



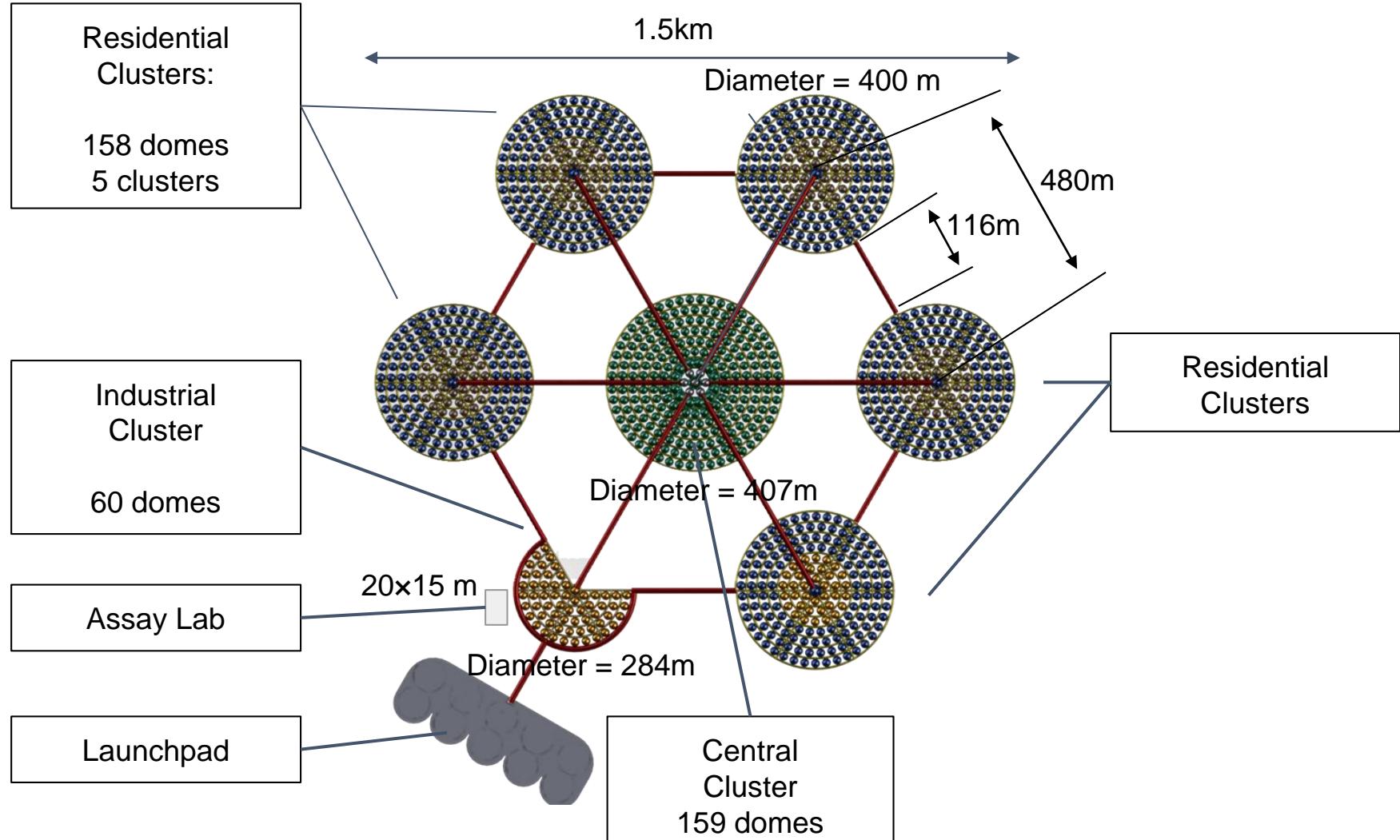


**“Established to study and terraform Venus,  
Asimov embodies the principle of  
uncompromising efficiency through compact  
structural design modules and multipurpose  
robots”**

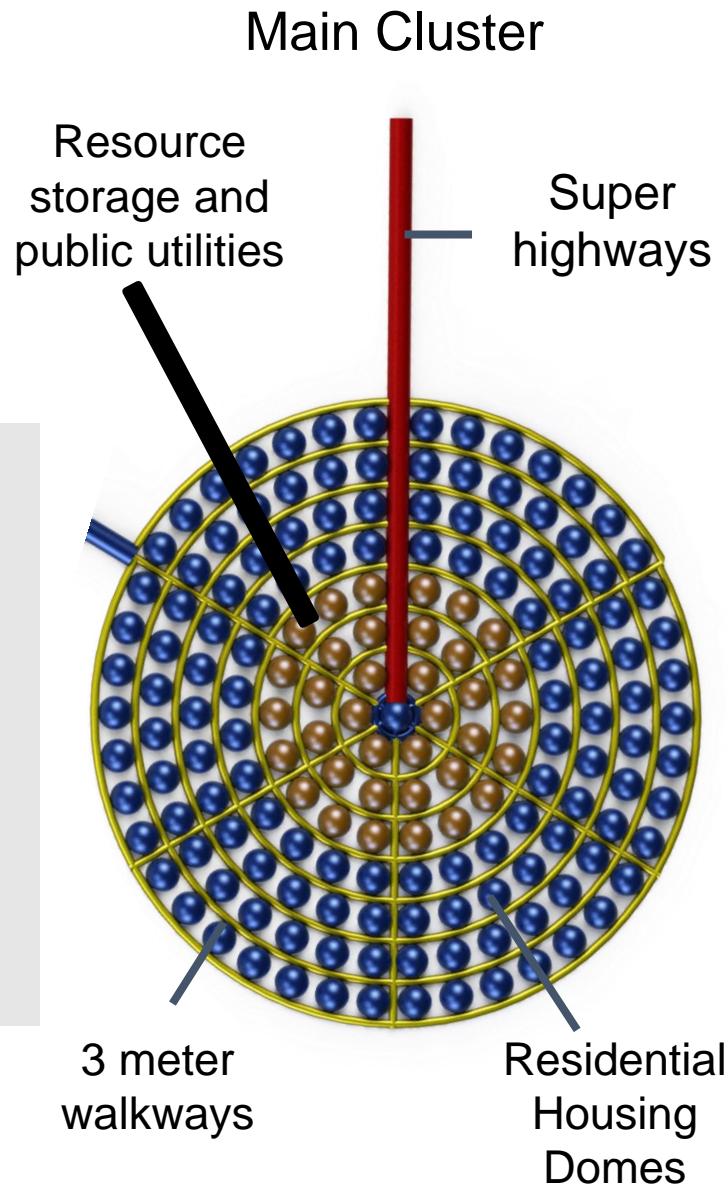


# Exterior Design

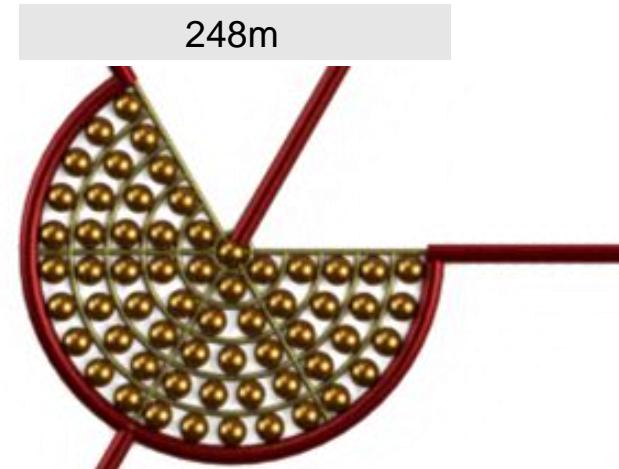
## Asimov Top View



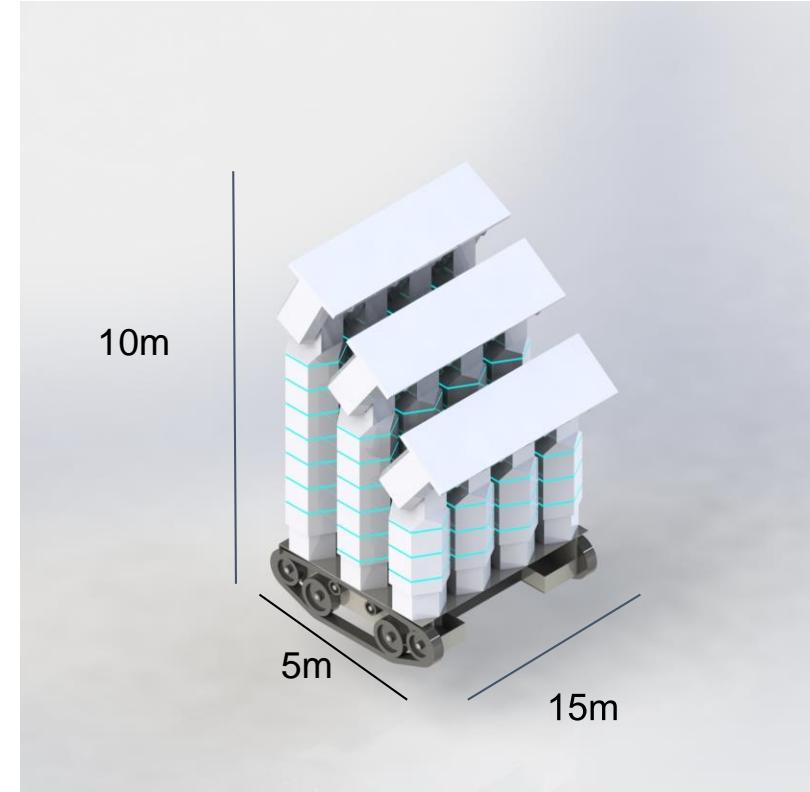
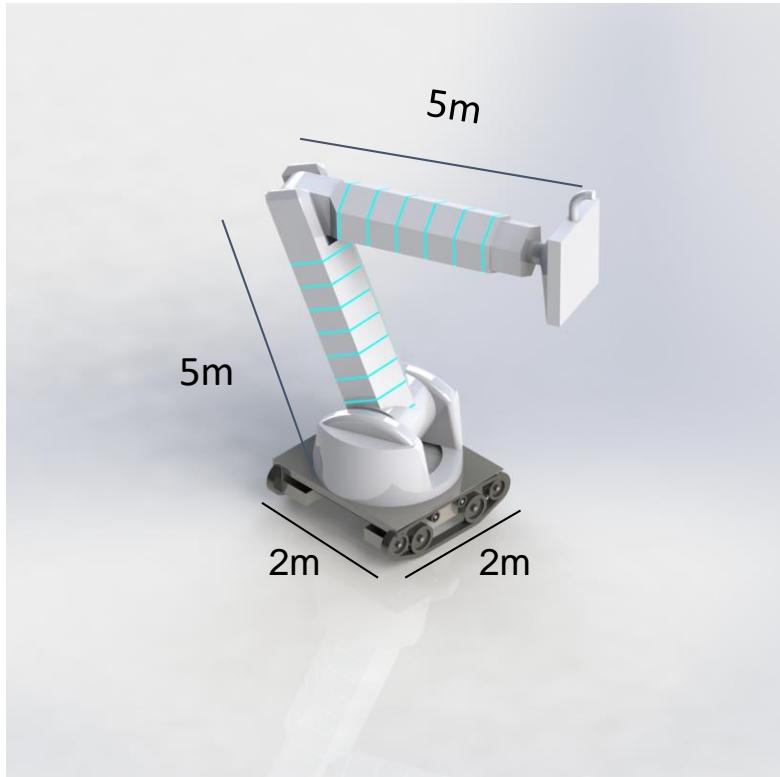
# Exterior Design



## Industrial Cluster



- Section off super highways
- 21 Airlocks surround Industrial Hub at highway entrances
- Specific location for storage, utilities and entertainment within each residential cluster



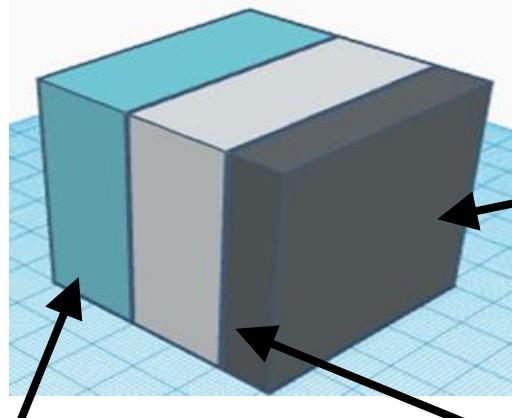
## Construction Robot

- Reardonium build
- Full range of motion
- Electromagnet and welder
- Disassemble CASSSCs
- 100 robots

## Jig Robot

- Reardonium build
- Many hands, light work
- Stackable design for added height
- 100 robots
- Folds down to fit in CASSSC

# Hull Composition, Thermal Insulation



Reardonium  
(20 cm)

Twice as strong as steel, half the density of aluminum, remarkable heat tolerance

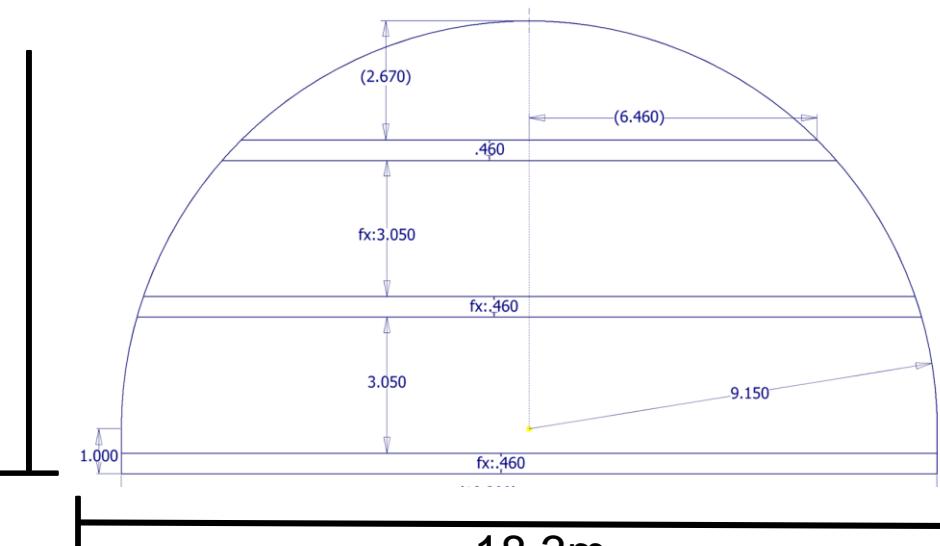
Silica Aerogel (20 cm)

A synthetic ultralight material where the liquid component of the silica gel has been replaced with air

Thermal conductivity of 100 mW/m-K at 500 °C under 90 bars of CO<sub>2</sub> pressure

Venusian Superadobe Blocks (10 cm)

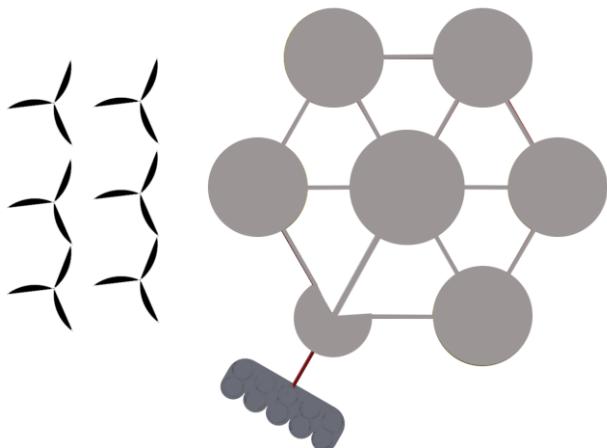
Made from the excavated Venusian material, provides necessary structural support



