

**COMPLEX ARCHITECTURAL CONCEPT AND
TECHNOLOGY FOR CREATING BUILDINGS OF
GREAT INNER SPACE ON THE MOON, WITH LOW
ASSET REQUIREMENT AND HIGH EFFICIENCY**

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Introduction:

The essence of our proposal is a

- comprehensive,
- complex
- construction and architectural concept,

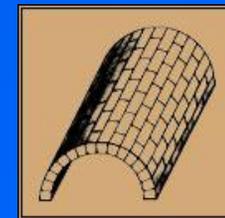
a building technology for creating buildings

- of great space,
- great inner volume

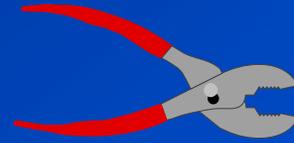
with a method of

- low asset requirement and
 - high efficiency
- on the lunar surface.

That buildings of arch structure should be created from the local materials, which can be used on the lunar surface as well as in lunar valleys, ditches and craters.

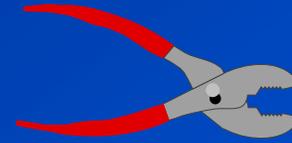


Main considerations:



1. Minimal asset requirement – devices, equipment to be delivered to the site,
2. Devices, equipment to be produced on site,
3. Maximum achievement – from the point of view of the inner space, volume of the building to be constructed,
4. Marginal additional requirements,
 - energy consumption,
 - human resources requirement,
 - other supplementary technologies, devices.

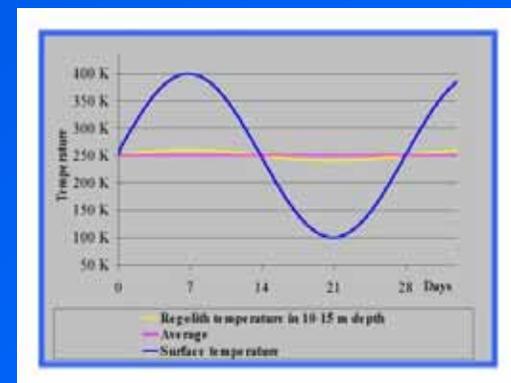
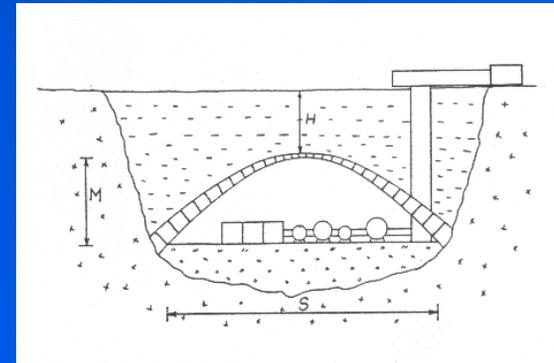
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In case it is built in lunar ditches or valleys and covered with a lunar regolith layer of proper thickness according to our previous proposals, then a structure of balanced inner space temperature can be made.

Besides this however creating buildings on the lunar surface should not be disregarded either.



Industrial building of arched structure and of great inner space on the Lunar surface

