NATIONAL MUSEUM OF SCIENCE AND TECHNOLOGY

Agargaon, Dhaka

By

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Abstract

Science and technology has taken over the power of human beings and has the whole world in their hands. Being a developing country, it is vital for us to be able to go hand in hand with the super paced world and the first step of it is to create and provide a new world for the people to broaden their imaginative world. Science museums tell stories about nature and the phenomena which shape our daily lives. They typically present some rational panorama of the evolution of human development in technical innovation and discovery. Moreover, they provide the visitors with reasonable and reliable explanations about all kinds of phenomena, simple and complex and helps visitors to appreciate logic and the need for systematic thought and belief.

This project has been developed to be a source of curiosity about the past, present and future visions of science and technology and attract people of all ages to the world of science. It would play a key role for the country in improving public perception of science, contributing to a positive evaluation of science and its technological developments. In addition, the museum would also be a science hub to host all the interactive and educational programs of science and technology through different workshops, seminars, science fairs etc. that would help people to understand different scientific concepts linked to the present day and propose steps for integrating them into the culture. Moreover, the museum will be self-sustaining as it will not only benefit the people and the young minds of our country but will also bring economic yield by attracting tourists.

Acknowledgment

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CHAPTER 01: INTRODUCTION

1.1 Project Brief

Name of the project: National Museum of Science and Technology

Location: Agargaon, Dhaka, Bangladesh

Area: 5 acres (approx)

Client: Ministry of Science and Technology

1.2 Project Introduction

Science is a systematic enterprise that creates, builds and organizes knowledge in the form of testable explanations and predictions about the universe. It is the reasoned investigation or study of natural phenomena, aimed at discovering enduring principles among elements of the phenomenal world by employing formal techniques. Technology is the collection of techniques, skills, methods and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes, etc. or it can be embedded in machines, computers, devices and factories, which can be operated by individuals without detailed knowledge of the workings of such things. In recent times, science and technology has taken over the power of human and has the whole world in their hands. As being a developing country, it is vital for us to be able to go hand in hand with the super paced world. Lately, within the last decade, Bangladesh has developed widely in the technical field, launching our mobile manufacturing company, remote controlled motorbikes and so on. Even though, there is still a margin between being technically challenged and technical enrichment.

The ministry of science and technology realized this requirement and made an attempt for technical enlightenment in 1966 through The National Museum of Science and Technology. It was a success, though for a certain period. Like many other institutions, it stopped its progress and development. The proposal of a new National Museum of Science and Technology aroused with the need of providing proper way of creative way of teaching, exhibiting and sharing knowledge about science and technology and creating a new world for the young minds to broaden their imaginative world. The Ministry of Science and Technology has declared to design and make a new museum for science in the present site of the science museum in Agargoan, Dhaka that would preserve the innovative works of local scientists while encouraging the younger generation of scientists to explore the endless possibilities that their scientific knowledge opens up to them. The museum would consist of research and museum facilities to show the rapid advancement of science and technology throughout humankind's existence. Regardless of background, age or education level, citizens of Bangladesh would be encouraged to visit the museum to increase their knowledge and broaden their outlook, with the focus on the beneficial effect that the advancement of science and technology has on the world.

1.3 Rationale of the project

A museum for science within the city premises is very important with its new purpose of its global phenomena. The global aspects and the overwhelming capability of being popularized bring about new complexities of the program, function, and their proper linkage along with its contextualized representation in the form. That is why it needs careful understanding of space, form and function to have a proper planning and understanding of the requirements. The museum would preserve natural exhibits and the innovative work of the local scientists and encourages the young scientists to carry out innovative work, displays exhibits showing the history of scientific and technological advancement of human society, and creates a scientifically educated citizenry. Dhaka demands a science museum within the city in which activities based on science and technology can be organized on the basis of needs, interests and levels of the target group people, which include students, school children, youth and adults, illiterate people, working people, amateur scientists, and persons who want to broaden their horizon of knowledge. Moreover, the museum can organize research activities on the exhibits for the development of the museum and arrange studies on space science by establishing a planetarium to depict the chronological development of science and technology. It can be a platform to foster science education and motivate the young generations to be more open to science and technology based activities which is very important for us to be able to go hand in hand with the current super paced world.

1.4 Aims and objectives of the project

- To bring creative minds together to explore and create awareness of science and technology among the common mass.

- To provide an inspirational area for all generations.

- To set up permanent exhibition in the museum and arrange science fairs, science exhibitions and organize various competitions on science and technology.

- To publish journal on different subjects of science and technology and arrange series of lecture on scientific topics, seminars and workshops.

- To organize research activities on the exhibits for the development of the museum and arrange studies on space science by establishing a planetarium.

- To depict the chronological development of science and technology through various exhibits.

- To foster science education and can attract and motivate the young generations to be more open to science and technology based activities.

1.5 Programs

- Permanent Gallery (Multiple galleries of different groups of science and technology)
- Temporary Gallery
- Administrative unit
- Technological unit
- Research and publication unit
- Planetarium/ Theater
- Multipurpose Hall
- Library
- Archive
- Workshops
- Studios
- Cafeteria
- Souvenir shop
- Parking (100 cars)

CHAPTER 02: SITE APPRAISAL

2.1 Location of Site

Location: Agargaon, Sher-e-Bangla Nagar, Dhaka, Bangladesh

Site area: 217800 sq.ft. 5 acres (approx)

Currently: The National Museum of Science and Technology

Altitude: 9m from sea level

Latitude: 23"46' N

Longitude: 90"22' E

The site is in Agargaon, which is a part of the master plan of Sher-E-Bangla nagar, Dhaka. Most of the government and parliamentary offices are situated in this area. It is divided into six sectors. The location of the chosen site is at the civic sector. The site currently holds The National Museum of Science and Technology which is planned to demolish and make a new science museum with museum and research facilities.

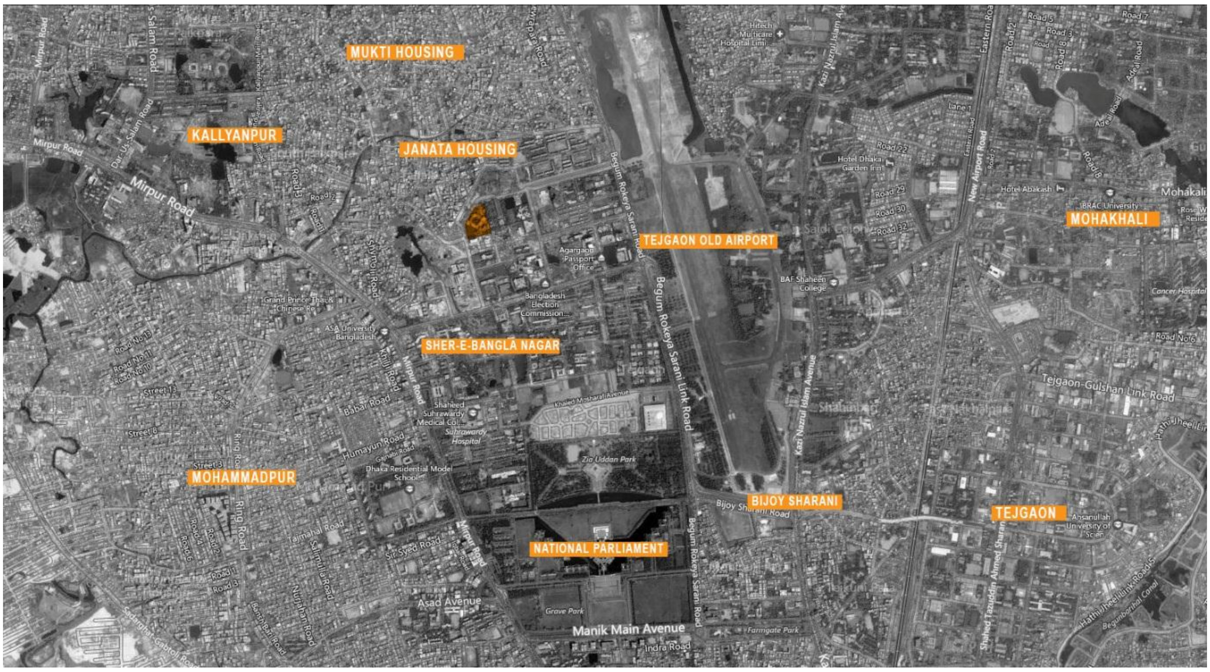


Fig: Location of the site and surrounding area

Fig: Location of the site within the civic sector

2.2 Site surroundings

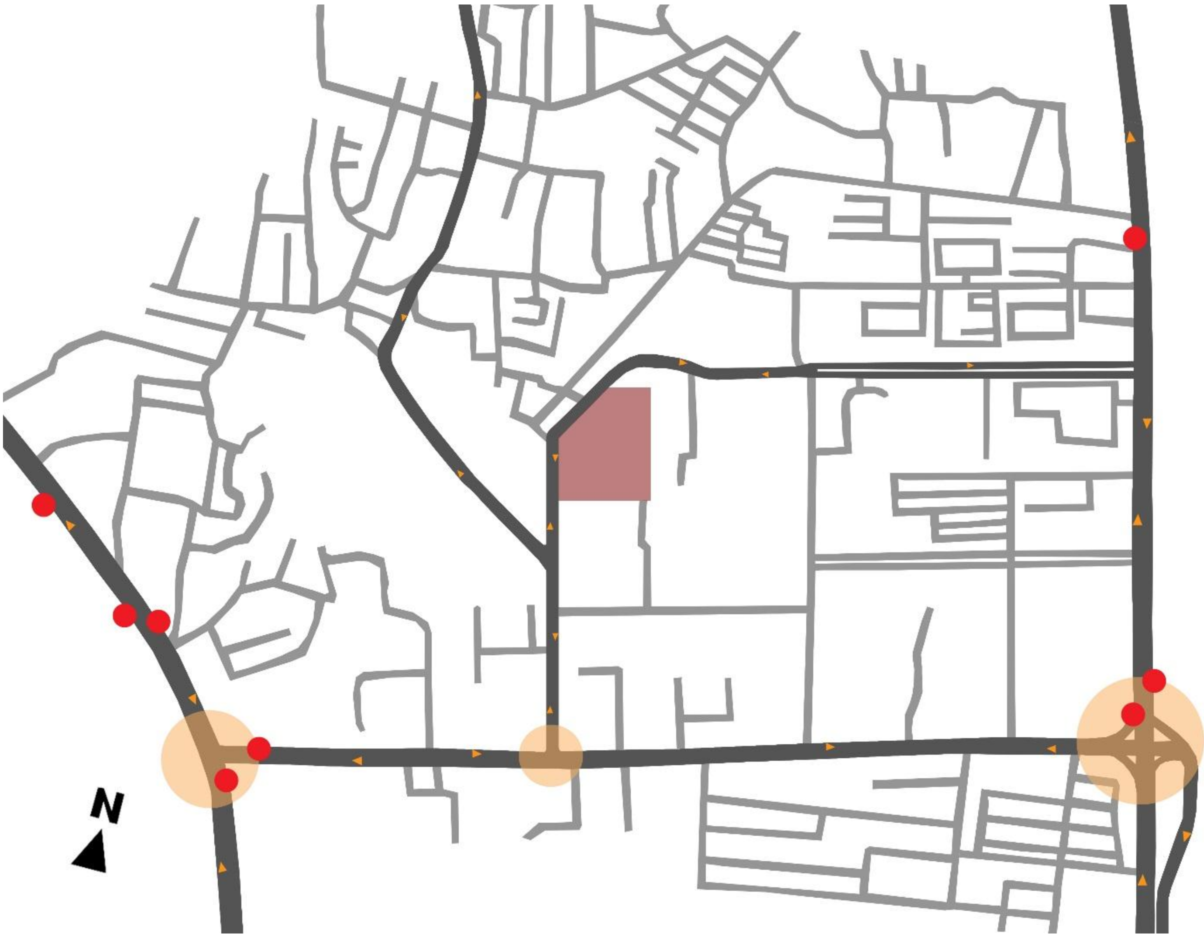


Fig: Road Networks, nodes, bus stands and traffic flow.

Findings:

- Roads are mostly in grid other than housing zone.

- Pedestrian roads are present.

- Usually no traffic congestion is seen other than the node areas.

Fig: Surrounding Build Forms

Findings:

- Mostly administrative and commercial buildings in the civic sector.

- Illegal settlements are seen around the site.

- Multistoried buildings ranging from 4-10 storied structures.

- Most buildings are made of brick and concrete

- No historical buildings are present in the surrounding area.