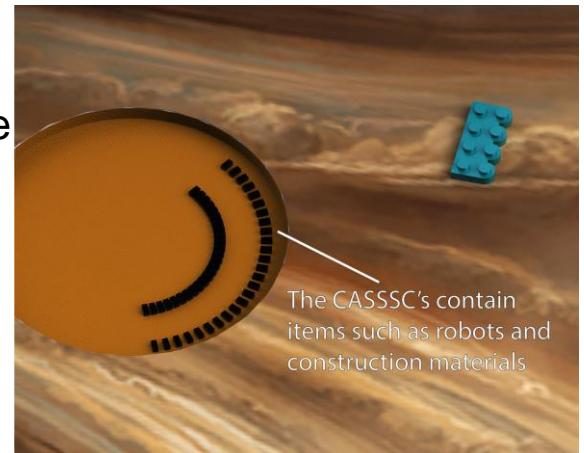
- Dome structure reduces weak points
- Modular design allowing isolation in emergency situations and easy repurposing of areas
- Clusters allow for a unique blend of convenience and spacial movement
- Alter boiling point to higher than ambient temperature of ammonia through pressure, thus cooling settlement with its latent heat when being circulated
- Dome with curvature with 9.15m radius

# Construction Process, Excavation

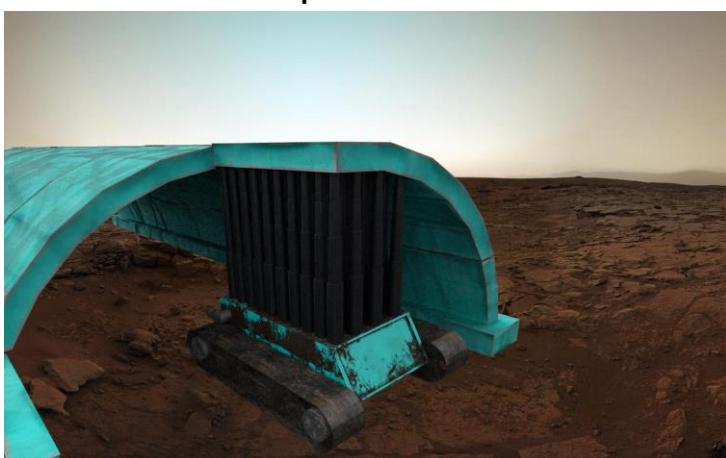
Step 1.  
Excavation  
Population:0



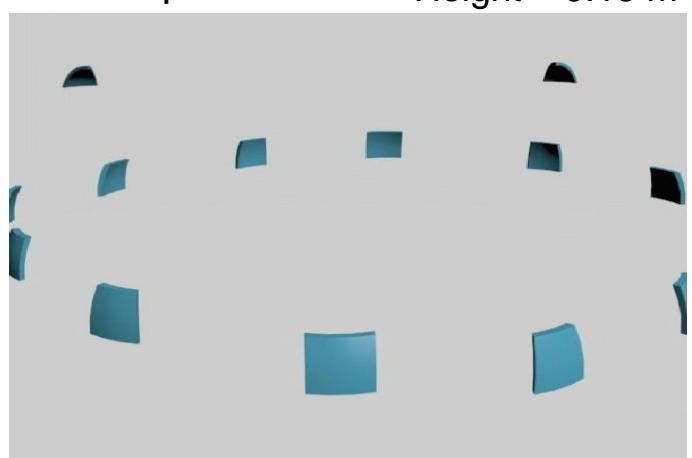
Step 2. Organize  
Construction  
Materials  
Population:0



Step 3. Welding  
Process  
Population:0      Radius = 6.9 m



Step 4. Dome  
Construction  
Population:0      Diameter = 18.3 m  
Height = 9.15 m

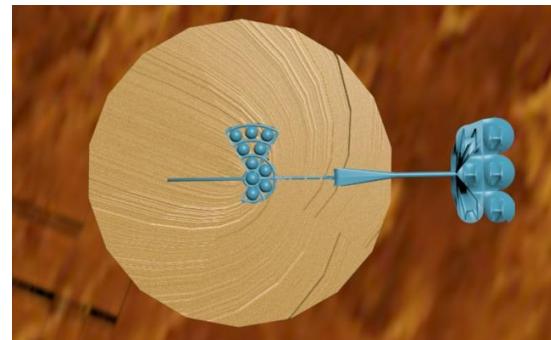


# Construction Process, Excavation

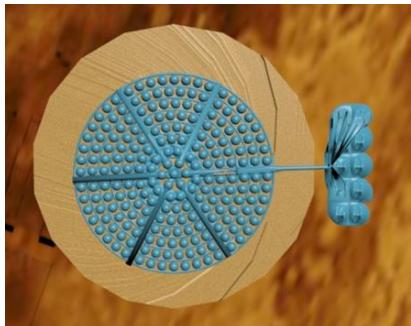
Step 5.:Intra-dome  
Pathways and Highway Construction  
Population:0



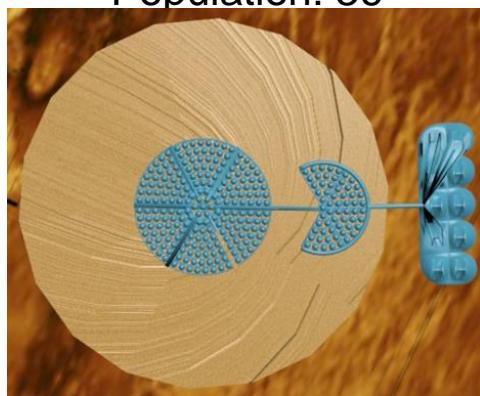
Step 6. Complete IOC  
Population: 36



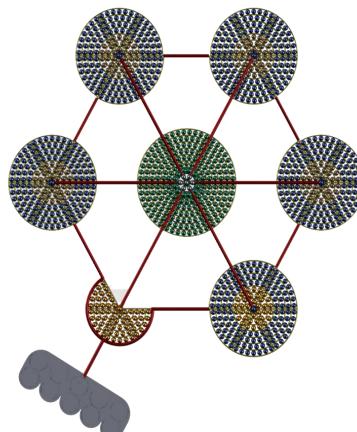
Step 7. Central Cluster Completed Population: 36



Step 8. Industrial Zones Construction  
Population: 36



Step 9. Residential Zones Construction  
Population per cluster: +2000  
Ending Population: 10,000



# Pre-Fab Components and Shipping

## Transport tubes (1,412 CASSSCs)

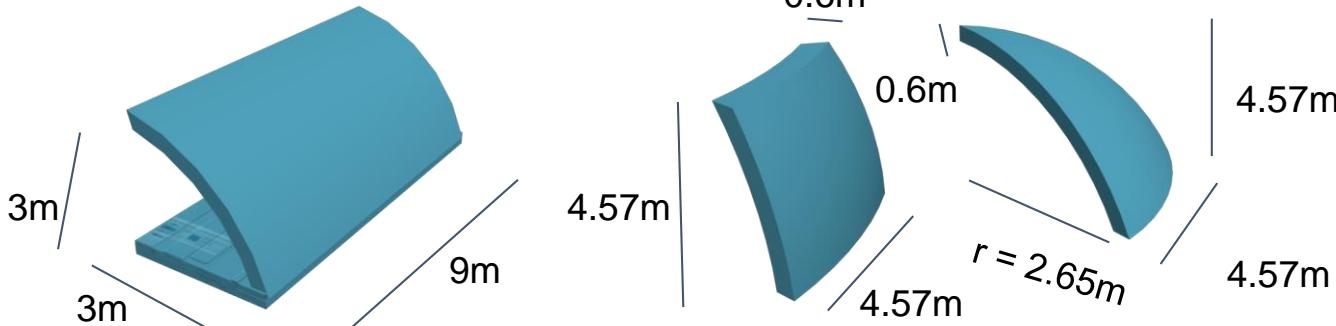
- 4.6m sections, divided into 2 top, 2 bottom, 2 floor pieces
- Ribs (carbon steel) every 5m (50cm wide) for support
- Most efficient way to pack, but also easy to construct

## In-Cluster Transport (4208 CASSSCs)

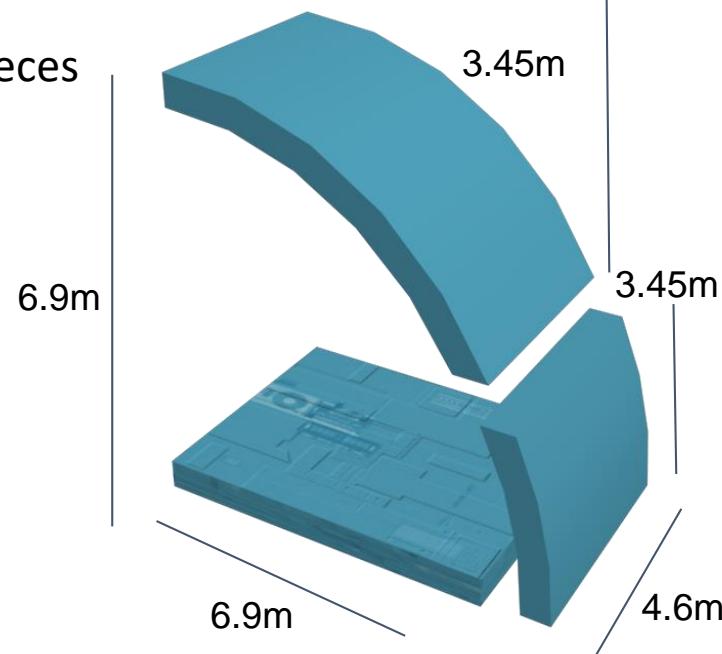
- 9 m sections, divided into 2 floor/arch pieces (1 per CASSSC)
- Very simple to construct

## Domes (5,827 CASSSCs)

- 8 top, 12 bottom (6 have windows), 16 floor pieces
- Efficient packing saves space in CASSSCs



Section of Transport Tube



**TOTAL:  
11,647  
CASSSCs**

# CASSSC Component Packaging

## Transportation of pieces in CASSCs

<b>Radius</b>	9.15	m
<b>Box width (max)</b>	9.15	m
<b>Width of one piece</b>	4.575	m
<b>Height of one piece</b>	4.575	m
<b>Number of layers</b>	2	
<b>Thickness of each piece</b>	0.61	m
<b>Angle of each piece</b>	0.5	rad
<b>Number of pieces for layer 1</b>	12	
<b>Number of pieces for layer 2</b>	8	
<b>Number of base pieces</b>	16	
<b>Number of boxes per dome</b>	4	
<b>Total number of pieces</b>	36	
<b>Total Number of boxes</b>	4045	

## Domes:



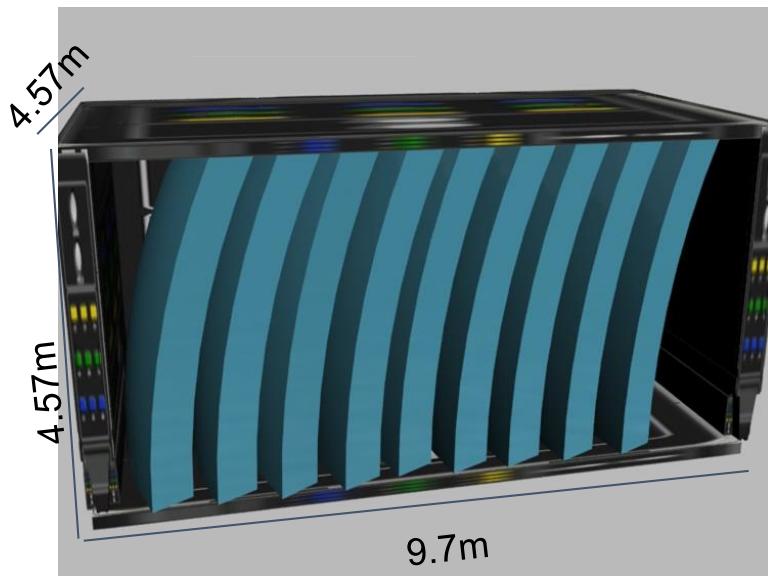
9.7m

18.3m

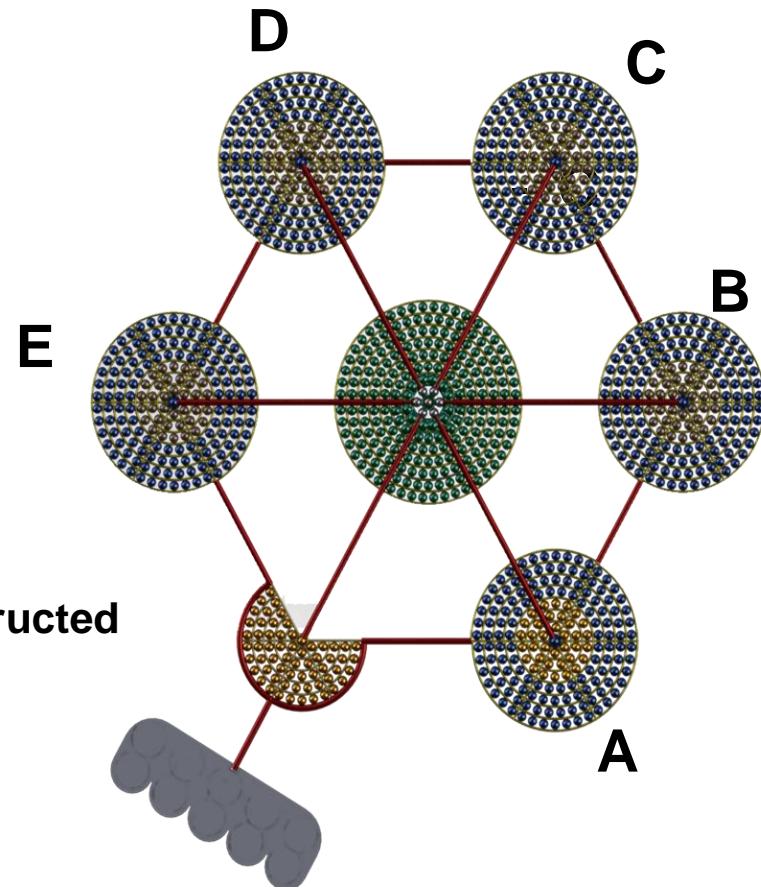
## Total Number of Pieces Necessary

<b>Dome</b>	<b>Superhighway</b>	<b>In-Cluster Transport</b>
Bottom pieces with windows: <b>4,452</b>	Bottom pieces: 3,146	Side/floor pieces: 4,909
Bottom pieces without windows: <b>7,680</b>	Top pieces: 3,146	_____
Top pieces: <b>8,088</b>	Floor Pieces: 3,146	_____
Floor pieces: <b>16,176</b>	Ribs: 715	_____

# CASSSCs Shipments During Construction



Packing of pieces for domes,  
Packed with 9 pieces per CASSSC.



