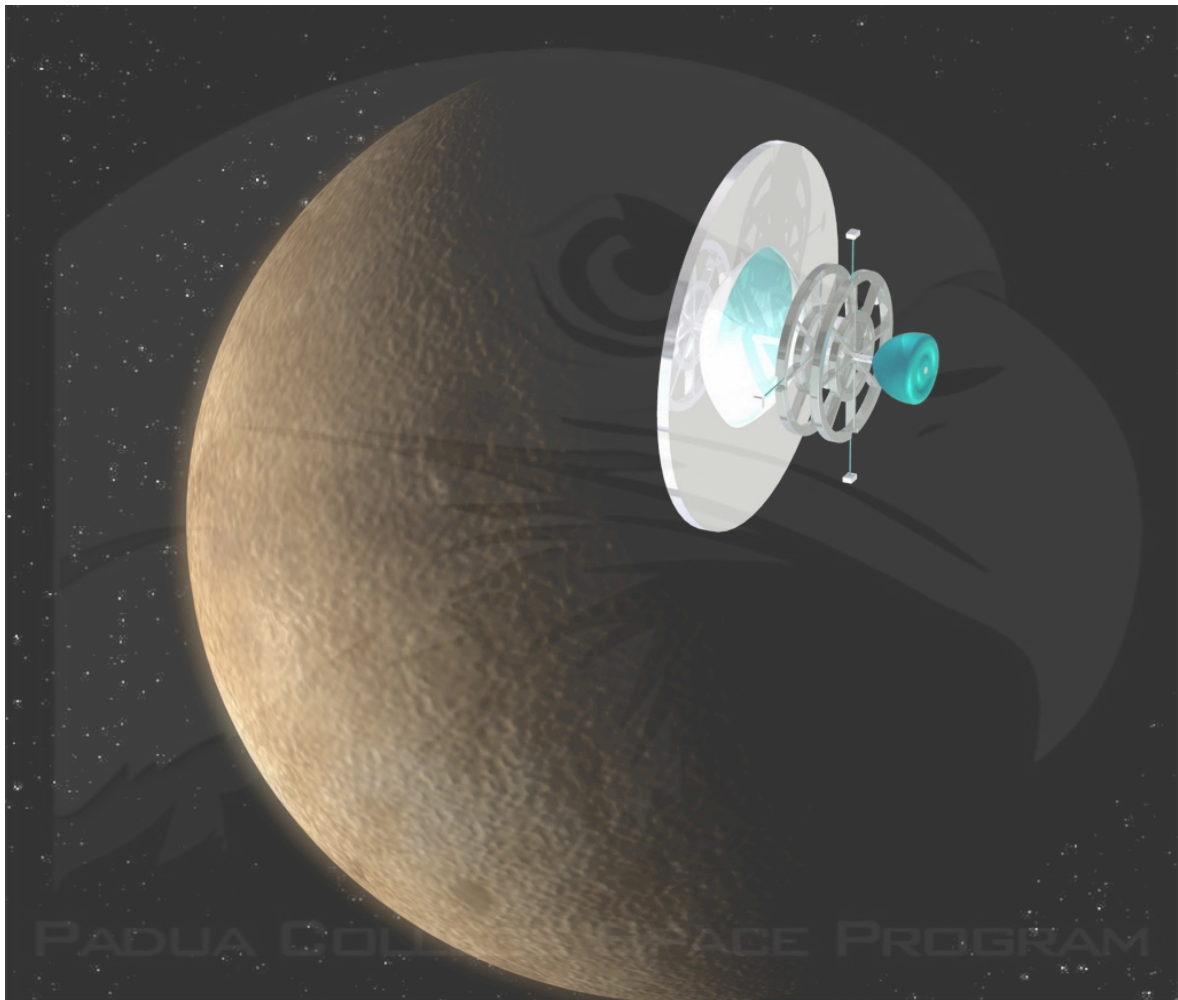


AYNAH

SPACE SETTLEMENT PROPOSAL



PROJECT PROPOSAL 2012
PADUA COLLEGE
BRISBANE, AUSTRALIA

19th Annual International Space Settlement Design Competition Proposing Team Data 2012

Name of responsible teacher/advisor: Stephen Thrum
 School (or other Group Name): Padua College
 School Address: 80 Turner Rd, Kedron
 School Address (2nd line): _____
 School City, State, ZIP or Postal Code: Brisbane, Queensland, 4031
 Country: Australia
 Daytime Telephone at School: 617 3857 9960
 Message Telephone: as above
 Fax Number: 617 3375 9693
 e-mail address: sthrum@padua.qld.edu.au
 Last day of school before Summer 2012: Australian school, no summer break.

Contact information for responsible teacher/advisor when school is not in session:

Name if different from above: As above, school will be in session here in Australia
 Address: _____
 Address (2nd line): _____
 City, State, ZIP or Postal Code: _____
 Country: _____
 Telephone (also evenings / weekends): _____
 e-mail address: _____

Name of alternate contact person (may be a student): Alexander McManus
 Telephone ____ day ____ eve ☒ weekend: 61 425 083 330
 e-mail address: alex.mcmanus@me.com

Names, [grade levels], and (ages) of 12 students currently expecting to attend the Finalist Competition:
(we request that participants be at least 15 years old, and not older than 19)

<u>Tim Hojnik [11] (16)</u>	<u>[] ()</u>
<u>Alexander McManus [12] (17)</u>	<u>[] ()</u>
<u>David De Innocentis [12] (17)</u>	<u>[] ()</u>
<u>[] ()</u>	<u>[] ()</u>
<u>[] ()</u>	<u>[] ()</u>
<u>[] ()</u>	<u>[] ()</u>

Names of two adult advisors currently expecting to attend the Finalist Competition:

<u>Peter Morris</u>	<u>Rok Hojnik</u>
---------------------	-------------------

Competition July 27 - 30, we will be expected to finance our own travel to/from Nassau Bay, Texas, USA.

<u>Stephen Thrum</u>	<u>25/03/12</u>
Responsible Teacher/Advisor Signature	Date

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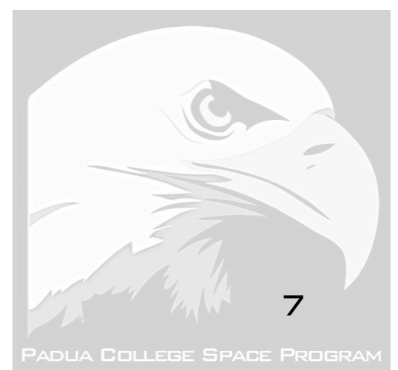
1.0 EXECUTIVE SUMMARY

A creative man is motivated by the desire to achieve, not by the desire to beat others.

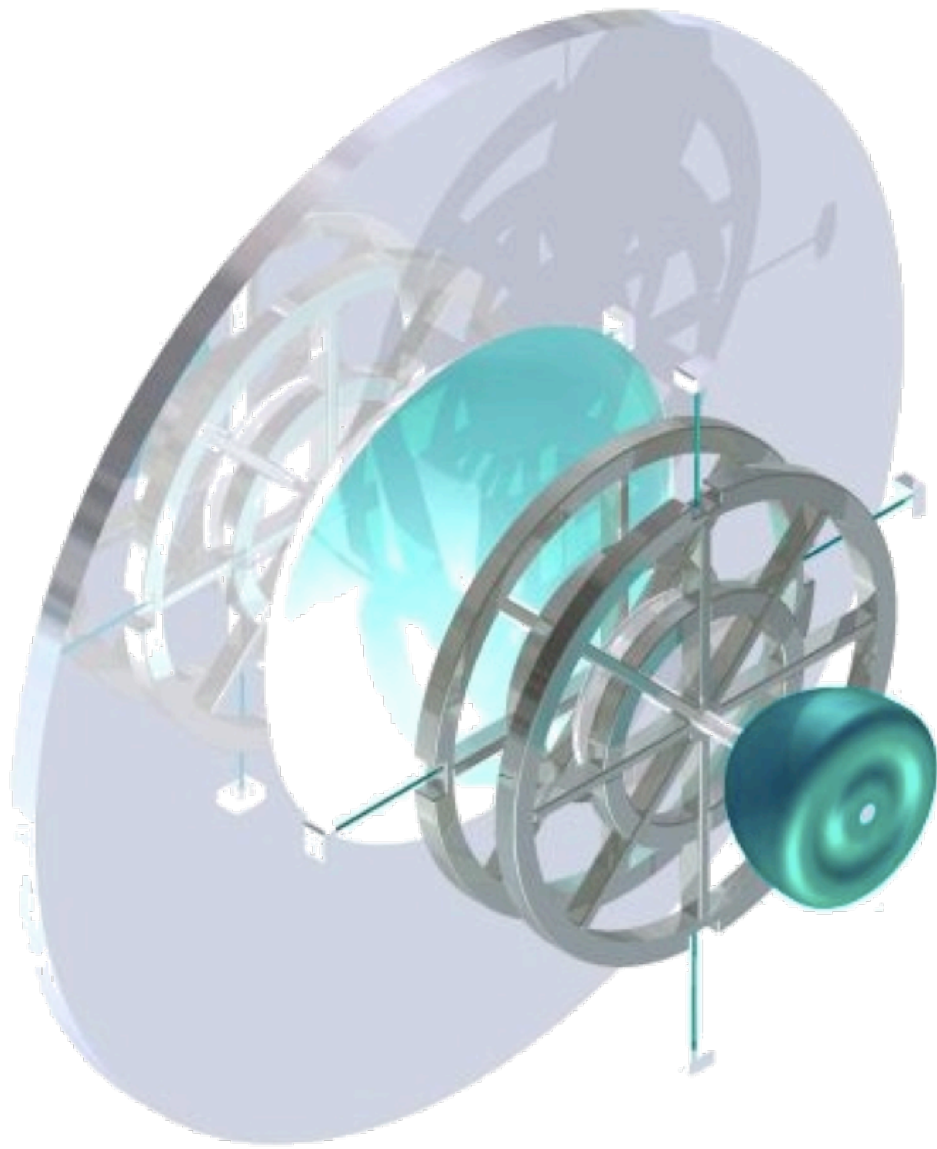
- Ayn Rand

The Padua College Space Design Team is honored to have the opportunity to propose a design for the Foundation Society's latest settlement. Our comprehensive proposal clearly describes the structural design of the station, the operations and infrastructure for the station, the factors relating to human life, the automation of systems in the station, the scheduling, costing and business prospects for the establishment of Aynah. We at Padua College Space Design, have worked tirelessly to present a proposal of the utmost quality and feasibility. Our design incorporates a forward facing solar shield for use as protection against solar radiation and as a means of powering the station resultant from its surface covering of high capacity solar panels. Behind this we have created an aeroponics dome to produce the majority of consumables onboard and to produce the ever so vital oxygen necessary to sustain human life. We have provided solutions to transport, electrical requirements, construction processes, machinery, and the automated systems of the station including security and life support. The maintenance of comfortable human life was one of the main concerns we have addressed, providing the individual inhabitant with majority of the creature comforts they can find and experience on earth. The settlement has also presented some commercial opportunities to be explored including the future transition of the station into a tourism settlement. We have also managed to keep costs reasonably low and the construction and initial implementation timeframe has been kept to a reasonable three year period.

The following document outlines our proposal for the Aynah settlement, which we at Padua College Space Design, hope pleases you and provides future opportunities for growth between us and the Foundation Society.



2.0 STRUCTURAL DESIGN



2.0 STRUCTURAL DESIGN

Aynah is designed to be a production settlement. Though it will also experiment with various alloys and exposure periods to create different propertied Reardonium, its main purpose will be to increase the production output of this alloy. Furthermore, as Aynah is situated very close to the center of the solar system, the settlement will function as a research centre for scientific analysis and testing on our Sun.

The design of the settlement will incorporate all the functioning features of a manufacturing facility, whilst still maintaining ideal living conditions in the residential area; hence Aynah will create the quintessential working environment. Aynah will provide a safe and pleasant living environment for its 14000 permanent residents and 400 visitors, by incorporating these features in-conjunction with providing sufficient working and living space throughout the settlement.

The people living on Aynah will be located within either of the two large torus rings. These rings are state of the art, star port and engineering sectors that will act as both the residential and engineering areas in the settlement. Aynah will also contain storage pods between each spoke of the torus rings, for further storage and ample space along the central tube. This allows for future development of the settlement and possible expansion.

2.0.1 NATURAL VIEWS

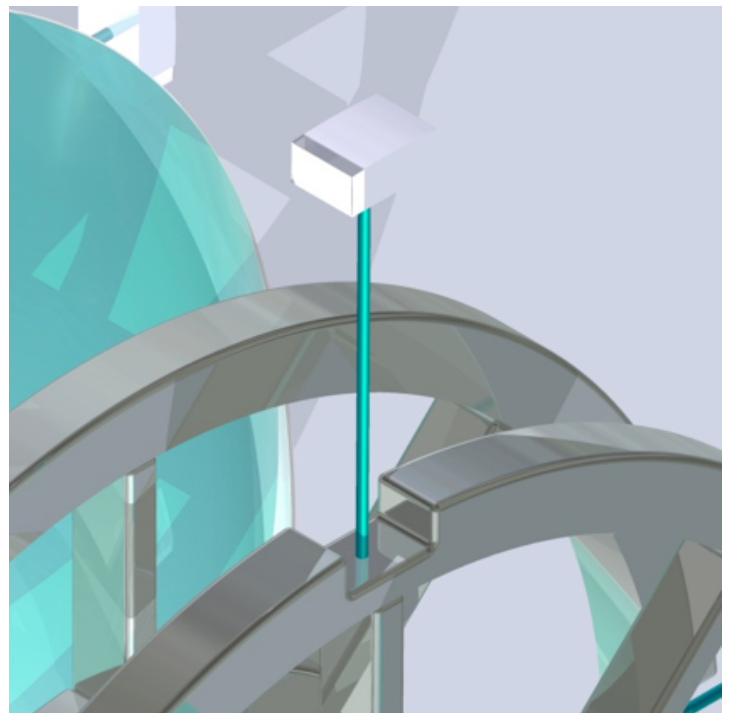
Aynah will provide residents with a natural view of Mercury. An array of window panes will be located in the community sector and various other sectors throughout the settlement. In-order to reduce the quantity of harmful radiation omitted by these views, the light will have to pass through a series of fibre optic cables before reaching the settlement. Subsequently, a system of mirrors will be used to focus the light to the correct destination thereby creating a natural view of outside the settlement and of Mercury. A total of 5% of the total surface area of each torus will be used as windows.

2.0.2 WINDOWS

Each torus ring will have large windows that face various directions, mainly towards aeroponics, Mercury and other chosen points in space.

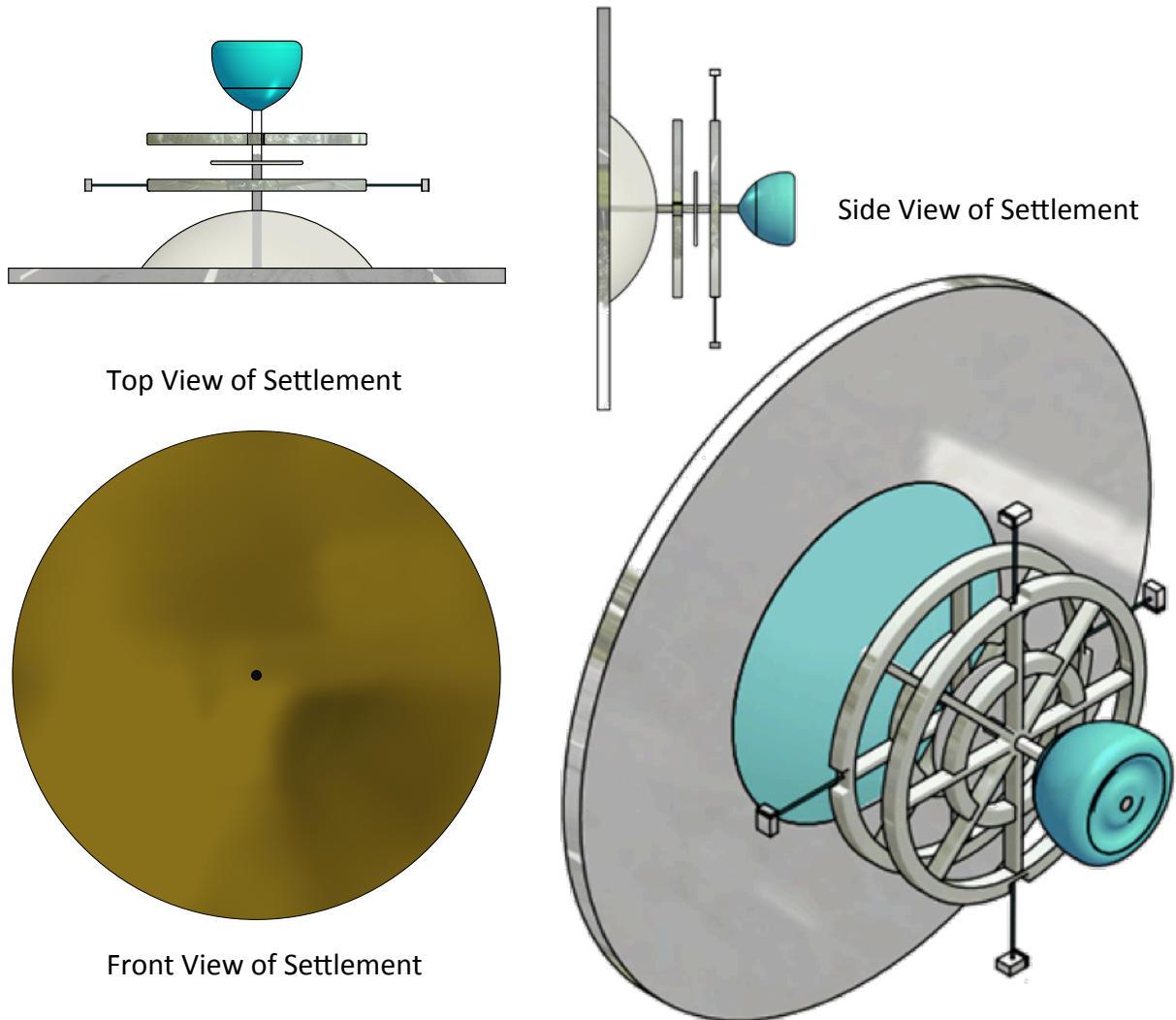
2.0.3 OBSERVATIONAL AREAS

There will be a total of 10 observation areas on each torus ring. A single observation area will be located within each school, however these observation areas will be primarily used by researchers and the school. Despite this, there are 9 other pubic observation areas within each community sector. These sectors will all be equipped with a telescope enabling the public to observe the surrounds of the space station.



2.1 EXTERNAL CONFIGURATION

For dimensions, larger images and component break down refer to Appendix 2.11, 2.22, 2.33, 2.44, 2.4



Parts List			
Item	Qty	Part	Description
1	1	Shield	No gravity, non-rotating, non pressured
2	1	Aeroponics dome	No gravity, non-rotating and pressured
3	1	Central tube	No gravity, non-rotating, certain sector are pressured
4	1	Manufacturing	Gravity, rotating and pressured
5	1	Engineering	No Gravity, non-rotating and pressured
6	12	Spokes	Gravity, rotating and pressured
7	2	Torus Rings	Gravity, rotating and Pressured
8	2	Torus Ring mount	No gravity, rotating and pressured
9	4	Schools	Gravity, rotating and pressured
10	4	School support tube	Gravity, rotating and pressured
11	12	Storage Pods	Gravity, rotating and pressured
12	1	Gyro	No gravity, non-rotating and non pressured

Please refer to Appendix 2.51, 2.52

2.1.1 EXTERIOR

The settlements' population will be housed within the two rotating torus rings. Aynah's commercial activities will be located in various locations within the torus rings, including two schools per ring. Manufacturing will take place in the rotating ring around engineering. The settlements agricultural (plants) will be grown behind the shield in a designated dome, using the technique aeroponics. These plants will also provide the oxygen used throughout the settlement and will aid in Aynah's attempt to create a self-sufficient settlement. Additionally, transport throughout the settlement will be done using various modes.

2.1.2 RESIDENTIAL AND SCHOOLS

This design features two tori rings, which allow the settlement to house schools and residential areas. These areas are able to be transferred easily between the tori rings in case of any depressurization or any other emergency, which may arise. There will be two tori rings for residential use, each being broken up into two districts and three levels. Each level has a ceiling height of 100m and ample movement space, so residents don't get claustrophobia. Level One has an area of 125678m²; Level Two has an area of 1352302m²; and Level Three has an area of 1477966m². Schools have an area of 13000m², which is more than enough room for multiple different activities and facilities.

2.1.3 STORAGE AND LABORATORY

There are a total of 12 spaces of storage and laboratory space within the spokes of the tori rings. Due to their location, the pods need to install in pairs in-order to keep the torus ring balance and reduce the possibility of a dangerous situation arising. Each storage and laboratory space will have two levels: Level One will have an area of 68380 and Level Two will have an area of 59930; both with a ceiling height of 65m.

2.1.4 ENGINEERING MANUFACTURING AND PORTS

Aynah's Engineering, Manufacturing and Ports will be located at the rear of the settlement. Due to the specific requirements of the manufacturing process of Reardonium, the manufacturing facilities will be housed in a torus ring around the engineering sector. The Ports will be located in the front portion of the engineering section. In order to accommodate the industry and domestic functions of Aynah, the Ports will be designed to receive up to four spacecraft's; storing two away and simultaneously storing the cargo.

2.1.5 CONSTRUCTION MATERIALS

Table 3.1.1 Materials for construction of Aynah

Materials	Composition	Amount (m3)	Source	Transportation
Reardonium	Standard	94028.05	Settlement on Mercury	ATLAS 1069
Aluminium Foam	Aluminium	27412808.99	Bellevistat	ATLAS 1069
Plastic	methyl 2-methylpropenoate	10766101.06	Bellevistat	ATLAS 1069
Carbon nanotube	Allotrope of carbon	13897470.03	Bellevistat	ATLAS 1069
Water	H2O	5875879.4	As ice in Mercury's poles	ATLAS 1069
Ozone	O3	2937939.7	Made from O2	ATLAS 1069
Glass	SiO2	233084.23	Bellevistat	ATLAS 1069

2.1.6 ARTIFICIAL GRAVITY

To make Aynah's residential area feel non-artificial, the settlement will provide residents and certain workers within the tori rings and manufacturing, with artificial gravity. Therefore, the residents and workers will experience centripetal acceleration, transferring between non-gravity areas and areas with gravity. The tori rings and manufacturing will have permeated fusion rockets, which will allow the manufacturing rings gravity to vary from 0 - .5 G, with a maximum rpm of 1.45. The tori rings will provide varying gravity between 0.78 - 0.99 G between the three level. Schooling districts will extend out to a maximum of 1.1G, with a maximum of 0.85 rpm. A gyro is located between each torus ring and acts as a counter balance maintain the rotation and ensuring a constant angular velocity

2.1.7 ZERO AND LOW GRAVITY AREAS

Gravity will only exist in the torus rings and manufacturing. The port, engineering, areoponics and central tube will operate in a zero gravity environment. Without gravity, the industrial sector will function more efficiently, as materials may be transported with less effort. Low gravity will exist in the storage pods and laboratory, due to their location.

2.1.8 HULL

The hull of the Aynah is composed of various materials with the optimal combination of protection and feasibility, and is heavily reinforced due to its position. Primarily, the hull composes of Foam, Reardonium and Carbon Nanotubes. Due to the requirement of different sections, the thickness of each material varies. The Foam will function as a shock absorber to effectively eliminate nearly all the kinetic energy of energy upon impact of incoming debris (small). The Reardonium will act as secondary debris shield for larger object and will also act as the Radiation Shield for the settlement. This combination of material, provide a lightweight, but durable, mix. All of this will be reinforced with Carbon Nanotubing, to provide a strong, but lightweight, skeleton for the structure. Aynah's hull is designed to provide optimal protection from space debris and radiation, ensuring a safe atmosphere for all occupants.

2.1.9 LOAD BEARING FEATURES

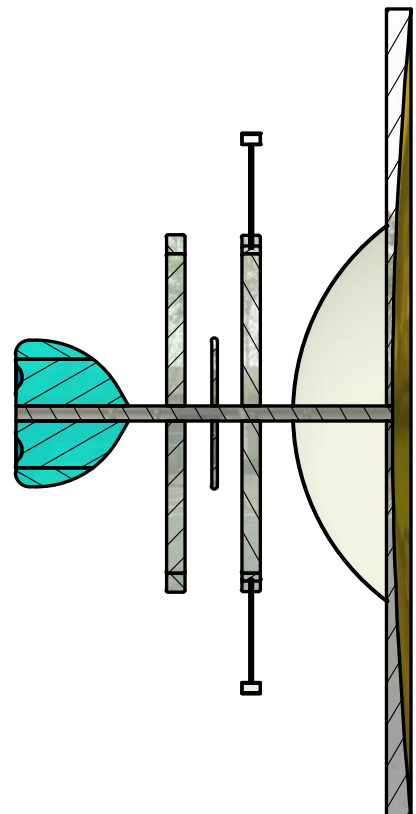
The entire load bearing structures on the Aynah will be constructed out of reardonium, as per the client request. For the exact specification refer to section 2.6.

2.2 INTERNAL ARRANGEMENT

2.2.1 SECTIONAL VIEW OF SETTLEMENT

For Technical Image refer to Appendix 2.14

All of the settlements occupants, both permanent and transient, will live in the torus rings. The residential sectors of the settlement, have been integrated into a single sector to facilitate human life, as well as to allow for maximum interaction between businesses and consumers. Entertainment facilities such as movie theaters and arcades provide recreation within the



settlement. Fitness centers promote exercise, health and wellbeing, in an otherwise cramped environment. Restaurants, bars and shopping centers will help to feed the occupants of the settlement, as well as maintaining the economy. Specialized parks will simulate an Earth-like setting and allow residents to experience a natural environment, with a total of 90% being down surface. There will be a vertical clearance of 80 meters in the down surface area.

The ports on Aynah will be able to accommodate up to 2 dormant and 4 active ships simultaneously. The port is capable of supporting spacecraft of any size. At the center of each port facility, is a reception and storage structure that provides access to the central rod. The ships will be able to hold cargo within the settlements storage pods. The industrial sector functions as a maintenance and repair facility for the settlement. Manufacturing will also take place in a ring around it. In addition, Industry is responsible for producing, housing, and repairing robots, which will serve to both maintain the colony and work in this department. Industry will also take place on the Mercury, with mining for new materials, acting as a supplement for Aynah's Reardonium industry. Additionally excess power will sent to Mercury via microwaves. The settlement propulsion will be done via a array of fusion rockets in the engineering sector. Manufacturing will have a total of 10% down surface. With a vertical clearance of 40 meters in the down surface area.

Aeroponics provides sufficient space for the growing, harvesting, of the settlements natural food supplies. The Aeroponics sector will be located behind the shield, as it close to natural source of light and will act as the radiation shield from the sun. Additionally, generating the settlements oxygen supply.

Aynah's power will be supplied through an array of solar panels, located on the shield. The energy will be stored in mineral salt in the spaces between the shield and aeroponics, acting as a solar shield. During construction there will be a number a nuclear power plant in place, to supply power to the machinery.

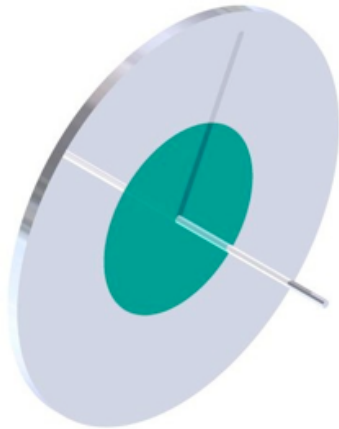
2.2.2 LAYOUT OF TORUS RINGS

Please refer to Appendix 4.2

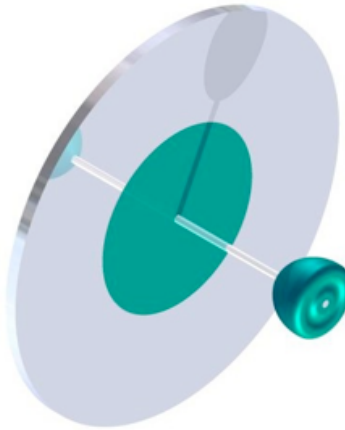
2.2.3 CENTRAL TUBE

Please refer to Appendix 2.3

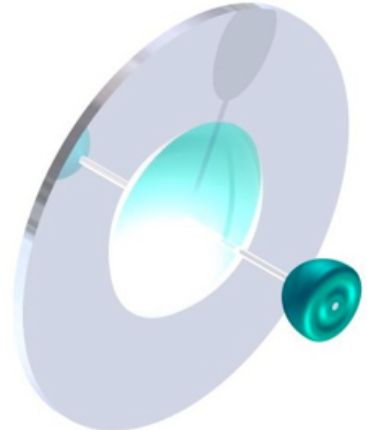
2.3 CONSTRUCTION SEQUENCE



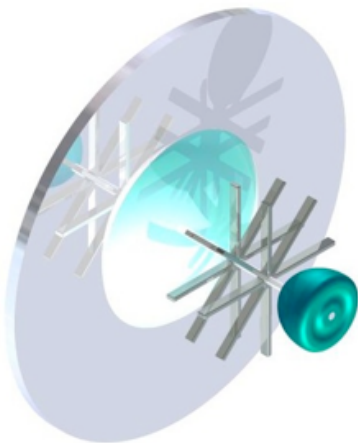
Phase -1 Shield and Central tube



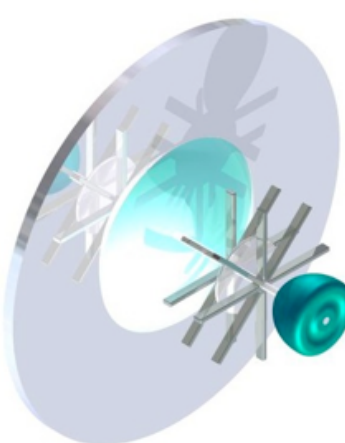
Phase – 2 Engineering and
Manufacturing



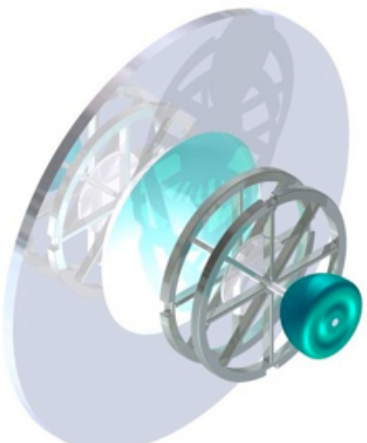
Phase 3 Aeroionics (Dome)



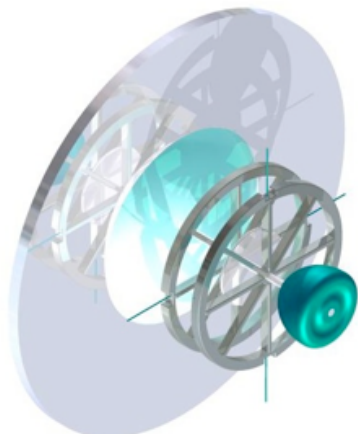
Phase - 4 Torus ring spokes



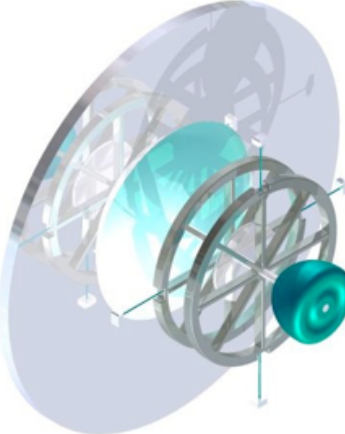
Phase - 5 Gyro



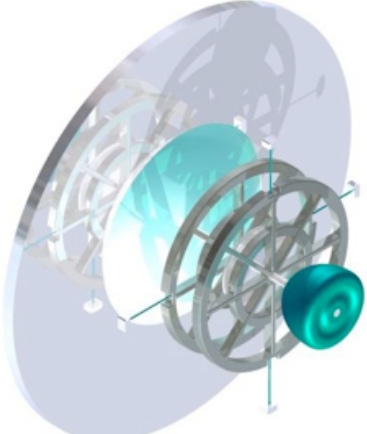
Phase - 6 Torus ring living



Phase - 7 School support rods



Phase - 8 Schools



Phase – 9 Storage and laboratory pods

2.3.1 INITIAL CONSTRUCTION

The initial construction of Aynah will commence on Bellevistat (Phase one, two and three), as it is relatively easy and cost-effective to build in a zero-G environment. The workforce will consist primarily of robots, while humans serve to supervise the early stages of construction. Housing and living amenities will be provided on Bellevistat for workers until temporary housing is established in the engineering facilities. The finished sections will be individually transported to the settlement in transit which will orbit Mercury.

