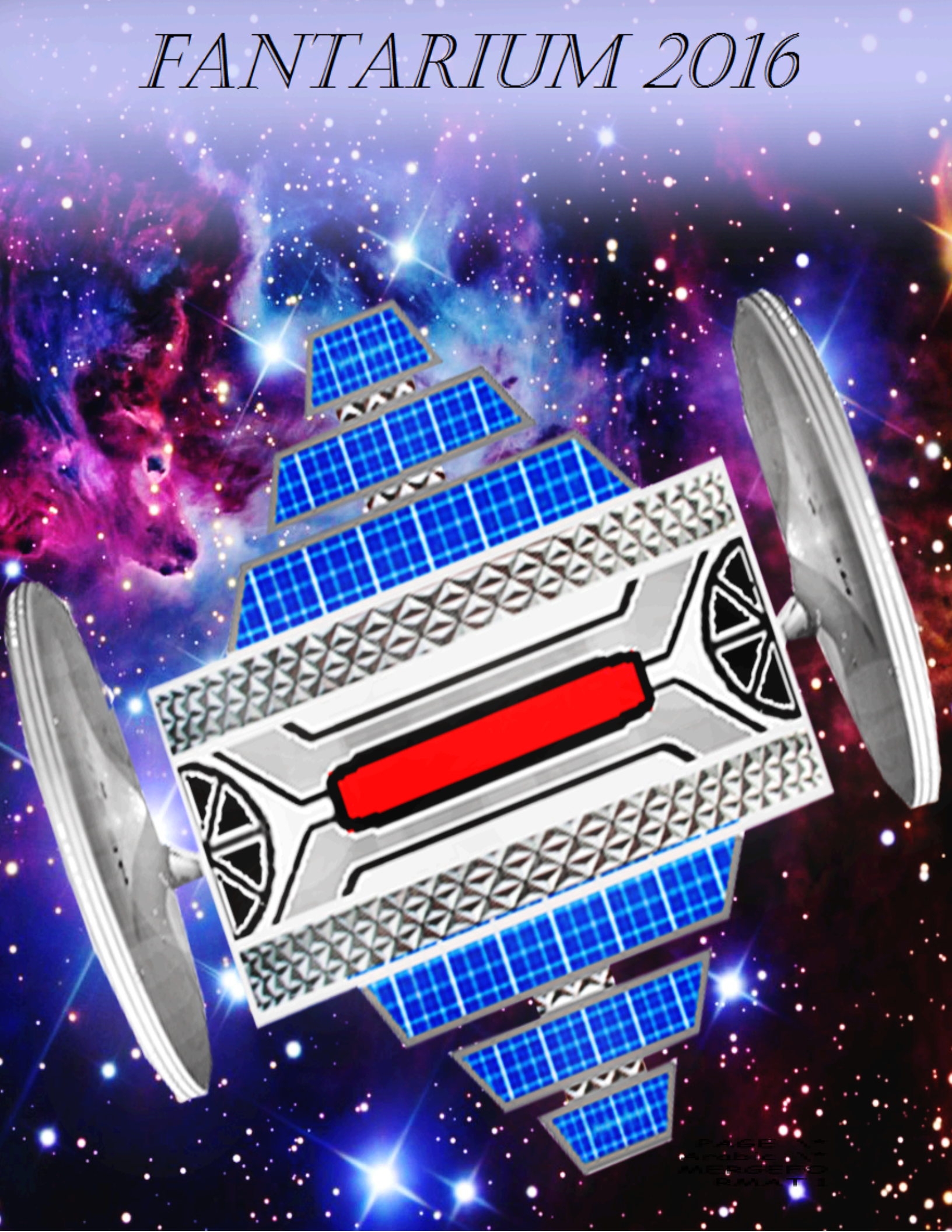
FANTARIUM 2016



Category: 10th grade, large group

The project is written, designed and described by a
Team of 10th grade students:

1. Anubhav Swamy
2. Tanmay Betrabet
3. Mayank Arya
4. Aarushi Saluja
5. Yash Jain
6. Anchal Gupta
7. Akshit Dhawan

The participants study at the Ryan International School –Gurgaon, Haryana, India.

EXECUTIVE SUMMARY

Every once in a while, a great thing comes around and changes the entire world. We believe that anything that we see in our dreams has to come true one day or another. For generations humans have dreamt of living in outer space, in a new settlement where life will be completely unique and people will be able to use the best of technology and utilize them for development, research and other purposes. This led to the birth of Fantarium.

We extend our sincere gratitude to the National Aeronautics and Space Administration (NASA) for giving us this opportunity to give thought to our dreams.

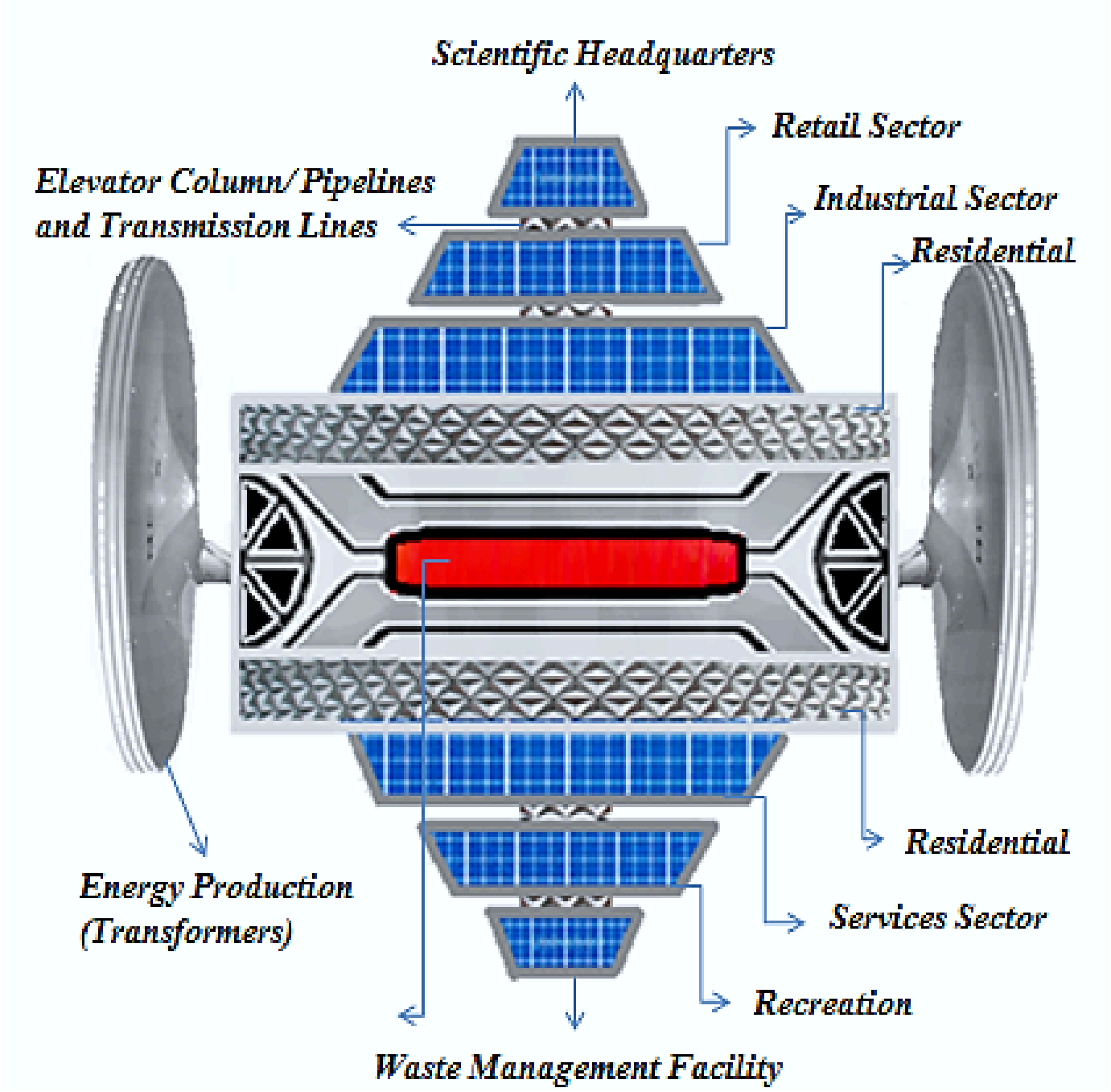
It provides a shelter and societal structure for 30,000 individuals and is invented to overcome the dream of millions of humans out there and to respond to humans need for a new place to accommodate, for a new place to explore in the outer space.

The project will cater the scientific needs and needs of many humans and will serve as a platform for space exploration, mining and many more things and especially perfect human settlements.

The project looks forward to launch research operations in cosmos and provide a launch base for operations on nearby planets and asteroid belt.

Fantarium is the first space settlement built by humans, but it is not intended to be the last. This mission serves as an experiment for future settlements.

STRUCTURE


Scientific Headquarters
Retail Sector
Elevator Column/ Pipelines
and Transmission Lines
Industrial Sector
Residential
Residential
Energy Production
(Transformers)
Services Sector
Recreation
Waste Management Facility

Like any other structure, our design also has various main divisions. Our settlement has been divided into following Primary components:-

- Inhabitation Area
- Buoyancy Tube
- Wiring and Pipeline connection of each floor
- Mechanism of Security and Safety
- Propulsion
- Locomotion
- Acceleration
- Docks

Inhabitation Area:

This is where all the life systems will exist. Here all the routines and activities will be carried out normally. It comprises of some sectors, each dedicated to a specific life system. All people will be living here and for their convenience, several facilities will be provided. The sectors will be accessible by elevator systems which will pass through the inhabitation column. The sectors are as follows:-

- Industries Sector
- Retail sector
- Recreation sector
- Services sector
- Scientific research sector
- Energy Sector
- Waste Management section
- Residential Sector

Wiring and Connection of each floor:

Each sector will be connected to the waste management sectors and energy matrix through the columns and pipelines that have been specifically provided for this purpose.

Safety and Security Mechanism:

We know the fact that Space comprises of large meteors/rocks, asteroids, comets, etc. To make sure that such objects and space debris doesn't collide with the settlement and to avoid destruction, loss of life and investment and also to guard against potential threats to the settlement, an advanced safety mechanism has been developed with the following key features:

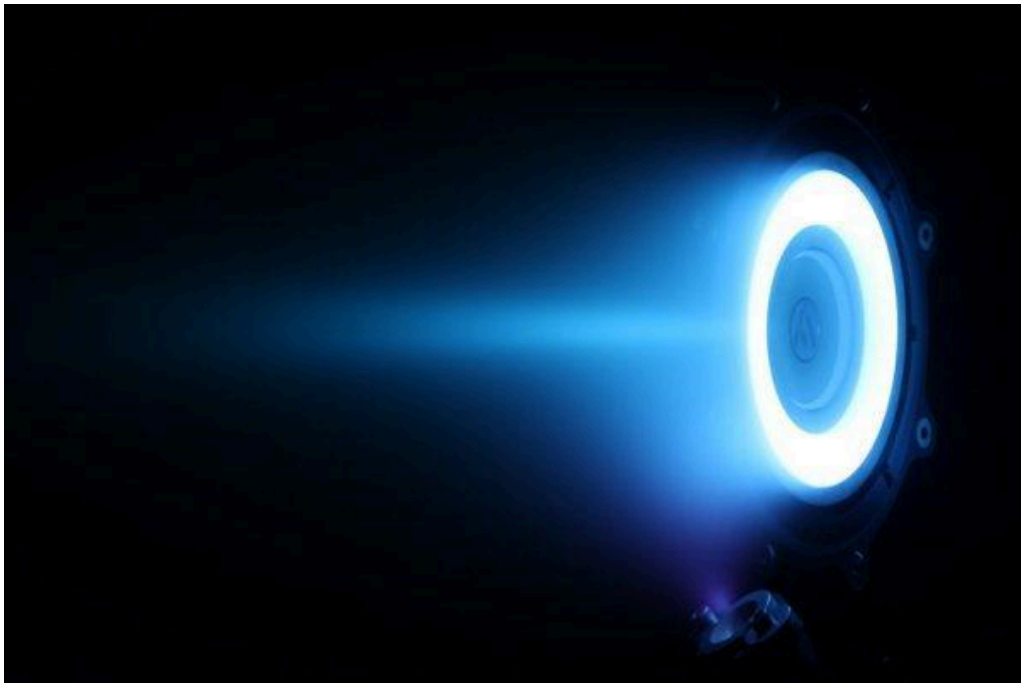
Photoelectric Sensors: These are positioned along the distance of the settlement that will sense potential threats, space debris, floating asteroids, etc. in a predefined nominal range around the settlement. It emits a ray of electromagnetic radiation, and observes for the changes in the return signal to sense the potential threats.

Rotor Mechanism: Rotors are the rotating segment of a centrifuge, which will also hold the rest of the settlement. These will be positioned along the centrifuge mechanism in the buoyancy tube. Their main purpose will be to rotate the settlement at an angle intended by the settlement's command central, so that it moves out of the path of any incoming threat; i.e. Space Debris, Meteor, etc.

Caution Alarms: These are positioned along the margin of the Inhabitation Area. These will alert the people of an incoming threat so that they can proceed into appointed safety zones without any fatality.

Propulsion, Locomotion and Acceleration:

To enable the settlement to move around in space, engines will be installed. For this settlement, we aspire to use Hall Thrusters. These use radio waves and magnetic fields to heat hydrogen gas up to 1 000 000°C and also to ionize the propellant to produce thrust and boost electrons with great skill. Some of these could also be utilized in the safety mechanism of the settlement to reform the aim of the project. Hall Thrusters have already been constructed and tested on Earth and also have been used for some satellites. These mechanisms are well organized and can have a remarkable thrust.



HALL THRUSTERS

For the purpose of locomotion in space i.e. for orbit correction or for the purpose of avoiding any approaching asteroid, comet or any other object or debris, the Fantarium needs to have a mechanism to move out of the trajectory to avoid collision. Various space projects have used various propulsion mechanisms but have never been on such a large scale as the Fantarium. To optimize the efficiency of the thrusters, they will be powered by liquid hydrogen fuel until the process of a stable nuclear fusion reaction on a moderate scale can be achieved. The thrusters will be large enough to exert a force of 200 Newton each and shall be placed along the outer surface of the structure. The jet propulsion fuel tanks will be situated within the structure itself and the operation of the thrusters shall be done from the operations control room in the heart of the structure.

Smaller propulsion thrusters shall also be placed to facilitate the rotation of the structure so that a centrifugal force is exerted on the people and all the objects inside the structure as well similar to laboratory centrifuges thereby attaining Earth like gravitational pull roughly equal to 9.8 m/s^2. This is a very important aspect of these thrusters as it would be impractical to try and generate this force in any other manner.

This propulsion method of using Hall thrusters may even be used during the time of correcting the orientation of the structure to improve the satellite connections with ground controllers at the operations base back on earth as well as communications with their friends and families. The orientation of the structure is important in these situations as in the past failure to establish connections once the satellite faces away from the Earth has led to the failure of various unmanned missions in the past such as India's Chandrayaan 1 which was a mission to the moon. Such kind of propulsion methods were also used in the recent Mars Orbiter Mission by ISRO where the thrusters were used to adjust the satellite's speed while entering into Mars's orbit and also while maneuvering the orbit expansion around Earth.

The thrusters will work on the principle of a reactionary force which will be exerted because of the heat being released from the burning of liquid hydrogen being used to propel the entire structure in the opposite direction. The jet propulsion tanks will be refueled at regular intervals as and when the maintenance shuttles from Earth would visit the Fantarium. The small thrusters of a scale close to 1 Newton could also be attached to each construction worker's suit, similar to a jetpack to assist in locomotion during EVAs and also to guide the large parts into place during the construction phase.

It would make maneuverability a little lower as compared to a suit without a thruster however with the proper training on the

operation of the suit thrusters, the time required for the completion of the project would greatly reduce and the efforts would also be optimized i.e. the amount of work that would be accomplished in every EVA would be significantly greater.



The thrusters would also come into use whenever a spacecraft from earth would be docking into the landing bays of the Fantarium. For the landing/docking of any such external ship on the surface of the Fantarium, the structure must be fixed as stationary as possible to reduce the chances of accidents and damage to expensive space equipment along with the precious lives of the astronauts on the spacecraft.

Docks:

Due to our settlement's exceptional goals, it will incessantly be interacting with the space throughout it. This makes the docks one of the most significant places in the settlement. 6 Docks will be provided. Two in the Scientific Research Sector, two in the Waste management section and two in the Industries Sector. The

first two and the last two will help serve as docks for skills that bring in space debris, etc. which will be sent to any of the four docks depending on the type of debris.

PRE-CONSTRUCTION PHASE

“Prepare before the execution and you will lead to success.”

The pre-construction phase will include the tasks with help of which construction phase and subsequent phases will be completed in better and convenient way.

It will include assembling the services, facilities, and required apparatus also it will include setting up of centers and various trainings would take place.

CONTROL CENTER: - This center would be established on the Earth itself. It will maintain constant access to the information of the city on mars and also help us to control all activities during construction phase, launching phase and transportation phase. All technical information about the city would be present in the center.

SERVICE CENTRE: - this center would include the dummy of the atmosphere of the settlement. This would help the citizens to adapt the atmosphere easily. Human training would take place in this service station itself.

EXPLORATION UNIT: - this unit would include a team of approximately 25 people who would go on mars and in outer space to explore resources there. This process would take place because if we find any essential resource it would be much cheaper from earth this martial would then be used in the construction of Fantarium.

MANUFACTURING FACILITY: - this facility would provide martial from both mars and earth during the construction phases. And all other material which would help in the success of the city.

CONSTRUCTION PHASE

In this phase construction of the city will take place. The phase is distributed into 3 phases.

Phase 1:- in this phase construction of torque and transformers would take place

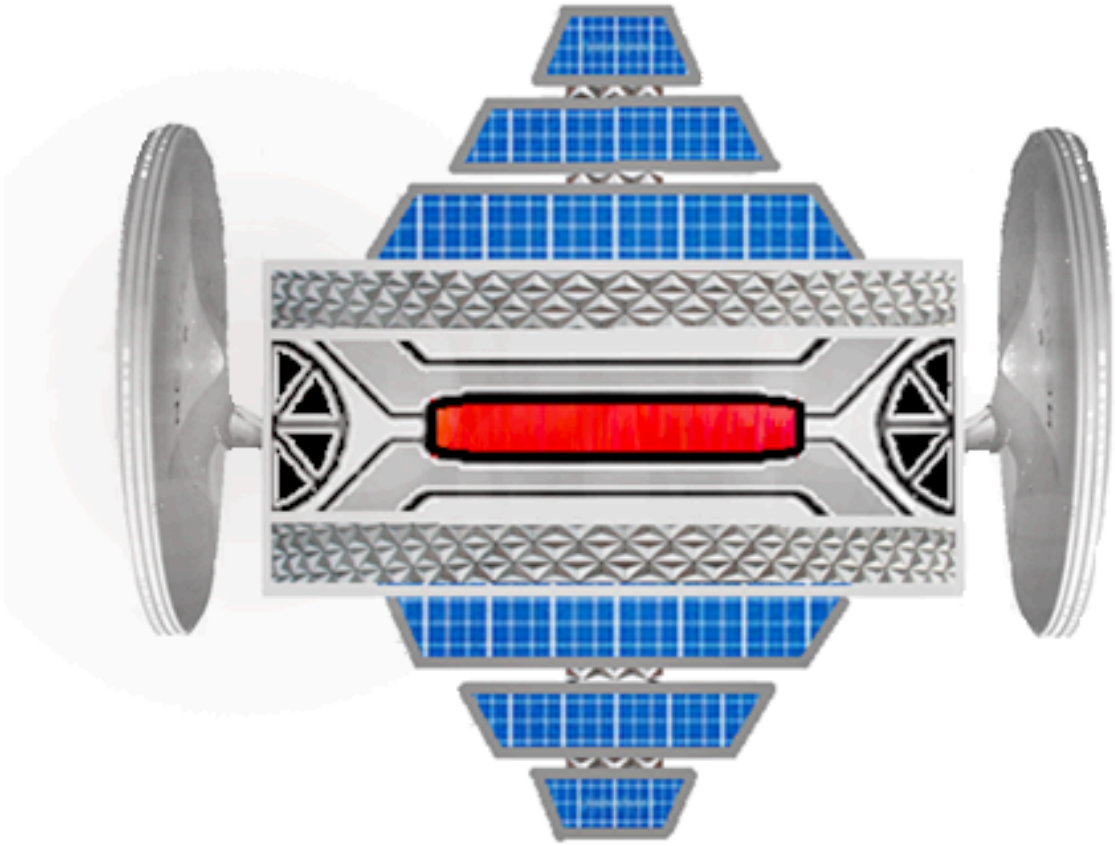
Phase 2:- in this phase construction of outer layers would take place. This includes residential area, industrial area and various other sectors.

Phase 3:- this would be the final stage in which all the wiring, insertion of pipeline and solar panels would take place.

PRIMARY FORM

A glance at the settlement

Phase 1



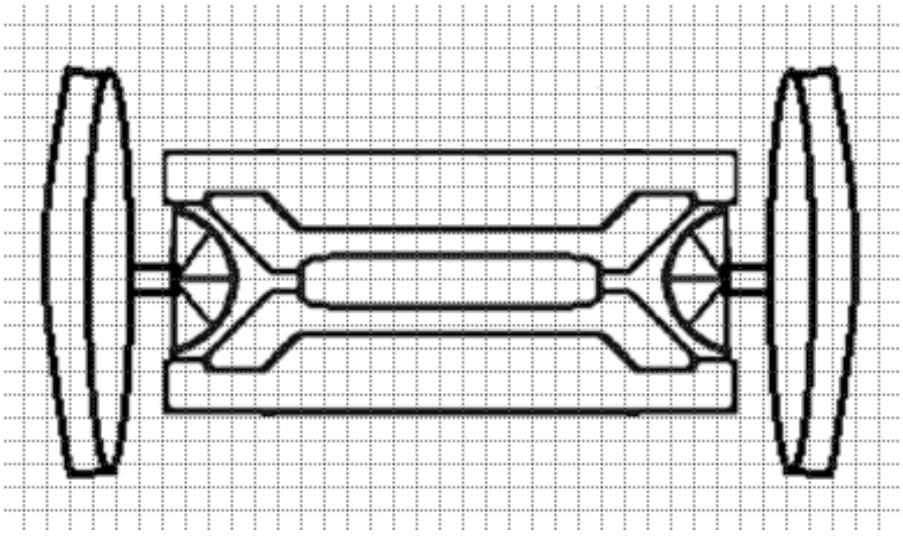
Constructed which is the torque.