## Water CASSSCs Delivered as Each Cluster is Constructed

Clusters	A	B	C	D	E
CASSSCs	4	8	11	14	17

## Food CASSSCs Delivered as Each Cluster is Constructed

Clusters	A	B	C	D	E
One CASSSC every _____	18 days	14 days	10 days	7 days	2 every 7 days

# Materials for Interior Construction

## Material Chart

Type of Metal	Source	Method of Shipping
Hydrogen	Venus	Subcontracted by Cryo Chemical
Reardonium	Mercury	Provided by Foundation Society
Nitrogen	Venus	Subcontracted by Cryo Chemical
Graphene	Venus	Subcontracted by Carbon Creations
Silica Aerogel	Venus	Extracted locally
Silica Clay	Venus	Subcontracted by Nano Solutions
Carbon Fiber	Venus	Subcontracted by Carbon Creations

# Breach of Inhabited Volume

## Contain - Stabilize - Normalize

		Time After Breach of Inhabited Area of the Settlement						
		Step	Right Away	3 sec after	3-25 seconds	30 min	1 hr	1 hr 30 min
Contain	Emergency alarm sounds							
	Doors to affected pods close							
Stabilize	Residents use Emergency Oxygen*							
	External and Internal Robots Plug Hole							
Normalize	New Air Pumped Through Valves							
	Return to Normal Operations							

\*Residents have 2 hours of emergency oxygen each

## Contain - Stabilize - Normalize

### Contamination of Atmosphere in Connected Areas due to Release of Hazardous Chemicals

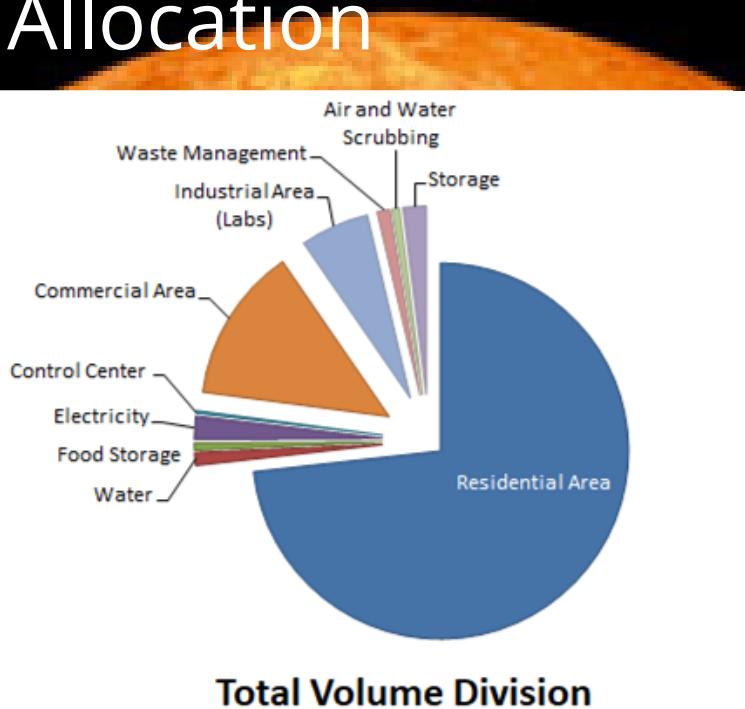
		Step	Right Away	After Evac.	After Decontamination
Contain	Emergency alarm sounds				
	Evacuation of Affected Unit*				
Stabilize	Evacuees Move to Emergency Housing				
	Doors to Contaminated Area Close				
	Robots De-Contaminate the Area**				
Normalize	Return to Normal Operations				

\*Means that at least one cleaning bot will be enclosed

\*\* Cleaning bots subcontracted from Bots4U will be built to collect and dispose of Hazardous Chemicals out of the either the air valves or the Lossless Airlocks.

# Down Surface Allocation

- Dispersed resources in clusters assure redundancy
- Multiple domes for each function assures redundancy
- Residential includes one clinic per dome, and VR education
- Main hospital located in center cluster



**Area Allocation**

	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Number of domes
Residential Area	365170.4	1190490.1	742
Water	2893.2	17648.8	11
Food Storage	1578.1	9626.6	6
Electricity	5260.4	32088.7	20
Control Center	526.0	3208.9	2
Commercial Area	34981.9	213389.7	133
Industrial Area (Labs)	15781.3	96266.0	60
Waste Management	2893.2	17648.8	11
Air and Water Scrubbing	1639.3	10000.0	6
Storage	5260.4	32088.7	20
<b>Total</b>	<b>435984.5</b>	<b>1622456.3</b>	<b>1011</b>

**Number of Residential clusters =**

5

Per Residential Cluster	Number of domes
Residential Area	147
Water	2
Food Storage	1
Electricity	3
Waste Management	2
Air and Water Scrubbing	1
Storage	1

**Center Cluster**

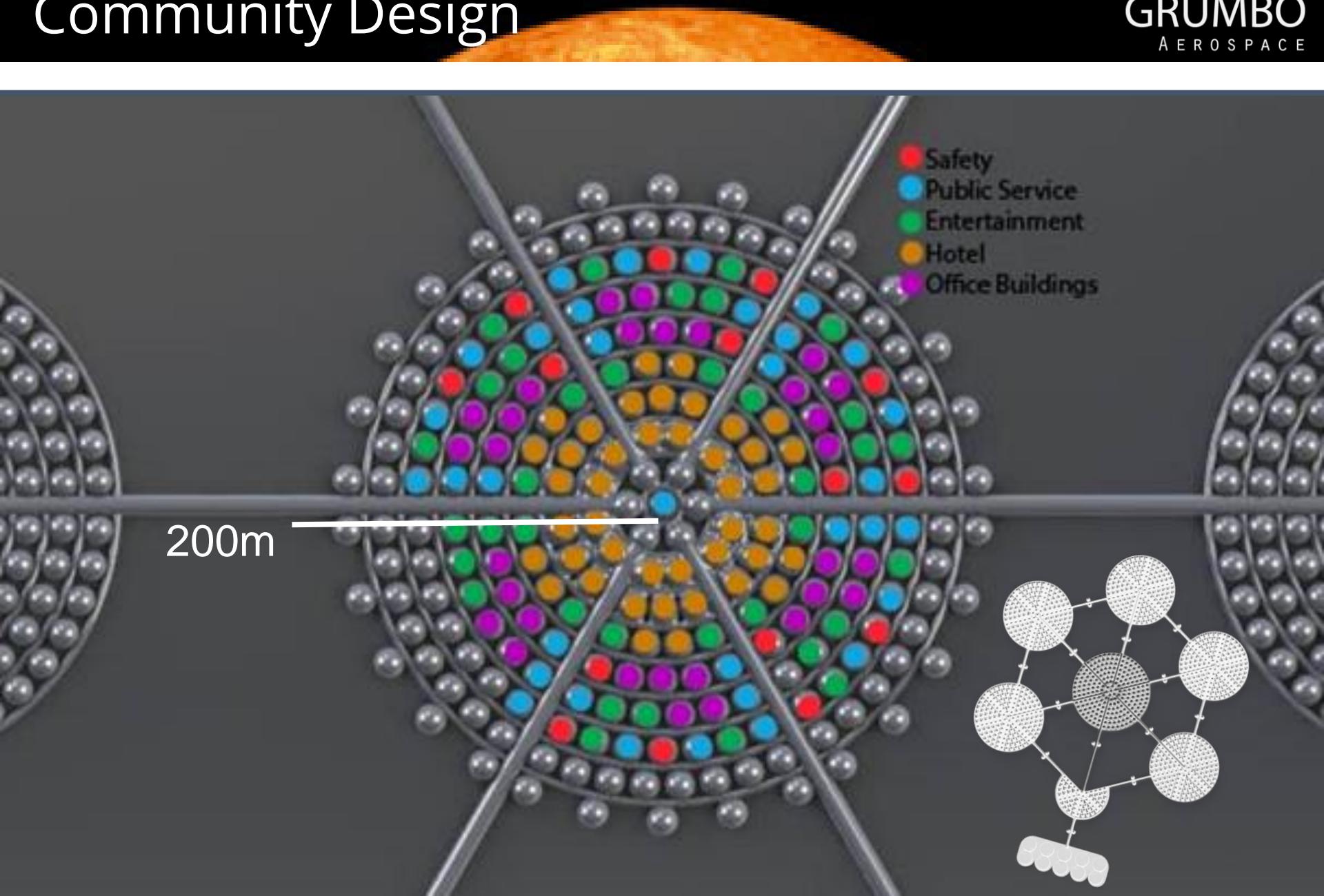
Water	1
Food Storage	1
Electricity	5
Control Center	2
Waste Management	1
Air and Water Scrubbing	1
Storage	15
Commercial Areas	133

**Operations cluster**

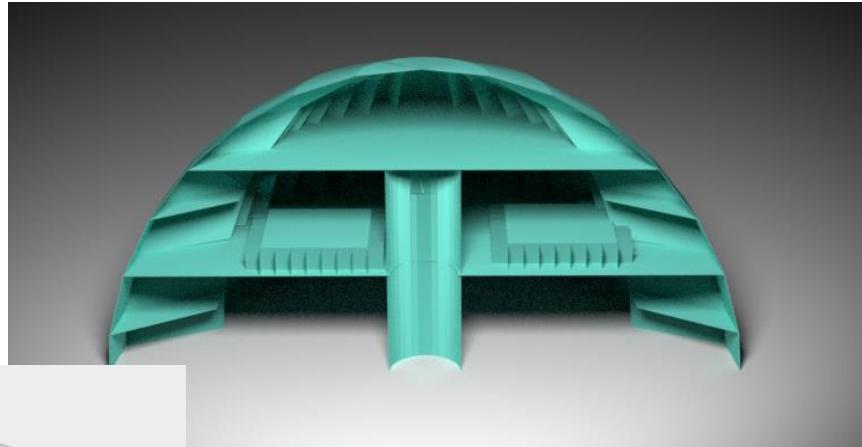
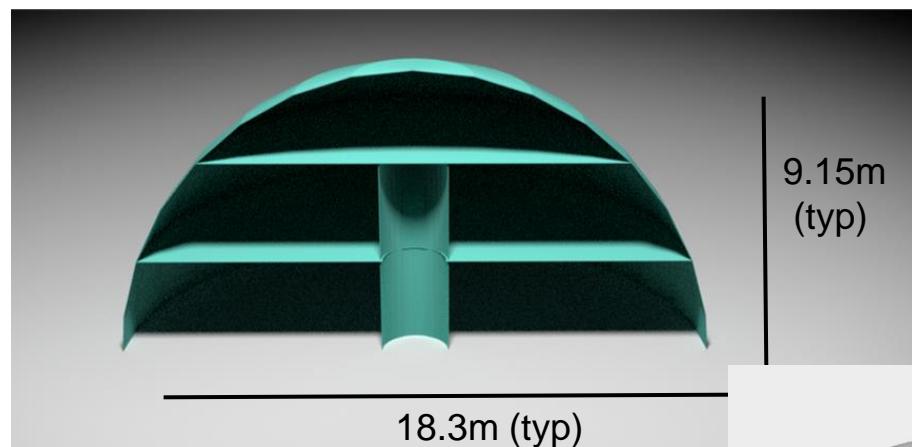
Industrial Labs etc.	60
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# Community Design

GRUMBO  
AEROSPACE

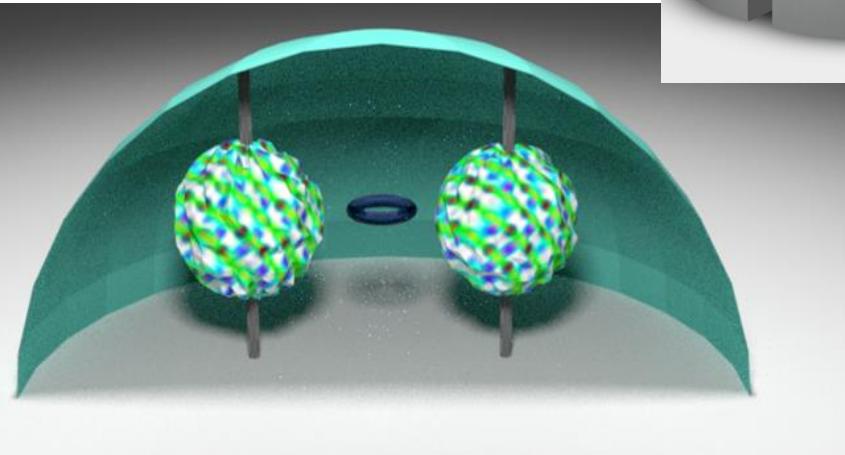
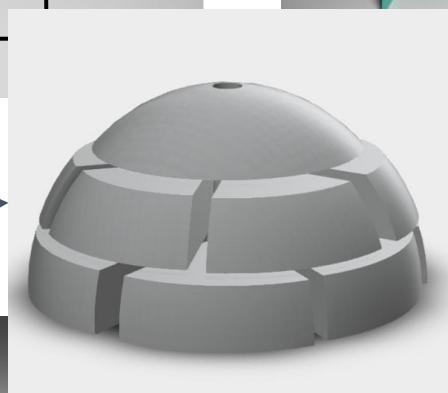


# Dome Shells

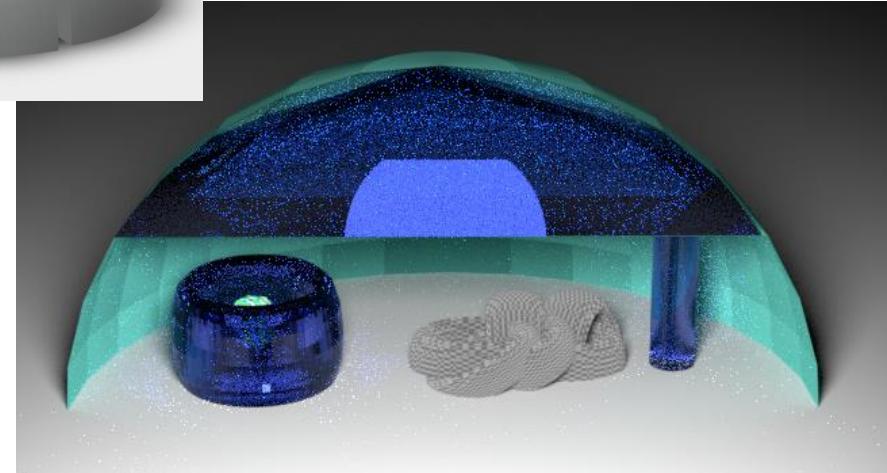


Empty Residential Dome

Empty Storage Dome



Energy Dome

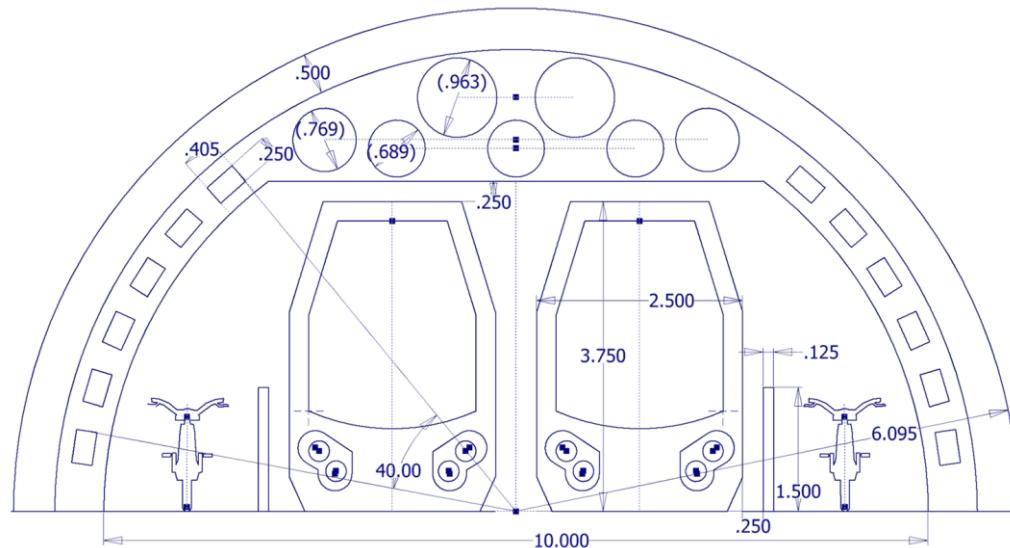


Water Storage Dome

# Internal Transportation

## Transportation Choices:

- Electric Street Car
  - Loops through Communities
  - Central access from each community
- Bike paths beside the tracks
- Emergency Vehicles for within clusters
  - 1.2m x 2.1m x 2.1m
  - Drive people to nearest clinic
  - Fight fires
- Paths within clusters for bikes and people
- Cargo Trains transport food and waste throughout facilities