2.3.2 CONSTRUCTION BRIEF

Construction of Aynah will commence with the building of the Central Tube and Solar Shield. This is ideal, as this is the main structure of the settlement. The Central Tube and Shield will be constructed at Bellevistat, which will provide accommodation and act as a suitable power source for the labor.

Both the engineering and manufacturing sectors, will also be built at Bellevistat. Here the two will combine and in conjunction with the Central Tube and the Shield, will form part of the settlement. The purpose of these facilities is to remove the industrial activity away from the primary domestic areas. Therefore the manufacturing sector will be converted partly, into temporary accommodation for the laborers during this construction phase. Once these phases are completed these sections will be towed into the desired orbit, via transport ships. After the temporary accommodation is removed, these sections will have the capability to build, manufacture, maintain, and repair its own robots, in-order to manufacture more structures and provide support within the colony.

The torus ring will mount and attach to the central rod, which will spin freely. The main purpose of these parts, is to add and transfer point between the non-rotating and rotating rods. These two parts will have to be shipped from Bellevistat to reach the final destination.

Construction of the gyroscope and torus ring spokes will happen simultaneously, due the location of the gyroscope. This part will be build at Bellevistat, then towed to catch up with the rest of Aynah, which is being shipped to Mercury. The gyroscope will be built directly onto the Central Tube, due to the type of instruments needed within this sector, so it will not rotate. The Torus ring spokes will be constructed on the top of the torus ring mounts; the spokes will be constructed at Bellevistat then towed to the location of Aynah, during transit.

Construction of the Aeroponics dome will be broken up into three stages, firstly, construction the Carbon Nanotube supporting structure for geodesic dome. Once that is complete, the plastic shell will be built over the top of the skeleton. Then various plants will be placed inside of the dome to create a circulating oxygen supply.

Construction will continue with the simultaneous building of Torus Rings (living Sector) on Bellevistat. They will then be transported to Aynah. This step marks the first stage in which the settlement will be fully functioning. After completion, the workers will live in the residential area, with the conversion of manufacturing beginning.

Phases seven and eight will be constructed at Bellevistat, then shipped to Aynah, finally assembling at the settlement. There will also be a small observation area within them, with high-powered telescopes to enrich the students education and assist scientists.

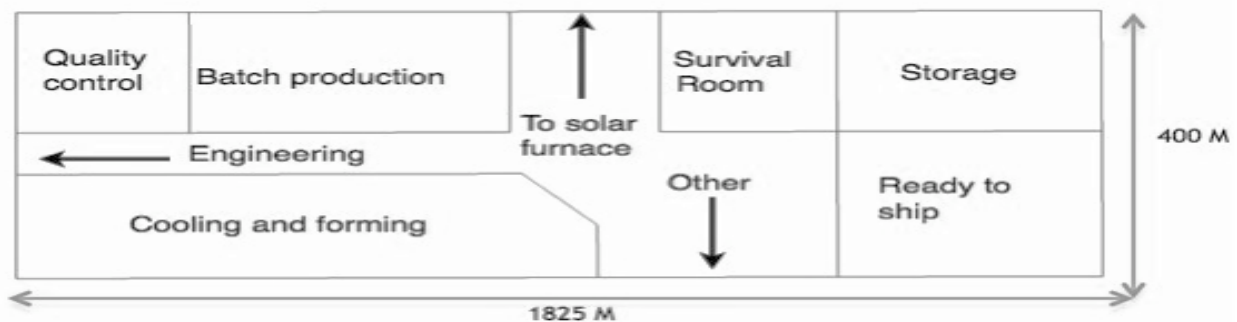
Should the population of the settlement expand such that the existing structures and the provisions become insufficient, the structure is equipped with the capability of expansion. The central rod will be extended from engineering and if necessary, alternate structures may be constructed and attached.

2.3.3 ARTIFICIAL GRAVITY

The permanent fusion rockets will initialize the artificial gravity in the torus ring and manufacturing sectors. Each torus ring will have a total of 6 six-fusion rockets and the manufacturing facility will have a total of 3 fusion rockets. Having permanent rockets will allow the rotation speed per minute to adjust, without any new structures being put in place. The rotation speed will be controlled through the gyroscope.

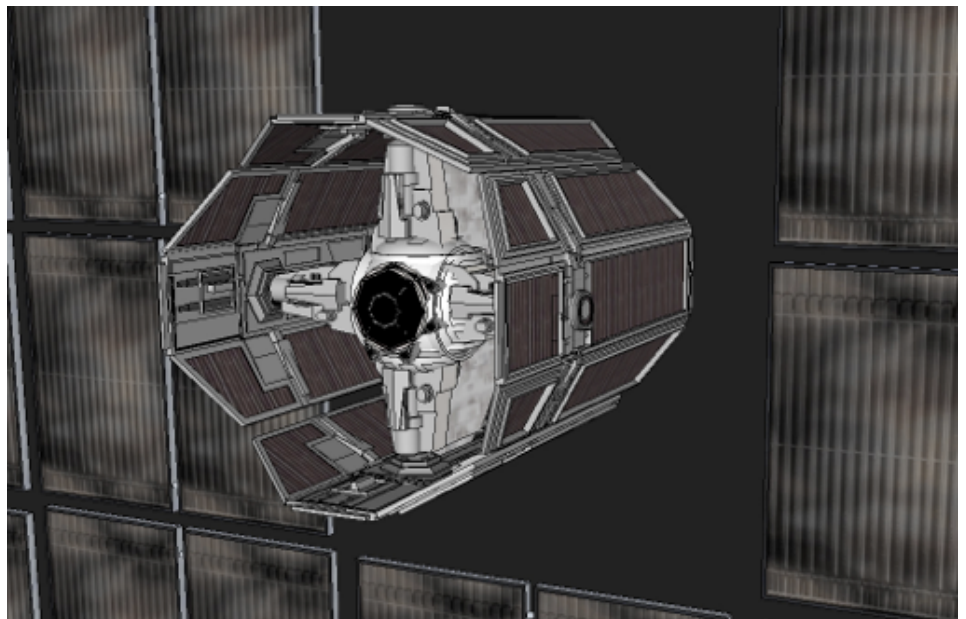
2.4 REARDONIUM MANUFACTURING

To manufacture Reardonium it requires a number of specific conditions. Reardonium parts production will require a refining and manufacturing capability of 0 to 0.5g and vacuum at 20 psi. To achieve these requirements, the manufacturing sector will be broken up into different sections. Each section will be equipped with air tight doors, which have the ability to spin, thus creating centripetal gravity, varying between 0 – 0.5 g at different rpm, controlled by the engineering department.



2.4.1 SOLAR FURNACE

The solar furnace will be able to retract into the central tube when it is not in use and then extend out when in use. The solar furnace will displace a total of 2048000 cubic meters, with a smelting capacity of 1500000 cubic meters. Its dimensions are 160 m by 160 m by 80 m. There will be designated tunnels within the central tube, in-order for transporting material between the Furnace and the manufacturing areas. As there is zero gravity within the Central Tube, material will be easy to transport. The solar furnace will harness the power of the Sun, to smelt the material within the furnace, it will then retract, allowing the material inside to cool.

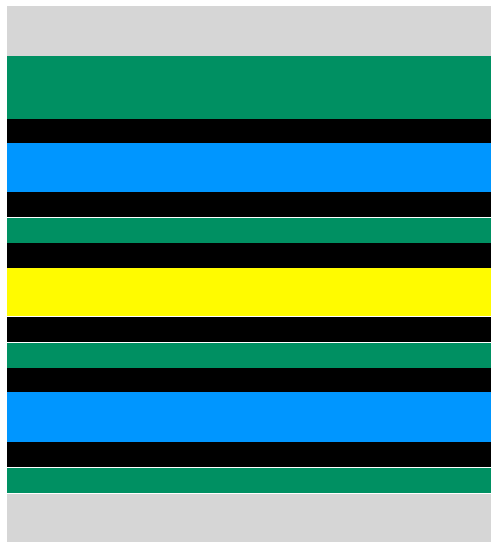


2.5 RADIATION PROTECTION

Due to the intense solar radiation of Mercury orbit, residential and commercial areas need to be located on the opposite side to the sun, and must be completely surrounded by a 0.5 meter layer of water.

2.5.1 SHIELD

The large shield will use passive radiation protection to block and reflect the majority of the radiation.



Aluminum foam – 1.5 m
Reardonium – 1 m
Carbon Nanotubes - .5 m
Water – 1 m
Carbon Nanotubes - .5 m
Reardonium – .5 m
Carbon Nanotubes - .5 m
Ozone – 1m
Carbon Nanotubes - .5 m
Reardonium – .5 m
Carbon Nanotubes - .5 m
Water – 1 m
Carbon Nanotubes - .5 m
Reardonium – .5 m
Aluminum foam – 1.5 m

2.5.2 TORUS RINGS



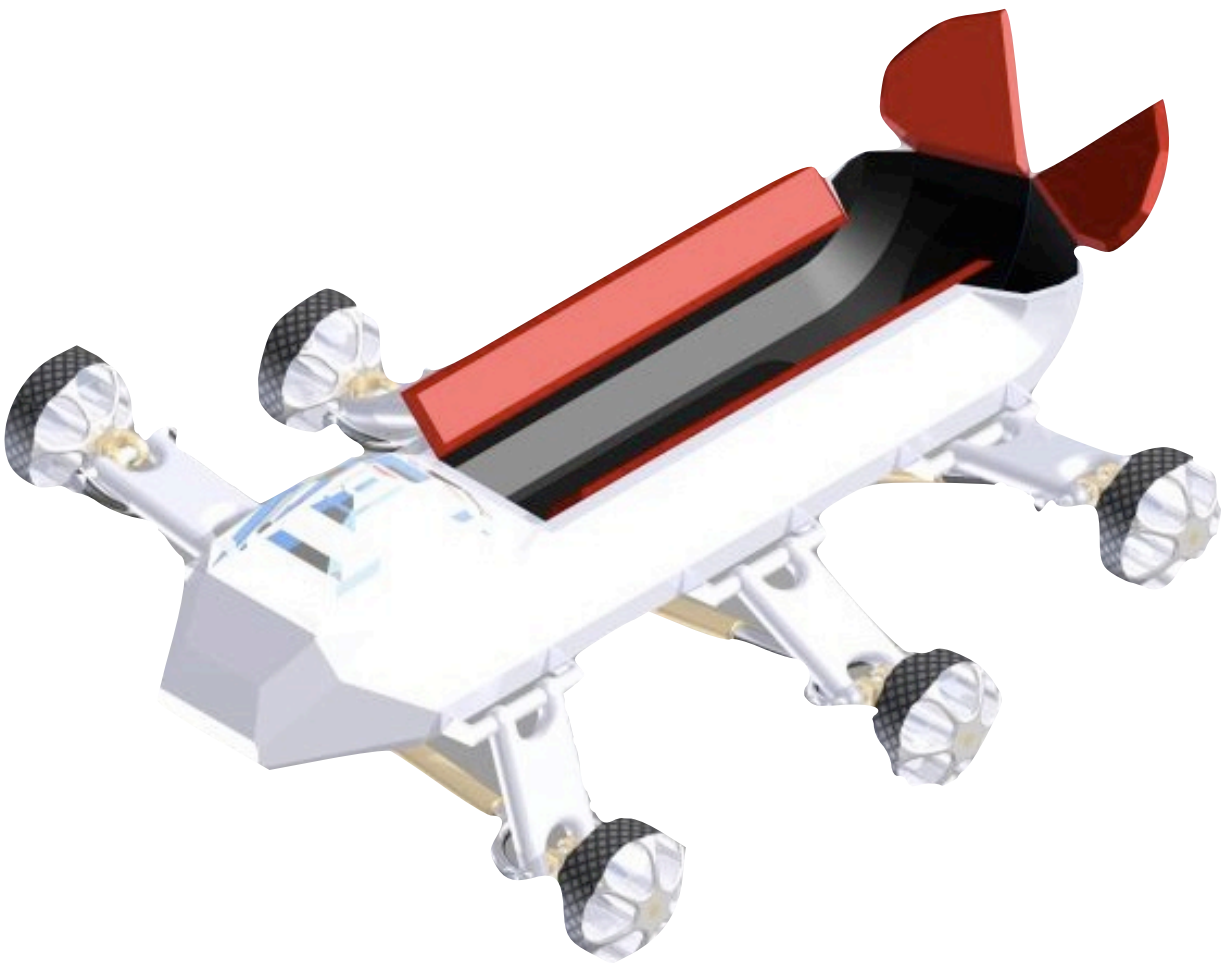
Aluminium foam – 1.5 m
Reardonium – 1 m
Carbon Nanotubes - .5 m
Water – 1 m
Carbon Nanotubes - .5 m
Ozone – 1m
Carbon Nanotubes - .5 m
Reardonium – .5 m

2.5.3 ALL OTHER SECTIONS



Aluminium foam – .5 m
Reardonium – .5 m
Carbon Nanotubes - .5 m
Water – 1 m
Carbon Nanotubes - .5 m
Ozone – .5 m
Carbon Nanotubes - .5 m
Reardonium – .5 m

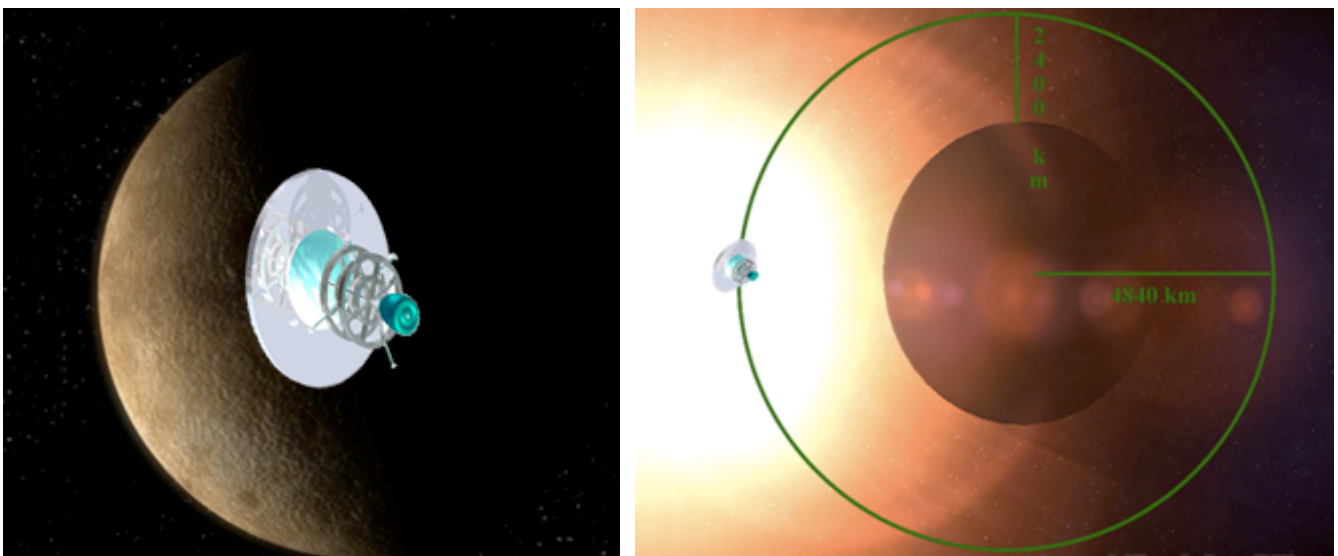
3.0 OPERATIONS + INFRASTRUCTURE



3.1 LOCATION AND MATERIALS SOURCES

3.1.1 LOCATION

Aynah will be in a sun-facing, polar orbit around Mercury, the settlement will orbit at an altitude of 2 400 km. The velocity of the settlement will be 7 712.7427 km/h; this enables Aynah to have direct access to Reardonium manufacturing settlement on Mercury every 3 hours 54 minutes 36 seconds or approximately 6 times each earth day. The reasons for the selection of this altitude for the settlement are protection and proximity. The settlement will be within the magnetosphere of Mercury; the purpose of this magnetosphere is to protect the planet from Solar Winds, in turn this provides Aynah with another layer of protection from Solar Winds and their profound effects. Please refer to pictures below for a visual representation of the settlement orbiting Mercury and a diagram of Aynah's orbit path in relation to Mercury and the sun respectively.



3.1.2 CONSTRUCTION MATERIALS AND EQUIPMENT

The materials required to construct Ayah will come from either Mercury or the low G manufacturing settlement of Bellevistat. Initially the Reardonium will be shipped by the constructed ATLAS 1069 to Bellevistat; along the way the Reardonium will be processed by the Henry Rearden which will be further explained in 3.3.1 Machines and equipment for construction, while at Bellevistat the Solar Shield and Central tube will be created using their resources, equipment and the Reardonium supplied by the ATLAS 1069. While Aynah is traveling to Mercury the equipment used in the construction of the settlement will be explained in section 3.3 Settlement construction. Refer to table 3.1.1 for list of materials used in external construction process.

Table 3.1.1 Materials for construction of Aynah

Materials	Composition	Amount (m ³)	Source	Transportation
Reardonium	Standard	94028.05	Settlement on Mercury	ATLAS 1069
Foam	Polystyrene	27412808.99	Bellevistat	ATLAS 1069
Plastic	methyl 2-methylpropenoate	10766101.06	Bellevistat	ATLAS 1069
Carbon nanotube	Allotrope of carbon	13897470.03	Bellevistat	ATLAS 1069
Water	H ₂ O	5875879.4	As ice in Mercury's poles	ATLAS 1069
Ozone	O ₃	2937939.7	Made from O ₂	ATLAS 1069
Glass	SiO ₂	233084.23	Bellevistat	ATLAS 1069

3.1.3 INTERNAL CONSTRUCTION MATERIALS

The materials used in the construction of the internal structure of Aynah will be sourced from various Foundation settlements and Mercury. The materials will be processed by the equipment explained in section 3.3 Settlement Construction whilst on-board one of the various ATLAS 1069 as it approaches Aynah moving towards its final destination. Refer to table 3.1.2 for the materials used in the internal construction process.

Table 3.1.2 Internal construction materials for Aynah			
Material	Composition	Amount (m ³)	Source
Amorphium	Nano-bots	306880945.714	Bellevistat
Aluminium	Alloy of different common metals, varies depending on the purpose	244587297.14	Mercury, Bellevistat and Astoria
Foam	Polystyrene	21146824.286	Bellevistat
Copper Cables	Copper	18251735.625	Earth
Oxygen	Molecular Oxygen	1000000	Mercury
Nitrogen	Molecular Nitrogen	4000000	Earth

3.2 COMMUNITY INFRASTRUCTURE

3.2.1 ATMOSPHERE AND CLIMATE

Aynah will maintain a constant atmosphere of .2 atm with a composition of pure oxygen. To import nitrogen to obtain a composition and atm similar to earth is exceedingly expensive by removing this factor and reducing the pressure to compensate the environment, particularly the atmosphere is as reactive as on earth. Over 100 years ago in the Apollo 1 fire, the cause was the combustion of a pure oxygen environment but however the key factor was that the fire was caused by pressurizing the environment to well over 1 atm of pure oxygen the environment will be .2 atm of pure oxygen creating the same combustibility of oxygen as on the Earth. Due to the low atm it will be harder to breathe which will not only help the body to stay fit in the lower gravity but the residence will be trained in this atm before arriving to the settlement to reduce the number of cases of altitude sickness.

The settlement Aynah will maintain a constant temperature and humidity of 20 to 24 and 30% to 50% respectfully in majority of the settlement. However as each resident will have their preferences for the climate they live in, Personal temperature control will be available to all residence on Aynah but also for optimal food production the aeroponics will maintain a vastly higher humidity than the rest of the settlement to allow the plants to grow.

Since Anyah is primarily an industrial settlement for the production of Reardonium there will be no Weather control or simulation of the weather experienced on Earth except for the animation on the community level's ceiling. For future expansion of this settlement, inside the torus rings there is a small amount of room in the community district which can be repurposed for "Weather Parks" which simulate the weather patterns of Earth.

3.2.2 DAY AND NIGHT CYCLE

Due to physiological effects the ceiling of the community level will be created into a 3D representation of the blue, slightly cloudy skies and black starry nights of Earth; to give the residence the appearance of a night and day cycle within the settlement, through the use of 3d projections. The night and day cycle maintained on Aynah will emulate the cycle maintained on Earth to allow the residence to adept easier to the settlements unique environment. However for the residences to view space there will be sections of the torus rings with glass not only to enable them to view space but also have different sights than the 3D representations provided.

3.2.3 POWER GENERATION AND DISTRIBUTION

The settlement will be powered by solar power, traveling wave reactors, molten salts and two way microwave transmission. The main source of power for Aynah is solar power and traveling wave reactors, due to not only the requirements of the foundation society but the low cost and high efficiency of operation of photovoltaic cells at about 41% they have been selected as the main power source; however due to the enormous variation in radiation intensity where the settlement will be located vital services will be powered via the traveling wave reactor. While the high periods of energy production from the photovoltaic cells the excess energy will be stored in molten salts, afterwards if there is any excess energy the two way microwave transmission will relay the excess power as microwaves to be absorbed by Mercury. The molten salts storage and two way microwave transmission in conjunction with the photovoltaic cells in periods of low energy will achieve the required power to run the settlement and simultaneously produce reardonium however the cost is during these periods the power supplied to the rail gun will be limited. Refer to table 3.2.1 for the average power production of the settlement and 3.2.2 for the average power consumption of the settlement. For future extensions to Aynah, there is an additional 4, 000, 000 KW of solar power, this will grant enough power for any future expansions to the settlement.

The power will be distributed throughout Aynah via copper cables, from the various power generators, the cables will run within the central tube. The cables will then be divided into power for the torus's and power for engineering sector. The power will be transferred from the non-spinning to the spinning sections of the settlement via copper brushes. It will then be distributed to each level within the torus rings and eventually to each resident.

Table 3.2.1 Power Generation

Role	Type of power	Output(average)	Number / Location
Primary	Solar	60, 920, 000 KW (including power for Reardonium production)	1 located at the Solar shield
Primary	Traveling Wave Reactor	2, 500, 000 KW (500, 000 KW each)	5 located between solar shield and aerponics
Secondary	Molten Salts storage	5, 000, 000 KW	1 located between solar shield and aerponics
Secondary	Two way Microwave transmission	10, 000, 000 KW	1 varies according to the position in orbit

Table 3.2.2 Power allocation including power lost in distribution

Purpose	Power
Production of Reardonium	38, 780, 400 KW
Residential	60, 000 KW
Commercial	60, 000 KW
Port / Spacecraft	98, 000 KW
Lighting	20, 000 KW
Utilities / Climate Control	20, 000 KW
Agriculture	79, 6000 KW
Communication	120, 000 KW
Automation	75, 000 KW
Transport	110, 000 KW
Rail Gun	15, 000, 000 KW
Molten Salts storage	5, 000, 000 KW
Total:	59, 420, 000 KW
Extra power for future extensions to Aynah	4, 000, 000 KW

3.2.3.1 TRAVELING WAVE REACTOR

The traveling wave reactor has the ability to run for years without refueling due to the reactor using and converting its depleted U – 238 fuel into usable U – 235 fuel as it operates. The reactor uses a fission reaction to create energy but the reason for the name traveling wave is that the use of the fuel within the reactor has the appearance of a wave; after one atom has reacted it causes the adjacent atoms to become usable fuel which then reacts and so on until all the fuel is consumed.

3.2.3.2 TWO WAY MICROWAVE TRANSMISSION

The transmitter has dual functionality hence “two way” microwave transmission, the purpose of the transmitter is either to expel excess power from the settlement in times of high solar power production and to receive energy during periods of low solar power production. When Aynah has excess power the transmitter will expel this energy by sending the microwaves at Mercury since the planet will absorb the energy. During periods of lower power production the settlement will transmit energy to Aynah via microwaves which the two way microwave transmitter receives and converts the microwave back into power for the settlement to consume.

3.2.4 FOOD PRODUCTION

Fruits and vegetables will be grown using Aeroponics. This involves greenhouses that are temperature controlled and artificially lit and are located in space between the settlement and the solar shield. These greenhouses will maintain an environment where carbon dioxide will be absorbed by the plants and oxygen produced which can be used in the settlement. The farms will be in a 0G environment as plants are able to grow in these conditions. A vapor comprised of water and nutrients essential for the plant survival will be distributed using a sprinkler system built into the structure.

Meat will be grown using the In Vitro method. The process of developing in vitro meat involves taking muscle cells and applying a protein that helps the cells to grow into large portions of meat. Once the initial cells have been obtained, additional animals would not be needed. Using this method saves space as paddocks for grazing are not needed, only a Laboratory.

3.2.5 FOOD PRODUCTION STORAGE

Both meat and vegetables will be harvested by robots and packaged. They will place produce down the packaging tubes, which will transport the produce to a packaging centre. These packaging centers will handle the produce, preserving them as required, and setting some aside to be made into by-products. Produce and products made will be packaged according to its requirements, such as sterilized and wrapped in foil, quick-frozen or freeze-dried. After food is packaged, it will be sold to the residents via traditional methods such as supermarkets and online shopping. However inside every residential house there will be one month’s supply of emergency food in case of disruptions to the food supply or other possible emergencies that occur.

3.2.6 WATER MANAGEMENT

Residents on board the space settlement will receive 220L of water each day. This amount caters for necessities such as drinking water, using the toilet, washing hands and preparing meals. The mining operations and other industrial quarters will receive 1 265 000L in total each day. This equates to 3 795 000L for the entire population for one day.

Therefore, around 4 000 000L of water will be set aside each day with extra water serving as emergency water for the population.

The water will be predominantly sourced from the ice located in creators near Mercury's poles and the rest from Earth. The water used on board will be recycled and purified again through the recycling plants. These plants filter the incoming water in three stages, which ensures that the water will be almost 100% pure after the process. The first stage is for the water to pass through the filter, which removes particles and debris. Then the water goes through the multi-filtration beds. These beds contain substances that remove any impurities present in the water. Finally, the catalytic oxidation reactor will remove unpredictable compounds and kill any remaining bacteria and viruses.

The water resulting from this recycling and purification process will be drinkable and distributed to the forty 100 000L capacity tanks situated around the settlement. These tanks will provide water for the area surrounding it. As water is used, pipes will carry the water back to the recycling plants, of which there will be five on the space station. For water lost through vapor and evaporation, the air will be condensed and the moisture drawn out of it, so that the water can be resupplied as well. All used water will be recycled and used again.

3.2.7 WASTE MANAGEMENT

The waste management on board the settlement will work using the central tube structure pipelines which will flow between the main module and the Waste Facility located at the end of the Station. As manual compaction of waste and subsequent on board storage will not be a long term option, all household and industrial waste will be collected and transported to a major waste treatment area. Wet Carbonization and advanced combustion technologies will be used to convert solid wastes into uniform and clean fuels while recyclable materials such as paper, cardboard, plastic and metals will be recycled. Metabolic wastes and components will be transported through the pipe system in the floors of the station to the Waste Management Facility and will be transformed there, through moderate temperature and pressure carbonization, into uniform and pumpable slurry, which will be combusted in a furnace located near the Solar shield to reduce the energy required to heat the furnace.

3.2.8 INTERNAL COMMUNICATION

People on Aynah will communicate using their personal devices, when a person is called on Aynah they will respond by accepting the call on the device or via voice command; the holographic capability of the device enables the two or even a multitude of people to have a face to face real time communication. The device will project holograms of the other people in the conversation, meanwhile the devices are sending and receiving numerous qubits; each qubit holds more information than the tradition bit but in quantum computing is the smallest unit of data, via the super dense coding WIFI network the qubit is analyzed and rebroadcasted to the correct device in a matter of milliseconds creating the illusion of instant communication.

3.2.9 EXTERNAL COMMUNICATION

To communicate to the other Foundation settlements and Earth, Aynah will utilize quantum cascading lasers being redirected by a satellites at either Sun-Earth L4 or Sun-Earth L5 to Earth. This is due to the fact that Mercury and Earth will not always be in direct contact. At Earth the communication will be directed via their communication system to another Foundation settlement or to the requested location on Earth. The communication system will be run by a program that sends and receives the messages sent via the cascading lasers while correcting for satellite positioning

and redirecting errors as well as encoding the message to enable the conversation to be protected from hacking. For future development of the settlement Aynah when the technology of quantum entanglement communication is reliable the satellites at Sun-Earth L4 and Sun-Earth L5 orbit can be converted to allow for instant communication between Aynah and the other Foundation settlements and Earth directly.

3.2.10 INTERNAL AND EXTERNAL TRANSPORT

The Frictionless Bicycle's body appear to hover above the bicycle's wheels, this is achieved by using magnetism however since the bicycle has no axels the traditional pedals cannot be used but instead a push pedal system connected to the body was invented that propels the bicycle forward when used. This increases the service life as tyre touching the ground and the axel between the push pedals are the only moving parts increasing the service life, this bicycle is also a very lightweight and cheap device due to it requiring less material to construct than the typical bicycle. Making it the perfect choice for a short commute around the settlement whilst allowing the rider to exercise and keep his muscles strong.

The Segway is the typical low cost and durable device; the advantages of this device are that the rider isn't required to perform exercise to commute between locations. The Segway will only be available to settlement workers that are required to commute for their job since it will enable them to perform their job easier and more enticing. The Segway's will contain a long life battery pack to allow them to be used continuously through the working day.

The main form of community transport around Aynah will be Maglevs; this will play a vital role in connecting the community. The Maglevs will allow a fast and reliable source of transport around the settlement; it will connect the torus rings, the school and engineering section together. Even though this will be an expensive investment to the infrastructure of Aynah the vital role the Maglev system performs with its speed and reliability will be worth the cost.