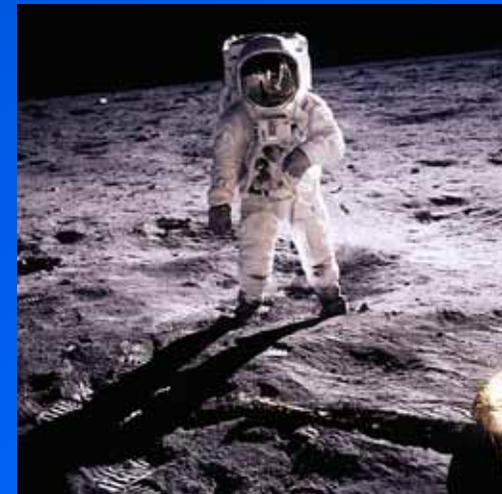
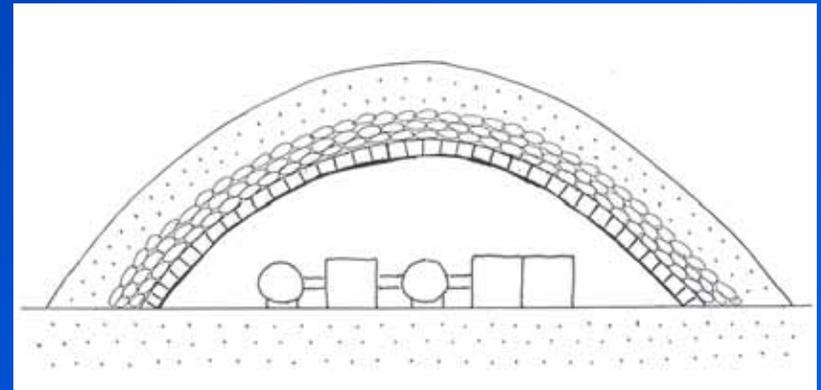
In case of several applications there is a demand for buildings on the lunar surface as well (shop-floors, hangars, silos), however those ones would not be of balanced inner temperature.

Though they can be made of great size, great inner space structures.

These structures could be covered with lunar regolith in a similar way to our concept made known earlier [SRR VII – 2005, and SRR VIII - 2006].

Several suggestions were published regarding the method beforehand as well.

The cost-effective solution of their construction is however not yet clarified.



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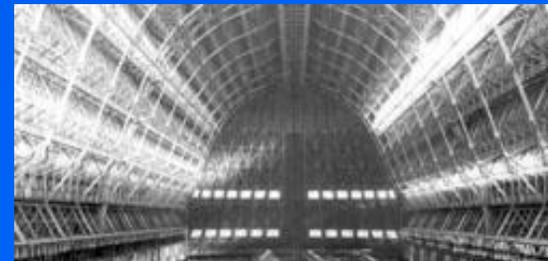


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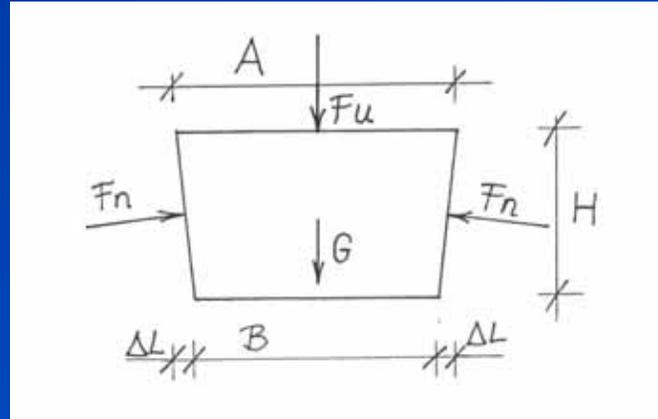


4. Create the arched structure on the desired place, on the surface or in a valley, ditch,

5. Use of available well-known supplementary technologies is necessary, respectively sufficient.



Considerations of the building element - Lunar brick:



A possible geometrical shaping of the Lunar building element (brick), dimensions, geometrical formations, and forces

- Main parameters:
material,
strength of material,
dimensions,
side convergence (wedge mechanism),
balanced forces.

The sides of the building elements can be parallel or convergent.

Feasibility study:

Main steps and necessary devices of a production technology of a lunar building element:

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Making of a solid “brick” unit of lunar regolith is possible in two ways:

- with the use of a binding material,
- or with caking, burning.

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The binding material can be produced on the Moon, or it must be transported – then the costs are considerably higher.