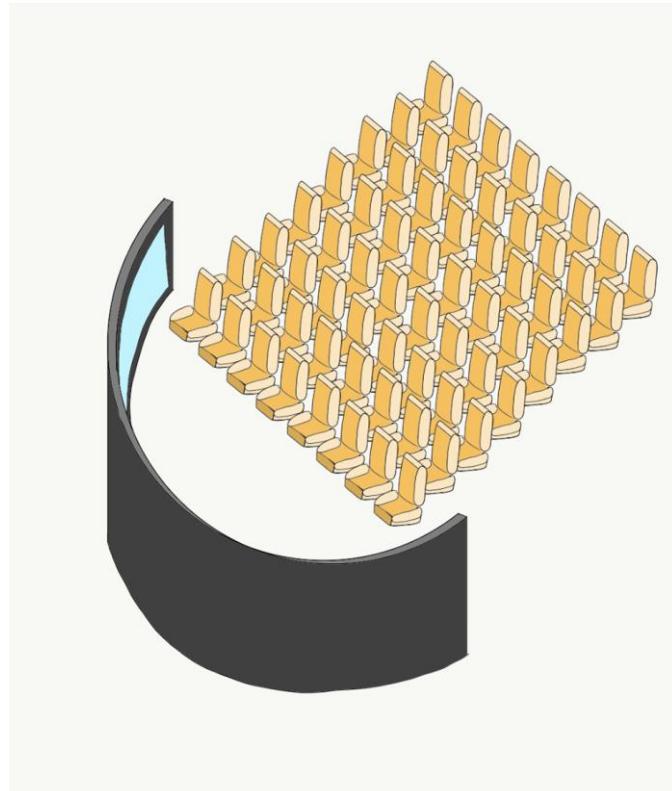


# Entertainment and Recreation

- 3D Theater
  - Augmented/Virtual Reality
  - Promotes balanced lifestyle
- Arcade
  - Augmented/Virtual Reality
  - Hovercraft bumper cars
  - Obstacle course with lasers
- Necessities
  - Parks
  - Medical Centers/Public Services
  - Schools



Product	Total price of units (\$)
Toiletries	\$3,267,140
Clothing	\$15,750,000
Furniture	\$36,869,258

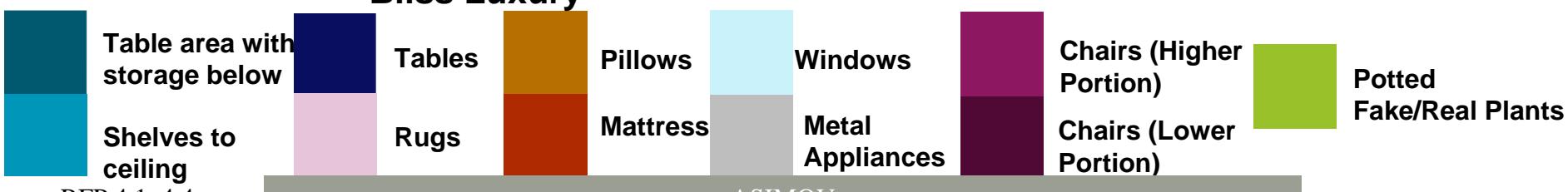
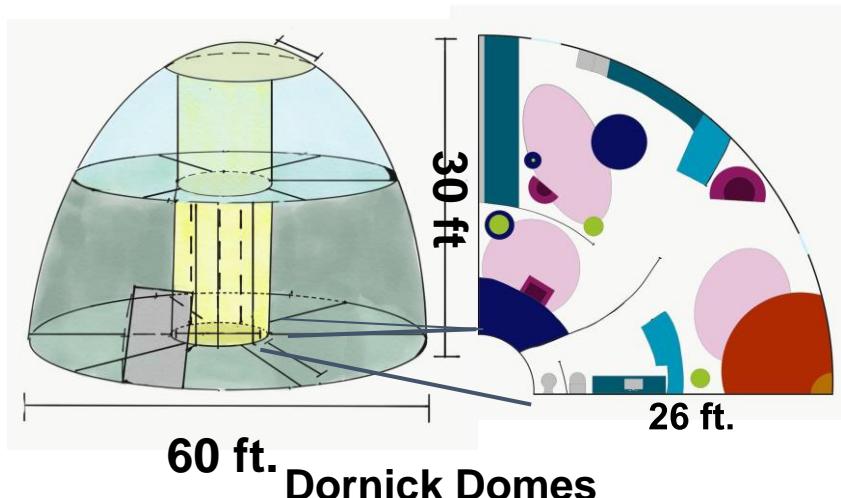
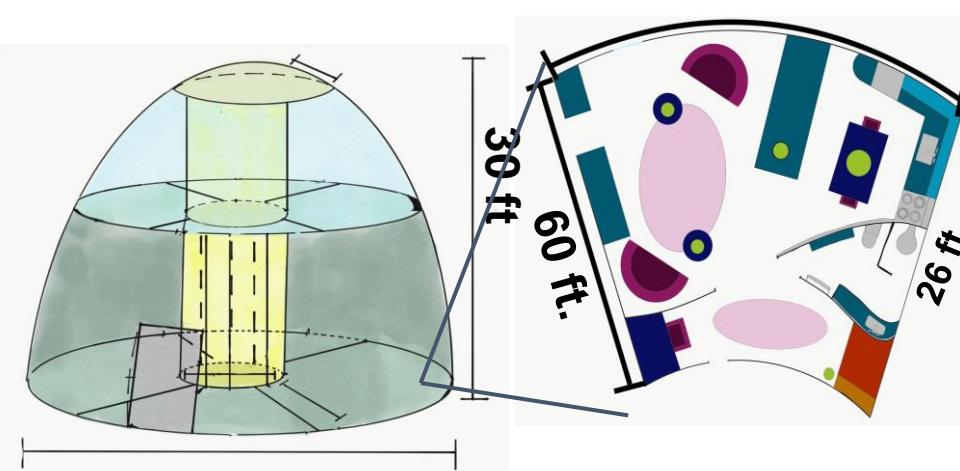
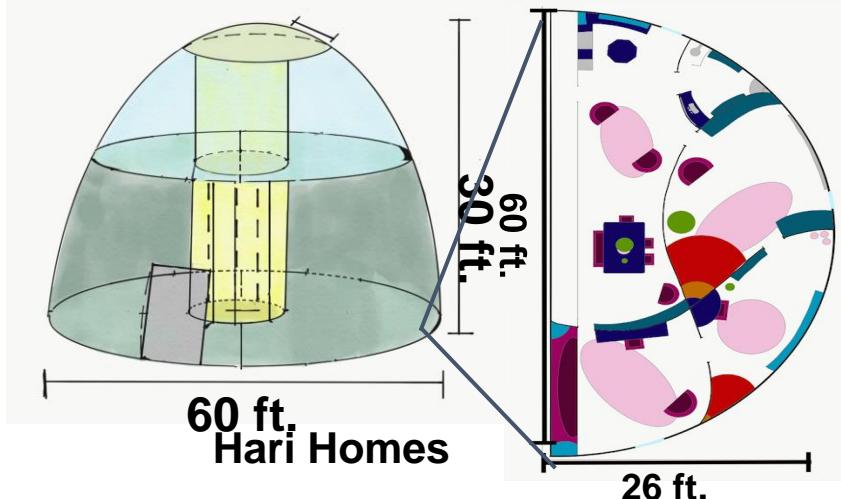
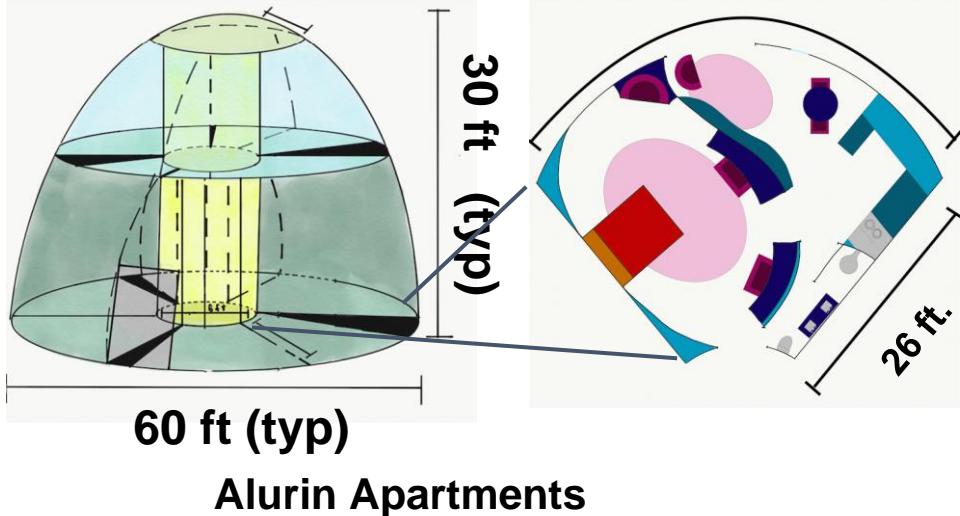


# Residential Living

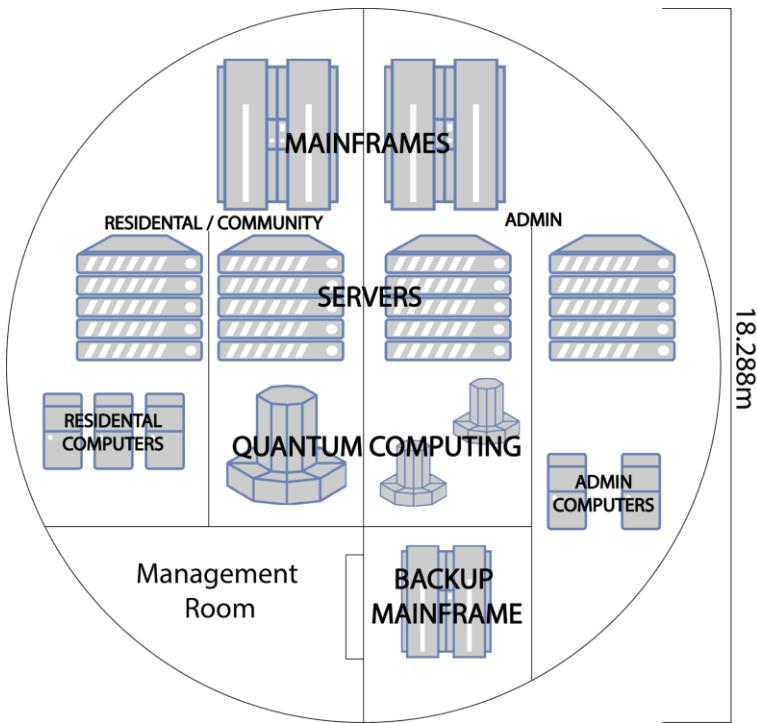
Type of House	Number of People	Houses per Dome	Number of Domes	Square Feet (Floor Dependent)
Single Apartments (Alurin Apartments)	4655 people	12	408	First: 410 ft <sup>2</sup> Second: 355 ft <sup>2</sup>
Luxury Housing (Bliss Luxury)	495 people	11	45	First: 498.85 ft <sup>2</sup> Second: 533 ft <sup>2</sup>
Couples Housing (Dornick Domes)	4750 people	22	222	First: 410 ft <sup>2</sup> Second: 355 ft <sup>2</sup>
Family Housing (Hari Homes)	200 people	16	13	First: 1413.7 ft <sup>2</sup> Second; 1,231 ft <sup>2</sup>
<b>Total</b>	<b>10100</b>	<b>61</b>	<b>688</b>	-----

# Residential Living

GRUMBO  
AEROSPACE



# Communications

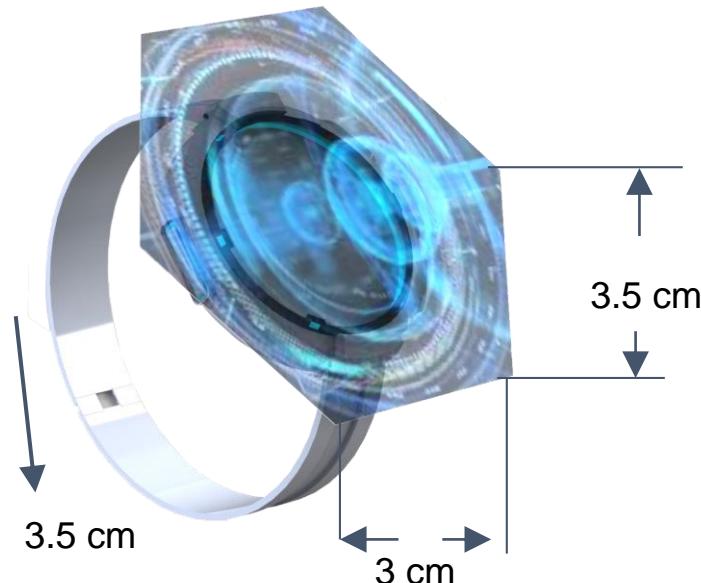


## Subcontractors:

- Dougeldyne Astrosystems - provide communication satellites
- ZAP! Industries - provide fiber optic cables throughout settlement

## Provided by Asimov:

- LED lights - provide internet as Li-Fi routers



## SmartRing: Holographic Wristwatches

### (PSCD) - Personal Security and Control Devices

- Real time data acquisition from aerial habitats on Venus and orbiting satellites
- Rechargeable batteries
- Provided to all residents of Asimov
- Consumes no additional power

# Community Robots

- Bots4U (Butler-bot)
- Purpose:
  - Do mundane tasks around the community
  - Provide secretarial services
- Design:
  - Small humanoid
  - Connects through Li-Fi network to public network
  - Bases response to human inquiry based of Big Data of previous successful/unsuccessful

# Infrastructure



## Business (PCSD's):

- PCSD's able to verify transactions through *ID-Go*
- Standard functions - date, time, temperature, voice calling, and internet access
- Communication with other PCSD's through Li-Fi
- Currency exchange through PCSD

## Emergency:

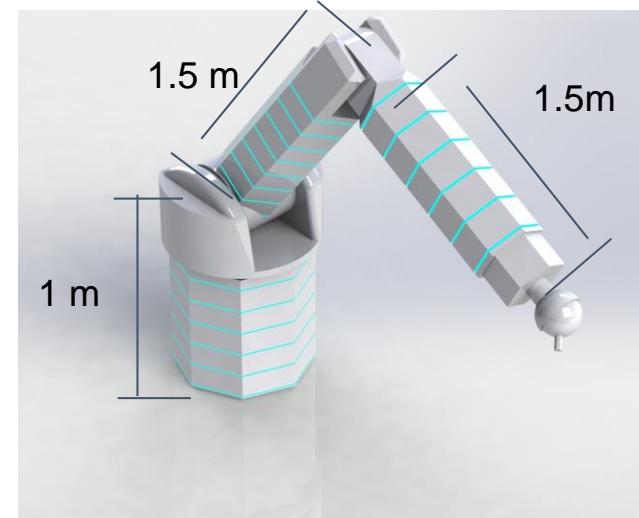
- Notifications and instructions
- *ID-Go* equipped on every PSCD and computer, ability to monitor health with biological scanners
- *Bots4U* robots can report any dangerous activities

