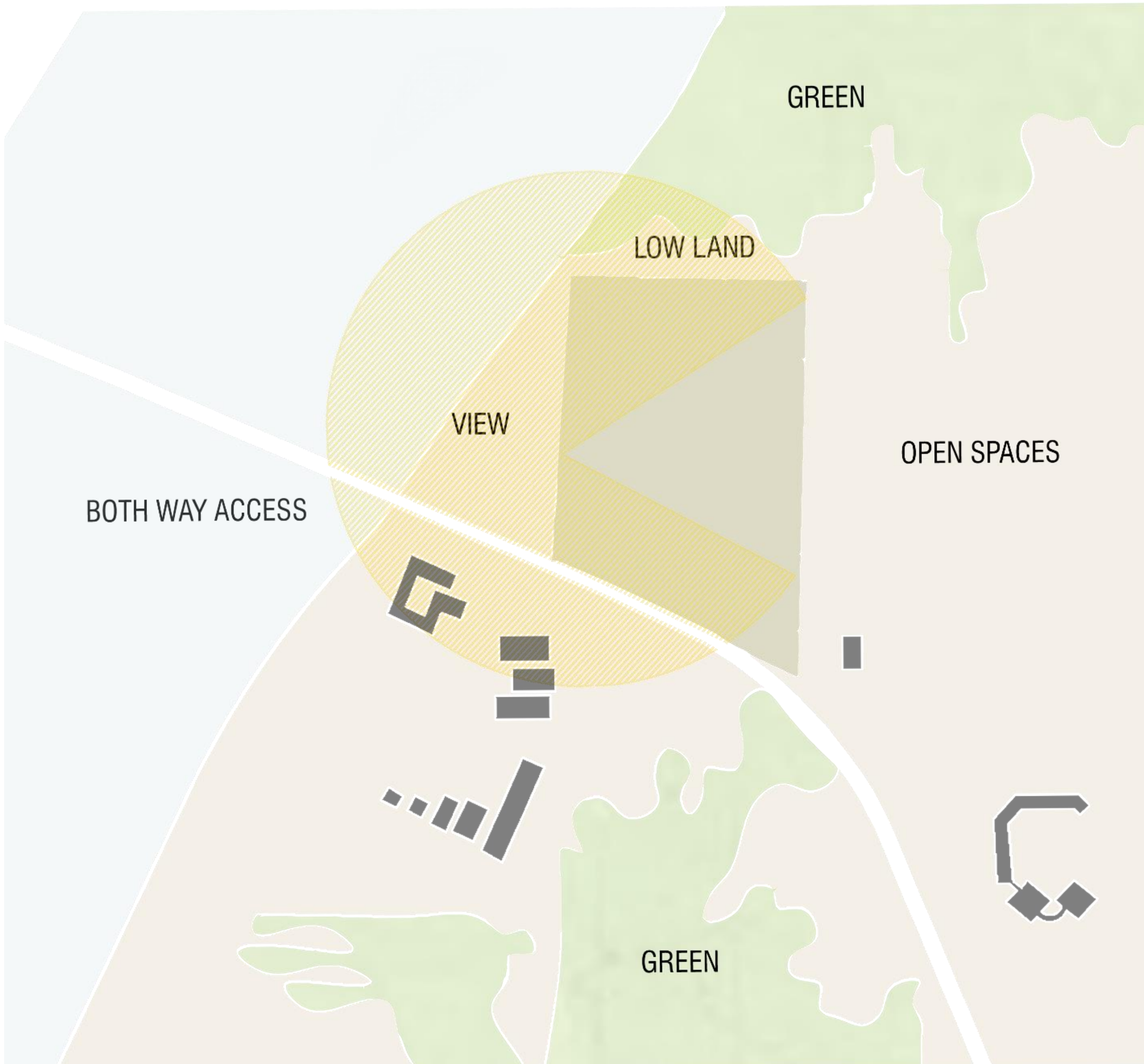


Fig: 3.17 **SWOT Analysis** (Author)

CHAPTER 4: PROGRAMME ANALYSIS

Program and Development

4.1 Proposed program:

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
ADMINISTRATION	Director’s Room + Toilet	1	300	300
	Personal Assistant	1	150	150
	Deputy. Director’s Room	1	200	200
	Curator’s Office	1	200	200
	Asst. Curator’s Office	1	150	150
	General Office	16	40	640
	Account’s	6	40	240
	Conference Room 1	10		120
	Conference Room 2	30		300
	Staff Lounge			400
	Record & Receiving Room			250
	Maintenance			120
	Toilet	8	30	240
	Store			200
	Subtotal			**3460**
	Circulation (30%)			1040
	Total			**4500**

4.2 Program Development

GENERAL OFFICE

Officer	Unit
Scientific Officer	2
Engineer	2
Public Relations Officer	1
Administrative Officer	1
S.A.E (Mechanical)	1
Assistant Engineer	2
S.O (General)	1
S.O (Astronomy)	1
Office Assistant	1
Office Attendant	4

LOBBY AREA

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Lobby Area	Lobby			2000
	Reception			100
	Ticket Corner			200
	Waiting	50	15	750
	Gift Corner			250
	Souvenir Shop			400
	Magazine Corner			200
	Prayer Room			300
	Toilet	8	30	240
	Sub Total			**4440**
	Circulation (30%)			1340
	Total			**5780**

PLANETARIUM

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Planetarium (Radius, d= 16-18 m)	Seating Area	250	20	5000
	Technical Support Area			500
	Maintenance			200
	Mechanical Room			1000
	Store			300
	Subtotal			**7000**
	Circulation			2100
	Total			**9100**

OBSERVATORY

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Observatory (Diameter ,d = 10 m)	Lobby			600
	Telescope Zone			3000
	Maintenance			300
	Mechanical Room			500
	Store			300
	Sub Total			**4700**
	Circulation (30%)			1500
	Total			**6200**

EXHIBITION SPACE

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Exhibition Space	Permanent			40,000
	Temporary			12,000
	Store			2000
	Sub Total			**54000**
	Circulation			21,000
	Total			**75000**

OPERATIVE TEAM

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Operative Team	Assistant programmer	1	120	120
	Space Theater Operator	1	120	120
	Assistant Engineer	1	100	100
	Technician	2	100	200
	Work Assistant	1	100	100
	Computer Operator	1	100	100
	Sub Total			**840**
	Circulation (30 %)			230
	Total			**1070**

SEMINAR HALL

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Seminar Hall	Lobby			1000
	Waiting	50	15	750
	Seating Area	300	10	3000
	Stage			700
	V.I.P Room			400
	Sub Total			6150
	Circulation			1850
	Total			8000

SCIENCE ATELIERS

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Science Ateliers	Paleontology	150	10	1500
	Astronomy	150	10	1500
	Astrology	100	10	1000
	Physics (General)	150	10	1500
	Physics (Applied)	150	10	1500
	Cosmology	100	10	1000
	Store			300
	Sub Total			**8300**
	Circulation			2490
	Total			**10790**

LIBRARY

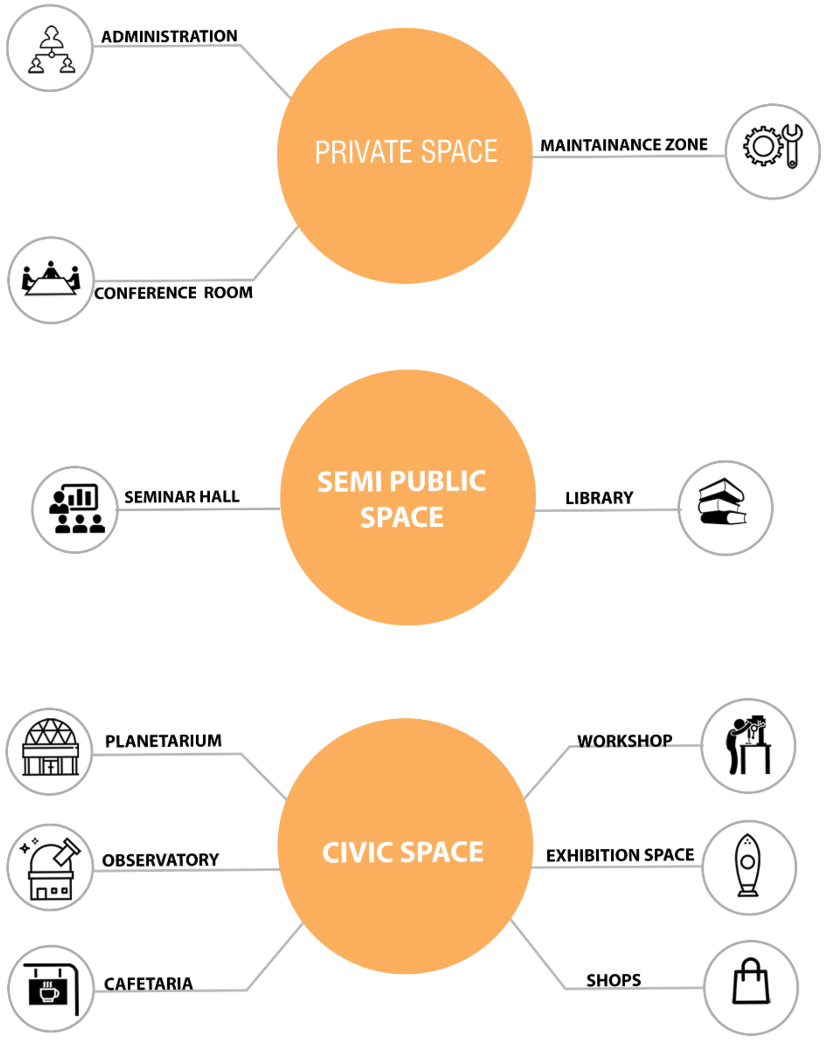
ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Library	Lobby			500
	Reading Area	120	20	2400
	Stack Area (5,000 Books)		16 sqft per 250 Books = 40 Stacks	640
	Librarian’s Office	1		200
	Archive (1000 Books)			80
	Researcher’s Room	3		300
	Documentation Room	3		300
	Store			200
	Sub Total			**6500**
	Circulation			1900
	Total			**8400**

CAFETERIA

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Cafeteria	Cafe	150	16-18	2700
	Counter			100
	Kitchen			800
	Store			400
	Sub Total			**4200**
	Circulation			1000
	Total			**5200**

SERVICE & MAINTENANCE

ZONE	SPACE	USER NO.	UNIT AREA	TOTAL SQFT
Service & Maintenance	Service Lobby			300
	Loading/ Unloading			500
	Substation			1500
	Supervisor			100
	Control & Security		300X2	600
	Maintenance Staff			300
	Machine Room			500
	Exhibit Repairing Storage			1000
	Toilets			300
	Drivers Waiting Room			200
	Sub Total			**5400**
	Circulation			1620
	Total			**7020**



Programmed Diagram

Fig: 4.1 (Author)

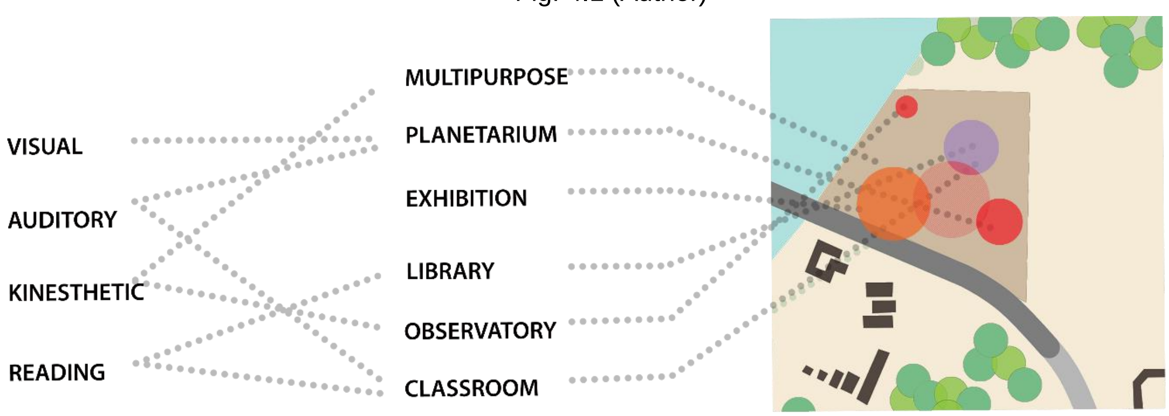


Fig: 4.2 (Author)

CHAPTER 5: CASE STUDY

5.1 Local Case Study

Case Study 1: Bangabandhu Sheikh Mujibur Rahman Novo Theater

Location: Bijoy Sharani, Tejgaon, Dhaka

Site Area: 5.4acres

Built Area: 2.86 acres

Client: Ministry of Science & Technology

Architect: Arch. Ali Imam.

Established: 25th September, 2004

Fig: 5.1.1

- The Novo Theater (Planetarium), Dhaka's famous landmark beside the Bijoy Sharani was inaugurated in 2004. It is located near the Bangladesh National Parliament Building.
- Inside the **planetarium** there are more than**150 projectors, models of the planets of the solar system, scientific exhibits, 3D movies of the universe, 5D Theater, and exciting space ride simulator** etc.
- In virtual reality, It creates an experience the thrills of an interplanetary journey in **a three dimensional environment**, immersing yourself in your solar system as well as the universe surrounding it.

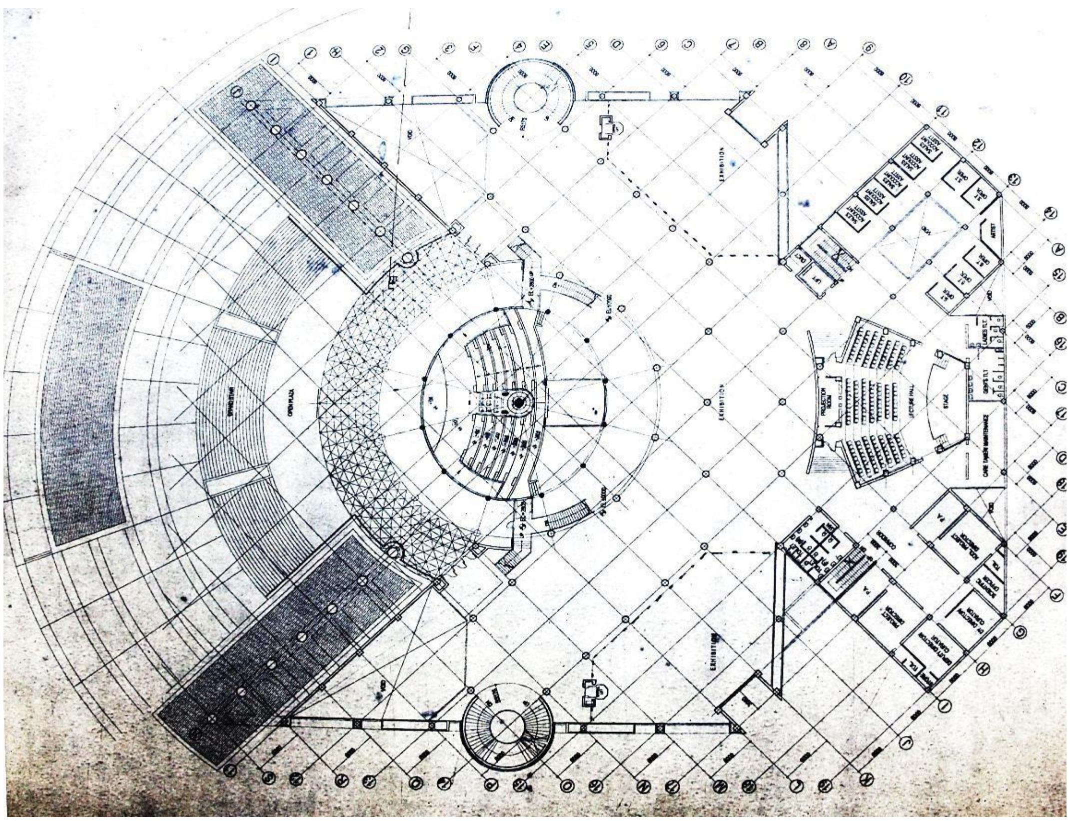


Fig: 5.1.2

PLAN AT PLAZA LEVEL

- The spherical dome i.e. **the space theatre, the focal point of the project** has been placed centrally. This arrangement automatically leads the visions of the main attraction of the complex.

- The **grand plaza** express the monumentality inspired from the parliament.
- The use of double and multiple height spaces for the arrangement of these functions provide **the visual linkage with one space and to another.**
- An influence of the cosmic image has been interpreted through forms and penetration of natural life from sky.
- **The roof of these stairs have been beveled at 45 angle** to create an observatory effect from outside.