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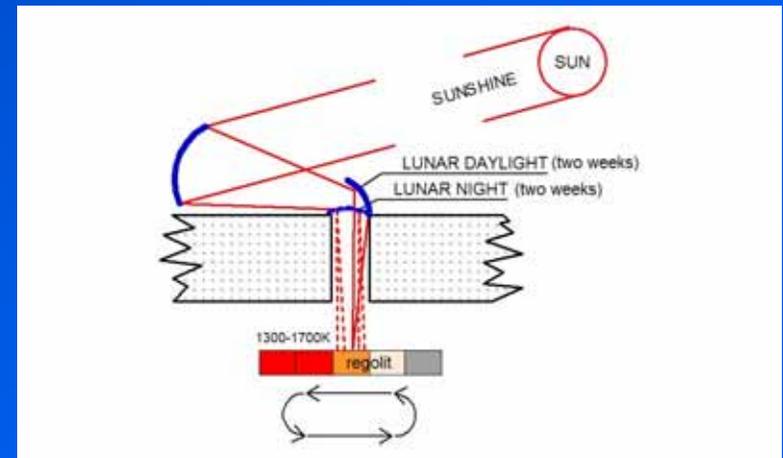


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It requires more facilities and energy, but it can be more cost-effective in the long run.

For the heating we can use the energy of the sun.

(Our relating idea was published on the SRR – LEAG conference in 2005, Houston)



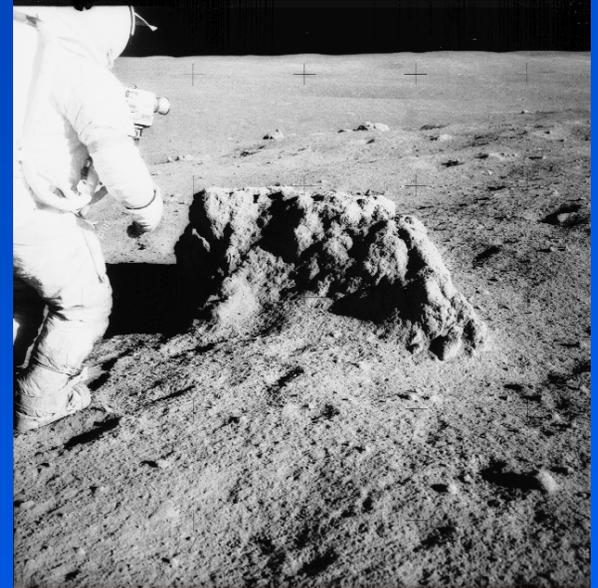
Other aspects of the production:



Raw material for the „Lunar brick”

Which material would be appropriate from the Moon?

- Stringy rocks – which is in one piece – it is relatively rare



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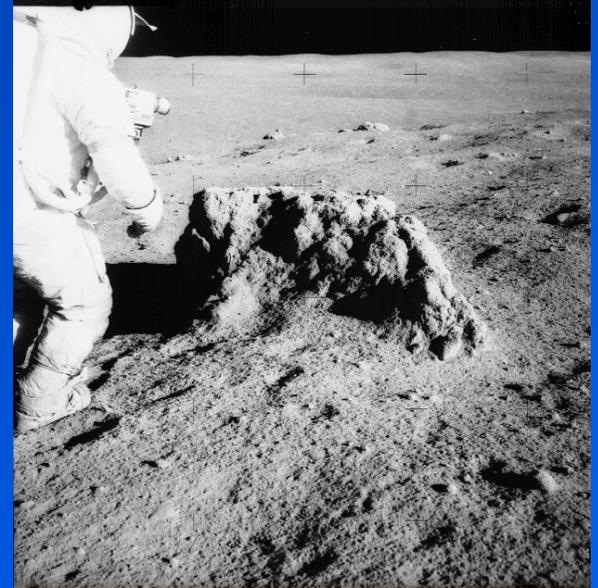
Which is in great amount and easily accessible?

- Fractured, partly settled, consistent stone, covered by dust in most areas.