## Production:

- Robotic arms to assemble products
- 3D printer to print complex parts

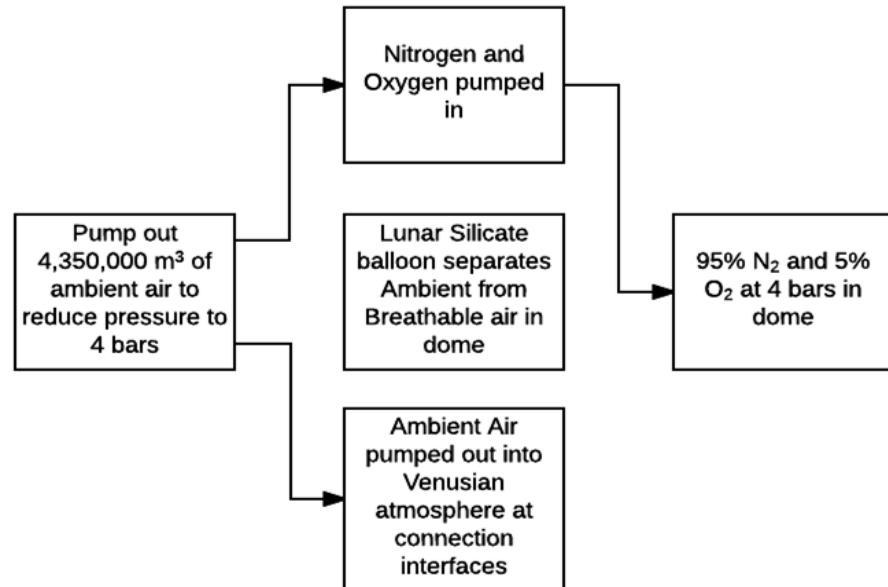
## Maintenance and Repair:

- *F1M8* robots able to repair interior
- Repurpose construction and Jigs bots
- Robots communicate with the control room and report their status (includes location)

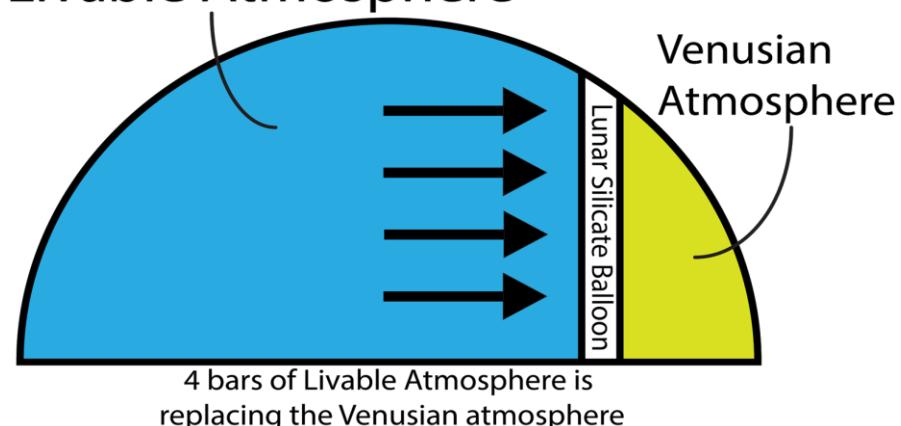


# Atmosphere Control

- Atmospheric composition at 4 atm:
  - 0.125% Water vapor
  - 5.25% Oxygen
  - 94.625% Nitrogen
- Using subcontractor Cryo Chemical to handle N<sub>2</sub>
  - Total CASSCs needed: 6
  - Volume of N<sub>2</sub> gas: 1,541,333.5 m<sup>3</sup>
  - Extra 3 containers of gas stored in cryogenic storage tank (in case of emergency)
- 2 CASSCs of ammonia will be delivered for the cooling system.
  - Volume of ammonia: 513.8 m<sup>3</sup>
- Using subcontractor Carbon Creations to separate CO<sub>2</sub>
  - Machines needed: 36,750
  - Total volume of machines: 618.3 m<sup>3</sup>



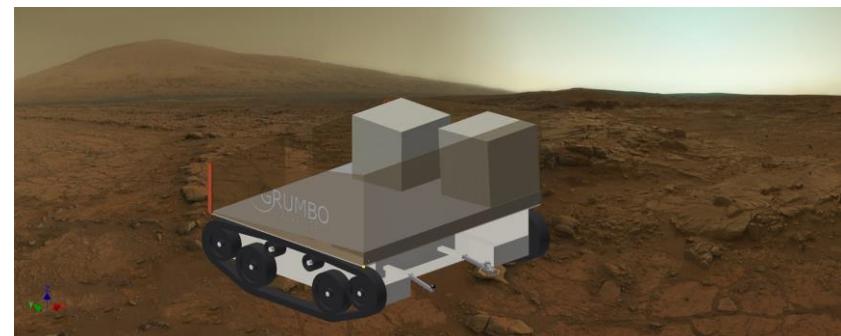
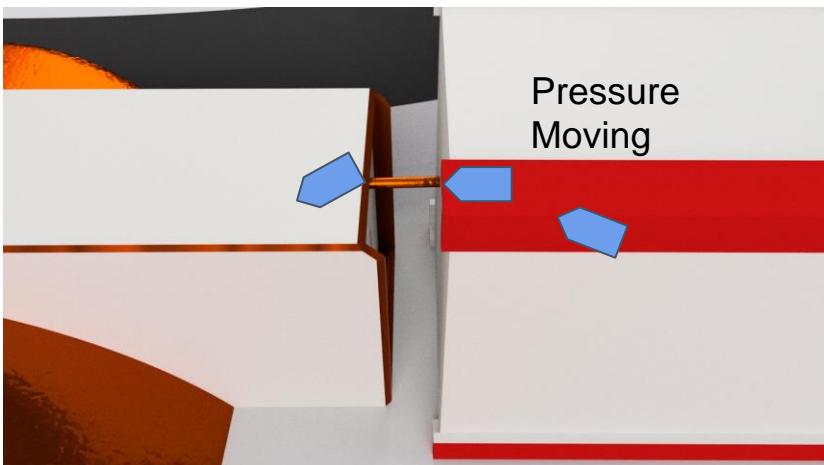
## Initial Atmosphere Establishment Livable Atmosphere



# Pressure Acclimation



- Transient residents
  - Decompression system before leaving settlement
  - CASSSC will attach to subcontracted connection interfaces on airlocks
  - Long Process
- Cargo
  - CASSSC transported by robots off launch pad into super highway
  - Attaches to airlock
  - Unloaded by F1M8 robots into airlocks
  - Cargo taken into settlement to central transportation hub



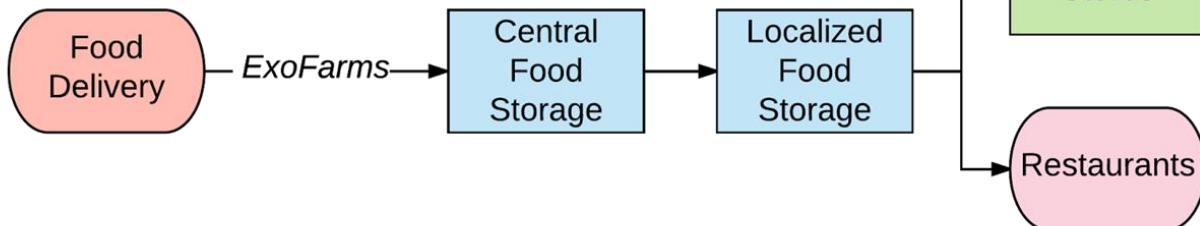
# Food, Shipping and Storage

## Food Delivery:

- Using subcontractor ExoFarms
  - Delivers 80 CASSSCs every Earthday
- Trains move food
  - Industrial area to central storage
  - Central storage to localized storage
  - Localized storage to restaurants and grocery stores

## Food Storage:

- 25% storage efficiency
- Six domes used 45 days of storage



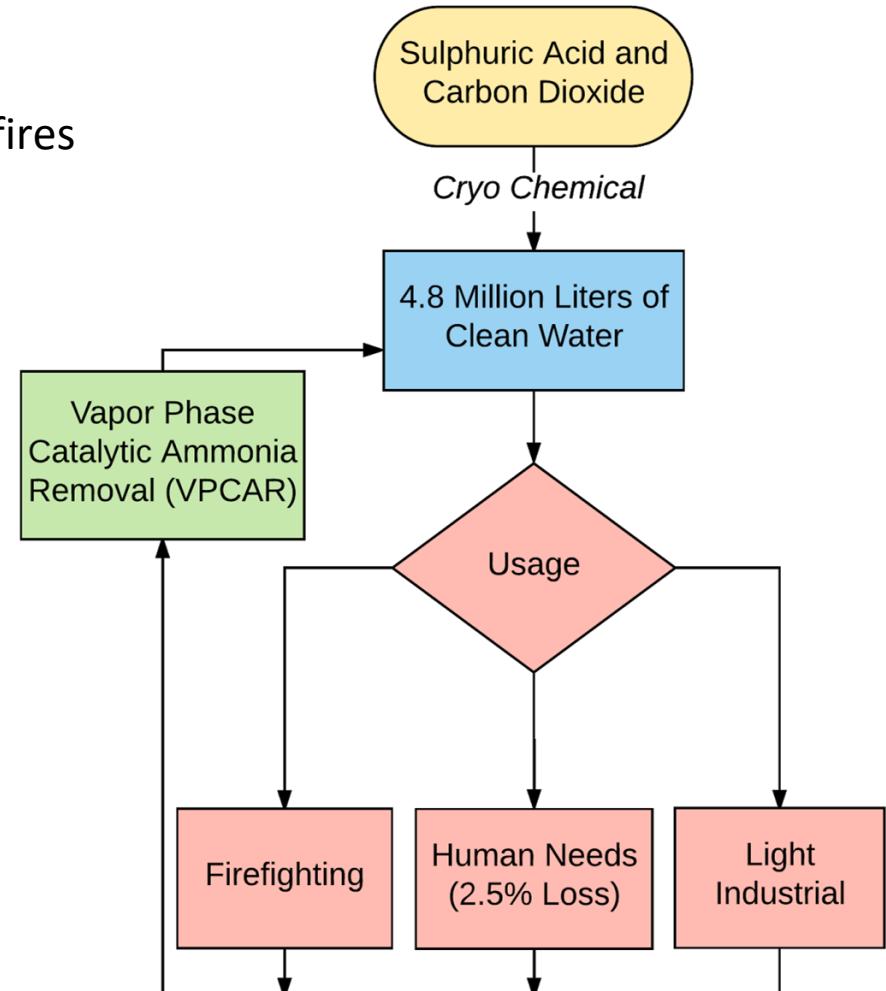
Food	Person/day (kg)	Sum (kg)
Vegetables	0.9	9450
Milk	0.22	2310
Egg	0.04	420
Carbon Energy Bars	0.07	735
Grain	0.54	5670
Meat	0.4	4200
Sugar	0.05	525
Flavor	0.01	105
Volume per day(m <sup>3</sup> )		23415
Volume per week (m <sup>3</sup> )		163905
Volume per month (m <sup>3</sup> )		702450

# Water Management

- Water collected from atmosphere subcontracted by Cryo Chemical
- Water fights traditional
  - potassium acetate( $\text{CH}_3\text{CO}_2\text{K}$ ) fights oil fires
  - $\text{CO}_2$  fight electrical and chemical fires

## Daily Water Demands

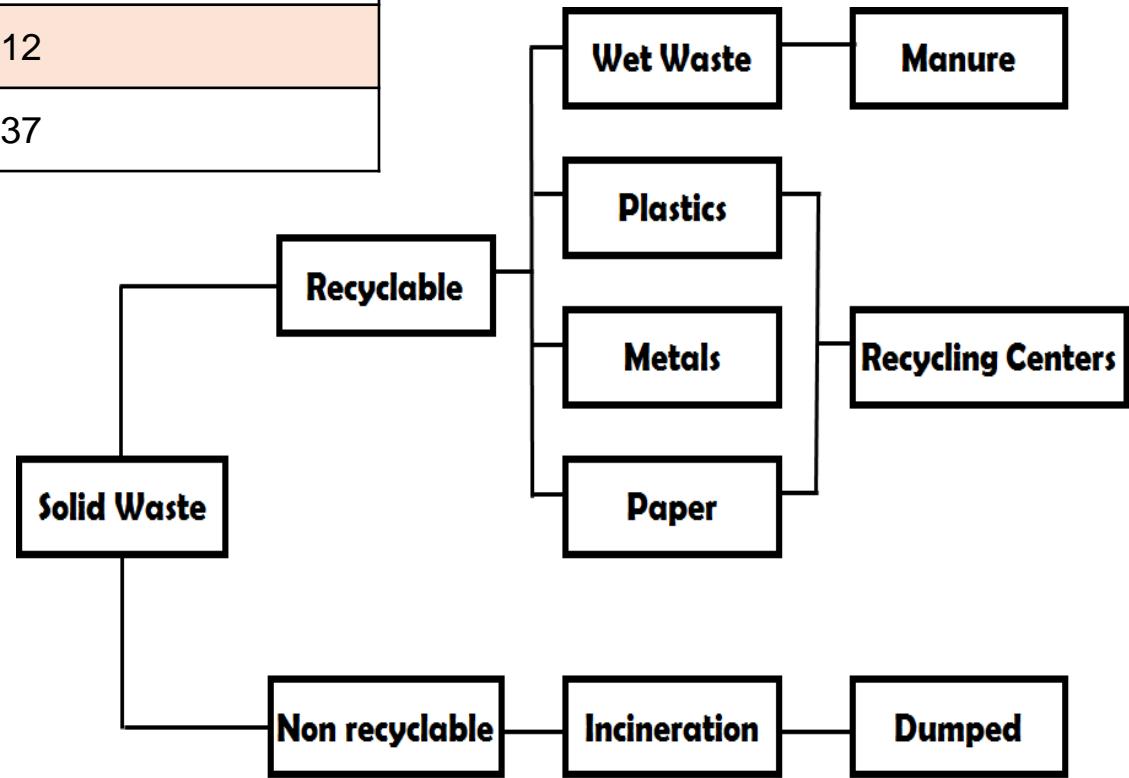
Source	Amount Used Daily (m <sup>3</sup> )
Demand of person	0.125
Demand of 10,500 people	1,312.5
Industrial	300
Emergency	3,200
Total Supply	4,812.5
No. of CASSSCs per day	17



# Solid Waste Management

Source	Waste Processed Daily (metric tons)
Residential	25
Industrial	12
Total	37

- Recyclable and non-recyclable waste collected separately in all public areas and houses
- Waste dumped outside of base at Clotho Tessera (an intensely deformed terrain)
- Because of high pressure, harmful gases do not rise to settlement



# Electrical Power

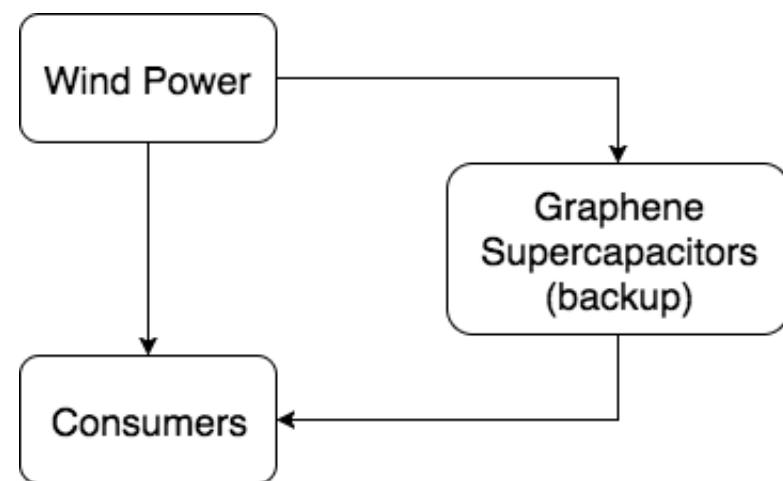
## *Power requirements*

Demand Source	Power (MW)
Personal Use	14.46
Water System	5
Atmosphere Control	10.3
Refrigeration	0.7
Cooling System	300
Other sources	1.3
Total	331.76