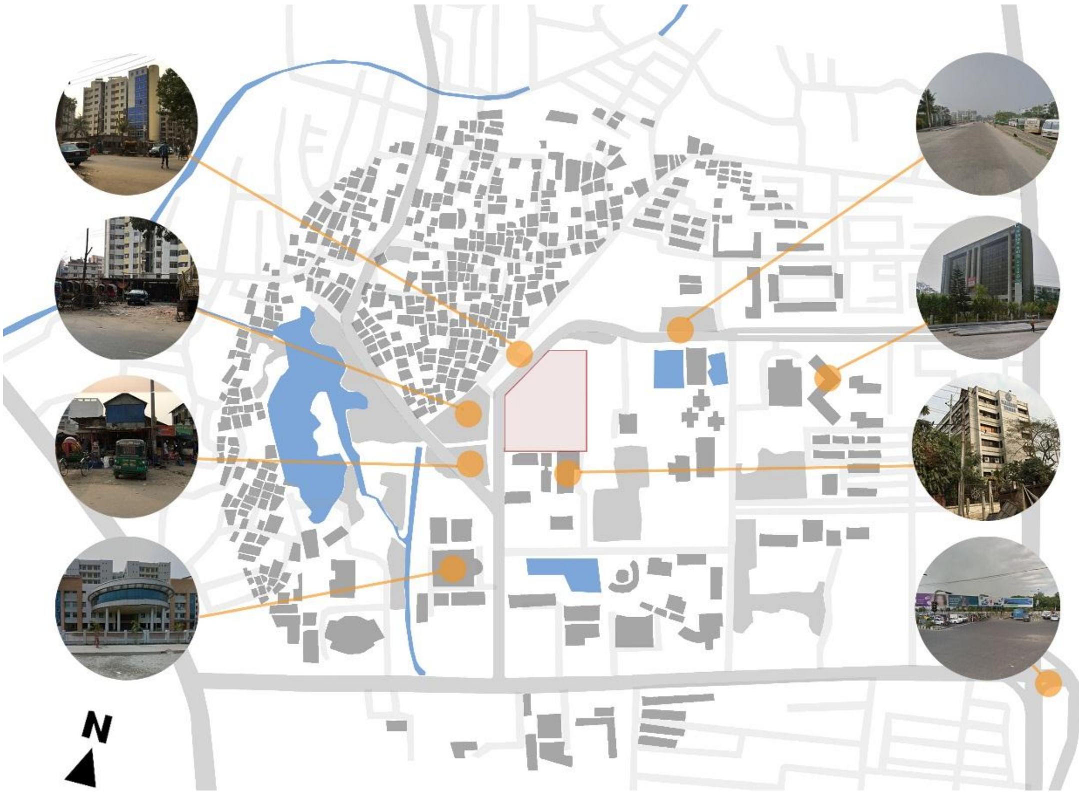


Fig: Surrounding Infrastructures

Fig: Green and Waterbody

2.3 Environmental considerations

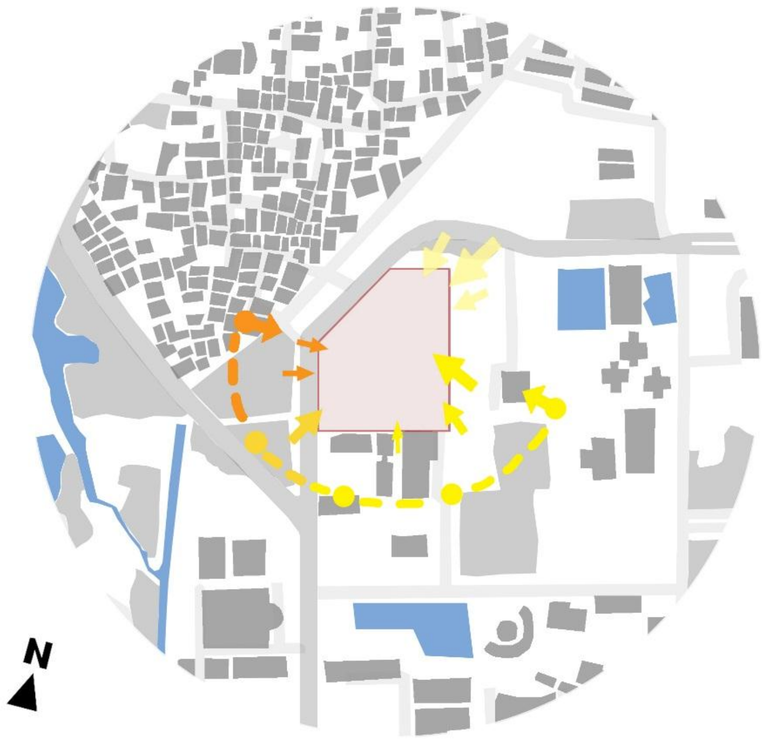


Fig: Sun path

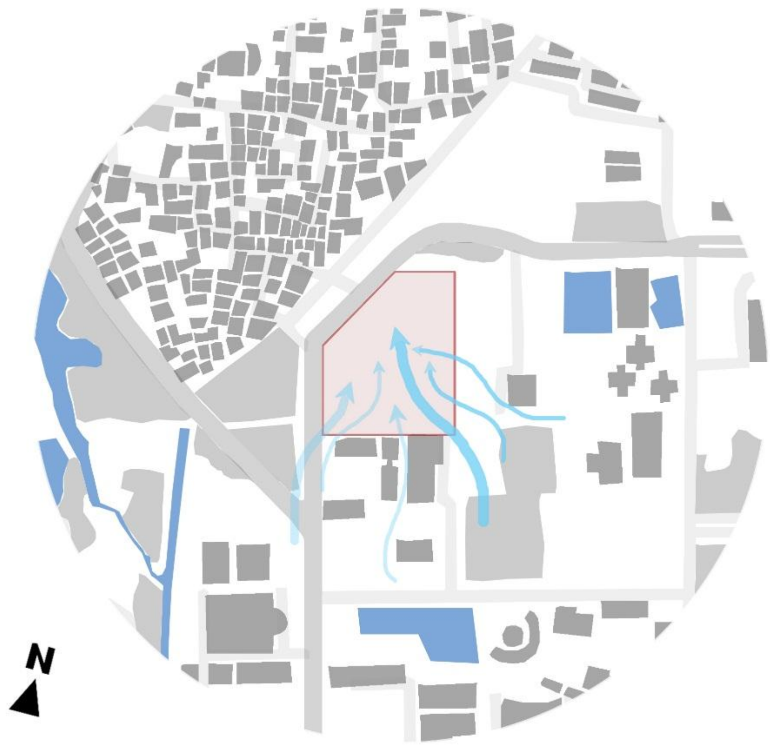


Fig: Wind Flow

Fig: Views from the site

Topography

The topography of the site is a flat land. There has no great variation in the elevation.

Habitation

To the north and the west it is still undeveloped. To the east is the BANSDOC. There is height variations from twenty storied to two storied.

Climatic consideration

The site receives constant southern breeze as the building height of the southern site is not more than five storied. Though the west side is still underdeveloped and the east is loaded with green trees. It also receives plentiful amount of north light.

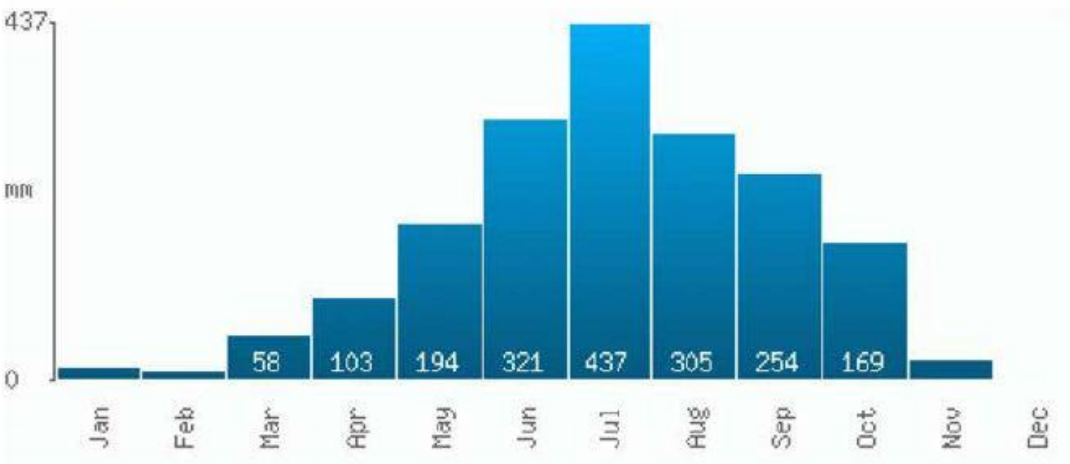
Temperature

Season	Month	Maximum (Degree C)	Minimum (Degree C)
Dry-Summer	March- June	40	35
Monsoon	July- October	30	32
Winter	Nov- Feb	26	28

Temparature chart of Agargaon
(source: http://weather.mirbig.net/en/BD/81/1349452_Agargaon])

Temparature chart of Agargaon
(source: http://weather.mirbig.net/en/BD/81/1349452_Agargaon])

Rainfall



Rainfall chart of Agargaon
(source: http://weather.mirbig.net/en/BD/81/1349452_Agargaon])

2.4 PHOTOGRAPS (Site Surrounding)








2.5 SWOT Analysis

➢**Strength:**

• Agargaon hasn't fully developed yet, so the site has a potential of becoming a good urban public place and will speed up the process of development.

• The place can be a centre of social hub and civic space since there is no significant civic space in the surrounding area.

• Indirect northern light available which is good for gallery spaces, library etc.

• Low height structures in south eastern side resulting availability of south east breeze and good cross ventilation.

• No pollution, dustbin or bad odor in the surrounding area.

• The site has no rush of traffic which is helpful for researcher. It is located almost centrally in the city and easily accessible.

➢**Weakness:**

• The present access road is not big enough.

• A large portion of west is exposed, so the western façade should be treated well in order to reduce heat gain during afternoon.

➢**Opportunity:**

• As the area does not have a proper public place, this site will give a chance to flourish the idea of public place in the city.

• The other public building around the site would act as positive forces for the centre.

• It will initiate a new kind of development in this area.

➢**Threat:**

• It the site is not handled appropriately, it might make a bad effect in community.

• The environment would be affected if the ratio of build area and green is not properly balanced.

CHAPTER 03: Literature Review

3.1 Science, Technology, Museum and Society

Science is a systematic enterprise that creates, builds and organizes knowledge in the form of testable explanations and predictions about the universe. It is the reasoned investigation or study of natural phenomena, aimed at discovering enduring principles among elements of the phenomenal world by employing formal techniques. Technology is the collection of techniques, skills, methods and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes, etc. or it can be embedded in machines, computers, devices and factories, which can be operated by individuals without detailed knowledge of the workings of such things. (Wikipedia)

A science museum is a museum devoted primarily to science. Older science museums tended to concentrate on static displays of objects related to natural history, paleontology, geology, industry and industrial machinery, etc. Modern trends in museology have broadened the range of subject matter and introduced many interactive exhibits. Many if not most modern science museums — which increasingly refer to themselves as science centers or discovery centers also emphasize technology, and are therefore also technology museums. The mission statements of science centers and modern museums vary, but they are united in being places that make science accessible and encourage the excitement of discovery. They are an integral and dynamic part of creating interactive learning environment and promoting exploration. (Wikipedia)

Science, technology and society (STS), also referred to as science and technology studies is a branch or offspring of science studies. It considers how social, political, and cultural values affect scientific research and technological innovation, and how these, in turn, affect society, politics and culture. STS is a new and expanding subject. Like most interdisciplinary programs, it emerged from the confluence of a variety of disciplines and disciplinary subfields, all of which had developed an interest typically, during the 1960s or 1970s in viewing science and technology as socially embedded enterprises. Science, technology, and society in the mid- to late-1960s, student and faculty social movements in the U.S., UK, and European universities helped to launch a range of new interdisciplinary fields that were seen to address relevant topics that the traditional curriculum ignored. One such development was the rise of science, technology, and society programs, which are also known by the STS acronym. Drawn from a variety of disciplines, including anthropology, history, political science, and sociology, scholars in these programs created undergraduate curricula devoted to exploring the issues raised by science and technology. Unlike scholars in science studies, history of technology, or the history and philosophy of science, they were and are more likely to see themselves as activists working for change. Science, engineering, and public policy studies emerged in the 1970s from the same concerns that motivated the founders of the science, technology, and society movement. The science, technology, and society movement tried to humanize those who would make tomorrow's science and technology, but this discipline took a different approach. It would train students with the professional skills needed to become players in science and technology policy. Some programs came to emphasize quantitative methodologies, and most of these were eventually absorbed into systems engineering. Others emphasized sociological and qualitative approaches, and found that their closest kin could be found among scholars in science, technology, and society departments.

3.2 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. (Wikipedia)

The need for faster technological development is increasingly felt in Bangladesh. Development plans of Bangladesh have emphasized science and technological research to develop technologies through adoption of imported technology as well as development of indigenous technologies. As the country is heavily dependent on imported technologies, proper planning is required for its effective transfer through acquisition, assimilation and adoption.

3.3 Branches of science and technology

The branches of science also referred to as science, 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:

1. 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.

2. 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.

3. 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.

3.4 Background of the National Museum of Science and Technology

The National Museum of Science and Technology was an initiative to acknowledge the country with the rich science and technology of the world. The National Museum of Science and Technology was established in 1966 by the East Pakistan government. After the liberation war in 1971, this vibrant museum was closed and it reopened in about 1982. After it reopened it organized annual exhibitions and programs so that they can still run smooth. It used to very crowded and vibrant place to be, as the museum had a wide range of galleries and exhibits. It ran successfully since then, but for some reasons it stopped upgrading the exhibits and it resulted in failure of the project. Failure in a sense that; it used to have 200 to 2000 visitors per day but in recent times it has about 100 visitors on average. The up gradation might not be the only problem, it might also be that the technology is so easy to reach and the people nowadays are so lazy to visit a museum or they have a wrong perception about museum being boring that they are no longer interested. The museum has 7 different galleries all integrated. All the galleries are dedicated to different sections and branches of science and technology. The proposal of a new museum aroused with the need of providing proper way of creative way of teaching, exhibiting and sharing knowledge about science and technology and creating a new world for the young minds of the generation to broaden their imaginative world. The Ministry of Science and Technology has declared to design and make a new science and technology museum in the present site of the science museum in Agargoan, Dhaka that would preserve the innovative works of local scientists while encouraging the younger generation of scientists to explore the endless possibilities that their scientific knowledge opens up to them.

3.5 Interactive Science Museum and Exhibits

Interactive museum exhibits are ubiquitous in science centers, and are becoming increasingly popular. At an interactive science museum, visitors can act on the exhibit and the exhibit reacts. While there is much theoretical and empirical support for the idea that interactive features in exhibits promote science learning, I believe that serious design problems can arise if an uncritical “more is better” approach is taken to interactivity. McLean (1993) defines interactive exhibits as “those in which visitors can conduct activities, gather evidence, select options, form conclusions, test skills, provide input, and actually alter a situation based on input.” At the heart of interactivity is reciprocity of action, where a visitor acts on the exhibit and the exhibit reacts in some way. Such interactivity is an essential element in the majority of exhibits in contemporary science and children’s museums. The

Exploratorium's founder, Frank Oppenheimer (1968), believed that members of the public would "gain some understanding (of science and technology) by controlling and watching the behavior of laboratory apparatus and machinery". The idea that interactivity should improve visitor learning at museum exhibits has its roots in the philosophies of experiential education (Dewey 1938/1997) and constructivism (Piaget 1957). Dewey proposed an experiential philosophy for education, emphasizing the importance of experiences for challenging or supporting a learner's previous understanding. Piaget valued interactions with the physical world because they encouraged learners either to assimilate new knowledge into their existing conceptual structure or to accommodate new, conflicting ideas by restructuring their previous understanding. In sum, both philosophies hold that people learn by building their own understandings based on experience, and that educational systems should offer experiences to support learning.