(Torque is the tendency of a force to rotate an object around the axis.) This would help our city to rotate and cause the gravitation. It is a rectangular surface which acts like the center of our city. And on either side of the torque would be transformers. In the transformers electricity would be produce.

Construction of this would take 2 years approximately.

The material that would mainly be used would be titanium, nickel, zirconium etc.

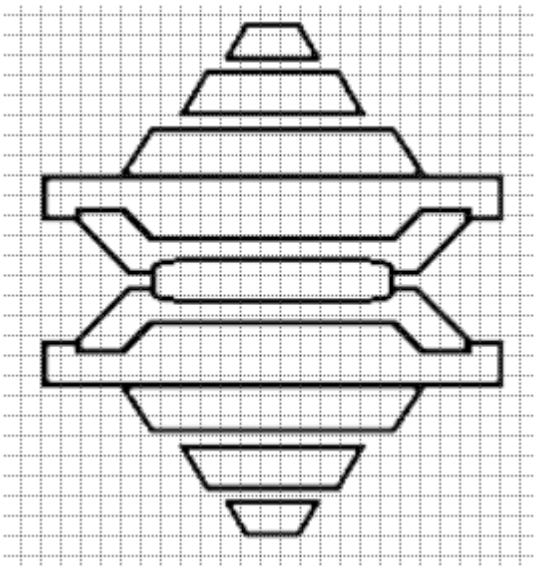
Construction of torque and transformers



Phase -2

In this phase construction of residential area, service sector, industrial sector, scientific headquarters, recreational sector and waste management facilities would take place. Which means this phase could be called the main phase as construction of the most of the city take place. For this we would have different kind of metals both from earth and mars. This stage would complete the structure of our city.

Approximate time needed would be of 5 years.

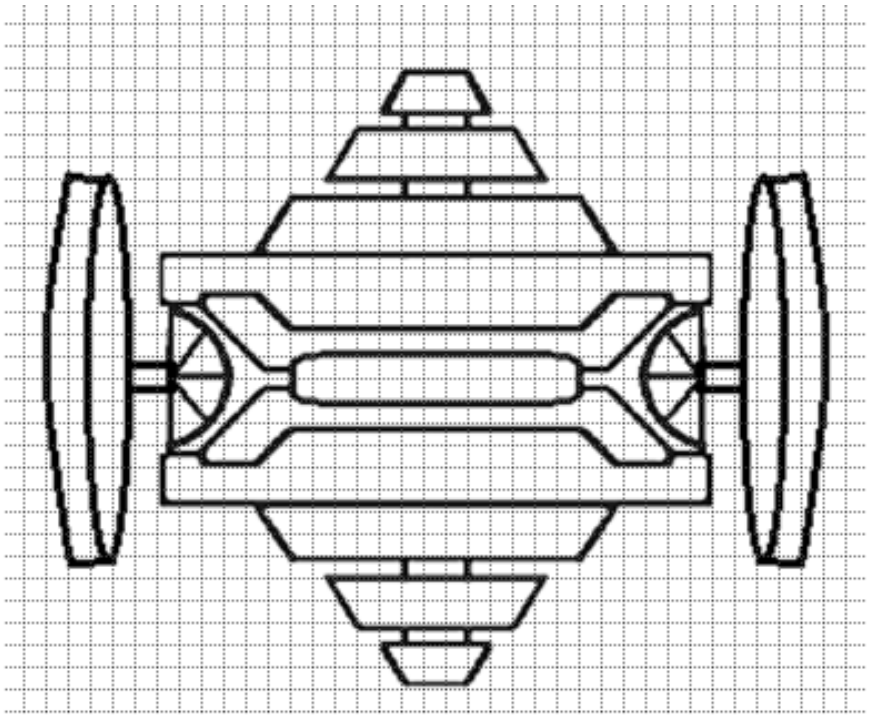
Construction of  outer layers (torus)

Phase-3

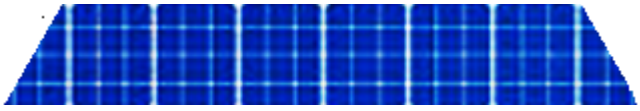
This would be the final stage which will include insertion of pipelines that would carry gas n liquids in homes, wires to provide electricity and solar panels to convert solar energy into other forms of energy. This phase would be known as the finalizing phase which would approximately take 2 years. It would also include setting up of agriculture. Thorough checking of the city would take place.

After the work of insertion is the several test would take place to find any kinds of leaks. The security systems and cameras would also be installed.

The city would be fully constructed in and out and would be ready for other phases. After which launching mechanisms would also be attached.



The final stage



Installing of solar panels on the rings (torus) to convert solar energy into other forms of energy

HABITATION PHASE

This phase would take place after our city is completely designed. After our city is completed and before it is launched to space. In this phase all the trained people would stay for 2-3 weeks so that they can experience a life in space before they go there. For that phase they will have no contact with the outer world. They will work there, eat there, and sleep there. So that we would get to know if there is any minor or major fault in our city or if the city is lacking in some kind of facility. And we could improvise that in the city. Not only we could improvise the city but the citizens of the city would also get to explore it and get familiar with it. And further training of the citizens would take place before they are sent to the mars to settle there and begin with their new life.

MONITORING PHASE

Monitoring phase would take place after the city is well settled in the space. This phase will take place for almost a year. As we did before the city was launched in habitation phase every single detail would be under observation. Any technical error related to the city would be solved. Or any health related hazards would be taken care of. This phase would check the working of our city. And if any problem occurs, it would be fixed.

LAUNCH PHASE

In this phase our city would be send to the outer space.

To place Fantarium into orbit, we prefer the use of the following.

- Launching vehicle: - this vehicle will help in launching of the city. It will help to take off from the earth's surface to the orbit.
- Altitude control: - when the city is launched altitude control subsystem is must as it has sensors and actuators which senses the outer force and respond to it
- Apart from this we need thermal receptors, communication, GNC, power system would also be installed.

The drawbacks are that these may allow a space launch into a lowest path. However, this issue will be solved by the Hall Thrusters, which are already inserted in the settlement.

ARTIFICIAL GRAVITY

Gravity plays a really important role for existence of life on earth. And its true life existence without gravity is not possible. As gravity plays a major role for maintenance of air pressure and several other important phenomena that if it's not there then human body could suffer from several deadly diseases.

As the gravity of earth is $9.8m/s^2$ we need to acquire same force of gravity on our city so that it's easy and comfortable for our citizens to adjust in the city.

Gravitation can be acquired by different methods:-

- Rotation
- Linear acceleration
- magnetism
- hypothetical gravity generation

If we take linear acceleration as our prime method to produce gravitation it will consume a large amount of energy as this kind of production of gravitation is recommended for smaller surfaces.

For using magnetism we need high power magnets all around the city with complex mechanism which could affect the working of our city. Hence this method is not the most appropriate method to produce gravitation

Hypothetical gravitation generation is an idea of a device that produce gravitation but this device has not been found yet.

The last method left is of rotation.

In this method centrifugal force is used to produce gravitation.

As per the calculations the rate of rotation is 0.94rpm and the rate of rotation in which the human body is comfortable is 1rpm hence there would be no chance of any disease.

This rate of rotation would be achieved with help of generators and other machineries.

MICROGRAVITY SIMULATOR

Before any human can enter into any environment having a gravitational pull weaker than that experienced on Earth, he or she needs proper training to survive and function properly and also that person's body must adapt to such environments. Therefore before the inhabitation or construction of Fantarium all workers and residents would have to go through a training procedure at the microgravity simulator facility.

Modeled along the lines of the Neutral Buoyancy Laboratory at NASA's Sonny Carter Training Facility this simulator would be more effective as compared to the reduced gravity aircraft. Even though the use of water has been questioned in the past due to the drag or resistance offered by it, other liquids such as chloroform, methylene chloride, trichloro ethylene and ethylene dichloride may be used. All of these liquids have a dynamic viscosity less than water thereby reducing the drag and also have a higher density than water. This makes them a better option as compared to water as the buoyant force would be greater and drag would be reduced which would help to give a more realistic simulation of space environments with zero gravity. But some of these like trichloro methylene are known to have an adverse impact on a person's health due to prolonged exposure. However the most affordable and least toxic of the liquids is methylene

chloride and this could be used to optimize the use of the simulator.

This simulator would have to be kept in a secure location and all persons undertaking the simulation must be careful not to damage any equipment and must not directly consume the methylene chloride in the pool.

Having such a facility would be helpful as the workers involved in the construction of the project in space must be aware of the challenges posed in zero gravity conditions during EVAs (extra vehicular activities) as a person wouldn't be able to use his or her own body weight to perform activities requiring the person to use reactionary force to perform the activity such as even pushing around equipment and tools. Getting used to such environments would also help the residents to get used to such environments. Any normal human would start feeling nausea and muscular degeneration very soon without experience of this sort and therefore to avoid this situation which we would call space-sickness, training at this facility must be made mandatory. Even though Fantarium would have adequate mechanisms to simulate earth like gravity, residents must be prepared for any sort of situation that may arise due to a failure of this system for a short span of time or for the time during the inhabitation before the gravitation mechanisms are in place.

Operations and Infrastructure

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OPERATIONS AND INFRASTRUCTURE

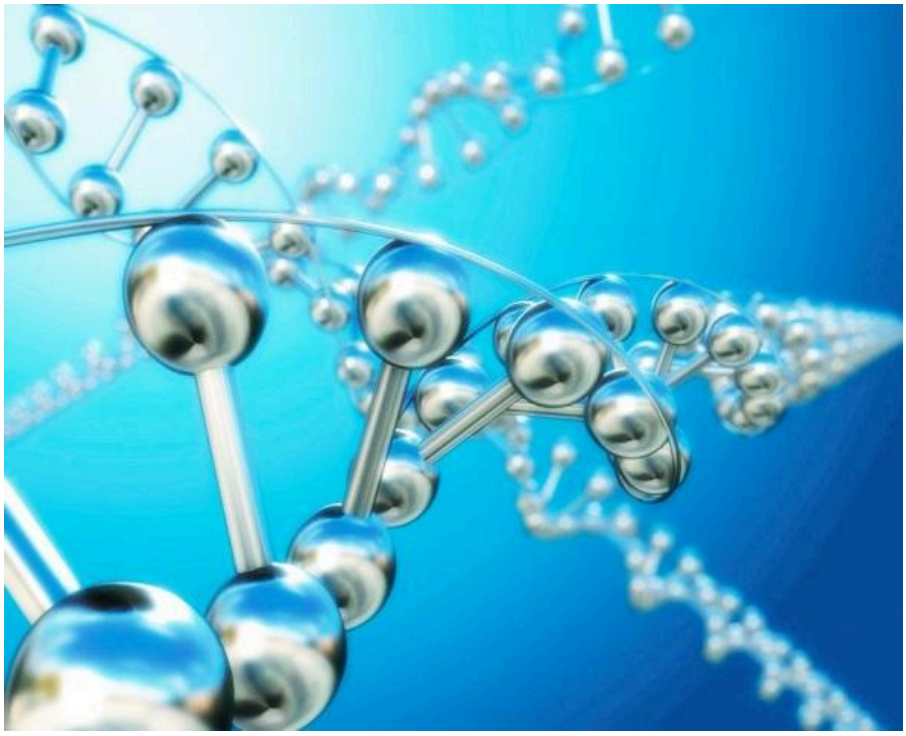
This section talks about the management of various things, for ex. Water, food, waste and the electricity generation. To make this city work these all are critical requirements that needs to be fulfilled. The population of Fantarium will be 30000.

POPULATION	30000
RESIDENTS	27000
TOURISTS	3000

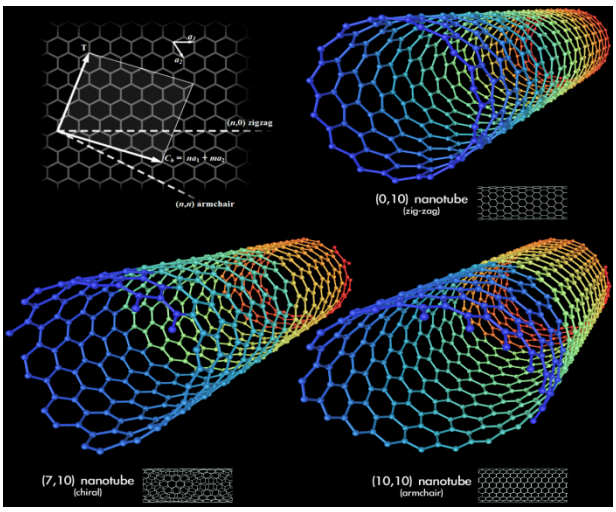
CONSTRUCTION MATERIAL

MACRO COMPOSITES

- This material can stand extreme temperatures which make it suitable for our space city and it may also be used in aerospace industries in The future.
- They are also cost effective and are easily available.
- Their strengths can be tailored according to the requirement and are environmentally resistant.



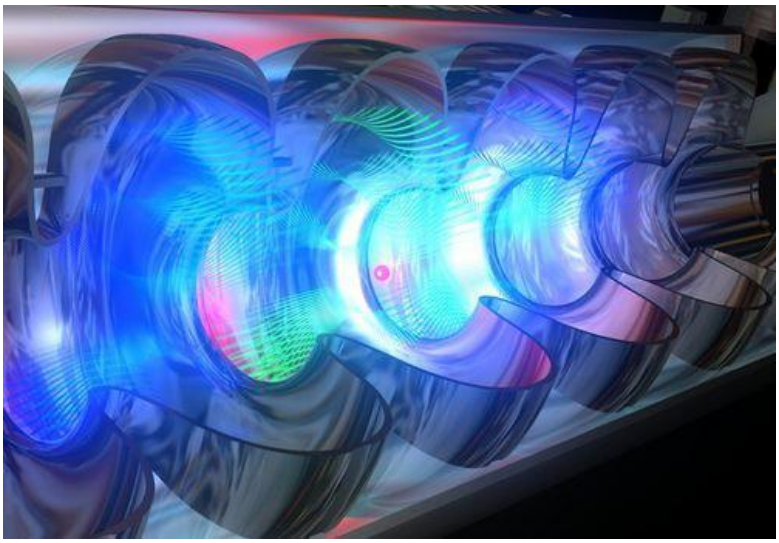
CARBON COMPOUNDS



- Carbon compounds are used in various things in our space city.
- CARBON NANO TUBES: these will be used in structural support due to its high tensile strength and ability to withstand high temperatures.

ALUMINIUM OXYNITRIDE

- It has a high tensile strength and very high melting point.
- It will be used for glass industry.
- It has high density and it is a high performance fiber.



INCONEL

- The hinges on the space shuttles are made of an alloy Inconel, which can withstand high temperatures.



SIALON

- It has a high tensile strength and has an excellent thermal shock resistance and low thermal expansion.



STAINLESS STEEL

- It will be used for the construction for the inner surface.

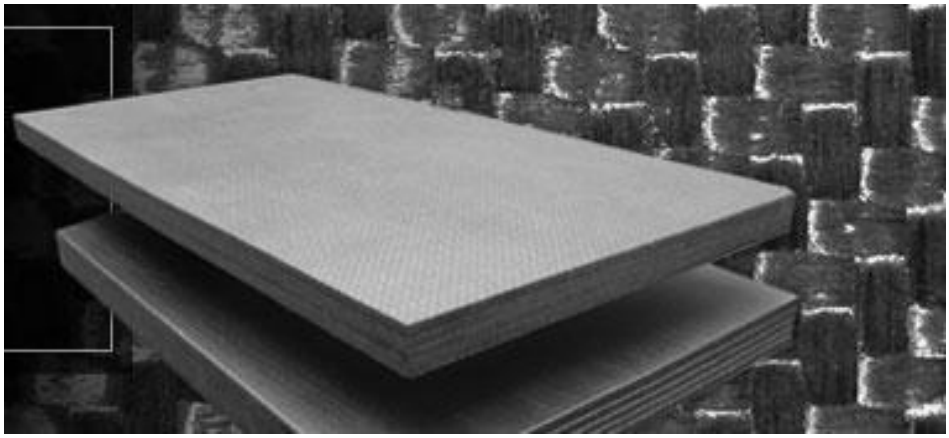
SEALANT GEL

- Restricts formation of air bubbles and cracks on silicone gel, Combustion resistant properties 50 MPa for filling up impact affected areas.



GRAPHITE COMPOSITORS

- These are light weight and can tolerate extreme temperatures.
- It would help to cut cost with durability.



WATER MANAGEMENT

Water is clean in Fantarium but it needs to be regularly recycled. Unlike earth all waste products and black water needs to be recycled too. In Fantarium we will not use treatment plants that use toxic chemicals which can be harmful for the people. We will not use any biological treatment because it will be too ineffective and will not serve our purpose of recycling water in large amounts.



Water Usage

We need to calculate the water usage by the population of the Fantarium.

Each person requires approximately 1.8 litres of water every day and almost 2 litres of water for cooking. Also, each person will need 13 litres for hand washing and 48 litres for showering. Assuming 5 flushes by each person every day, we will need about 22L of water every day. We can also use gray water for flushing and then the water will be recycled and also the water for flushing will be reduced to zero. Other water Uses (Dishwashing, cleaning, recreation) can amount to about 30L / Day. So, the total water use by each person amounts to 95L/Day. This means that the water system must be capable of processing 2850000 L of water every day.



WASTEWATER MANAGEMENT

Ultraviolet germicidal irradiation (UVGI) is a disinfection method that uses short-wavelength ultraviolet (UV-C) light to kill or inactivate microorganisms by destroying nucleic acids and disrupting their DNA, leaving them unable to perform vital cellular functions. We will be using this method in our project.

A disadvantage of UVGI is that while water treated by chlorination is resistant to reinfection (until the chlorine off-gasses), UVGI water is not resistant to reinfection. UVGI water must be transported or delivered in such a way as to avoid reinfection.

In UVGI systems the lamps are shielded or are in environments that limit exposure, such as a closed water tank or closed air circulation system, often with interlocks that automatically shut off the UV lamps if the system is opened for access by human beings. These shields make sure that humans are not affected by ozone.

The UVGI system can clean large amounts of water thus only 2 reactors are enough for processing about 500,000 L of water.

UV light is electromagnetic radiation with wavelengths shorter than visible light. UV can be separated into various ranges, with short-wavelength UV (UVC) considered "germicidal UV". At certain wavelengths, UV is mutagenic to bacteria, viruses and other microorganisms.

Particularly at wavelengths around 250 nm–260 nm, UV breaks molecular bonds within microorganism DNA, producing thymine

dimers that can kill or disable the organisms. It is a process similar to the effect of longer wavelengths (UVB) producing sunburn in humans.

Microorganisms have less protection from UV and cannot survive prolonged exposure to it.



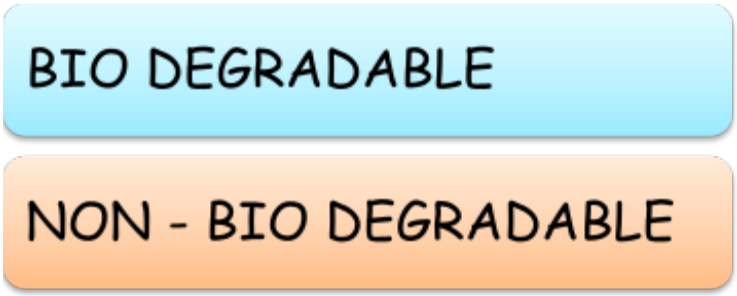
A UVGI system is designed to expose environments such as water tanks, sealed rooms and forced air systems to germicidal UV. Exposure comes from germicidal lamps that emit germicidal UV electromagnetic radiation at the correct wavelength, thus irradiating the environment. The forced flow of air or water through this environment ensures the exposure.

Safety Margin

when the reactor fails to work it will take a lot of time for repairing, thus during that time water restrictions will take place. Also we will have a backup of about 1 million L of water in our city so that the everyday life does not get disturbed

WASTE MANAGEMENT

The waste will be classified into two categories:



The Bio degradable waste will be further sorted out for agricultural use. Bio degradable wastes will be made fertilizers and manures.

The other Bio degradable waste will be treated which will be further used for power generation.

NON BIO DEGRADABLE WASTE MANAGEMENT

we will use the system of thermal di- polymerisation to manage the non-bio degradable waste. Thermal depolymerisation (TDP) is a depolymerisation process using hydrous pyrolysis for the reduction of complex organic materials (usually waste products of various sorts, often biomass and plastic) into light crude oil.

It mimics the natural geological processes thought to be involved in the production of fossil fuels. Under pressure and heat, long chain polymers of hydrogen, oxygen, and carbon decompose into short-chain petroleum hydrocarbons with a maximum length of around 18 carbons.

The process only breaks long molecular chains into shorter ones, so small molecules such as carbon dioxide or methane cannot be converted to oil through this process. However, the methane in the feedstock is recovered and burned to heat the water that is an essential part of the process.

In addition, the gas can be burned in a combined heat and power plant, consisting of a gas turbine which drives a generator to create electricity, and a heat exchanger to heat the process input water from the exhaust gas. In this way the small molecules are used. The fuel that will be provided by this system will be further used in the industrial sector of this city.

Placement

There is a particular sector present for the waste management in which the system will be placed. The sector is away from the recreation part and the tourist's spots of the city because these systems might produce smell which may hamper the development in tourism sector of the city thus a particular sector is assigned for waste management.

Both types of waste will be treated properly in Fantarium.



FOOD MANAGEMENT

Access to food and nutrition is very important. To maintain high standards of living, access to food is necessary.
In the beginning the Fantarium will have to import food from earth but after some time it will be capable of manufacturing food products.



People will be urged to eat healthy food to avoid health problems.

Maintaining a buffer stock is very important thus a buffer stock will be maintained round the year in case of shortage of products and will be circulated in the market before it rots.

A person must get about 2500 calories of food per day thus growing crops which satisfies the above will be our target.

Food in Fantarium will only be vegetarian and no animal will be consumed.

The necessary proteins required can be obtained from soybeans.



Vegetables and fruits rich in protein will also be consumed.

Potatoes are a good source of carbohydrates and can grow at

room temperature thus potatoes will also be grown in Fantarium.

AEROPONICS



Crops will be grown in Fantarium by using aeroponics. Aeroponics is the process of growing plants in an air or mist environment without the use of soil or an aggregate medium.

Less amount of water is used in aeroponics.