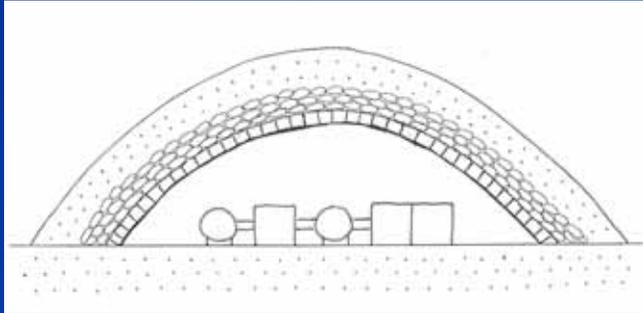
It should create building material, Lunar „brick”.

The arched structure doesn't require much material.

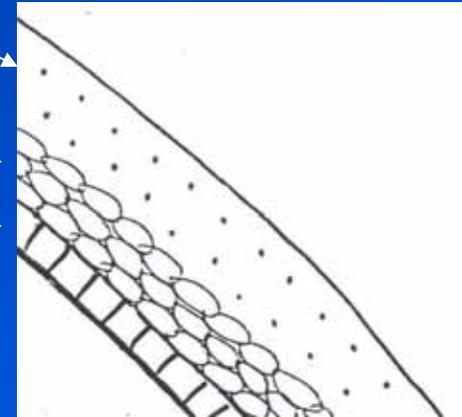
With relatively small amount of building material can huge areas be covered, and great inner volumes be created.



Building structure

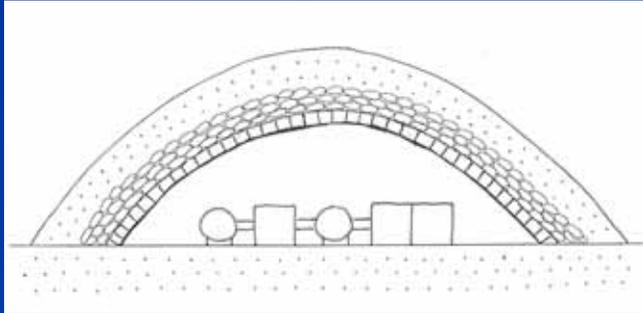


Outer Covering Layer →
Bagged Covering Layer →
Inner Building Shell →

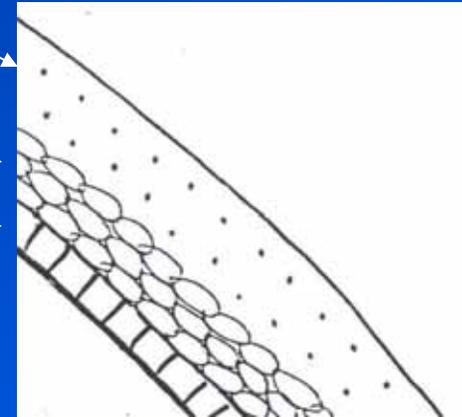


The coating of the building consist of 3 layers,
which production has 3 different technical level

Building structure



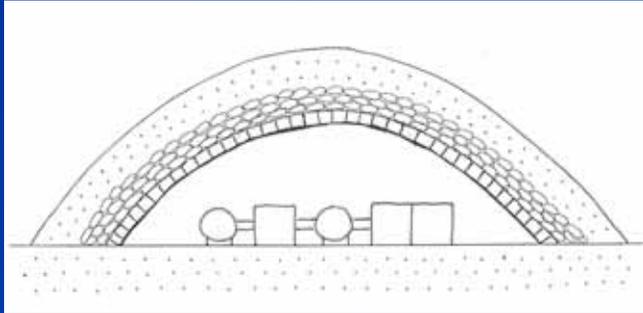
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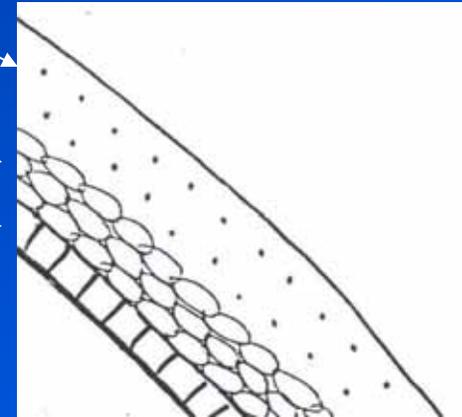
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I – Inner Building Shell - made of Bricks - it requires high technical claim