Research on visitor learning in museums suggests that interactivity promotes engagement, understanding and recall of exhibits and their content (for a recent review, see Schneider & Cheslock 2003). According to Hein and Alexander (1998), "visitors greatly prefer interactive elements" in exhibitions (p.16). In one study, Hein and Heald (1988) found that renovating a diorama exhibition to include multisensory interactive components led to increases in visitor holding time and visitors' knowledge of the exhibition's themes. In an art museum study, Richards and Menninger (2000) evaluated specially-designed interactive galleries at the J. Paul Getty Museum and found that holding time was greater in those galleries. Research also suggests that interactive exhibits can be memorable, with many visitors able to describe the thoughts and feelings they had at the exhibits over 6 months after a visit (Stevenson 1991). Borun et al. (1998), after studying families at science centers in detail, explicitly list interactive design features such as multi-outcome and multi modal as key ingredients in exhibits that will foster family learning.

3.6 The evolving roles of science museums

Science centers and museums, working with research centers, have the opportunity to serve as interpreters of technology for public audiences and as arenas for engaging citizens in the consideration of exploring the various applications of science and technology. These roles can, in fact, apply to any new domain of cutting edge science and technology. As informal science educators, science museum staffs provide insight into scientific methods and findings regarding the natural world and into human-made tools and technologies. Science centers and museums that have already committed themselves to the challenge of providing exhibits and programs on current science and technology will see the robust and influential domain of nanotechnology as an essential element of their mission-driven educational portfolio. These organizations will no doubt also have also begun to grapple with their approach to considerations of the ethical, environmental, public health, and societal controversies that surface with many emerging technologies. Such science and society issues engender values-based as well as fact-based discussion and debate. As a result, the role of the science museum interpreter is often to help audiences understand the distinction between the two, remaining neutral on the values questions, while serving as a resource for the accuracy of the factual information. “Remaining neutral on the values questions,” however, no longer means they are ignored as if completely separable from the science itself. Instead, it may mean that educators find ways of facilitating their audiences’ understandings of the framework and terms of the debate and the various perspectives brought to bear.

Science, technology, and society discussions tend to engage mostly adults and some teens. Their emergence as an important aspect of the science museum experience has helped to expand the very concept of the science museum far beyond that of a kid-centered, indoor playground filled with hands-on opportunities to explore the natural and manmade world. With nanotechnology, science museums once again have the opportunity to expand the horizons of their visitors with awareness and understanding of the ways future technologies could transform our world in unique and unexpected ways. They can provide a forum for citizen participation in thoughtful consideration of the application and governance of new technologies. They can also bring science and technology researchers as well as other stakeholders into the discussion.

3.7 Science as “Culture”

Science museums are conveyors of culture, the cultural quest for scientific knowledge of our world and the culture of wonder, discovery and invention. They help us honor these key aspects of the human spirit and human achievement. Science museums celebrate visionary explorers and inventors the way art museums celebrate visionary painters and sculptors and symphonies celebrate visionary musicians and composers. And like symphonies and museums of art, it is important for science museums to try to recognize great new works in the making.

Just as Galileo’s telescope opened the heavens to close inspection, and ultimately to space travel, and just as Leeuwenhoek’s microscope opened our eyes to the teeming world of micro-organisms, and thus to modern medicine, perhaps it will be said in the future that IBM’s development of the scanning probe microscope first put human beings in touch with atoms, the very building blocks of matter, and opened up new frontiers of materials, electronics, and photonics possibilities. Or maybe not. Maybe the analogy is less to instruments of vision and more too enabling technologies – the harnessing of fire, the carving of the wheel, the development of agriculture, the discovery of radio waves, and the invention of the transistor.

In any case, for science museums, the trouble with waiting until the history books are written, the Nobel is awarded, or a Nano-enhanced cure for cancer wins FDA approval, is that it makes the story of science so anti-climatic. There's no suspense, no challenge, no fighting against the odds; it's the equivalent of reporting on the medals count at the end of the Olympics rather than watching the highlights of the competition along the way. The stories we tell about what John Durant calls "finished science" are pre-determined – we know which way they end; who was wrong; who was right. [2006 Durant]. We end up conveying facts, like textbooks, making today's inventions look the result of an inevitable line of progress. No wonder the history of science seems so boring to so many people. Even a hands-on exhibit allowing a museum visitor to explore Newton's forces is, at best a re-enactment, with a known outcome. If "the experiment" doesn't turn out "right," we know the exhibit needs maintenance, or, perhaps our use of it requires "adjustment". We don't expect to turn an accepted theory – one that has sent men to the Moon – on its head. On the other hand, if we dare to ride the actual wave of discovery and experimentation, we can portray the culture of science as it truly is: the proverbial story of blindfolded people exploring an elephant, trying to grasp what it is; five pathways up a mountain, all but one of them dead-ends; a flash of inspiration that ends up saving a million lives; a flash of inspiration that lies in a pool of embarrassment on the laboratory floor.

It is part of the mission of most science centers and museums to foster appreciation as well as participation in the culture of science and engineering. Authentic encounters with and stories of the pioneers in our midst Nano researchers and others – bring science alive and capture the imagination of the next generation of explorers. We are celebrants as well as holders of the flame for inspiring that next generation.

3.8 Importance of science and technology museum in Bangladesh

The importance of science and technology in contemporary society is demonstrated by the use of it in our daily lives. And we often have no idea how science and technology really affect us. We live and work in structures given to us by science and technology. We are transported around on the ground, across the water and in the air by vehicles that are the direct result of science and technology. Modern societies are literally built on science and technology. When we turn on the tap, flush the toilet, or flip a light switch, we are accessing science and technology. Medicine is wall-to-wall science and technology, and anyone who is more than mildly ill or has been injured in more than a minor way will benefit from science and technology. Without technology, we would not have a TV, computer, phones and other things. Without science, we would hardly know anything about our planet, country or even our local area. Therefore, acknowledging the young generations of the variety of science and technology, our country could be developed in an extent we might have never considered. Also knowledge about science and technology could shape Bangladesh in an extent that it could be able to compete with the developed countries.

3.9 Goals for public audiences in science museums

- Visitors contribute to the process of scientific discovery through participation in active studies
- Visitors engage in one-on-few educational interactions with scientists conducting the research
- Visitor education focuses on the process of science, increasing interest in and understanding of research “questions and methods” as well as “results”
- Studies occur in plain view of the public, on the exhibit floor (not behind closed doors).
- Non-participant visitors talk with researchers and learn about on- going studies in ways similar to study participants.

3.10 Goals for professional audiences in science museums

-Researchers receive training from museum staff in effective museum-style education techniques, improving researchers’ communication skills with public audiences

-Museum educators gain direct access to current science that is relevant to their work with the public, improving educators’ understanding of science and its potential application to their practice

-Museum educators and researchers communicate regularly, collaboratively monitoring the program to ensure scientific and educational goals are met, and that programmatic needs (e.g. logistical, financial) are fulfilled.

CHAPTER 04: CASE STUDIES

4.1 The Patricia and Phillip Frost Museum of Science

Project name: The Patricia and Phillip Frost Museum of Science

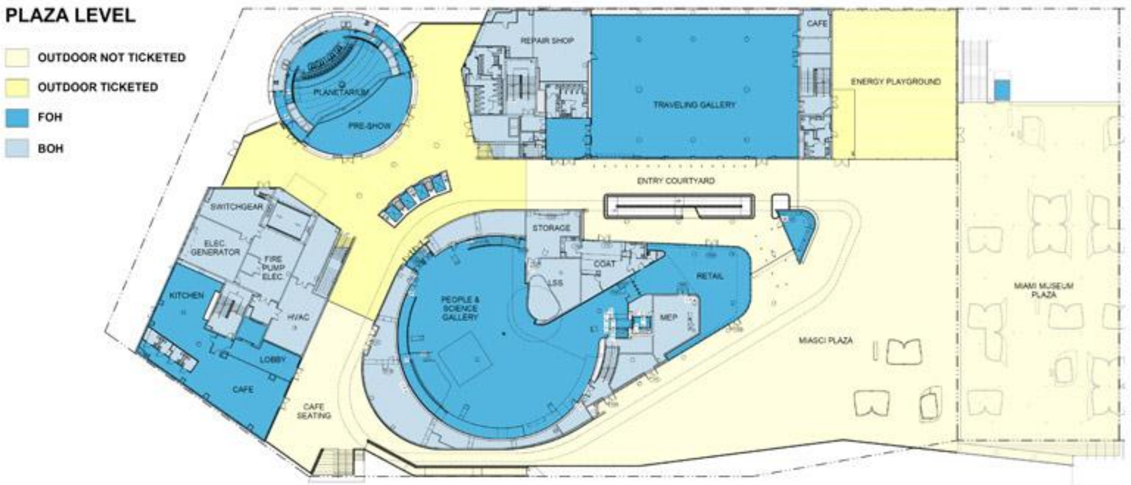
Location: Miami, Florida

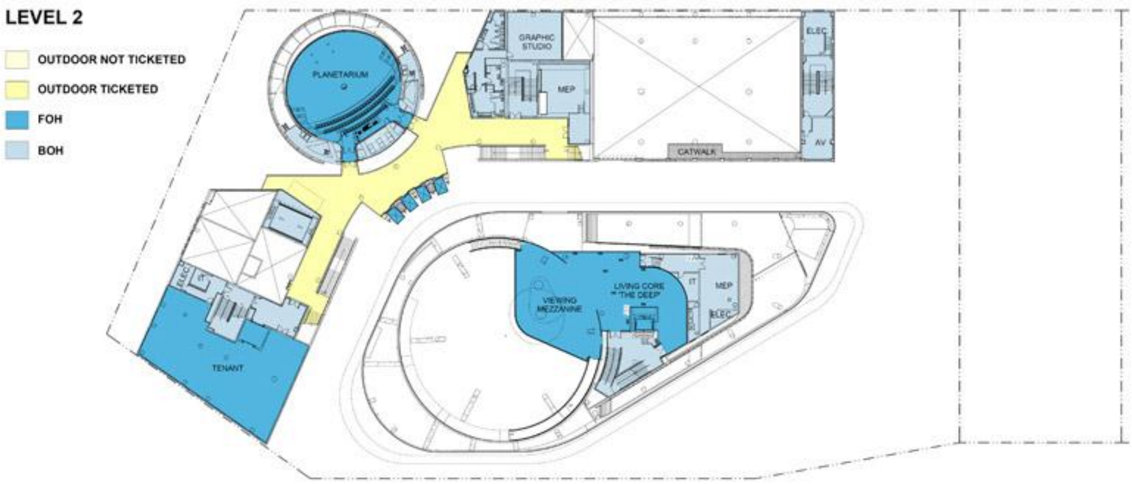
Key words: Programmatic analysis, distribution of space and functions, galleries, climatic considerations, sustainability.

Centered around the idea of 'building as exhibit', the Grim Shaw-designed Patricia and Phillip Frost museum of science will contain a 'living core' comprised of an aquarium and wildlife center that act as a microcosm of south Florida's local ecology. The new facilities are an architecture of response, complete with vegetated roof surfaces that provide a home to local flora and fauna, shade and shelter and a rain water and gray water collection system. Plaza spaces are energized by the outdoors and complement a constructed wetland used to control storm water runoff.

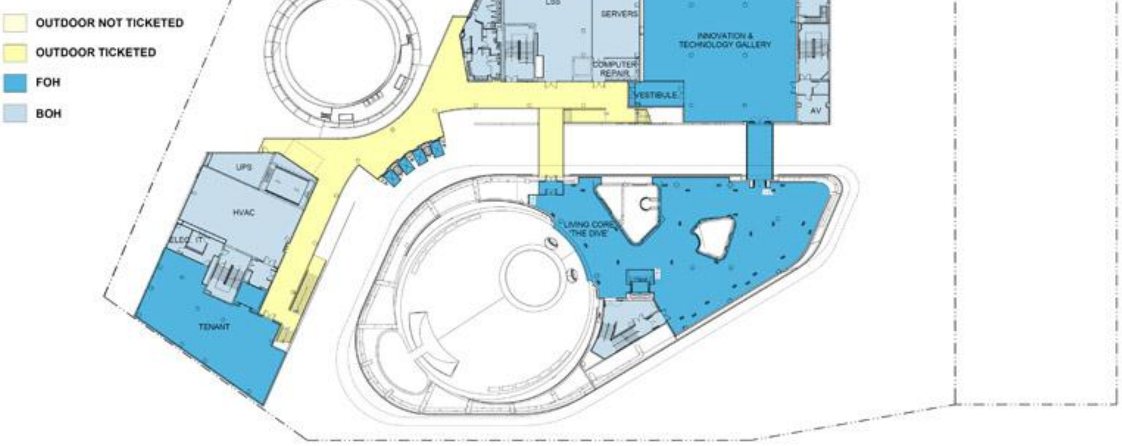
Floor Plans


GROUND LEVEL
OUTDOOR NOT TICKETED
OUTDOOR TICKETED
FOH
BOH
LSS INFRASTRUCTURE
MEP
TANKS
PUMP ROOM
ELEC VAULT
HUSBANDRY
FUEL
MAIN ENTRY RAMP
LOADING DOCK
SHIPPING & RECEIVING
TRASH
ADMIN
PLAZA ACCESS


PLAZA LEVEL
OUTDOOR NOT TICKETED
OUTDOOR TICKETED
FOH
BOH
PLANETARIUM
PRE-SHOW
REPAIR SHOP
TRAVELING GALLERY
CAFE
ENERGY PLAYGROUND
ENTRY COURTYARD
SWITCHGEAR
ELEC GENERATOR
FIRE PUMP ELEC
KITCHEN
HVAC
LOBBY
CAFE
CAFE SEATING
STORAGE
COAT
LSS
PEOPLE & SCIENCE GALLERY
RETAIL
MEP
MIASCI PLAZA
MIAMI MUSEUM PLAZA


LEVEL 2
OUTDOOR NOT TICKETED
OUTDOOR TICKETED
FOH
BOH
PLANETARIUM
GRAPHIC STUDIO
MEP
ELEC
AV
CATWALK
ELEC
TENANT
VIEWING MEZZANINE
LIVING CORE "THE DEEP"
IT
MEP
ELEC