## *Backup Requirements*

Backup source :	Graphene supercapacitors
Specific energy :	0.308 MJ/kg
Energy density :	1,297 Wh/L
Backup power time :	30 Earth days of survival
Total mass :	$5.32 \times 10^8$ kg
Total volume:	88 ML, or approx. 54 domes

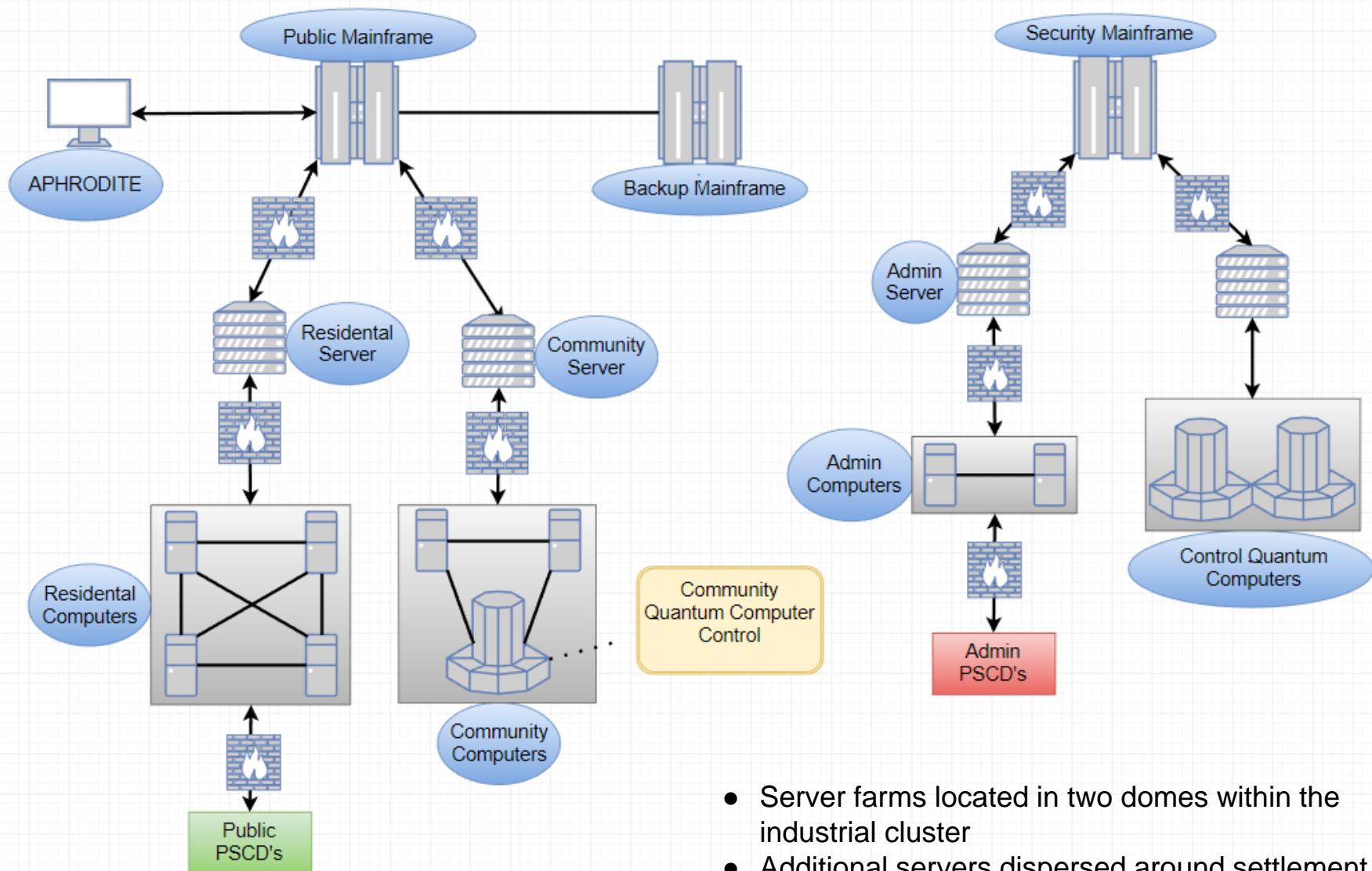
- Wind power will be subcontracted from Dougeldyne Astrosystem
- Power delivery wires will be subcontracted from ZAP! Industries
- Protection of these wires will be subcontracted from ElectroProtect
- In power failures, personal use, water system, and cooling system power consumption will be reduced for ensuring survival only



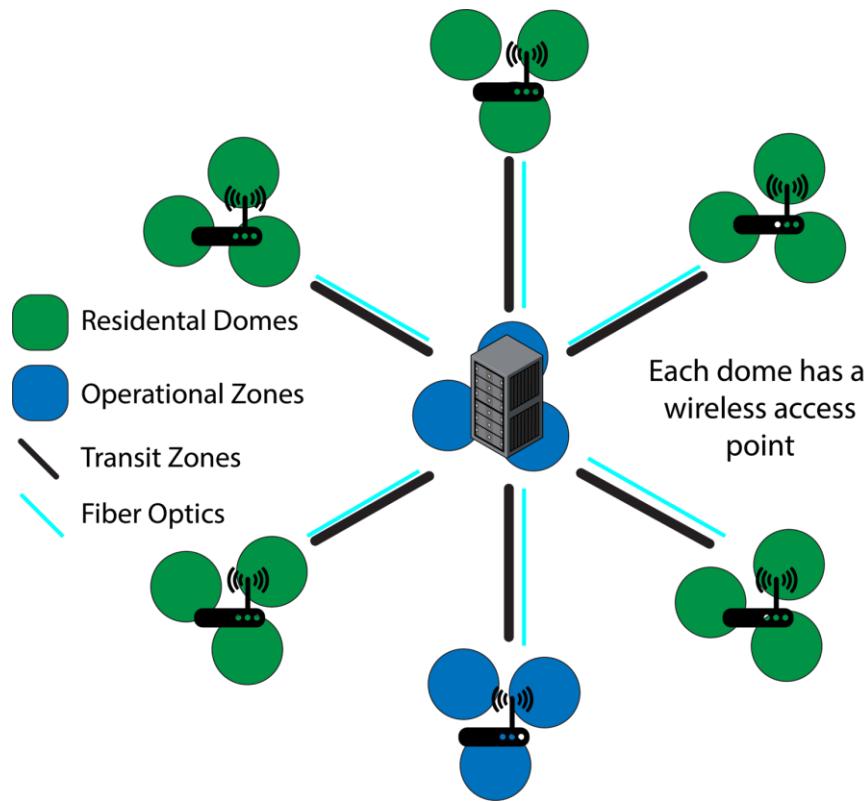
# System Contingencies

Emergency	Detection	Immediate Action	Long-Term Action
<b>Power Failure</b>	Current / Voltage sensors	Backup energy source activates, cut down on power consumption	Determine cause, repair source of error
<b>Cyber Breach / Network Failure</b>	Mesh Network, Firewall failure, Antivirus detection	Affected sections shutdown, purged of errors and reset	Full system check for source of failure and detection updated
<b>Automation Failure</b>	Loss of communication with robots and lack of real-time updates	Have nearby F1M8 units repair broken robots or assembly lines and alert admins	Perform regular system checks, bots and systems alert admins of abnormal processes
<b>Structural Breach</b>	Piezoelectric Sensors	System seals dome, F1M8 bots arrive to apply temporary patch	Immediate repair and reconstruction of impacted dome
<b>Disease Outbreak</b>	Grumbo data storage “ID-Go” biosensors in personal devices	Quarantine and care of impacted populace	Develop/use cure or hinderance for disease
<b>Water Contamination</b>	Multi-form sampling (pH, contaminants)	Back-up filtration and water begins cycling	Treat water and repair sources of failure
<b>Fire</b>	Smoke detectors, piezoelectric sensors	Fire suppression systems activates, bots in vicinity respond	Repair, determine what kind of fire occurred and prepare for future fires
<b>Main A.I. Failure</b>	Backup A.I. that monitors all processes	The Backup A.I. will take control of the main A.I. until it is fixed	Backup A.I. sends data to the main A.I. and admins about its crash so that it will be debugged

# Networking Systems



# Layout & Security

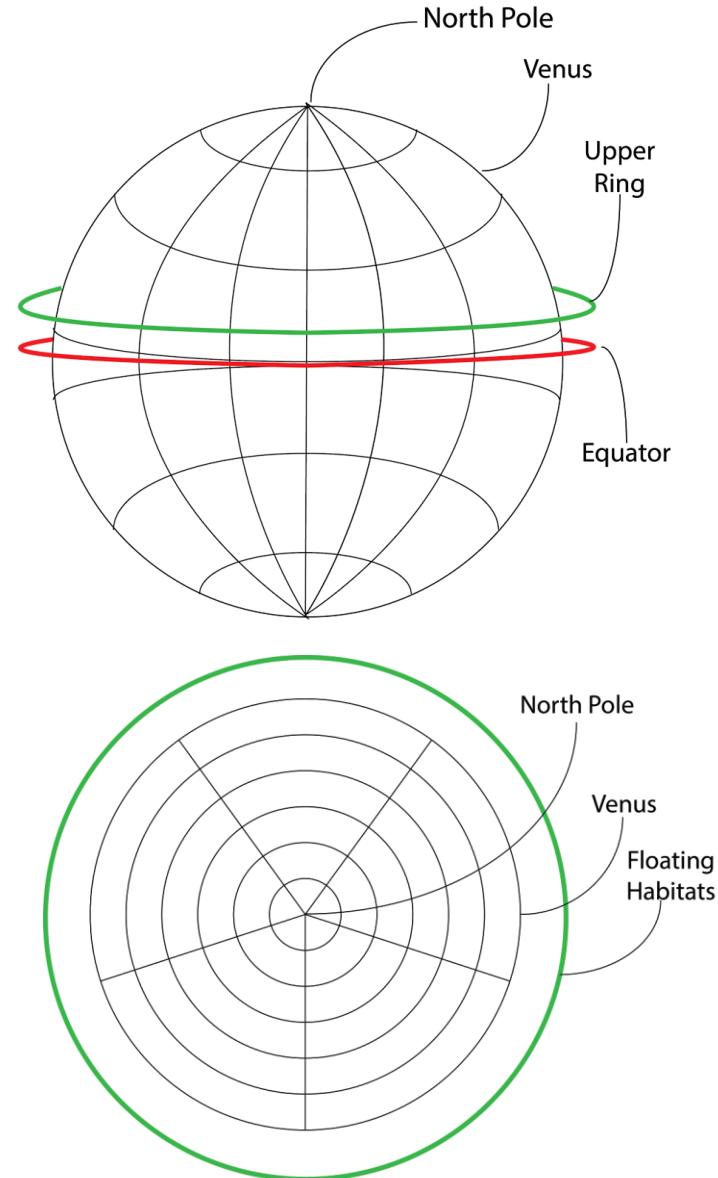


- ZAP! Industries will be providing fiber optic cable to each room.
- All residents will have high speed, wireless connection to the network.

- Grumbo *ID-Go* technology used for multi-factor authentication
- Security Mainframe air-gapped from public network
- Fiber optic cables span the settlement
- Li-Fi from Led bulbs
- 1 dome for repair, maintenance, and storage bots

# Terraforming and Exploration

- Utilize floating habitats
- Two rings at latitudes  $10^\circ$  and  $-10^\circ$
- Reardonium cables connect 760 floating habitats
- Space: 100 km apart
- Altitude: 60 km
- Pipes run along cables and deliver microbes every 100 meters into atmosphere
- Each floating habitat delivers microbes to lower atmosphere by hanging cable
- Hadley cells circulate microbes throughout Venus atmosphere
- Vulture Aviation transport for between floating habitats



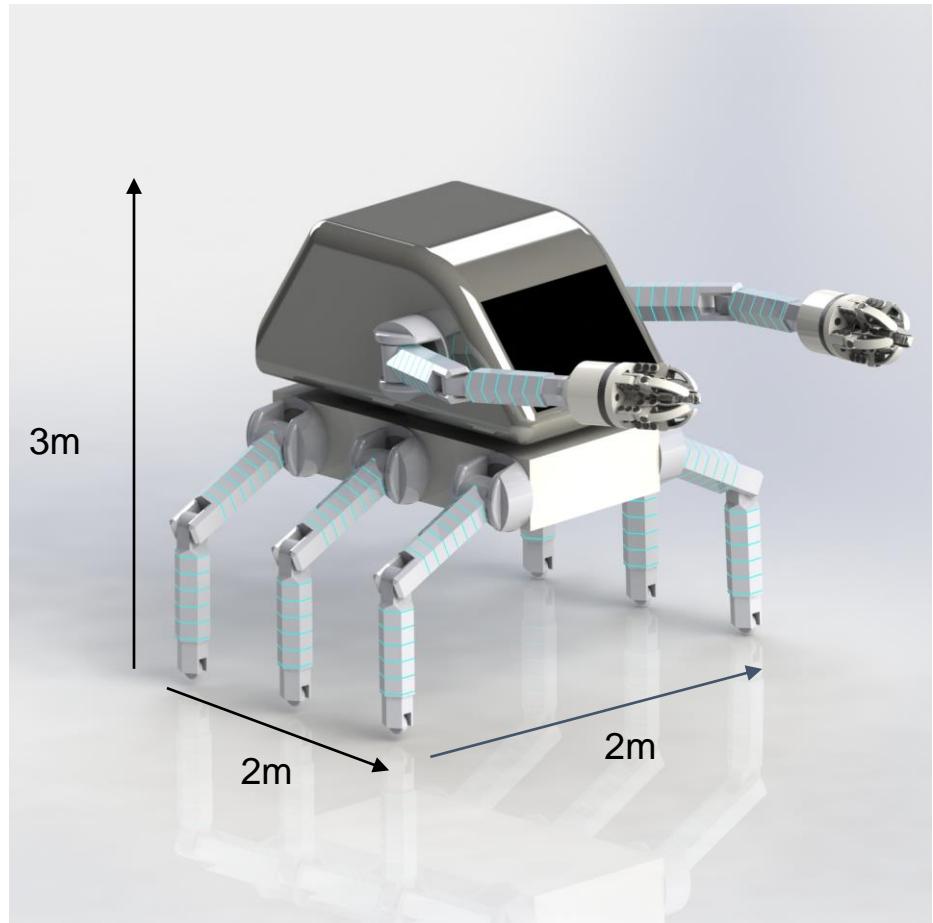
# Exploration, Prospecting, Surveying

GRUMBO  
AEROSPACE

- **Mining Process**

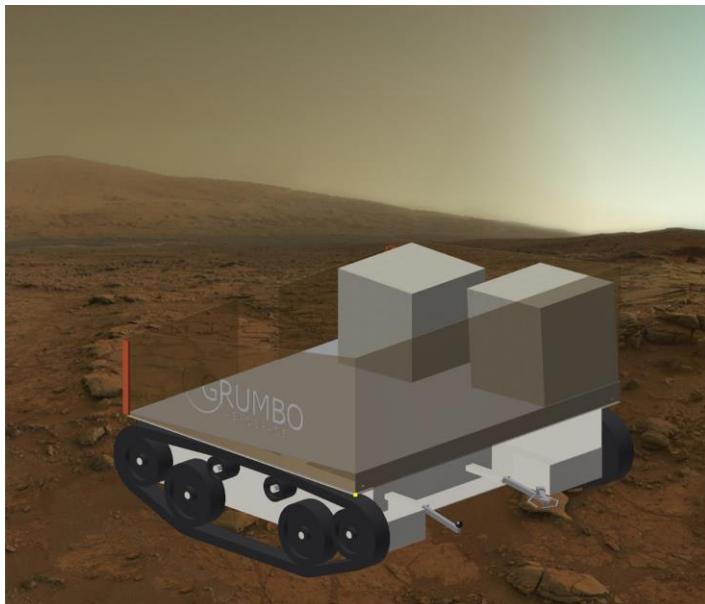
- Mining done in circular formation. Ore to be dug up every 10 km after each trip
- Ore stored within the robot and unloaded in operations dome
- 10 bots inspired by Nasa Athlete design would be used for exploration