The Admin Office Includes Space for:

- Deputy Director Curator
- Project Director
- Scientific Officer
- Asst. Project Director
- Maintenance
- Account assistant
- Office Assistant

Planetarium

- The Dome of the Planetarium is **21** meter in diameter
- **275** seats for the viewers to watch each show being1hr
- The shows are scheduled **3-5** times a day
- Tickets are sold at the gate and are also available at the entry of the building
- The area of the planetarium is **8790**sft
- The area of the exhibition space is **40,284**sft

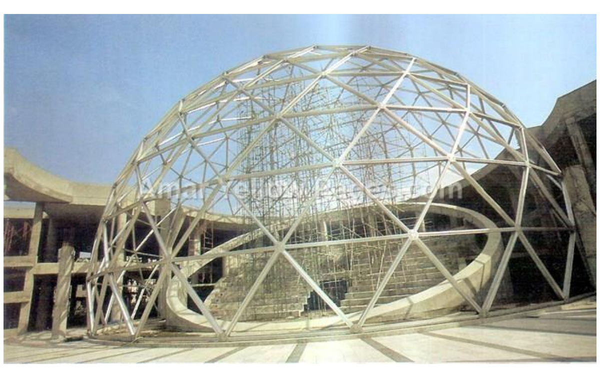
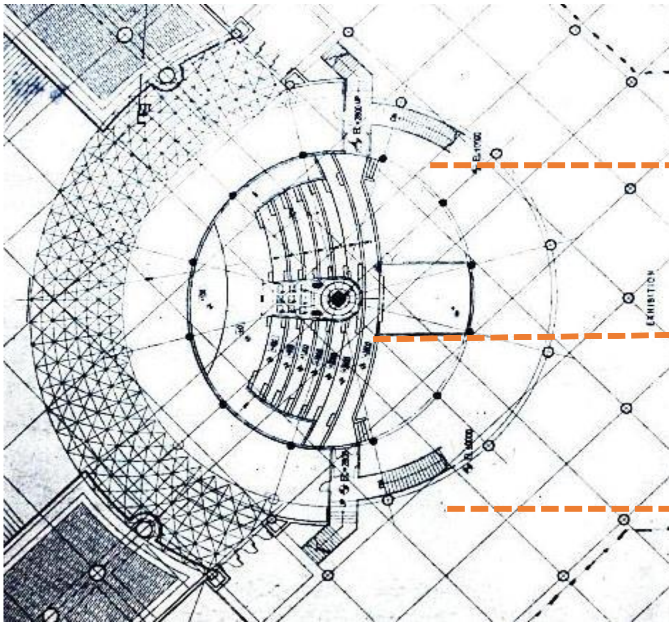
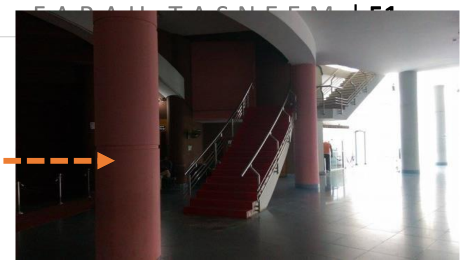


Fig: 5.1.3.Steel Structure of the Planetarium





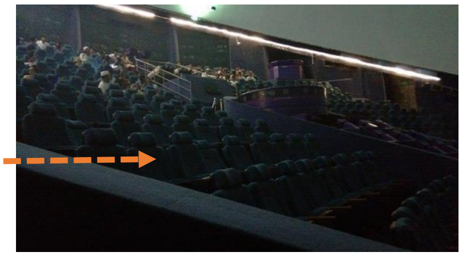


Fig: 5.1.4

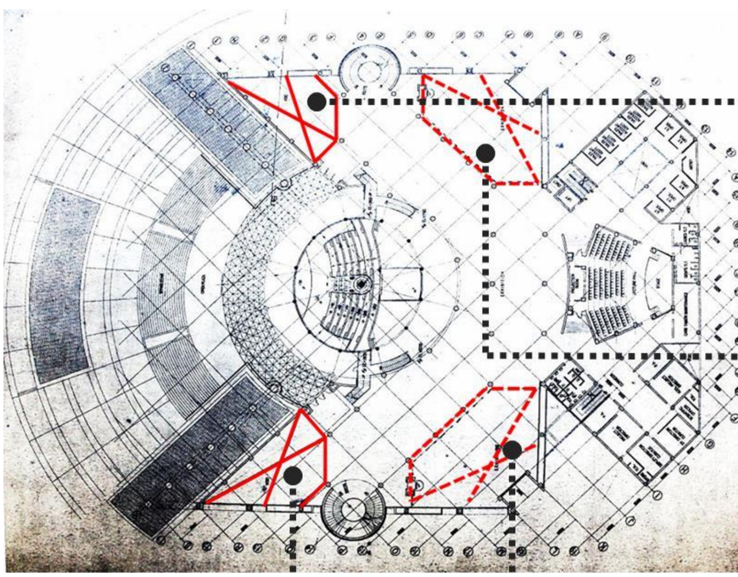
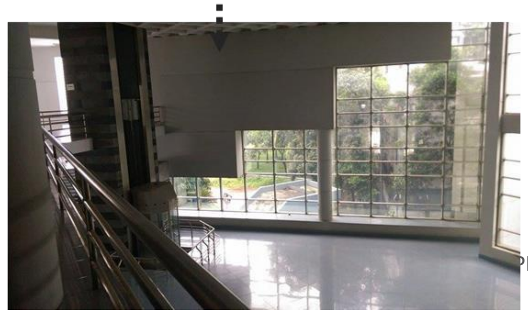


Fig: 5.1.5



Functional Zoning

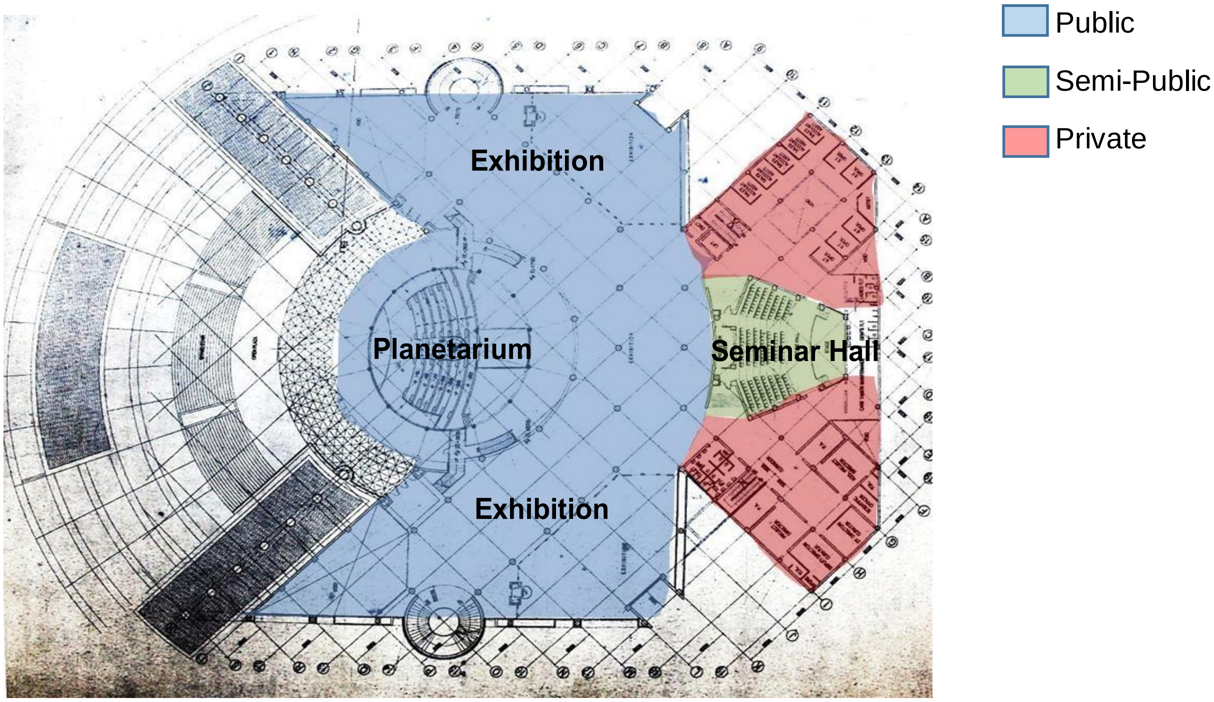
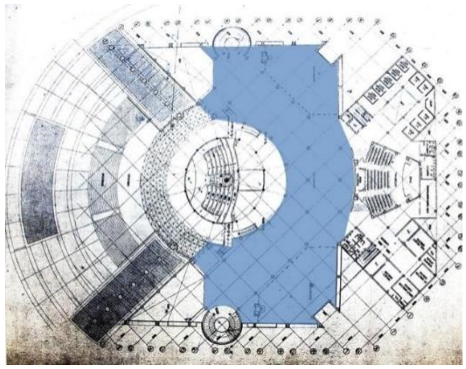


Fig: 5.1.6

Vertical Zoning

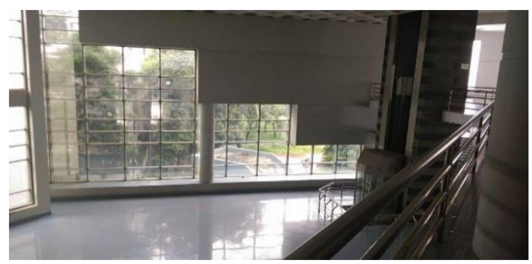
- The theatre comprises of five floors, two underground floors for car parking and accommodations for the officials and employees of the theatre.
- Remaining three floors are for shows and administrative activities covering an area 125000 sqft.
- The gallery starts from the first floor and extends up to the3rd floor.
- The first floor holds a lecture hall having a capacity for 150persons.

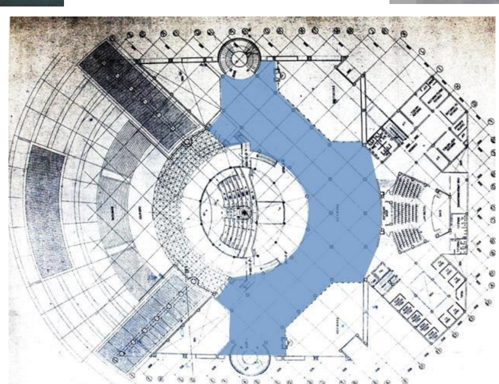
Fig: 5.1.7



Plan at Level 0 (Exhibition Space)

Fig: 5.1.8





Plan at Level 1 (Exhibition Space)

Fig: 5.1.9

EXHIBITION SPACE (LEVEL 2)

Fig: 5.1.10.Scientific Exhibition

Fig: 5.1.11.Scientific Exhibition

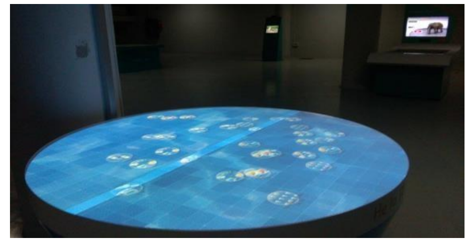


Fig: 5.1.12.Holographic Table

Fig: 5.1.13. Scientific Exhibition

Fig: 5.1.14.Scientific Exhibition

Fig: 5.1.15. 5D Simulation

CIRCULATIONS

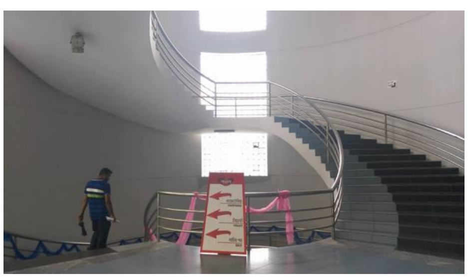


Fig: 5.1.15. Stair Case

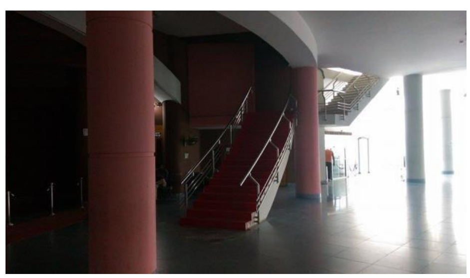


Fig: 5.1.16. Stair Case

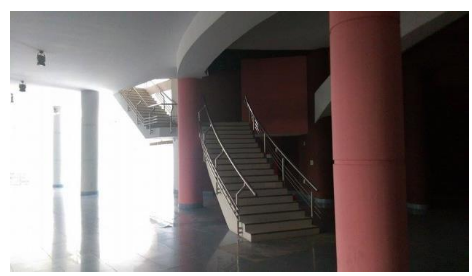


Fig: 5.1.17. Stair Case

Fig: 5.1.18. Lift

Fig: 5.1.19. Lift

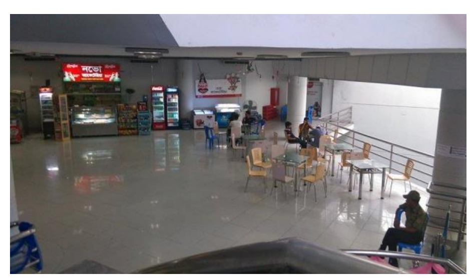


Fig: 5.1.20. Cafeteria

ELEVATIONS & SECTIONS

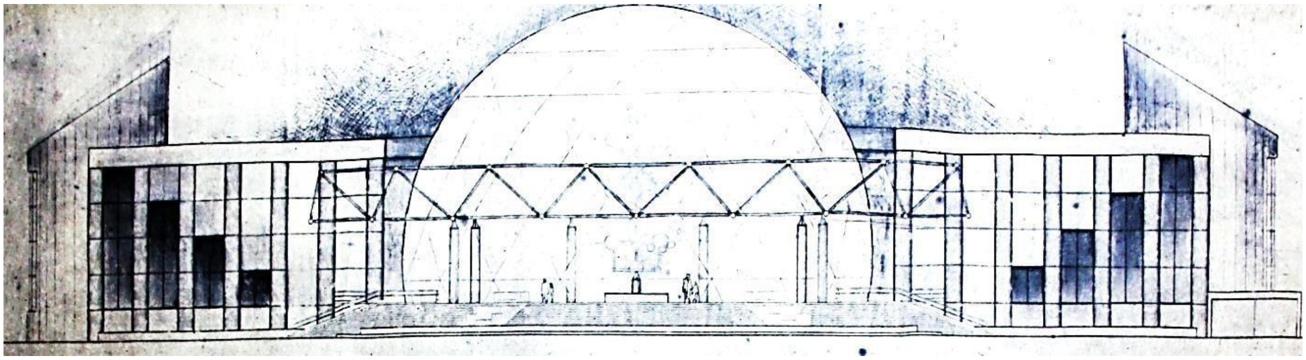


Fig: 5.1.21. **North Elevation**

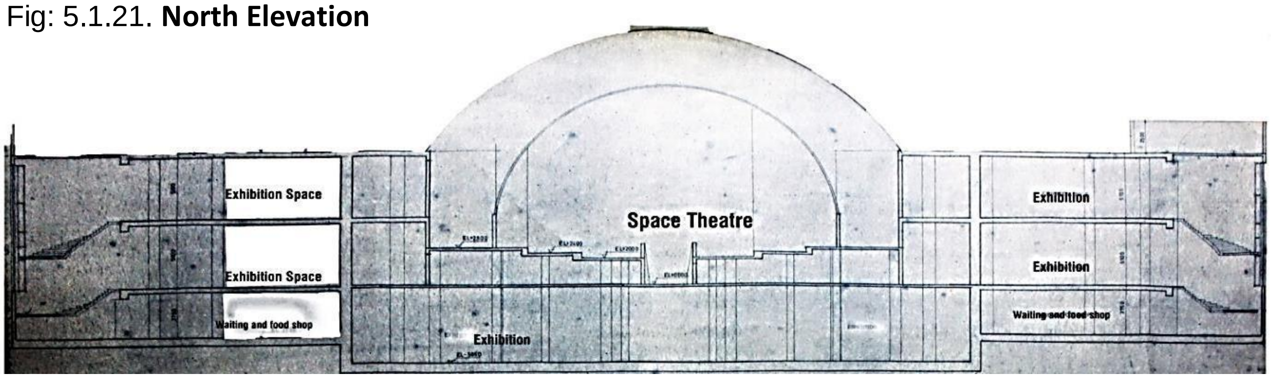


Fig: 5.1.22. **Section AA'**

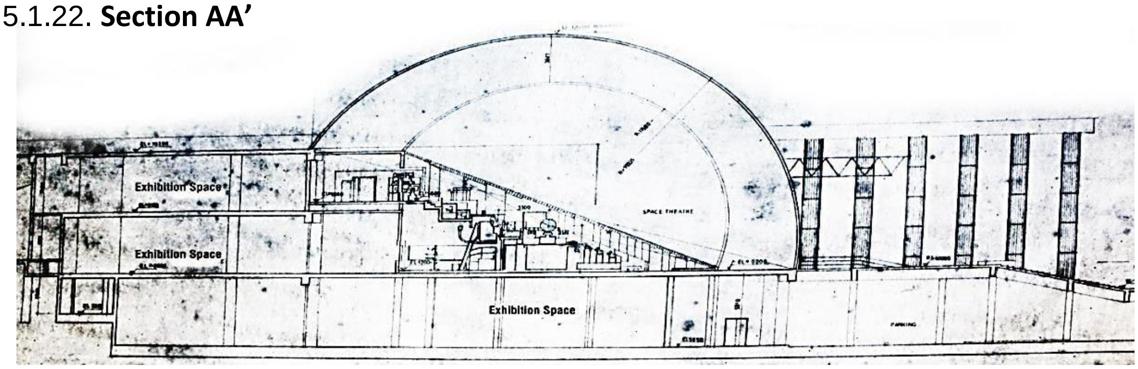


Fig: 5.1.23 Section BB'

Findings:

Positive:

- Planetarium is designed with a concept of planet.
- Simplicity in built form.
- Several double height and triple height spaces
- Exhibit gallery of first floor has the view of all the exhibits of downstairs. There is visual connection in all of the floors

- The landscape in grand and can be seen from the road

Negative:

- The built form is totally symmetrical.
- Theentranceofthebuildingisnotproperlydefinedbuttheplazacreates anambience of the approach of grand entry in the complex,
- There is not outdoor display gallery.
- There is no hierarchy of internal spaces which can be observed at various levels.

Case Study 2: National Science Museum,Agargaon,Dhaka

Architect: Shah Alam Zahiruddin

Location: Shahid Shahabuddin Shorok, Agargaon, Dhaka

Site area: 5 acres

Built area: 165,723 sq ft.

Fig: 5.1.24

Fig: 5.23

- The National Museum of Science and Technology in Dhaka, Bangladesh, was established in 1966 by the government of Pakistan.
- It was first based in the Dhaka Public Library building, after which the museum moved a number of times before it was established in its permanent home in1981.
- The museum aims to preserve the innovative work of local scientists while encouraging the younger generation of scientists to explore the endless possibilities that their scientific knowledge opens up to them.