LEVEL 3



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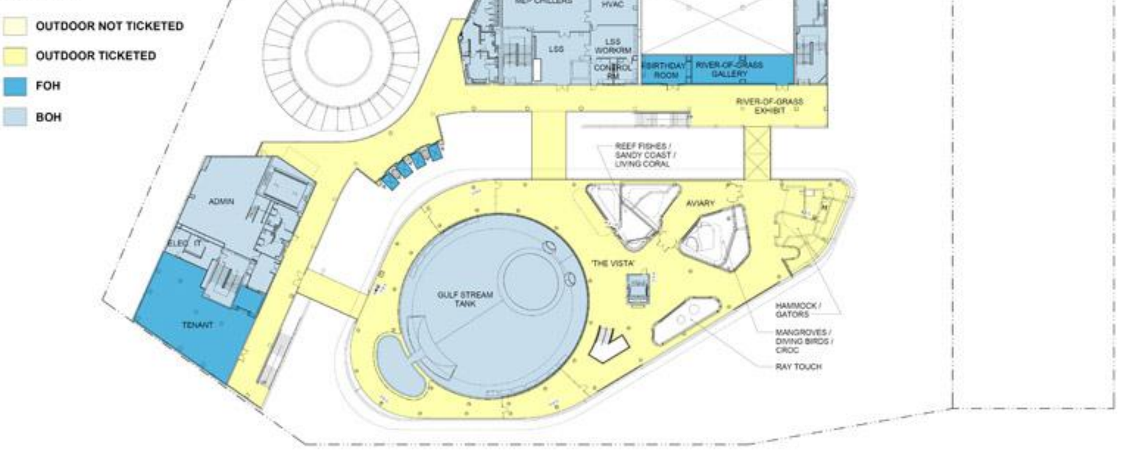

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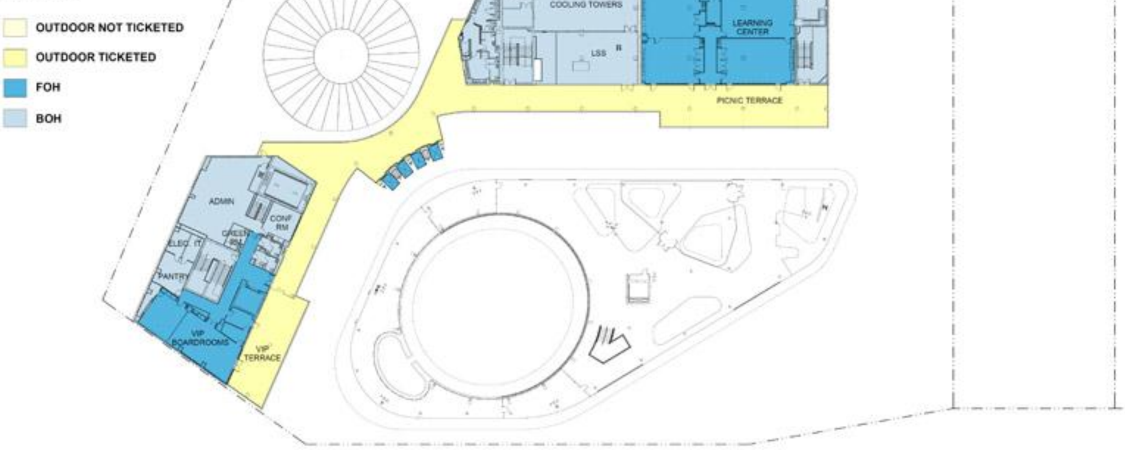
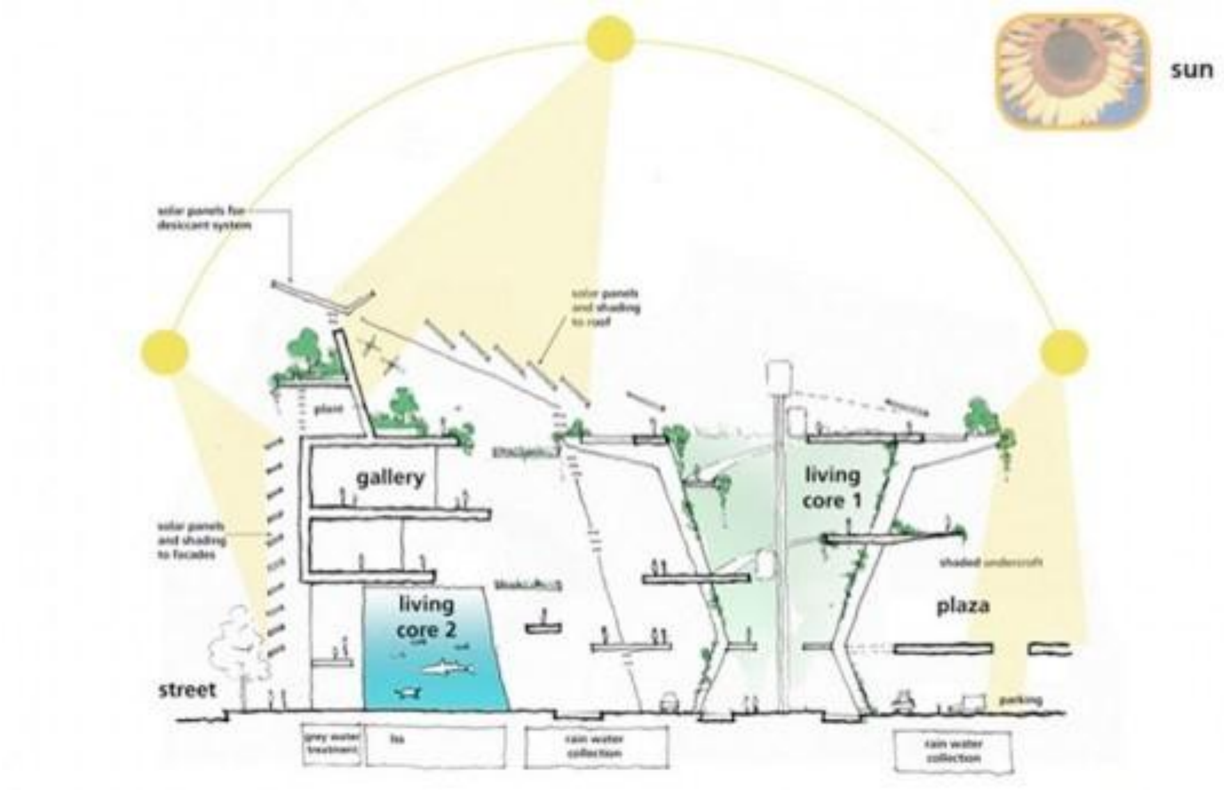


SOLAR STRATEGIES



<u>Findings:</u>

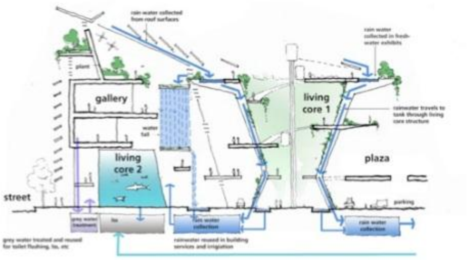
- The Miami Science Museum carefully integrates the direction and location of the sun into its design engaging in both passive and active solar design strategies.

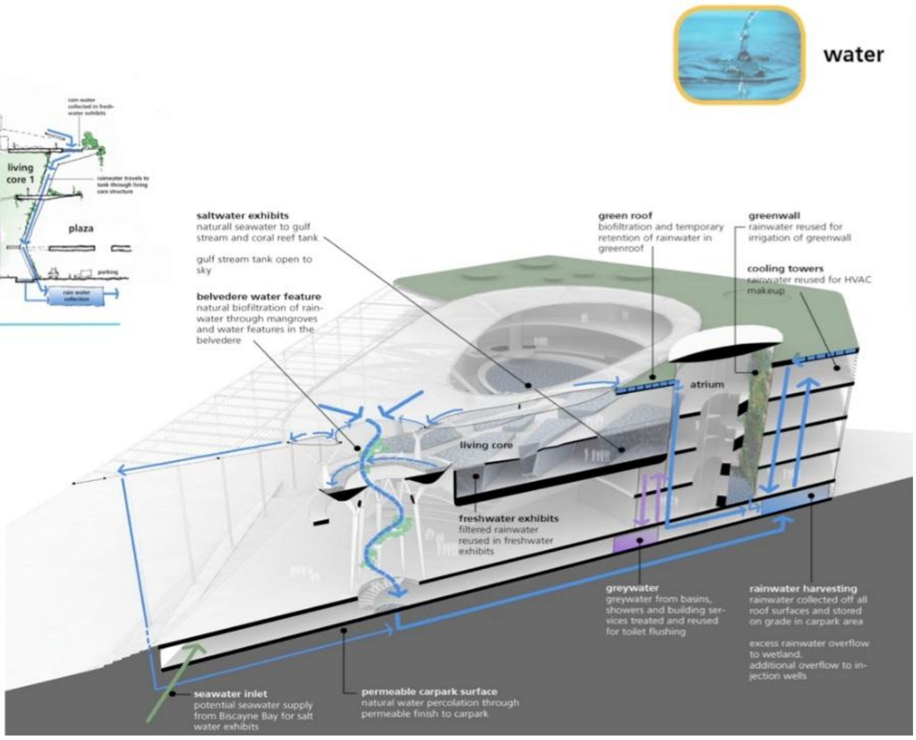
- Building Information Modelling (BIM) was used to model out varying solar conditions throughout the day and the year to help design the building shape, overhangs and PV installations.

- Solar panels cover areas of both the museum's roof and facade for energy capture from the sun. Highly efficient thin film PVs have also been used in areas such as the atrium and skylights to power up the building, but never at the expense of natural daylighting.

- Passive solar strategies are well-integrated into the design, and provide a mode for both heating and cooling. In fact, in many instances the PV panels offer direct shading for the building and the interior spaces.

WATER STRATEGIES





Findings:

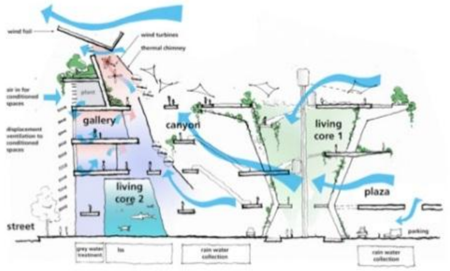
- MiaSci is a virtual sponge when it comes to water catchment. A belvedere water feature is designed at the roof of the building and uses the natural bio-filtration of rainwater through mangroves and other elements within the opening.

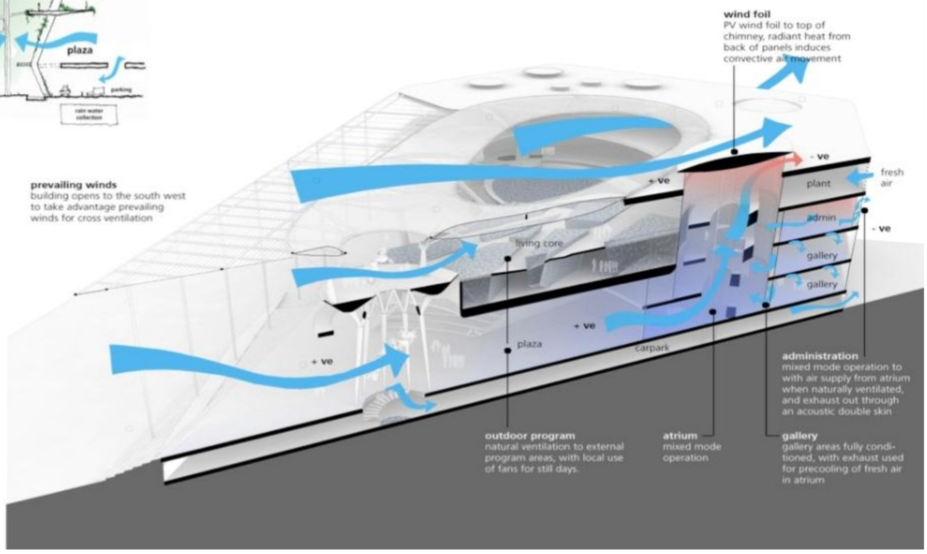
- The museum's green roof and interior green wall provide further bio-filtration as well as a temporary means of rainwater retention for later irrigation. Rainwater harvesting is also done at the roof surface, and all captured water is stored on grade in the car park area. Any water in excess of capacity is directed to wetland or to injection wells.

- Moreover, the museum's toilets are just as efficient, using treated greywater captured from basins, showers and building systems. Hosting several water exhibits, MiaSci draws upon rain catchment and the local bay as its main source of water.

- Freshwater exhibits are supplied by filtered rainwater; and as the museum is sited next to the Biscayne Bay, an inlet has been constructed below the building to draw in seawater for the saltwater exhibits.

AIR FLOW AND VENTILATION





<u>Findings:</u>

- The shape of the MiaSci building was deliberately designed in a specific way to work with the pattern of wind flow on the site, and ventilation and airflow in regards to building shape was carefully studied and iterated using BIM.

- The MiaSci building was designed as a solid block on the north and west boundaries of the site, and the southwest orientation was chosen to take advantage of the prevailing winds.

- While gallery areas are fully conditioned mechanically, the air that is exhausted into these spaces is recycled to pre-cool the fresh air of the atrium, which then flows to cool the administrative floor eventually being exhausted through an acoustic double skin.

- Photovoltaic wind foils tops off the roof at the western end of the structure, and the radiant heat absorbed by the back of the panels induce convective air movement.