- Refining uses atmospheric and vacuum distillation with hydrodesulfurization

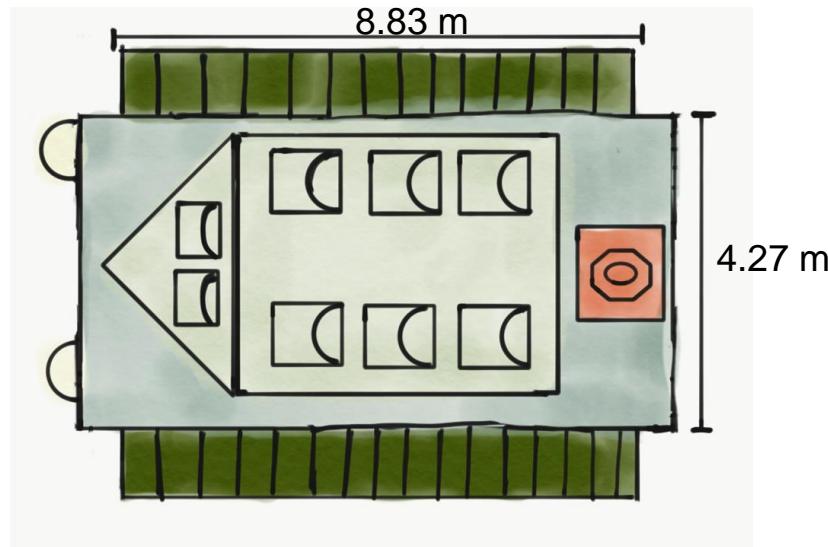


# Crewed & Uncrewed Vehicles

- 500 Multipurpose rovers transport boxes 36 at a time
- Soil samples taken during drop-off
- Terraforming bots controlled autonomously
- Sensor and camera data is analyzed by computers for malfunctions and route modifications.
- Malfunctions that are then flagged for humans to review



- Reclining seats to allow for comfortable seating on long rides
- 360 degree cameras that are projected onto the inside of the vehicle to allow riders to feel as if they're open to Venus
- Mostly autonomous controls
- Large touch screen controls in cockpit of vehicle if humans need to take control

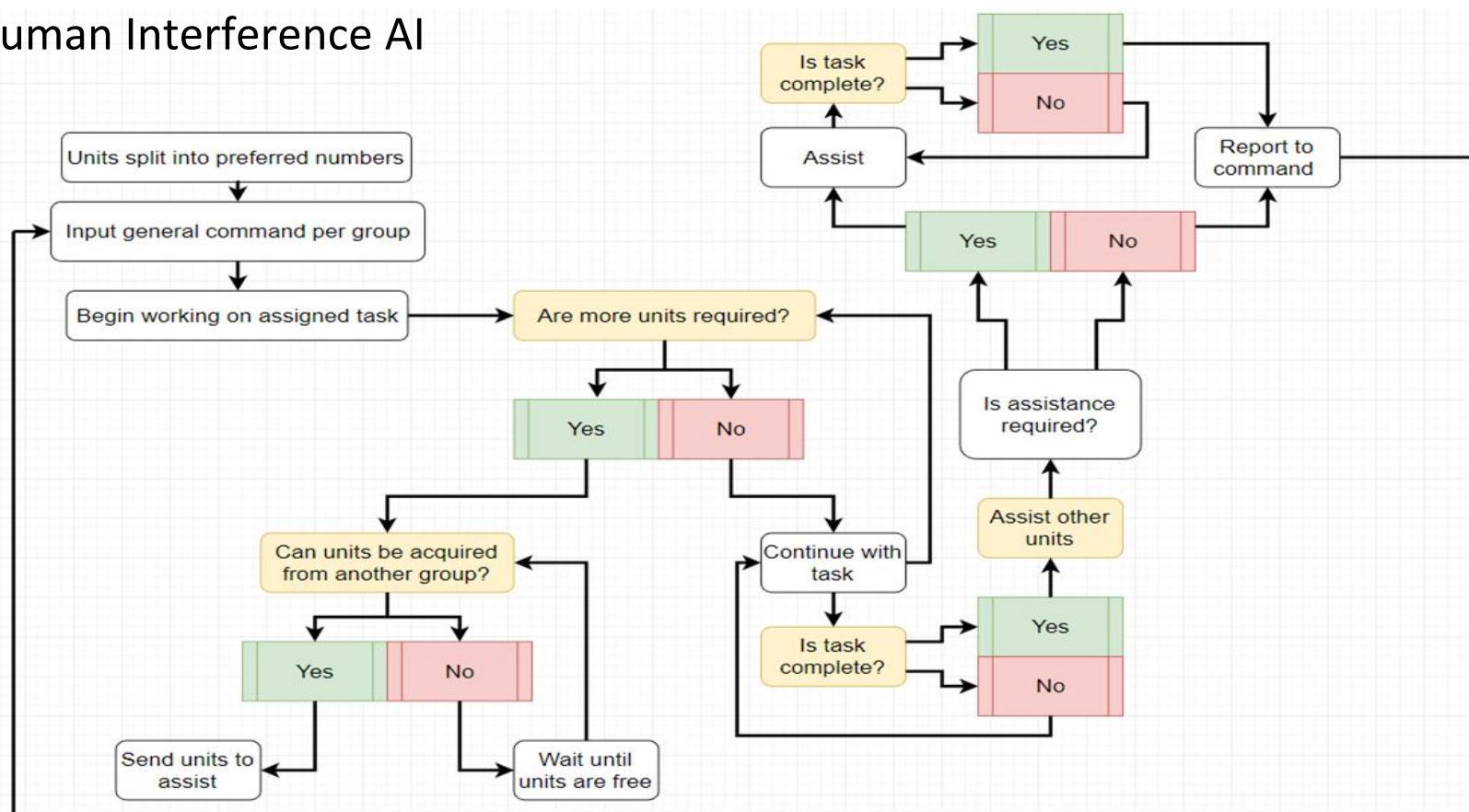


# Human Interactions

- *Bots4U*, “ButlerBots,” subcontracted to keep residences and pods clean
- Internal *F1M8* maintenance bots for maintenance

*Example: Rover boxes collect sample automatically, to see what mineral deposits are worth pursuit*

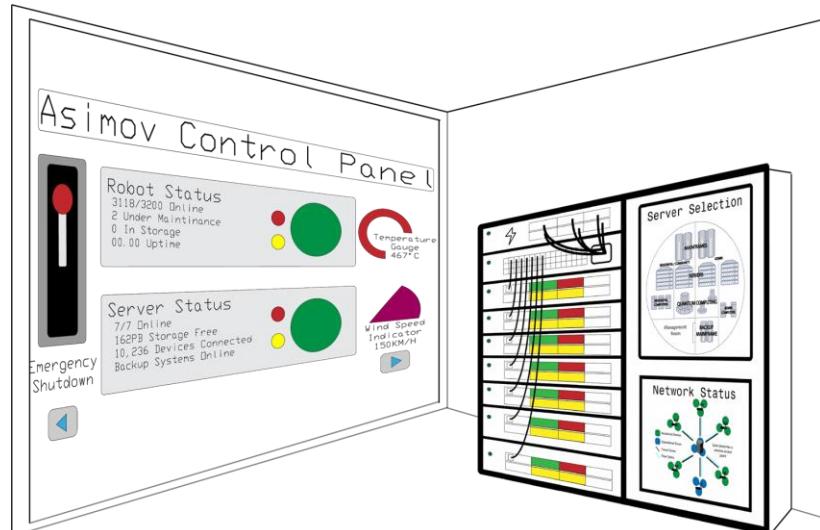
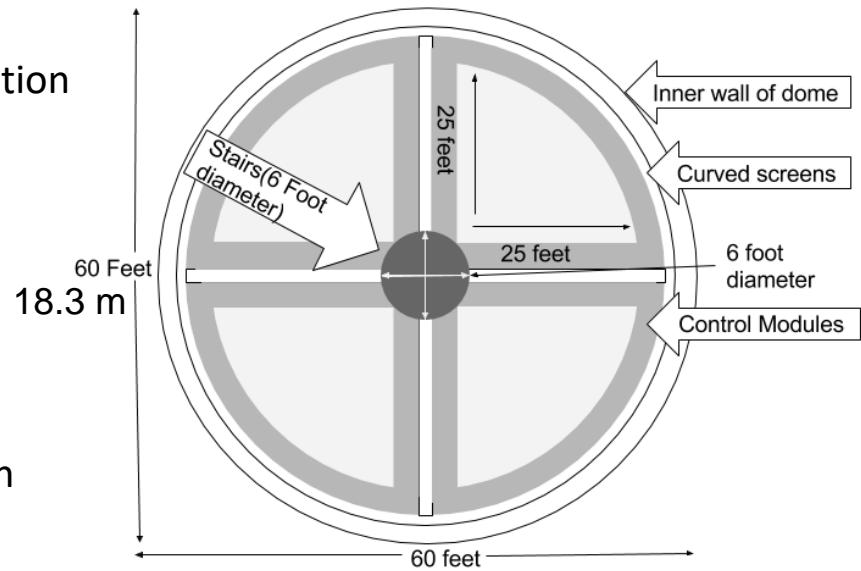
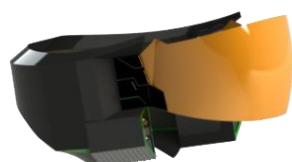
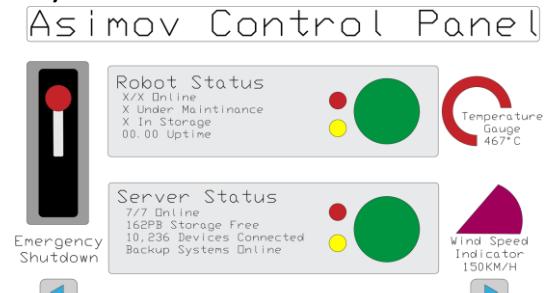
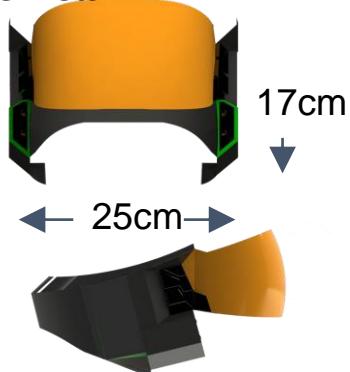
## Human Interference AI



# Control Room

- 2800 square foot room
  - High quality TV screens - maximum visualization
- Humans have optional control of robots
  - Haptic technology allows humans to have maximum control of robots
- Asimov Control Room allows access to server management
- Grumbo ID-Go technology used for authentication
- Humans direct terraforming from this effor
- Human Controllers have these available displays:
  - *Smart Rings* (PSCD)
  - *Smart TVs*
  - *VR Helmets*

VR Helmets

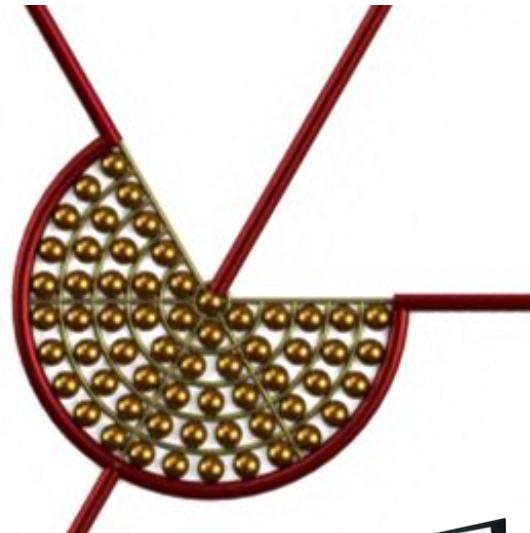
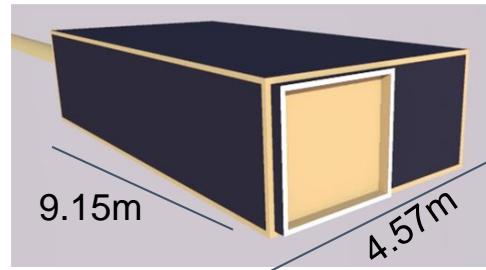


# Assay Lab Operations

## Lab Information:

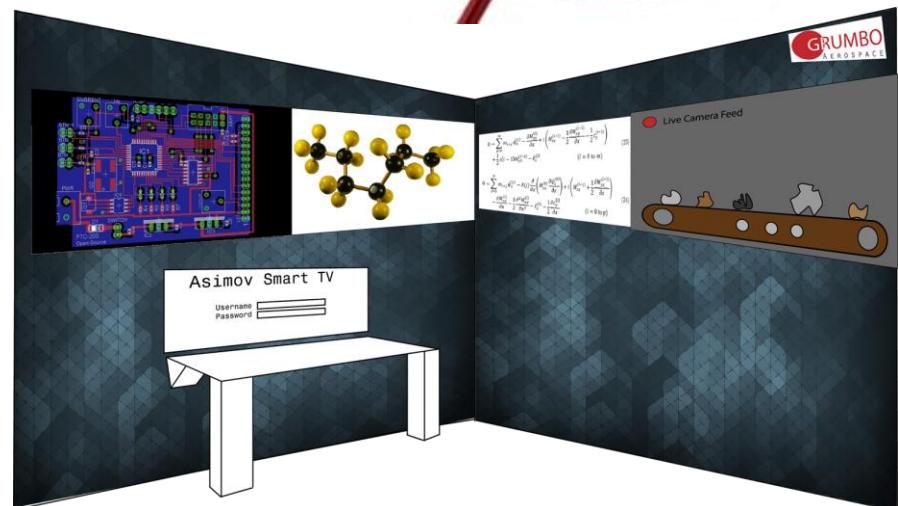
- Outside of industrial cluster
- Two CASSSC used for structure
- Movable CASSSC transfer port allows samples to go in for analysis
- Lab will be monitored in the robotics control room through fiber optics
- Labs connect to base for power, water, communication, waste management
- Water and waste system controlled by valve system, preventing pressure failures