Ground Floor plan

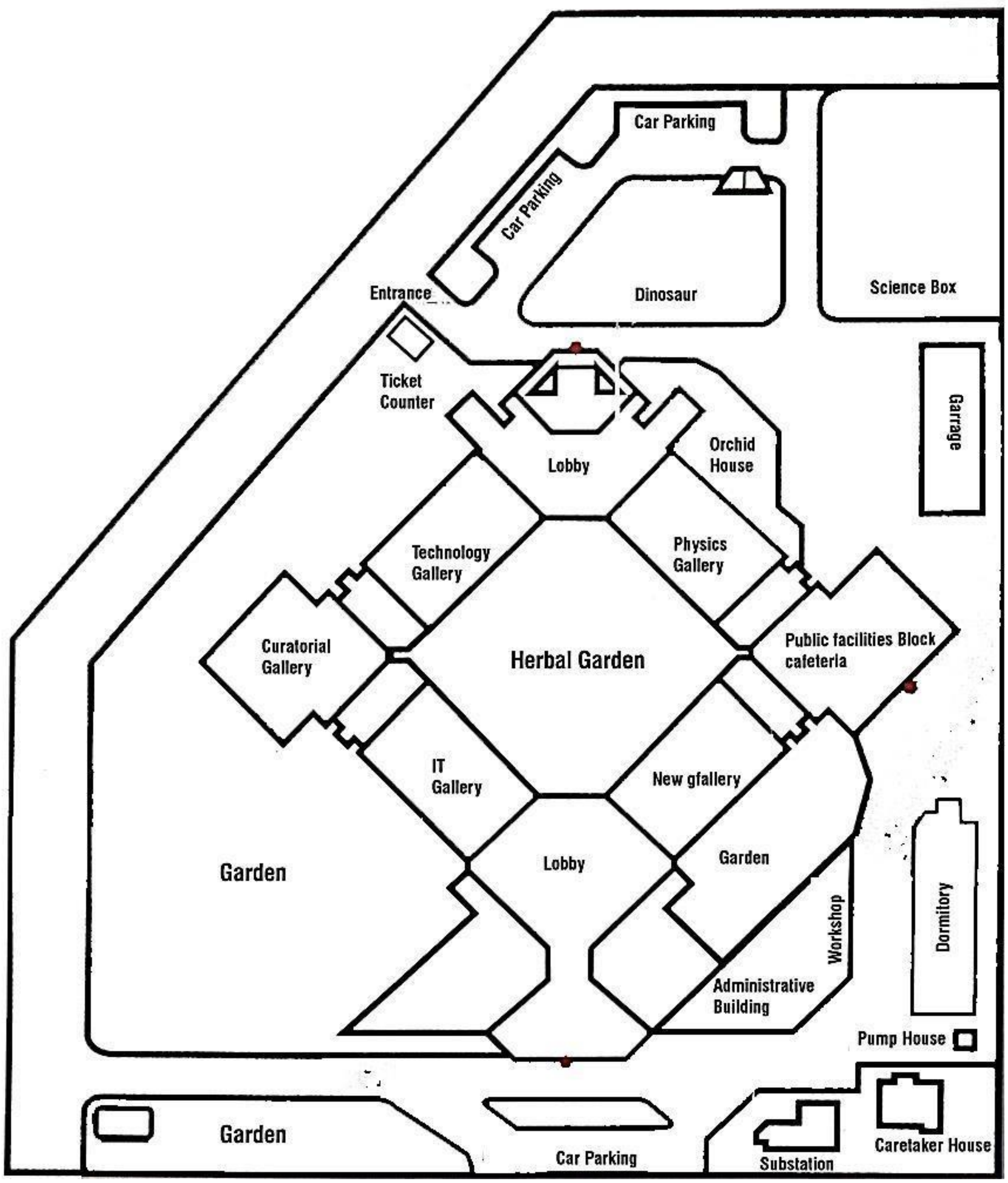
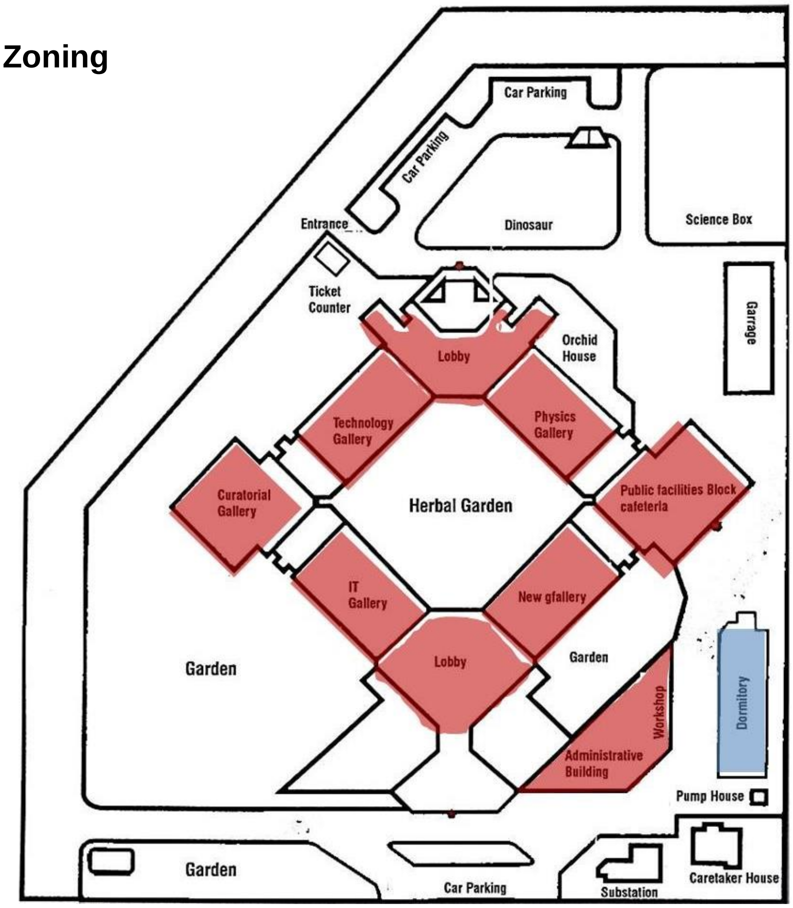
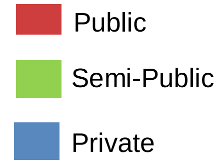


Fig: 5.1.25

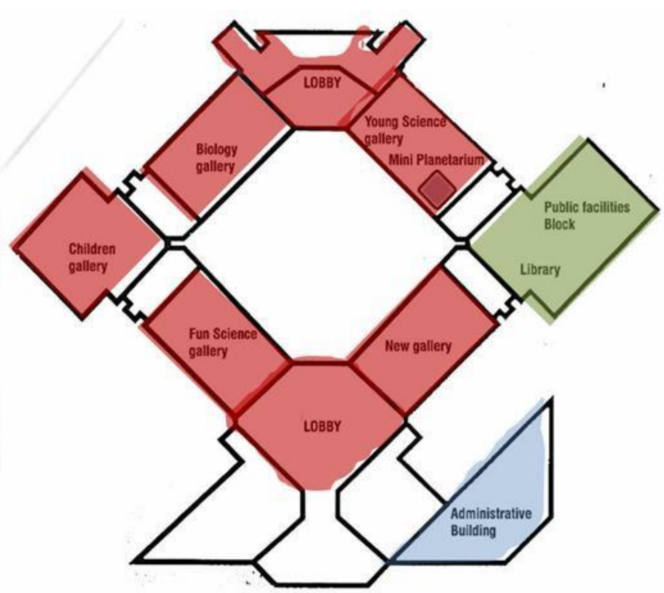
Functional Zoning





Ground Floor Plan

Fig: 5.1.26



First Floor Plan

Fig: 5.1.27

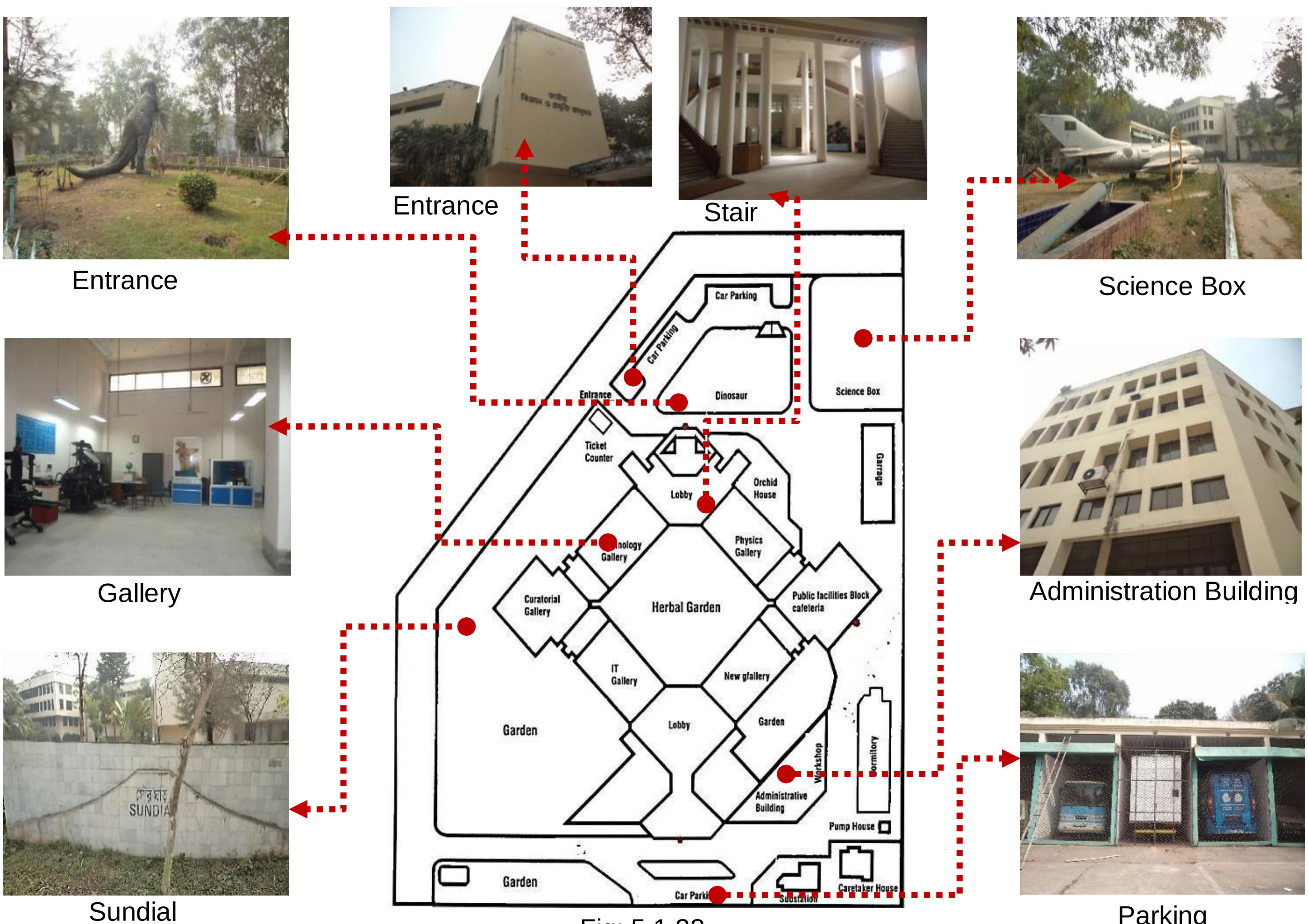


Fig: 5.1.28

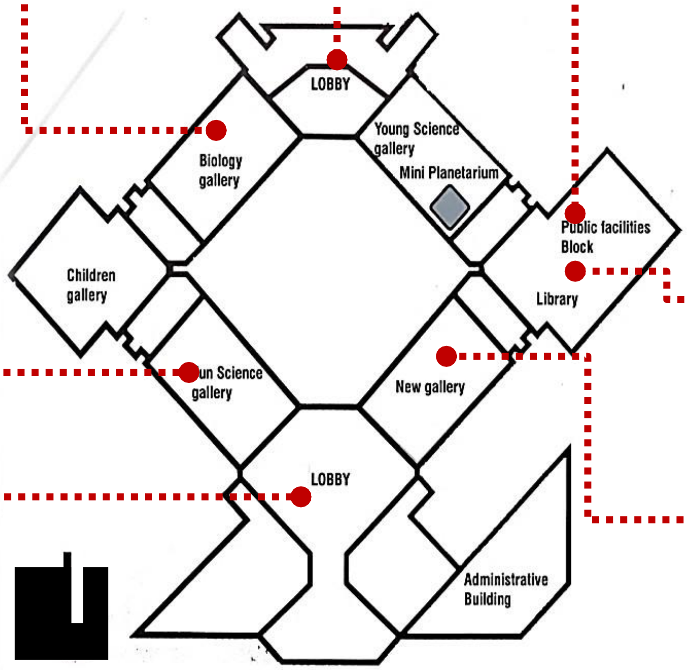
Ground Floor plan

Biology Gallery

Lobby

Space science

Fun



Library

Lobby

New gallery

Fig: 5.1.29

Fig: 5.1.30. Exhibits from

Fig: 5.1.31. Exhibits from Industrial

Fig: 5.32. Exhibits from Fun-Science

Fig: 5.1.33.

Exhibits from physics gallery

Fig: 5.1.34.

Exhibits from space science gallery

The museum has several galleries such as its

- physical science gallery,
- fun science gallery,
- biological science gallery,
- technological gallery,
- IT gallery,
- space science gallery,
- young scientist’s gallery,
- science library,
- a sky observatory, and
- Science Park.

Findings

Positive:

- There is outdoor display area.
- Diffused natural lighting in the lobby space.
- Galleries are divided into different categories.

Negative:

- Circulation is more like a corridor and lack of sufficient natural light.
- Poor collection for the exhibition.
- Poor maintenance facilities.

5.2 International Case Study

Case Study 1: Hayden Planetarium, New York

Location: New York, USA

Architect: ENNEAD Architects

Project Year: 2000

The Rose Center for Earth and Space encompasses the spectacular Hayden Sphere and exhibitions that explore the vast range of sizes in the cosmos, the 13-billion-year history of the universe, the nature of galaxies, stars, and planets, and the dynamic features of planet Earth.

Fig: 5.2.1

Fig: 5.2.2. The entrance **gallery**

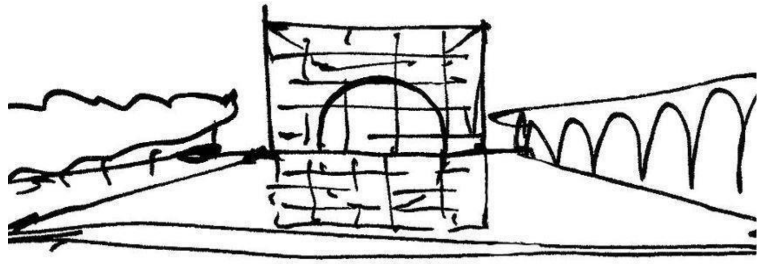


Fig: 5.2.3.Sketch

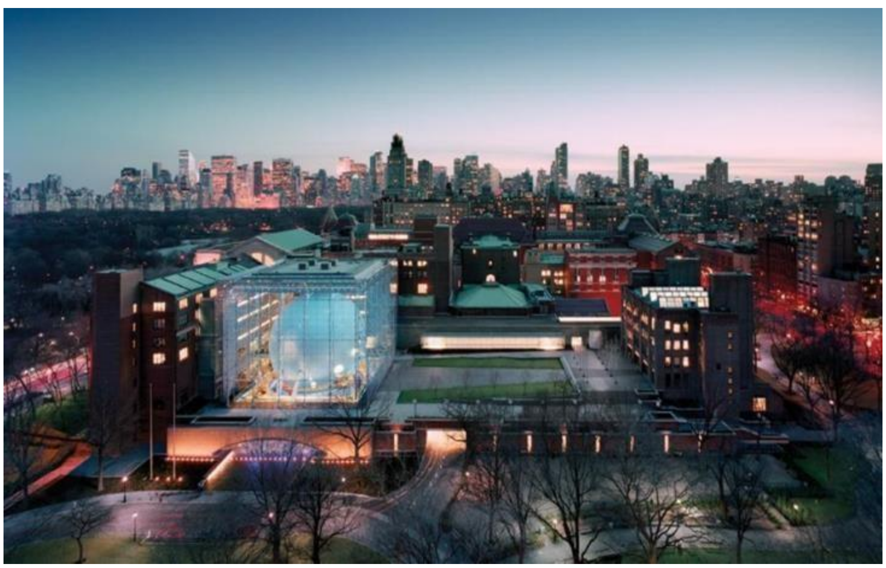


Fig: 5.2.4.The facade of the Rose Center for Earth and space, with the Hayden Sphere Planetarium gallery

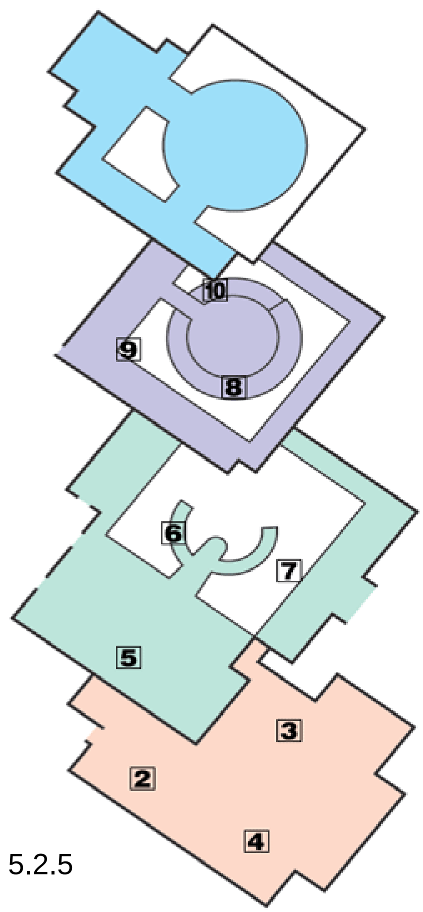
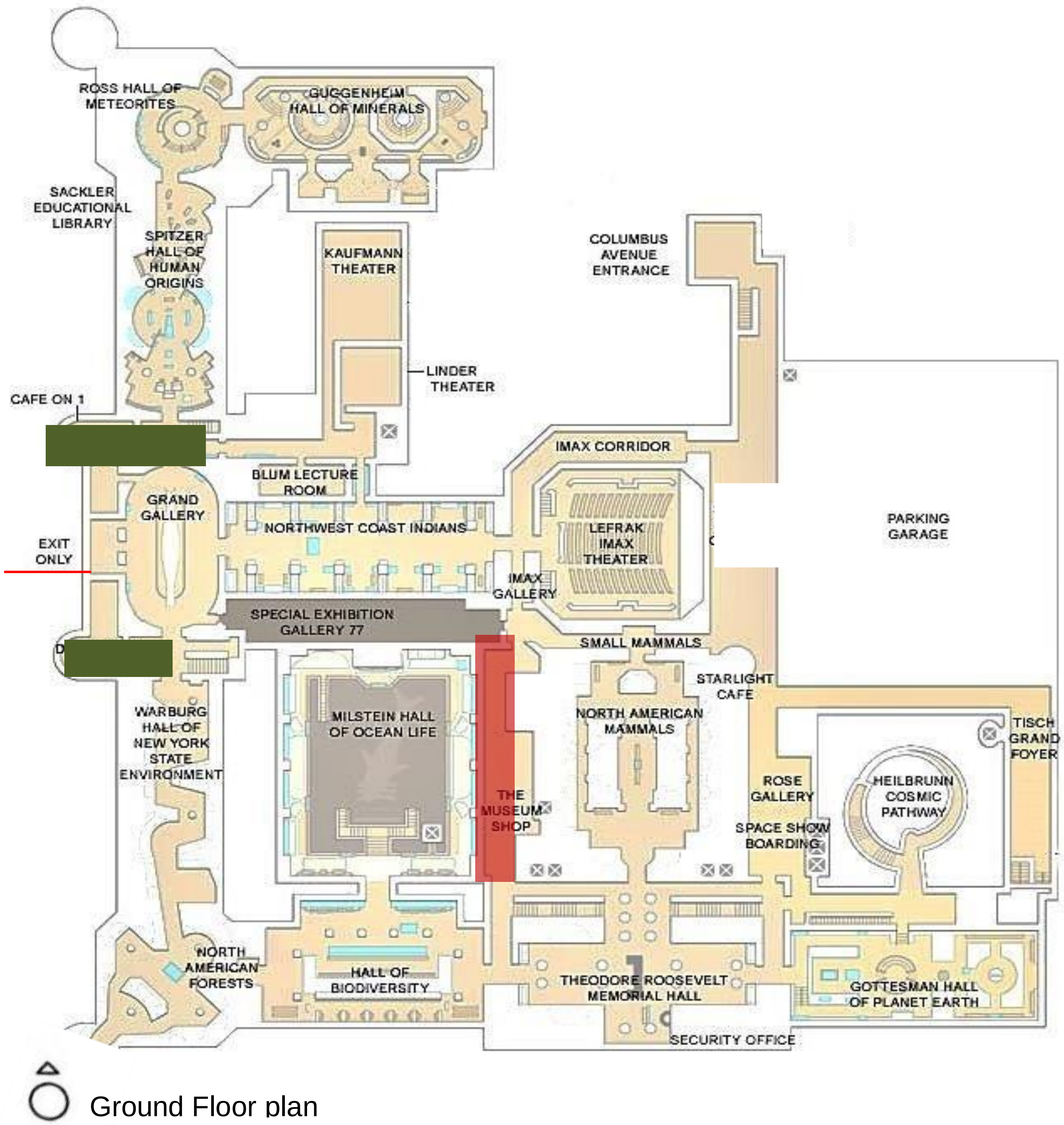