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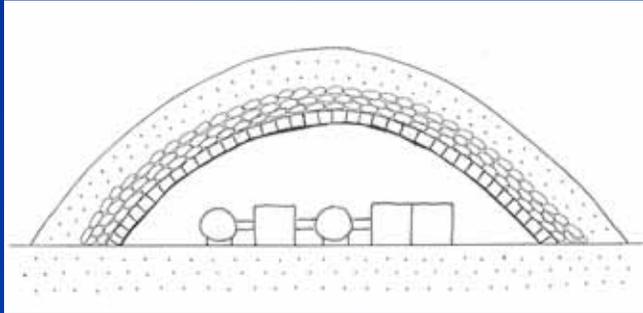


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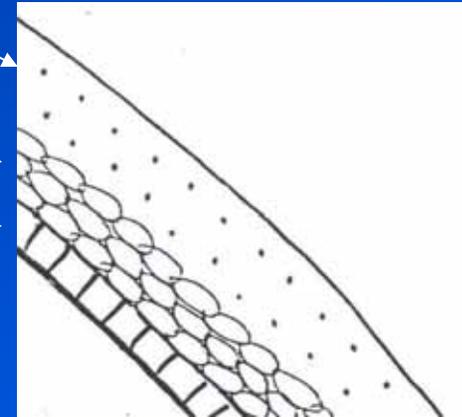
I – Inner Building Shell - made of Bricks - it requires high technical claim

II – Bagged middle Covering Layer - it requires medium technical claim

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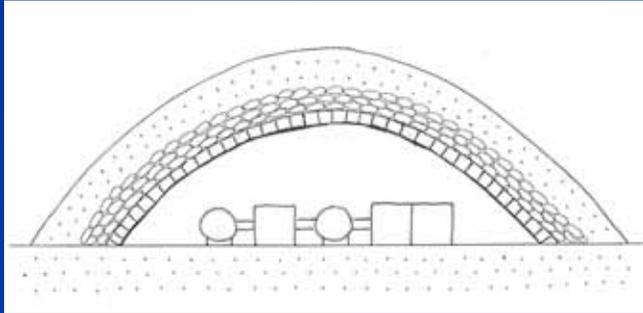
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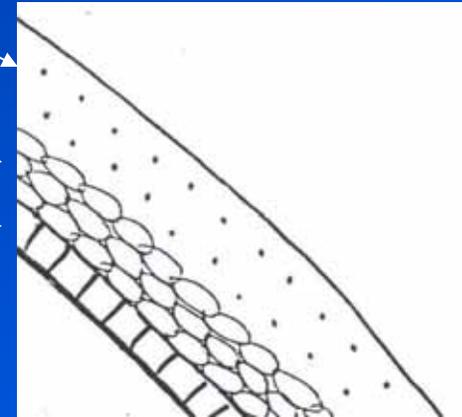
III – Outer Covering Layer, made of Lunar regolith - it requires low technical level

Only the bricks of the inner building shell should be created „in situ” with high technical preparedness (forming, heating or binding)