The ATLAS 1069 is the external transportation system for people and the system of transport for cargo and people to Mercury. The ATLAS 1069 spacecraft follows a naming convention to honor author Ayn Rand and her novel "Atlas Shrugged". The 1069 designation pays homage to the number of pages in the novel. ATLAS 1069 spacecraft are named; the "John Galt" in honor of the character, while the ATLAS 1069 to Mercury will be named the "Rebirth" after the concept in the novel. The wings of the ATLAS 1069 will retract and only extend when landing on a planet, this allows the ATLAS 1069 to be launched by the rail gun for an increased acceleration. The ATLAS 1069 will be propelled by fusion propulsion allowing for an unassisted launch from Earth.

The Supply crates will allow for the cheap transportation of cargo to other Foundation settlements and Earth, the cargo will be located inside the insulated box which will be propelled by the rail gun but at a faster acceleration. Before the crate is sent the trajectory of the supply crate is calculated for a short and safe trip to the selected settlement. When the crate nearly reaches the settlement there will be a vehicle ready to "catch" or retrieve the crate. The crate will be disassembled and stored when the next ATLAS 1069 arrives the crate will be loaded onto the ship; the cargo within the crate will be removed before this process begins.

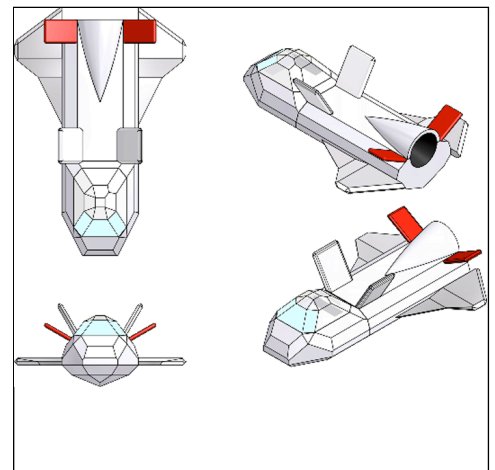


Figure 3.2.4 ATLAS 1069

Table 3.2.3 List of transportation on Aynah				
Type	Summary	Location and Purpose	Dimensions	Number
Frictionless Bicycle	A bicycle that hovers above its wheels due to magnetism	Internal Short distance travel around the community level	Height 1 meter Width .5 meter Length 1.5 meters	10, 000
Segway	A light weight Segway with a long life battery pack	Internal Alternative transport only available to settlement workers	Height 1 meter Width .5 meter Length .25 meter	2, 000
Maglev	The Maglev travels a long distance circuit around the settlement creating a fast and reliable transport for the community	Internal Long distance travel and travelling to and from the central tube	Height 3 meters Width 3 meters Length 100 meters	6 (1 within each torus, 4 between central tube and torus's)
ATLAS 1069	The workhouse of human transportation to any of the Foundation settlements and Earth	External Transport to Mercury, Earth, Mars, Moon, Alexandriat, Bellevistat, Columbiat, Aresam and Astoria	Height 35 meters Width 69 meters 40meters retracted Length 100 meters	10 (1 between Aynah and each location stated, 2 for Mercury)
Supply Crates	The cargo is sent inside these crates to other Foundation settlements and Earth	External Cargo transport to Mercury, Earth, Mars, Moon, Alexandriat, Bellevistat, Columbiat, Aresam and Astoria	Height 40 meters Width 40 meters Length 40 meters	Varies

For the routes of the internal transport please refer to appendix Community Open Level Shops which depicts the routes for the Maglev, Frictionless bicycles and Segways. The Maglevs will be traveling on the Maglev track while the Frictionless bicycles and Segways will be traveling on the Bike road/track.

3.3 CONSTRUCTION MACHINERY

3.3.1 MACHINES AND EQUIPMENT FOR CONSTRUCTION

Due to the modular design of Aynah the equipment required to construct the settlement will be reduced, initially the Solar Shield and Central Tube will be created at Bellevistat, when completed the settlement will start approaching its final destination. Meanwhile the ATLAS 1069 will be bringing the required materials to complete the construction of the settlement. As an ATLAS 1069 is approaching Aynah the Henry Rearden will be used to process the materials into the desired models. When the ATLAS 1069 reaches Aynah, the Francisco d'Anconia will remove the models from the ATLAS 1069 and install them in the settlement. This equipment was named in honour of the characters Henry Rearden and Francisco d'Anconia due to them being the largest metal producers within the novel and these equipment deal with all the incoming metal and other materials. Refer to table 3.3.1 for the equipment required to create the settlement.

Table 3.3.1 Equipment and Machines			
Device	Purpose	Dimensions	Amount
Henry Rearden	Machine to smelt and process reardonium and other metals into the required shape	L = 10m W = 10m H = 5m	9 (1 per ATLAS 1069)
Francisco d'Anconia	Robots to move, weld and connect the modules used to create Aynah	L = 0.5m W = 0.5m H = 1m	250

3.3.2 MANIPULATION OF MATERIALS INTO SETTLEMENT STRUCTURES

The external and internal construction materials that originate for Bellevistat will be processed into the required modules except for the Amorphium due to it shaping its self and the Aluminium which will be first sent to Bellevistat to be processed into the required composition. The Aluminium will be shipped to Aynah via means of the ATLAS 1069 where the material will be processed into the required shape or module. The Henry Rearden will achieve its required function by first heating the metal until it reaches its molten shape. The metal will then be easily processed into the required shape and cooled until it solidifies. The metal will then be extracted out of the Henry Rearden and the processes will restart with different metal all metal which cannot be processed by the Henry Rearden will be pre-processed at Bellevistat. The Francisco d'Anconia will work in groups to manipulate the materials into the internal and external structures, when an ATLAS 1069 arrives at Aynah the Francisco d'Anconia's will unload the various modules and locate them in a designated storage sector depending on being either an internal or external module; the robots will query the construction database to check if any of the models can be installed. If a module is able to be installed the robots will relocate the module to the designed location, through the use of welding and the modular design of the settlement the Francisco d'Anconia's will install the module in a short period of time. The other benefit of the Francisco d'Anconia's are that if a module is in sections as the whole module didn't fit inside the Henry Rearden they will be able to connect the different sections together into a complete module when the ATLAS 1069 reaches Aynah.

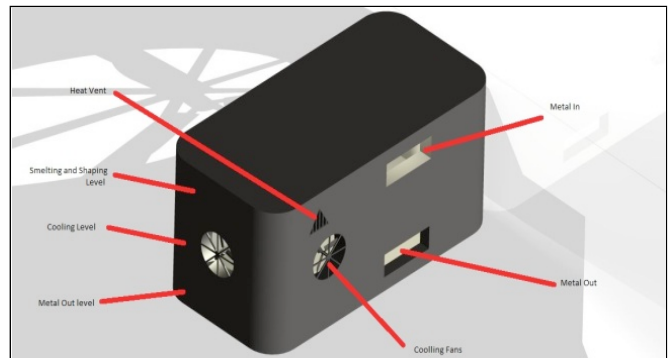


Figure 3.3.2 The Henry Rearden

3.4 POWER FOR REARDONIUM PRODUCTION

3.4.1 DESIGNATED SOLAR PANELS

Refer to Figure 3.4.1 the area within the square has been designated to fit the power requirements of the production of Reardonium. The area within this is 10.3626 km^2 or 4 miles^2 this fits the Foundation's specified power requirements. The power generated by the Solar shield at average light intensity is approximately 60.92 GW or 60,920,000 KW however the designated power will generate 38.8 GW or 38,800,000 KW meaning that the settlement will be left with 22.1 GW or 22,100,000 KW. In periods of low light intensity the supplementary power provided by; travelling wave reactors, molten salt storage and two way microwave transmission can be used to increase the available power for the production of Reardonium to the 38.8 GW or 38,800,000 KW if required.

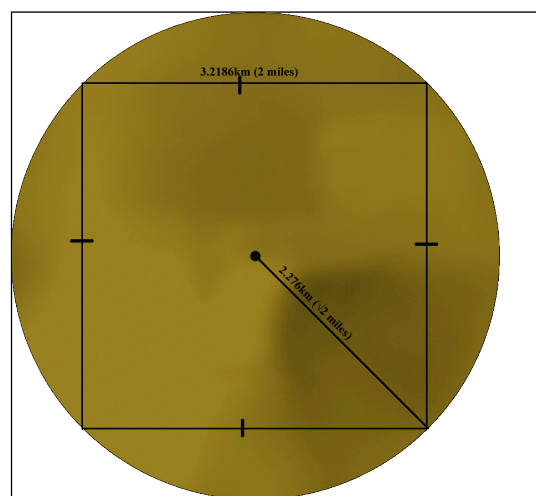


Figure 3.4.1 Dimensions of Solar shield and section for Reardonium indicated

3.5 TRANSPORT OF REARDONIUM

3.5.1 VEHICLES FOR SURFACE TRANSPORT

Table 3.5.1 Surface transportation of Reardonium				
Type	Summary	Location and Purpose	Dimensions	Number
ATLAS S.T.R	A rugged and tough vehicle for the transportation of Reardonium	Surface of Mercury for the transportation of Reardonium	Height 35 meters Width 40 meters Length 100 meters	15

The ATLAS S.T.R will aid the current settlement on Mercury with transporting Reardonium to the required location depending on the period of the curing process. To provide the vehicle with the necessary hull strength for transporting missions on Mercury the hull will be produced from carbon nanotubes. To reduce production costs, and research and development times, this vehicle will use the same base-frame as the ATLAS 1069. This vehicle was named ATLAS S.T.R due to the title of the novel being “Atlas shrugged” and to the purpose of this vehicle being S.T.R or surface transporter of Reardonium. Due to the versatility of this vehicle the cargo department will be utilized to transport ore collected in the mining operation on Mercury. For the specification about the surface transporter please refer to table 3.5.1 and figure 3.5.2 for the visual representation of the transporter.

The ATLAS S.T.R will be loaded by convention method of lowering the Reardonium ore or cured Reardonium into the cargo compartment. When the load is required to be deposited, the hydraulic arm raises the vehicle. Meanwhile the overall clearance underneath the vehicle will increase and the width will decrease. The bottom bay doors located on the floor of the ATLAS S.T.R cargo compartment either side of the middle axle will open. Thus, allowing for larger piles of cargo to be dumped. After all the cargo has been dumped the ATLAS S.T.R will relocate itself away from the dumped cargo to allow for ample clearance for when the reset process occurs; which is reducing the vehicle’s clearance by resetting the hydraulic arm.

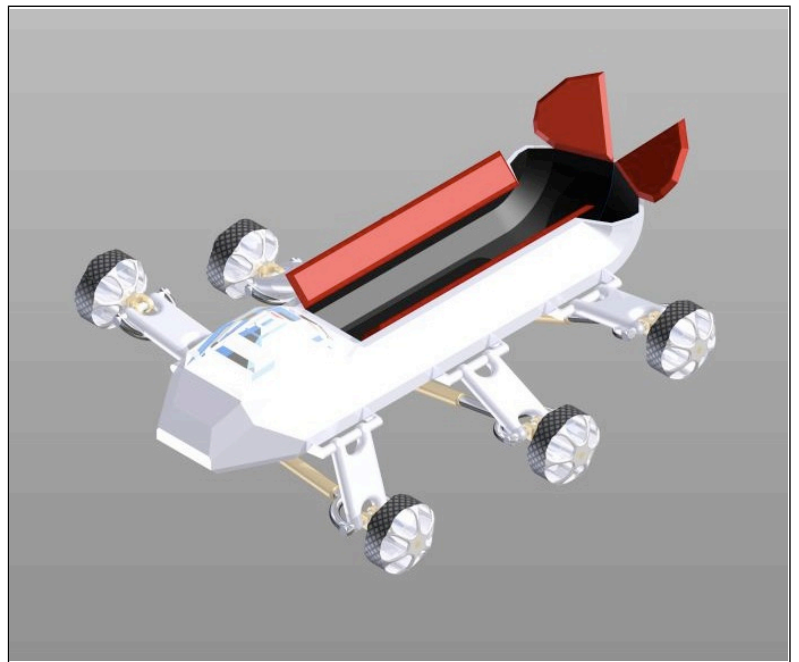
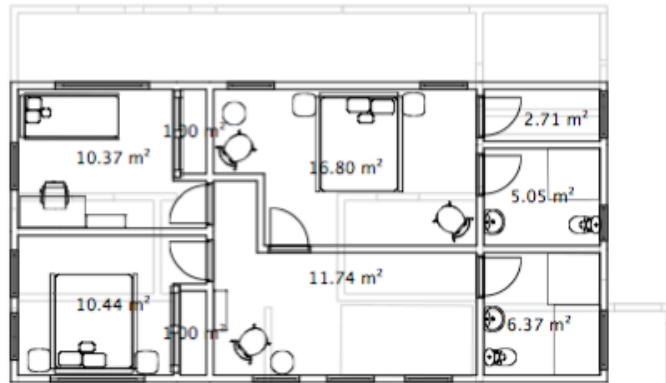


Figure 3.5.2 ATLAS S.T.R

4.0 HUMAN FACTORS



4.0 HUMAN FACTORS

Aynah will provide services which best emulate the material comforts of earth. In order to achieve this goal, Aynah will incorporate a myriad of features that create desirable living conditions for the settlement's inhabitants. Aynah will fulfill these requirements by addressing a number of components categorized carefully to maximize the enjoyments of living. These areas include housing, entertainment, medical systems, parks, recreation and other public areas, education and safe operating environments. By analyzing each of these specific constituents vigilantly and satisfying the requirements for their design, Aynah will provide an enjoyable living and working environment for those who call the settlement home.

4.1 COMMUNITY DESIGN

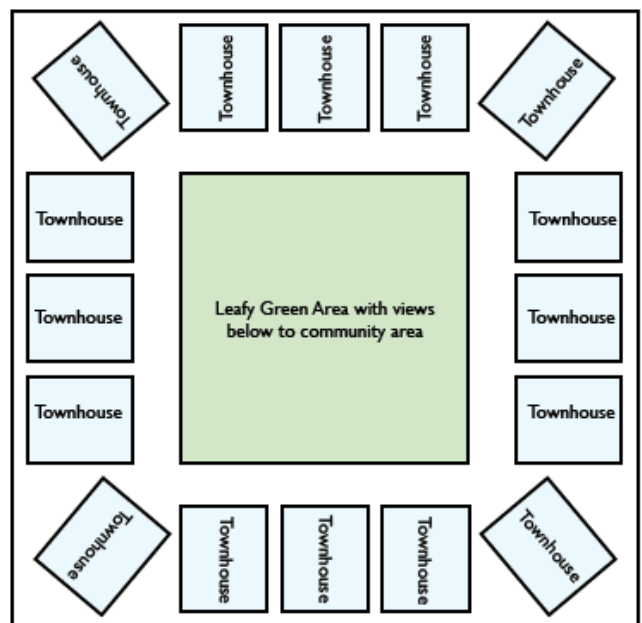
Aynah hopes to offer amenities which residents would expect to find in a modern community. In an effort to create a comfortable environment, Aynah will provide a number of systems which work towards achieving this goal. Certain aspects are important to consider, such as diamond-shaped paths and non-existence of corners (by incorporating curvature into housing designs). Such a district can thrive because of certain attributes valuable to life in a communal area which Aynah will address, namely accessibility, functionality and comfort. An appendix has been attached with more detailed community designs. Please refer to Appendix 4.2 for more information.

4.1.1 HOUSING

Aynah's dwellings aspire to create a relaxing environment for all residents and the transiting population. Important elements of housing will be addressed in this section while design demographics will be covered in 4.2. Curvature was considered vital to incorporate into Aynah's house designs. Research shows corners can create a feeling of claustrophobia and abolishing the use of these allows for a comfortable environment, because it allows the room to appear continuous.

Windows were considered to be an important part of a household because outside views can offer entertainment opportunities and reduce claustrophobia even further. However, because windows are essentially a close link between the interior and exterior of the settlement, their design needs to be considered carefully to ensure the safety of a house's occupants is not compromised. Windows will be rounded rather than square as it will reduce the chances of metal fatigue, which has been proven to crack in pressurised vessels, such as modern aircraft. Similar constituents used in sunglasses (concentrations of zinc oxide particles) will be used in order to ensure exposure to potentially harmful sunlight is not an issue.

Dwellings are configured in a hotel-style, with a corridor connecting all the varying sized rooms. To ensure claustrophobia is not an issue eventuating from the confines of a hotel corridor, the other side will be panelled with glass overlooking an area occupied by parks which residents can experience at their leisure.



4.1.2 ENTERTAINMENT

Aynah will provide its residents with maximum comfort and in order to achieve this aim, considers it imperative to provide a number of types of entertainment. Aynah offers a number of facilities that cater to the needs of the settlement dwellers.

Cinemas are provided throughout the community to provide young and old with an environment not dissimilar to the comforts of home. The cinemas will screen productions made on earth in order to create a sense of comfort and discourage homesickness. The variety of screened films will be suited to a number of interests and will cover a myriad of genres.

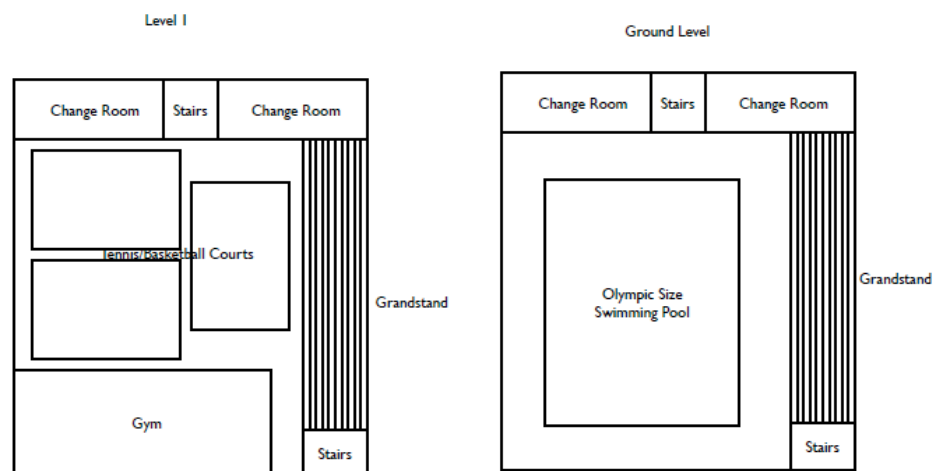
Shopping malls will provide residents with alternative jobs to the often technically demanding tasks required to maintain the settlement of Aynah. Also, these malls act as a social center for young and old to gather and mingle. This encourages the strengthening of relationships between the residents. The malls offer a number of specialty shops that sell goods designed to meet the technological and entertainment needs the residents have.

4.1.2 MEDICAL

Aynah considers the health and wellbeing of its inhabitants to be a top priority. Medical clinics are located in every neighborhood area in order to ensure residents can be treated accordingly should their health be compromised. The interior design of these clinics will emulate common medical centers on earth, simply due to the fact Aynah will provide its residents with the comforts of a home away from home. The settlement design (see section 2.0) will minimize any dangers that space work may create, and the Human Factors department has ensured the incorporation of safe and easy-to-operate systems (see 4.3) was mandatory. In short, Aynah will provide a comfortable working environment with as minimal amount of risk as possible, however, recognizes that should something happen to one of the inhabitants, the best way to treat the injury or illness is no different to the corresponding procedure here on earth. This way, medical staff that work on the station will be able to begin their work immediately; minimal amounts of extra training are required.

4.1.4 PARKS AND RECREATION

In order to prevent families feeling nostalgic towards home or feeling restricted, Aynah has incorporated a number of design features into our proposal which aim to address the recreational needs of occupants. On the bottom floor of the housing complexes, residents will have ample room to move around, with approximately 15% of the floor space allocated to footpaths and open areas for walking, such as plazas where



residents can socialize with others who live in the same environment to them. Sports centers will be built with courts, pools and fields, three areas which aim to cater for a variety of sports which are played around the globe such as soccer, rugby, swimming, water polo, hockey, tennis, basketball, volleyball and badminton. This caters for a wide variety of interests, however adaptability to accommodate sports exclusive to certain countries involves a switch of sporting equipment which can be purchased at various shops in the centers around the neighborhoods, or, alternatively, brought from earth.

Various open parks are dotted around the neighborhoods (see community designs in this section) to allow residents open spaces, thereby reducing claustrophobic feelings which may result from tight spaces. Aynah's design allows for wide paths, whether they be meandering through a local park or circling through a shopping centre. The recreational value of not only the sports centers which Aynah offers, but the shopping centers equipped with speciality stores, department stores and cinemas makes Aynah a desirable place to live and work – a home away from home.

Of course, because of its unique location, Aynah is able to offer recreational activities with a space-themed aspect to them, such as observatories with views of space, completely furnished with telescopes and designed with windows suitable for viewing and controlling potentially harmful rays of light from outside the settlement (see section 4.1.1 Housing for information on window designs).

4.1.5 MAJOR CONSUMABLES AND DISTRIBUTION

For ease of purpose, residents can request delivery to their home should they be unable to shop at the adapted shops which sell such consumables (stored appropriately in containers to avoid contamination) or feel it is more convenient. Otherwise, to maintain common practices that residents have adapted to on earth, the shopping centers offer grocery stores where residents can find the foods listed below. This design feature allows for a goal of Aynah's to be achieved, as mentioned previously. Maintaining the common, recognizable design of a shopping centre will enable residents to feel at home.

For ease of purpose, the items have been grouped into broad categories. From these, residents have the option to choose certain types of food to cater for their dietary needs or intolerance to certain products.

Group	Grams/Person/Day	Production
<u>Bread and Grain</u> bread (<i>white, wholemeal, wholegrain</i>), rice (<i>brown, white</i>), pasta (<i>varieties</i>), cereals (<i>wheat biscuits, bran, wholegrain</i> <i>cereal varieties</i>)	600g	Aeroponics
<u>Dairy</u> yoghurt (<i>various flavours</i>), milk (<i>various types</i>), cheese <i>(varieties)</i>	400mL	Aeroponics

<p><u>Fruit and Veg.</u></p> <p>fruit (<i>apple, orange, mango, watermelon, banana, rockmelon, pear, honeydew melon, apricot, avocado, tomato, strawberry, blueberry, blackberry, boysenberry, cherry, coconut, grapefruit, fig, grape, guava</i>), vegetable (<i>beetroot, cauliflower, broccoli, carrot, cabbage, celery, lettuce (varying types), corn, peas, cucumber, leek, mushrooms, onions, potatoes, peppers (assorted), spinach, shallots, yams</i>)</p>	<p>2 serves fruit</p> <p>5 serves vegetables</p> <p>(These are provided, but as residents have freedom of choice, do not have to be strictly consumed)</p>	Aeroponics
<p><u>Meat and Nuts</u></p> <p>Meat (<i>steak, beef, lamb, chicken</i>), Fish (<i>varieties</i>), Nuts (<i>cashews, peanuts, walnuts, almonds, pistachios, hazelnuts, macadamia</i>)</p>	500g	In-Vitro Fertilisation/ Aeroponics
<p><u>Fats and Oils</u></p> <p>Olive Oil, Ice cream (<i>assorted flavours</i>), Chocolate (<i>dark, milk, white</i>)</p>	100g	Aeroponics

4.2 RESIDENTIAL DESIGN

Aynah is designed with four varying home types. Each one aims to fulfill a differing purpose. Home styles are listed in the table below. Please refer to Appendix 4.1 for more details

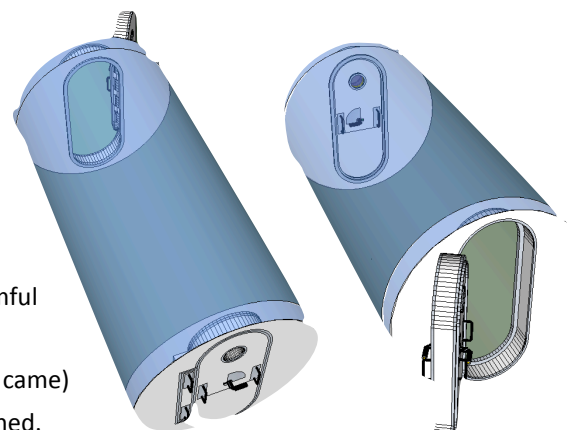
Dwelling Type	Size (sq. ft.)	No. of Dwellings	Caters for...
Transit	1076.4	125	1-2 people
Single	1399.3	3000	1 person
Couple	1829.7	2000	2 person
Family	2152.8	1750	4 people

4.3 SAFE ACCESS

The systems designed for use on the settlement include features designed for maximum safety and efficiency.

4.3.1 AIRLOCKS

Airlock designs on Aynah will be carefully constructed to ensure the wellbeing of the occupants was not compromised. Seeing as these structures offer a link to the outside of the settlement, the utmost care was taken when designing the airlock. It consists of two doors, one of which only opens when the other is closed. The individual then steps into the chamber and is scanned for foreign and potentially harmful objects. On approval, they are granted entry to the settlement. On disapproval, they will be removed from the airlock (back the way they came) and quarantined at another station. The airlock itself will then be cleaned.



4.3.2 SPACESUITS

Two types of spacesuits will be utilized by Aynah: one made of hard fabric for maintenance missions and another made of softer, more comfortable fabric for recreational space walks. Aynah will use spacesuits designed by EST (Extreme Survival Technologies), a company renowned for their technically sophisticated projects. The tethers (listed in this section) are able to be attached to the back of the suit. The small stowage pouch which rests on the back of the person wearing the suit is of sufficient size (about the height and width of a small toolbox) for carrying equipment needed for settlement maintenance or space walks.

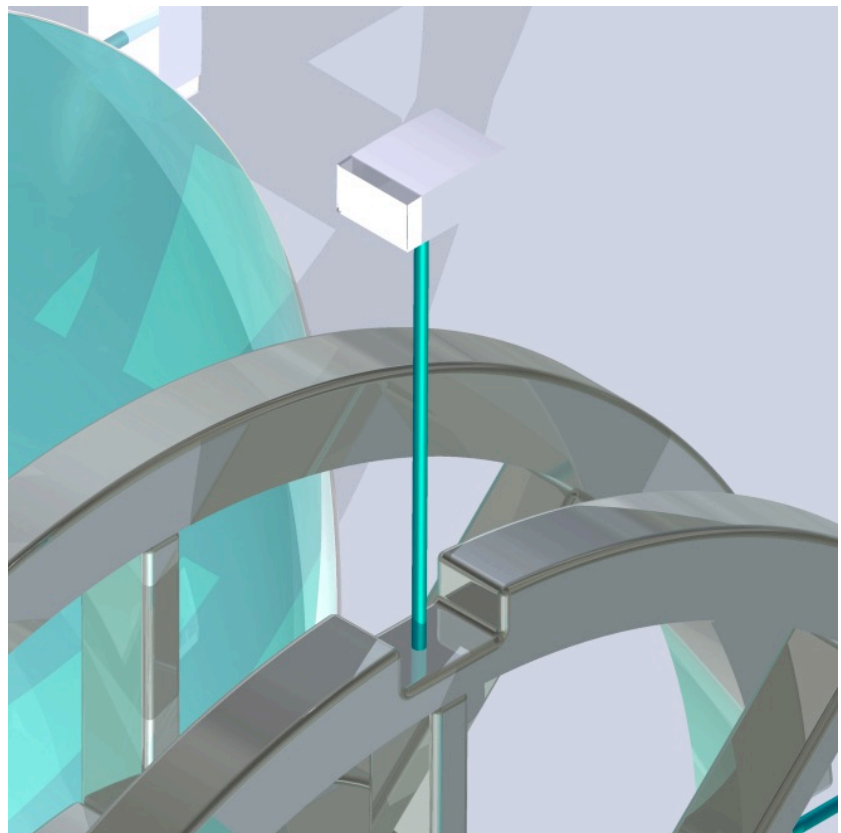


4.3.2 TETHERS

The tethers on the settlement are constructed from aluminum balls covered in Kevlar. The durable outer substance holds together the beads which are flexible in certain situations. However, if the Kevlar is tightened, it becomes rigid, a system developed by Dr. Theodore Martin. (Time Magazine, 1967) This durable tether is attached to the spacesuit during space walks and is designed to maximize safety. It is also very efficient. Handrails will be stationed near all locations where space walks are undertaken. They are bolted to the settlement and designed out of titanium to ensure they are stable for all who use them.

4.4 SCHOOL ENVIRONMENT

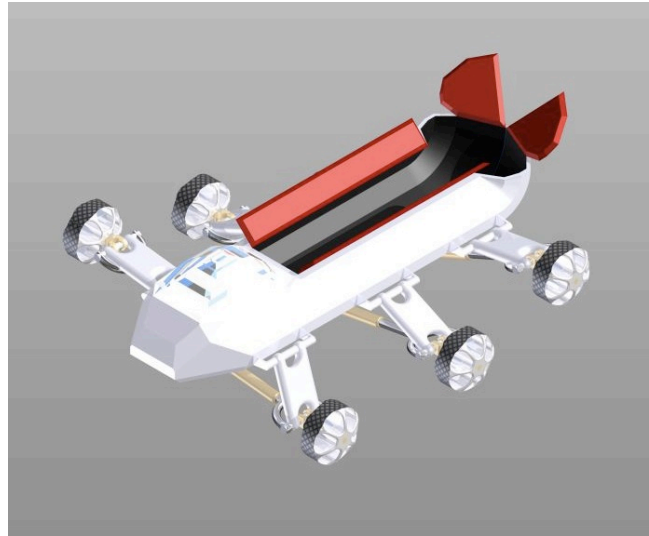
In order to provide children with a comfortable 1g environment for their growth, Aynah will provide a school out side of the settlement (as shown). This fulfills two purposes, one being the provision of a 1g environment for a child's growth, and the second involving an educational environment where students can socialize and learn. Because it caters for these two worthwhile purposes, the school was deemed highly suitable for Aynah's design. The purpose of the extension from the lower-g environment closer to the centre of Aynah is to create the 1g environment that is required for the children to experience.



4.5 SURFACE VEHICLES

The ATLAS S.T.R. (refer to Operations Section for technical details) is both a day and night surface vehicle for use by Aynah's working population. Its adaptation for both day time and evening shifts increases working efficiency. During the design process, conclusions were drawn as to the potentially intimidating "space climate" residents and workers would be exposed to. Thus, it was considered imperative that systems such as the ATLAS were designed effectively to allow for functions to be performed easily, as outlined in the Operations Section.