4.2 Guangzhou Science Museum

Project name: Guangzhou Science Museum

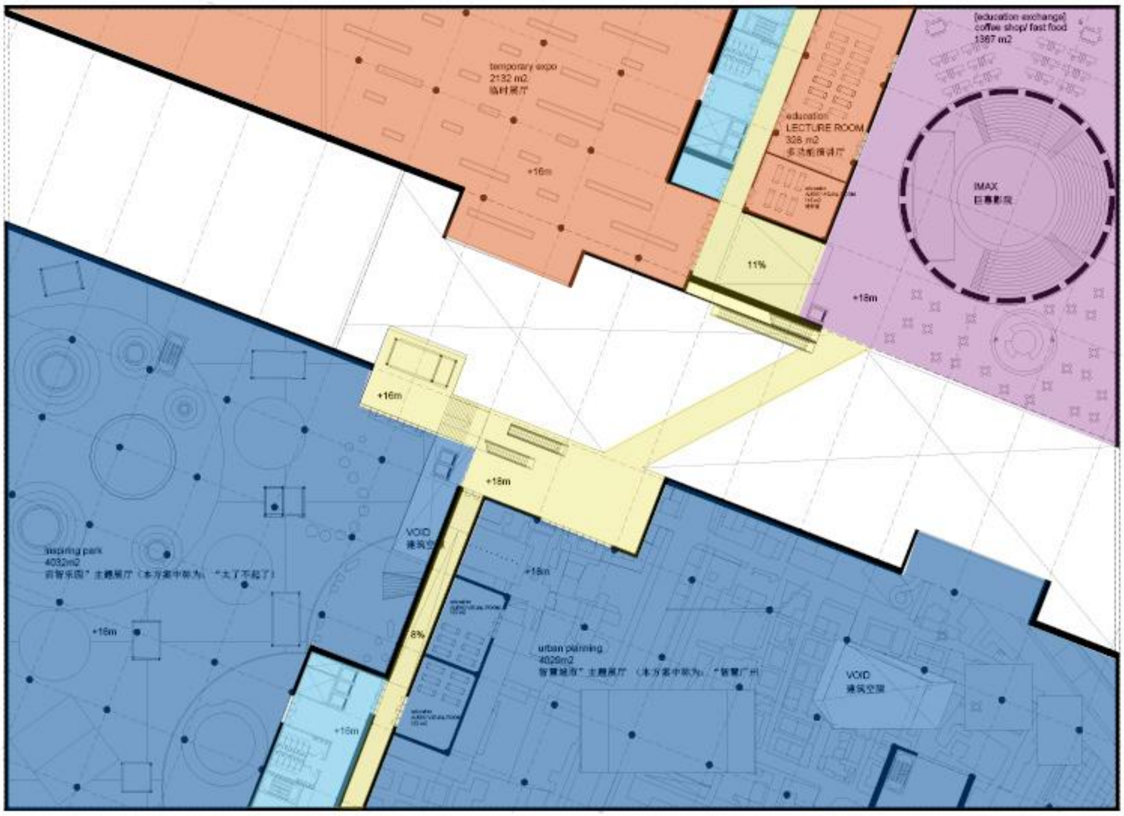
Location: Guangzhou, China

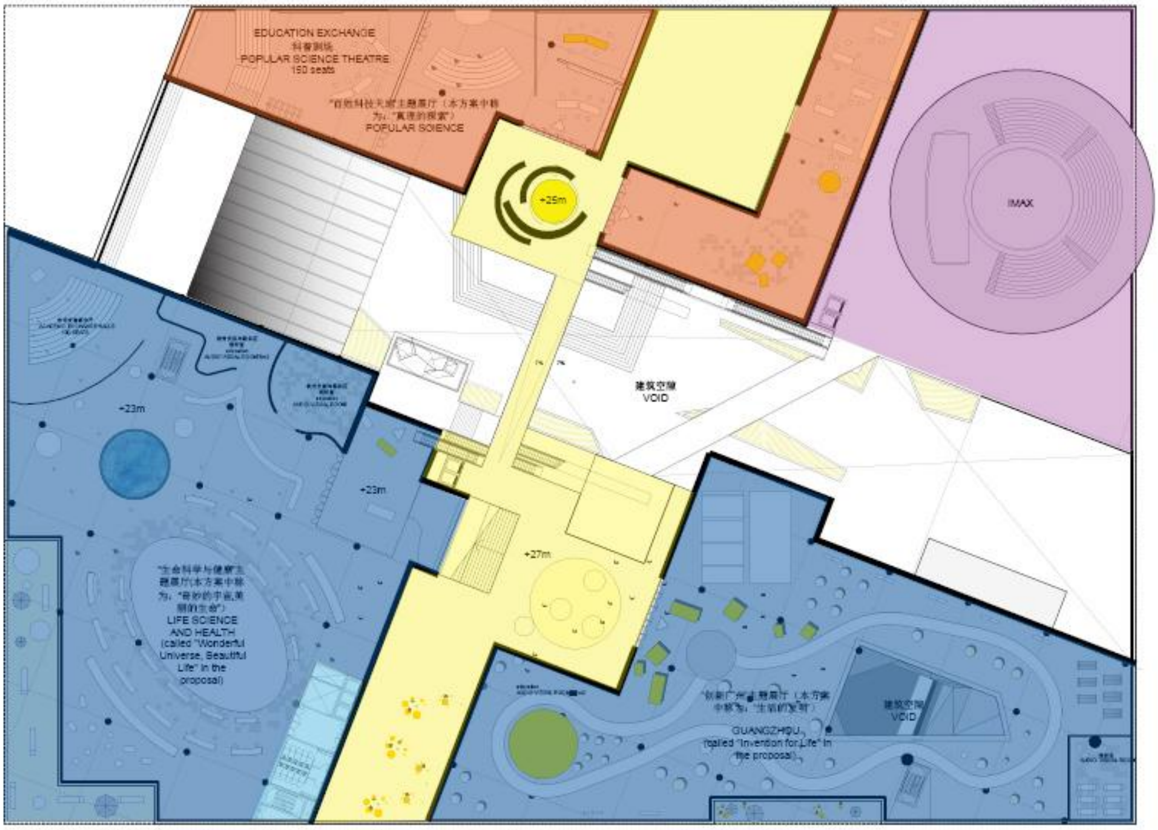
Key words: Programmatic analysis, distribution of space and functions, galleries, climatic and contextual considerations, sustainability.

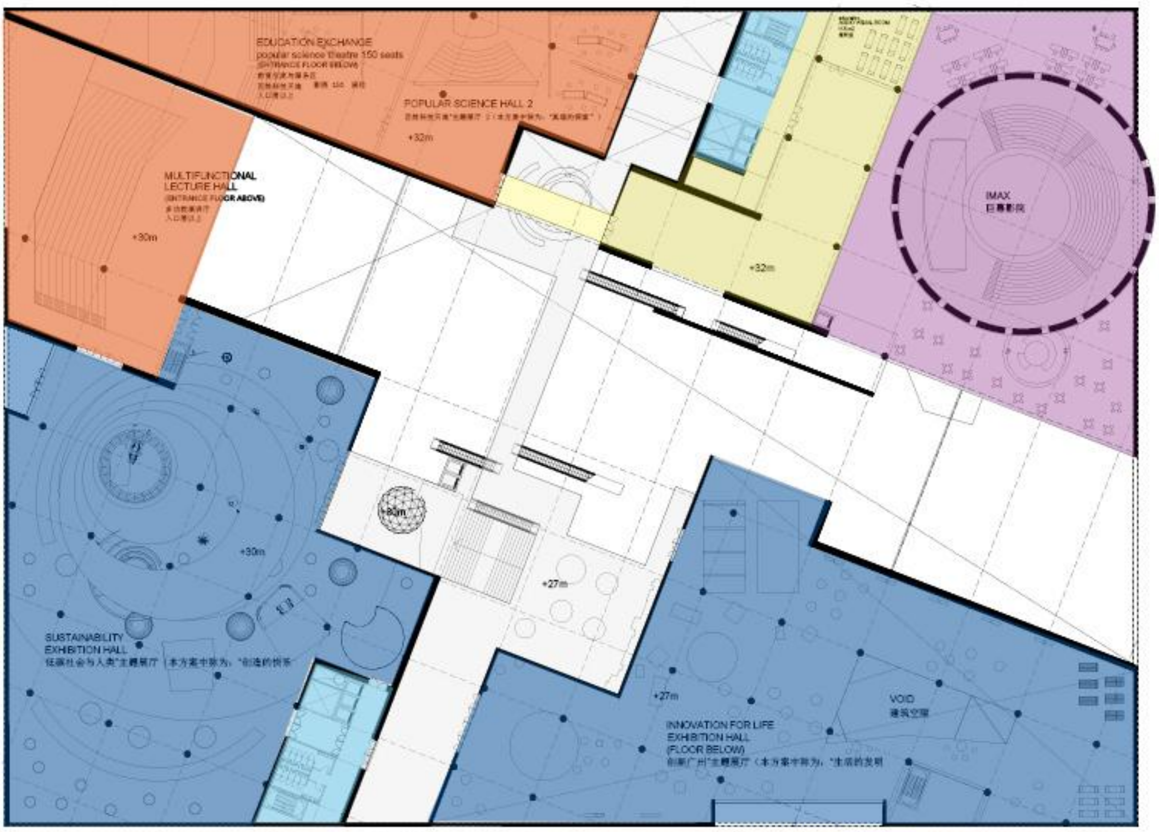
The design started with an ‘inside-out’ approach, where visitor experiences are developed hand in hand with the architectural planning. A public route from a public park runs diagonally through the building, becoming the center’s atrium that serves as entrance hall, distribution space and public display of developments in contemporary science. From this central space the exhibition halls each featuring a different topic and the 360 degree cinema can be accessed.

Floor Plans


SUNKEN PLAZA
ENTRANCE B1
TEMPORARY EXPO
HALL 1
TEMPORARY EXHIBITION
2
lobby IMAX
RECEPTION
WAITING AREA
TICKET BOOTHS
ENTRANCE ZONE/
TRAVEL INFO
BUS
STATION
BUS
entrance


temporary expo
2132 m2
+16m
education
LECTURE ROOM
328 m2
[education exchange]
coffee shop/ fast food
1367 m2
IMAX
11%
+16m
+16m
+16m
VOID
aspiring park
4032m2
+16m
8%
urban planning
4029m2
VOID
+16m


EDUCATION EXCHANGE
POPULAR SCIENCE THEATRE
150 seats
POPULAR SCIENCE
+25m
IMAX
VOID
+23m
+23m
+27m
LIFE SCIENCE
AND HEALTH
(called "Wonderful
Universe, Beautiful
Life" in the
proposal)
GUANGZHOU
(called "Invention for Life" in
the proposal)
VOID


EDUCATION EXCHANGE
popular science theatre 150 seats
POPULAR SCIENCE HALL 2
+32m
MULTIFUNCTIONAL
LECTURE HALL
(ENTRANCE FLOOR ABOVE)
+30m
IMAX
+32m
+30m
+27m
SUSTAINABILITY
EXHIBITION HALL
+27m
VOID
INNOVATION FOR LIFE
EXHIBITION HALL
(FLOOR BELOW)


POPULAR SCIENCE RESEARCH
lounge (for public use)
RESEARCH ROOMS FOR PROFESSIONALS
+38m
EXHIBITION DESIGN AND PRODUCTION ROOM
SECURITY CONTROL AREA
+38m
KITCHEN
STAFF CANTEEN
+30m
+38m
建筑空隙 VOID
RECEPTION
建筑空隙 VOID
+37m
+40m
+40m
LOW CARBON AND MANKIND (called "The Joy of Making" in the proposal)
建筑空隙 VOID
+37m
+40m


图书资料室
LIBRARY & REFERENCE ROOM
PUBLIC EDUCATION SECTION
BUSINESS DEVELOPMENT SECTION
RESEARCH ROOMS
研究设计部
RESEARCH AND DESIGN SECTION
void
行政管理用房
ADMINISTRATIVE ROOM
DOCUMENT & FILE ROOM
lounge (for public use)
+43m
YOUTH LOUNGE
PROJECT MANAGEMENT
EQUIPMENT MANAGEMENT
ACTIVITY CENTRE
+38m
行政管理用房
ADMINISTRATIVE ROOM
void
+43m
+40m
建筑空隙
VOID

CHAPTER 05: PROGRAM DEVELOPMENT

5.1 Rationale of the program

The programs have been selected to make the museum more public. The museum will house all the functions which will help to make a vibrant science hub. Temporary gallery spaces have been provided to exhibit works produced in the workshops. Classrooms and studios will facilitate the scientists and the researchers to work in silence. Classrooms and studios will be rentable for weeks. Workshops can be arranged in the studios or workshop areas depending on the number of attendants. People would be able to work in different types of specialized workshops and general workshops. Archive and library will give an opportunity to acquire knowledge about science and technology. Children space will encourage the young mind to involve more into creative work. People would be able to know about science and technology of past present and future.

5.2 Programs with required area

Permanent Gallery	80,000 sq.ft
Temporary gallery	20,000 sq.ft
Administrative unit	5,000 sq.ft
Research and publication	4,000 sq.ft
Innovation unit	5,000 sq.ft
Exploration unit	3,000 sq.ft
Library and Archive	8,000 sq.ft
Workshops	6,000 sq.ft
Seminar/Lecture Hall	4,500 sq.ft
Multipurpose Hall	5,000 sq.ft
Planetarium	1,500 sq.ft (50-100 people)
Sky Observatory	1,000 sq.ft
Cafeteria	2,500 sq.ft

Souvenir Shop	500 sq.ft
Parking	100 cars
Total sq.ft	1, 55,000 sq.ft (approx.)

Permanent Gallery:

Physical science: Physics, Chemistry, Mathematics	10,000 sq.ft
Earth Science: Geology, Oceanography, Paleontology, Meteorology	8,000 sq.ft
Life Science: Botany, Zoology, Genetics, Medicine, Human Health	10,000 sq.ft
Industrial Technology	12,000 sq.ft
Information Technology	5,000 sq.ft
Robot World	8,000 sq.ft
Fun science and Children Techno land	5,000 sq.ft
Astronomy and Space Navigation	8,000 sq.ft
Current trend and Emerging science	8,000 sq.ft
Sci-fi and Futuristic science/inventions	5,000 sq.ft

Administrative unit:

Director General	300 sq.ft
Project Director	200 sq.ft
General Curator	200 sq.ft
Academic Curator	100 sq.ft
Conference Room	500 sq.ft
Staff Room	1,000 sq.ft (10 people)
Lobby/Lounge	500 sq.ft
Office space	2,000 sq.ft (20 people)
Toilets + 30% Circulation	

CHAPTER 06: DESIGN DEVELOPMENT

6.1 Introduction:

Being science museum, the main purpose of this project is to reveal the relationship between people and science in an exceptional manner. Firstly, the new museum should become a landmark on the horizon as a geographical fact and it should grow from the site with respect to the surroundings. A museum that observes and is observed, a building that reveals itself and originates a new relation between man and nature, architecture and landscape. Secondly, it is crucial that the new museum should, above all, enhance the value of the institution through its architecture, be the science in itself. Simultaneously the new building seeks through its design, the primal metaphor between the infinite dimension of the universe and the human property of understanding reality through science, intervention and landscape, vertical and horizontal, interior and exterior, light and shadow, cosmos and individual. Thus, it is unquestionable in determining the synthesis of the significance of the museum and its action in the territory.