Building structure



Outer Covering Layer →
Bagged Covering Layer →
Inner Building Shell →



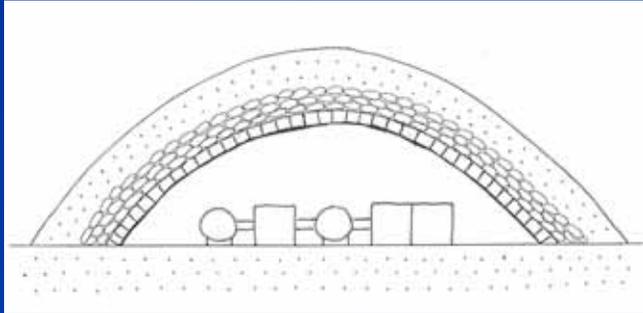
Structural relations

I – Inner Building Shell	1 unit	e.g.	0.3... 0.5 m
II – Bagged middle Covering Layer	3 unit	e.g.	0.9... 1.5 m
III – Outer Covering Layer	3-5 unit	e.g.	0.9... 2.5 m
Whole skin of the building	7-9 unit	e.g.	2.1... 4.5 m

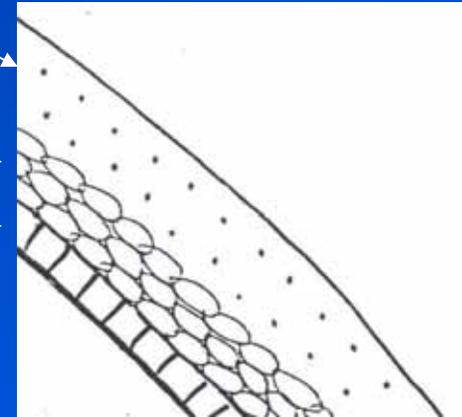
Only the 1/7 – 1/9 of the whole skin is the inner building shell made of „bricks”, which requires high level technology.

It is the only the 11-15% of the total thickness.

Building structure



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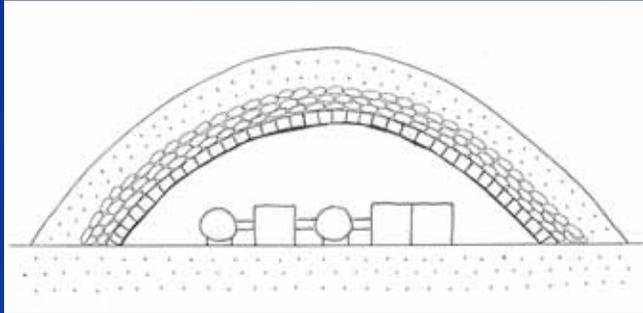


Different technical levels of the different layers

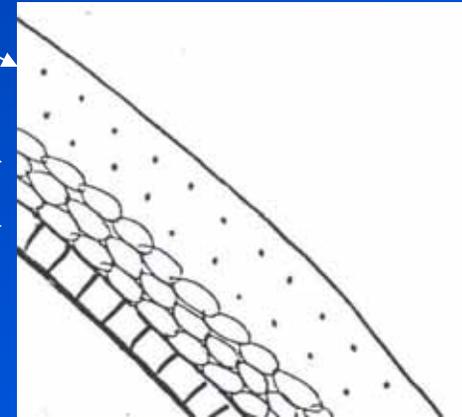
I – Inner Building Shell	1 unit	e.g.	0.3... 0.5 m	11-15%
II – Bagged middle Covering Layer	3 unit	e.g.	0.9... 1.5 m	33-42%
III – Outer Covering Layer	3-5 unit	e.g.	0.9... 2.5 m	43-56%
Whole skin of the building	7-9 unit	e.g.	2.1... 4.5 m	100%

11-15 % is the high technological claim of the building, the others are medium or low requirement.

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It means, that almost half of the building's technological and material requirements can be ensured mostly with the moving of the Lunar regolith, by low technological requirements.