A particular body will be made to supervise farming in Fantarium. Through Aeroponics the intended crops through which the nutrition needs to be fulfilled can be grown. The population of Fantarium is 5000 and 1 kg per person every day makes 5 tons of food for production every day and 1825 tons per year. 182 kg can easily grow in 1 square metre, thus 1000 square metres is more than enough for the cultivation of crop.

Commercial systems:

Commercial aeroponic systems comprise high-pressure device hardware and biological systems. The biological systems matrix includes enhancements for extended plant life and crop maturation.

Biological subsystems and hardware components include effluent controls systems, disease prevention, pathogen resistance features, precision timing and nutrient solution pressurization, heating and cooling sensors, thermal control of solutions, efficient photon-flux light arrays, spectrum filtration spanning, fail-safe sensors and protection, reduced maintenance & labour saving features, and ergonomics and long-term reliability features.

Commercial aeroponic systems, like the high-pressure devices, are used for the cultivation of high value crops where multiple crop rotations are achieved on an on-going commercial basis.

Advanced commercial systems include data gathering, monitoring, analytical feedback and internet connections to various subsystems.

ATMOSPHERE

The atmosphere of Fantarium will be similar as that of the earth. The atmosphere must contain partial lung pressure, High enough to provide partial pressure above the lung vesicles. The pressure must be at least 13.5 kPa.

The level of Carbon dioxide must be maintained and it must be below 0.4 kPa.

The temperature will be around 25 to 30 degree Celsius. The humidity will not be more than 40 %.

The atmosphere will have 21 % oxygen and 78% of nitrogen and small amounts of carbon dioxide and argon. Carbon dioxide must be high enough for the process of photosynthesis.

Every person needs about 16 cubic metres of air thus we need to have 80000 cubic metres of air every day (16 x 5000). The atmosphere in different sectors will be variable.

Removal of microbial activities is necessary for the betterment of the health of people and the air must be cleaned from time to time for preventing it to become stagnant.

The filters can purify the air and sampling of air would ensure that the filters are working properly and if there is need for repairs or cleaning of the filters.

AIR REQUIRED PER PERSON PER DAY	18 m^3
TOTAL NO. OF PEOPLE	30000
TOTAL AIR REQUIRED PER DAY	540000 m^3

ELECTRICITY GENERATION

Energy is very important for the everyday life and in this project we will use various types of energy for various purposes.

The energy resources that will be utilised in this project are:

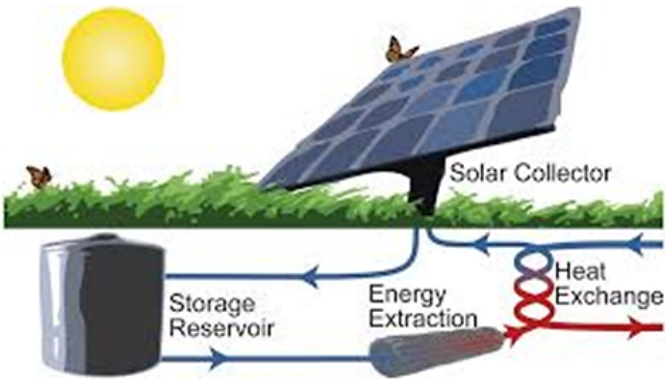
- Solar energy
- Nuclear energy
- Hydrogen





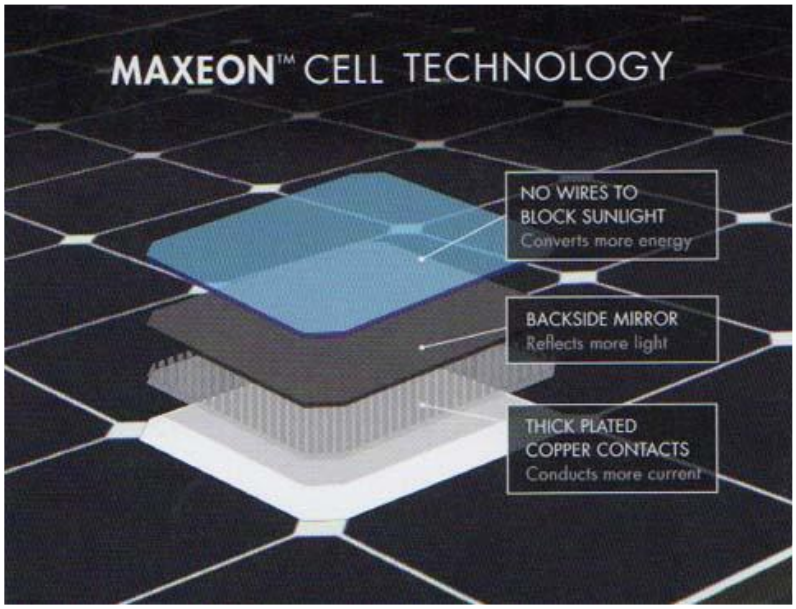


SOLAR ENERGY



Solar panels will be installed in the energy production sector of our project. We will be using the Maxeon cell Technology which is made of mono crystalline silicon solar photovoltaic cells with high efficiency developed by 'Sun power', with efficiency of 21.5%.

Silicon solar cells typically consist of a thin layer of silicon chemically treated to produce an electrically active layer near the front that produces electricity when the sun shines on it. Collecting that energy is normally handled via a series of very fine wires embedded on the front.



Off-grid PV systems have traditionally used rechargeable batteries to store excess electricity. With grid-tied systems, excess electricity can be sent to the transmission grid, while standard grid electricity can be used to meet shortfalls.

Thermal mass systems can store solar energy in the form of heat at domestically useful temperatures for daily or interseasonal durations. Thermal storage systems generally use readily available materials with high specific heat capacities such as water, earth and stone.

These methods can also be used to store solar energy.

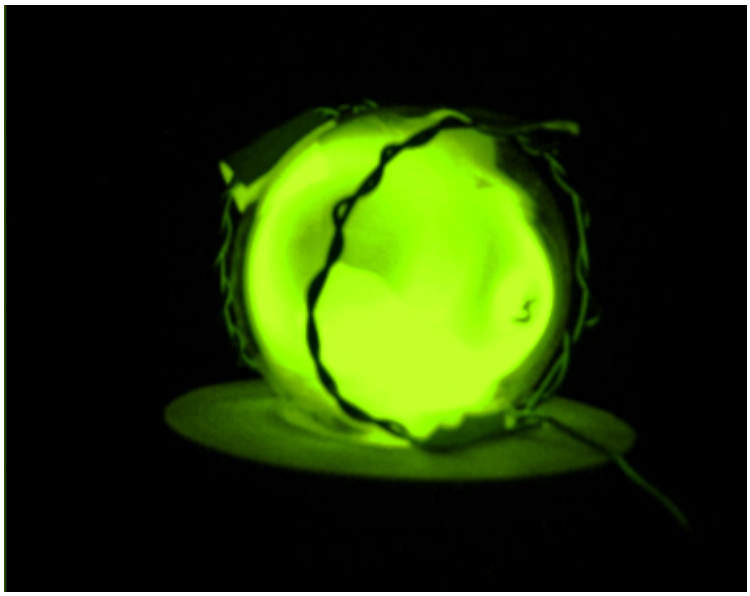
The solar energy will then be converted into electricity and will be circulated in the city.



NUCLEAR ENERGY



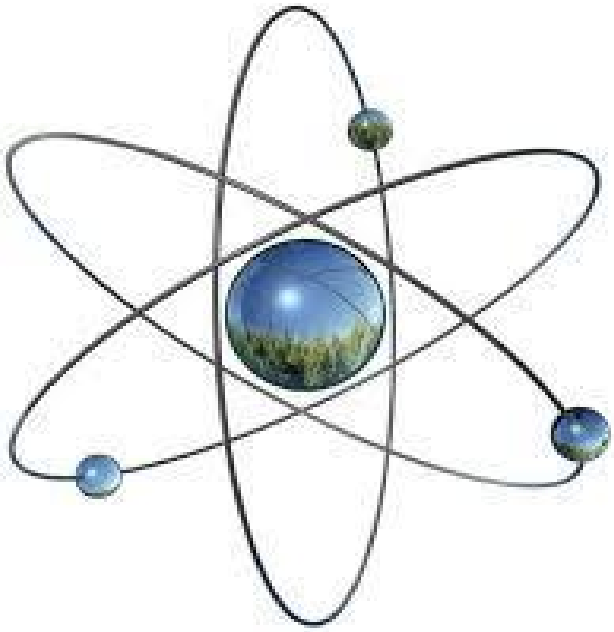
Another source of energy on the settlement would be nuclear energy, produced through nuclear fusion. Helium 3 is a non-reactive and a non-radioactive isotope of helium made up of 2 protons and 1 neutron. It can be used in nuclear fusion reactors for the production of electricity.



In fusion of helium 3, a helium 3 atom is bombarded with deuterium atom giving off a highly excited proton and helium 4. The mass of the products is slightly less than the mass of the reactants.

This lost mass is converted to produce energy for the production of electricity.

Helium 3 though is not present in abundance on earth but is available in plenty on moon. It can be obtained from moon rocks and then electricity can be generated in the energy production sector through nuclear fusion.



The properties of helium 3 have not yet been discovered fully but the production will depend in quantity. Also the fusion reaction will not produce any harmful greenhouse gases in that sector and the nuclear radiation is also low which makes it perfect for producing nuclear energy.

HYDROGEN



There are two ways in which we can produce hydrogen:

- Steam reforming
- Plasma pyrolysis

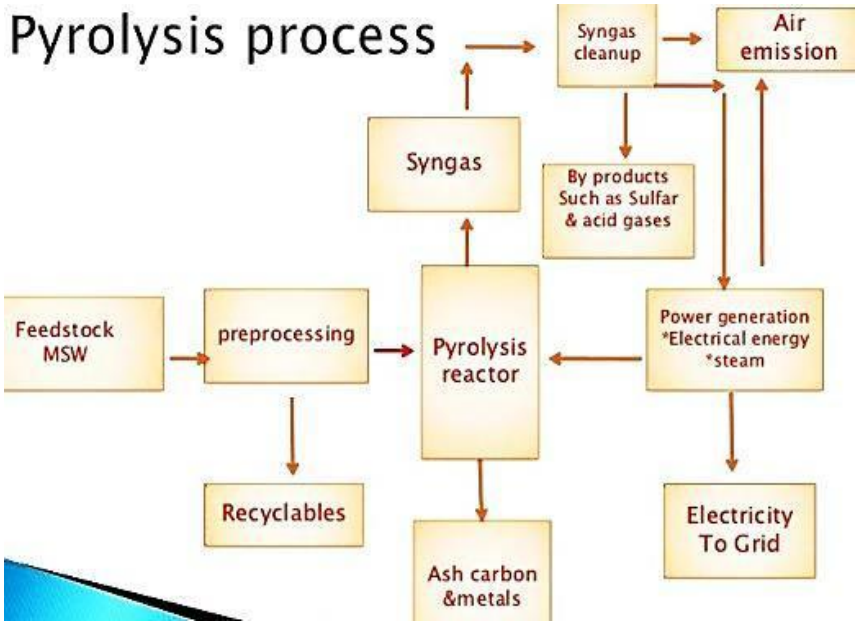
Steam reforming:

Steam reforming is a method for producing hydrogen, carbon monoxide, or other useful products from hydrocarbon fuels such as natural gas. This is achieved in a processing device called a reformer which reacts steam at high temperature with the fossil fuel. The steam methane reformer is widely used in industry to make hydrogen.

Steam reforming of gaseous hydrocarbons is seen as a potential way to provide fuel for fuel cells. The basic idea for vehicle on-board reforming is that for example a methanol tank and a steam reforming unit would replace the bulky pressurized hydrogen tanks that would otherwise be necessary.

Plasma Pyrolysis:

Methane is produced as a byproduct of this reaction. Plasma Pyrolysis would be used for separation of hydrogen from methane.

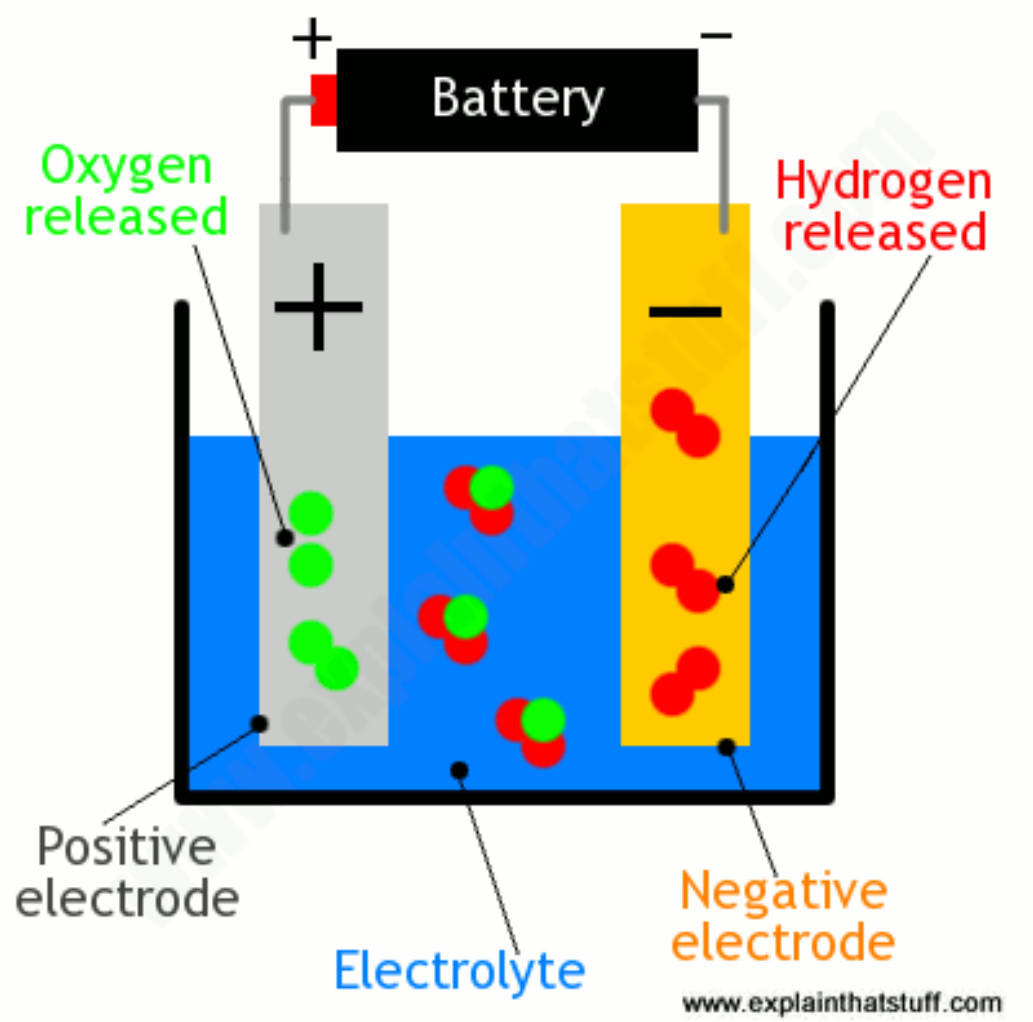


As Plasma Pyrolysis doesn't use any catalysts, the apparatus is subjected to a long term use. The hydrogen obtained would be used as a fuel for cars and various other machineries.

The hydrogen obtained would be pumped in the vehicles as a fuel for the fuel cell. In fuel cells, the hydrogen electrons would be separated from the protons through a chemical reaction.These electrons would produce electricity required for movement of the car. Then these electrons would combine with hydrogen ions and oxygen leading to the production of water which in presence of heat changes to steam which comes out as the exhaust.

ELECTROLYSIS

Hydrogen will also be produced by electrolysis of water which will be done from the water obtained by the purifiers and the oxygen will be used for breathing.



ELECTRICITY CONSUMPTION



Electricity will be mainly consumed in the residential and the industrial sectors in Fantarium.

DESCRIPTION	QUANTITY
DOMESTIC	90 MW
VEHICLE BATTERY CHARGING	45 MW
PUBLIC UTILITIES	40 MW
INDUSTRIAL POWER	100 MW
OTHER USES	30 MW

TOTAL CONSUMPTION BY THE FANTARIUM IS EQUAL TO 305MW.



PAGE * Arabic * MERGEFORMAT 1

HUMAN FACTORS

This phase will give you the basic formation of how humans at these new surroundings could live with any complications like those we face on Earth right now. The high levels of pollution, uncontrollably growing population, and lack of employment, illiteracy, and reduction of residential places and others like these are big issues on Earth. To make sure these issues do not affect the efficiency in this new city we have made some plans to make people start a new life here.



SIMULATOR TRAINING

Introducing a new city makes an altogether new challenge for the human race. Centuries have crossed by the early humans to understand some basic activities like finding food, basic clothing and shelter and then they have got on to research about the other complex issues like usage of nuclear power and geothermal energy usage. Fantarium will firstly focus on training a handful of people on how to do some basic activities which will further help them train a large bunch of people.



The training will start focusing some basic issues like how will we train people in building houses and how to live in them till how will the industries be run.

Similarly this training will help the doctors to understand the basic surroundings of the place and help them undergo changes in their basic medical courses. The number of people at first shifted here will be undergoing this special training to get used to the basic environment of the scenario and undergo the changes as according to their profession.

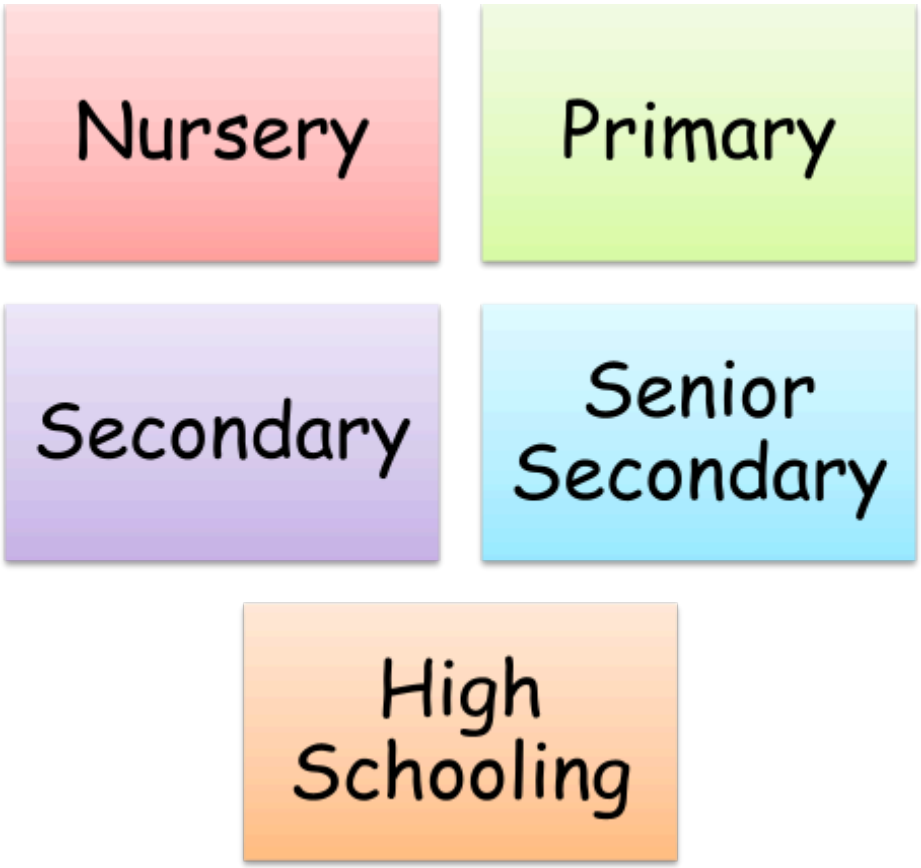
This training will not just help the adults to understand the new aspects of their job but can also be used to increase the knowledge and skills of the students of various classes as by moving in the city the basics of education will change. As by this we would like to state that one of the most basic things to do



on our new city is training simulation.

EDUCATION

As our new city develops, it becomes all the more important for us to modify the methods of education in our new city. Various methods of education can be used in the schools made in the Fantarium. The system of education would be divided into 5 areas: -



Nursery and Primary

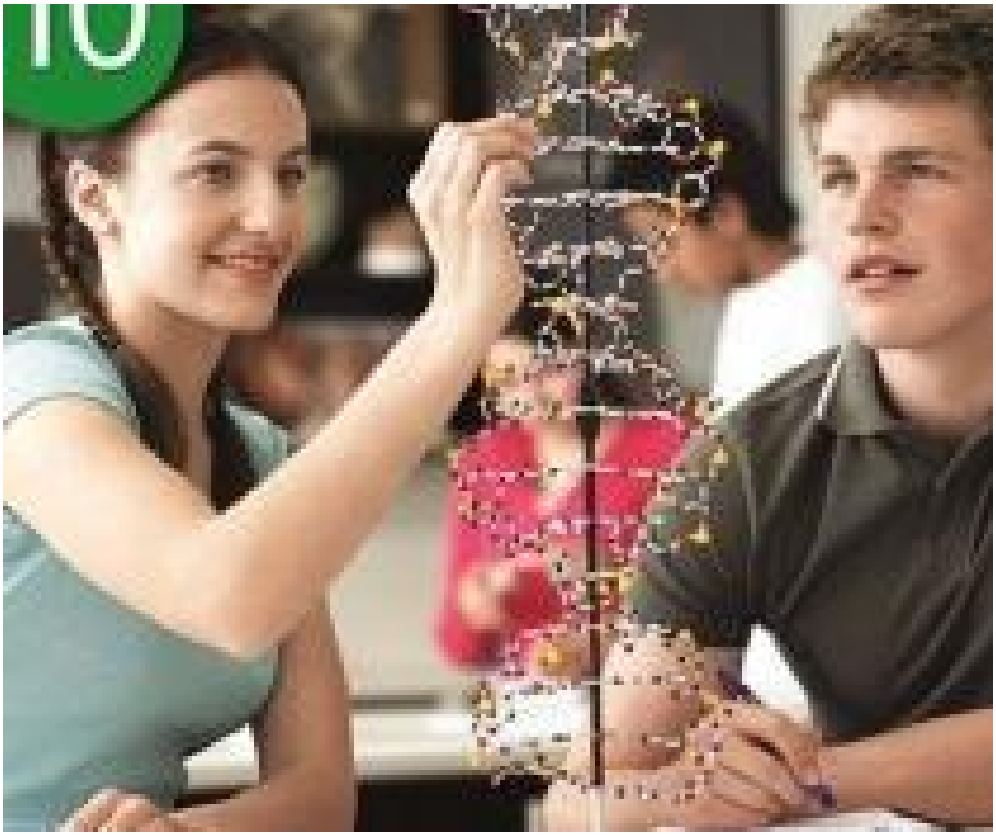
The basics of a child start from the nursery age when he/she is taught just basic alphabets and numbers. As he promotes until he is in primary he learns basic colors, names of fruits and vegetables, and simple tables. When he starts with primary he learns further higher tables and various other small aspects of life, without any pressure of other things.