Fig: 5.2.5

- At the heart of the Rose Center for Earth and Space is an**87-foot-diameter sphere**thatappearstofloatinsideaglasscube.
- Its upper half constitutes the Hayden Planetarium, which opened in 2000alongwith the Rose Center for Earth and Space.
- The **429-seat** Space Theater, which features a custom-made **Zeiss Mark IX Star Projector** and a Digital Dome ProjectionSystem.
- It is known as the **Digital UniverseAtlas.**

Fig: 5.2.6

Fig: 5.2.7



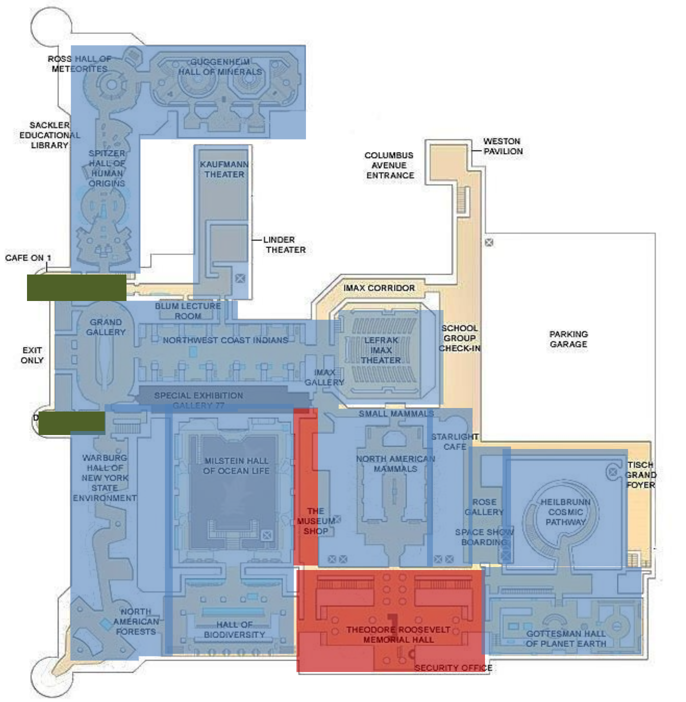
Ground Floor plan

Fig: 5.2.8

Public Function

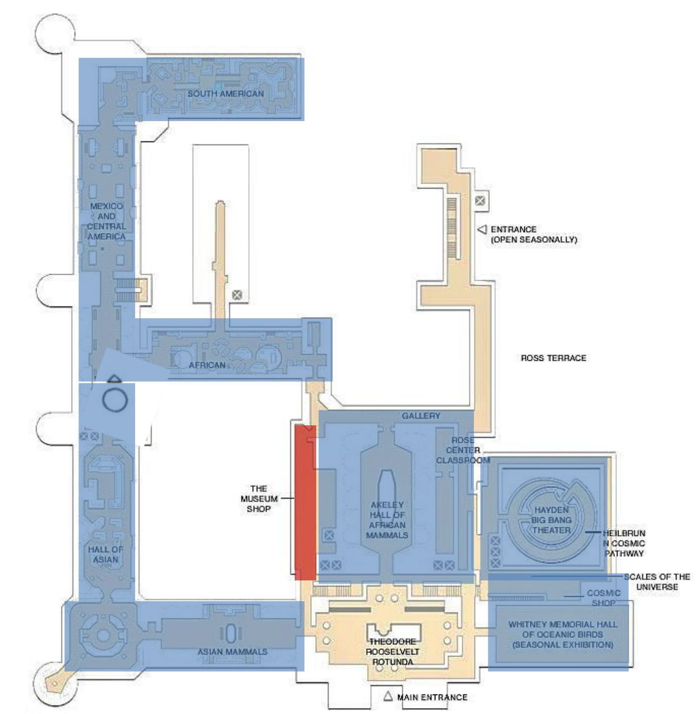
Semi-public

Private Function



Ground Floor Plan

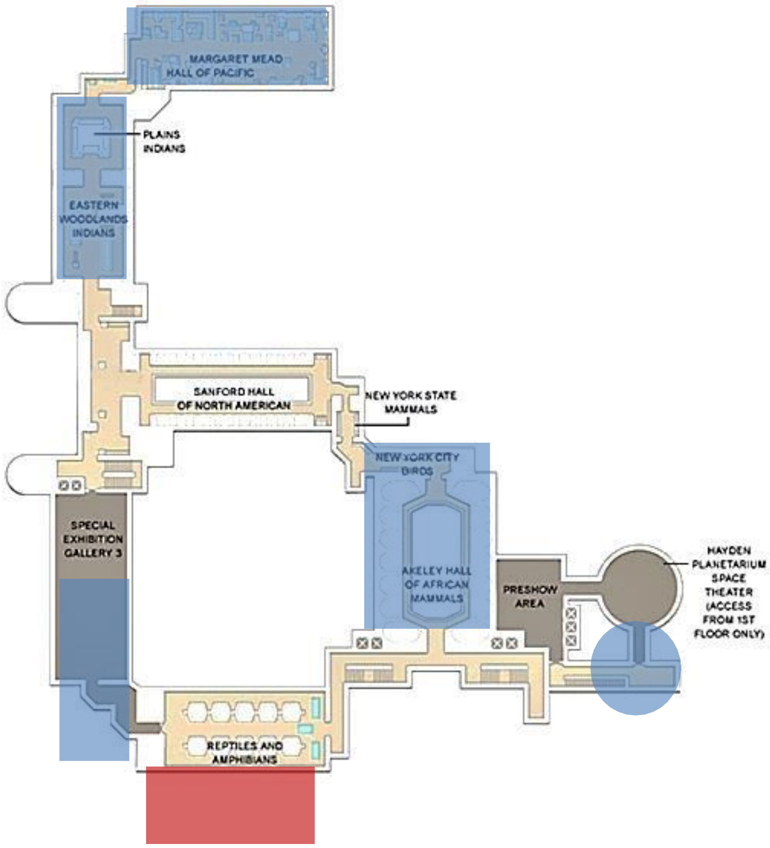
Fig: 5.2.9



First Floor Plan

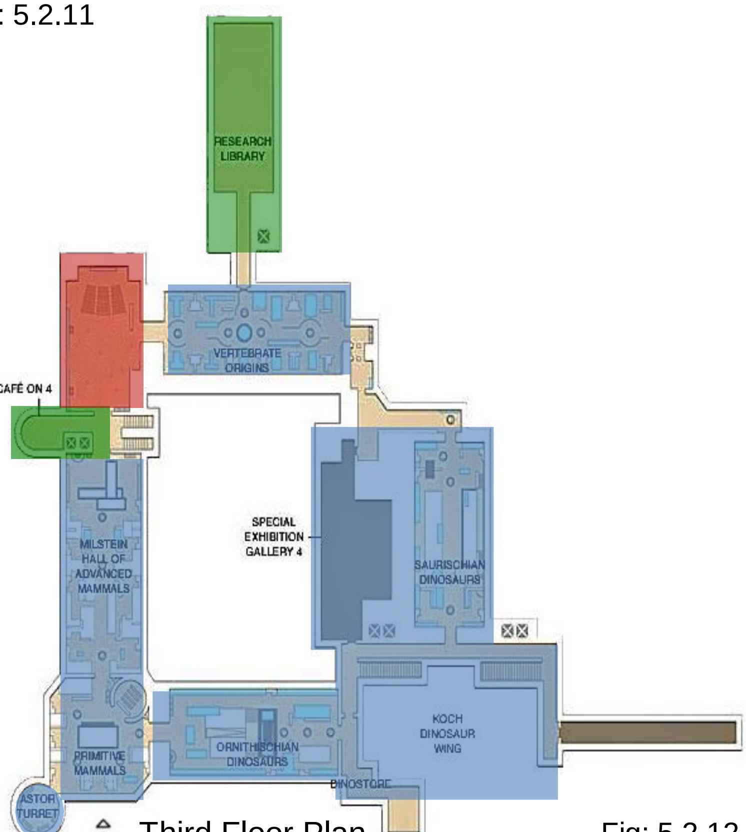
Fig: 5.2.10

Public Zone
Semi-Public Zone
Private Zone



Second Floor Plan

Fig: 5.2.11



Third Floor Plan

Fig: 5.2.12

Walking down the pathway, visitors also pass by a photographic record of cosmic history. Astronomical images appear at that time of the universe to that place on the pathway.

Fig: 5.2.13

Elliptical ramp way to the planatarium

circulation

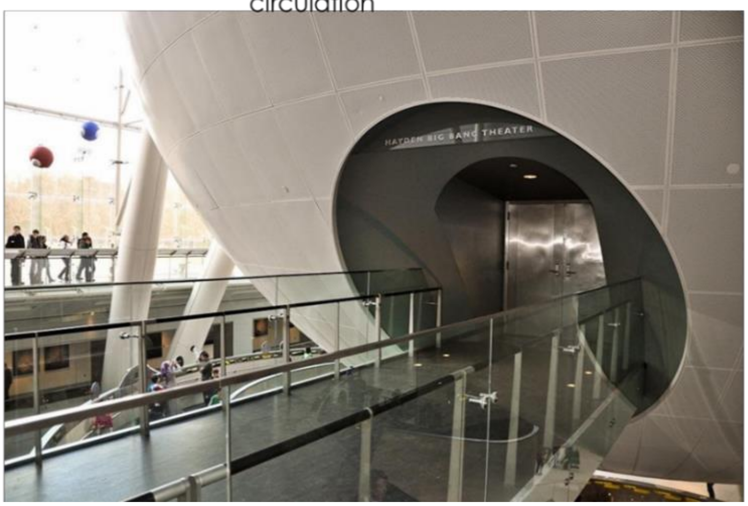


Fig: 5.2.14

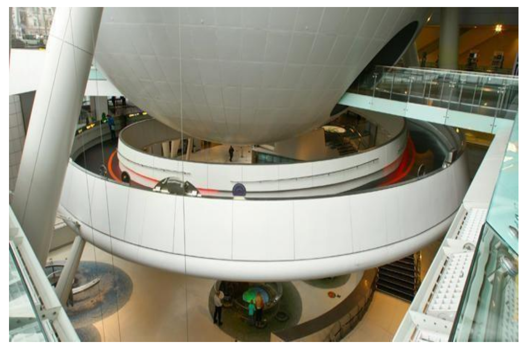


Fig: 5.2.15.Circular ramp towards the theatre

- This map of the cosmos is maintained by a team of Museum scientists and visualization experts in collaboration with colleagues from organizations such as NASA.
- The Digital Universe Atlas also provides the foundation for the Museum's Space Shows, which are screened in the Space Theater.

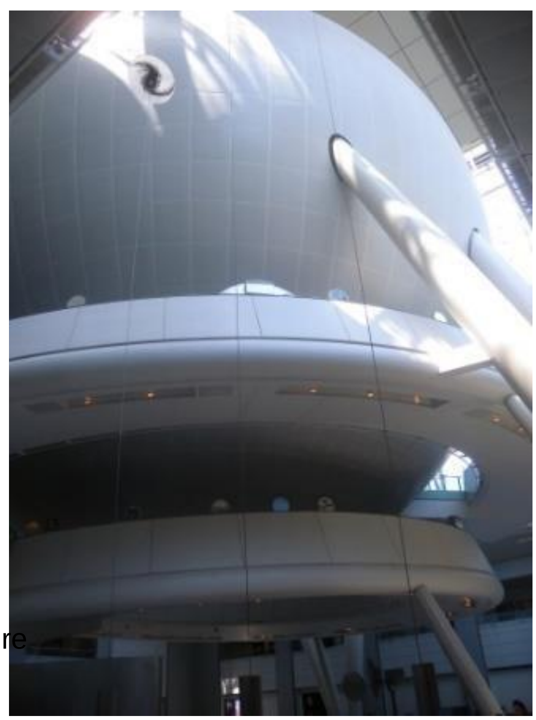


Fig: 5.2.16

The Hayden Sphere with the winding Cosmic Pathway

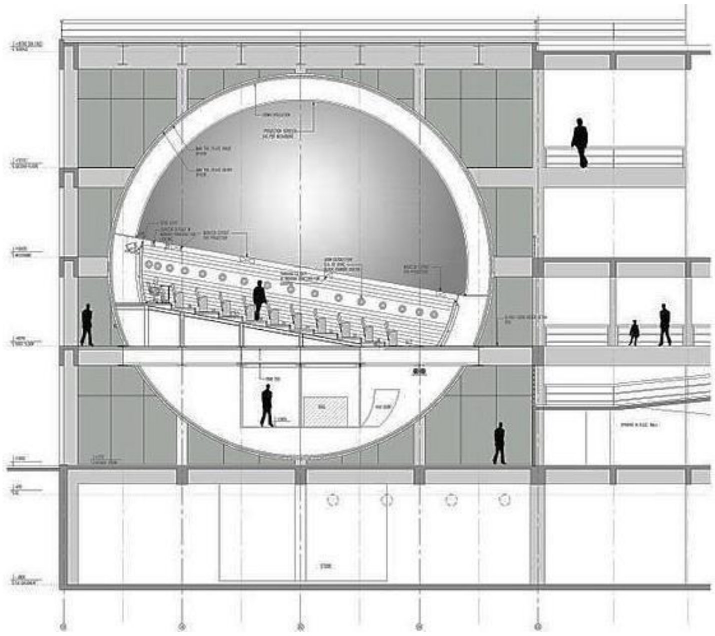


Fig: 5.2.17 Section through the planetarium

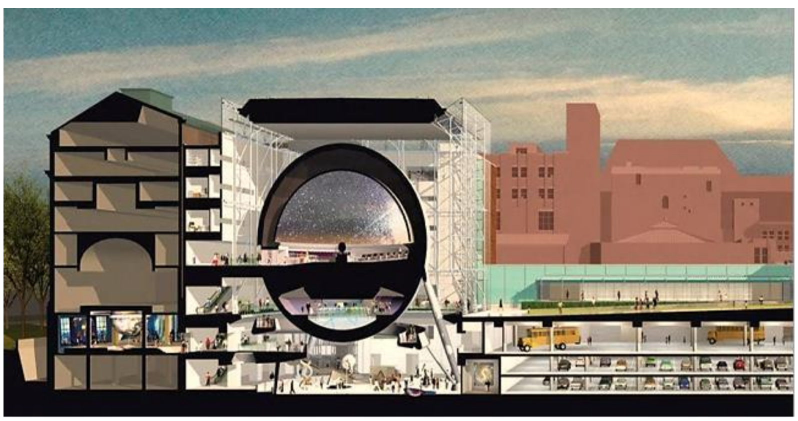


Fig: 5.2.18 Perspective of Hayden planetarium

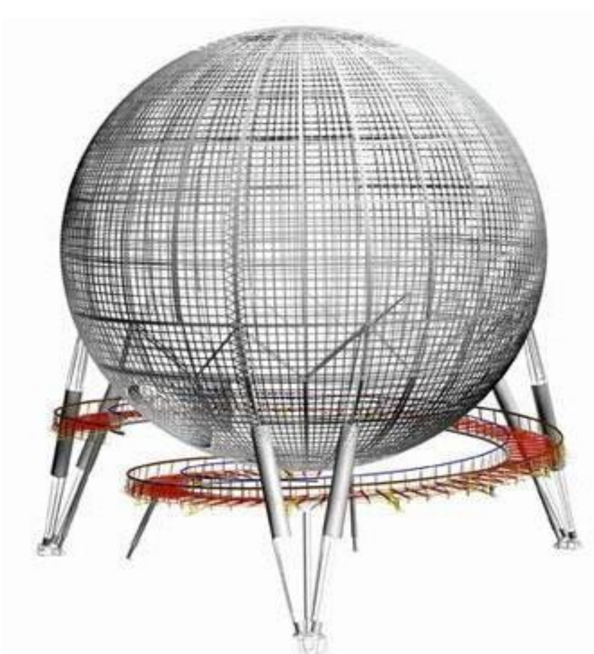


Fig: 5.2.19.Structure of the Globe

Findings

Positive:

- Esthetically enriched.
- Glass and stainless steel complements the structure of the dome.
- The entry approach is prominent
- Diff-able entry is considered here.

Negative:

- The planetarium itself holds a beautiful built-form but cannot blend as a whole.
- Huge circulation.

Case Study 2: Shanghai Planetarium

Competition: Shanghai Planetarium

Award: First Prize

Architects: Ennead Architects

Location: Lin Gang Da Dao, PudongXinqu, Shanghai Shi, China
Area: 409028 sqft

Completion Year: 2018

Fig: 5.2.20

The **38,000sq m (409,000sq ft.)** facility will explore the mysteries of space, celebrate the history of Chinese astronomy and reflect the future ambitions of China's space exploration programme.

It will feature an

- opticalplanetarium,
- a digital skytheatre,
- an IMAXcinema,

- a solartelescope,
- an observatoryand
- a range ofgalleries.

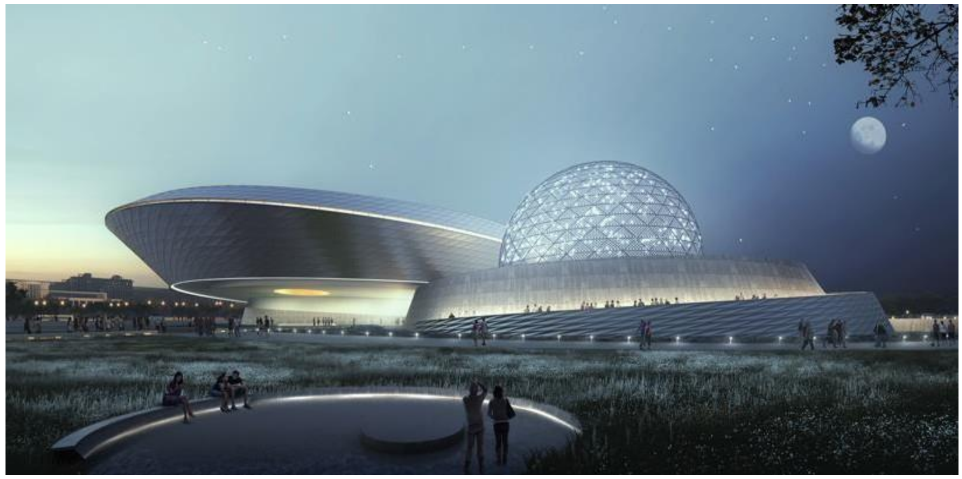


Fig: 5.2.21

Fig: 5.2.22

The international competition-winning design draws inspiration from astronomical principles, invoking the experience of orbital motion. Visitors will be guided through each of the building's three principal forms – the Oculus, the Inverted Dome and the Sphere – that act as astronomical instruments, tracking the sun, moon and stars and reminding visitors that our conception of time originates in distant astronomical objects.