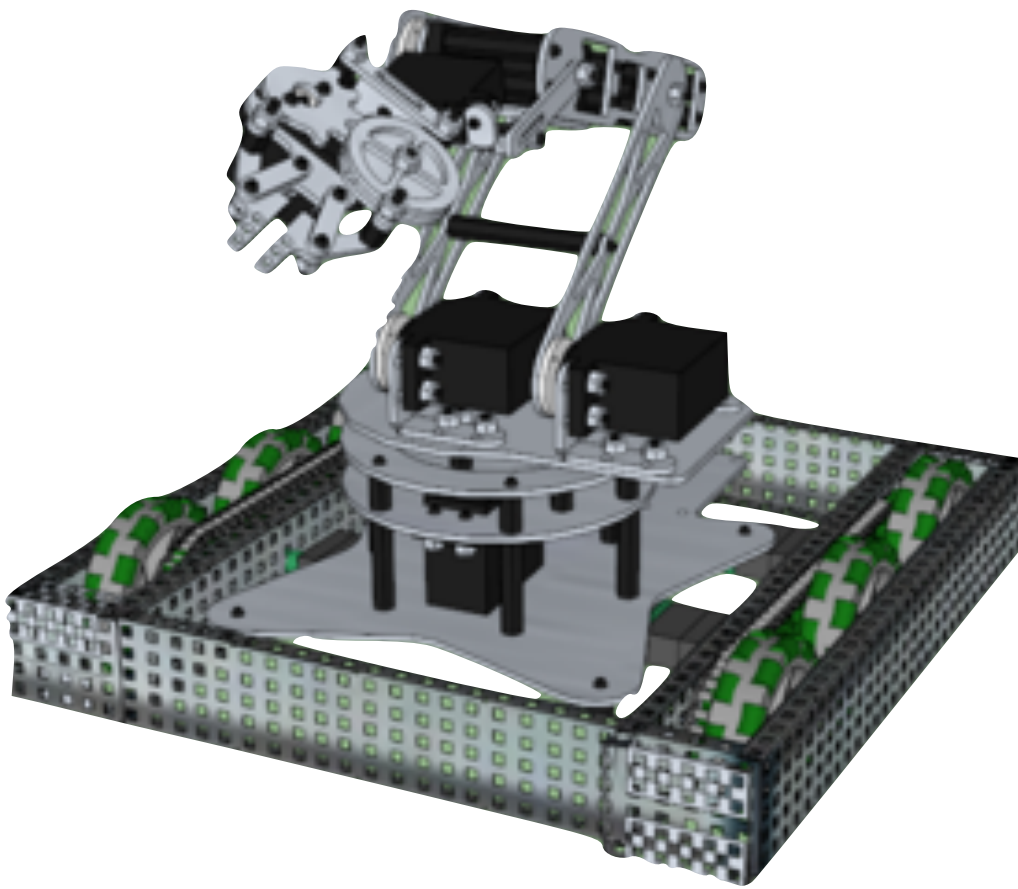
The Human Factors Department focused its attention on the interior design to ensure ATLAS vehicles were comfortably designed to operate with similar functionality to vehicles on earth. ATLAS is of similar size to a large jumbo jet, yet is drivable by anyone who has a driver's license on earth, provided they take the AVA (the Aynah Vehicle Aptitude) Test – engineers recognized operation of such a vehicle would need extra testing to ensure maximum safety. The interior is designed similar to a luxury private jet, with luxurious seating areas and maintenance sections for operations that must be done in the confines of the vehicle. The vehicle itself is not difficult to control and the wheel platforms provide natural "stairwells" to the top of the vehicle if maintenance needs to be done. Like a great deal of other areas on the settlement, corners are designed to incorporate curvature which reduces Coriolis effects from head-turning.



CONCLUSION

Human Factors aims to cater for all the needs humans would have on earth yet in the new and unique environment that is space. Over a century ago, space was an unconquerable frontier, a vast, inhabitable unknown. With advances in technology, humans are slowly venturing into space with projects like Aynah. Because of the great deal of uncertainties associated with space exploration, Aynah aims to ensure the humans who live on the settlement are guaranteed the utmost comfort and safety. Humans are at the core of technological advancements and discoveries this settlement is responsible for, therefore they are a priority. Human Factors has worked towards providing both residents and workers with a suitable environment to live and work in, not overly dissimilar to the ones offered by neighborhoods of earth. Space exploration is often the road less travelled, however, with a great deal of care and effective implementation of safety measures, humans are one step closer to conquering the vast, inhabitable frontier that has surrounded us since the dawn of time.

5.0 AUTOMATION DESIGN + SERVICES



5.0 AUTOMATION DESIGN AND SERVICES

The PSDC is proud to announce a number of innovations and improvements that will, given the necessary funding, propel Aynah to be one of the most productive and profitable foundation settlements to date. In particular, the embracement of distributed networks and new business partnerships allow easy sharing of data and a clear plan leading to a profit.

5.0.1 BUSINESS LEASING

Aynah is proud to announce a new collaboration between two companies. The PSDC has been approached by, and accepted a proposal by, Grumbo Aerospace. Grumbo wished for a second platform to test the breakthrough material “Amorphium”, which was a star draw of their Bradburydom. Amorphium is a material that holds a solution of nanobots. These nanobots, when producing a certain frequency of electromagnetic energy, turn Amorphium from a material that is harder than steel, into a malleable gel like material, allowing easy manipulation of the structure. This material will be initially used in the low density housing and residential areas, eventually though, it is intended that it will be integrated into most of the settlement’s superstructure.

5.1 AUTOMATION OF CONSTRUCTION PROCESS

The construction of the settlement will utilize automated robots and machinery. This will provide a fast and efficient construction of the settlement. The use of automated robots will ensure greater accuracy than if it was constructed by human, the robots will ensure safer construction of the settlement. These robots will also have a camera fitted to them, to ensure safe observation of the construction process.

5.1.1 EXTERIOR CONSTRUCTION

The exterior of the settlement will be built using Modular Robots. These consist of a “Base Bot (SP-IK)” which will connect with multiple attachments; each designed to perform a specific set of tasks. This robot would also be modified for maintenance purposes after the construction has been completed. Attachments for the exterior construction of the space settlement are tabulated below;

Automation Required	Purpose
Welding Attachment	The purpose of this attachment is to allow the process of Welding to occur.
Wrench and Screwdriver Attachment	The purpose of this attachment is to allow the process of fastening, and unfastening (If Required) of any nut/bolt that requires a Wrench and/or Screwdriver.
Jointer and Manipulator Attachment	The purpose of this attachment is to allow the process of joining and manipulating pieces of the Space Settlement as needed during the construction phase.
“Hand” Attachment	This attachment would act as a bionic hand for the robot, enabling the use of many other functions.
Transporter Attachment	This attachment would look much like a flat bed; it would be used for transporting construction materials.

5.1.2 INTERIOR CONSTRUCTION

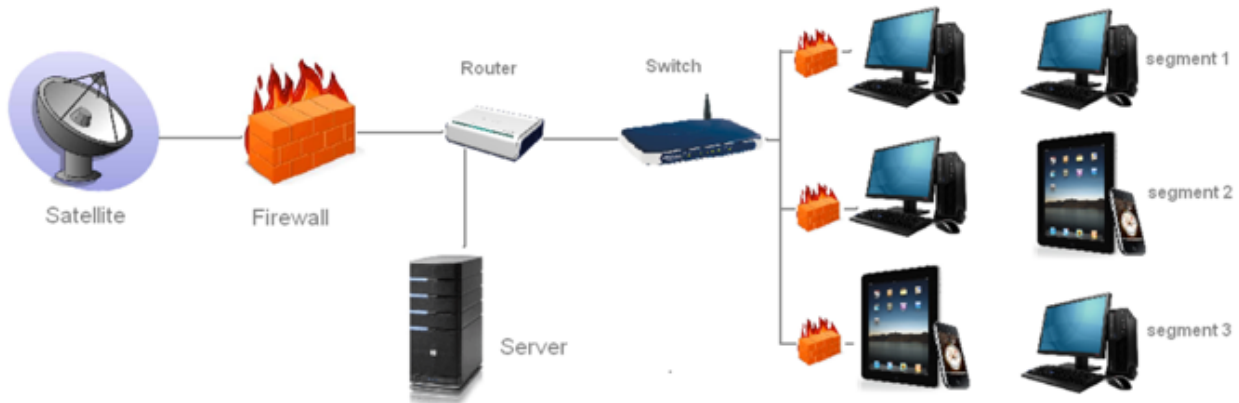
The construction of the interior of would use the same idea of a “Base Bot (SP-IK)” as used for the exterior construction. This reduces the need for multiple models of robots to perform one task, and is also easier to maintain to robots.

Automation Required	Purpose
Flooring Attachment	The purpose of this attachment is to allow the process of putting flooring down through the settlement.
Painting Attachment	The purpose of this attachment is to allow the process of painting to occur, it would have multiple brushes available and would intelligently decide what brush would suite the task at hand.
Furnishing Attachment	The purpose of this attachment is to allow the process of furnishing the accommodation. It would have the pre determined furnishing design programmed, and would carry out as required.
Electrical Installation Attachment	This attachment would install all Electrical and Data cabling through the settlement.
Utilities Attachment	This attachment would install all utility lines thought the settlement, for example Water and Sewerage.
“Hand” Attachment	This attachment would act as a bionic hand for the robot, enabling the use of many other functions.

5.2 FACILITY AUTOMATION

Application	Automated Response	Human Interaction
Monitoring of Settlement	Atmosphere -- Sensors and central intelligence monitor for changes in pressure, composition etc	Atmosphere -- Humans notified of changes that could affect settlement.
Monitoring of Settlement	Hull Integrity – Sensors are woven into the hull structure, and constantly report information such as nearby stress, temperature, and position. If a patch of sensors goes “dark” it is immediately recognised there is a flaw or breech, and the area is sealed off.	Bubble Integrity -- Humans notified of any changes to integrity of hull.
Monitoring of Settlement	Security – For security from external intrusion, the servers and processing power for all automated systems is hosted away from all other systems, in with the critical system database.	Security – The settlement will, in all restricted sections, have security cameras automatically recording everything that happens. In the public areas, the coverage is less severe, but is still enough to give a view of everything that is happening. No surveillance will be conducted inside a private residence, unless some wrongdoing is suspected.

5.3 AUTOMATED CONNECTIVITY



Aynah's networking and communications systems called the "Aglialoro Kaslow Communications System" in honor of the two producers of the movie "Atlas Shrugged", follow a distributed load system. There is no one central database, but a number of them scattered around the settlement. This design allows for a more robust system, a loss of power in one section cannot take down the entire system, allowing for emergency communications to be up all the time, except in a case where the entire station has disintegrated, which would be impossible. The distributed nodes allow for demand to be met dynamically, and shunted to the most efficient node, rather than just to the central database.

Aynah will initially use a combination of fibre optics and wireless systems, however this will be subsequent to changes and upgrades, as new technology becomes available. For this reason, data throughputs are not included in this diagram, as it will be evaluated closer to the date of interior construction.

5.4 MINING AUTOMATIONS

5.4.1 REARDONIUM MINING

The Reardonium Mining process will follow the same procedure as "block-caving" subterranean Diamond Mining. This was chosen as it is the most cost effective form of mining for this purpose. It involves undercutting the ore body (with the Reardonium Miner 3000) and allowing it to break-up or 'cave' under it's own weight, removing the need for blasting.

5.4.2 INDUSTRIAL ROBOTS

Industrial style robots are used to load and unload all the raw and cured material off of Mercury's surface into the ATLAS 1069. (Refer to 3.2.10 ATLAS 1069)

5.4.3 SHUTTLE AUTOMATIONS

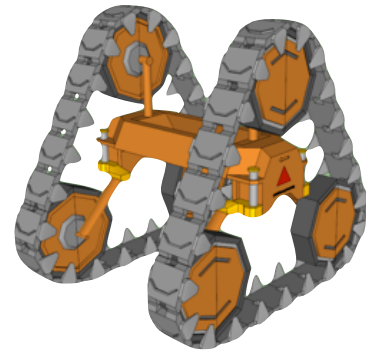
The Shuttle is a multi-purpose transportation device with different spaces on board which are used for different tasks. One space holds the mining robots whilst the shuttle is flying. A different space will store the refined ore whilst two spaces will be used for life support and one for search and rescue. There are further spaces on the shuttle that are spare.

The Shuttles, in keeping with the idea of multi purpose, will be able to respond to almost any situation, using a number of configurations. Situations include the day to day, such as transporting materials and miners, all the way to emergencies, providing a mobile medical centre and abilities to tow disabled spacecraft.

5.5 SURFACE AUTOMATIONS

5.5.1 IX3

The robot "IX3" is used to transport material/supplies and humans across rough terrain. Attachments such as a robotic arm can be attached in order for the robot to assist with maintenance and construction of the buildings.



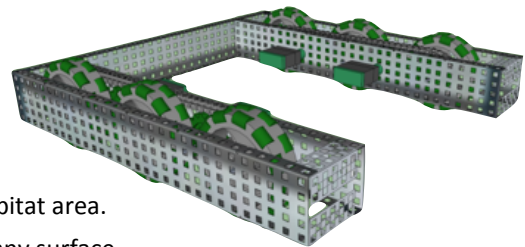
5.5.2 HEXAPOD

The "Hexapod" is a universal surface robot. It can be used to perform duties such as : transport, maintenance, scientific research and emergency operations. The robot is fully self-sustained and can operate under extreme conditions such as solar flares. Robotic arm can also be mounted on the front side and many more activities may be performed.



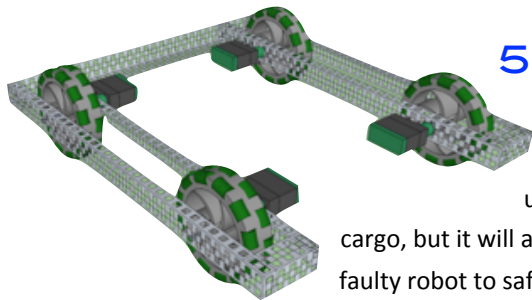
5.5.3 HTR (HEAVY TRANSPORT ROBOT)

The "HTR" robot is used to transport any heavy equipment on the surface. Is also designed to remove any unwanted materials in the habitat area. Such as removal of big boulders that may cause a potential threat to any surface structures.



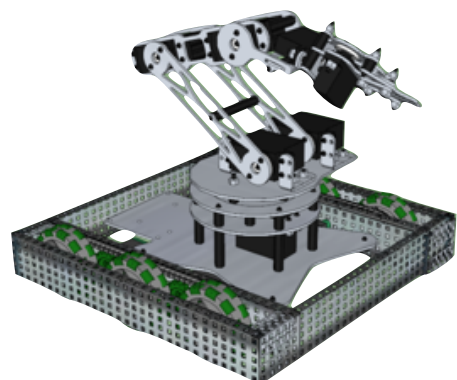
5.5.4 LTR (LIGHT TRANSPORT ROBOT)

LTR is used to transport cargo throughout the settlement, it is mostly used for surface operations. The robot's main function is to transport cargo, but it will also be used in an event of another robots' malfunction, to transport the faulty robot to safe ground in order for it to be repaired.



5.5.5 SR-RA (SURFACE ROBOT - ROBOTIC ARM)

The robot "GRRRA" will be used to load and unload any robots or vehicles that require to be loaded. It has a robotic arm to reach just about anywhere and the strong grabber can lift any object. The robot will ensure a fast, safe and efficient loading and unloading.



6.0 SCHEDULE + COST



6.0 SCHEDULE AND COSTS

Please refer to Appendix 6.1 for larger image



6.1 DESIGN AND CONSTRUCTION SCHEDULE

As seen in Appendix 6.1 the project schedule has a standard six month planning stage in which the specifications of each component of the space station will be finalized and prepared for construction. Two months into the planning stage, after the finalization of the specifications of the central tube and solar shield, these components will begin to be constructed. After the 10 month construction period, these two components will be launched en-route to their final destination orbiting Mercury. In month 7 of the project, construction on the torus rings, aeroponics dome, engineering, gyroscope and manufacturing components will begin, to later be launched in Month 17. Directly after the launch of the first three components the second torus ring and all other components will be manufactured to be launched after the 21st month. In months 30/31 the components from the second launch will reach the central tube and solar shield, they will then be integrated into Aynah en-route to Mercury, the final components will arrive soon after and will be integrated into the station during months 34 and 35. Between months 36 and 37 the polar orbits will be refined and members of the Foundation Society will begin to occupy their homes. Any initial implementation issues will be resolved in preparation for establishment of the entire original population and the final handover to the customer.

6.2 COSTS

The table below shows the estimated costs of building Aynah with separate prices for the amount of materials in each section, the total cost of each section and the projected overall build cost of Aynah. A more detailed explanation of the building materials is available in section 3.1.2. We have been able to reduce the cost of labor through the use of multi-capable robots. The internal infrastructure costs include all intramural components of Aynah, this includes but is not limited to; technological systems - i.e. Life support, security, human interaction interfaces, construction costs of the residences to house the population, internal transports systems (Maglev train, Frictionless bicycles etc.). The total costs of constructing Aynah were estimated to be 100,515,000,000.00 US Dollars not taking into account inflation in currency and exchange rates.

Commodity	Central Tube	Aeroponics	Torus Rings	Engineering	Solar Shield	Total
Reardonium	\$1,000,000,000	N/A	\$15,000,000,000	\$1,000,000,000	\$50,000,000,000	\$67,000,000,000
Aluminium Foam	\$500,000,000	N/A	\$750,000,000	\$100,000,000	N/A	\$1,350,000,000
Carbon Nanotubes	\$50,000,000	\$100,000,000	\$300,000,000	\$50,000,000	\$500,000,000	\$1,000,000,000
Plastic	N/A	\$50,000,000	N/A	N/A	N/A	\$50,000,000
Water	N/A	N/A	\$15,000,000	N/A	N/A	\$15,000,000
Labor	\$100,000,000	\$75,000,000	\$350,000,000	\$75,000,000	\$500,000,000	\$1,100,000,000
Internal Infrastructure	\$15,000,000,000	\$2,500,000,000	\$5,000,000,000	\$5,000,000,000	\$2,500,000,000	\$30,000,000,000
Totals	\$16,650,000,000	\$2,725,000,000	\$21,415,000,000	\$6,225,000,000	\$53,500,000,000	\$100,515,000,000

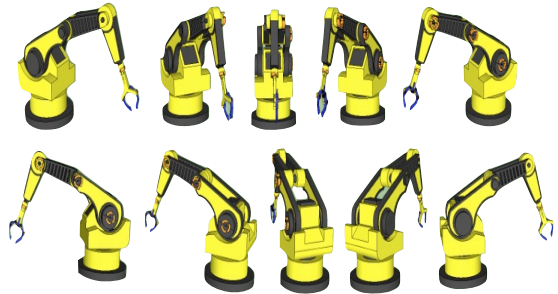
7.0 BUSINESS DEVELOPMENT



7.0 BUSINESS DEVELOPMENT

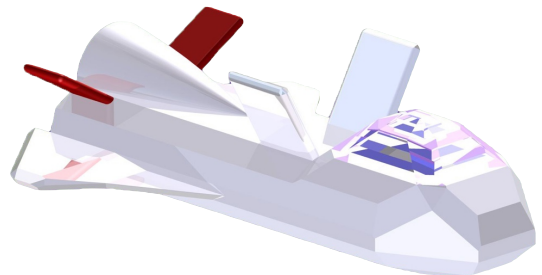
7.0.1 PROSPECTS

Manufacturing will compose most of the industry of Aynah and it will be primarily a mining settlement focused on the manufacturing of Reardonium - however as a result of the settlement, synergistic benefits will result in other industry's such as retail, food production, services and entertainment. In the community plans, it is seen the variety of different business opportunities which stem from the design of Aynah, the community designs show large shopping, entertainment, business and culinary districts which will become economic hubs as the station grows and expands its horizons.



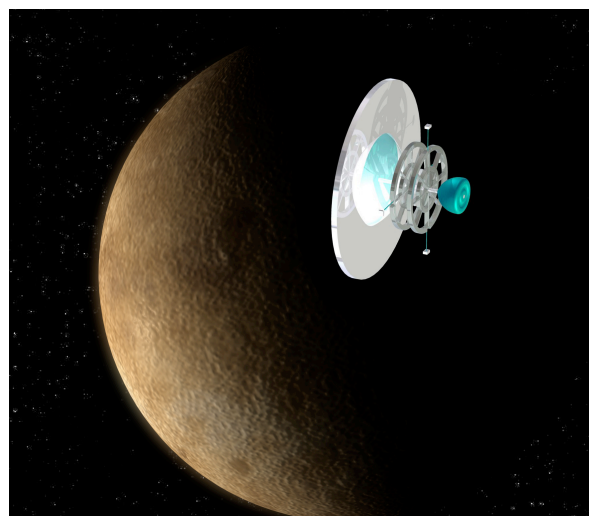
The manufacturing of the miracle metal Reardonium will be the centre of business on Aynah. The one year required cold spell needed for manufacturing such a material may be conceived as a detriment to business operations, however as manufacturing will begin on a small scale before the completed station arrives, mass production of Reardonium will be easily achieved upon the arrival of Aynah to Mercury. Reardonium's many qualities make it one of the most sought after materials for many applications, testament to this is the large amount of Reardonium being used in the construction of Aynah.

As a result of the immense commercial potential and geographic position of Aynah, the station will become the primary Port of Entry for Mercury and our proposal capitalizes on this through the use of our fleet of Atlas 1069 multi-capable shuttles. These advanced aircraft are capable of storing cargo, passengers or a mixture of the two. Using our spaceport located in the rear of Aynah, these spacecraft will transport both cargo and passengers to the surface of Mercury, and to other planets and settlements using our innovative rail gun system.



7.0.2 FUTURE VENTURES

Initially Aynah, will act as the primary manufacturer and retailer of Reardonium and Reardonium products. It will also become the main Port of Entry for Mercury encouraging future business prospects including space tourism and other heavy manufacturing duties. The flexibility of the design as a result of the shape changing material Amorphium (5.0.1) and the immense planning of the original design ensures an easy transition for Aynah to other ventures. The potential for this space station is limitless, thanks to the immense planning and revolutionary design outlined in this proposal.



APPENDIX A

OPERATIONAL SCENARIO

EQUIPMENT USED

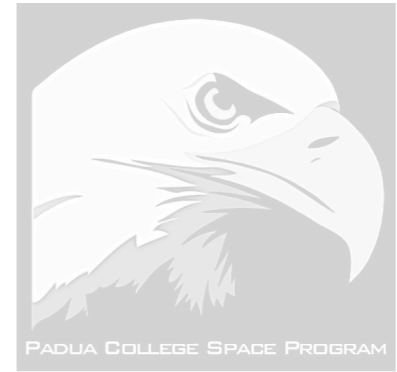


Table Appendix A 1 Robots, equipment and vehicles used	
Equipment / Robot/ Vehicle	Purpose
Reardonium Miner 3000	A robotic mining vehicle with the sole purpose of mining Reardonium from Mercury and transporting the Reardonium to the surface of Mercury to be collected.
Industrial Robots	A robotic arm which moves the cargo from the conveyer belts attached to the Reardonium Miner 3000 into the ATLAS 1069 (Rebirth).
ATLAS S.T.R	The Reardonium transported from the conveyer belt will be loaded onto this vehicle and transported to the settlement on Mercury to be loaded on to the ATLAS 1069 (Rebirth).
Francisco d’Anconia	These small robots look like a rolling platform with arms but are able to transport the heaviest of loads due to their ability to work together. They will be utilized to transport loads around the settlement after construction is completed.
Solar Furnace	A furnace located at the solar shield with the purpose of refining the Reardonium before the curing process occurs.
ATLAS 1069 (Rebirth)	The multi-purpose ATLAS 1069 or shuttle used to transport the Reardonium and people to and from Mercury to Aynah.
Supply Crate	The crate is used to transport the Reardonium to the customer as it is loaded into the crate and propelled by the rail gun to its designation.

MINING

The Reardonium Miner 3000 will employ state of the art 3D scanner to map the current location to determine the most efficient route to mine the Reardonium ore. The Reardonium miner use its drill and shovel to progress through its path; the drill will serve the purpose of breaking the minerals from the tunnels walls while the shovel will be employed to “shovel” or “move” the mineral which have been recently broken to the conveyer belt attached to the Reardonium Miner 3000.

As the minerals progress along the conveyer belt it will merge with several other conveyer belts to a larger conveyer belt where industrial robots and 3D scanners will be employed to sort the various mineral obtained from the miner robots into Reardonium ore, other useful minerals and unimportant minerals. At the end of this large conveyer belt the Reardonium ore will be loaded onto a ATLAS S.T.R. Once the vehicle reaches nearly maximum load, it will travel to

the Foundation settlement on Mercury where the Reardonium ore will be loaded onto the ATLAS 1069 (Rebirth) in the cargo section. If there is any extra space the other useful minerals will also be transported to Aynah after traveling to the Foundation settlement via a ATLAS S.T.R while the unimportant minerals will be moved to a dumping site far away from the mining site.

TRANSPORT REARDONIUM TO AYNAH

After the Reardonium ore has been processed the Francisco d'Anconia will be utilized as a group; of five with one on each corner and one in the centre, to slowly transport the cargo to the solar furnace via the Cargo transport shaft above the rail gun in the central tube. Once the Reardonium ore has reached the Solar Furnace it will be unloaded in the correct location to allow the refining process to begin.

REFINING OF REARDONIUM

The initial refining of the Reardonium ore will occur at the Solar Furnace which is heated by a combination of the sun's heat, the reflection of the solar shield and electricity the settlement has generated. The process will occur by first smelting the Reardonium ore into Reardonium bars. After this process occurs most of the impurities within the Reardonium will not be present however to further improve this the Reardonium is passed over a heated area several times in the same direction until nearly all the impurities are at the end of the bar. The section containing the impurities is sliced off the bar leaving nearly pure Reardonium bar.

The Reardonium bars would then be transported back to the engineering sector where the shaping, further refining and doping of the Reardonium would occur. To further refine the Reardonium the same process of moving the Reardonium would occur several more times until all the impurities reach the designated side where they would be removed. Afterwards if the Reardonium needed to be mixed or "doped" with other metal or chemicals would occur to tailor the Reardonium to the needs of the customer. After this occurs the Reardonium would be heated until melting point where the metal would be shaped into the request shape. The Reardonium would then be loaded for further transport.

TRANSPORT OF REARDONIUM

After the Reardonium has been processed the Francisco d'Anconia will be utilized as a group; of five with one on each corner and one in the centre, to slowly transport the cargo to the spaceport from the engineering sector. Once the Reardonium has reached the spaceport it will be unloaded to be reprocessed before being loaded onto the ATLAS 1069 (Rebirth).

The ATLAS 1069 (Rebirth) will transport passengers and the refined Reardonium to the Foundation Settlement located on Mercury, The ATLAS 1069 (Rebirth) will provide a soft landing on Mercury due to the enormous amount of materials else the vehicle will be damaged and the passengers could be possibly hurt.

CURING OF REARDONIUM ON MERCURY

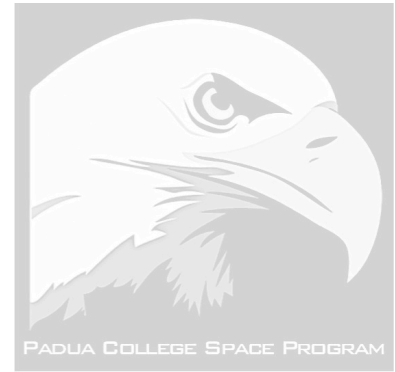
Once the ATLAS 1069 (Rebirth) reaches the Foundation settlement on Mercury, the Reardonium would be unloaded onto the ATLAS S.T.R via the industrial robots. The Reardonium would be transported to the curing area. The Reardonium would be unloaded and any Reardonium that has finished the required curing process to achieve the

desired properties would be loaded onto the ATLAS S.T.R. The vehicle would return to the Foundation settlement on Mercury to load the cured Reardonium onto the ATLAS 1069 (Rebirth).

TRANSPORT OF REARDONIUM TO CUSTOMER

The same priority system in Step 3 will be used however when the Reardonium reaches Aynah it will be de-processed and loaded into a supply crate depending on the location of the customer. A large group of Francisco d'Anconia will be utilized to transport and load the supply crate of cured Reardonium into the rail gun. The flight path of the supply crate will be calculated to reach the customer in the shortest possible time without damage to the product. After the final adjustments occur the rail gun will propel the supply crate. The catching system specified in 3.2.10 Internal and External transport for the supply crate will be used to retrieve the crates when they reach their destination.