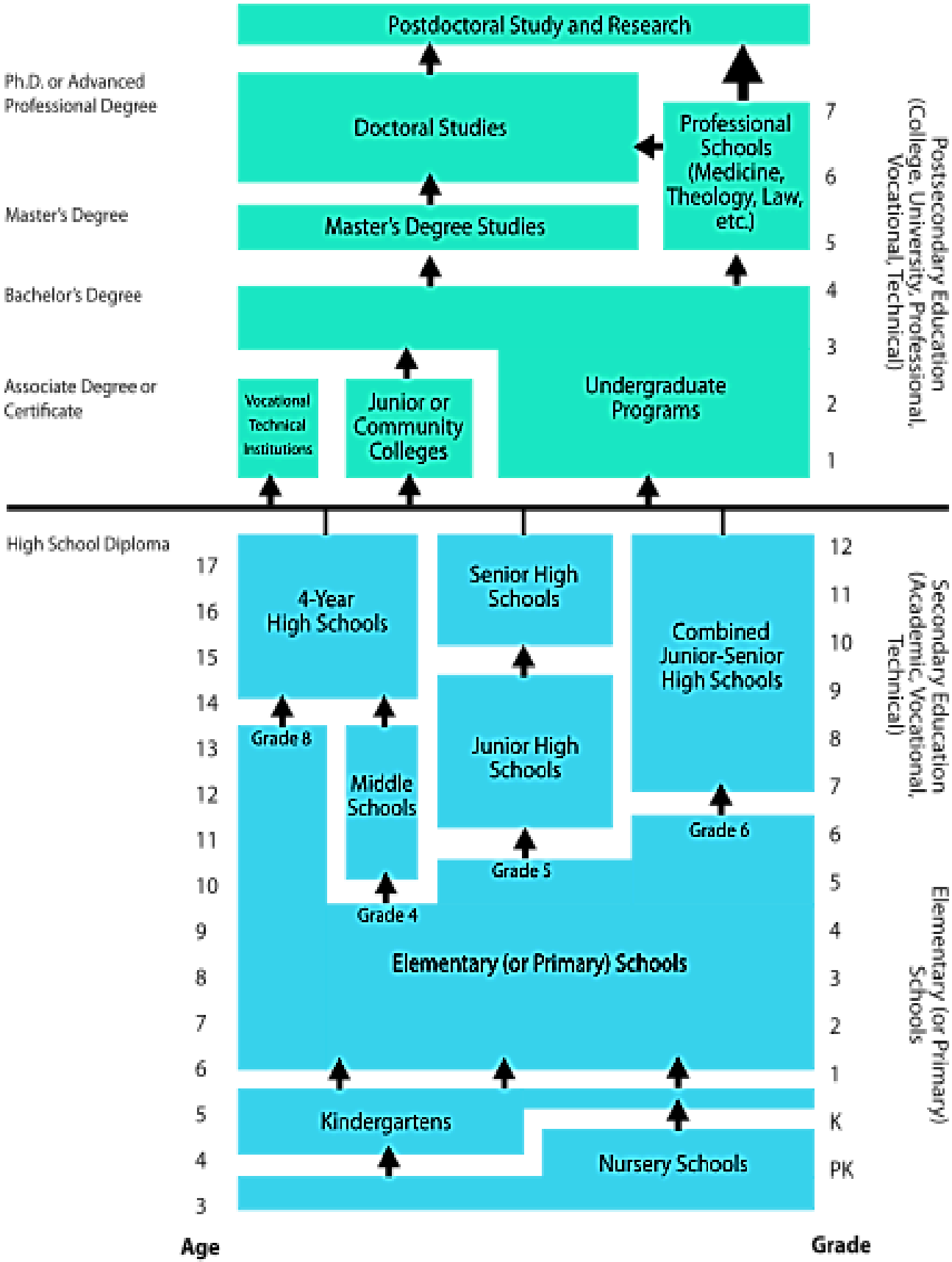




Secondary and Senior Secondary

When he is up in secondary a child must be introduced to a little complexity of subjects like science and mathematics. He is now in the age to be addressed to various issues which he will face in life and must be taught how to deal with them. Senior secondary education is the time when he decides finally what he / she has to achieve in life and decides his final subjects. The child must now be focused on how to achieve the goal he/she has set for himself/herself.

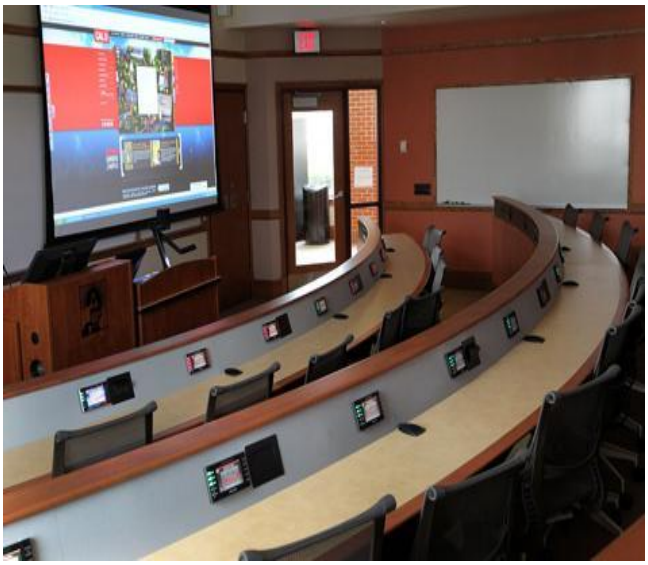



Postdoctoral Study and Research
Ph.D. or Advanced Professional Degree
Doctoral Studies
Professional Schools (Medicine, Theology, Law, etc.)
Master's Degree
Master's Degree Studies
Bachelor's Degree
Associate Degree or Certificate
Vocational Technical Institutions
Junior or Community Colleges
Undergraduate Programs
Postsecondary Education (College, University, Professional, Vocational, Technical)
7
6
5
4
3
2
1
High School Diploma
4-Year High Schools
Senior High Schools
Combined Junior-Senior High Schools
Grade 8
Middle Schools
Junior High Schools
Grade 6
Grade 5
Grade 4
Elementary (or Primary) Schools
Kindergartens
Nursery Schools
Secondary Education (Academic, Vocational, Technical)
Elementary (or Primary) Schools
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
12
11
10
9
8
7
6
5
4
3
2
1
K
PK
Age
Grade

High Schooling

High schooling is would be entering the college and universities build in Fantarium. He / She would be made focused on his particular field in the most complex way and would be made to work hard. At this stage he will also be taught how to work in various jobs present in his field.

But we the makers of Fantarium want the education of students in our city to not just be bound by some rules but be free and open minded. We would suggest some methods.



Methods may include:-

- Interactive classes
- Better trained teachers and professors in schools and university.
- Teaching students, various fields like philosophy, aeronautics, space study, science etc.



- Studies to focus on basic awareness and help students to develop in the field they want to access.

- Online education can established so that students unable to attend classes can understand what was actually taught in the lecture.
- Studies that focus on developing the mind should be given more importance than extra co-curricular activities.



POLLUTION CONTROL



Pollution is the addition of dangerous contaminants into our atmosphere which is caused by the greenhouse gases and waste of industries and various others. Pollution is one of the main causes of damaging of our Earth. It has caused in making holes on the ozone layer of our earth's atmosphere which lead to entering of harmful ultra violet rays into our atmosphere. Some methods by which we would not face these issues could be:-

Most of the pollution percentage depends on 2 things. One of them is the emission of gases in the atmosphere by industries. Therefore it becomes all the more important in our new city Fantarium for us to control the emission of these gases. We cannot stop the working of industries but the gases emitted can be purified and then released in the environment.



By this we reduce the effect of these gases. This is one of the aims of Fantarium project.

The second big reason of air pollution is the emission of gases by the vehicles into the atmosphere. This also has the same effect on

the atmosphere as the gases of industries. It becomes all the more for us to be careful in what we use as vehicles over there.

Second form of pollution is the water pollution. The water is polluted by the wasted emitted by the people and factories into the rivers. The Fantarium focuses on protecting its limited water resources by not allowing the industries or the residents to dump anything harmful into the water resources.



Soil pollution is one of the most dangerous forms of pollution is the modern world. It caused mainly by the deposition of plastic in the soil. So it becomes important for us in Fantarium to reduce the use of plastic and use more and more other reusable and recyclable substances like jute etc.



The concept of 5R'sthat is reform, refuse, reduce, reuse and recycle can be used in protecting Fantarium from being exposed to pollution.

The first and foremost thing that is to be done to protect the newly planted trees and plant more and more trees to form a garden. This small garden can play a vital role in the succesful working of Fantarium.

POPULATION CONTROL



Growing population is also one of the reasons why Earth is losing its salinity; salinity of humanity. Therefore it is important for us to keep a check at the population growth at the Fantarium project. Various schemes which many countries, which have a pretty high ratio of population, have invented can be used to stop the unwanted growth of population. The following could be applied:-

One Child Policy – Regarded as one of the most successful policy in controlling the growth of population in China, this policy allows a couple to have only child. This would help the couple financially and would also reduce the population.



PARTICIPATION AND INVOLVEMENT

The construction of Fantarium will require a number of materials which may be not located at one place. Also just moving forward on one way on one's thought will not lead to progressing of the Fantarium. Therefore the participation of even the smallest countries like the Vatican City to the countries which have a greater impact like the United States of America is necessary for the successful working of the Fantarium.



Involvement of all the countries in the Fantarium is very necessary in its success. Approximately the population of the

Earth has reached around 7 billion. 7 billion people with 7 billion minds with 7 billion different mindsets. Because we cannot transport all the people, it becomes important for us to select a representative from each country so that they could help in constructing the Fantarium in a better way.



FOOD AND NUTRITION

Food is one of the most essential elements in the life of a human. It is essential that in Fantarium, all the people get proper nutritious food at a reasonable price.



- During the early days some problems of food production may occur as the food has to be transported from Earth as there is no other alternative at this time.
- But as the food production progressed, Fantarium will be able to produce its own food.
- The food produced will be of 2 types
  - ✔Natural
  - ✔Artificial



- The seeds would be high quality transported from Earth.
- Top quality of manures (compost, vermicompost and green manure) and fertilizers [monoammonium phosphate (MAP) and diammonium phosphate (DAP)]
- The production will under full control

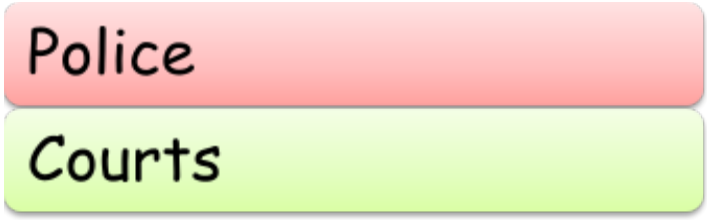
- The storage of food will be checked upon so that we could avoid wastage or destroying of food grains.
- The adulteration of the food would be checked so that no cases of food poisoning occur.



- Various products having different types of nutrients would be produced and sold at reasonable prices.
- A special body would be formed to functions the process of food production which will control all the processes starting from a farmer buying a seed till a consumer buying it.
- A buffer stock will always be maintained so that a shortage of grains is never faced.

LAW AND ORDER

Law and order is one of the most important factors of criminal justice. In Fantarium, law and order would be place under the following categories:-



POLICE:

The police play an important part in law enforcement in any city. The Fantarium Police department focuses on giving protection to the citizens from various types of crimes like murder, robbery etc. Not only from these crimes but the police will also be focusing on some basic driving rules which would be formed for safe driving in Fantarium. The police would be divided into following portfolios

- Federal
- State
- Agencies

Federal



Federal police is the all over country police which deals with crimes from all over the country and even is responsible for the protection of various high post officials. It is the biggest organ of police function in Fantarium. It has just one headquarters.

State

The state police are the body under federal police. It has a body in every district and is responsible of reaching at the crime location as fast as it could. It functions under the federal police. It has various types of policemen in it:-

- High Commissioner
- Deputy Commissioner
- Watchman
- Constables



Agencies

Accept of these formal policemen bodies, an independent informal body which has officers that lookout for big as well as small crimes. These officers would be free of the police department and would be chosen by high officials.

Police Functions

The police and agencies have the following functions to maintain law and order in Fantarium.



Order Maintenance

The main function of police is to maintain order in the city and to keep a check at the rule breaking by the citizens. One of the main is that traffic rule breaking should be checked upon.

Law enforcement

They have to lookout for the crimes happening inside their area of control and keep a check on them and try and reduce them. Crimes like robbery and murder would be investigated properly so that the criminals could be caught.

COURTS:

In Fantarium, a proper system of jurisdiction of criminals would be carried out in the courts. Courts would be a place where all the issues. The Fantarium city would have just one court and all types of issues would be sorted out in the same court.



The court would have:-

- A panel of 12 judges
- 2 defense lawyers for the accused (of his choice)
- 2 opposition lawyers (by the government)
- A translator
- Some observers

This would, therefore, help in proper jurisdiction.

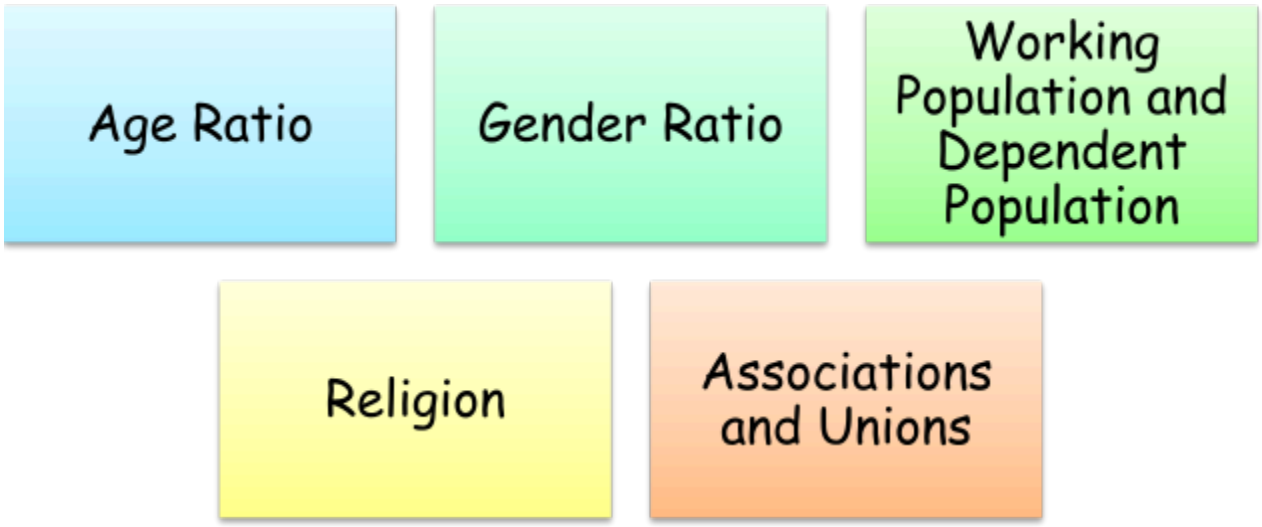


COMMUNITY AND RECREATION

COMMUNITY



The Fantarium is rather a place bit far off from the surface of Earth and the connection between them would not be that easy. Therefore it is important for us to form a community here itself and to form a community here on our own. The community of Fantarium would contain the following view point: -



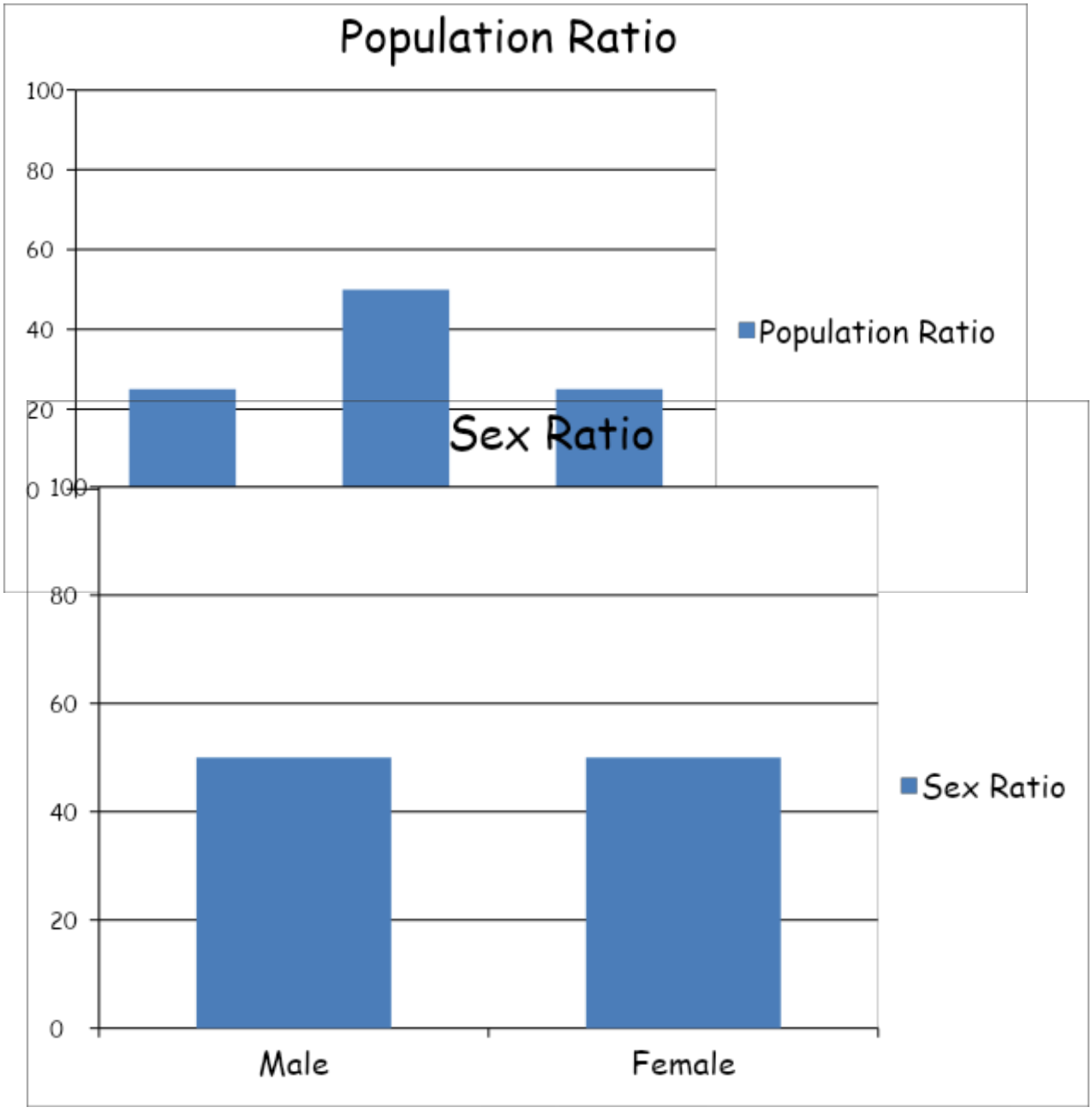
Age Ratio

The Age ratio in would be high and the life expectancy would be high up to 80. The focus would be on the population raging between 18 and 65. The children below 18 and the old aged people above 65 would be taken special care of so that they are not mistreated as in many parts of the world. This is a graph of age ratio of Fantarium.

The ratio is: -

- Children below 18 = 25%
- Youth between 18 and 65 = 50%

- Old Age people above 65 = 25%



Gender Ratio

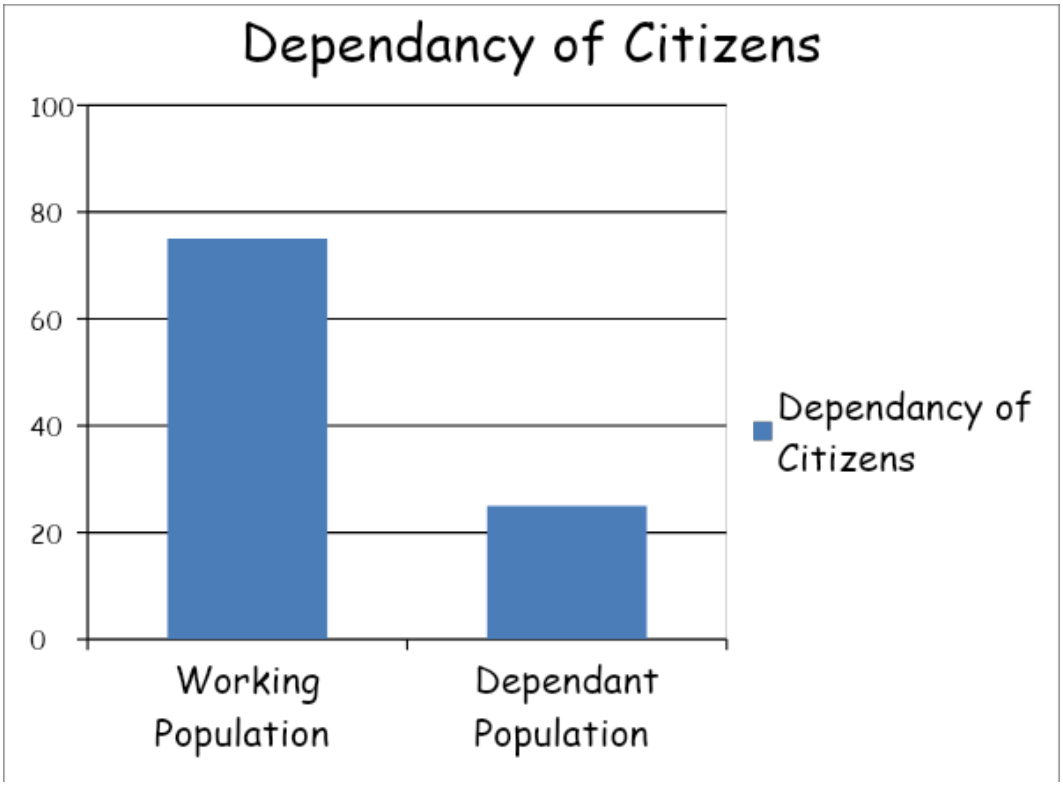
The Fantarium focuses on treating its people equally irrespective of their sex. All the men and women will be treated equally and

would be giving equal dignity to all its members. The ratio maintained would be equal (50)

Working and Dependent Population

The Fantarium wants the dependent population to be as less as possible and the working population to be increasing and they find a proper employment. Then also Fantarium wants that at minimum a family should have 2 members of working population. The ratio expected to be is

- Working Population = 75%
- Dependent Population = 25%


Dependancy of Citizens
100
80
60
40
20
0
Working Population
Dependant Population
Dependancy of Citizens

Religion

Respect of every religion would be one objective of The Fantarium. The development of every religion in terms of their rituals would be a freedom of every person, irrespective of his or her religion. There would be no official religion of Fantarium. Any citizen has the right to follow any religion. It is also expected that some part of population (such as 10%) do not follow any religion. They would be respecting the beliefs of others.