Three 'celestial bodies' comprise the architecture: the Oculus, the Inverted Dome, and the Sphere.

SOURCE: https://www.archdaily.com/607311/ennead-tapped-to-design-shanghai-planetarium/54fe692fe58ece0642000096-sections

Suspended above the main entry to the Museum, the Oculus demonstrates the passage of time by tracking a circle of sunlight on the ground across the entry plaza and reflecting pool. The Inverted Dome, which facilitates an authentic experience of both day and night sky, sits atop the central atrium around which all galleries are organized and through which all visitors pass.

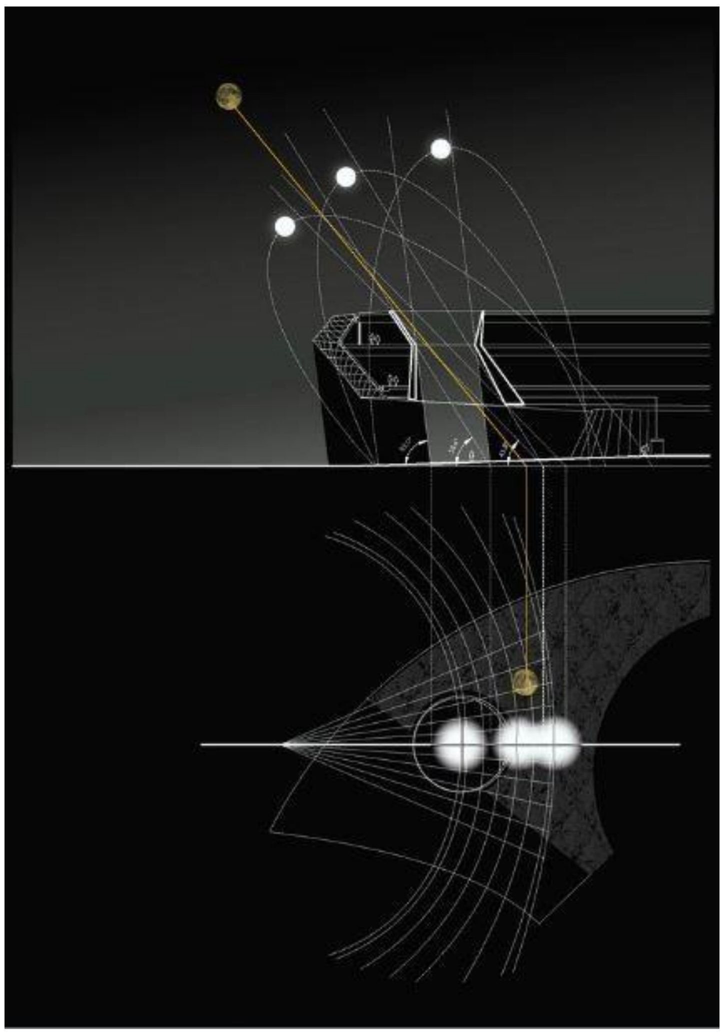


Fig: 5.2.23

SOURCE: https://www.archdaily.com/607311/ennead-tapped-to-design-shanghai-planetarium/54fe692fe58ece0642000096-sections

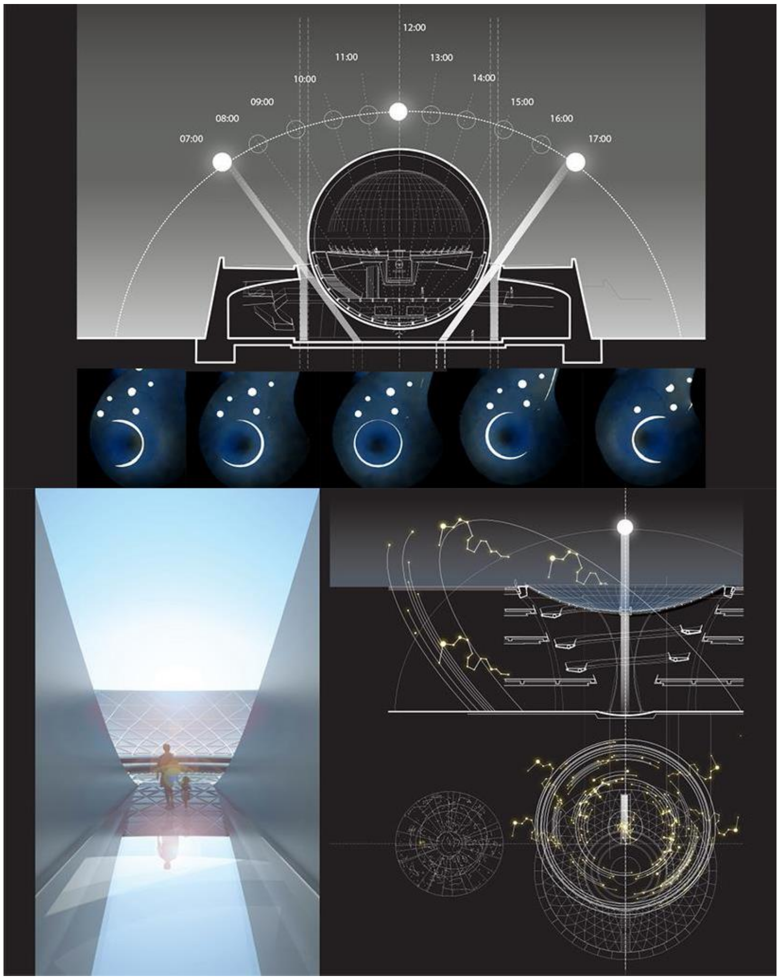


Fig: 5.2.24

Finally the Sphere contains the domed screen ofthe Planetarium; a continuous skylight around the Sphere allows direct sunlight to enter and marks the passage of time in the Museum below, with a full circular ring of light realized at the non-hour of the summer solstice.

SOURCE: https://www.archdaily.com/607311/ennead-tapped-to-design-shanghai-planetarium/54fe692fe58ece0642000096-sections

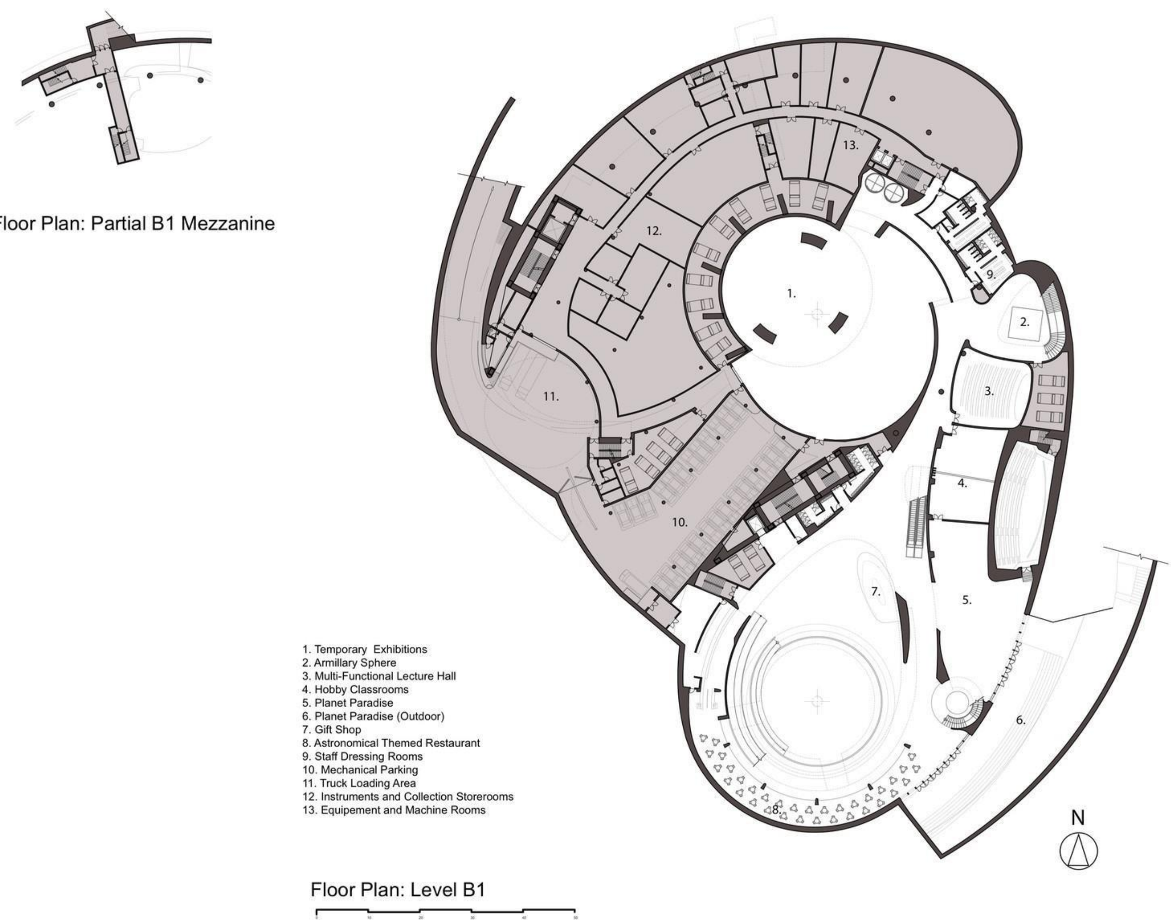
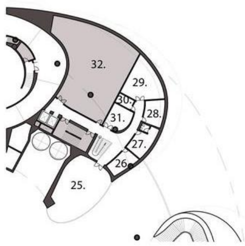
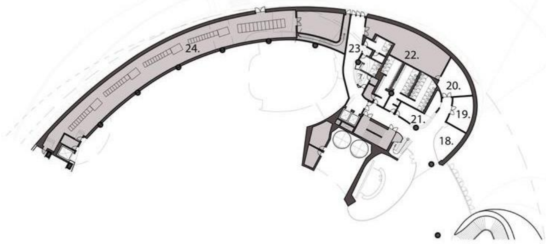


Fig: 5.2.25

SOURCE: https://www.archdaily.com/607311/ennead-tapped-to-design-shanghai-planetarium/54fe692fe58ece0642000096-sections

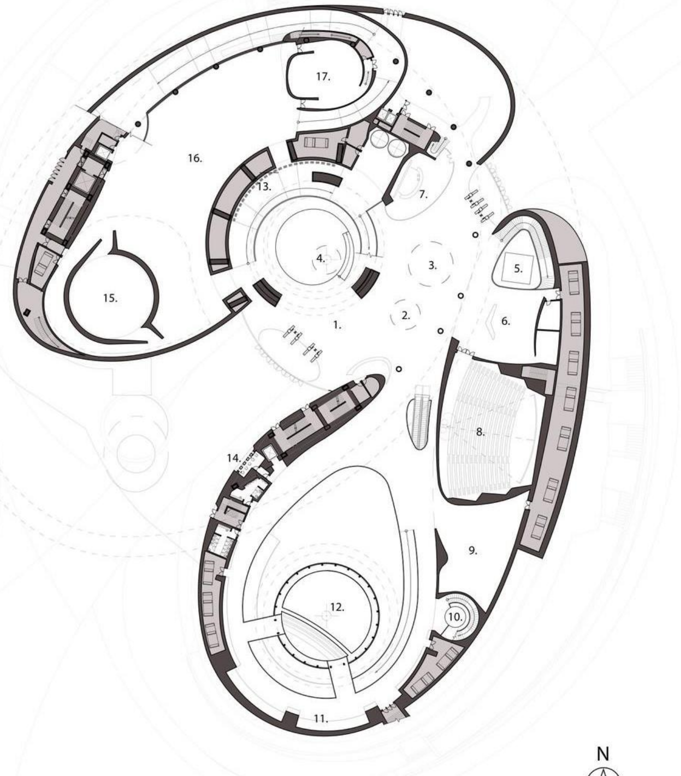


Floor Plan: Level 1 Mezzanine

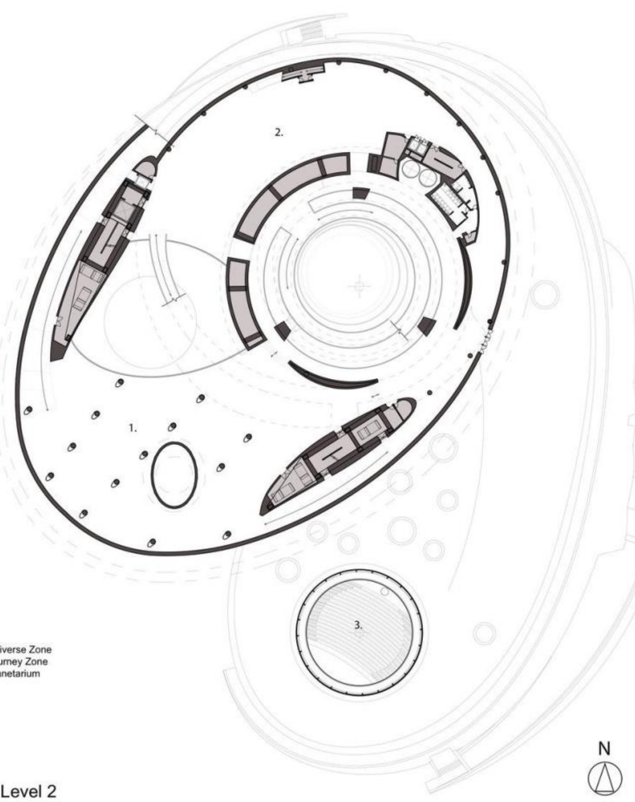


Floor Plan: Partial Level 1

1. Preface Hall
2. Large Meteor
3. Zodiacal Constellations
4. Pendulum
5. Armillary Sphere
6. Science Mall
7. Universe News Studio
8. IMAX Theater
9. Chinese Ancient Astronomy
10. Slide to Planet Paradise
11. Atronomy and Society
12. Planetarium
13. Universe News Broadcasting Wall
14. Ticketing
15. Starry Sky
16. Home Zone
17. Volcano Theater
18. News Meeting Room
19. Infirmary
20. Guard Room
21. Cloak Room
22. Fire Control Room, Bldg Security, BA Control
23. Office Lobby Security
24. Transformers
25. Universe News Press Room
26. Broadcasting Room
27. Expert Lounge
28. Small Meeting Room
29. Medium Meeting Room
30. Service Room
31. Small Meeting Room
32. Management Room

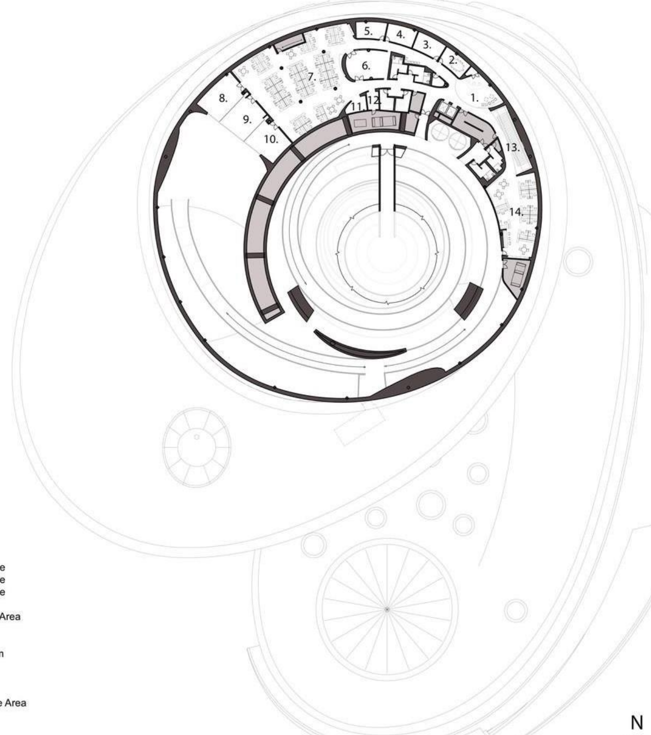


Floor Plan: Level 1



1. Universe Zone
2. Journey Zone
3. Planetarium

Floor Plan: Level 2



1. Reception
2. Meeting Room
3. Executive Office
4. Executive Office
5. Executive Office
6. Meeting Room
7. Regular Office Area
8. Meeting Room
9. Meeting Room
10. Meeting Room
11. Tea Room
12. Copy Room
13. Archive
14. Regular Office Area

Floor Plan: Level 3

Fig: 5.2.26-5.2.29

SOURCE: https://www.archdaily.com/607311/ennead-tapped-to-design-shanghai-planetarium/54fe692fe58ece0642000096-sections

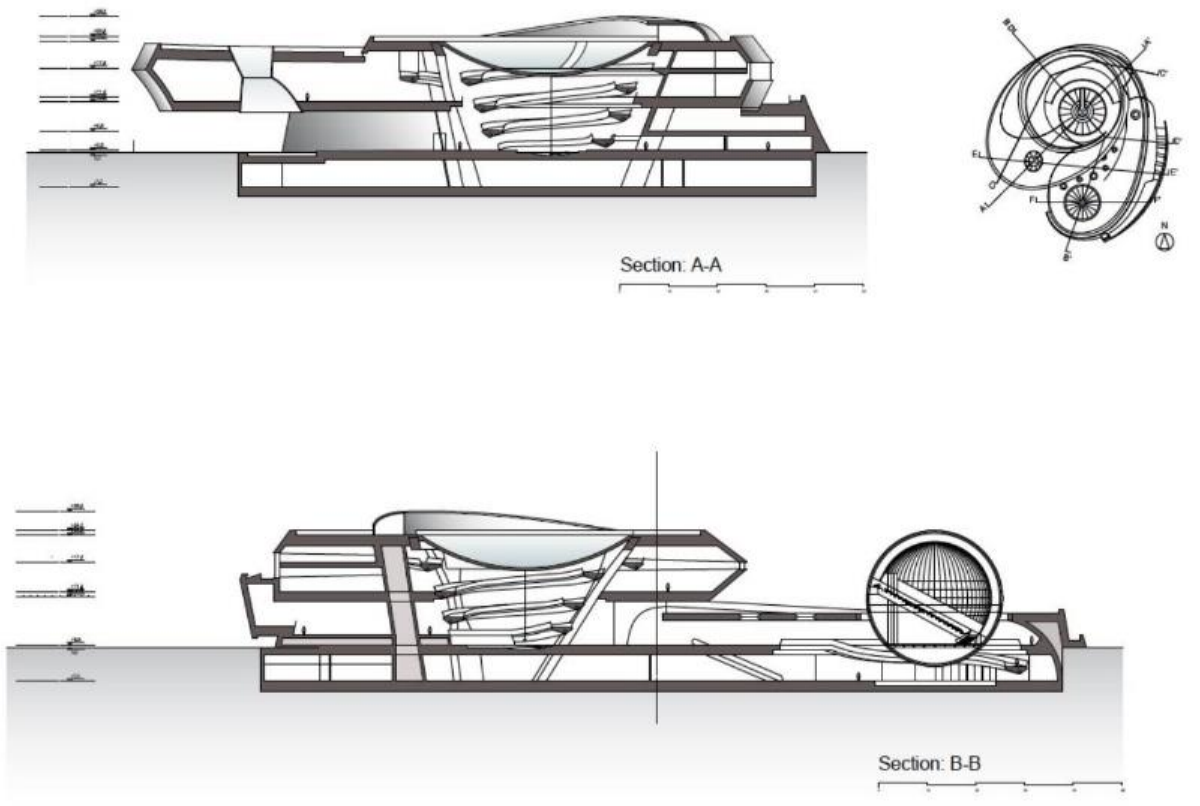


Fig: 5.2.30-5.2.31

SOURCE: https://www.archdaily.com/607311/ennead-tapped-to-design-shanghai-planetarium/54fe692fe58ece0642000096-sections