APPENDIX B



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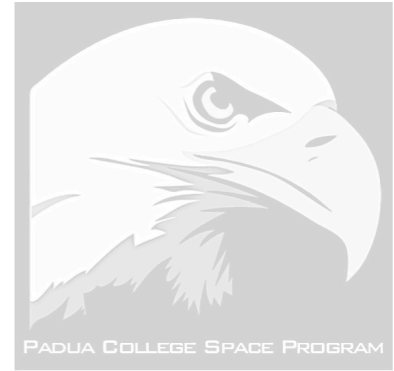
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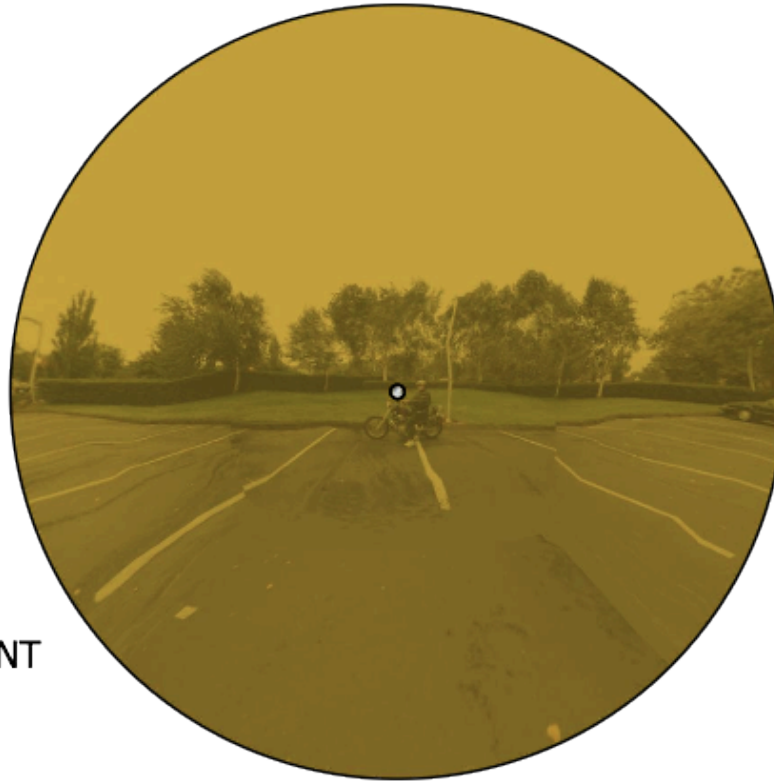
APPENDIX D

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2.1.1

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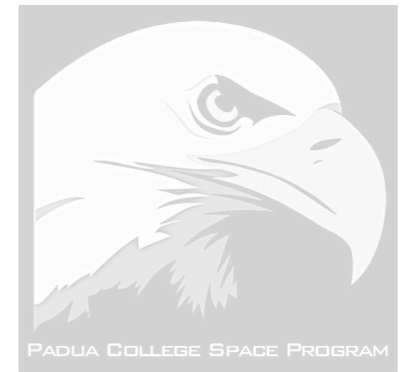


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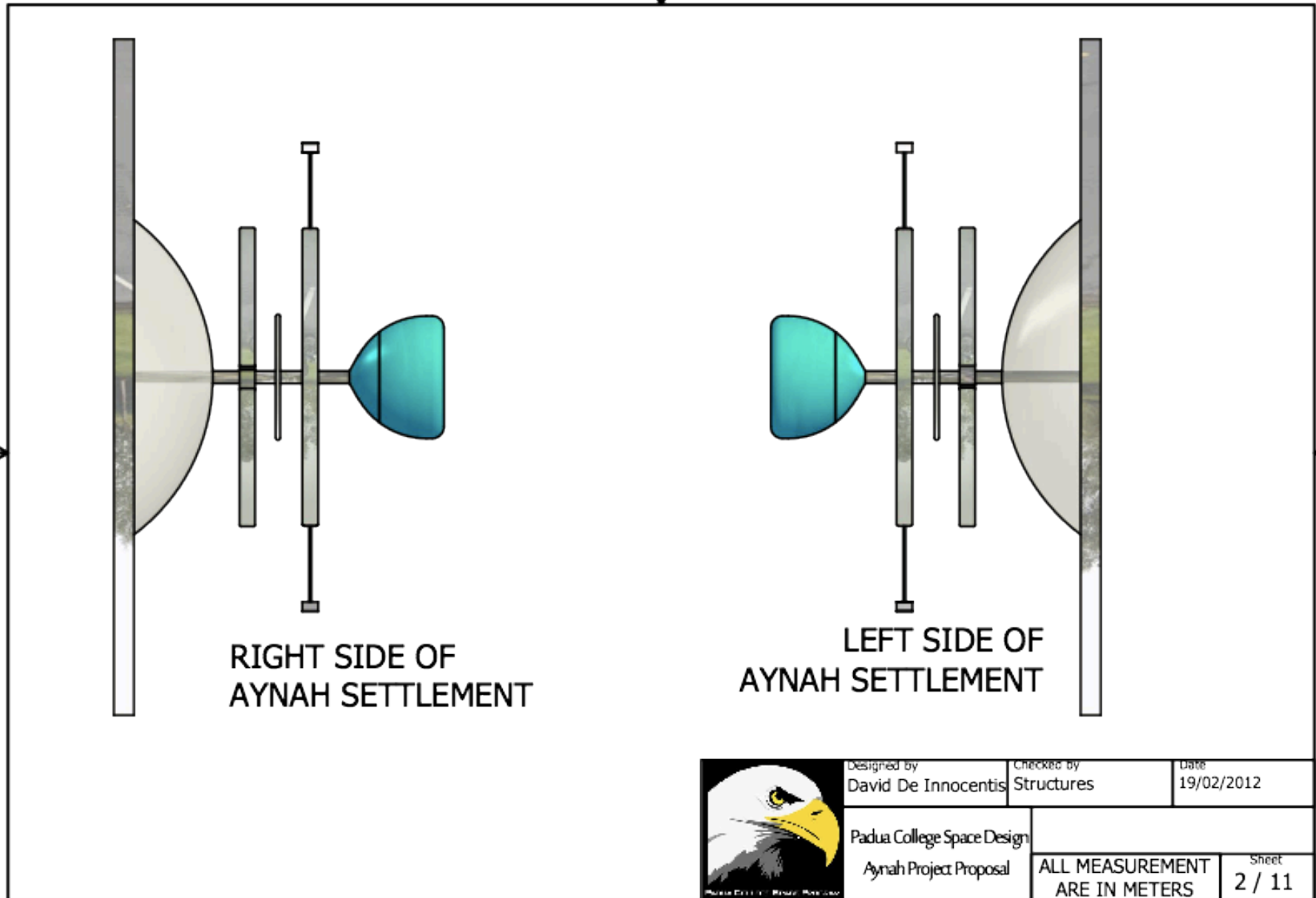
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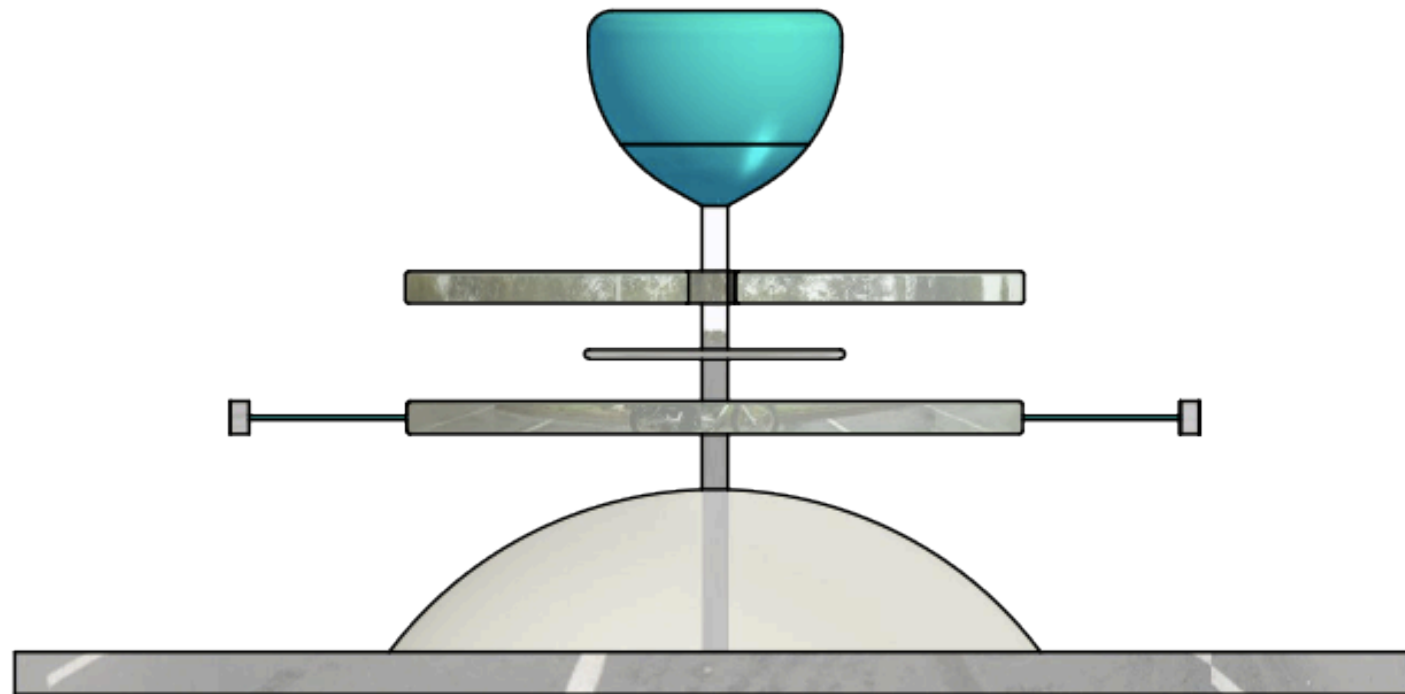
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TOP VIEW OF AYNAH SETTLEMENT

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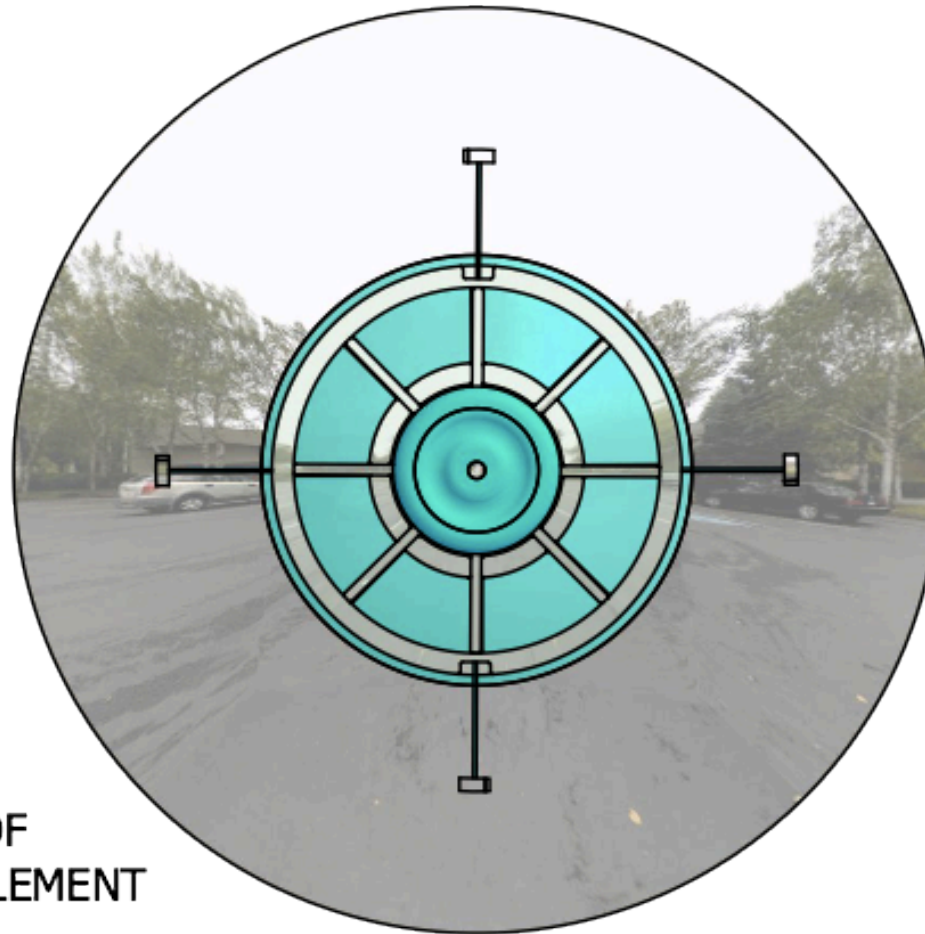