But people would have some restrictions:-

- People would not be allowed to hurt any other type of organism whether plants, animals or other human beings.
- Followers are not allowed to do illegal businesses like smuggling or any other type of such activity under the name of religion. The consequences would be severe
- No type of riots are allowed between people of different religion and nobody should be hurt any innocent person on the crimes of other (under the name of religion)
- And lastly any type of pollution activities or activities that disturb others for religious practices are strictly not allowed.

The ratio of followers of religion could be anything and are most invited to be a part of Fantarium.

RECREATION



Recreation would be an essential part of resident's life which would be practiced between work and going to sleep. The recreation activities could be: -

- Zero gravity activities - Although being in space, there would be some artificial gravity maintained (details in the section for artificial gravity). But a special chamber with no gravity would be there for the people to enjoy the real fun of zero gravity
- Sports – Various sports like soccer and rugby could be played to entertain people and people can themselves take part in them by forming small clubs and competing.
- Training – Gyms and training courses could be one part of recreation for adults to pass extra time and to build to their fitness.
- Parks and gardens – Small public parks could be made for the children playing up and for old aged people to have a morning walk. This could even aid in stopping pollution and spreading fresh air.
- Coffee shops and restaurants – These places could a discussion point of various topics and issues.

MEDICAL

The Fantarium is to be planned in such a way that the people moving in it are healthy and they remain so. The project focuses on:-



- Giving a fast first-aid to any person injured
- Giving treatments to dangerous and vulnerable diseases such as cancer, tuber coulisses, cholera etc.
- Use modern techniques and better functioning ambulances to give patients as much care as we can.
- Better training of doctors to handle crisis cases such as sudden case of cancer etc.
- To introduce better machinery and techniques for treating even the smallest of disease.



- The medical facilities of Fantarium will also focus in various other important matters:-

- Hospitals

✔The betterment of hospitals will focus on well-organized rooms, with comfortable beds, and high class machines which use less energy and produce work of quality



✔

✔The hospital would be provided with a special emergency room big enough to comfortably fit a large number of people even at the time of crisis.



✔The operation room constructed will also be large enough to handle critical and non-time- critical- patients together.

✔Doctors would be given special training for handling crisis even at the time of an epidemic.

- Medical Research Centre
  - ✔Since the surroundings would be new, the type of diseases may also be new. Therefore building up and good functioning of these laboratories is very essential for the Fantarium.



  - ✔These would be serving the centres of research of new vaccines and medicines which would be applied in the medical course in curing a number of diseases.

- After Death
  - ✔ After death, the body of a patient is needed to be dealt. It should be properly decomposed and converted into smaller organisms or be recycled for its nutrients.

TRANSPORT

The transportation of people in the Fantarium would be well organized so that people do not face any problems. Our citizens would be provided with best transportation facilities. Well-built roads with side walkways would be built. These sidewalks would be used for cycling, jogging or walking. We will have both the types of transportation:-

Public Transport

Private Transport



Public Transport

The first objective is to promote public transport so that we could reduce pollution.

- Buses -Well organized buses would be used which could carry a large number of person.



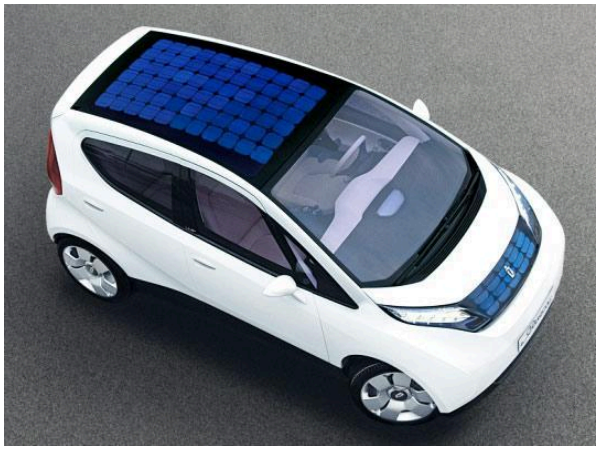


- Trains -Trains used would be highly organized and highly advanced that do not use up much energy and work efficiently.

Private transport



- Walking - Walking is one of the best way to reach a destination nearby without any the fuel consumption. It is a way to preserve energy and a better way to workout. “A 68 kg (150 lb) person walking at 4 km/h (2.5 mph) requires approximately 210 kilocalories of food energy per hour.”



- Bicycle – The best way to travel without any consumption of fuel is by going through a cycle.
- Automobiles – Cars which are the most basic piece of transport in the city of Fantarium. Therefore cars which run solar energy can be used to prevent releasing of



- Velomobile – Regarded as one of the most efficient ways of travelling these, velomobiles could be used by a person to travel to various places far off. Organizations, ex. WAW, that build velomobile could be asked to produce some basic so that we can transport these types of vehicles to Fantarium.

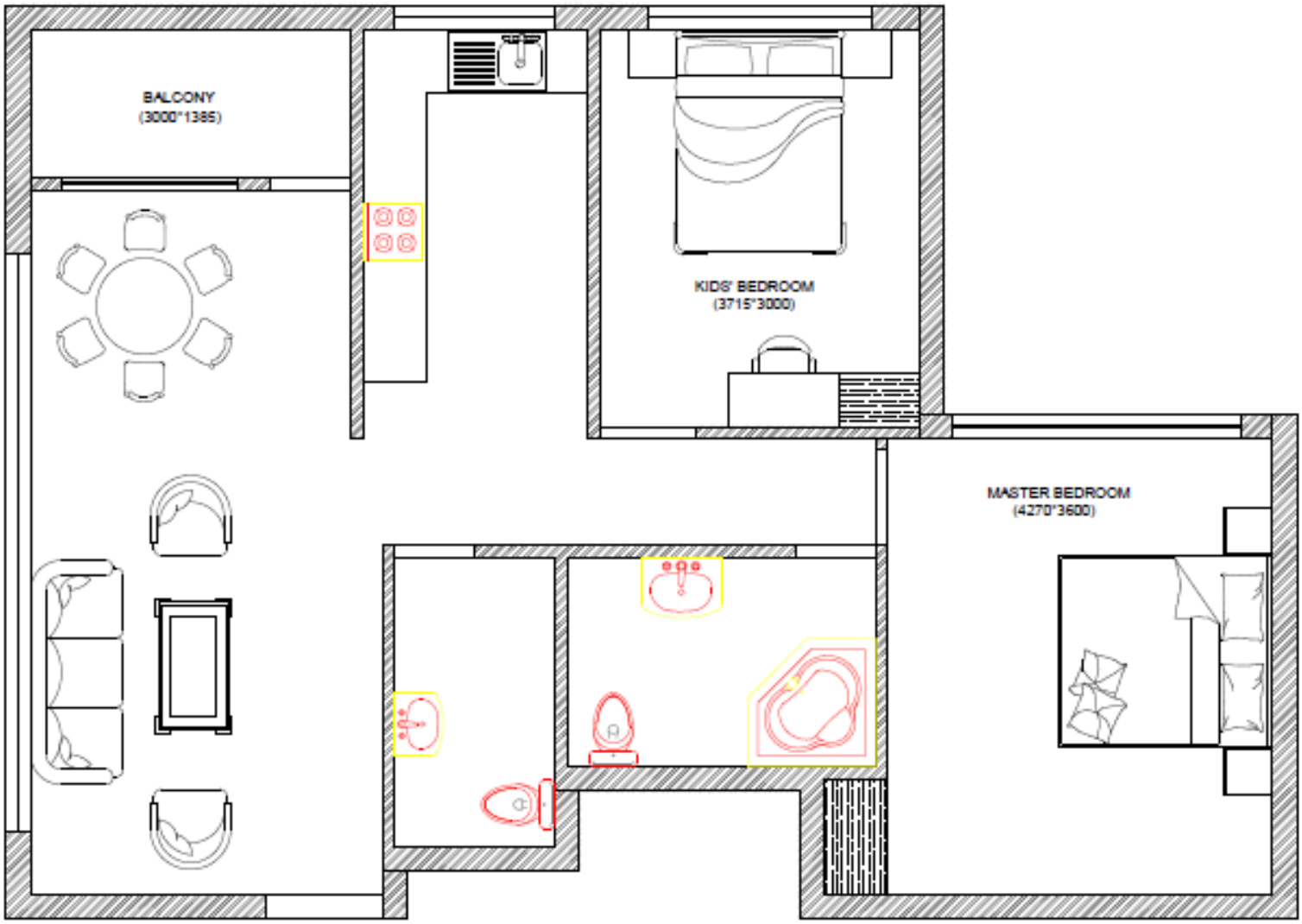


LAYOUTS FOR STRUCTURES THAT WILL BE BUILT

The following are the structural layouts or the plans of new buildings that will have to be built.

- 2BHK House
- 3BHK House
- Grocery Store
- Gymnasium
- Penthouse
- Restaurant
- Small Restaurant
- Shopping Mall
- Studio Appartment

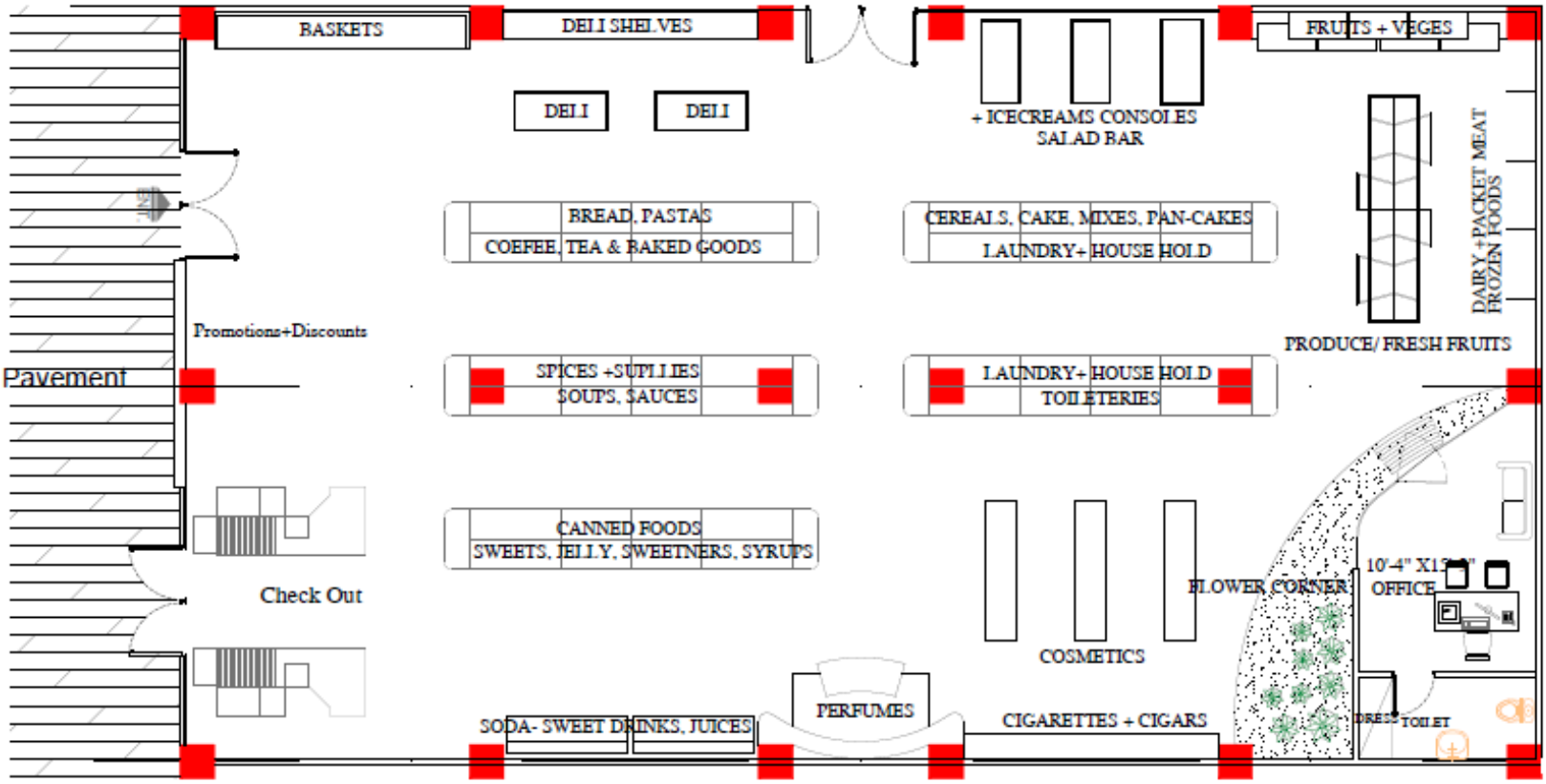
2BHK House


BALCONY
(3000*1385)
KIDS' BEDROOM
(3715*3000)
MASTER BEDROOM
(4270*3600)

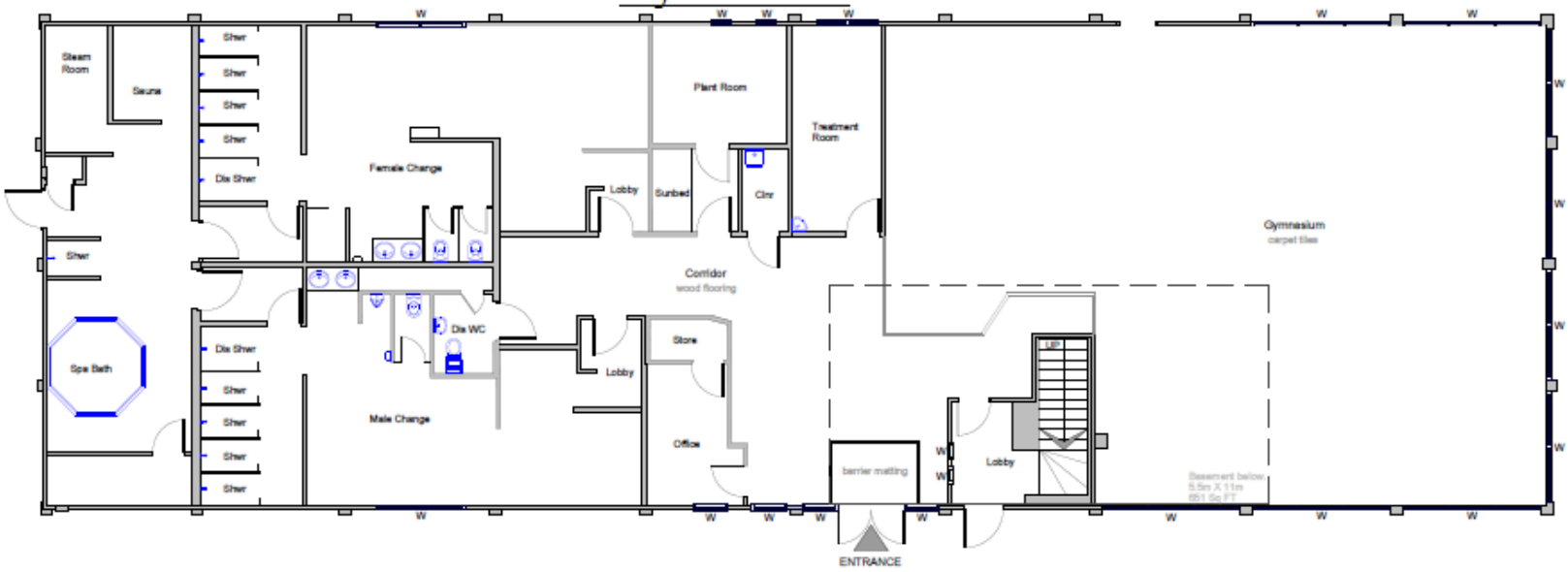
3BHK House


master bedroom
walk-in
office
courtyard
bedroom
bedroom
shower
bathroom
utensil washing
bathroom
side door
kitchen
living room

Grocery Store

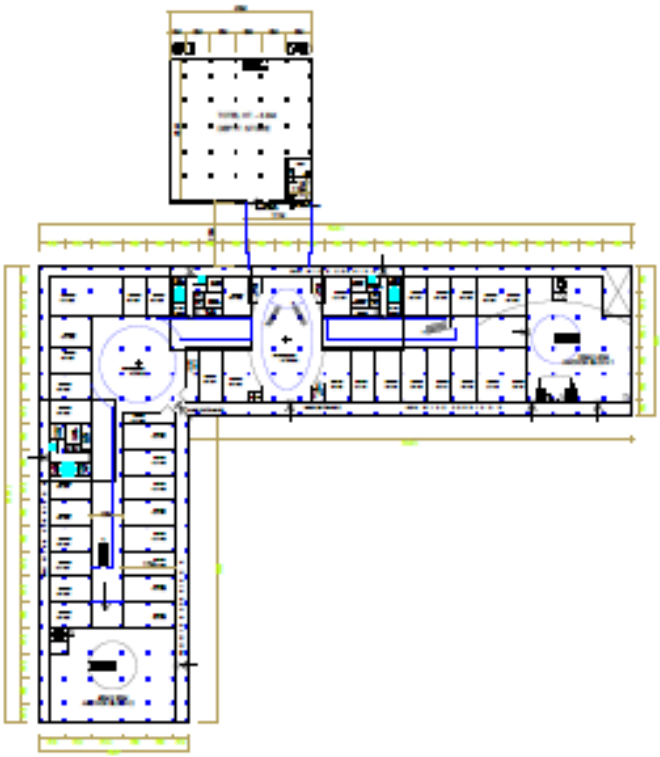


Gymnasium

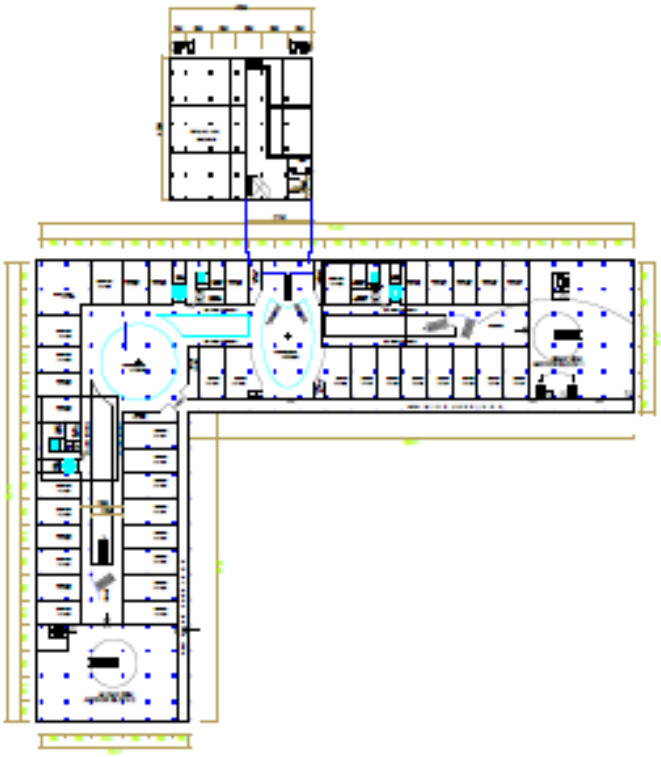

Steam Room
Sauna
Shwr
Shwr
Shwr
Shwr
Dis Shwr
Shwr
Spa Bath
Dis Shwr
Shwr
Shwr
Shwr
Shwr
Female Change
Male Change
Dis WC
Lobby
Plant Room
Sunbed
Clnr
Treatment Room
Corridor
wood flooring
Lobby
Store
Office
Gymnasium
carpet tiles
barrier matting
Lobby
UP
Basement below
5.5m X 11m
ENTRANCE

Penthouse

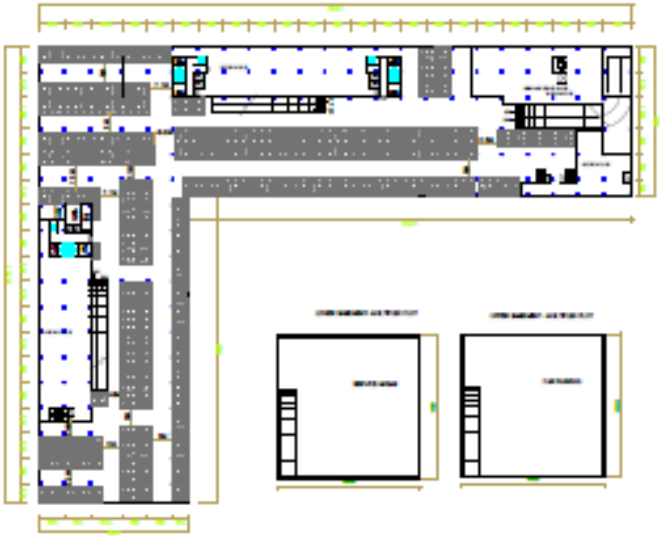

bedroom
wash room
bedroom
washroom
kitchen
bedroom
lift lobby
living room
living room
bar