6.2 Distribution of Functions and Flow

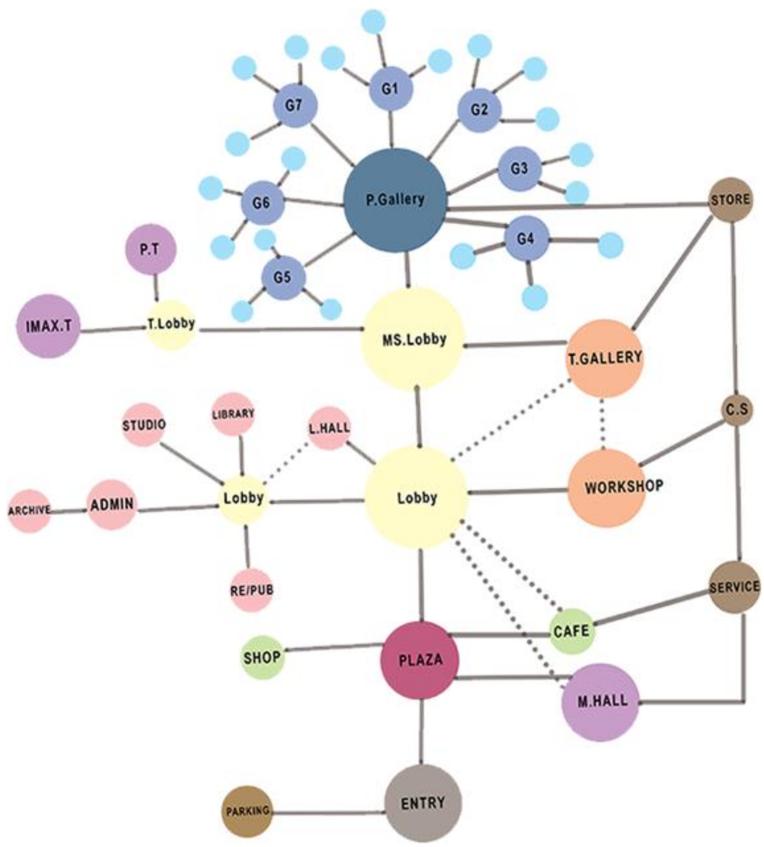
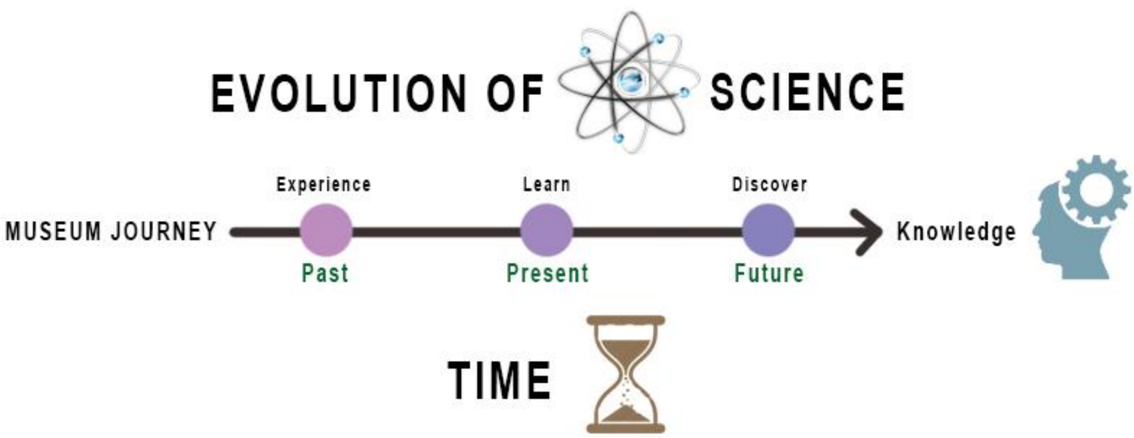


Fig: Surrounding Infrastructures

6.3 Concept:

When we think about the concept of science and its technological advancement a lot of things come into our mind. My main goal was to create something that would offer a powerful teaching experience of the museum, seeking the essential interaction between architecture and museum content, a synthesis of both in a proper organized way. Since science is constantly evolving with time, the basic idea was to create a sequence of experience during the journey so that it gives a clear notion about the past, present and future visions of the branches of science to the visitors and help in improving public perception, contributing to a positive evaluation of science and its technological developments.



The galleries were chosen from the primary fields and subfields of science and its technological development and are arranged in a specific sequence that maintains the notion of the evolution of science with respect to the time. As a result, the flow of the galleries guides the visitors in such a way so that the journey starts from the earliest discoveries of science to the present era and then to the visions of futuristic inventions and fantasies as the visitors experience, learn and discover the evolution and wonders of science having a proper knowledge of the timeline.

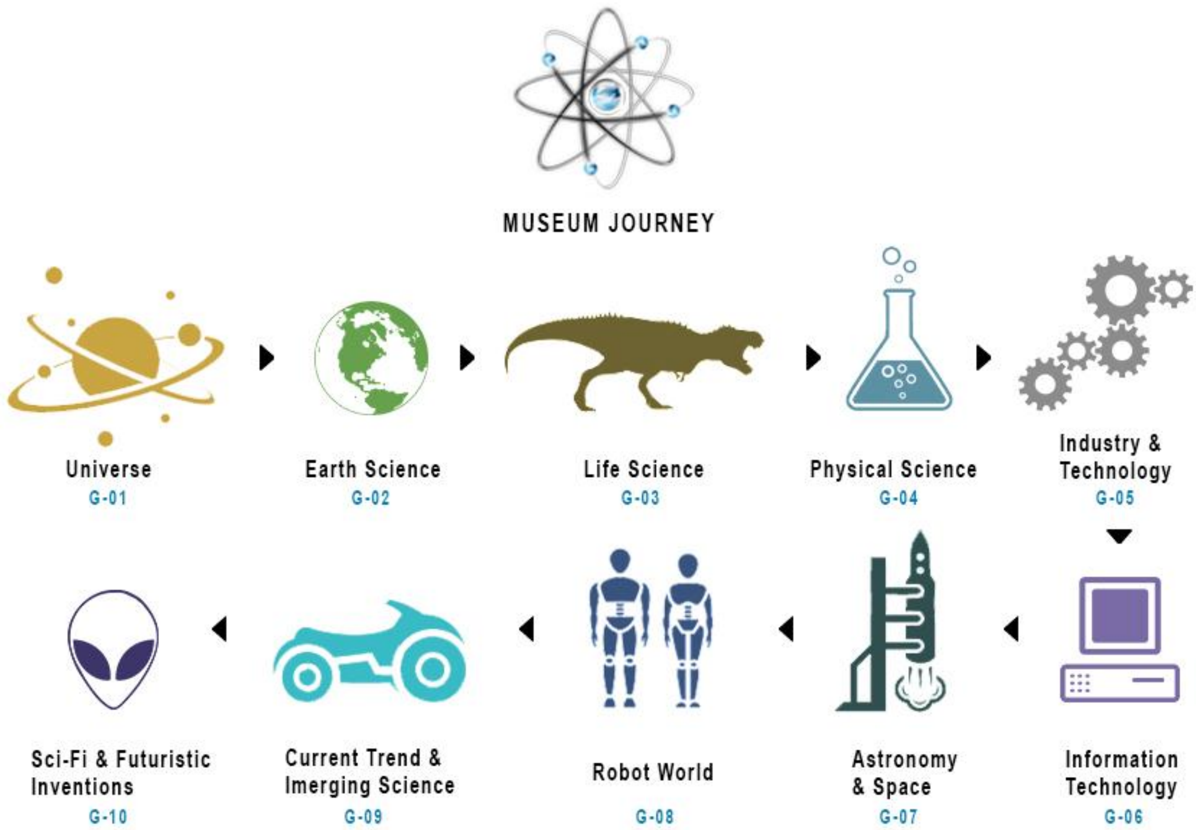
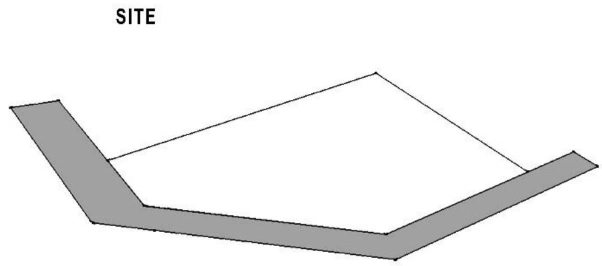
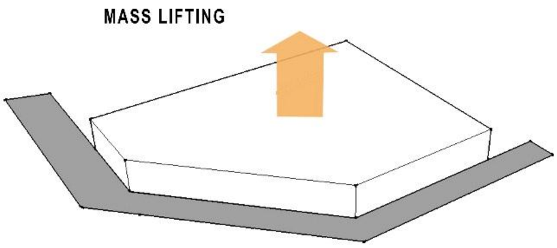


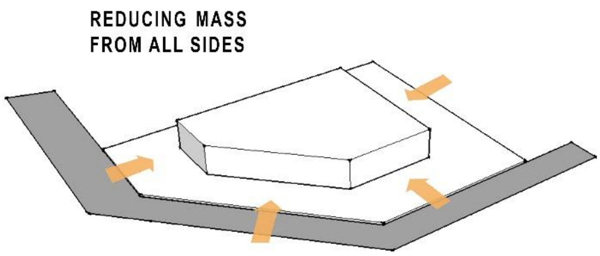
Fig: Sequence of galleries and flow of visitors in the museum

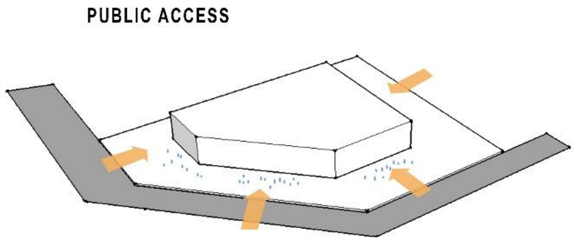
Moreover, the freedom of the various possible displacements within the museum provides a diversity of spatial qualities and sensations, setting up a process of knowledge construction through the emotions that the visitors experience along their movements through the spaces.

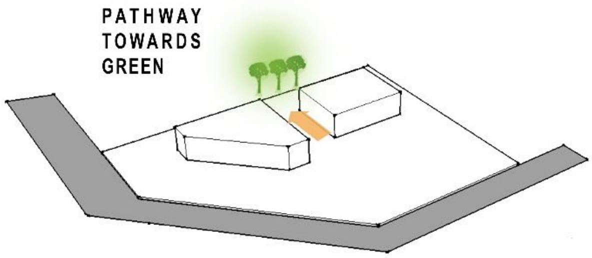
6.4 Form Generation:

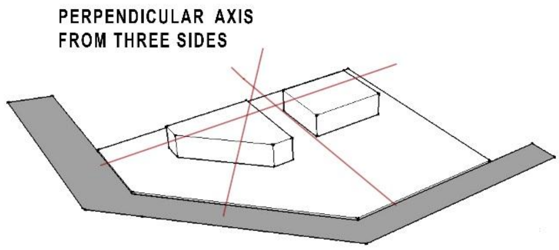




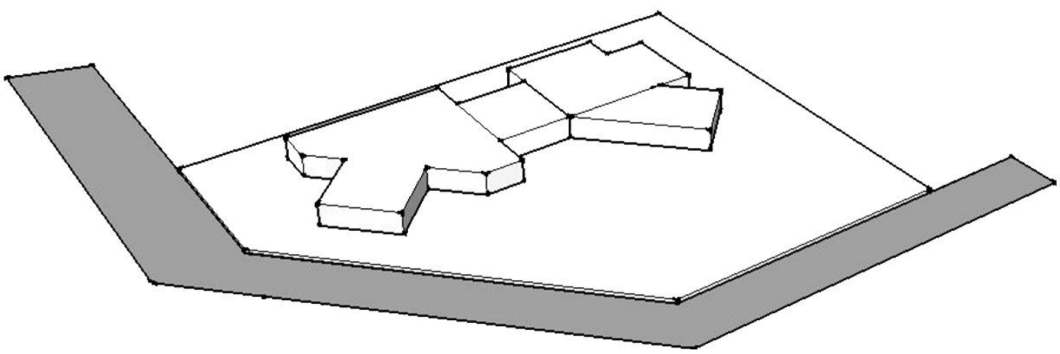




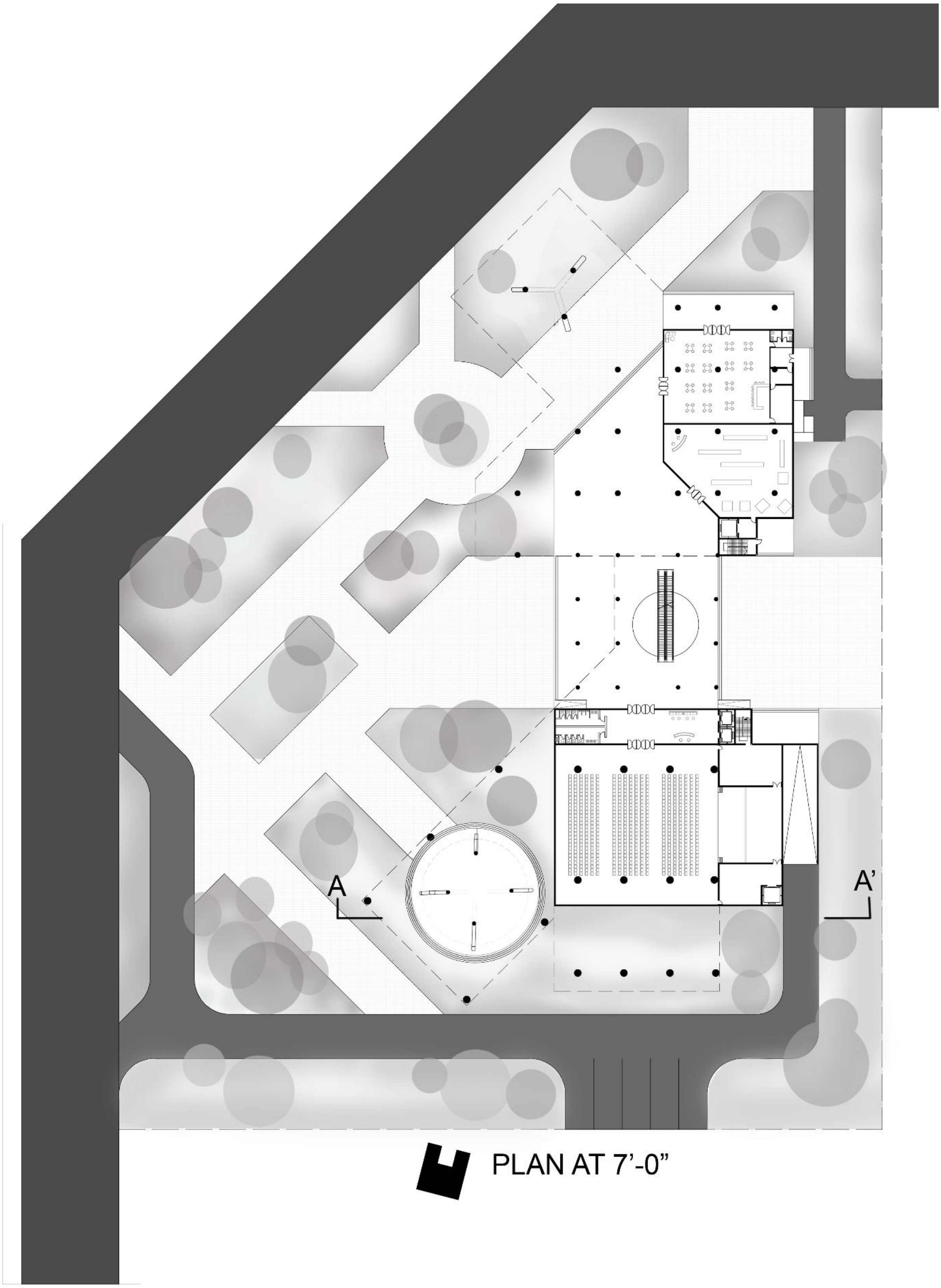


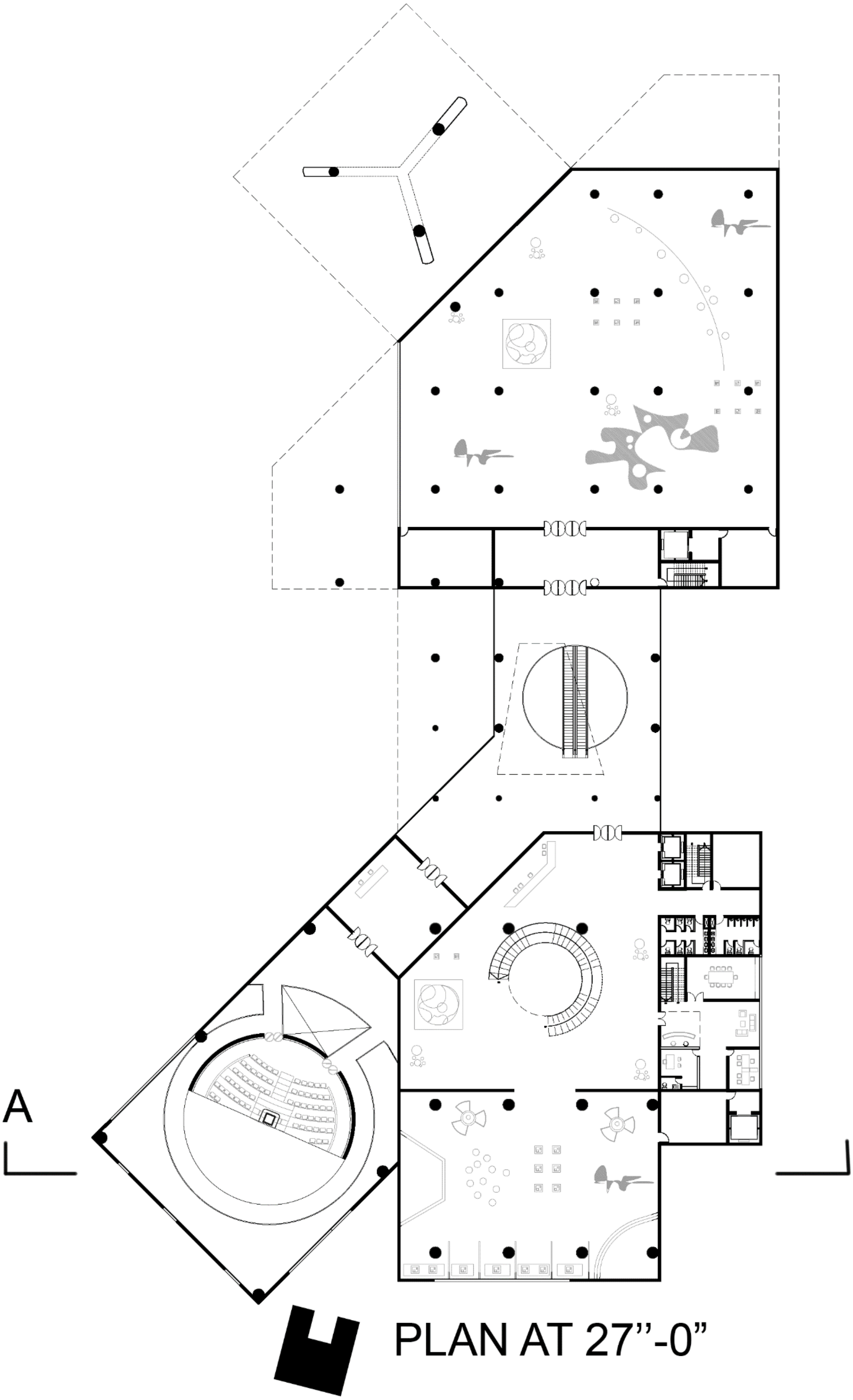


BASIC FORM

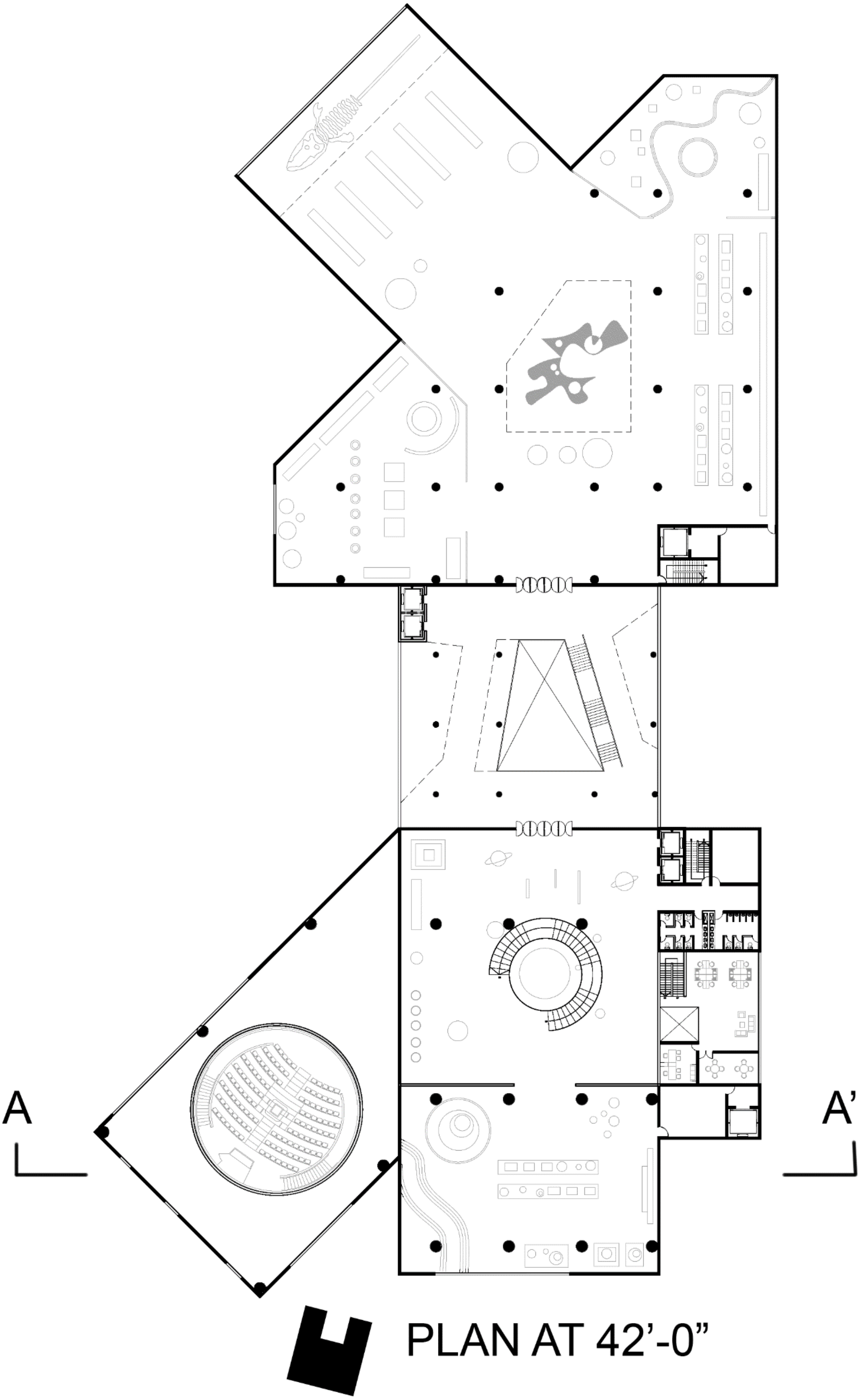


6.5 Final Design Drawings

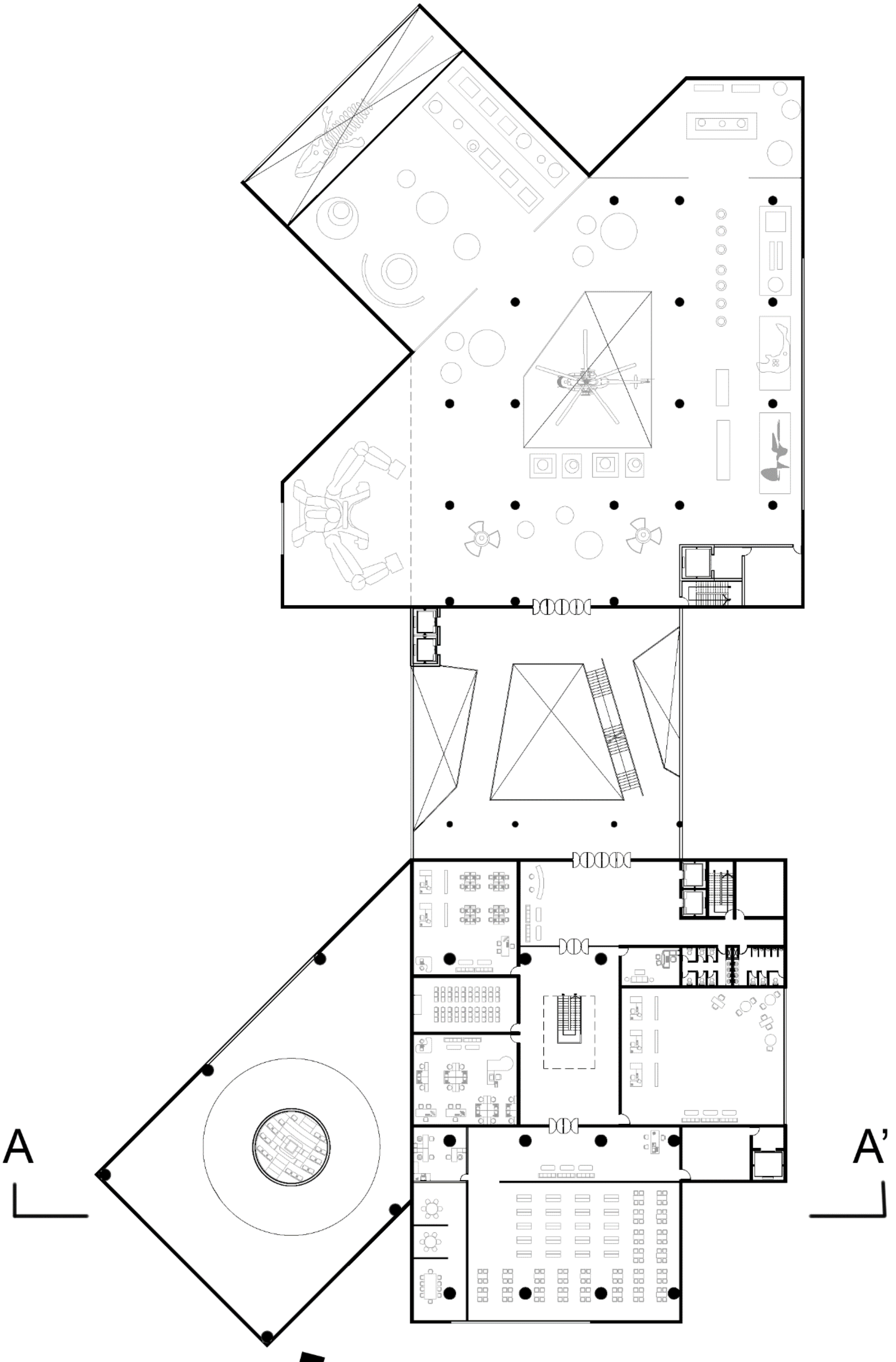




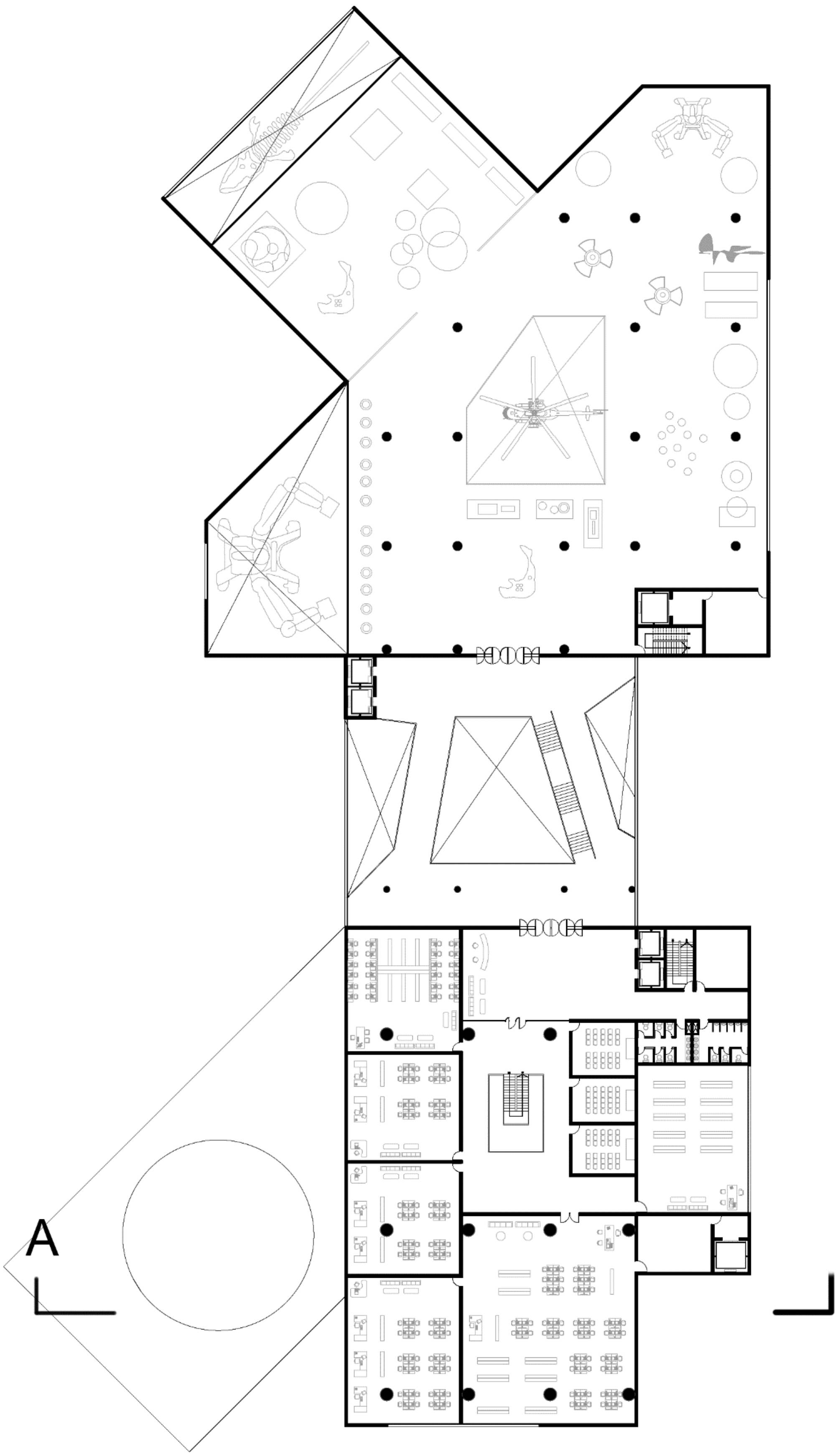
PLAN AT 27''-0"



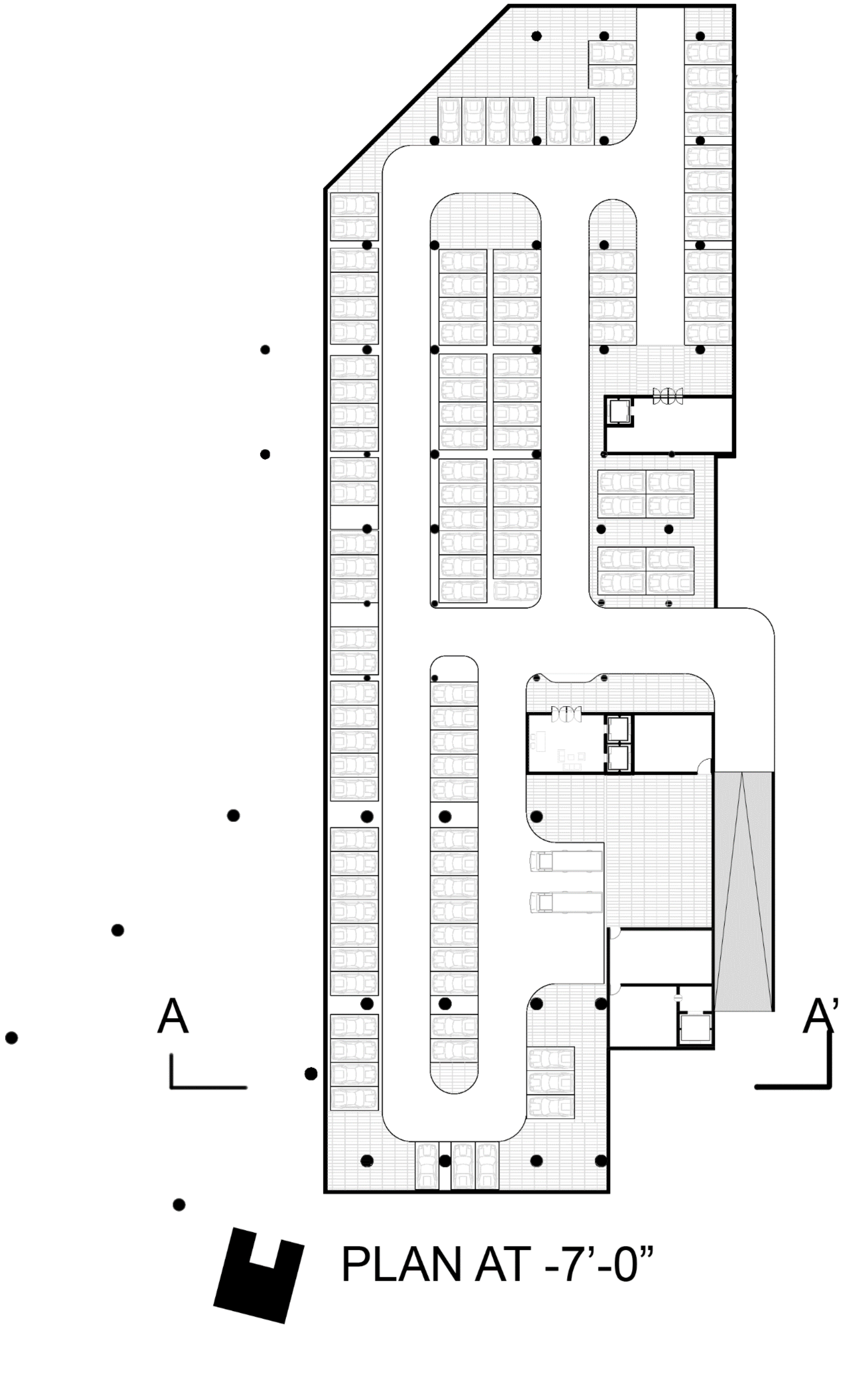
PLAN AT 42'-0"



PLAN AT 57'-0"



PLAN AT 72'-0"



PLAN AT -7'-0"

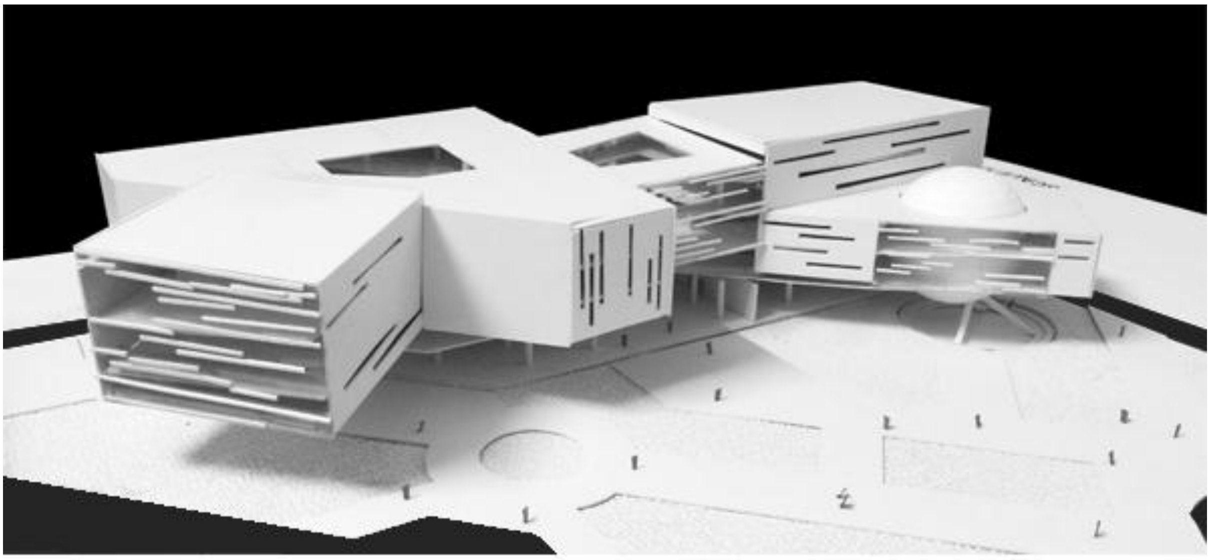
Elevation and Section

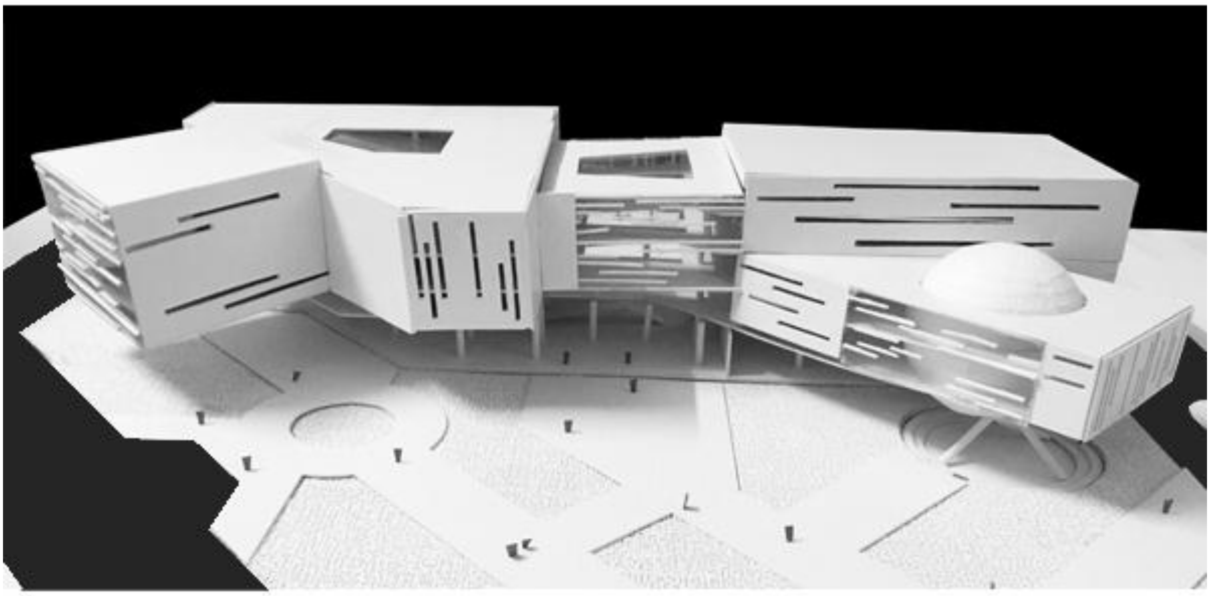
Fig: North West Elevation

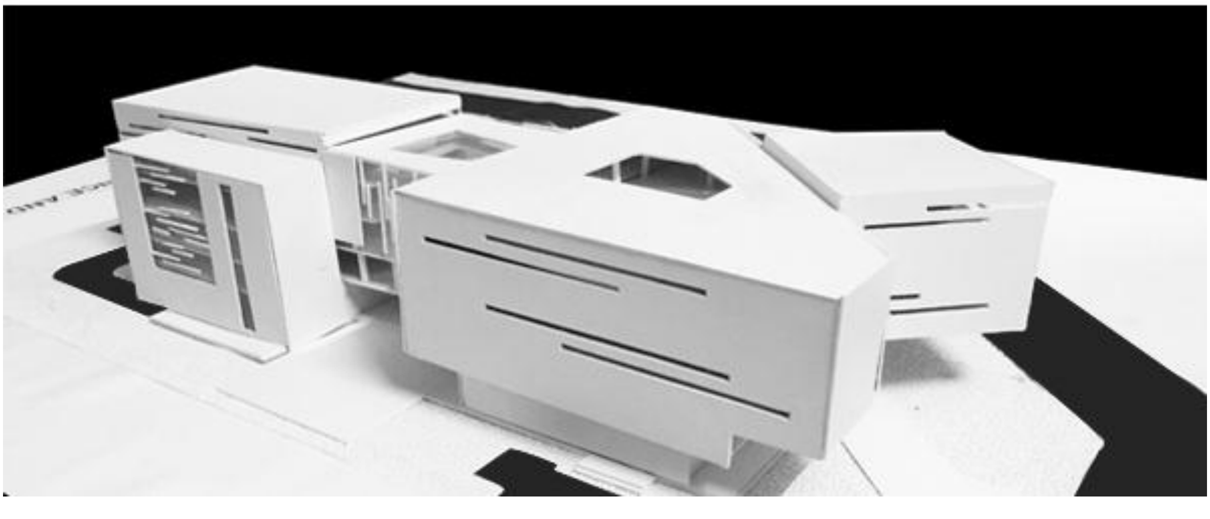
Fig: Section AA’

6.6 Perspective Views

6.7 Model photographs







CHAPTER 07: CONCLUSION

The new National Museum of Science and Technology strives to provide a notion about the past, present and future visions of science and technology and can attract people of all ages to the world of science and its technological advancement. The city demands a science museum in which activities based on science and technology can be organized on the basis of needs, interests and levels of the target group people, which include students, school children, youth and adults, working people, amateur scientists, and persons who want to broaden their horizon of knowledge. It can be a platform to foster science education and motivate the young generations to be more open to science and technology based activities which is very important for us to be able to go hand in hand with the current super paced world.

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