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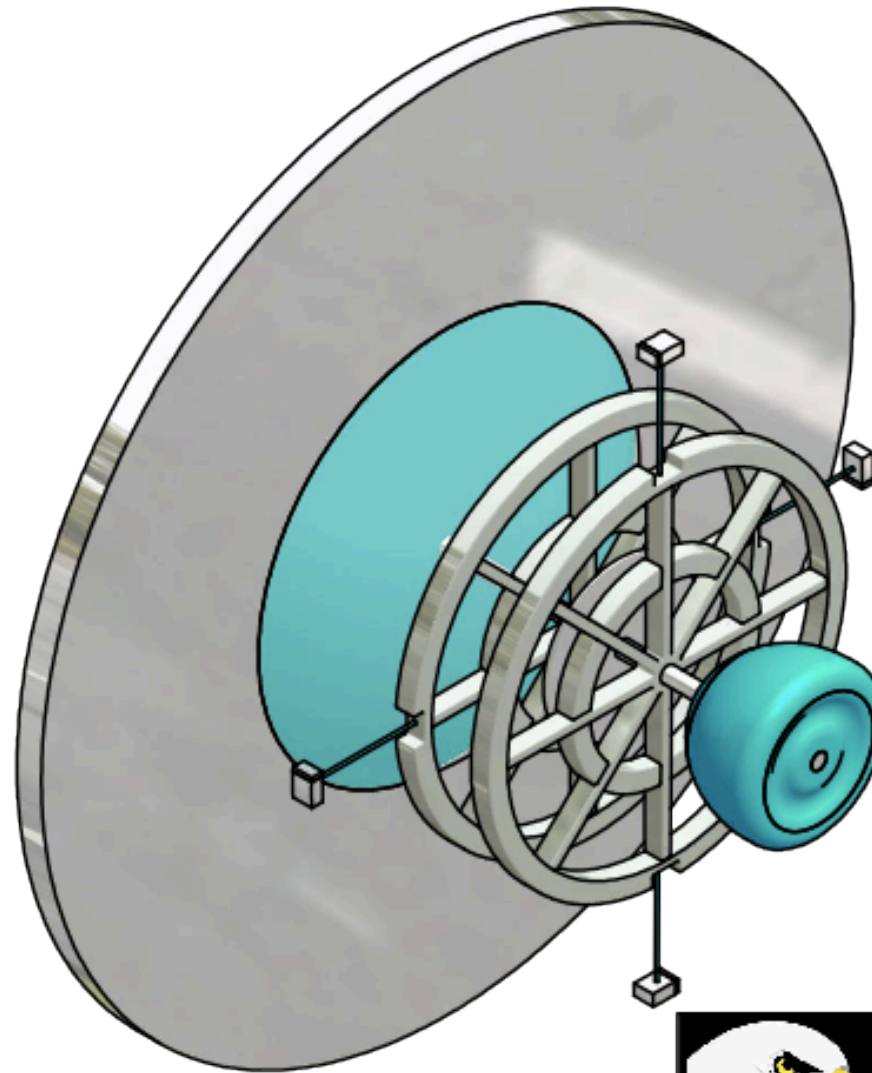
**BACK VIEW OF
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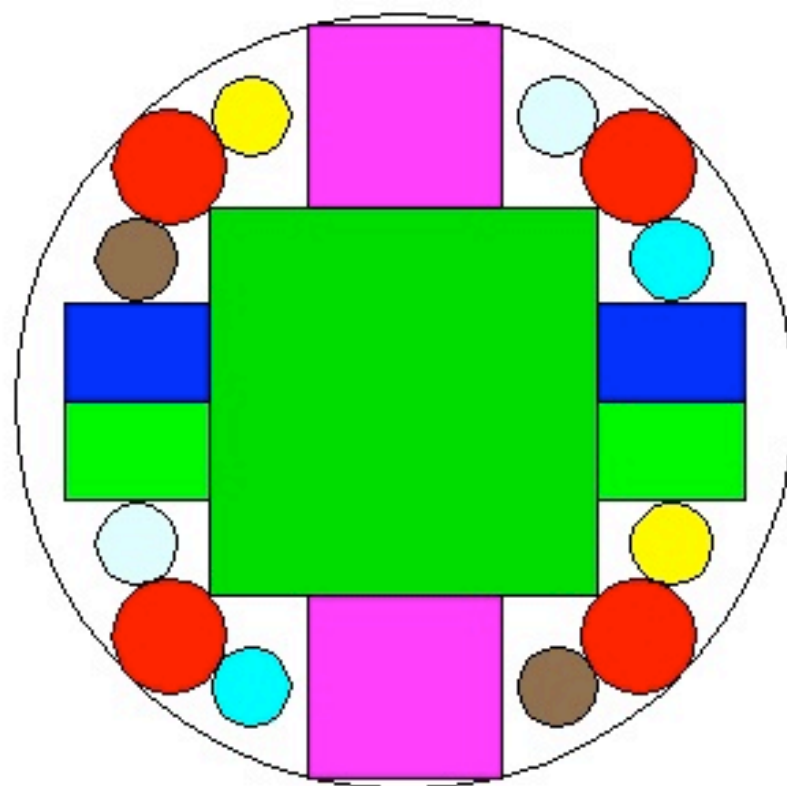
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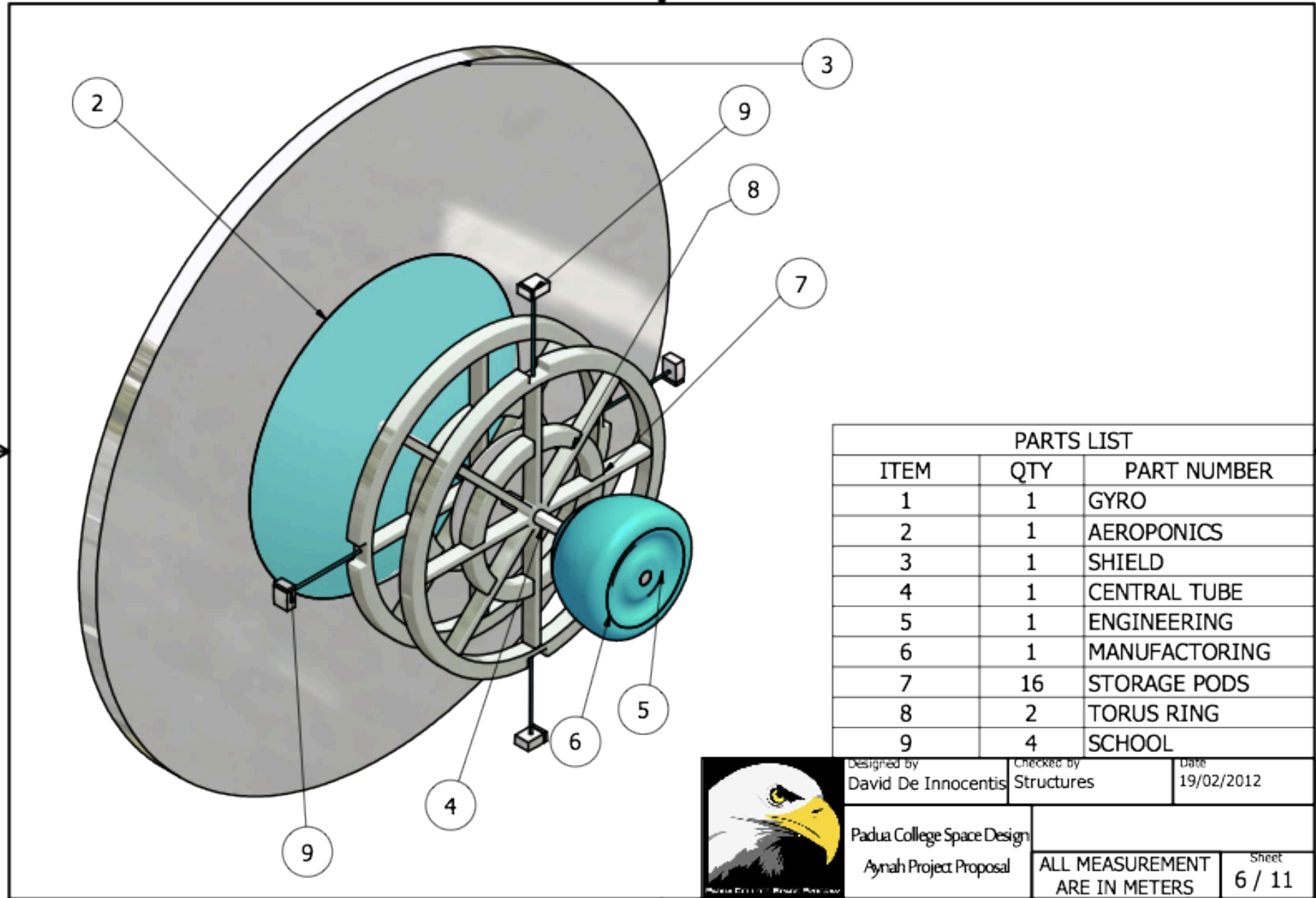
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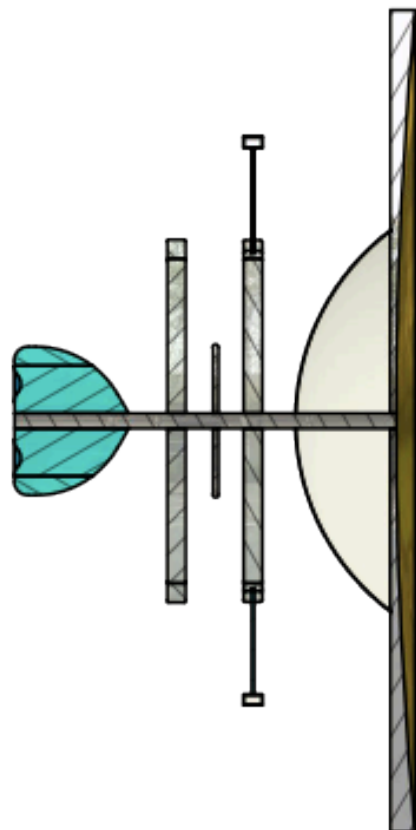
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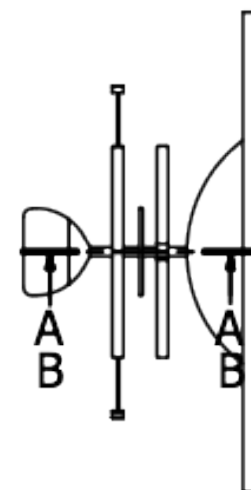
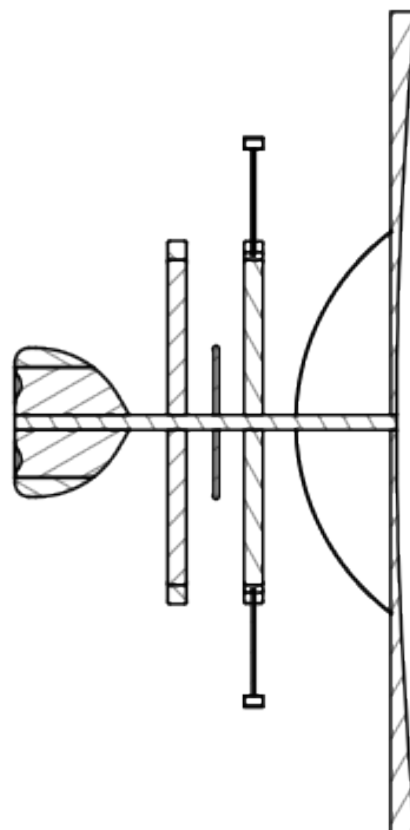
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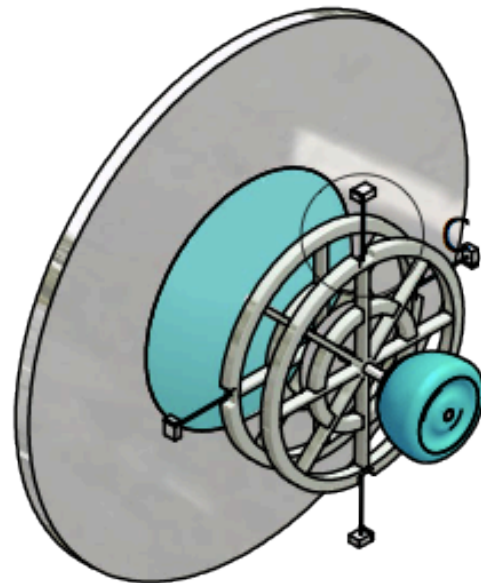
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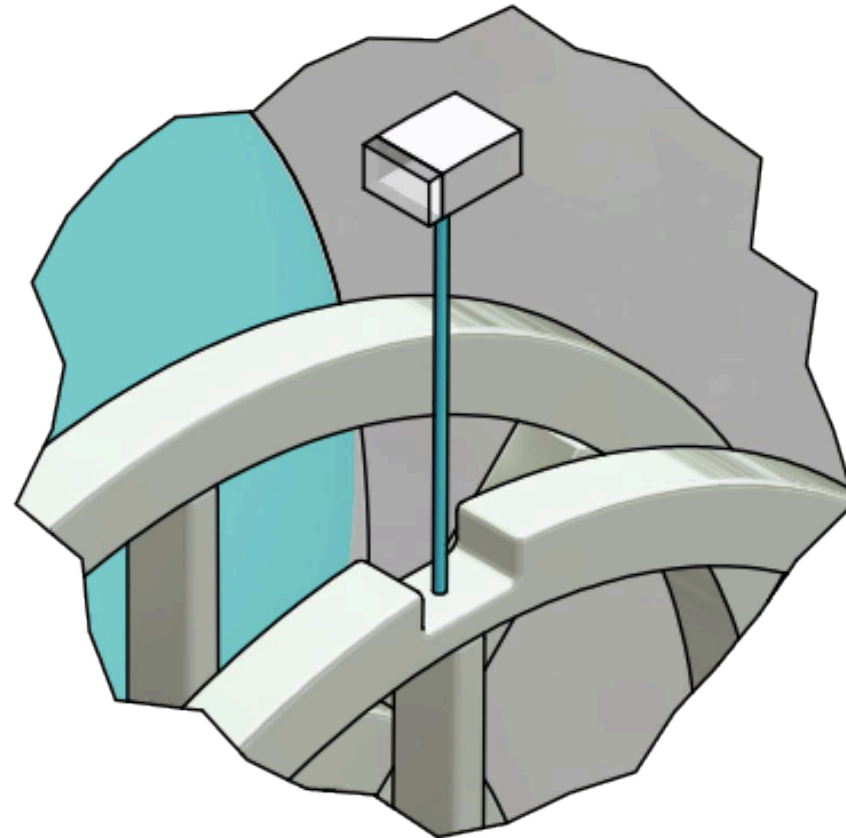
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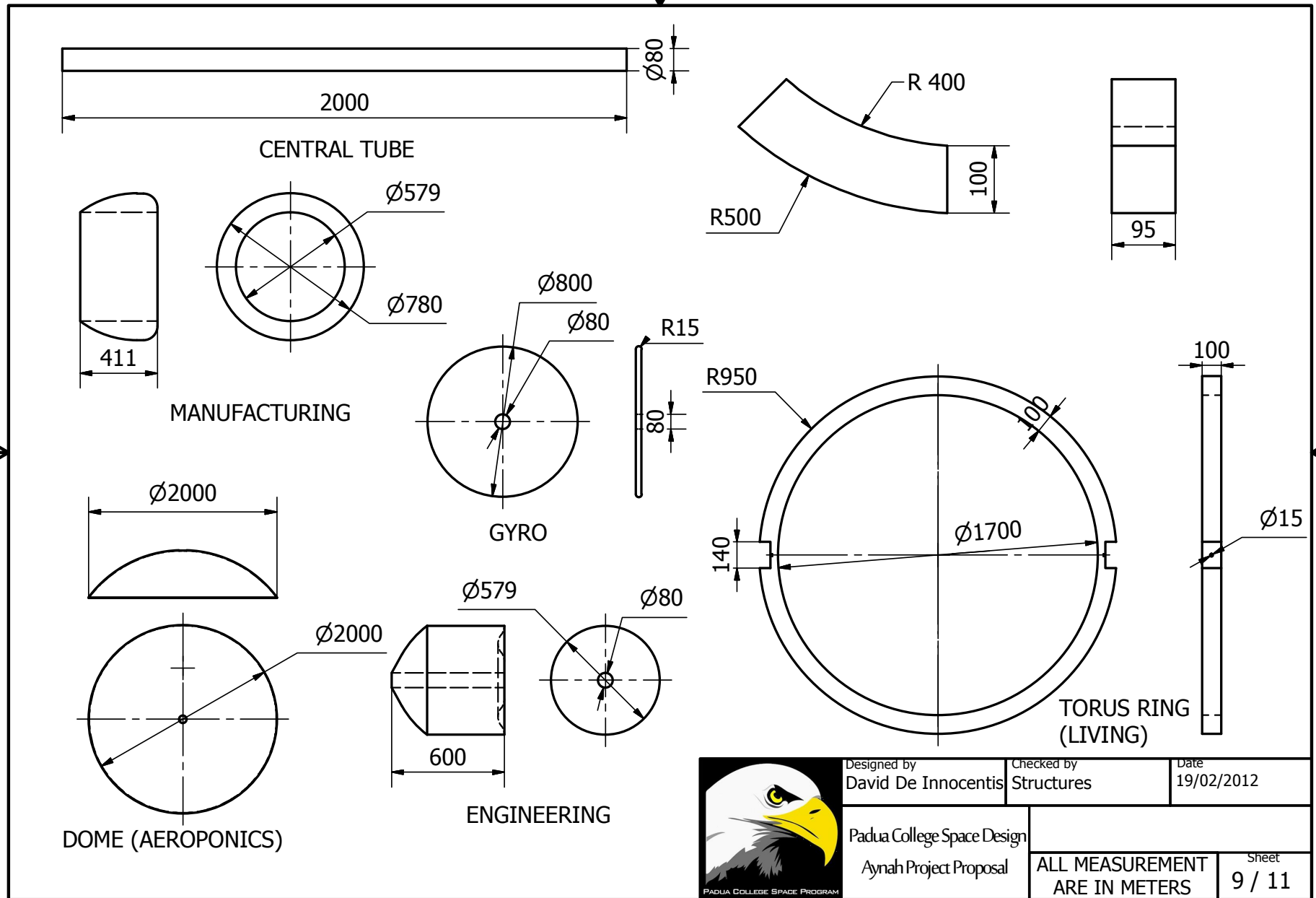
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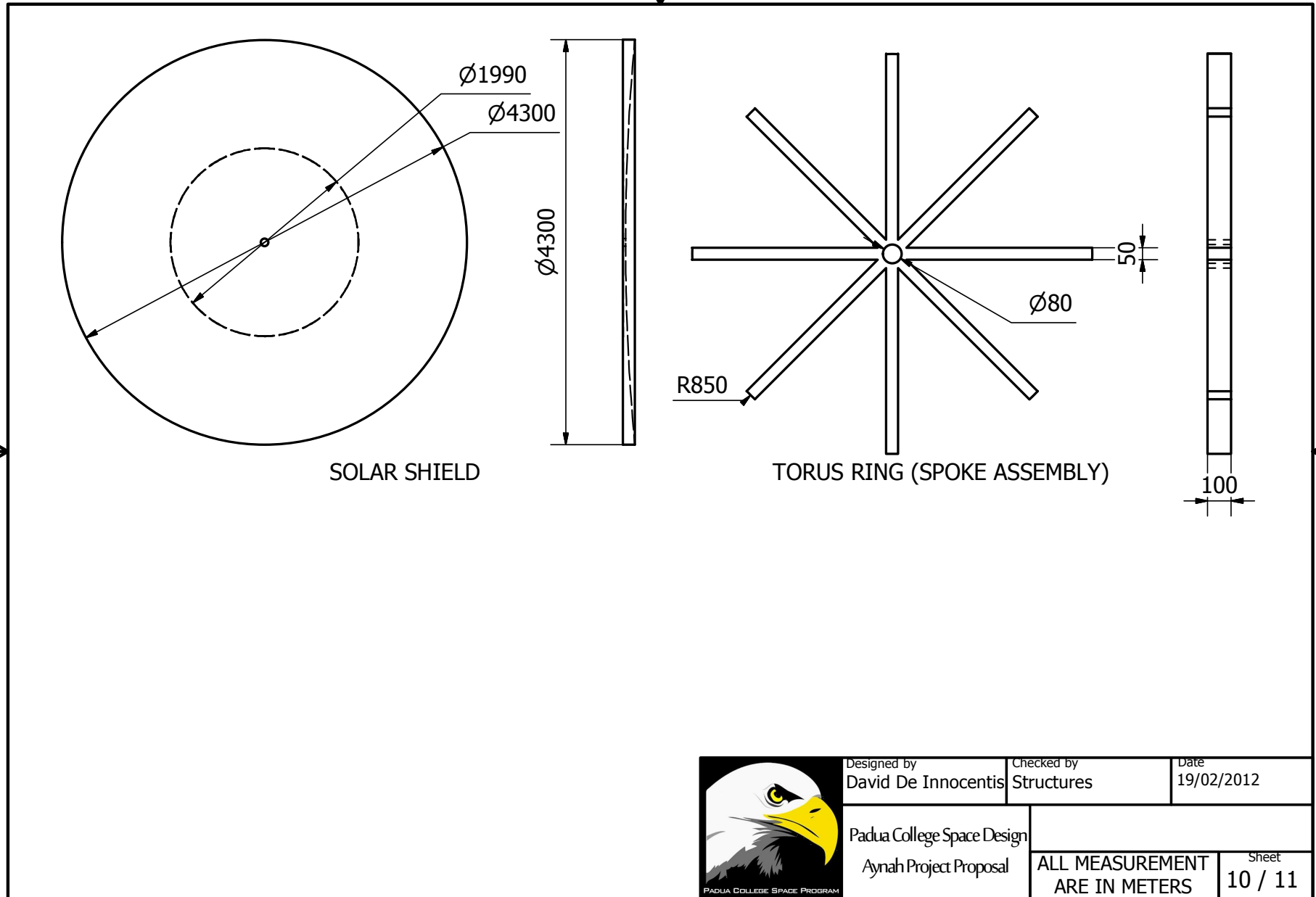
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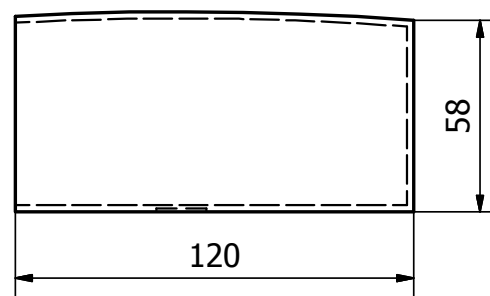
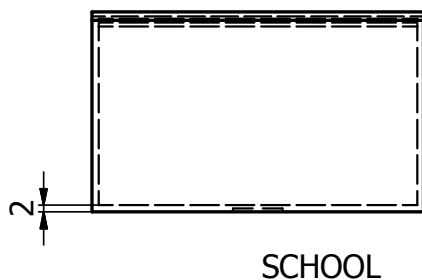
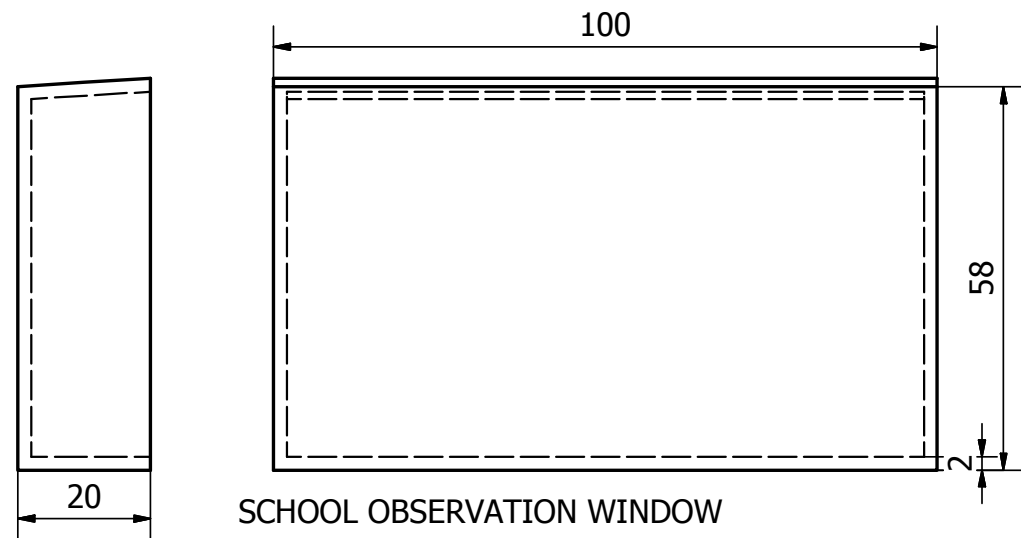
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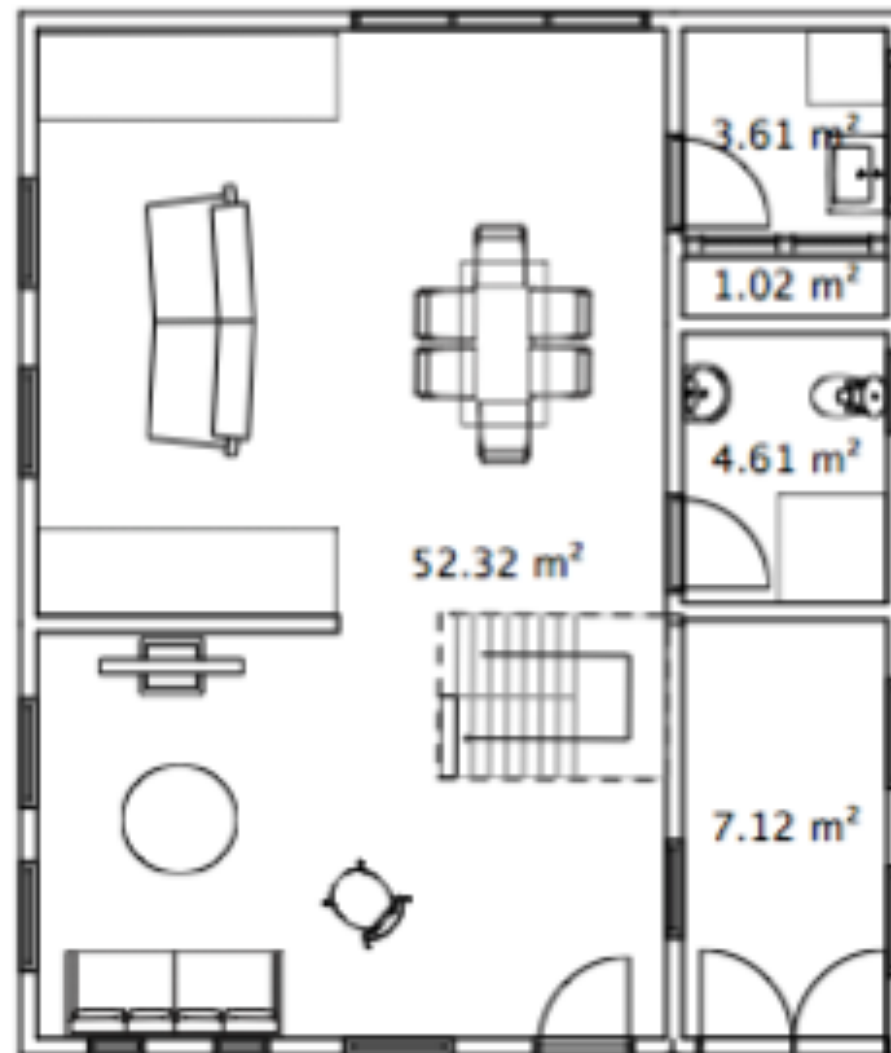
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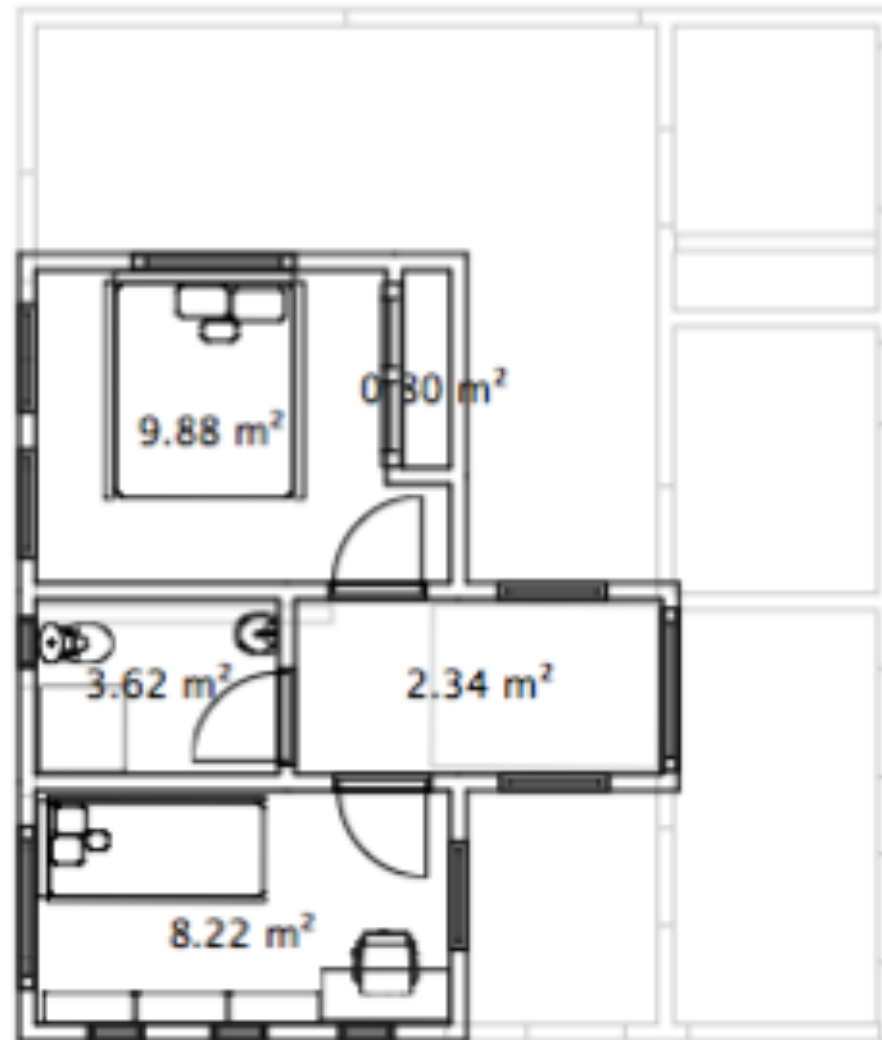
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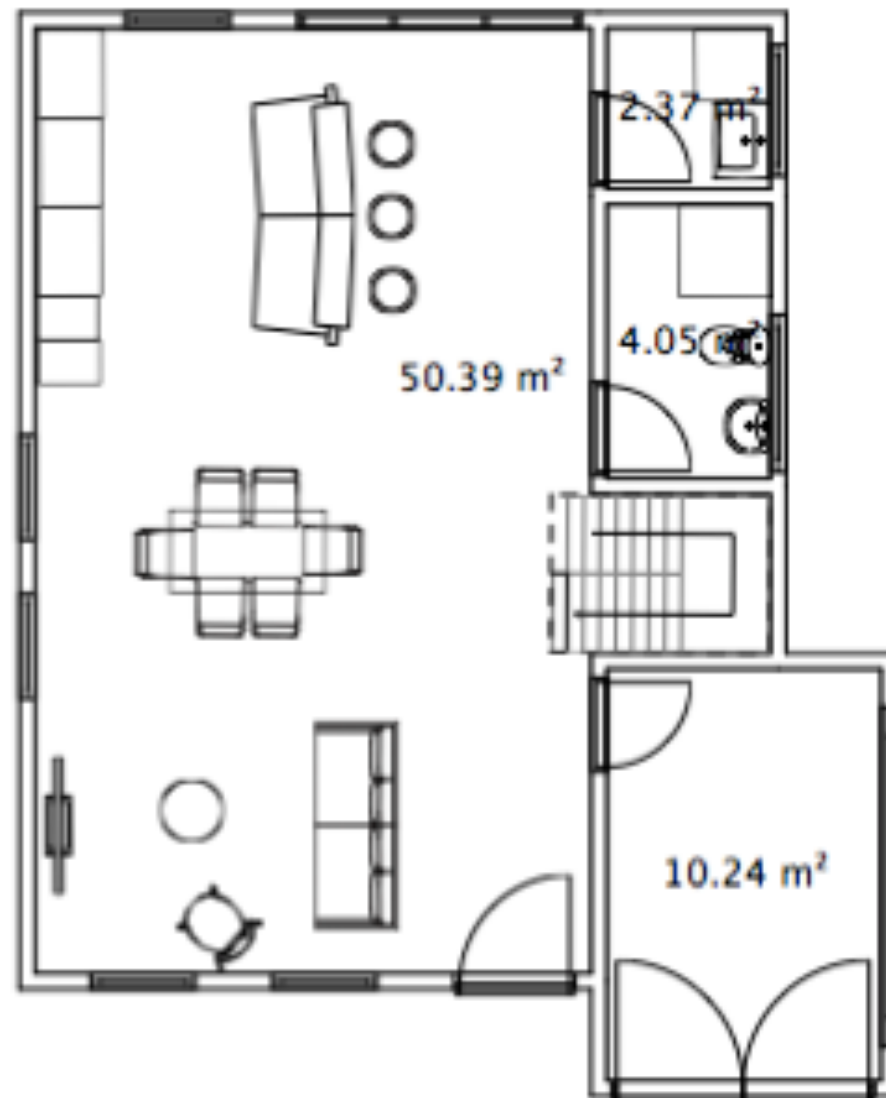
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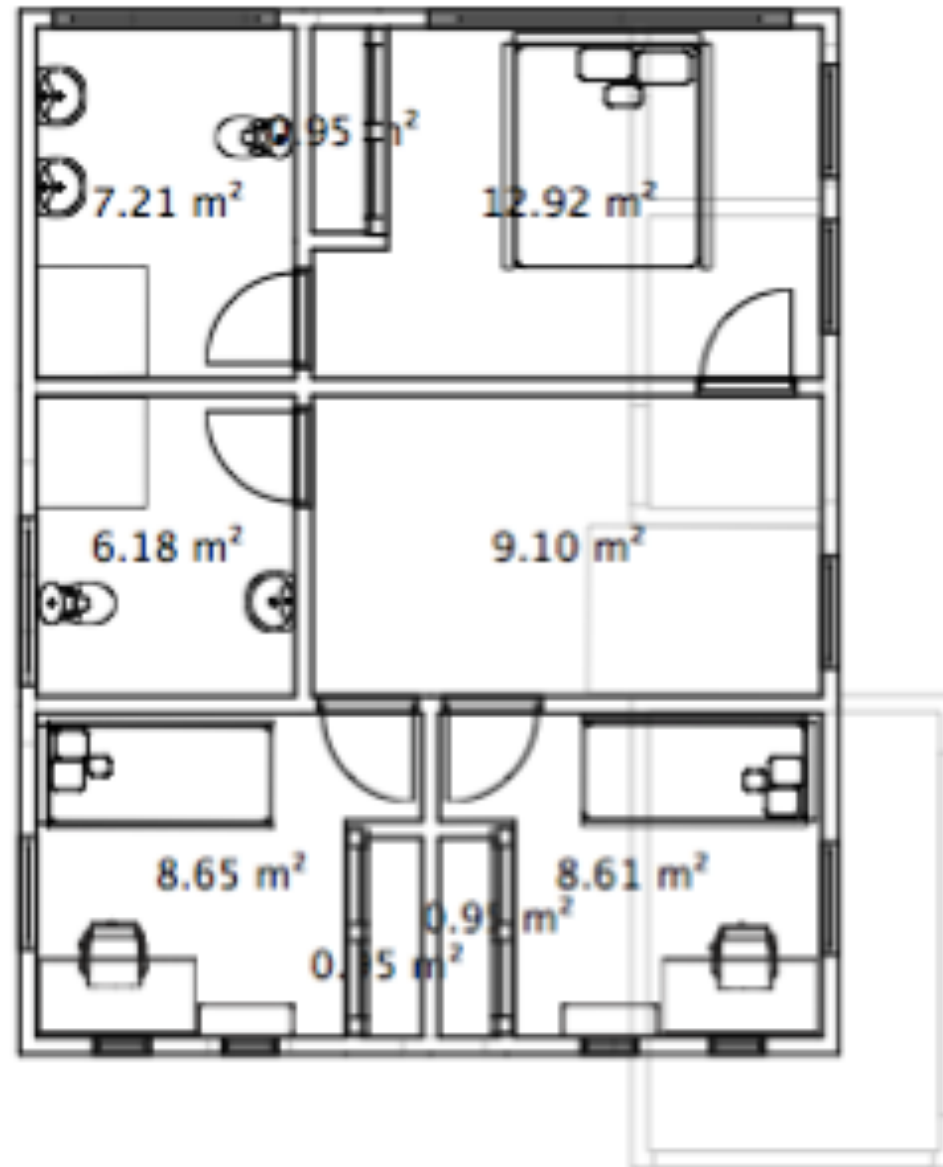
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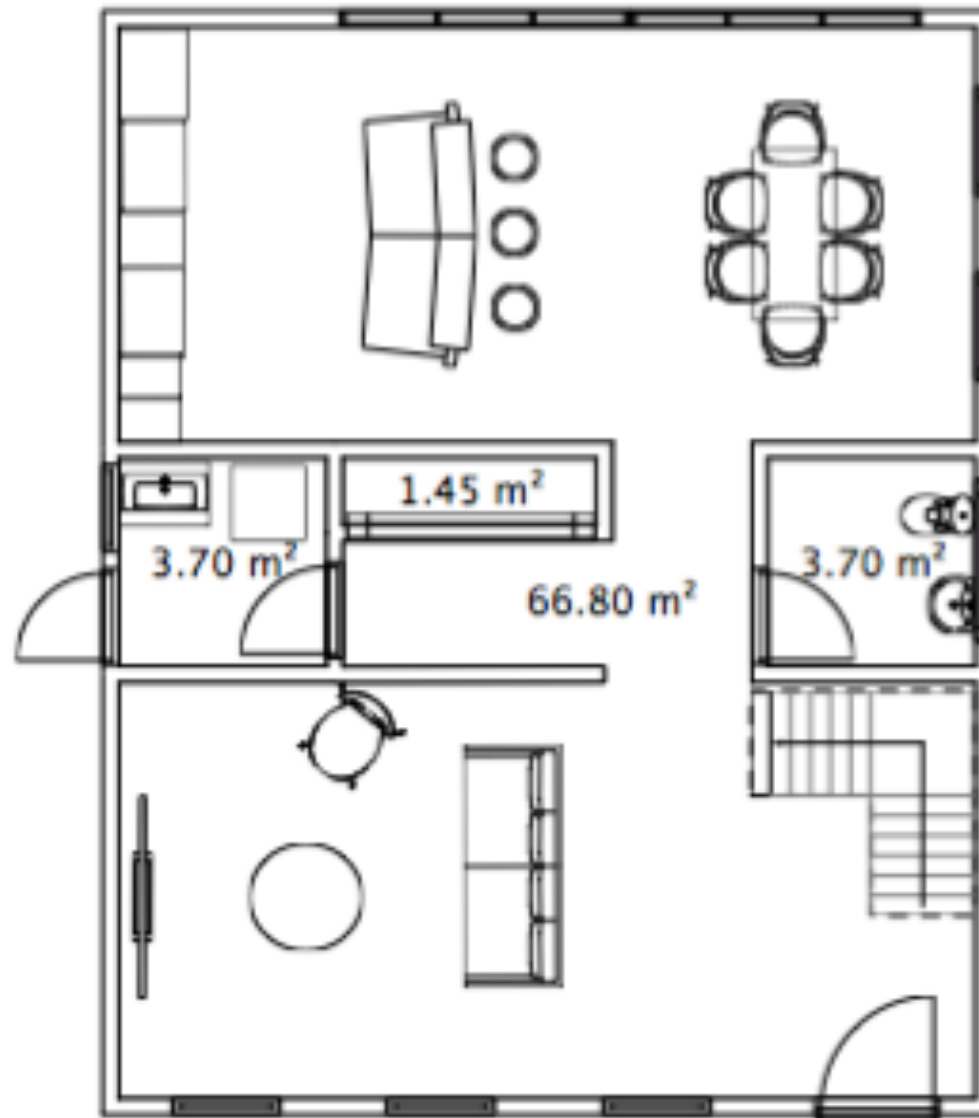
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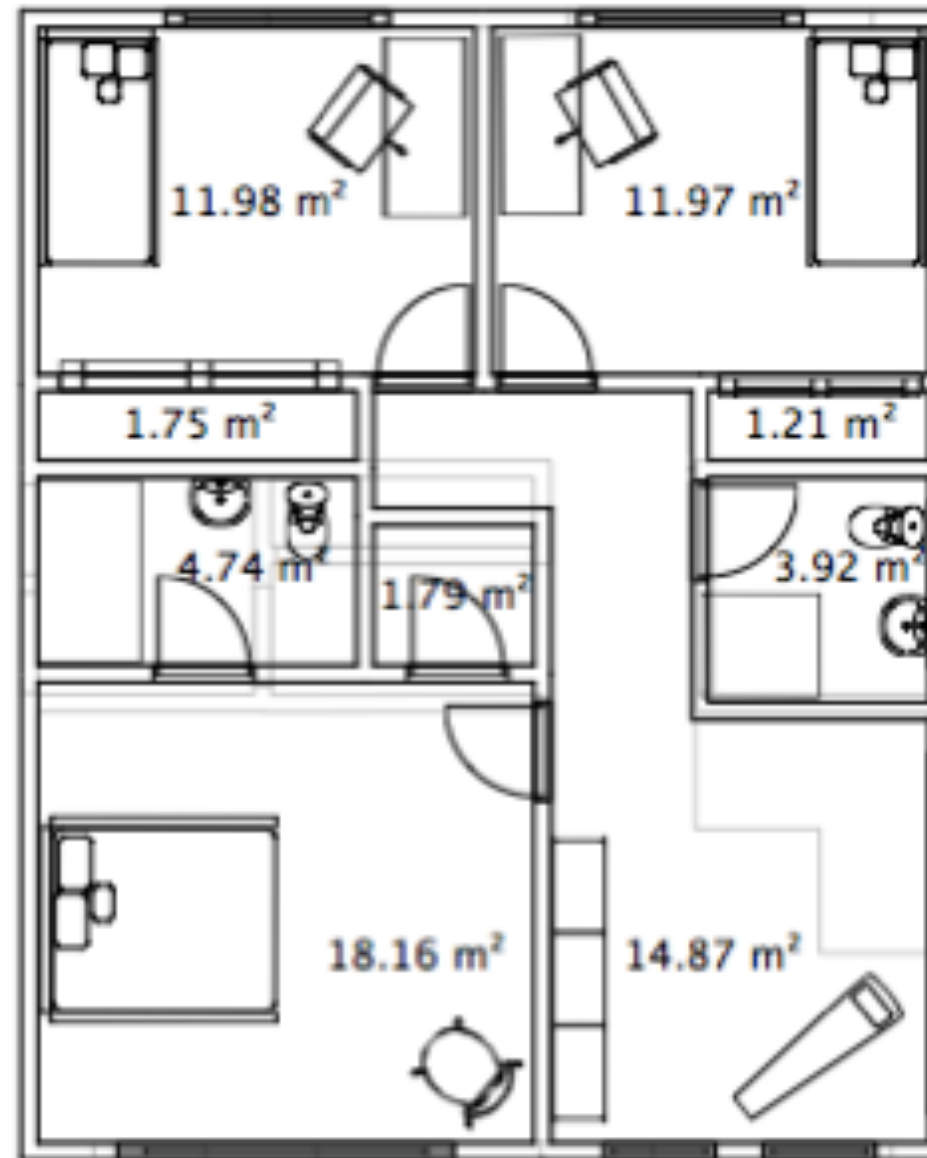
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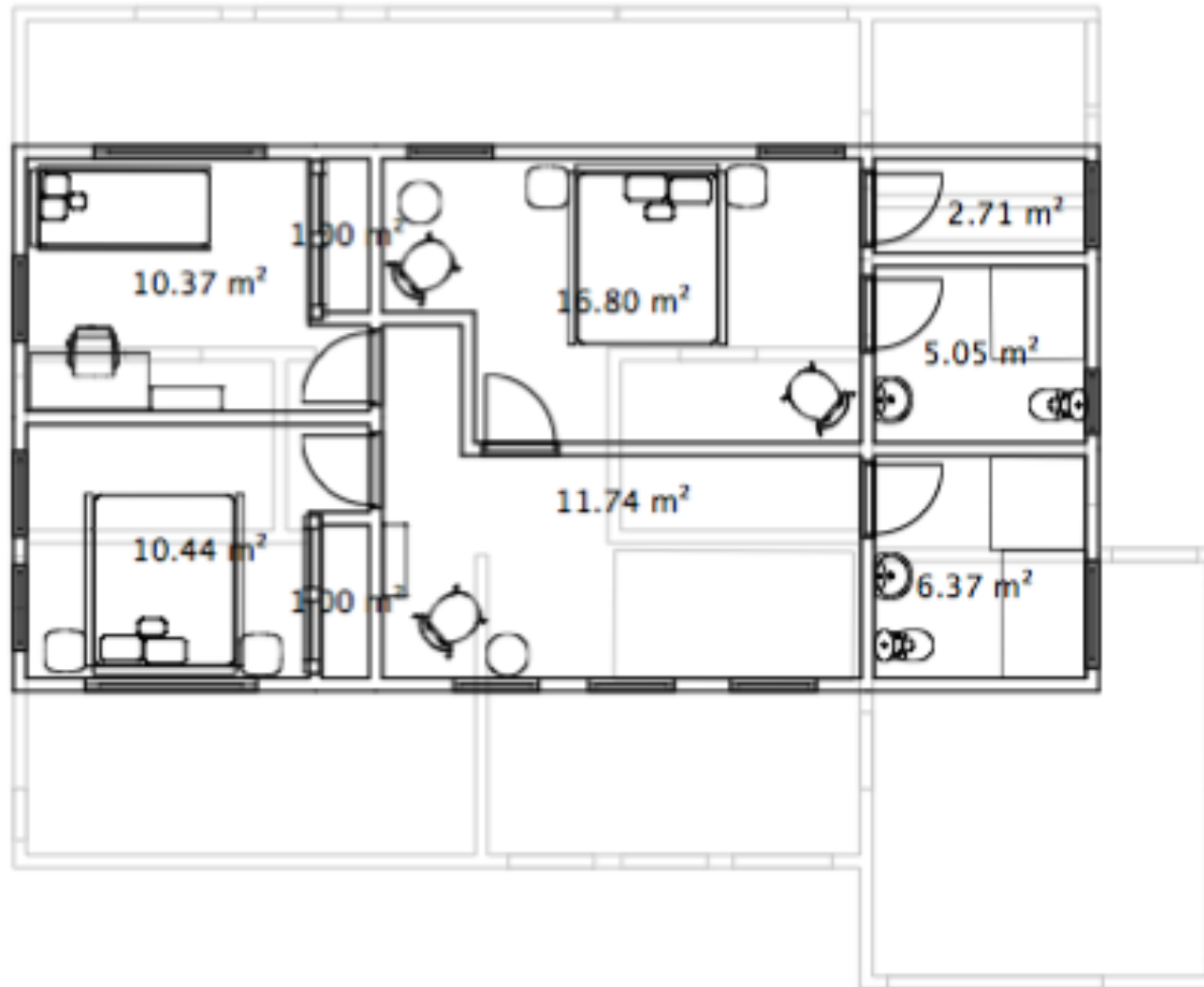
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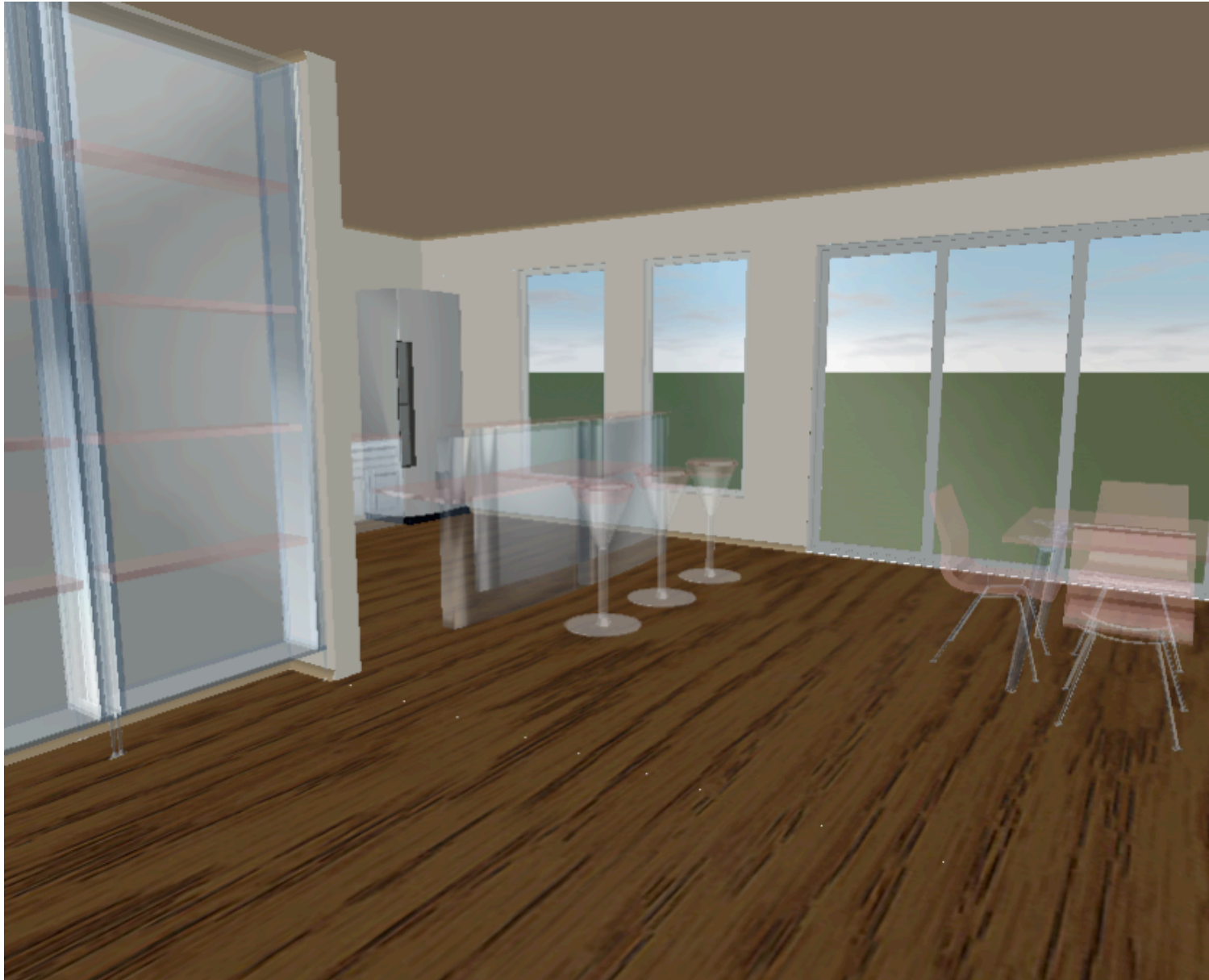
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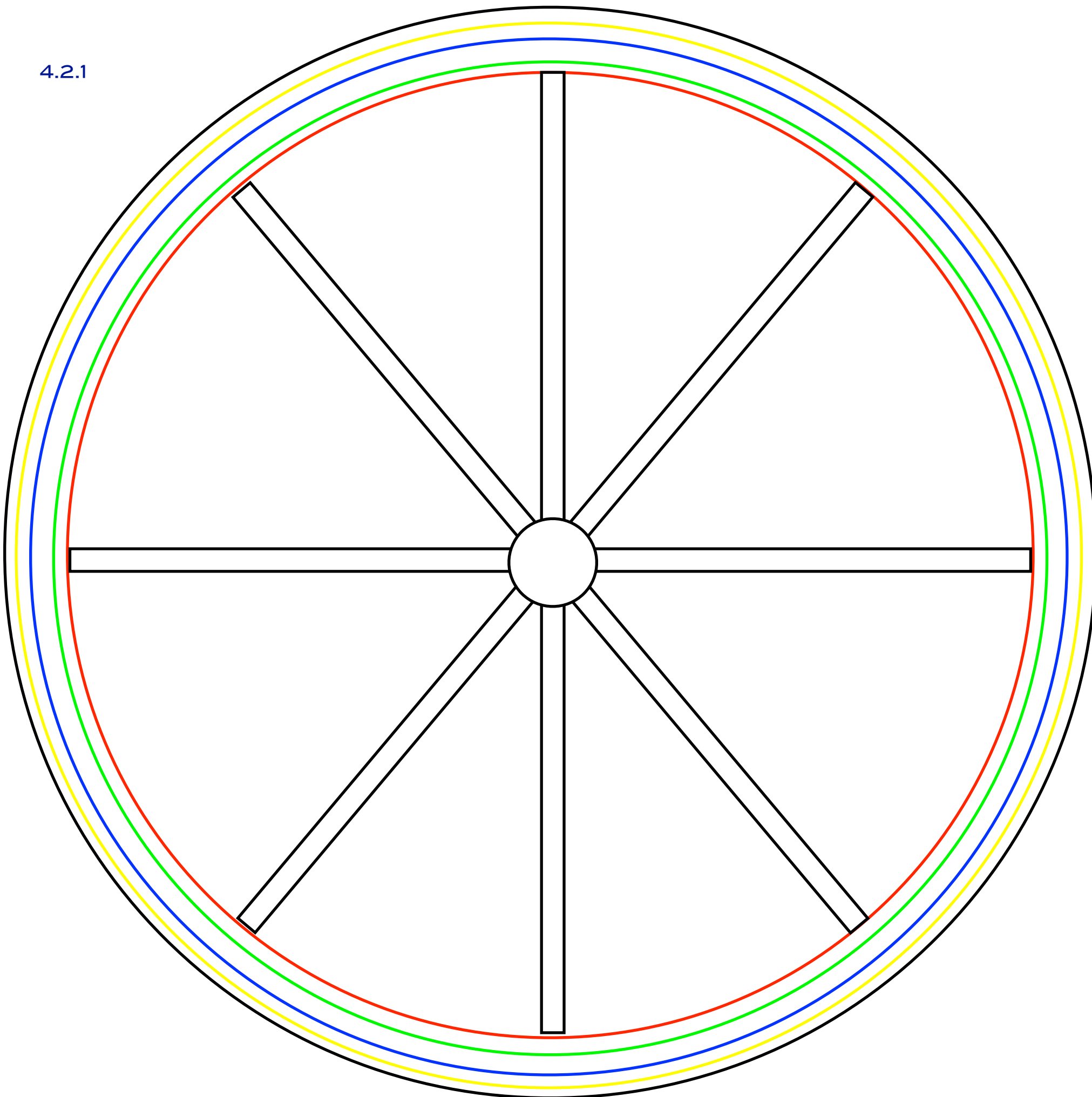
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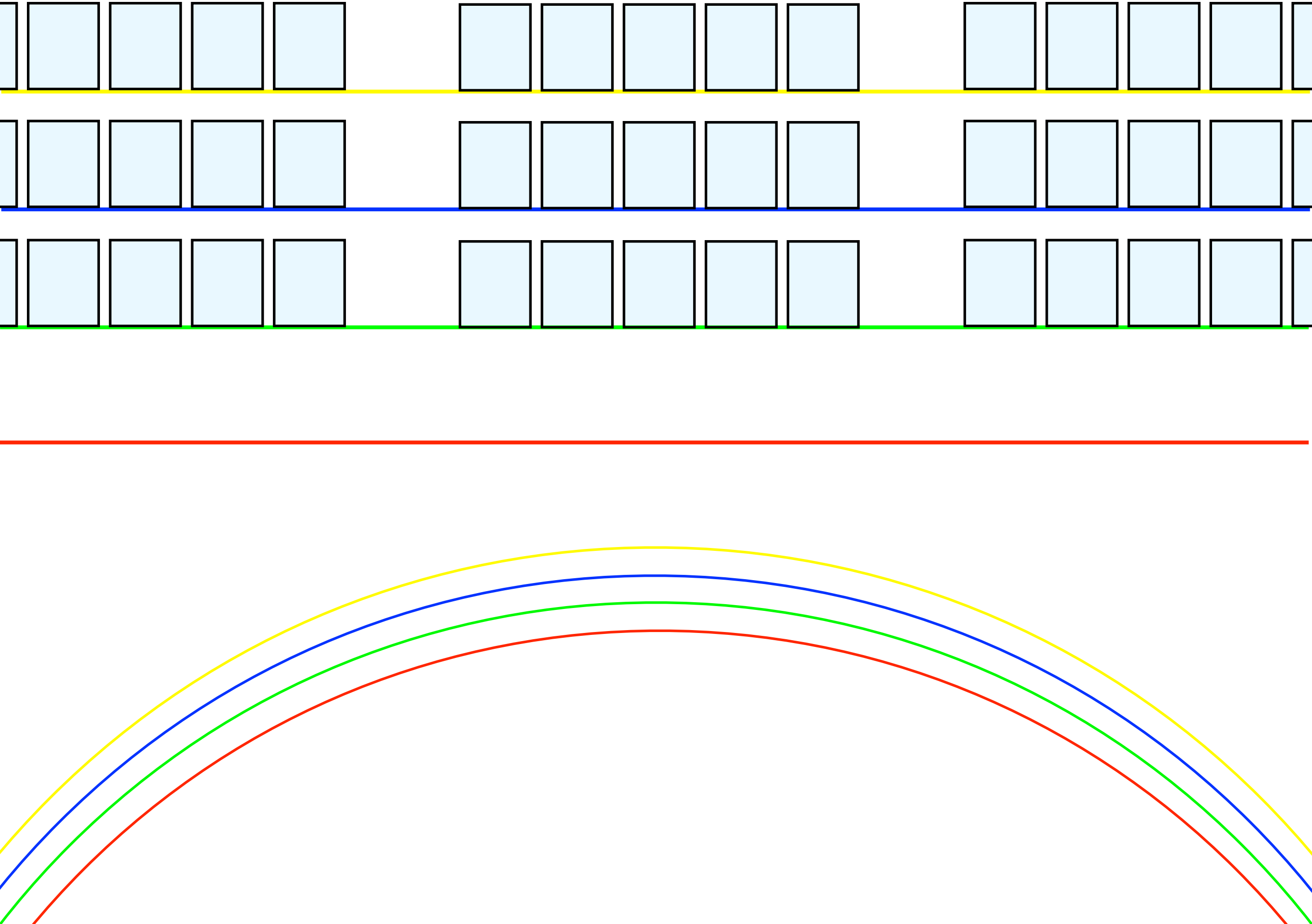