GROUND FLOOR PLAN



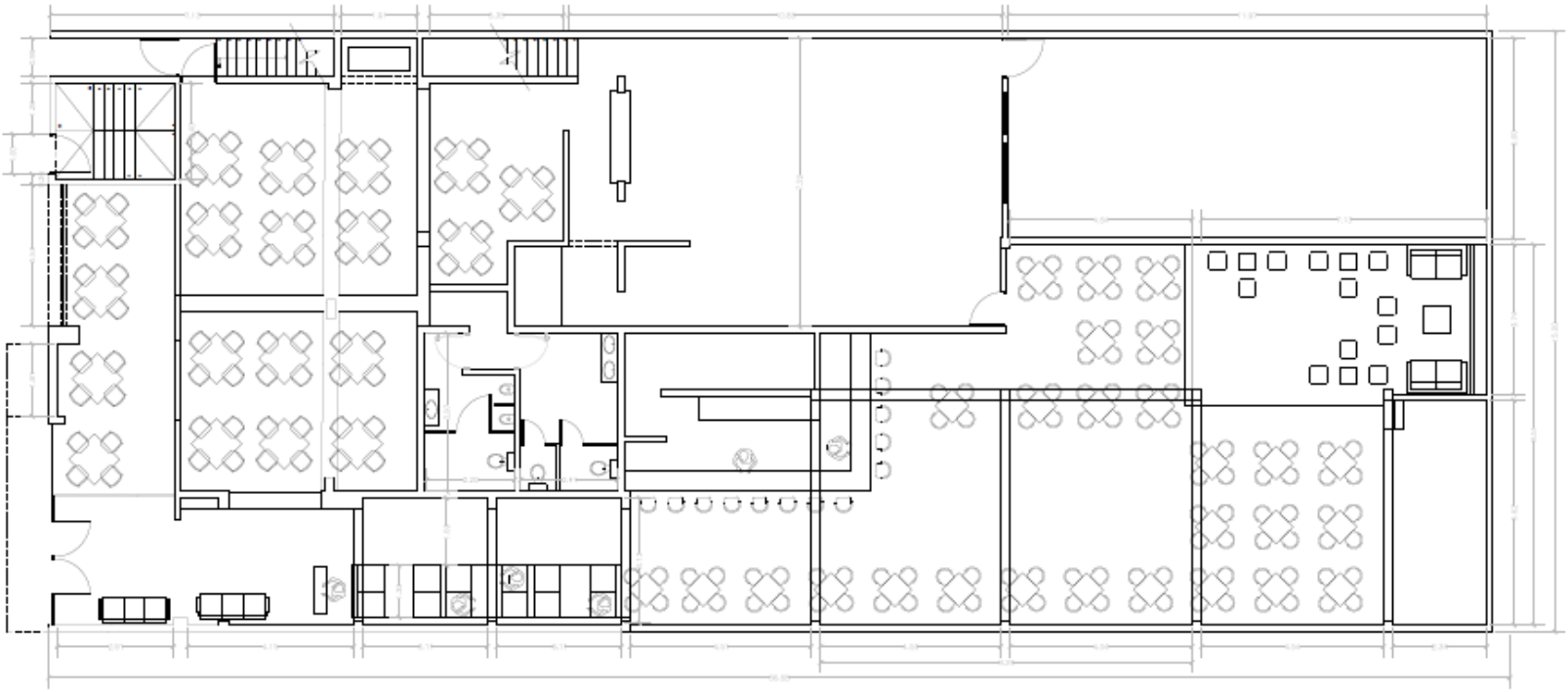
FIRST FLOOR PLAN



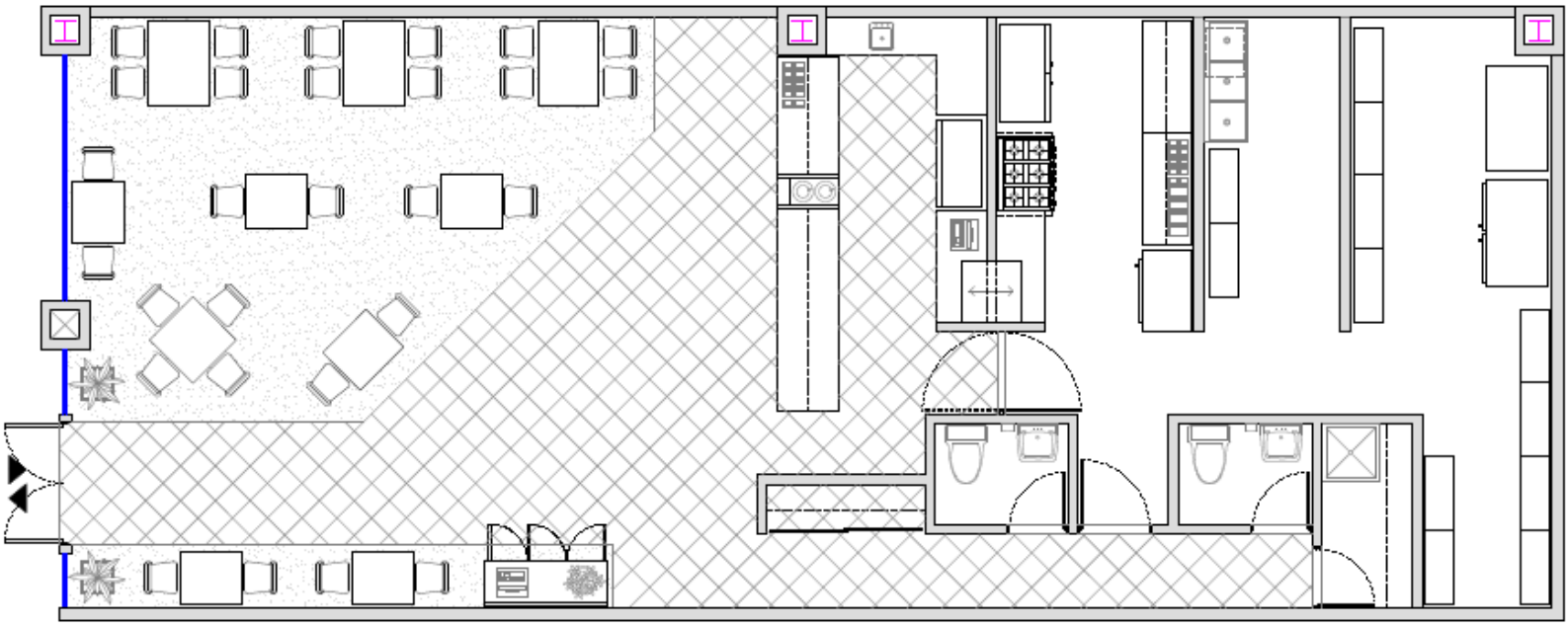
LOWER GROUND FLOOR PLAN

Shopping Mall

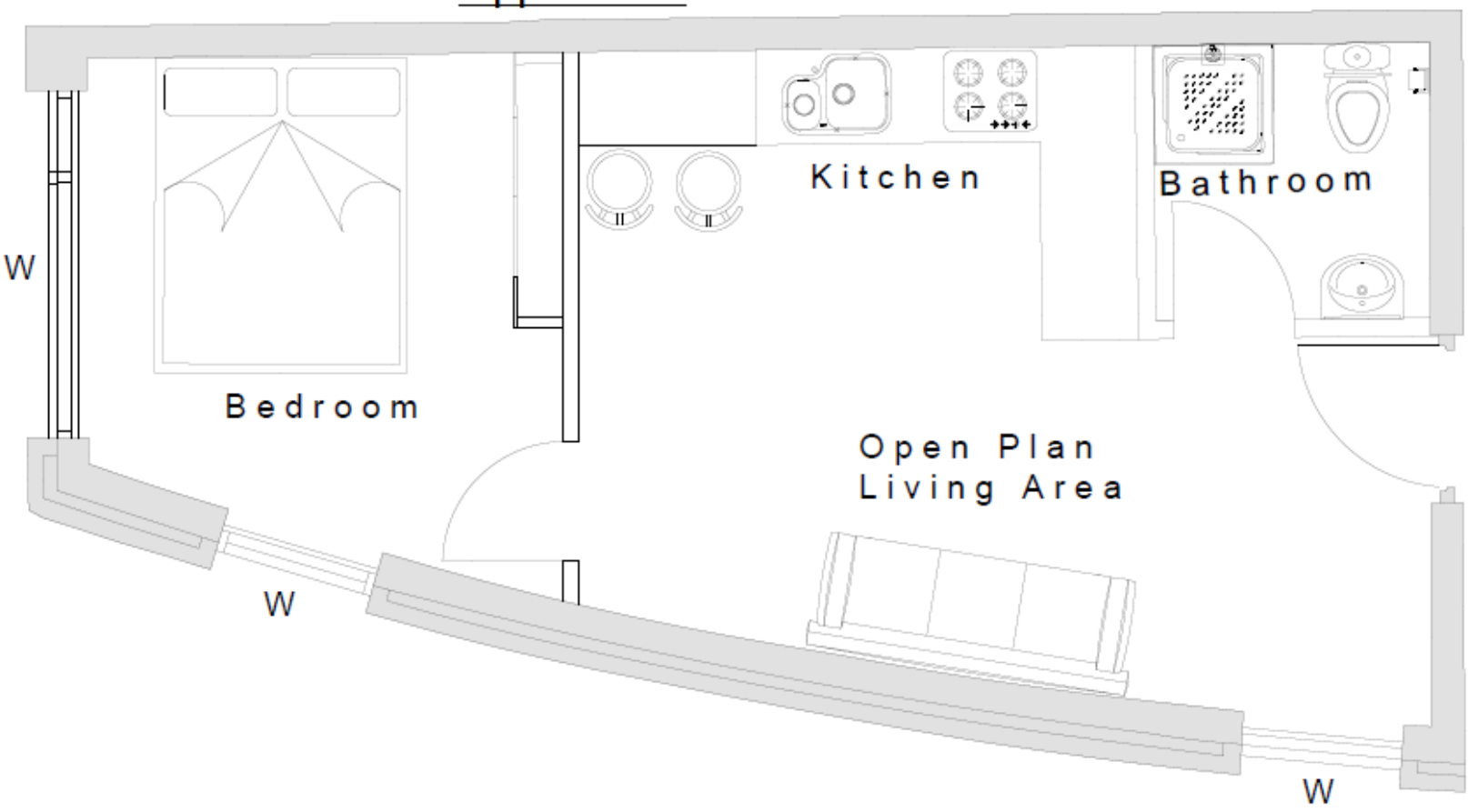
Restaurant

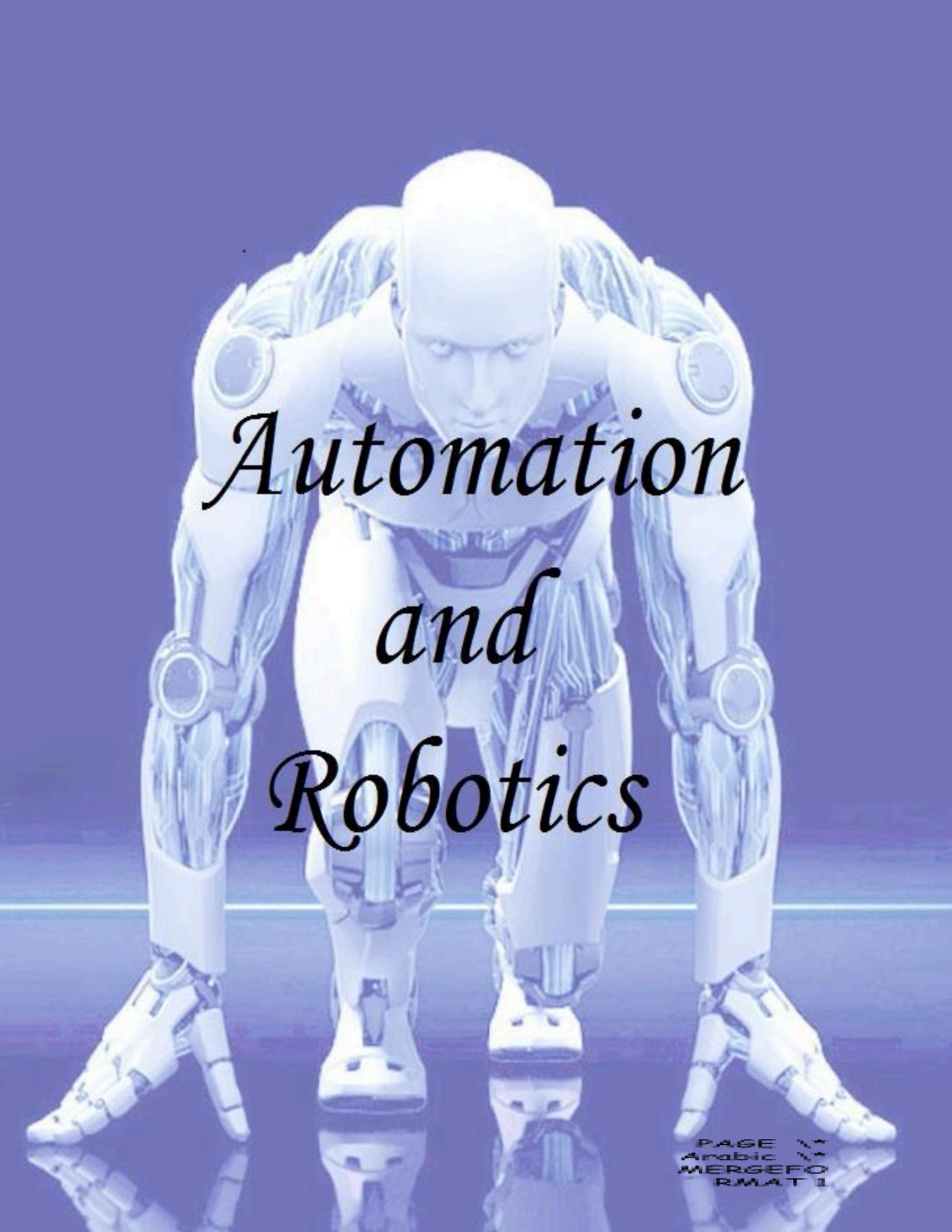


Small Restaurant



Appartment





Automation and Robotics

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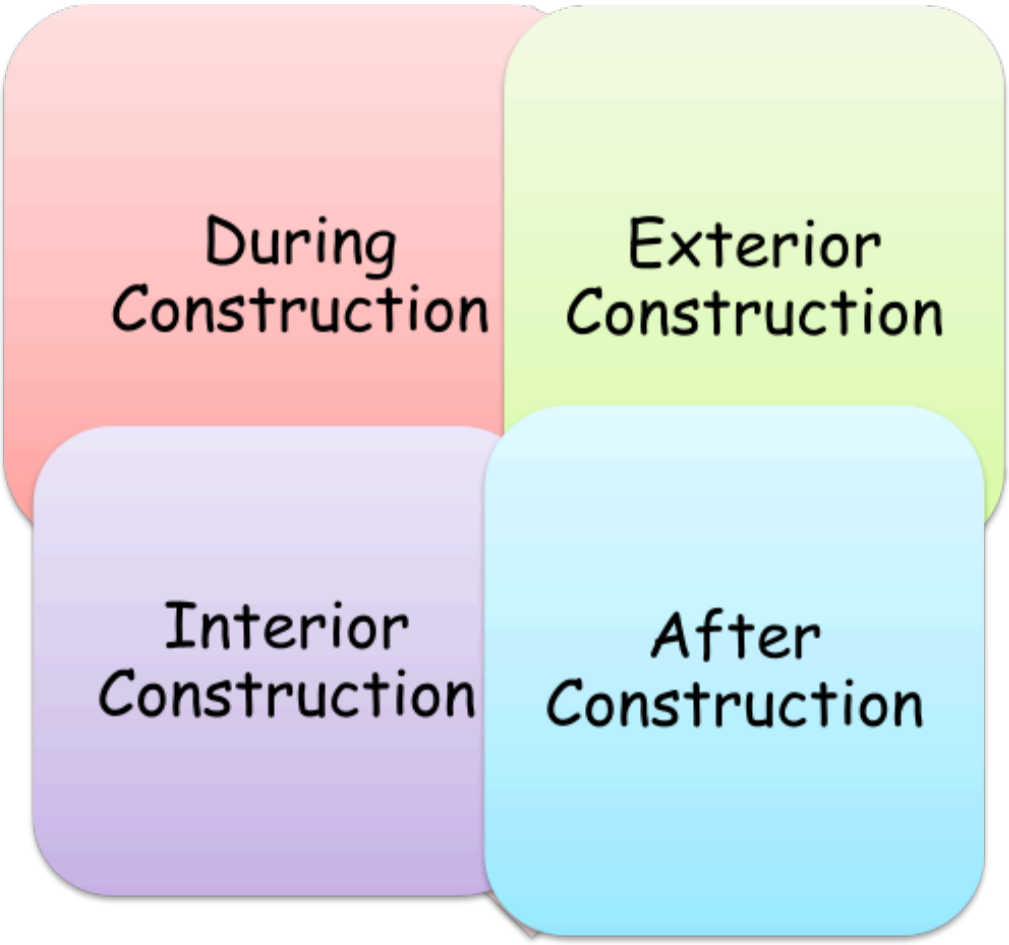
The Fantarium consists of many activities and doing is manually not only cost more but also consumes lot of time. With advancement of technology and availability of “Automation” means, we can achieve goal more efficiently and also much faster, cheaper and with better and consistent quality.

Automated services including Robots, Drones and specialized advanced soldiers with the latest technology can help in Settlement. These services are provided with the DNI technology which can make Human life reach the next level of advancement. These Robots can perform any kind of work from construction work to doing any domestic task. For every task, specialized robots are designed. Human Civilization can make full use of these robots. The ATLAS CORPORATIONS are the biggest source for the robots supplied on this settlement. Robots will maintain a secured nature in which humans can easily inhabit.

ABBREVIATIONS AND TERMINOLOGY

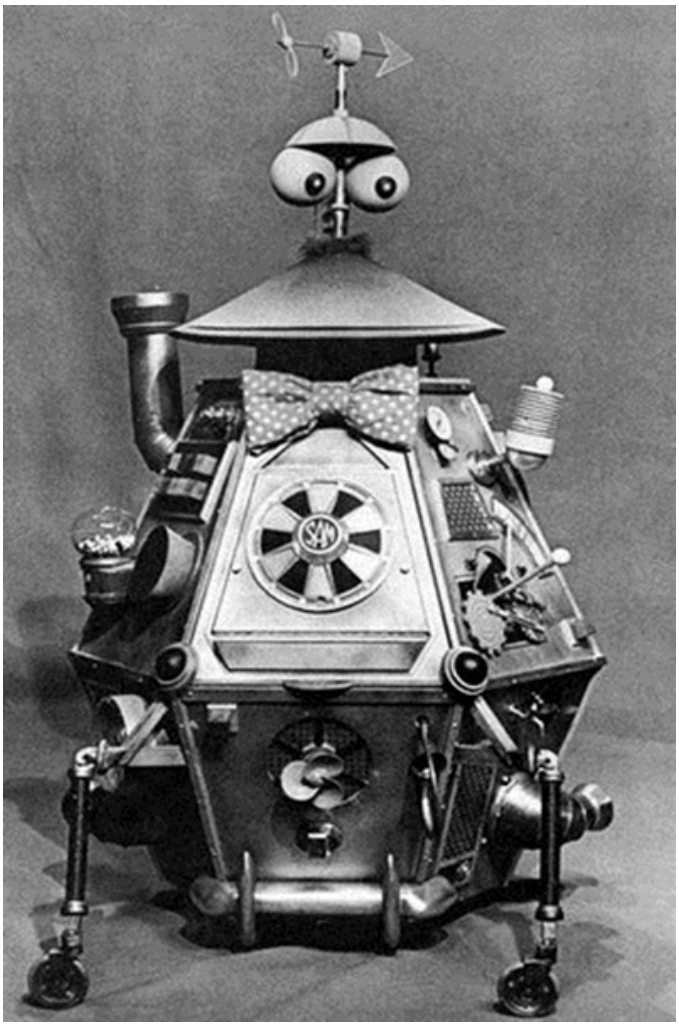
BCI	Brain-Computer Interface
BWR	Boiling Water Reactor
Chain Reaction	Producing a lot of heat in a continuous process
DNI	Direct Neutral Interface
EMR	Electronic Medical Records
MMI	Mind-Machine Interface
PV	Photovoltaic
PWR	Pressurized Water Reactor
UAV	Unmanned Aerial Vehicle

PHASES OF CONSTRUCTION



During Construction:

During the construction of settlement, there would be many distractions as every Human works differently. The methodical use of Robots will aid them to do the work systematically and smoothly. Some of the machines used are as follows:



S.A.M. (Super Automated Machine)

NAME	FUNCTION
BED('Bio-Electronic Detector')	This machine helps to locate or search for various minerals to be used in construction on the settlement or from Earth.
K-91	It has majestic powers which services in the extraction work.
ZAT-8	ZAT has been allotted the work to fix the security procedures in the settlement.
R.A.C. 2.0	RAC can metamorphose resources to be utilizable in construction.

HAL 9900	This has all the vigor to do the interior construction.
KITT	A dauber and polisher brings new ambience in construction.
S.A.M.(Super Automated Machine)	It does the work of Lineman for flexing or fixing cables

Exterior Construction:

Exterior Construction involves the detection of various resources, allocating them for different sort of works and other vital tasks.

- First, the work of constructing is in the hands of BED and his multitude. They will visit Earth and other galaxies to search for crucial components of Construction. This information is transmitted to the Headquarters.

- Headquarters report this to the K-91s and they do their extraction work. The amount of resources get extracted depends on the requirement of appropriate resources.

- Next, R.A.C- a gigantic robot does the concentration of resources by physical or chemical processes and then

refines them so that they are ready for use as they futile in original form.

- K-91 with assistance of R.A.C will start the small- scale establishment project.

Interior Construction:

- The Internal manufacturing is the main step in this settlement and requires foremost supervision so as to reduce the probability of defaults in the process of construction.
- Firstly, Energy Production Transformers would be assembled, and then the Reactor would be set which provides potential for smooth operating of all sectors.
- The quotidian report of construction will be scrutinized by Mainframe PCs and the Final Details will be notified to the Headquarters.
- H.A.L 9900 conclude the interior of each sector and ultimately help in the work of Electricity Wires and Polishing surfaces which would be overseen by KITT and his Co-members.

- The sequence in which sectors would be developed would depend upon the factor that how much hectares of area the sector would capture and the amount of resources required to construct it.

After Construction:

After the settlement is all set so that people can inhabit, it requires some key difficulties that the resident would have to overcome so there is panacea to this.

NAME	FUNCTION
D.A.V.S.	An advanced smasher who could easily pursue delinquent or a malefactor.
ZETA 42-97	A man-portable UAV capable of 100min flight time with video, photo and IR camera.