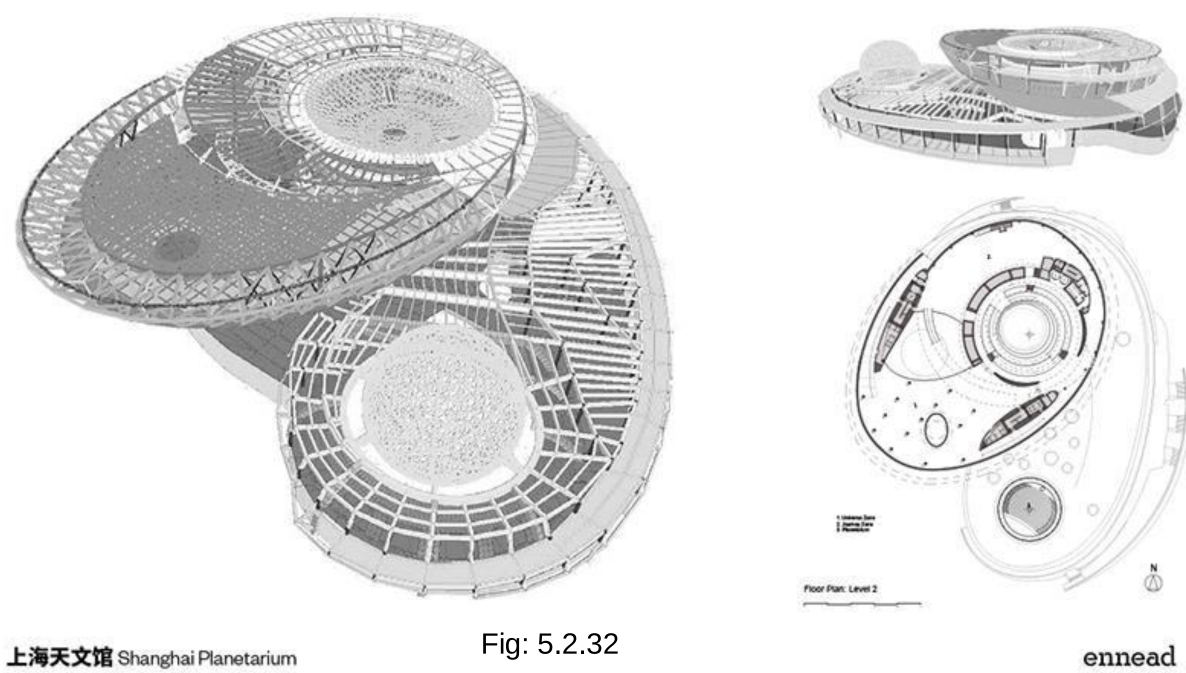


Fig: 5.2.32

SOURCE: https://www.archdaily.com/607311/ennead-tapped-to-design-shanghai-planetarium/54fe692fe58ece0642000096-sections

Fig: 5.2.33-5.2.38

- The design should have a conceptual theme which relate towards the cosmic or galaxy to ensure the spirituality of the soul of the project that is the planetarium.
- Generally oval ,concave or semi-spherical in shape, semi outdoor functions must blend with the planetarium and the site as a whole
- The site of the project is located beside Kirtonkhola River, so the functions in the design must respect the site force.
- The site is located near the Dopdapai Bridge in Barisal Sadar and the Arial view of the planetarium will be seen from the bridge.
- Thefenestrationofthebuiltformmustidentifyitasaplanetariumfromdistanceand entrance as well as the entry of the site in a sloped area.
- The site may have access from both land and the Kirtonkhola River. The design and Functions have to place considering that.

As the Planetarium May become one of the Landmarks of the Barisal City, the Form of the built form has to be majestic

CHAPTER 6: DESIGN DEVELOPMENT

6.1 Introduction

The aim of this learning centre was to develop a scientific minded approach to prepare for the digital world that beholds in our future and advance the citizens so that they can help to develop the country as a whole. Helping the country to fight new problems and create new discoveries in the world of space science. It should attract people through its spaces and by taking people through a walkway connecting them to the cosmos. Also, there is a need of interacting spaces where people can meet and learn from each other.

6.2 Aims of a space science learning centre

Learning centres provide the visitors with an informal learning environment which enhances the capability for them to pick up new knowledge in comparison with more formal learning spaces, such as schools and colleges

Some of the suggestions that UGurlu (2005) stated in his study are as follows:

1. Use of visual materials
2. Using only teaching materials to give the subject is not sufficient. It may be more effective to use activities in which students join personally.
3. Related documentary can be watched
4. Group should work on a related subject

Several studies have been conducted on the effectiveness of planetariums on astronomy education. In one study, Plummer (2009) found that planetariums improve understanding of celestial motion because of planetariums rich visual environment and kinesthetic learning techniques.

This gives planetariums better position to support both formal and informal science education. Planetariums, as a result, effectively demonstrate astronomical principles, represent concepts and information that other media cannot. This advantage should be taken into consideration for science education goals which are meaningful and permanent learning.

According to Barstow et al. (2001), education should continue outside the classroom with strong support and involvement from parents and in collaboration with museums, science centers, planetariums and other center of informal science learning. Planetariums make learning more enjoyable and efficient.

Thus, the need for such learning centres is crucial to create an efficient education system for our future generation.

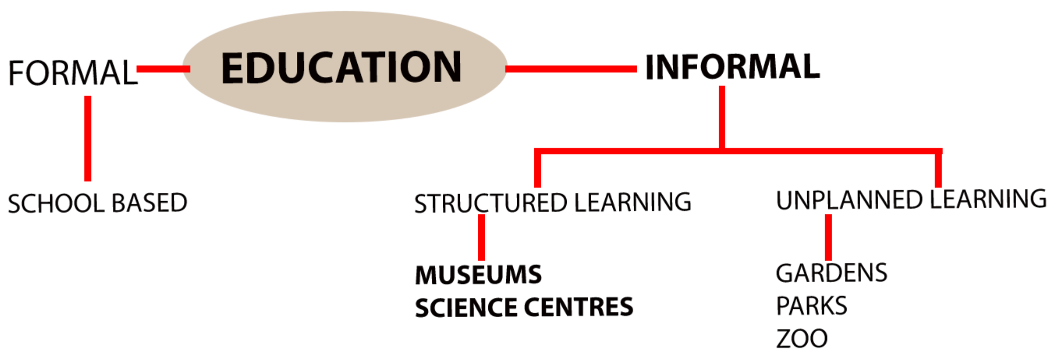


Fig: 6.2.1 Diagram of education (Author)

Contextual model of learning in planetarium

Personal context includes student motivation and expectations, prior knowledge and experience and prior interests and beliefs

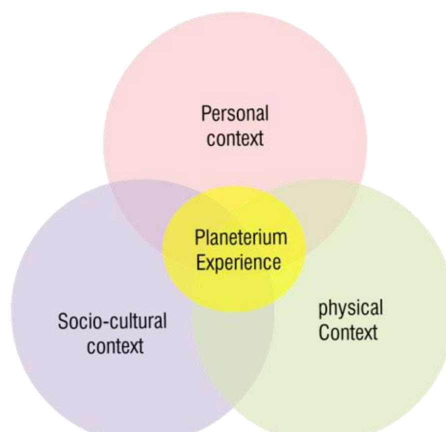


Fig: 6.2.2

Physical context includes orientation to the physical space and reinforcing events and experiences in the planetarium to real-world experiences

Socio-cultural context includes within group mediation and facilitated mediation by the planetarium educator. In other words, how interactions between students in the class and students with planetarium educator contribute to learning

SOURCE: 6.2.1- Author, 6.2.2(Falk & Dierking, 1992; revised 2000)

6.3 Form Development

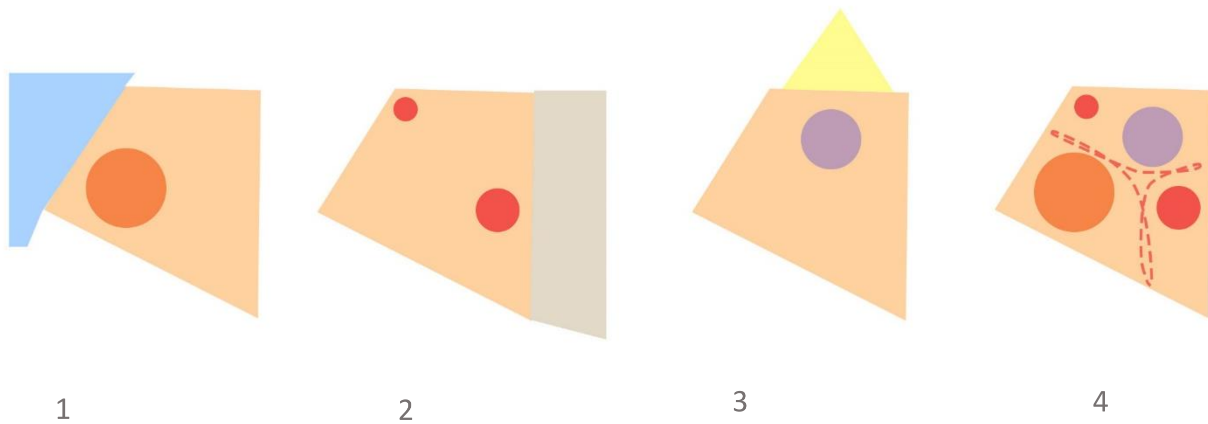


Fig: 6.3.1 (Author)

Dots, circle, dome these are the words which clicks my mind first whenever to the thought of designing a planetarium. So I tried to cover the whole site with connecting 3 main circles. The first one is the museum mass, the second one is the planetarium mass and the last one is the library and science atelier mass.

1. The museum mass is near the river as it is covering most of the functions and area as well. The elevation of this mass is designed like a celestial body with stars and zodiacs. So that during the night time from above the Dopdopia Bridge it can be seen as a sky full of stars merged with the actual sky.

2. Then the mass of the planetarium. Planetarium functions inside a dome where projectors are used for the 3d visualizations and where there has to be dark inside and no view from outside. As there is an open field without any tress on the eastern side of the site so I placed the planetarium dome on that side. Another related function of the planetarium dome is the observatory. For the observatory it has to be an open vista in front of it and less mass and light so that it can be used to observe the night sky easily.

3. The last mass is the library mass. For a library north light is one of the most important consideration. This function needs huge amount of lights and natural views. For this reason it’s been placed on the northern part of the site.

4. Flow of the visitors inside the compound. The whole compound is ultimately a public plaza.

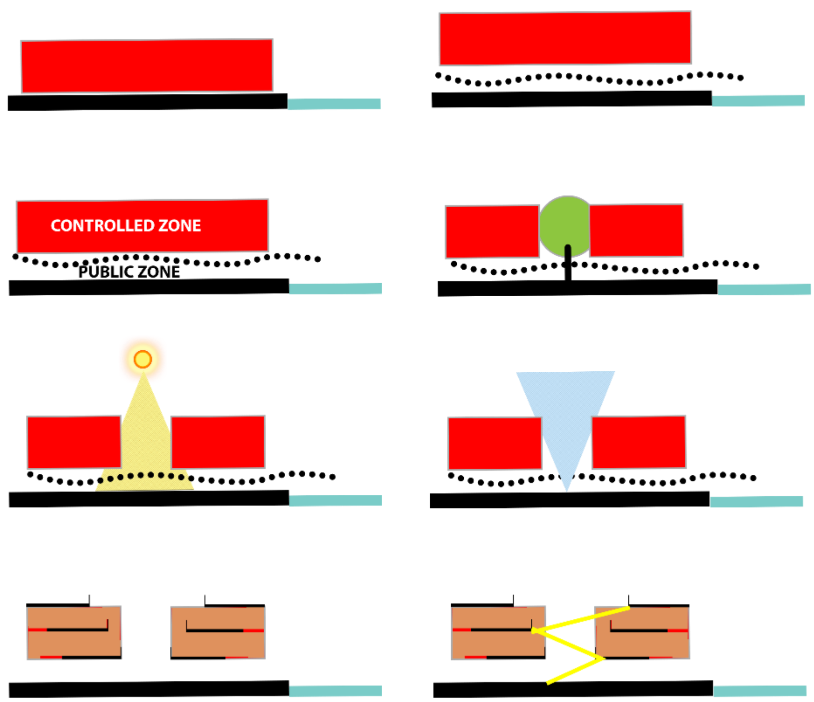


Fig: 6.3.2 (Author)

The main focus of the design was to make it a both public gathering space and an interactive space between children and adults. And as the site has a river embankment so the site has to give an exposure of the river and other amenities related to this river to the citizen of Barishal.

Considering the river the function of the zero level of the building mass is mostly public without any control. To enter inside the ground level no one has to buy any tickets so that people can enjoy the natural beauty of the river or use it as a public plaza except visiting the planetarium and museum only once.

So basically I have uplifted the main function of museum and planetarium above the zero level where it is totally controlled with ticketing system.

The main mass of the museum has an atrium where there is a ramp connecting to all the other floors which will give the visitors the walking experience on an orbital pathway which will give them the feeling of walking towards the sky or galaxy as there will be hanging monuments of planets or other exhibits related to galaxy and planet.

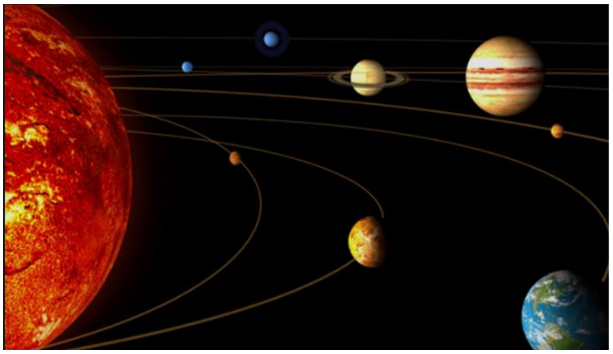
Concept of the museum

From the big bang and galaxy evolution to human civilization.

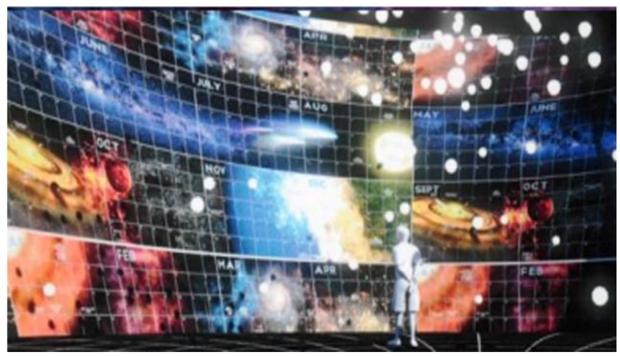
Exhibiting design

Three main exhibition blocks

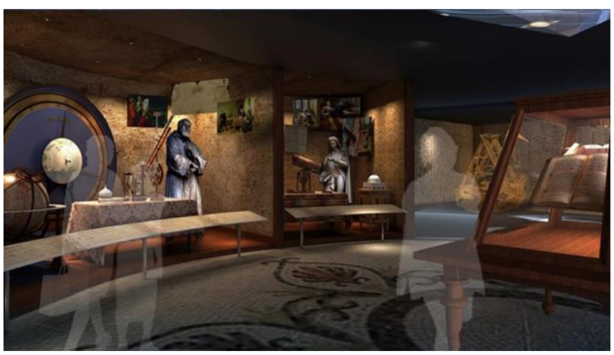
Home- from earth to solar system and galaxy



Cosmos- space-time, gravity, light, element, life



Odyssey - growth, flying, future



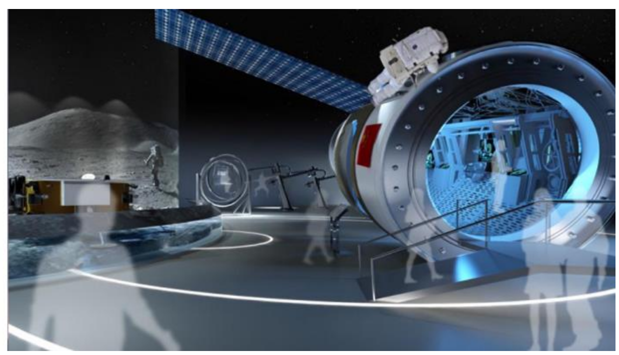


Fig: 6.3.3-6.3.8

6.4 Architectural Drawings

Fig: 6.4.1

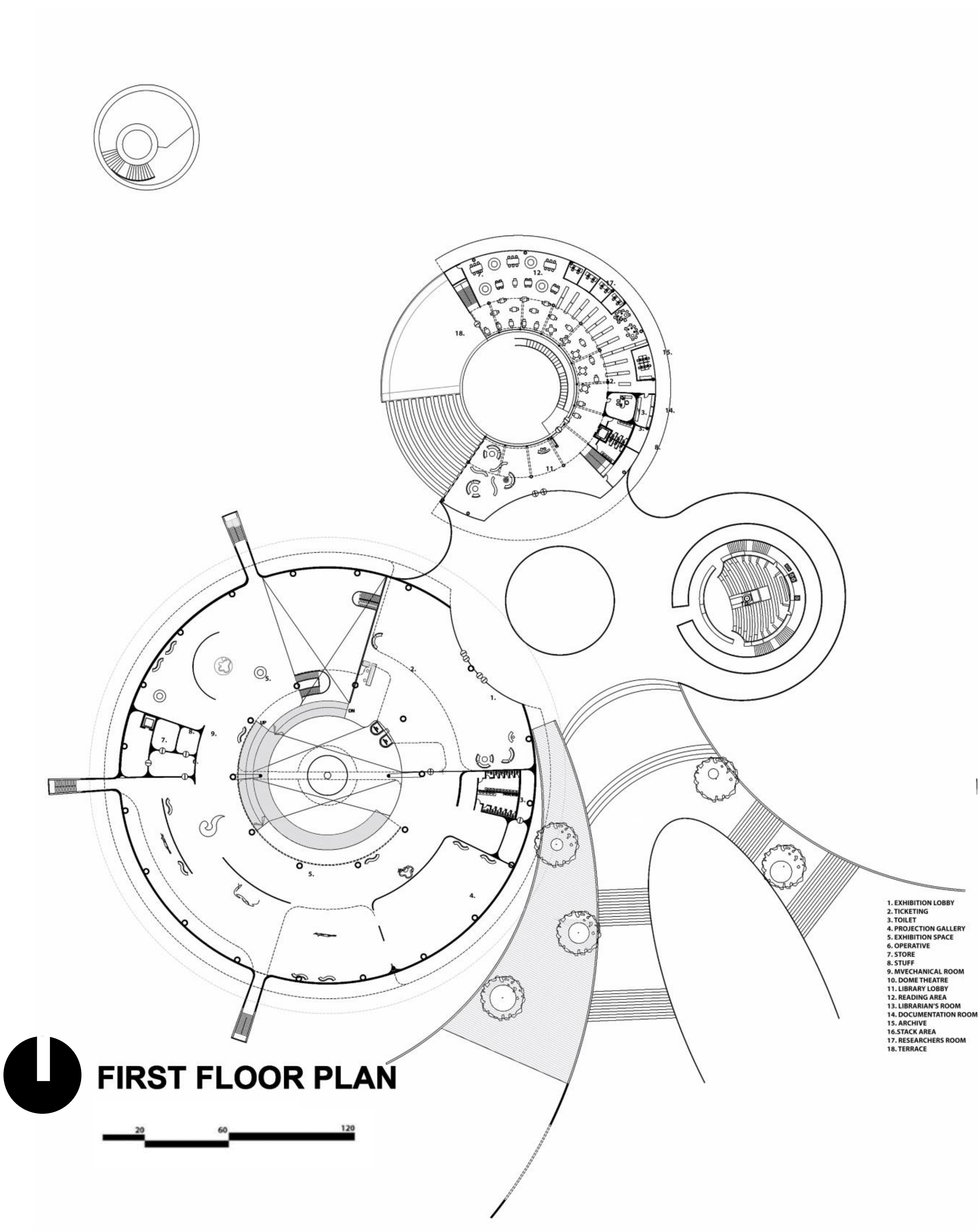

1. EXHIBITION LOBBY
2. TICKETING
3. TOILET
4. PROJECTION GALLERY
5. EXHIBITION SPACE
6. OPERATIVE
7. STORE
8. STUFF
9. MVECHANICAL ROOM
10. DOME THEATRE
11. LIBRARY LOBBY
12. READING AREA
13. LIBRARIAN'S ROOM
14. DOCUMENTATION ROOM
15. ARCHIVE
16.STACK AREA
17. RESEARCHERS ROOM
18. TERRACE
FIRST FLOOR PLAN
20
60
120