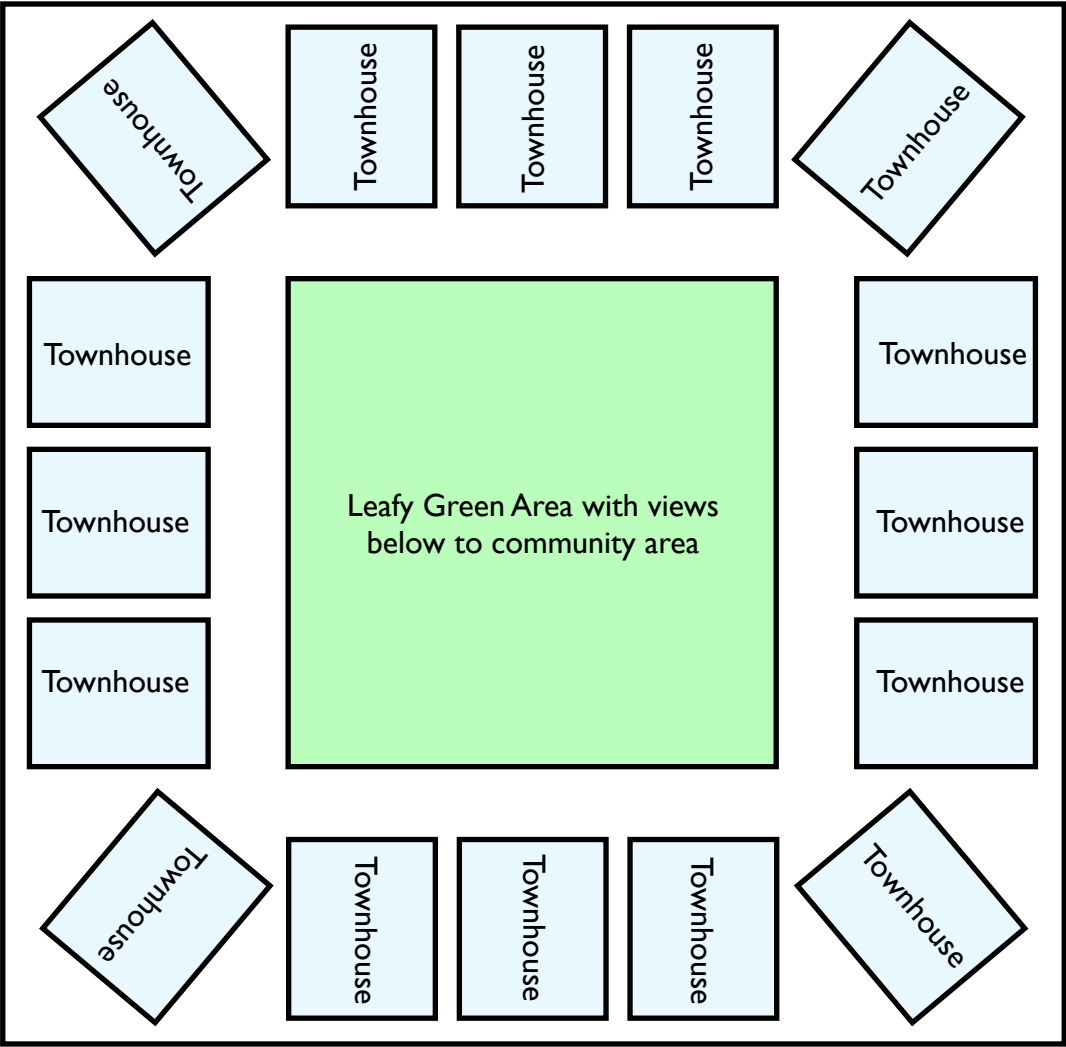
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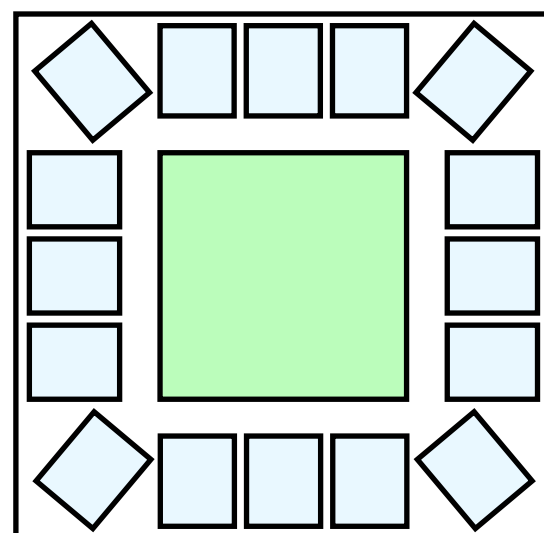
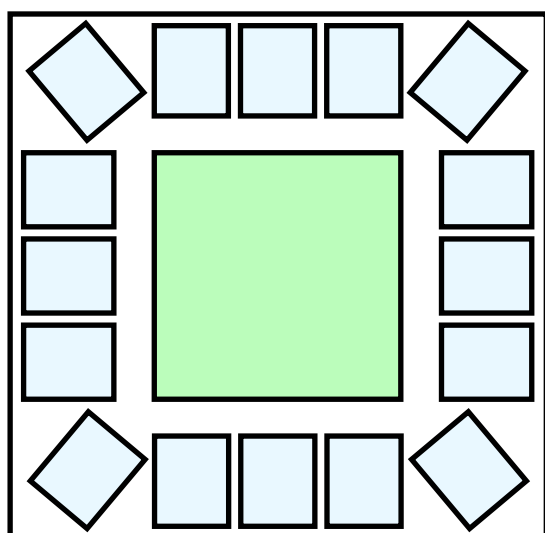
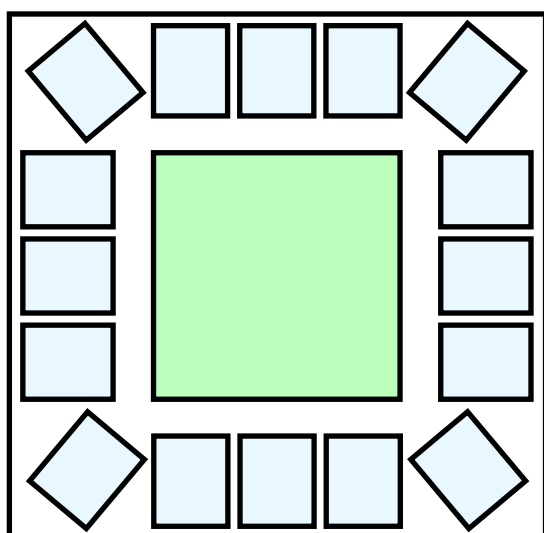
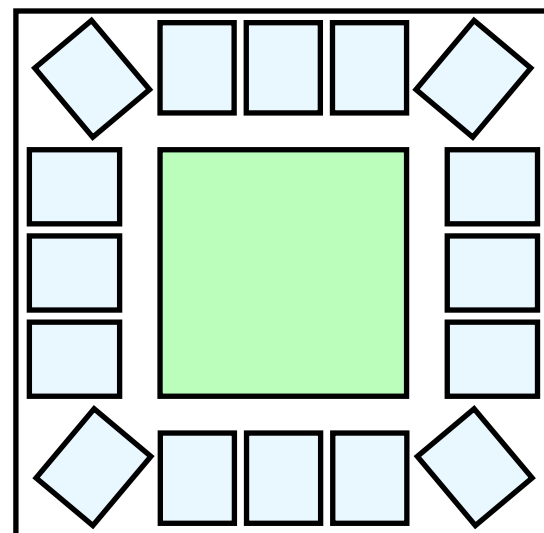
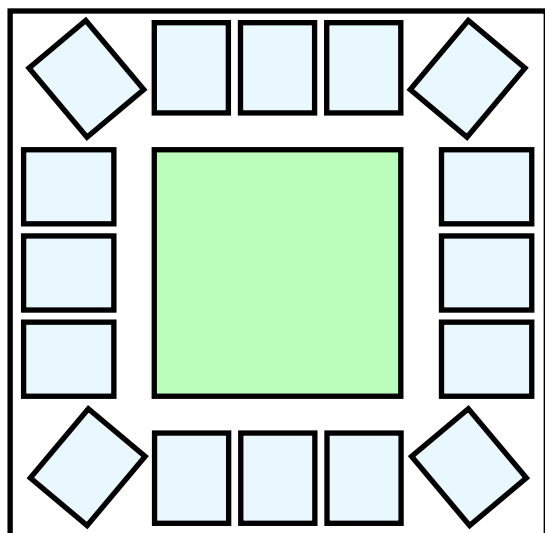
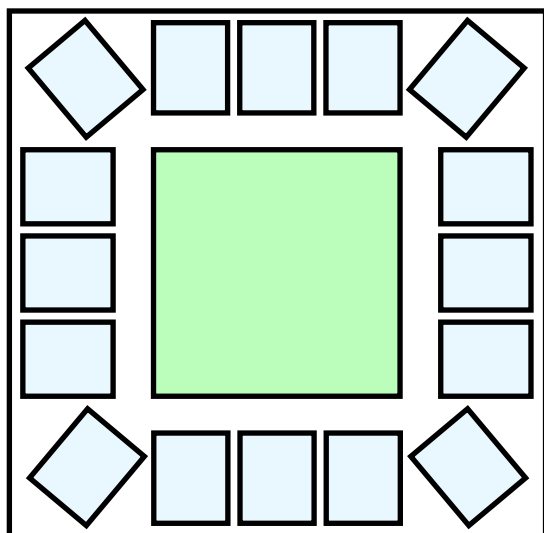
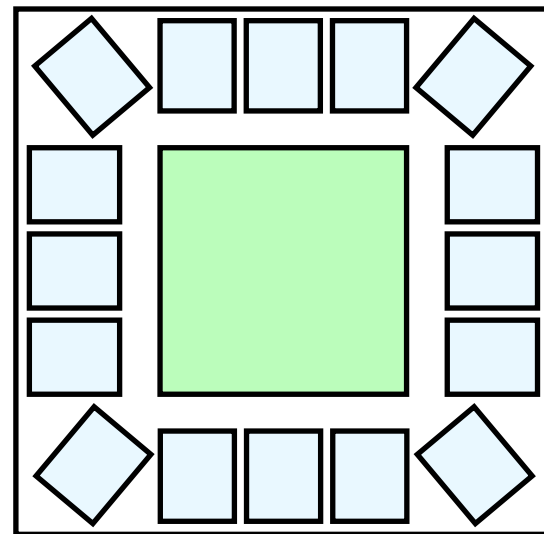
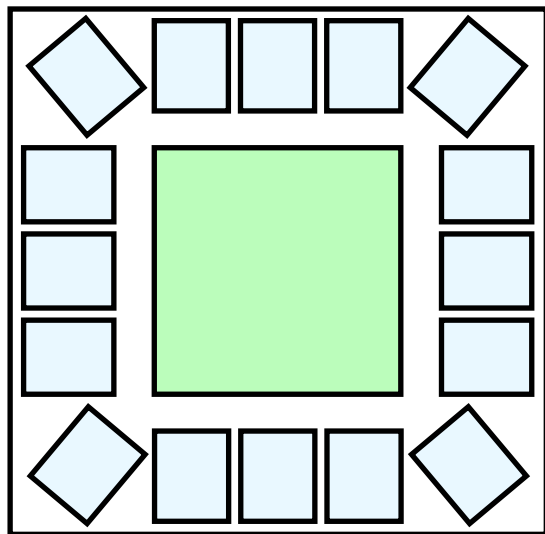
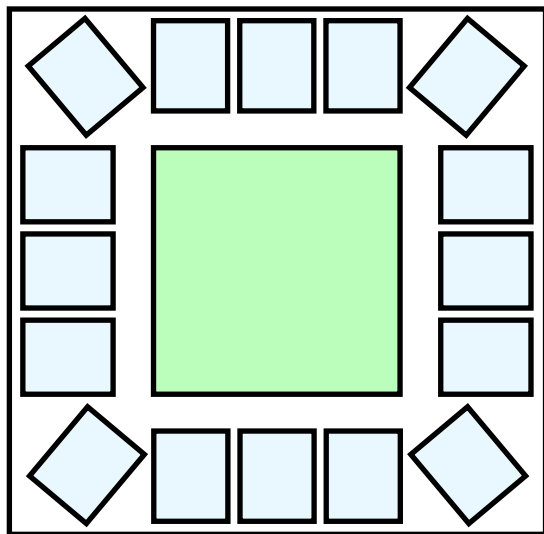
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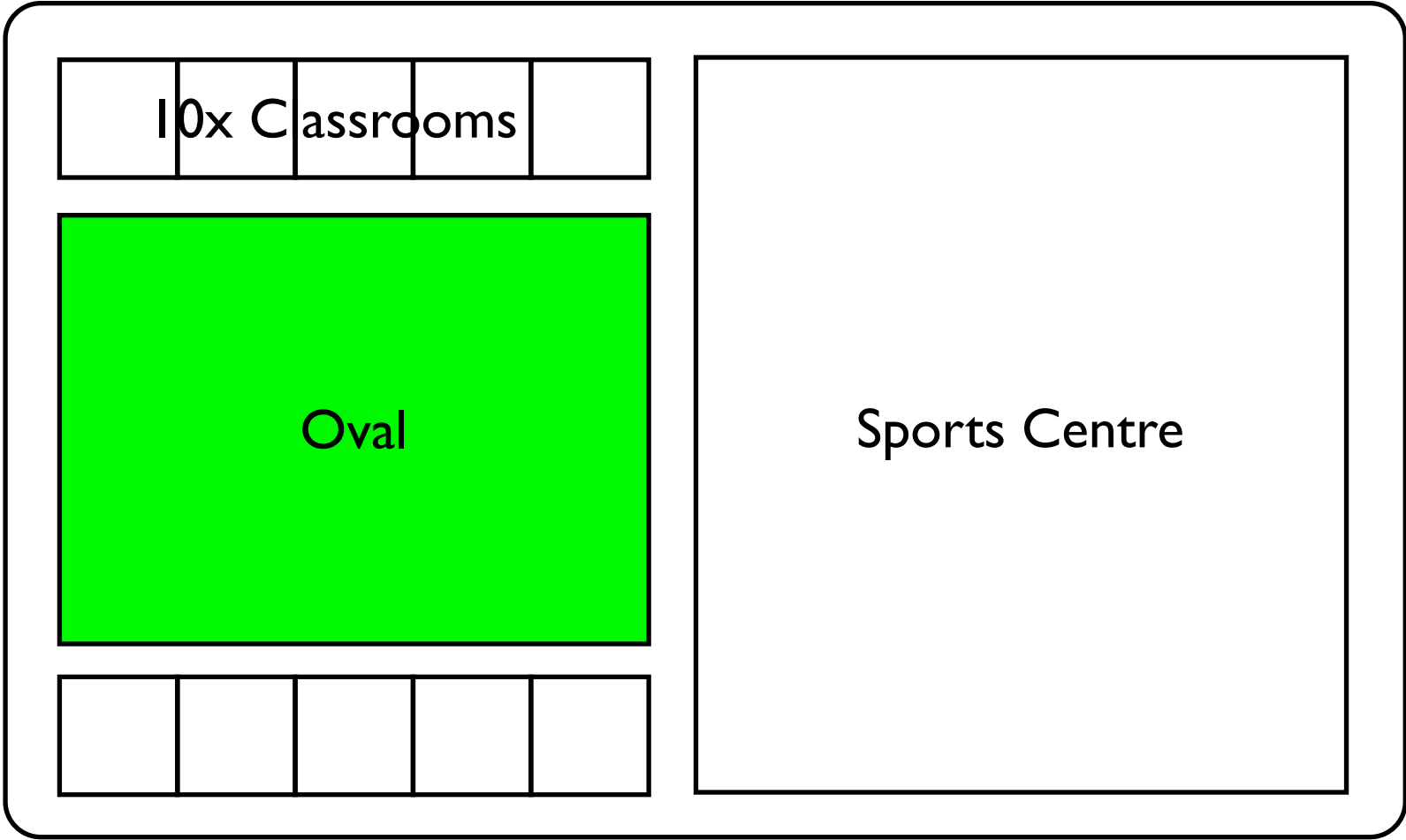




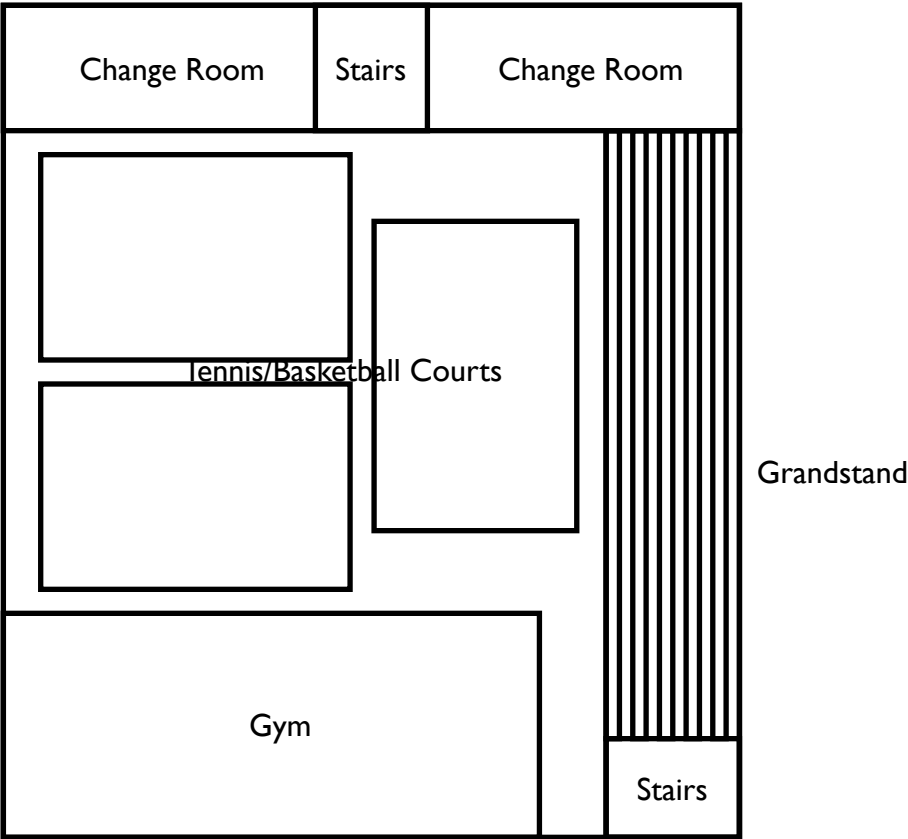
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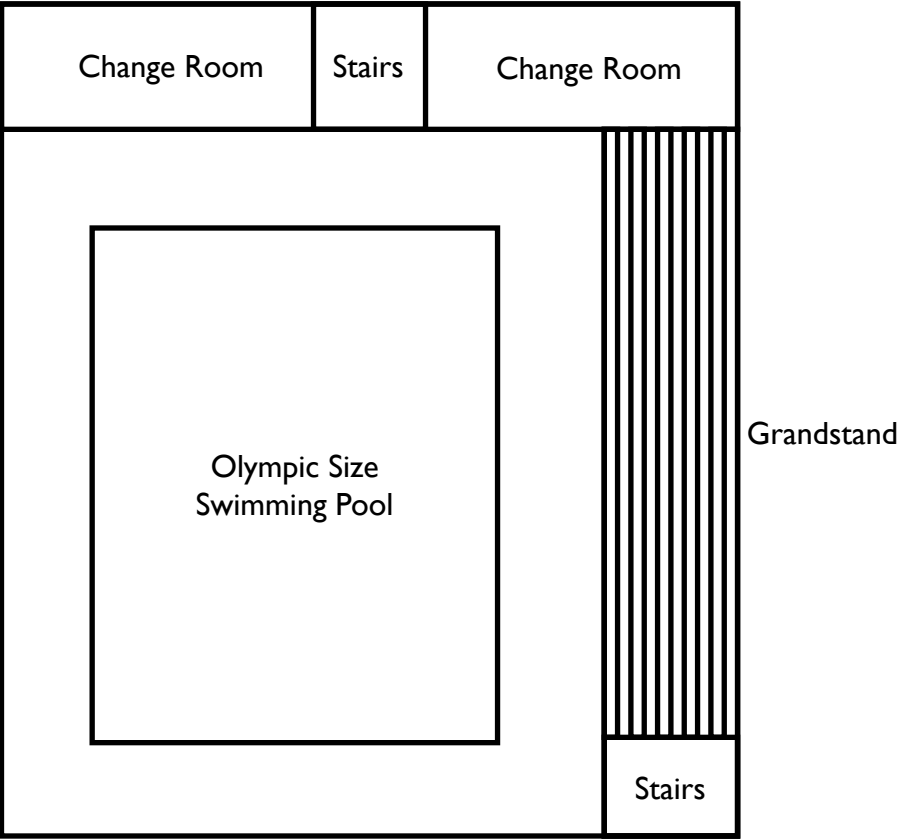




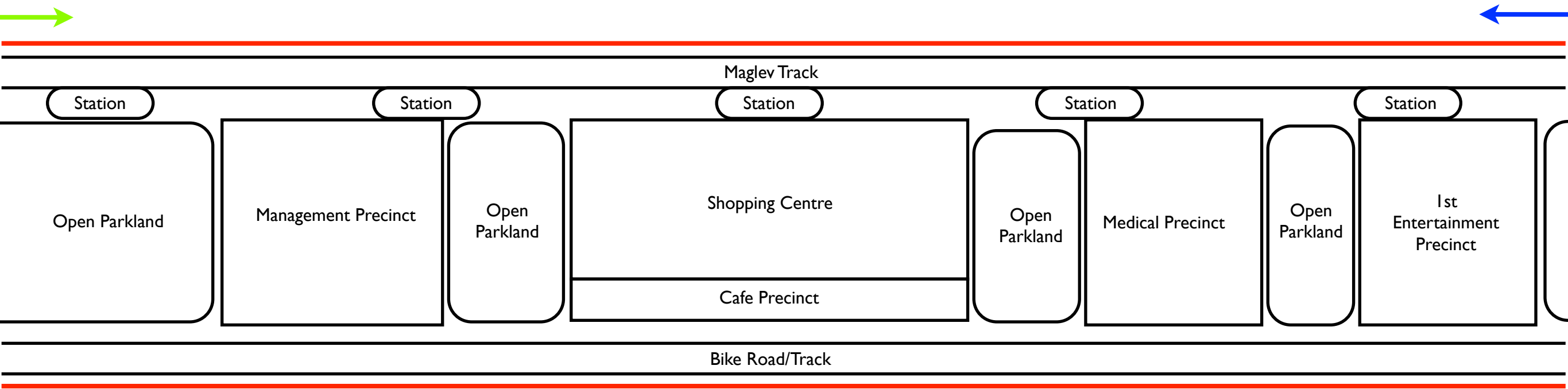
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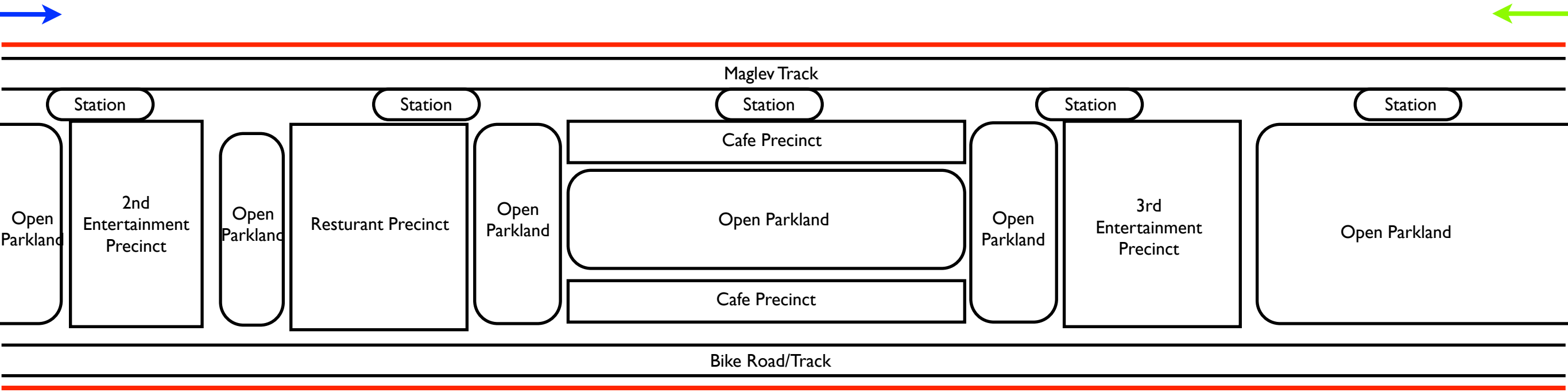
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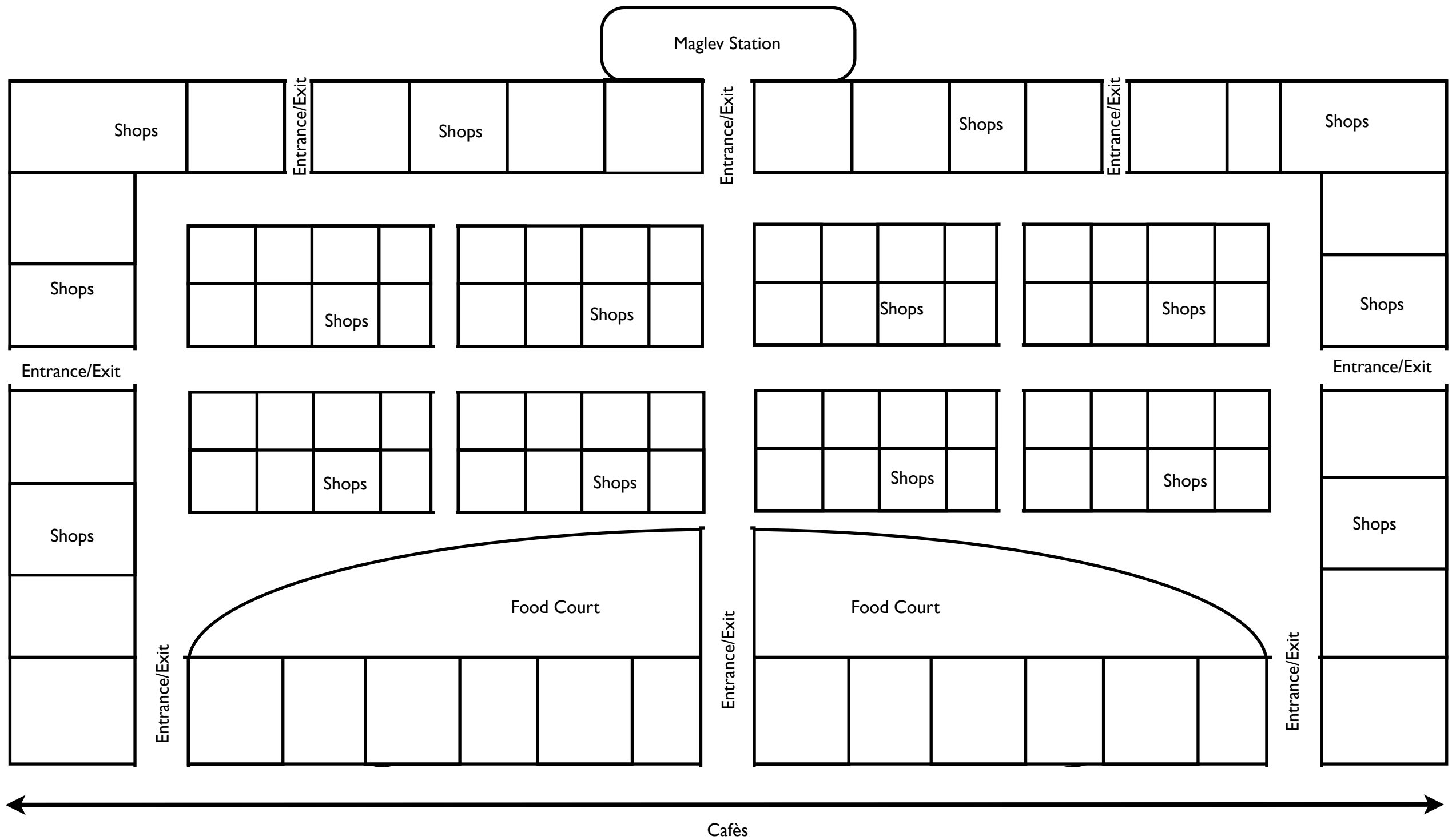