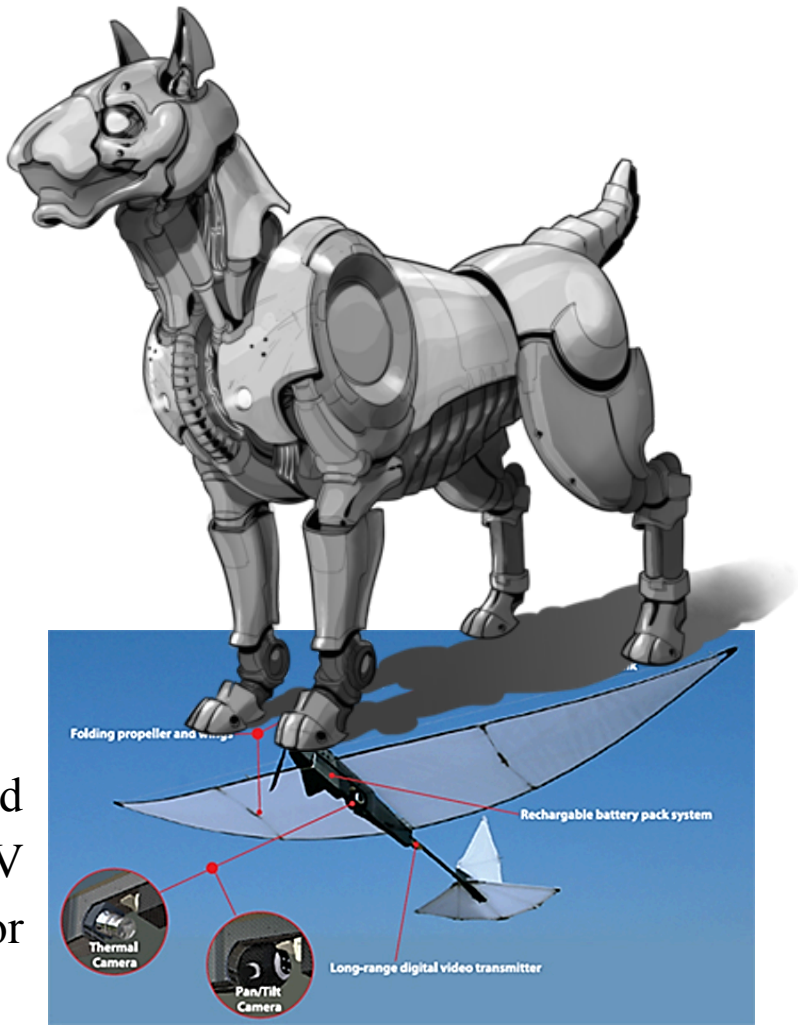
CHOMPS	A robot dog that escort the residents to their avenues and moreover will avert them from going to unsuitable whereabouts.
XLR8	An overwhelming robot provided with a great velocity used for capturing criminals.

D.A.V.S {"Digitally Advanced Villain Seizer"}:

An Armed robot bestowed with the advanced technology of BCI who can transmit itself in a short span of time thus pursuing thugs at an ease rate. But another problem is that the criminals might have weapons but DAVS has advanced ammunitions stored in it so as to knock down criminals.

ZETA 42-97:

It is a Micro air vehicle developed and produced by the ATLAS Corporations. It is a portable and reliable UAV platform. It weighs only 9 kg. It also include two aerial vehicles, compact ground control station, two spare power supply kits and backpack container used for transportation. It is designed for front-line reconnaissance for both over-ground and over-sea surveillance. The UAV is operated in the autonomous or semi-autonomous mode.



CHOMPS:

CHOMPS -Canine HOMe Prevention System is a robot dog who will enjoin the resident for the paths of settlement and will aid in case of any crisis. Side by side he has also been allotted the work of surveying the resident who are doing something inappropriate or could harm other citizens.

XLR8:

XLR8 has Sphere-shaped feet, scissor-like claws and a retracting helmet with a windshield. It has the ability to manipulate friction and reach a velocity of 500 mph, thus allowing him to climb up walls and run on water with relative ease. Using his fast speed, XLR8 can perform a number of unique feats like creating tornadoes through centrifugal force either through running in a small circle or spinning. Amazing reflexes accompany this speed, allowing XLR8 to quickly dodge attacks. Thus he helps to maintain law and order by catching hold of people performing unprofessional tasks.

SYSTEM SECURITY CONSTRUCTION

Another major factor that this settlement requires is System Security. This would be looked over by HARLIE 242 who would ensure entire security while construction of this settlement. Their protection would comprise of Anti-humanoid robots, drones, mini air helicopters, rotors and other UAVs.

MACHINES FOR ENERGY PRODUCTION

Energy Production is a field of endeavour which focus on making available sufficient primary, secondary and tertiary sector sources to meet the needs of settlement.

NAME	FUNCTION
SHROUD-253	A machine having the ability to manufacture solar cells which could be fitted in solar panels so as to produce energy.
R.I.N.G	RING is a machine having the capability to take part in various reactions like nuclear fission and fusion so that energy could be manufactured.

SHROUD-253:

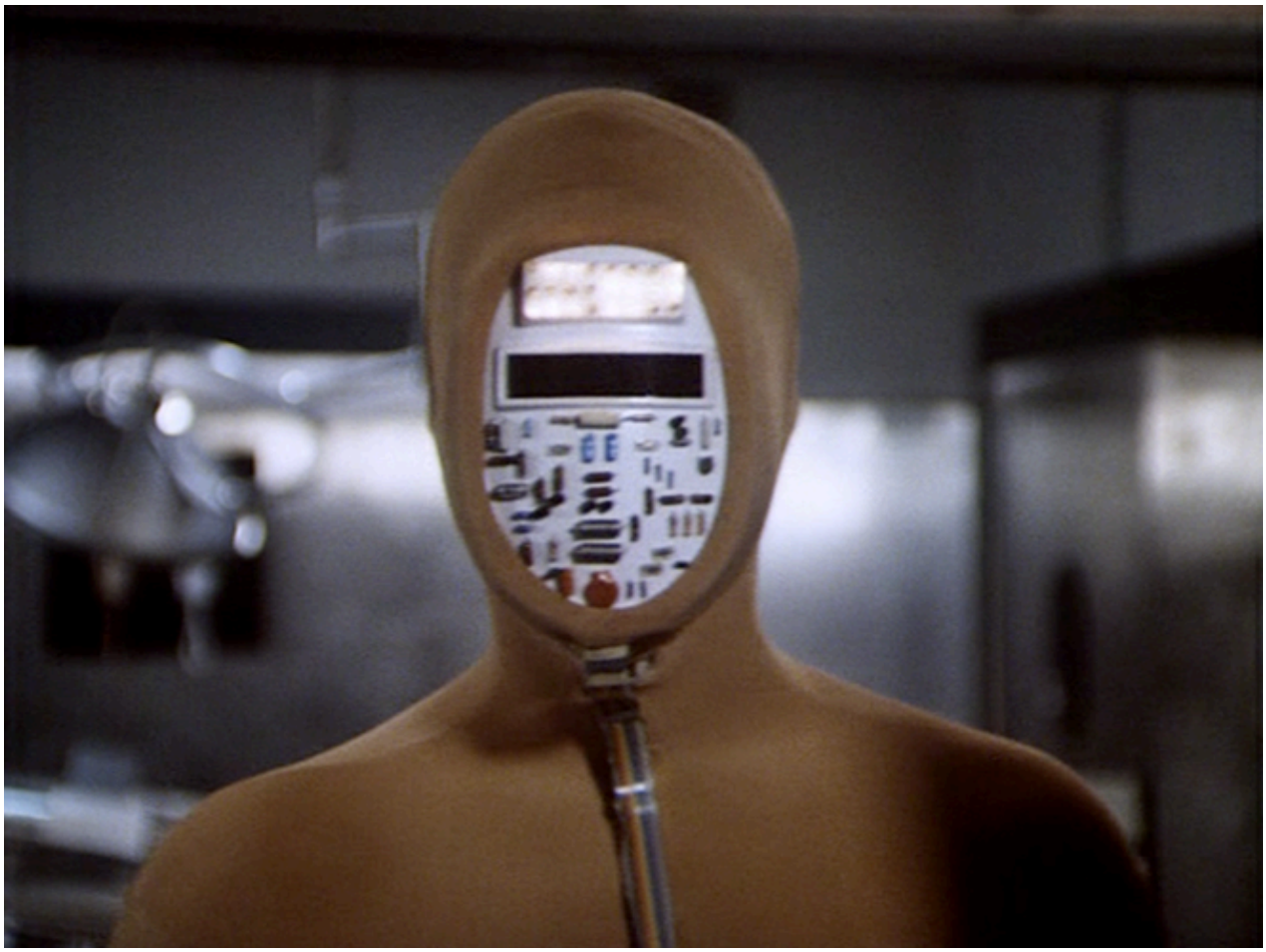
SHROUD=253 is an advanced robot which would be the most efficient source of renewable energy on this settlement. It has been inserted with Solar-power PV panels which can convert the sun's rays into electricity as it can excite electrons in silicon cells using the photons of light from the sun. This electricity can then be used to supply renewable energy to any part of the settlement.

R.I.N.G:

RING has been provided with a reactor core which contains thousands of small pellets of ceramic uranium oxide. As RING has an output of 2000 MW so it contains about 100 tonnes of enriched uranium that is refilled every 15 days. In RING the

U-235 isotope fissions or splits, taking a chain reaction. Some of the U-238 in the reactor core is turned into plutonium and about half of this is also fission similarly, providing about one third of the reactor's energy output.

The waste products include the radioactive decay and more heat but RING has a capability of absorbing heat at extreme high temperatures also. RING then sits inside a steel pressure vessel, so that water around it remains liquid even at the operating temperature of over 320°C. Steam is formed either above the reactor core or in separate pressure vessels **[BWRs or PWRs]** and this drives the turbine to produce electricity. The steam is then condensed and the water is recycled. RING repeats this process over and over again.



R.I.N.G

MACHINES FOR MAINTAING CONDITIONS FOR SURVIVAL

The settlement has been fitted with sensor Homeostasis machines which inform the Mainframe PCs about maintaining the stability of human body's internal environment in response to changes in external conditions.

Some of them include:

NAME	FUNCTION
AQUATIC-9J	It has the tendency to extract fresh water from icebergs from polar caps. Provided with a huge storage tank which can carry huge gallons of water.
SPUTNIK-56Y	SPUTNIK removes contaminants from the airmake the atmosphere suitable for Humans. It filters allergens and pollutants seen or unseen by Humans.

AQUATIC-9J:

As fresh water may become scarce on this settlement so the fresh water will is locked up in polar ice caps is needed to be harvested. AQUATIC has been fitted with brazier to melt icebergs and fetch Fresh water. He can carry 3 gallons of water at once which is enough for 4 million people to remove their thirst for 150 days. He has provided with iceberg locator which will hunt for big and stable icebergs for him.

SPUTNIK-56Y:

SPUTNIK has the ability to protect the residents from airborne pollutants. Every night he'll release Oxygenated air and absorb the DEADLY THREE. Installed with a CARBON MONOXIDE ALARM, SPUTNIK will roam in the settlement and reduce the percentage of harmful gases making the atmosphere pure. To prevent any danger to human civilization, he will eliminate all dirt, filth, contamination etc. from settlement's atmosphere.

MACHINES FOR OTHER WORKS

Other than these machines, Human residents would also require more services which could aid them in their daily chores. Some of these include:

NAME	FUNCTION
IRONA	A group of domestic robots who'll be used for household works.
MARs	This team of medical assistants will help humans in medication.
POLARS	A team of automated vehicles used as transportation.
WALL ("Waste Allocation Load Lifter")	WALL and his co-members are allotted the duty for waste management.

IRONA:



An autonomous robot group used for service purposes. They are mostly used for basic household chores. While most of them are simplistic, some are connected to Wi-Fi home networks or smart environments and
are autonomous to a high degree. Their help has made the works for residents simpler.

MARs:

MARs are technologically advanced medical robotic assistants. They relieve the nurses from some of the mundane tasks of collecting patient data and vital signs allowing nurses to pay personal attention to patients. There's display panel on the top to

input collected data straight into the patient's EMR. Patient records, history, and medications are available instantly on the robots' display for reference. MARs can recognize possible allergies and potentially dangerous medication interactions.

POLARS:

A team which constitutes of a collaboration of Humans and Robots. Humans take bookings and Robots transport the residents. Their app has been installed in their digital wireless cell phones and they are just a button away. Their services comprise an integral part of transportation on this settlement.

WALL ("Waste Allocation Load Lifter"):

WALL and his co-members have put a garbage bins in the whole settlement. Gathering of waste can lead to many kinds of diseases which would be a great problem for the residents. Waste Management is a chief role on this settlement as health is first wealth.

MACHINES FOR INDIVIDUAL SAFETY



Safety of the residents is the first and foremost important motto of the constructors of this settlement. Recognition of one's identity is vital as it would prevent the settlement from outsiders. Some of these measures include:

Identification measures	Specifications	Locations
Retina and Iris Scan	Retina serves as part of eye responsible for vision and blood vessels around retina are as unique as fingerprints. An automated machine will recognize iris of both eyes by biometric identification ant these patterns are unique.	Every sector especially highly biometric in Production Unit and Transmission Lines.
Fingerprint Scanners	Fingerprint authentication will verify fingerprints of humans. Fingerprints are of many sort of biometrics used to know one's identity.	Residential area, Headquarters and Service sectors.
Heartbeat Scanners	Heartbeat Scanners are based on the principle of photo-plethysmography. They measure heart beat based on optical	Mainframe computers access, Headquarters and Energy

	power variation as light is scattered or absorbed during its path through the blood as the heart beat changes.	Production Unit.
Ear Pattern	The use of ears as biometric is a good way of recognition. It will recognize individuals based on their outer ear images through spatial segmentation and prevent them from occlusions.	Residential Area, Elevator column.
Voice	Voice biometrics is recognition of voice by its characteristics. It can be used to authenticate or verify the identity of the person as part of a security process.	Public areas, Mainframe PCs, Service sector etc.
Periocular	Periocular biometrics will recognize facial region in the immediate	Headquarters, Law court areas.

	vicinity of eye. Although it doesn't have high user cooperation but can be used to catch criminals.	
Rapid D.N.A Testing	Humans have 23 pairs of chromosomes. These contain genetic information from the parents. Although most people have similar D.N.A but 0.10 % of everyone's genome would be unique to individual.	Residential Area, Public Places etc.
Gait	Gait Recognition will purely analyze people of the way they walk. It will be used to identify perpetrators at a crime scene.	In emergency cases like Crime, violation of rights, etc.

MAINFRAME PCs

Mainframe PCs would act like Presidents for this settlement. Their planning and control will only make this settlement successful. They'll be creating, delegating, and tracking the progress of multiple tasks at once for the settlement's completion.

NAME	FUNCTION
MAINFRAME CONSTRUCTION PCs	They have the work of overall forethought, coordination and regulation of this project from the beginning to its completion.
MAINFRAME SECURITY PCs	Allotted the duty to maintain a sophisticated environment so that residents can inhabit with full protection.

MAINFRAME CONSTRUCTION PCs:

They will be heading the Construction Department. They'll specify project objectives and plans which will budgeting, worker participants etc. They would also maximize the resource efficiency by procuring labour and the equipment. Ultimately they'll implement various operations through proper work force, planning, designing, and contracting in this process of construction.

MAINFRAME SECURITY PCs:

They'll keep a record of the identification of an individual's identity. Followed by this, they will also work on the areas of development, documentation and that the policies and procedures are being followed for residents' protection. Their robots will be surveying the settlement 24*7, so as to lower the chances of any mischiefs or inappropriate things.

MACHINES FOR MAINTENANCE AND REPAIR

NAME: Maintaining and Repairing Robots {MRRs}

FUNCTION: They have a crucial role to perform. As the residents start inhabiting, they will for sure face many sorts of difficulties. MRRs will look over these issues. MRR and his team are multi-talented workers who can do the works of Dauber, Polisher etc. If there is some interior or exterior repairing work, MRRs will get to know about that by their local satellite detector.

Secondly, there would be surveillance by ZETA 42-97 till the whole working day. They'll giving reports of every second to the MAINFRAME SECURITY PCs so as to keep a check of any non-happening in the settlement.

The Headquarters will allot different sort of duties to robots squadron as per their capability to work.

Thirdly, if the residents are facing any sort of problem in their houses, they could contact the MRRs with an automated wrist phone specially manufactured by ATLAS CORPORATIONS for

this settlement. The MRRs will send his team as soon so as to workout with the complaint filed.

Finally, if there is any leakage in the exterior of settlement, MAINFRAME CONSTRUCTION PCs will look over the problem without any delay and resolve the default as quickly as possible.

This machinery will aid HUMAN CIVILIZATION to inhabit in this settlement with full luxury and protection.

GADGETS



Communication acts as a basis of coordination & cooperation and it is very fundamental for the positive result of a community. To grant individuals to communicate, we will install extremely interactive and futuristic communication services and gadgets.

Individuals can pick for the gadgets of their preference. Present-day tablets would be substituted by indeed finer, lustrous, and stunning tablets & pads. The constantly favoured innovation of crystalline and glassy gadgets would then come true, with all the gadgets being crystalline and glassy, the individuals will find them fascinating and attractive. Most of the gadgets would be Holographic (i.e. 3D).



The interactive gadgets and services would control all the



devices available in the house or in office and most of the common frequent objects too. For example, it would control current day Remote Access. Our settlement's interactive technology would also be able to control the basic lifestyle factors such as change the room temperature, changing the song or channel being played, opening and closing of the doors, curtains, etc. The field of gaming and technology will completely be rectified and reformed in the settlement.







Gaming would serve as one of the most relaxing recreational activity at the Fantarium. It is understandable that Fantarium would also be the home for a number of small children as well who may be interested in space and related science fiction. To cater to their entertainment, Fantarium would have an entire gaming arcade for the children to play. Apart from all the regular amusement park rides, the Fantarium gaming arcade would also have state of the art gaming technology in the form of virtual reality gaming with hands free motion sensed controller.



Games which draw from the legacy of space exploration would be given special attention to make children aware of the work put into the settlement.



An assortment of games would also be available at the gaming arcade keeping the trends on Earth in mind. The games would be supported on a number of gaming consoles which makes it a much more fun experience without having to check for compatibility with the preferred platforms.

Apart from virtual gaming, the option of playing physical games would also be there by utilizing the hands free motion sensor technology offered. This way, one doesn't require an entire field to play football or baseball but only a small area where the console is present.



FIRE SAFETY

In any settlement like the Fantarium, the threat posed by fires is a cause of concern as fires are some of the most destructive phenomenon of nature. Prevention and early detection of fires will be the priority for Fantarium.

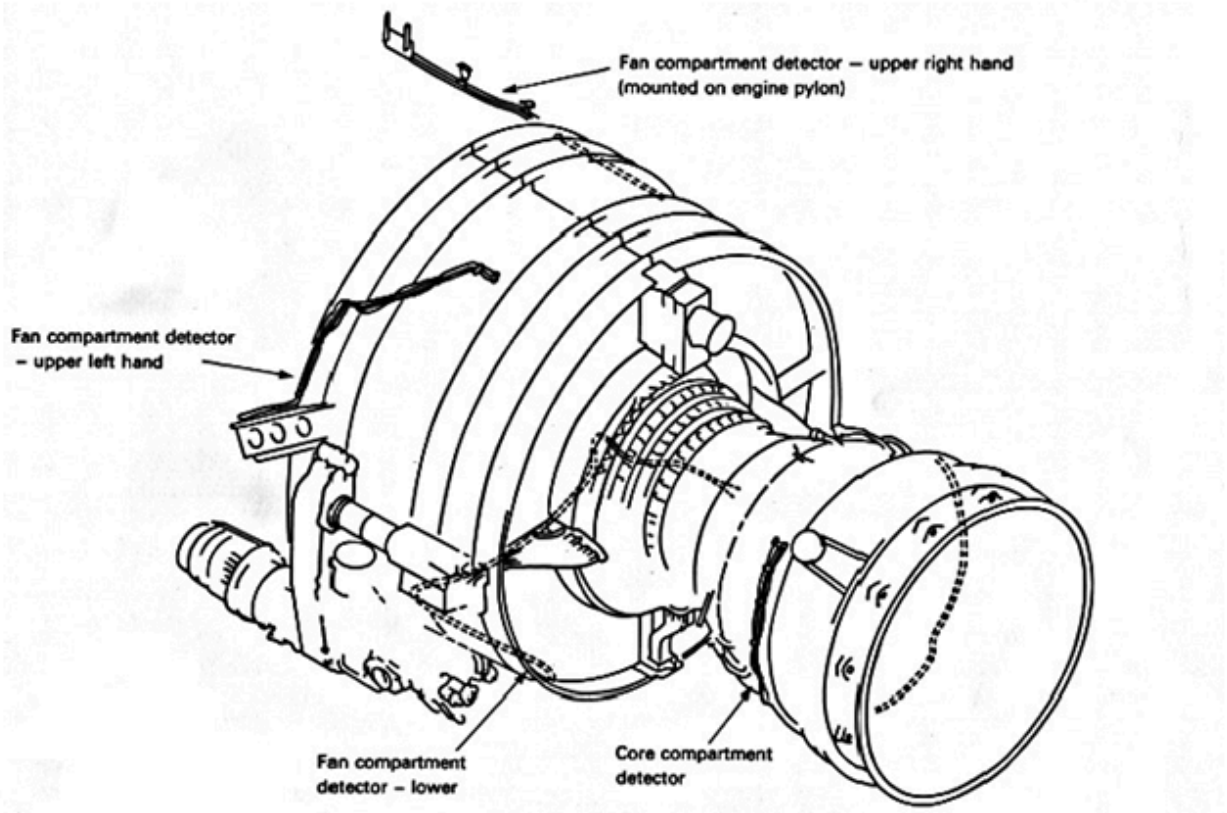
Numerous mechanisms will be put in place to detect and extinguish any fire that may occur within the city.

It is important to note that fires can cause great destruction if not handled in a proper manner and so the fire safety mechanisms put in place in Fantarium would serve multiple functions.



The detectors would have a location beacon which would give out an accurate location and address of where the fire has started and for how long it has been burning. This would greatly benefit the fire safety crews employed at Fantarium to put out the fire effectively and as soon as possible. Also prompt action by the fire crews would ensure minimal damage to life and property as any damage to the structure would result in very heavy losses.

As far as the fuel present in the jet propulsion tanks for the thrusters is concerned, there would be special overheating detectors to ensure that the temperature of the tanks doesn't rise above a critical temperature beyond which there would be a risk of spontaneous combustion of the hydrogen fuel which is anyways highly inflammable. These detectors would be present in each of the thrusters' tanks and would be connected to a coolants system that would trigger the release of the coolant and cut off any air supply to the tanks as soon as the temperature rises above a certain temperature. The coolants would cool the tank down rapidly to prevent the liquid hydrogen from catching fire and also cutting off the air supply would completely eliminate the risk of combustion. The method that would be employed for cutting off air supply would be by circulating heavy incombustible gases especially CO_2 which would prevent the oxygen.