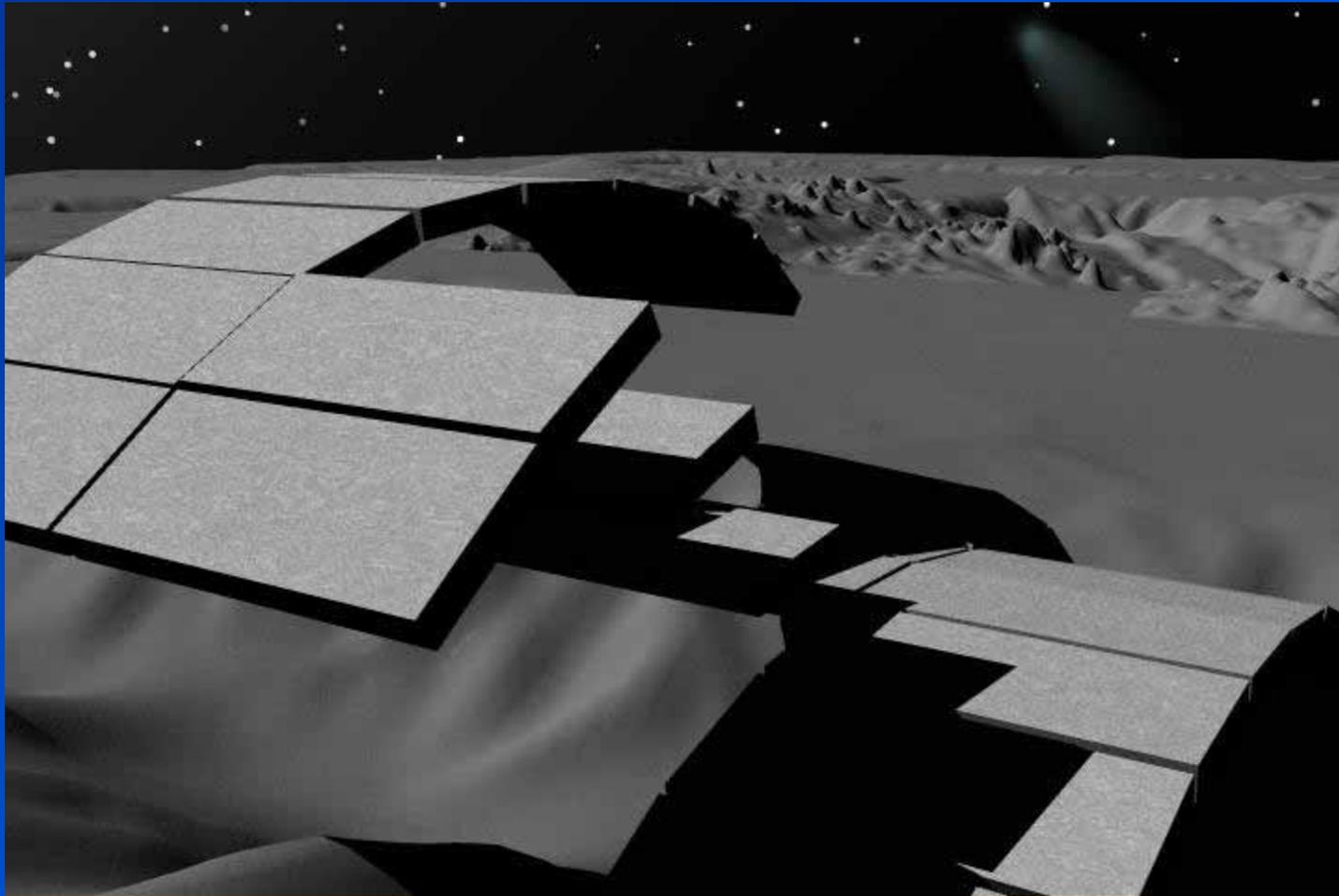
33-42% - the bagging and moving of the regolith is, and only moving is near 50%.