Fig: 6.4.2

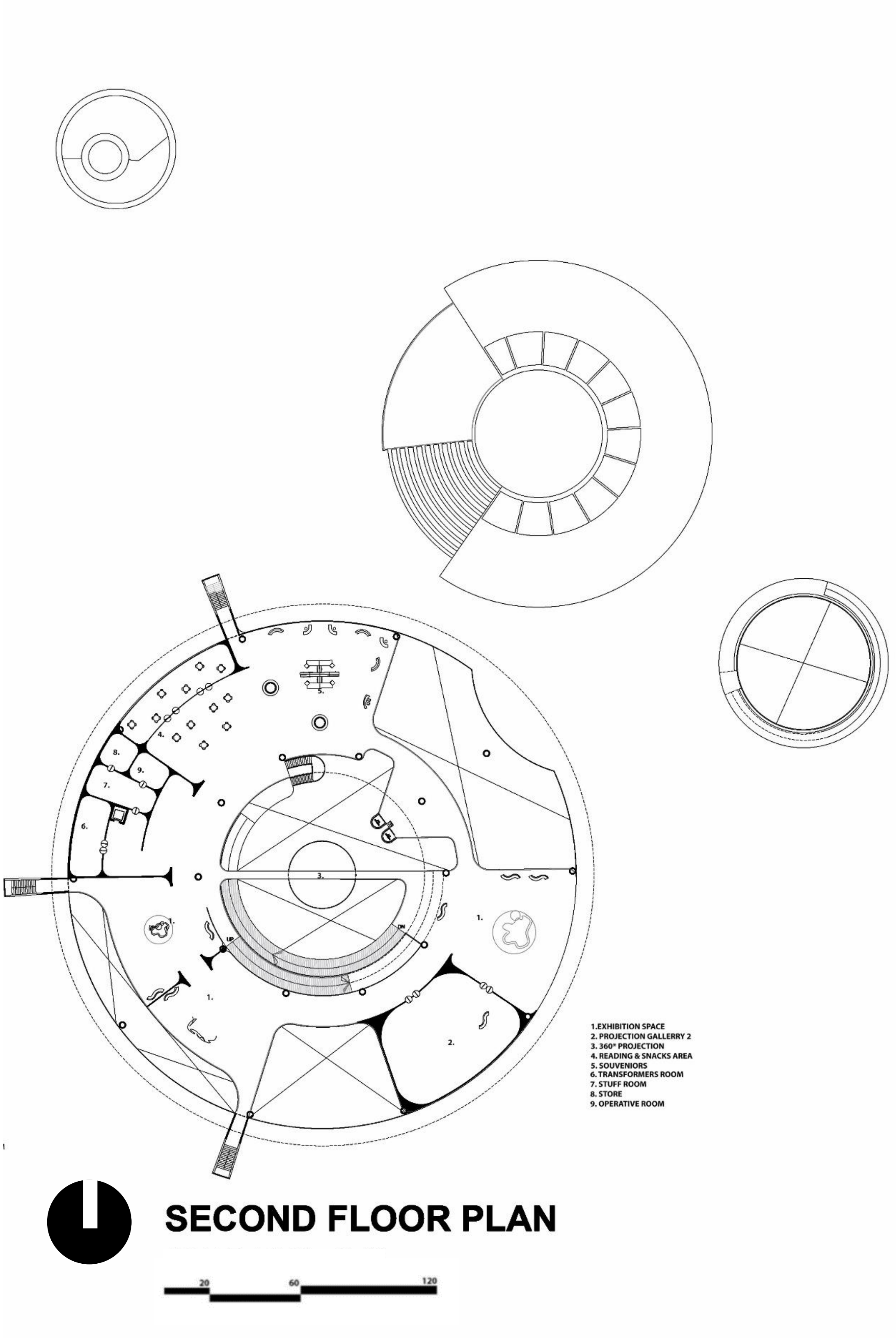

1.EXHIBITION SPACE
2. PROJECTION GALLERRY 2
3. 360* PROJECTION
4. READING & SNACKS AREA
5. SOUVENIORS
6. TRANSFORMERS ROOM
7. STUFF ROOM
8. STORE
9. OPERATIVE ROOM
SECOND FLOOR PLAN
20
60
120

Fig: 6.4.3

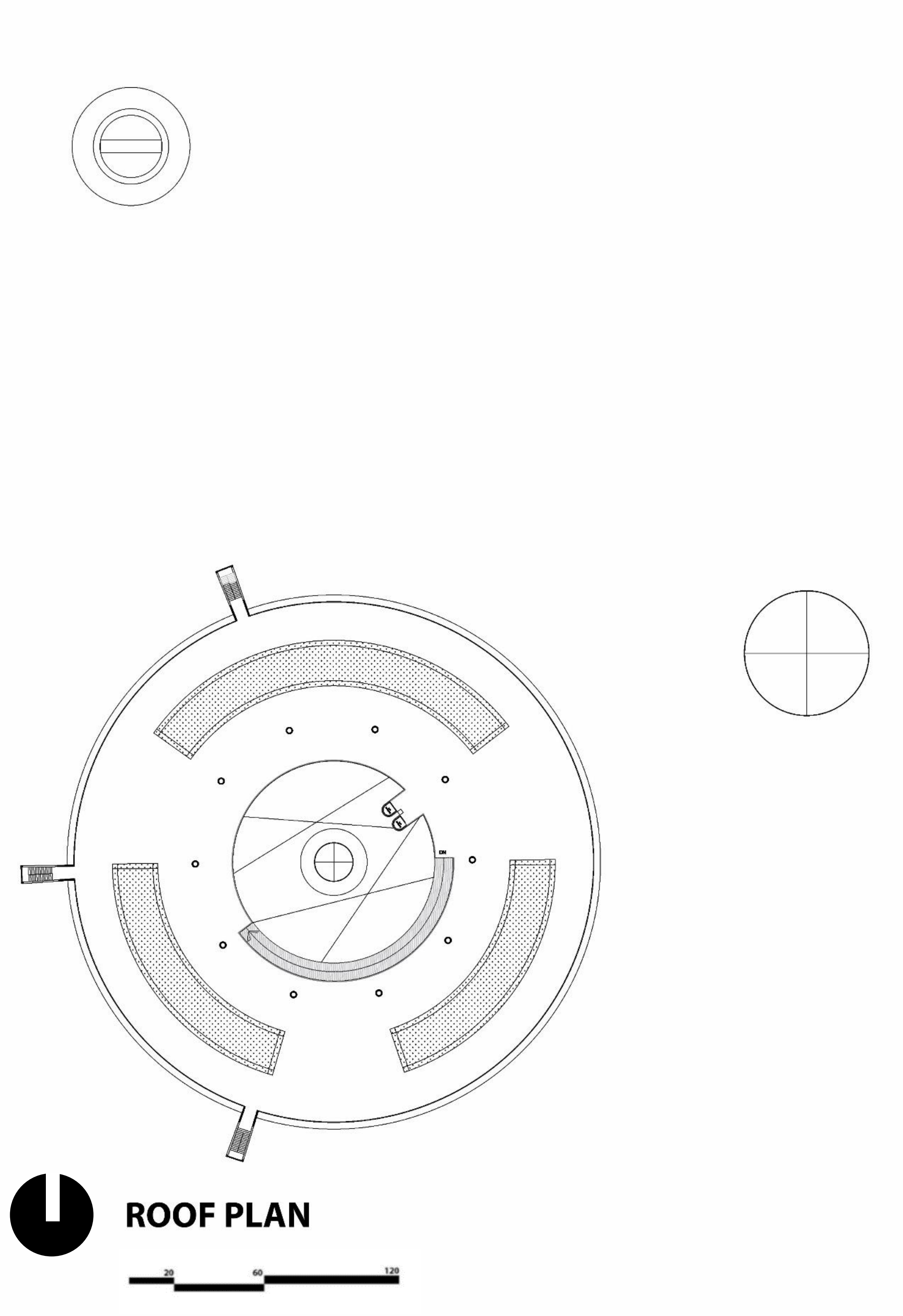


Fig: 6.4.4

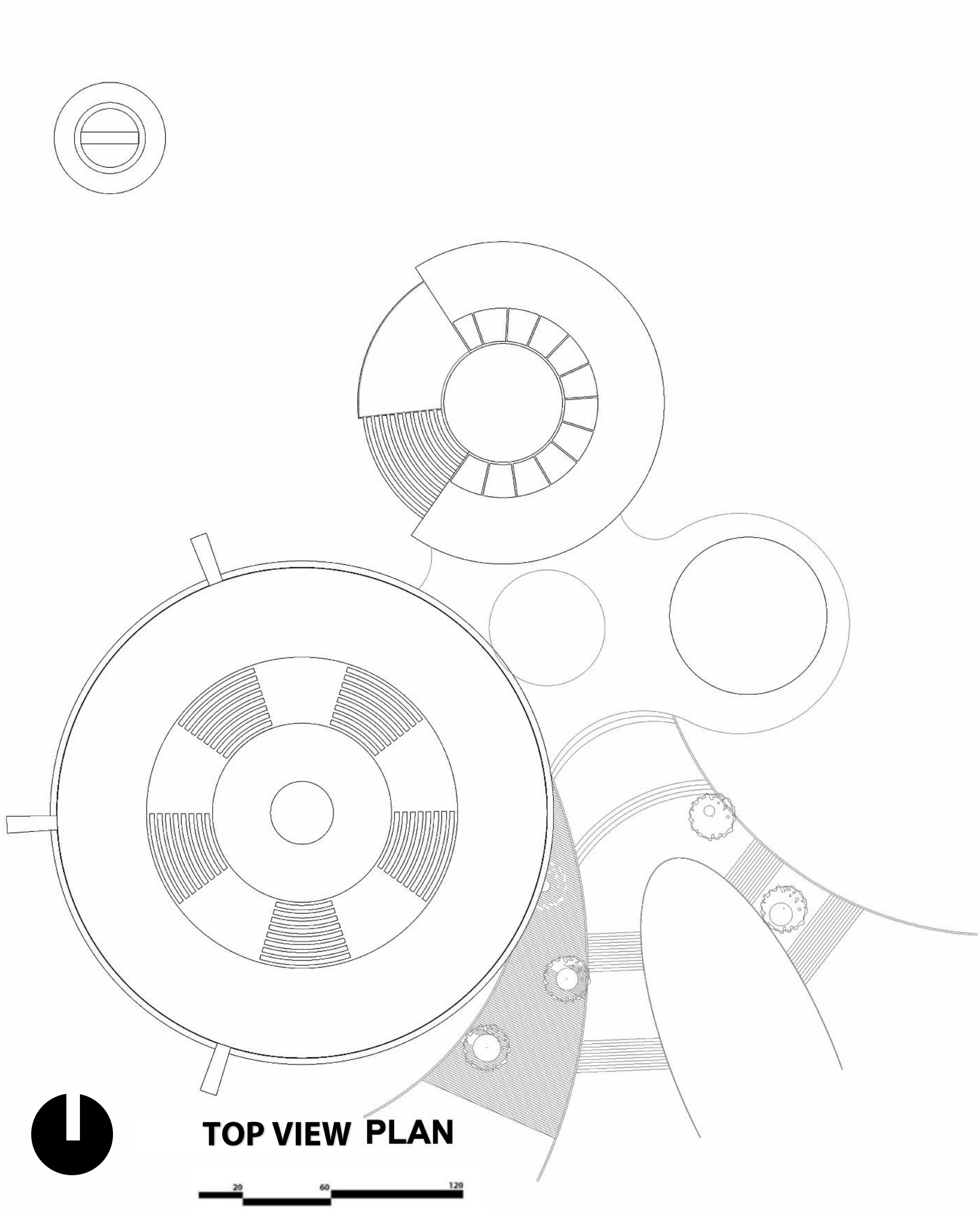


Fig: 6.4.5

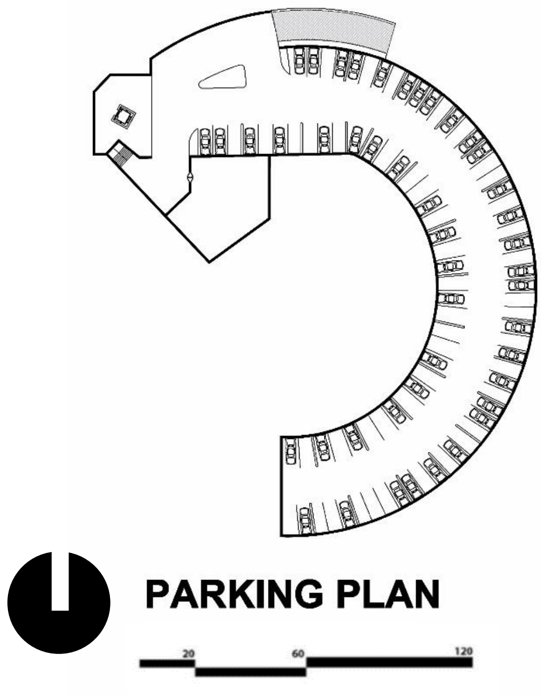
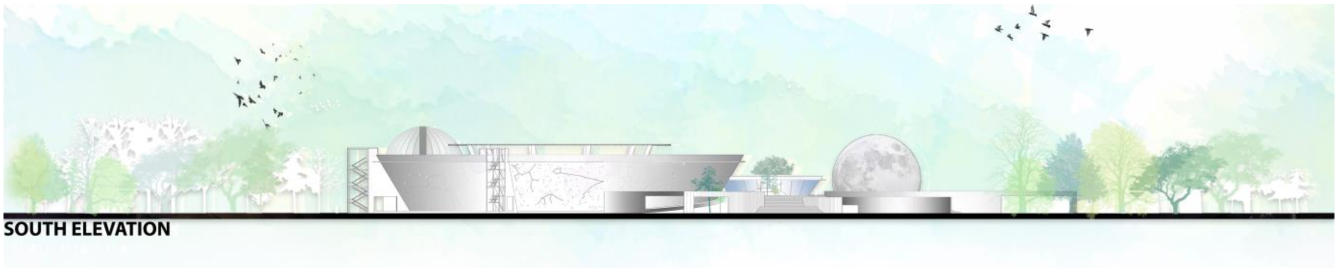
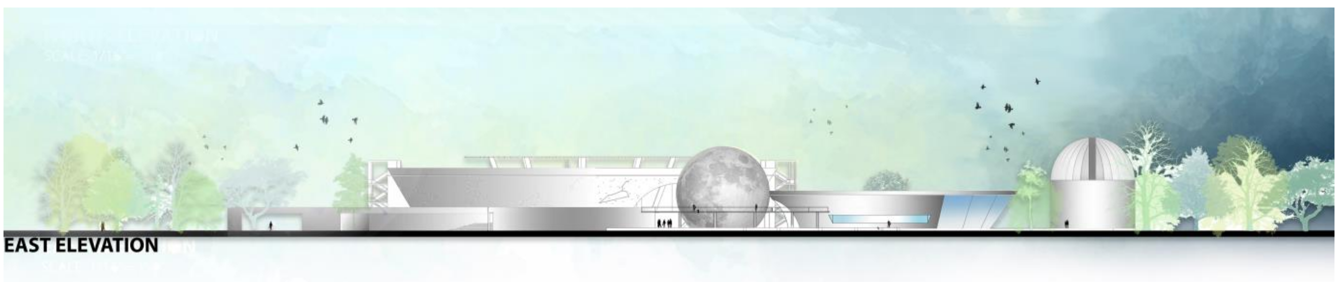