## Industrial Cluster

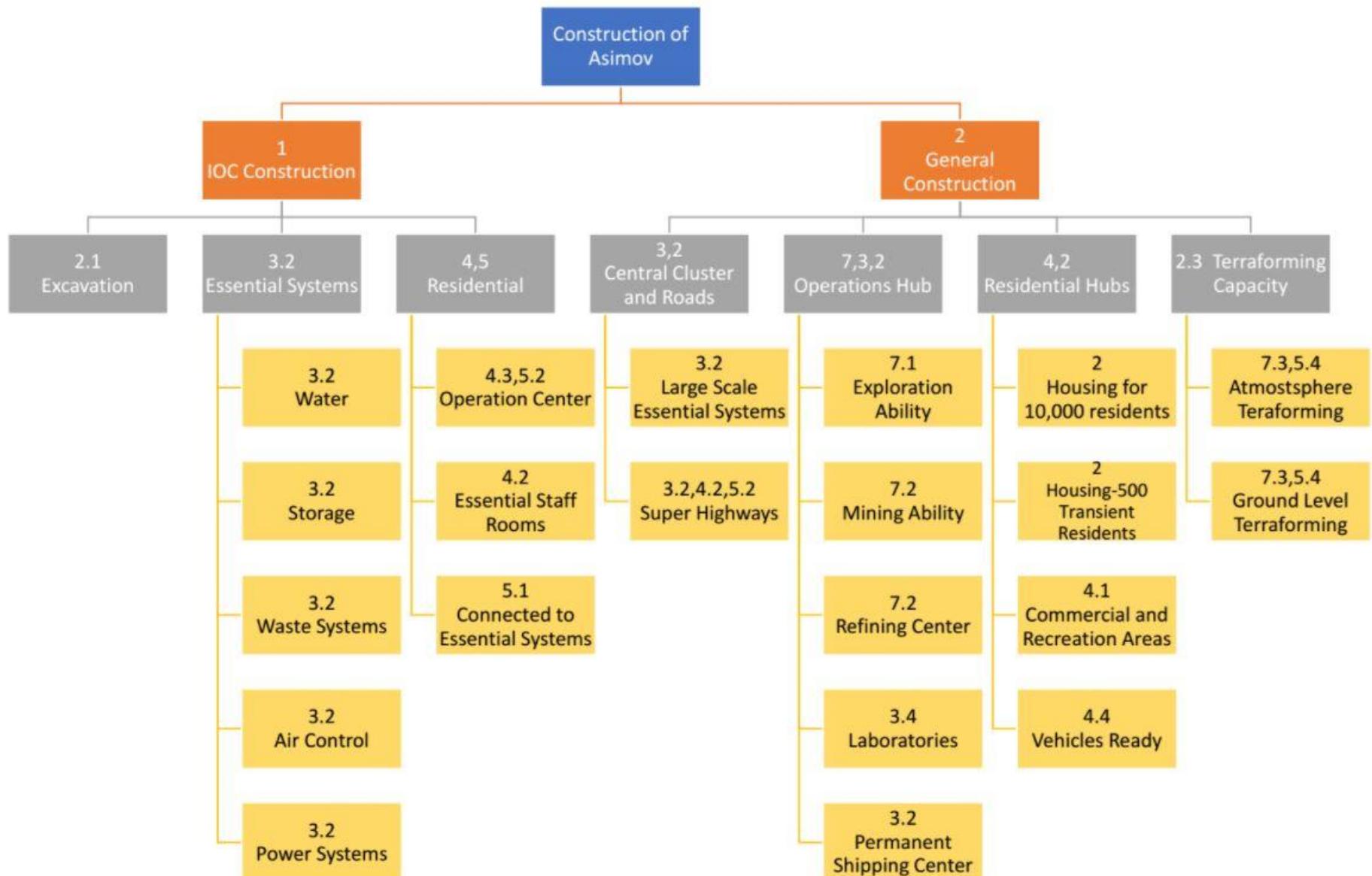


## Human Interaction:

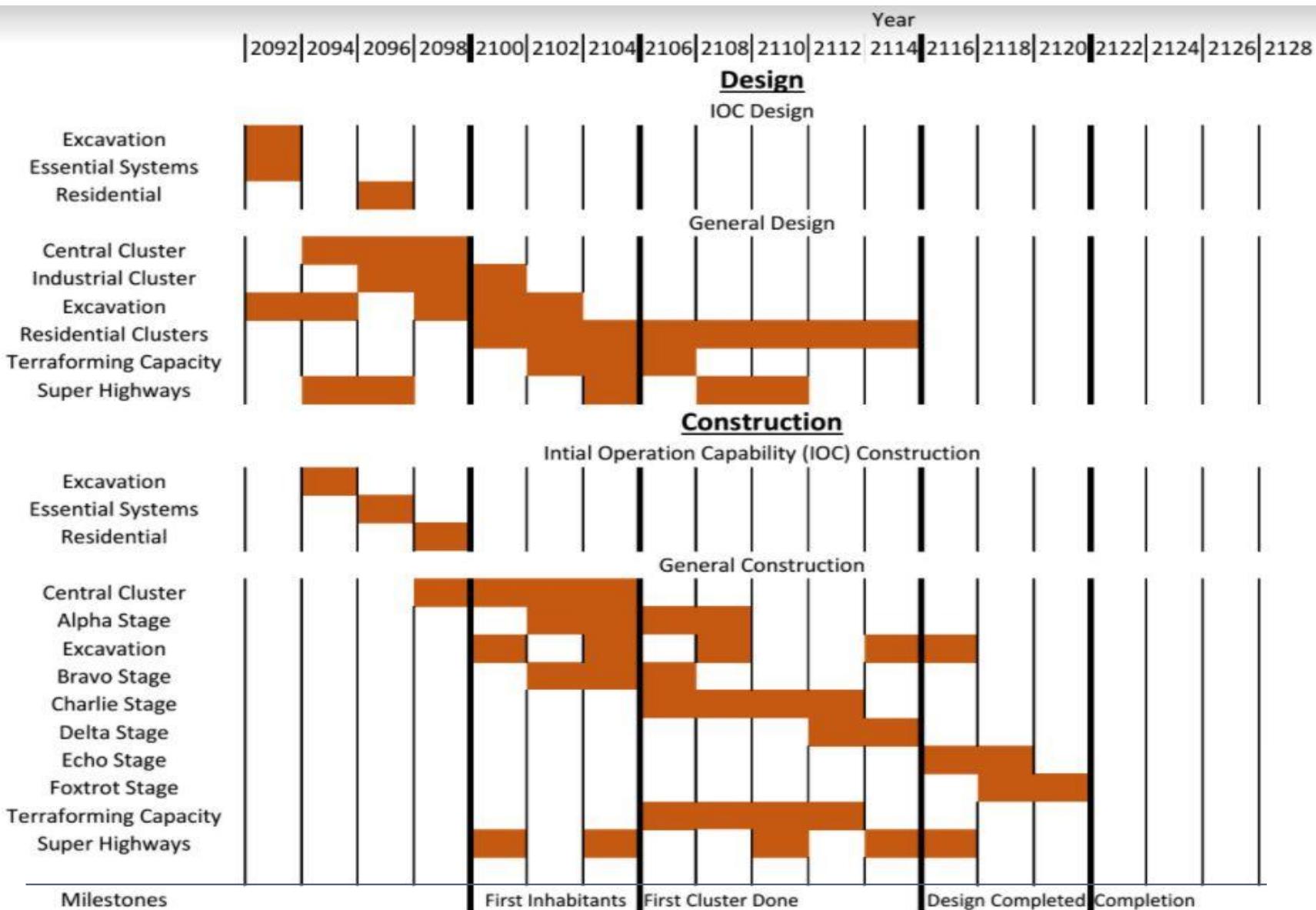
- From operation center
- Humans able to:
  - Gain visual image and physical property of ore
  - Select assay method
  - Check sample analysis results



# Work Breakdown Structure



# Schedule



### Construction Costs By Stage

Item (Design and Construction)		Amount (Man Hour)	Cost Per	Cost
IOC	Excavation	750,320	\$ 150	\$ 112,548,000
	Essential Systems	750,320	\$ 150	\$ 112,548,000
	Residential	750,320	\$ 150	\$ 112,548,000
General	Central Cluster	2,401,024	\$ 150	\$ 360,153,600
	Industrial Cluster	2,401,024	\$ 150	\$ 360,153,600
	Excavation	<b>Subcontracted (Grumbo)</b>		
	Residential Clusters	15,006,400	\$ 150	\$ 2,250,960,000
	Terraforming Capacity	750,320	\$ 150	\$ 112,548,000
Super Highways		3,901,664	\$ 150	\$ 585,249,600
Total Cost		26,711,392	\$ 150	\$ 4,006,708,800

### Structure

Item	Amount (Kg)	Number of CASSSCs	Shipping Costs	Total Cost
Pre-Fab Dome Panels	106,940	5827	<b>Subcontracted (Mercury Manu.)</b>	
Super Highway Panels	116,400	5820	<b>Subcontracted (Mercury Manu.)</b>	
Dougeldyne Nano-bots	100	1	\$ 408	\$ 318,620,000.00
<b>Total Amounts</b>	<b>223,440</b>	<b>11,648</b>	<b>\$ 408</b>	<b>\$ 318,620,000.00</b>

### Operations

Item	Source Planet	Amount Shipped (M^3)	Mass Shipped (kg)	Shipping Costs	Total Cost
Hydrogen	Venus	N/A	N/A	<b>Subcontracted (Cryo Chemical)</b>	
Reardonium	Mercury	365410	500,611,000	<b>Subcontracted (Mercury Manu.)</b>	
Nitrogen	Venus	N/A	N/A	<b>Subcontracted (Carbon Creations)</b>	
Graphene	Venus	N/A	N/A	<b>Subcontracted (Carbon Creations)</b>	
Silica Aerogel	Venus	N/A	N/A	<b>Subcontracted (Nano Solution)</b>	
Silica Clay	Venus	N/A	N/A	<b>Subcontracted (Nano Solution)</b>	
Carbon Fiber	Venus	N/A	N/A	<b>Subcontracted (Carbon Creations)</b>	

Estimated Subcontracter Cost = \$350,000,000,000

# Cost and Potential

<u>Humans</u>						
Item	Cost	Number of CASSCs	Shipping Costs		Total Cost	
Furniture	\$ 122,039,700	331	\$ 3,723,750,000	\$	\$ 3,845,789,700	
Toiletries + Clothing	\$ 190,017,000	23	\$ 258,750,000	\$	\$ 448,767,000	
Flooring	\$ 20,157,630	27	\$ 303,750,000	\$	\$ 323,907,630	
Interior Walls	\$ 328,031,900	1215	\$ 2,733,750,000	\$	\$ 3,061,781,900	
<b>Total Human Costs</b>	<b>\$ 660,246,230</b>	<b>\$ 1,596</b>	<b>\$ 7,020,000,000</b>	<b>\$</b>	<b>\$ 7,680,246,230</b>	

<u>Automation</u>						
Item	Amount	Cost Per	Cost	Number of CASSCs	Shipping Costs	Total Cost
Construction Bots	200	\$ 6,800,000	\$ 1,360,000,000	300	\$ 3,794,400,000	\$ 5,154,400,000
F1M8 (Grumbo)	200	\$ 1,000	\$ 200,000	200	\$ 1,836,000,000	\$ 1,836,200,000
Bots4U (Bots4U)	2800	\$ 900	\$ 2,520,000	1	\$ 33,832,890	\$ 36,352,890
SmartRing	12500	\$ 500	\$ 6,250,000	3	\$ 68,850	\$ 6,318,850
Terraforming Vehicle	500	\$ 6,000,000	\$ 3,000,000,000	2000	\$ 18,360,000,000	\$ 21,360,000,000
Ore Transport	10	\$ 7,000,000	\$ 70,000,000	10	\$ 91,800,000	\$ 161,800,000
Transport Vehicle	20	<b>Subcontracted</b>				\$ 100,000,000
Communications	N/A	N/A	\$ 57,000,000	3	\$ 6,120,000	\$ 63,120,000
<b>Total Automation Costs</b>	<b>16230</b>	<b>\$ 19,802,400</b>	<b>\$ 4,495,970,000</b>	<b>2517</b>	<b>\$ 24,122,221,740</b>	<b>\$ 28,718,191,740</b>

● Total cost is \$391,230,296,000

- Market Opportunities:
  - Carbon Dioxide is Abundant
    - Is the high strength building material of the future
  - With our Laboratories we might discover new ways to make materials that could shape the 22<sup>nd</sup> century and beyond

RFP	Work	Page	RFP	Work	Page
2.1.1	Exterior designs of all volumes and their uses + dimensions of major structural features	4,5,7,17	3.2.2.5	Atmosphere control	25,26
2.1.2	Locations and amount of connection interfaces	4,5,7,17	3.2.2.6	Solid Waste Management	29
2.1.3	Overall views of Asimov	4,5,7,17	3.2.2.7	Water Management	28
2.2	Dimensioned and labelled map of interior land areas with their usage and size	15,17	3.2.3	Means of access through interior.	18
2.3.1	Steps of construction and plans of Initial Operating Capability	8,9	3.2.4	Dimensioned drawings of transportation vehicles for use in settlement	18
2.3.2	Excavation needed to be done	8,9	3.3	Primary construction jigs and machinery. How these systems install components into completed settlement structures	6
2.3.3	Define thermal insulation materials	8,9	3.4.1	Conditions in assay lab	39
2.3.4	Plans to start moving residents into settlement	8,9	3.4.2	Means of humans to manage activities in uninhabitable environment of assay lab.	39
2.4.1	Number of standard space shipping container loads required	10,11	4.1.1	Maps and illustrations depicting overall community designs with a distance scale. Locations of amenities	16,19 ,21,36
2.4.2	How many of each type of pre-fab component and how they will be packed	10,11	4.1.2	Variety and quantity of consumables	16,21
3.1	Materials and equipment required for construction process. Sources and methods of transportation of materials	13	4.1.3	Facilities for services and public areas designed with open space.	16,21
3.2.1	Number of CASSSC loads of air/N2, food, water shipped at each phase of construction	12	4.2	Floor plans for 4 different options of home design with area. Options for likely demographic changes.	20
3.2.2.1	Food shipping and storage	27	4.3	Locations, amenities, control capabilities and monitoring systems for human management of Asimov construction	38
3.2.2.2	Electric Power	30	4.4	Interior floor plans and amenities of surface vehicles	21
3.2.2.3	Communication systems	22	5.1.1	Chart or table describing automated construction and assembly functions	6,8,9
3.2.2.4	Internal Transportation	18	5.1.2	Describe what construction robots need to do and human interactions with them	6,8,9

# Compliance Matrix

RFP	Work	Page	RFP	Work	Page
5.2.1	Floor plan of control room. Listing of displays and examples.	4	5.2.2	Automation systems - business, production process, maintenance, repair, safety, backups and contingencies.	31
3.2.2.5	Atmosphere control	25,26	6.2.3	Show WBS cost breakdown for tasks in correlation with SOW	40
5.2.3	Physical locations of computers and robots	4	7.1.1	Automated vehicles looking for mineral deposits	35
5.2.4	Schematics of networking systems	4,32,3 3	7.1.2	Crewed vehicles visiting most promising sites	35
5.2.5	Means of authorized personnel to access critical data and command computer and robot systems. Security measures to ensure that only authorised personnel have access for authorized purposes	4	7.1.3	Lab to assay Venus materials in Venus pressure, operated from inside.	38
5.3.1	Drawings of computers and robots people will encounter outside their homes and how many of each	22,23, 37	7.2.1	Define automated mining and refining functions	38
5.3.2	Diagrams of networks for computer connectivity	22,23	7.2.2	Define teleoperated mining and refining functions	38
5.3.3	Show how automation systems will determine when human decision-making is requested	22,23	7.2.3	Describe human monitoring of autonomous operations	38
5.3.4	Provide for privacy of personal data and control of systems in private spaces.	24	7.3.1	Deploy microbes at various levels to start consuming CO2 and breaking up sulphuric acid	34
5.3.5	Describe access to community computing assets	24	7.3.2	Deploy boxes on the ground around Venus to break up CO2 and bury Carbon underground	34
5.4.1	Show center for controlling devices across Venus	34	8.1.1	Describe plan to isolate affected volume from other parts of the settlement	14
5.4.2	Show and describe control of automation systems to aid terraforming on Venus	34	8.1.2	Schedule of repair activities and resumption of full services in affected volume	14
6.1	Duration and completion dates of major design, construction and occupation tasks.	41	8.1.3	Describe provisions for relocation of affected personnel and activities during clean-up	14,31
6.2.1	Cost associated with Asimov design by phase. Clearly show total costs	42,43	8.2	Schedule activities to return the settlement to full operation	14,31
6.2.2	Show estimates of number of workers associated with each phase.	42,43			45