OVERHEAT DETECTION ELEMENTS

All the public places as well as every residence would be equipped with a fire extinguisher which would contain specially synthesized Mono-ammonium phosphate and Ammonium sulphate powder which is one of the most widely used chemicals in fire extinguishers. The advantage of using such chemicals is that they can be used to extinguish fires irrespective of the combusting substance. This means that whether the fire has started because of electrical short-circuits, flammable substances like wood, paper or by liquid fuels such as cooking gas or cooking fats like oil, butter etc. the extinguisher mixture would be able to extinguish that fire unlike commonly used extinguishing methods of pouring water.

The Fire Extinguishing gun will be placed in the corridors of the residential area, which would fire Fire Extinguishing Bullets. Any resident of Fantarium can use these guns. The gun would shoot rubber bullets which would contain Carbon dioxide and extinguish fire.

Some of the technologies installed in Fantarium to extinguish, prevent and to reduce the risk of fires would include:-

- Smoke detectors in every residential sector including all house kitchens as kitchen fires are the most common type of fire
- Fire alarms at places which are at a high risk of catching fires including all public places as well as industrial areas and residential areas.
- Overheat detectors present in the fuels tanks to detect abnormalities in the core fuel and tank temperatures
- Fire extinguishers with Mono-ammonium phosphate and Ammonium sulphate powder
- Coolant storage tanks connected with the overheat detectors in the fuel tanks which would contain molten sodium.



Business Factors

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BUSINESS FACTORS



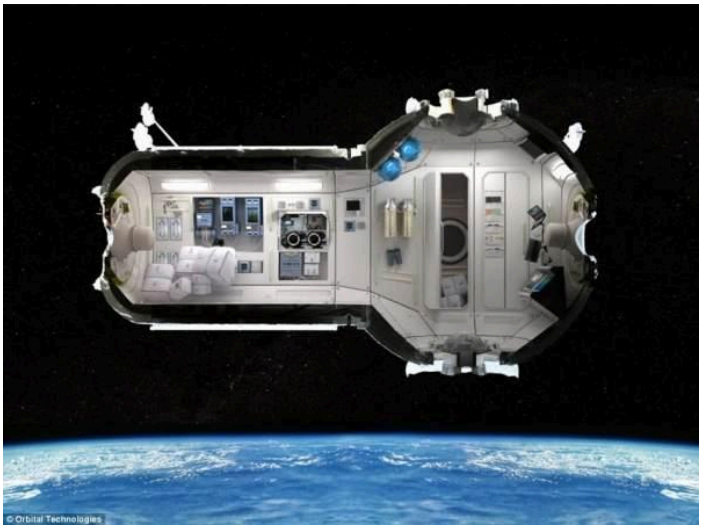
It is not possible to run any business or industry without proper management as it acts as a strong infrastructural support.

For the development of this space city the following business aspects will be taken up:

SPACE TOURISM

Space tourism is another business developing purposes. As this new settlement develops more and more, gradually better ways of living will be established, so more and more people would desire to visit. Space tourism would provide a great recreational opportunity. People will not only get to explore, they will too gain a lot more knowledge about the recently developed technologies and also settle in the space city for their living.





Through this arrangement, beautiful universe all around can be explored and studied in a much better way. Some of the tourist spots such as auditoriums, studios and restaurants will also be build.

People who desire to visit the space city or to make a living would be provided with special training sessions respectively. They will be trained to survive in this new environment and adjust according the artificial gravity created. Some of the devices would be handed over so that they can be in touch with the tourism agency during the tour for any guidance.

People will be provided with the opportunity to visit the developing sites within the city. They will be guided through the mining and other industrial sites to explore and learn about the new technologies used for the space city's development. Tourist agency will be in contact for various proceedings before and during the tour.

While so much of development and settlement will be going on in the space city it also important to have a time to time report about all the changes and progress in and around the space city.

So to monitor all the actions and jobs going around, a space agency will be established. It will be monitoring and keeping a record of all the residents as well as the new machine made up.

Robots will be accountable around the city along with professional scientists to have a check.

They will be monitoring all the industrial proceedings form using the resources till the production sites. Mining and refining buildings will also be monitored so that the work id continued in sustainable manner.



Not only this, they will have records regarding the activities regarding the residents living. Regarding their education, employment and training for living in this new settlement.

These agencies will also be responsible for making manuals regarding how all the exchange and transaction has to take place. Manufacturing products, imports and exports.

Basically they will be accountable for all the works and decisions from mining, refining processes to agricultural practices.

FUELING SERVICES



As it can clearly be observed and popularly discussed in recent years that earth is undergoing a rise in temperature. Poor fueling services can be one of the reasons contributing towards the negative impact on earth's environment.

Fueling services are yet another factor contributing in the business field. But keeping the above point in mind, it is important to develop such services which cause as much as less pollution it can create.

Though it is not possible to travel without vehicles and stop using fuels but efficient way of usage can be tried instead. To avoid harmful effects of the fueling services, some of the

following steps can be taken and residents can be made aware about the same.

- High price does not always guarantee the best quality. So, low-octane fuels can be referred instead of the high-octane ones.
- While selecting fuel or oil for the vehicle, it is important to choose a fuel or oil with correct viscosity. High viscosity oils can affect the movable parts of the vehicle and can result in much more loss of the fuel or gas.

Along with the regular fuel, a new method also be planned that is to use cryogenic tanks. These have the ability to store super cold fuels. This method will be used so as to maintain fuel efficient vehicles.



If every year there are 1000 to 2000 new small and big vehicles made then it would be a target to make more than half of them fuel efficient.

Along with the fuel selection another important point is to use various parts of the vehicles properly and get then services within given

time slot so that the vehicle as well as the environment can remain healthy.

CARGO SERVICES

Cargo Management is another critical success factor. Speed, efficiency and reliability are the factors that determine success of Cargo Management. Hence our Unit will use the State-of-the-art technology and automated processes to achieve customer satisfaction as well as operational efficiency.

The Cargo handling services will range from receiving request to the final delivery of goods. This will encompass:

- Setting up the receiving process
- Maintaining cargo logistics
- Facilities management
- Documenting and Training different levels and keeping safety at the top
- Capacity and Security management
- Providing good Customers services with efficient global cargo tracking

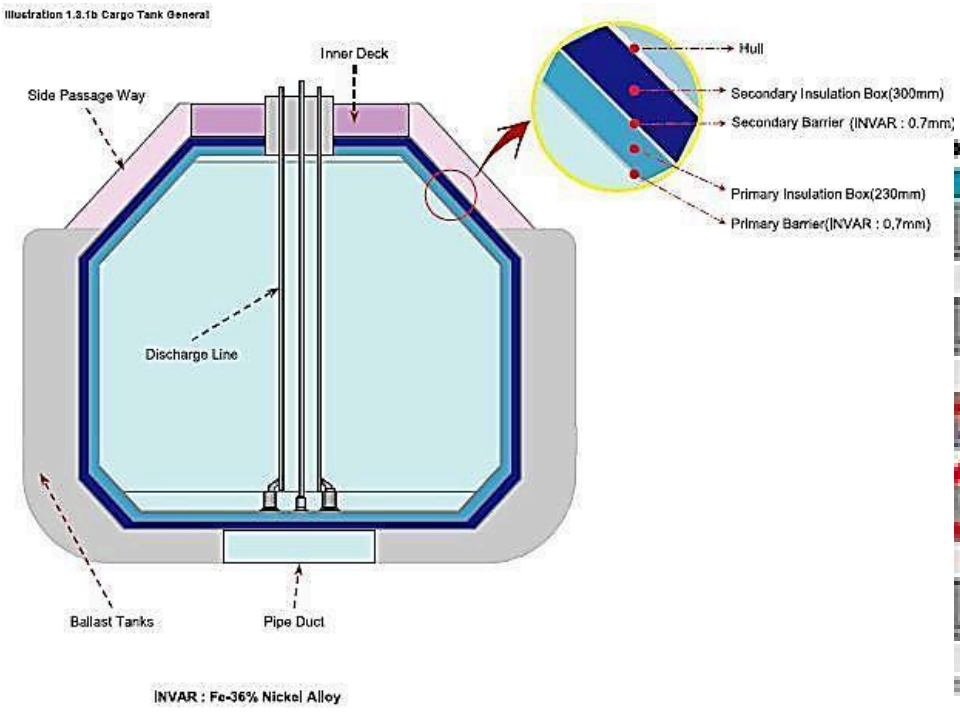
The overall Cargo system will be developed and monitored for excellence. The key performance indicators will be:

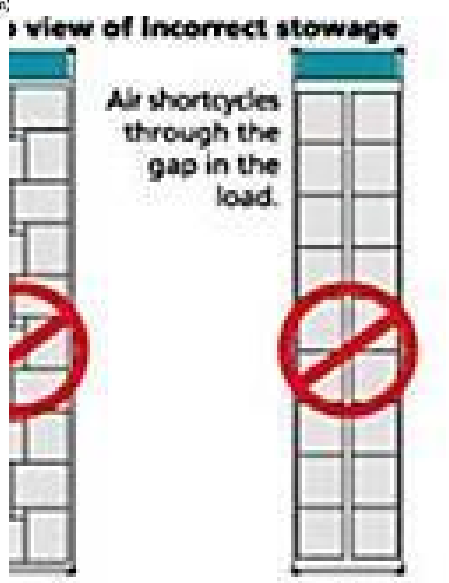
Timeliness: Fast and careful physical handling. Warehouses and equipment are constantly stimulated by the input of technical innovation and by the need for a permanent improvement of functional efficiency. Apply cautious handling techniques with advanced processing methods and software to ensure integrity in physical cargo handling.

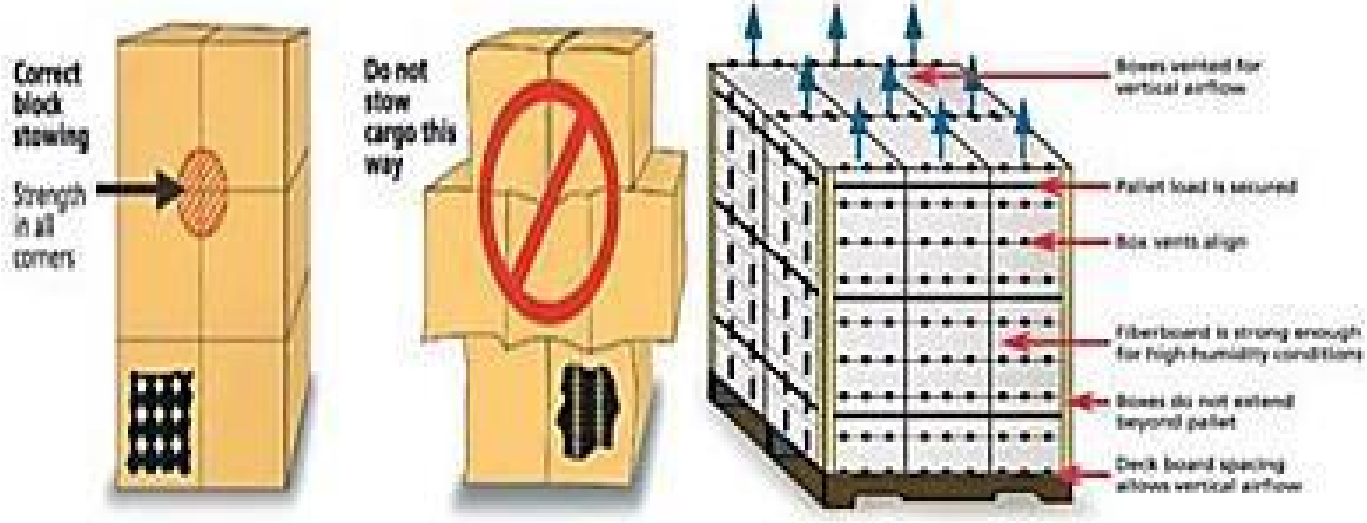
Security: Compliant equipment and processes are installed such as X-ray machines, CCTV, decompression chambers, dog-assisted team units, RasCargo diagnosis for detection of explosives. Security audits and regular dangerous goods inspections are conducted as well as random tests in operative conditions.

Tracking: Real-time information and status of each shipment for the tracking.An integrated network supporting in and out road feeding of cargo shipments.

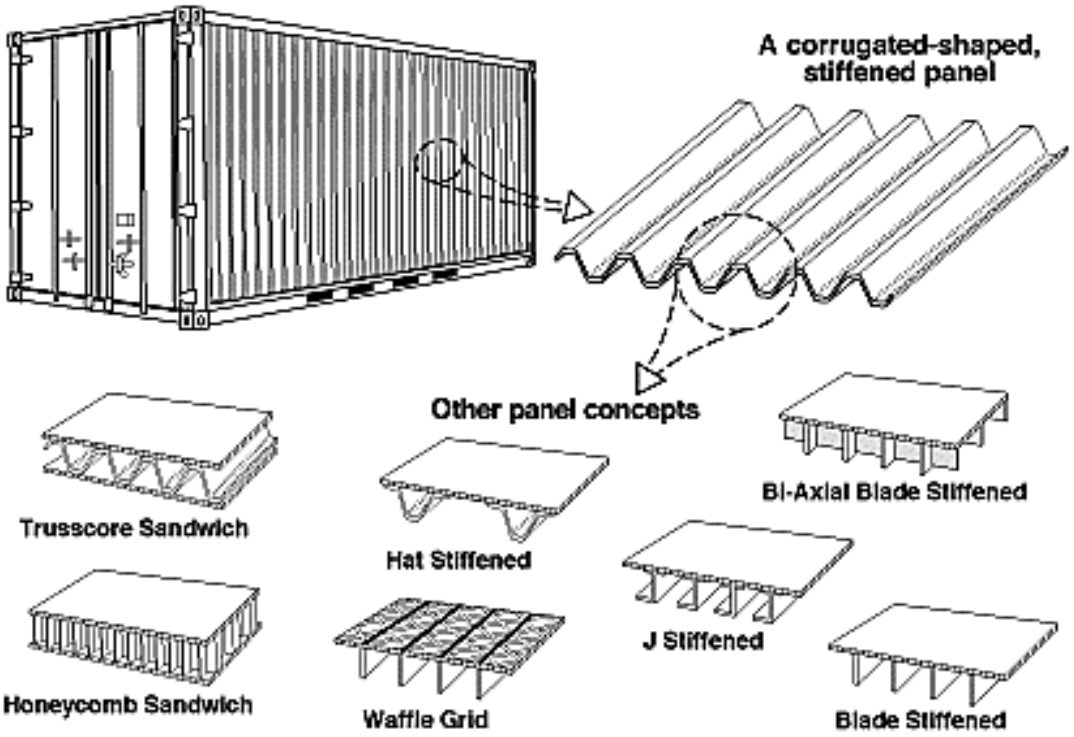
The following Do's and don'ts for Packing will be followed as mentioned below:







Special Container will be used:



Most importantly the FIFO (First in First Out) and LIFO (Last in First Out) concepts will be kept in mind while loading the material depending on the container so that the unloading process is fast and break free. The containers will also be appropriately be tagged so that the fragile items can be handled with extra care as well as there is no damage during transit.

ASTEROID METALS



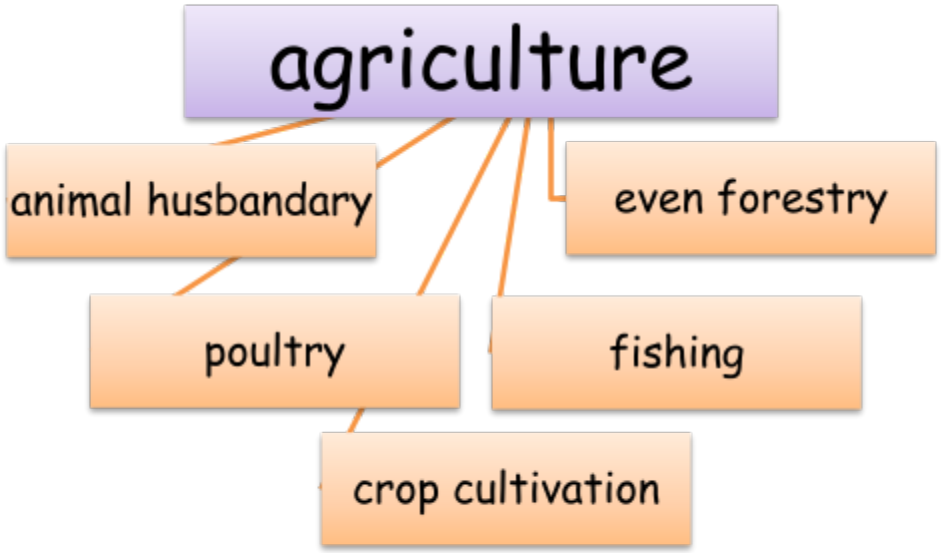
Asteroids are small and huge pieces like rocks that are continuously moving in the universe. Ming and reefing of metals from these asteroids can help us progress with great aspect. It can also help us explore more and more about the formation of solar system. Added to this we can too progress in the field of science.

Through the space agencies developed we can search of the asteroids that can be used for extraction purposes. Some of the useful metals that can be extracted include cobalt, palladium, nickel, gold, rhodium etc., these can be profitable for the economy of the space city.

Some of the asteroids can also be used to extract water, which can serve a very important fuel consisting of hydrogen and oxygen.

AGRICULTURE

Agriculture is considered as one of the main source of livelihood. Moreover it is a way of life as it plays a major role in economic development. Mainly it provides us with fodder, grains and fuel.



Proper demarcation of land will be done to carry of various agricultural practices. Land divided among people will be specified and taken care that the available land is not wasted or left uncultivated/ barren.

Actions regarding resource management will help to use only the required amount of resources so as to preserve the rest of the resources for the upcoming years.

As it serves as a source of income for a large population, proper management projects will be undertaken so that all the agricultural activities can be supervised in a systematic way.

The environment created for the agricultural purposes will be maintained by:

- Controlling the intensity of light required by different plants and crops in different time periods.
- Artificial drainage system would be created in order to take care of the health of the residents living nearby.
- Advanced irrigation system would be established so that right amount of water id distributed among all the irrigating lands and wastage of water resource is controlled.
- The environment created would help the plants and crops to grow in much better healthy surroundings.
- New methods will be introduced to use the manures and fertilizers in such an efficient way that it does not harm the environment around it.



Harvest: newly developed machines and robots will be accountable for the activities.

Storage grounds with appropriate temperatures will be built to store and secure the harvest and used when required.

Sealed packages will be transported in the city. With the well-developed services these might be transported to the Earth.

CRISES:

In case of any crises or any other obstructions in the agricultural department, agencies have made policies which would provide help.

Special storage houses will be built to store the products even for a year or two so that arrangements are made in advance for any emergency.

MINING AND EXTRACTION

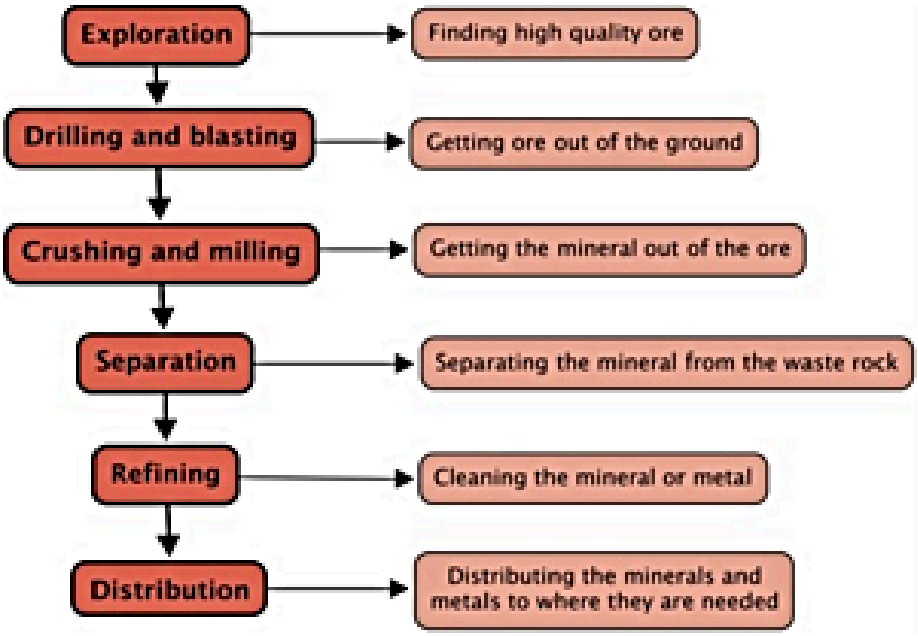
For the modernization and civilization mining can be proved



profitable for this new settlement. Mining is one of those processes which led to the usage of resources by extracting various metals and purifying them. On one hand, it seems important for progress but at the other end it too cause harm to the environment.

In our city we have well planned process through which mining and extraction of metals can be carried out at sustainable methods. By adopting these methods we can move towards progress and at the same time take care about the ecological balance that maintains our lives.

We will



be carrying out mining and refining of the minerals by the following systematic method.

In this way equal and systematic distribution of the resources can be carried out for the present as well as the future use.

Various furnaces and machines would be running with the help of solar panels so as to use as wella s conserve our resources.

All the proceedings from searching the right place for extracting till we have refined products, well developed robots will be at charge.

COST CALCULATION & REVENUE

CATEGORIES	NO. OF EMPLOYEES X SALARY FOR EVERY 3 YEARS	TOTAL VALUE IN DOLLARS
ENGINEERS	2,700 X 96,000 X 3	777,600,000
CONSTRUCTION WORKERS	4,600 X 40,000 X 3	552,000,000

MINING WORKERS	1,600 X 38,000 X 3	182,400,000
SPECIALISTS	175 X 52,000 X 10	91,000,000
MATERIAL COST (For CONSTRUCTION)		190,000,000,000
TRANSPORT		230,000,000
TOTAL COST	ADDING ALL EXPENSES	191,833,000,000

ANNUAL REVENUE

VARIOUS FUNCTIONS	COST (US DOLLARS $)
STORAGE	5,60,00,000
MANAGEMNT SERVICE	63,00,00,000
MAINTENANCE AND REPAIR	1,25,00,00,000

ROBOTS	84,00,00,000
TOURISM	87,00,00,000
TRANSPORT	3,10,00,00,000
TOTAL	6,74,60,00,000