Fig: 6.4.6





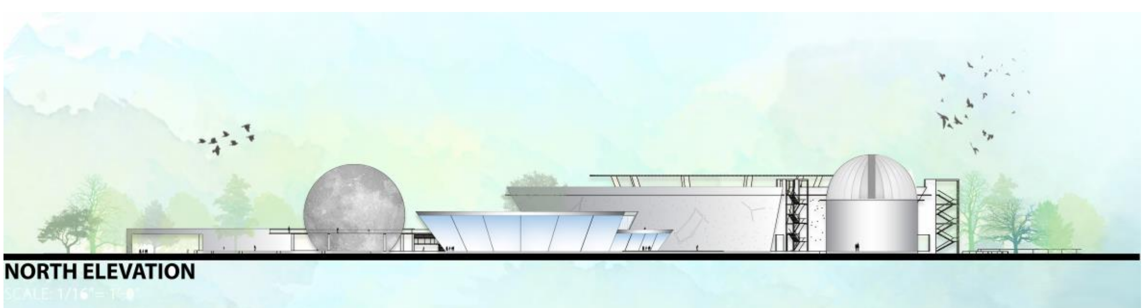
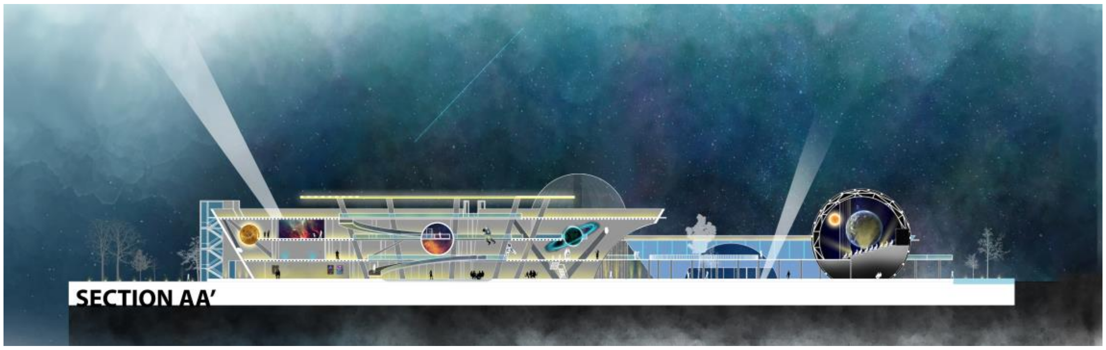


Fig: 6. (4.7-4.9)



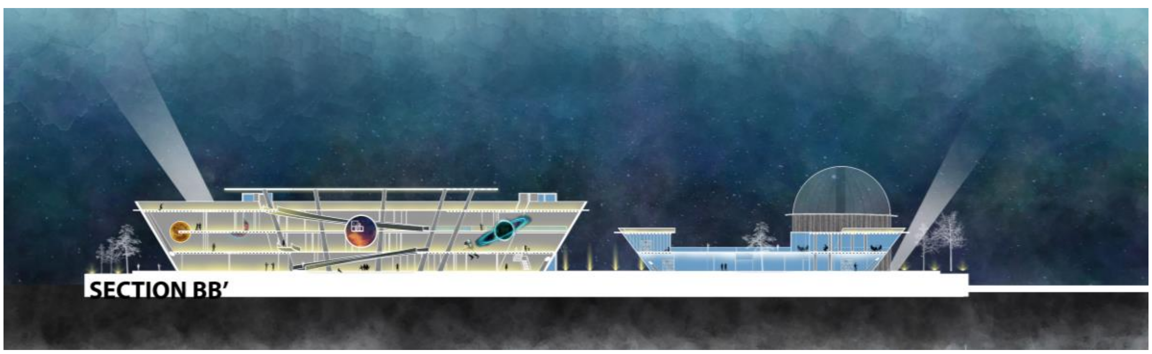


Fig: 6. (4.10-4.11)

6.5 Renders

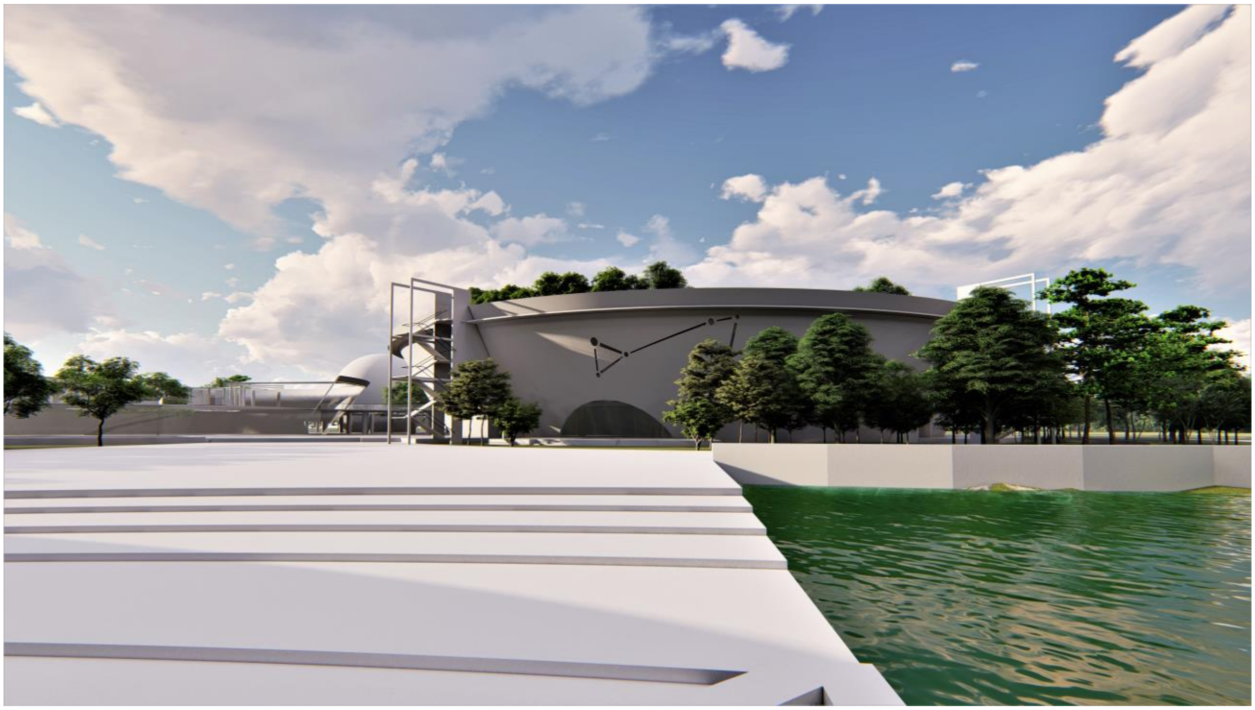


Fig: 6.5.1

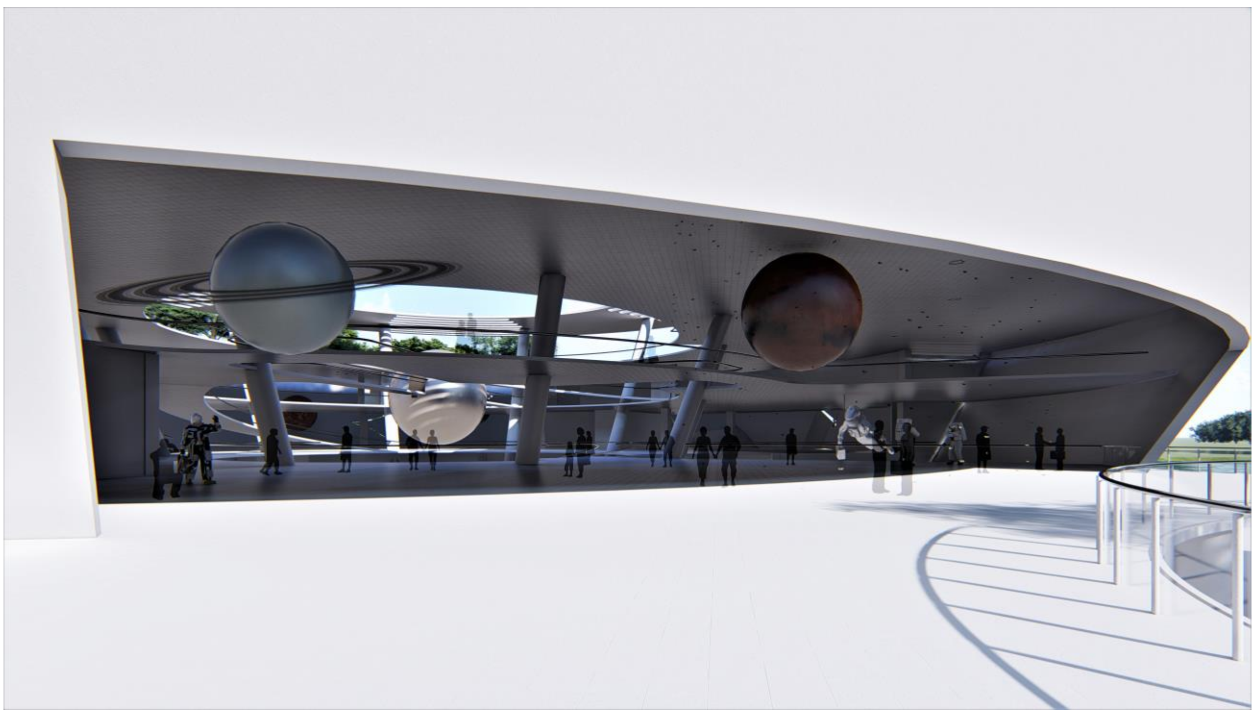


Fig: 6.5.2

Fig: 6.5.3

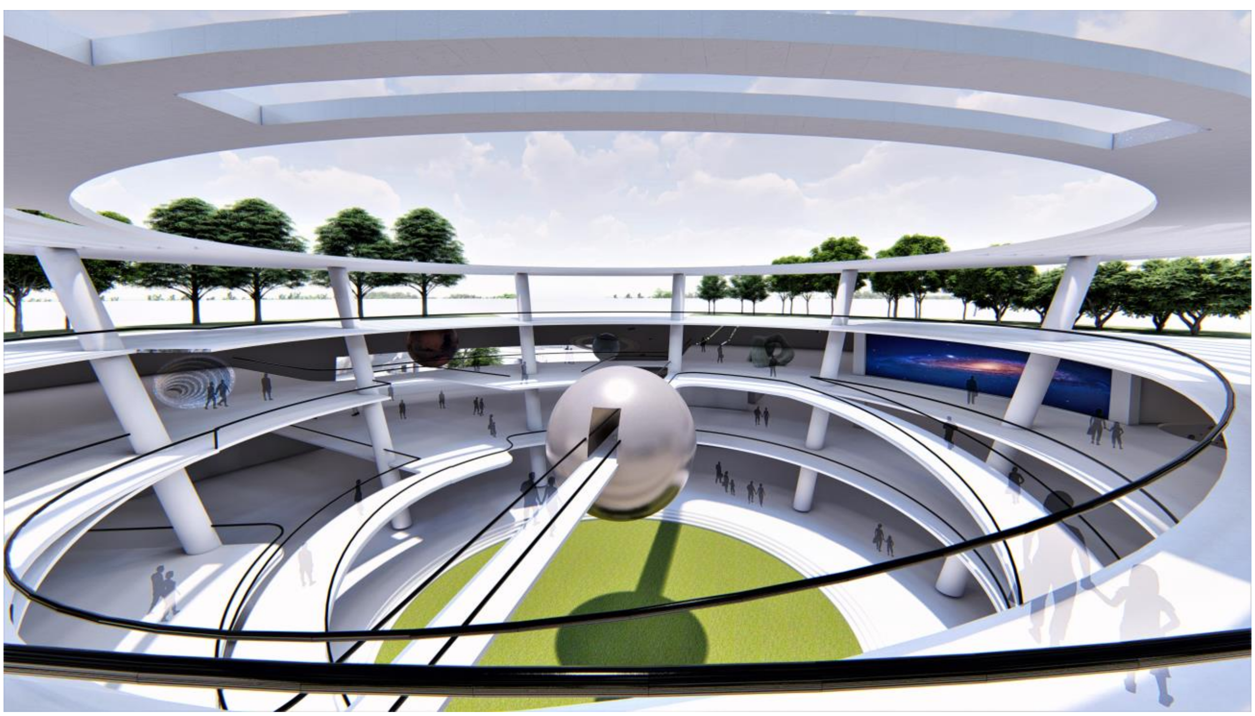


Fig: 6.5.4

Fig: 6.5.5

6.6 Model Photos

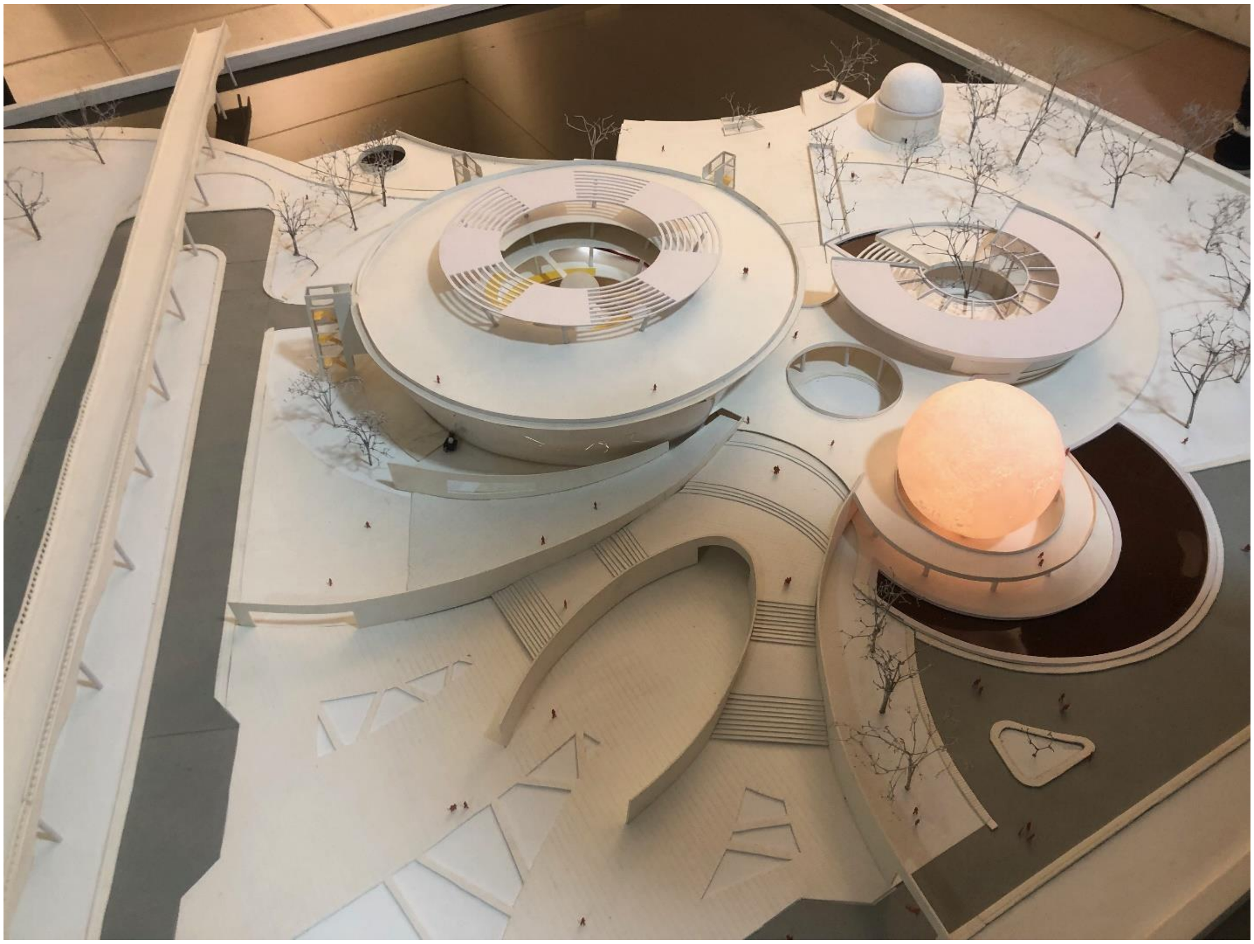


Fig: 6.6.1

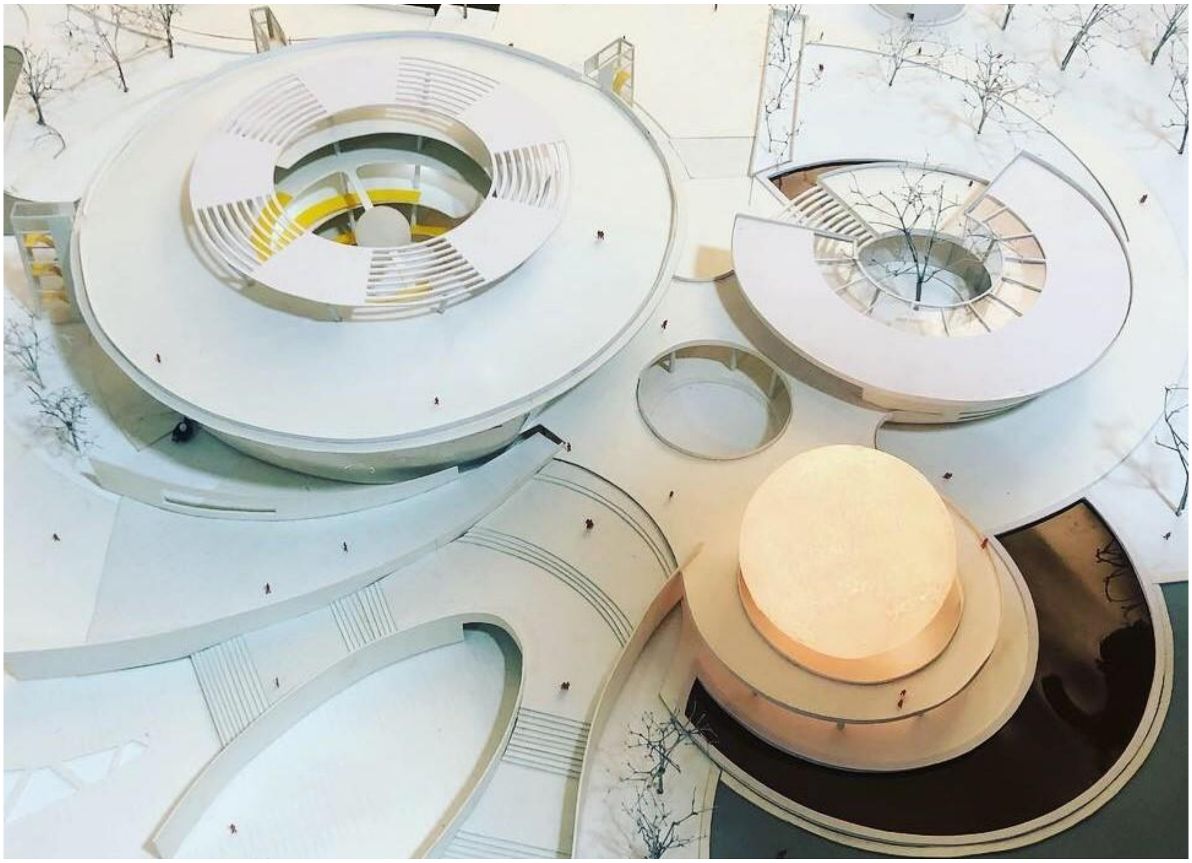


Fig: 6.6.2

Fig: 6.6.3

CHAPTER 7: CONCLUSION

With the advancement of science and technology nor the modern world is being stopped in one place not our country as well. Barisal will be the hub for the development of the southern part of Bangladesh and this planetarium will not only help the citizen of Barishal but also the people of other nearer cities to develop a scientific minded approach and prepare for the digital world that beholds in our future. Furthermore, this can also be a well-known research Centre to the world and uphold the name of our country as well. Moreover, such learning centers will ensure that young minds are motivated to learn, share knowledge and explore new things rather than learning from inside the boxes.

LIST OF FIGURES, IMAGES AND DIAGRAMS

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