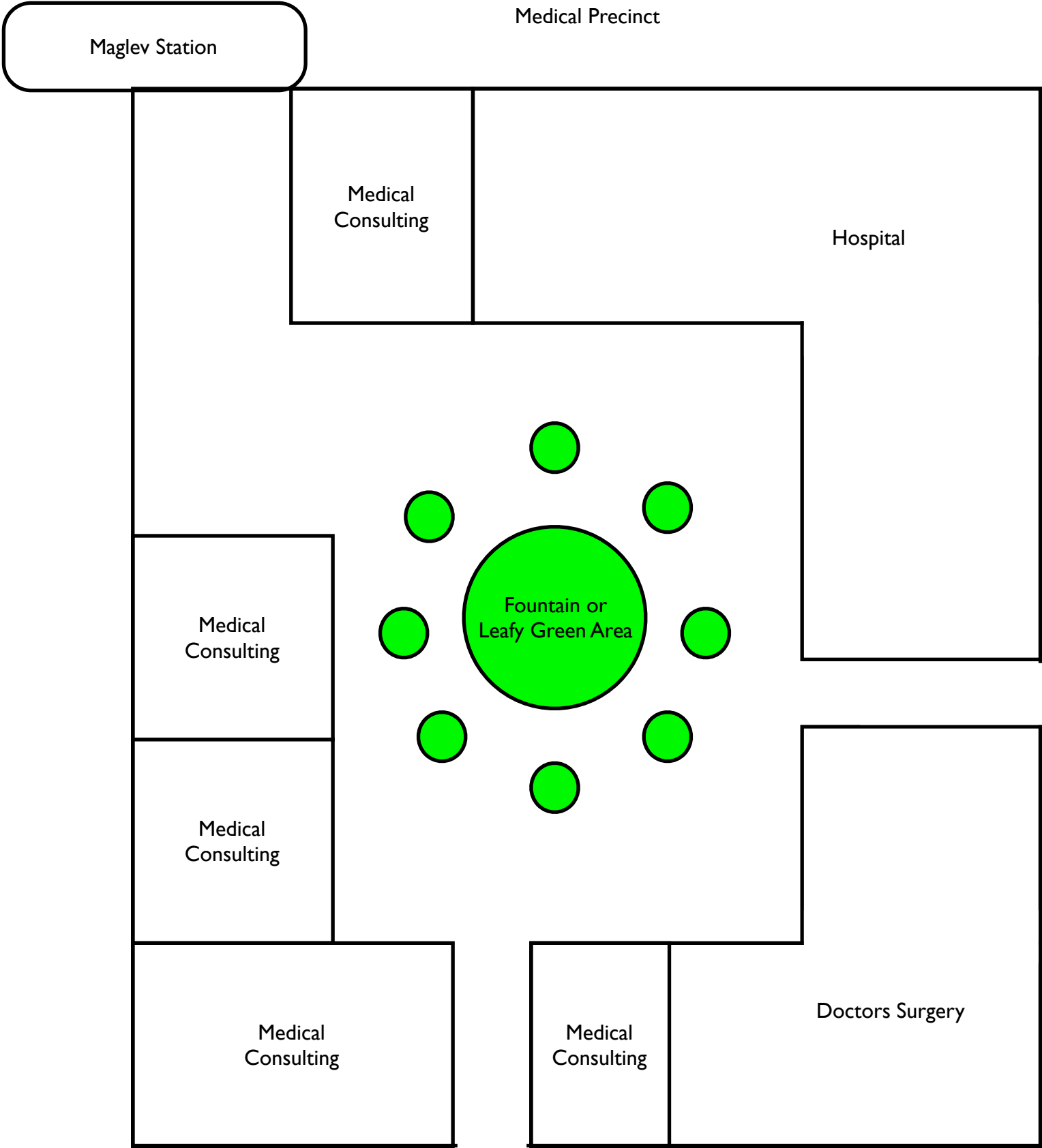
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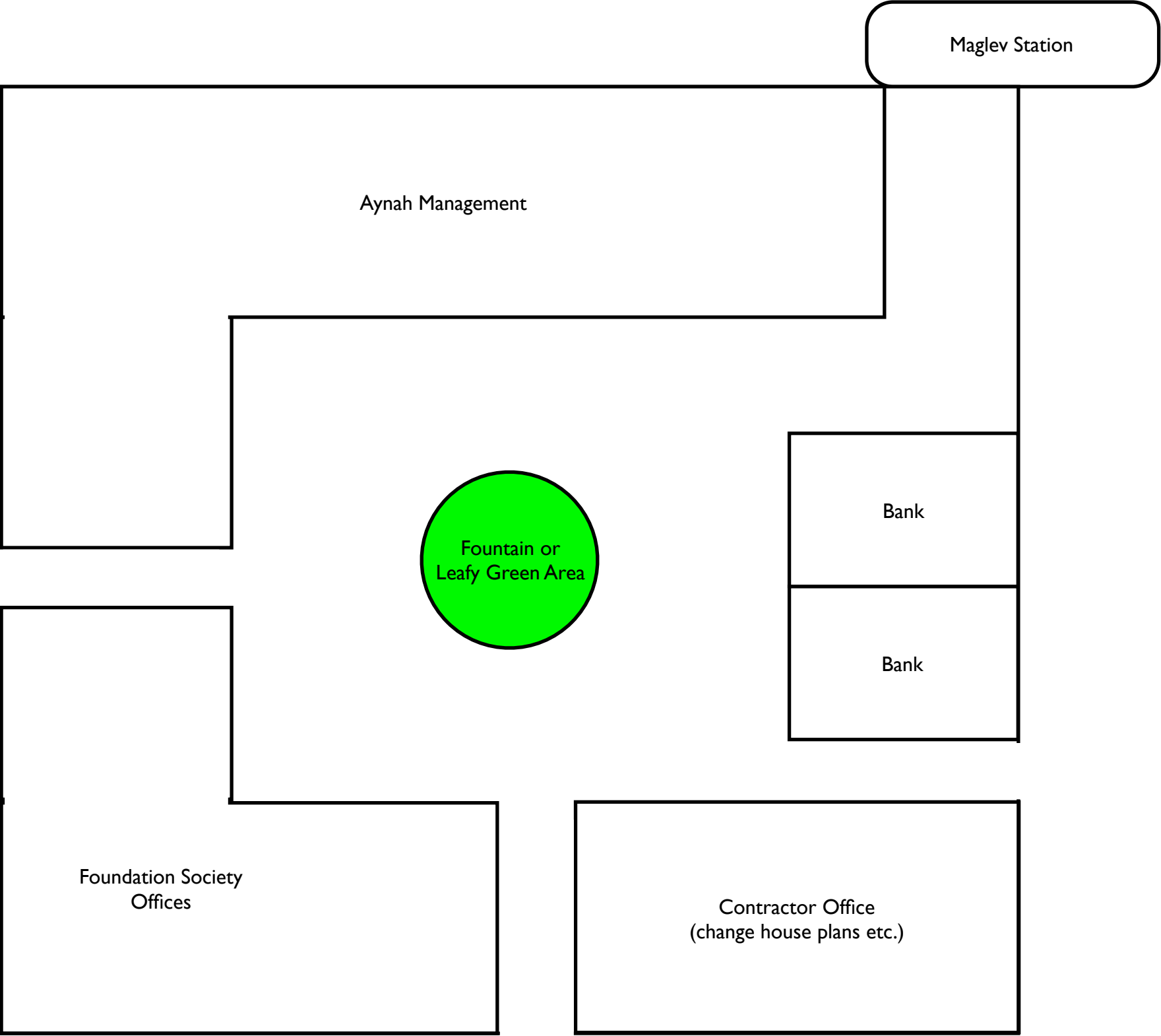
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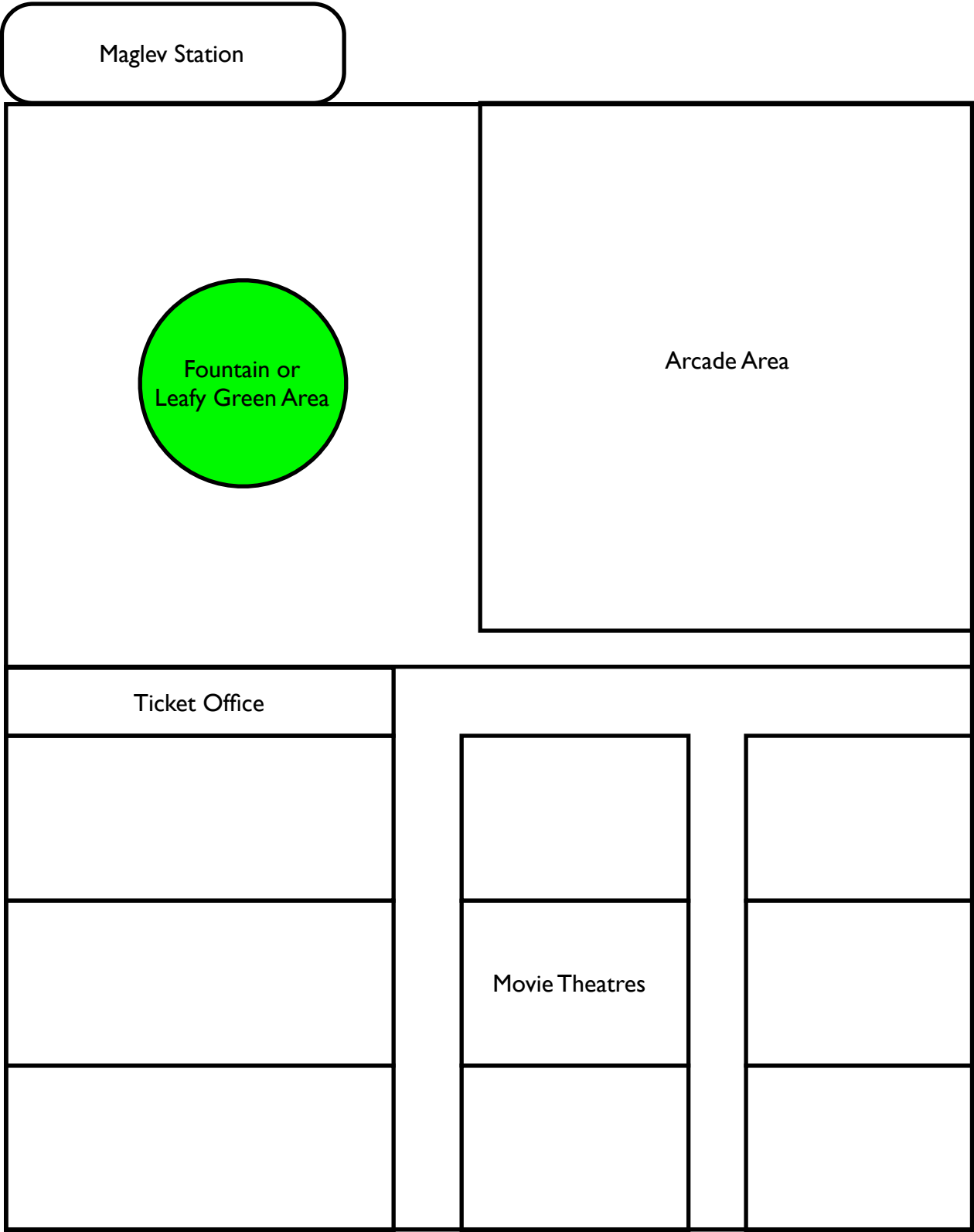




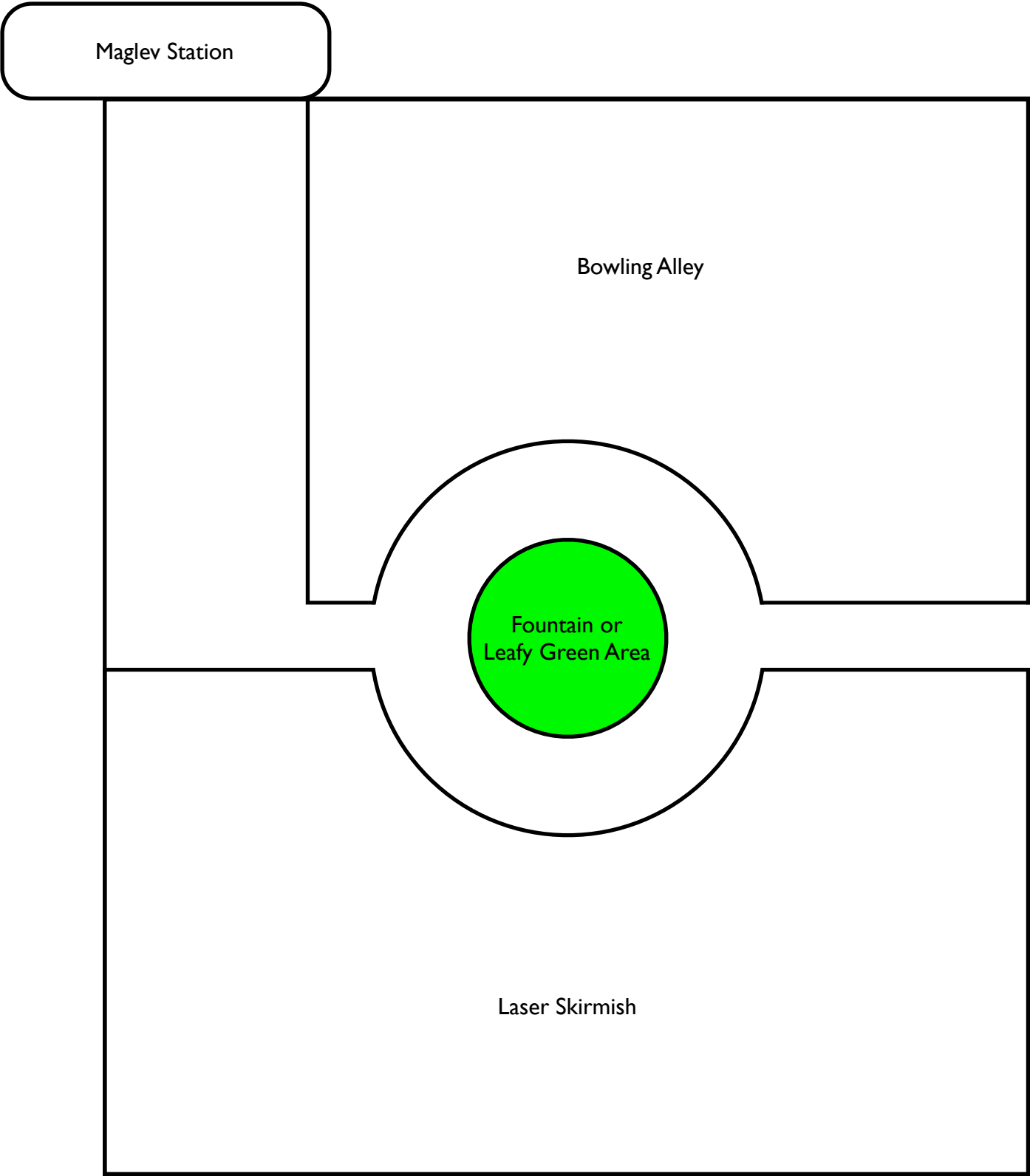
Management Precinct



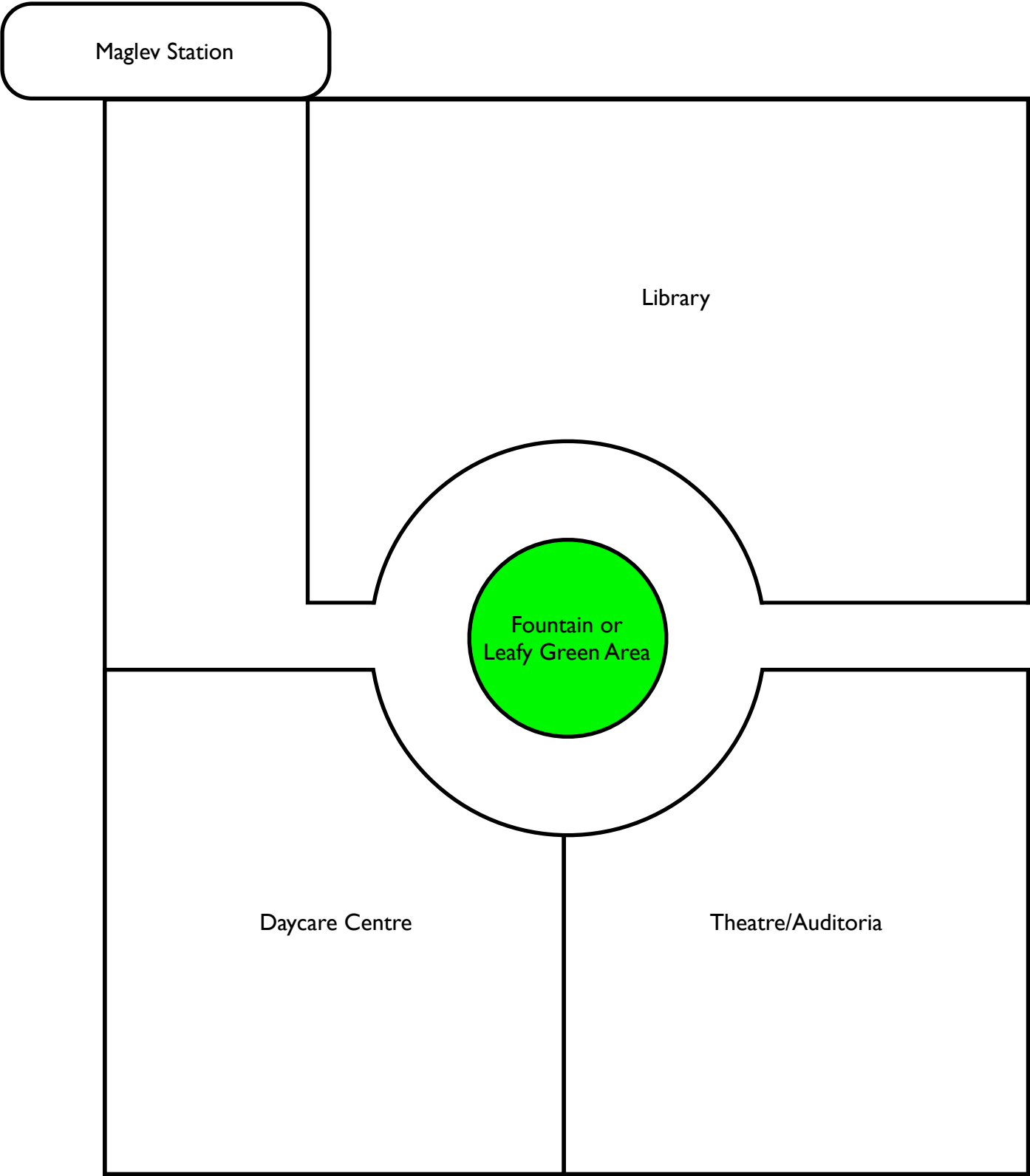
Entertainment
Precinct I

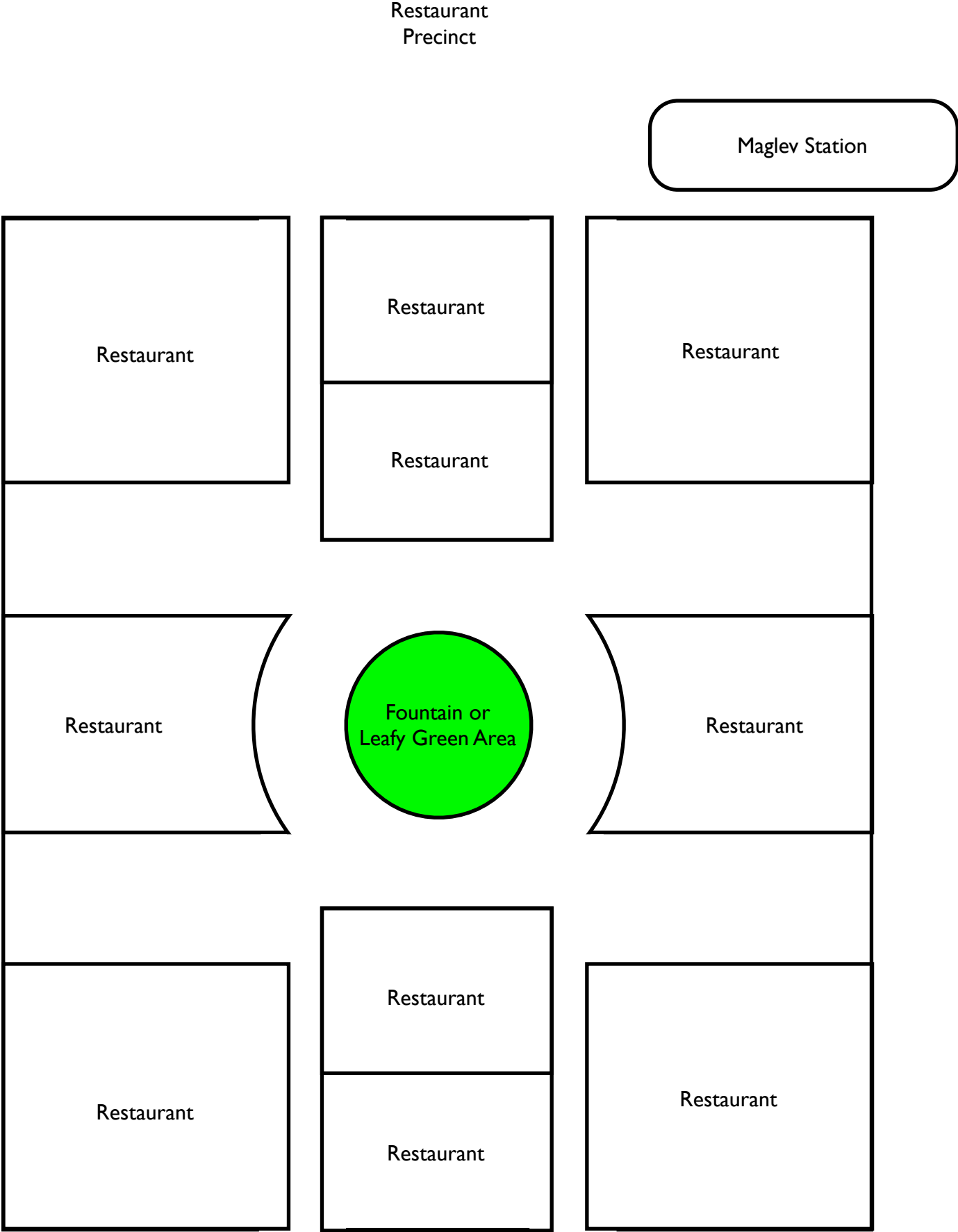


Entertainment
Precinct 2

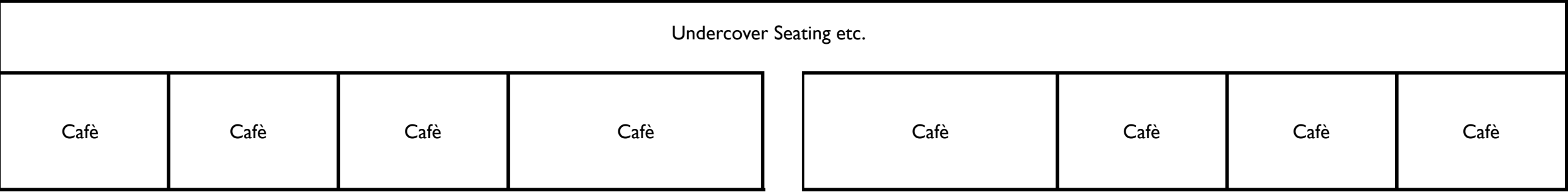
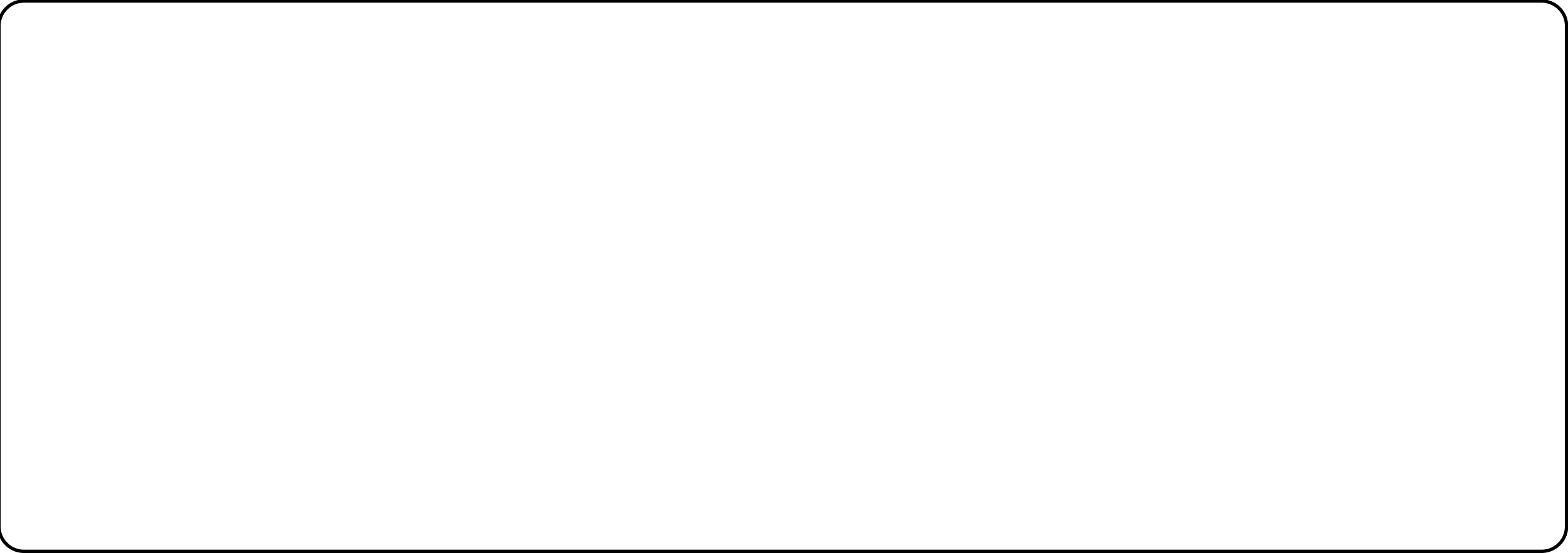
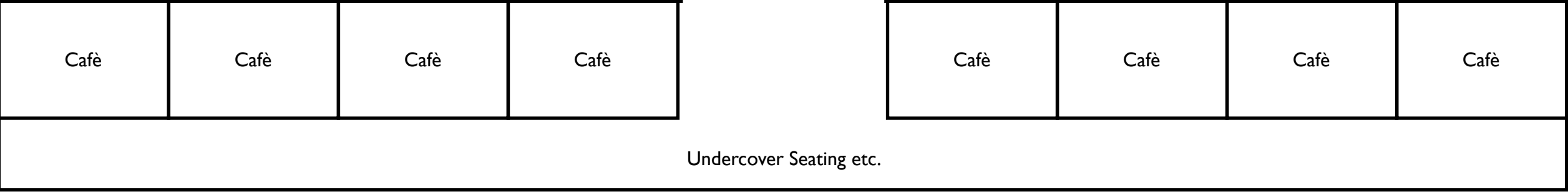


Entertainment
Precinct 3





Maglev Station



6.1

MONTH

[illegible]

6.1.1

MONTH

12		13	14	15	16	17		18	19	20	21
	LAUNCH OF COMPONENTS										
HYDROGEN, FUSION ROCKETS, GYROSCOPE AND MANUFACTURING							LAUNCH OF COMPONENTS				
TORUS RING 1 CONSTRUCTION											
HYDROPONICS DOME CONSTRUCTION											
		TORUS RING 2 CONSTRUCTION									
		ALL OTHER COMPONENTS FOR FINAL COMPLETION CONSTRUCTION									

6.1.2

MONTH

	22	23	24	25	26	27	28	29	30	31
	IN TRANSIT									
	IN TRANSIT									
	IN TRANSIT								INTEGRATION INTO STATION	
	IN TRANSIT								INTEGRATION INTO STATION	
	IN TRANSIT								INTEGRATION INTO STATION	
LAUNCH OF COMPONENTS	IN TRANSIT									
	IN TRANSIT									

6.1.3

MONTH

32	33	34	35	36		37	38	39	40
					ARRIVAL AT MERCURY	FOUNDATION SOCIETY MEMBERS BEGIN TO MOVE INTO HOMES	RESOLVING INITIAL IMPLEMENTATION ISSUES AND PREPARING FOR FINAL HANDOVER	ESTABLISHMENT OF ENTIRE ORIGINAL POPULATION	FINAL HANDOVER TO CUSTOMER
IN TRANSIT									
		INTEGRATION INTO STATION		IN TRANSIT					
		INTEGRATION INTO STATION		IN TRANSIT					