Some pictures from the animation of the building technology



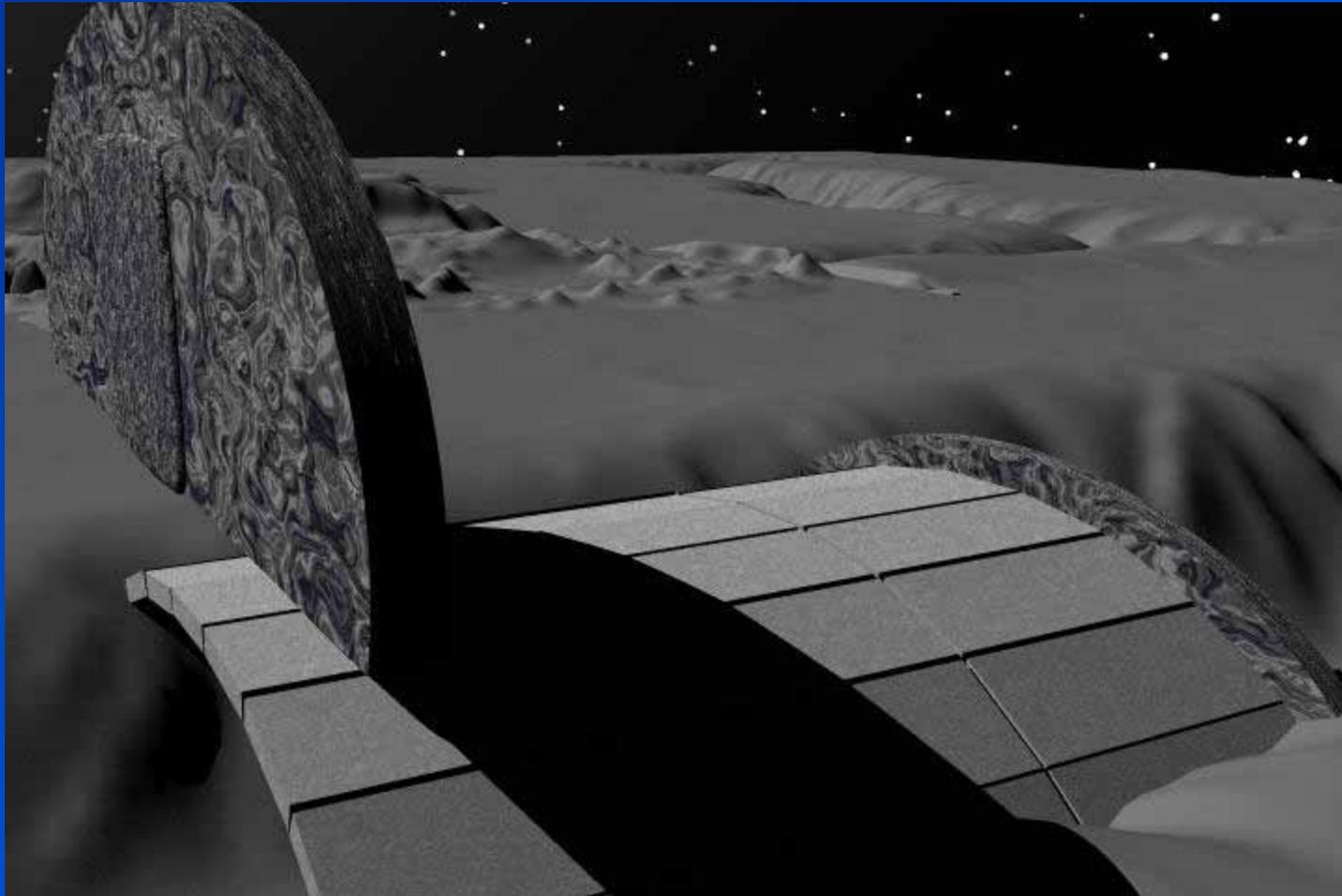
Choosing a proper Lunar Valley

Some pictures from the animation of the building technology



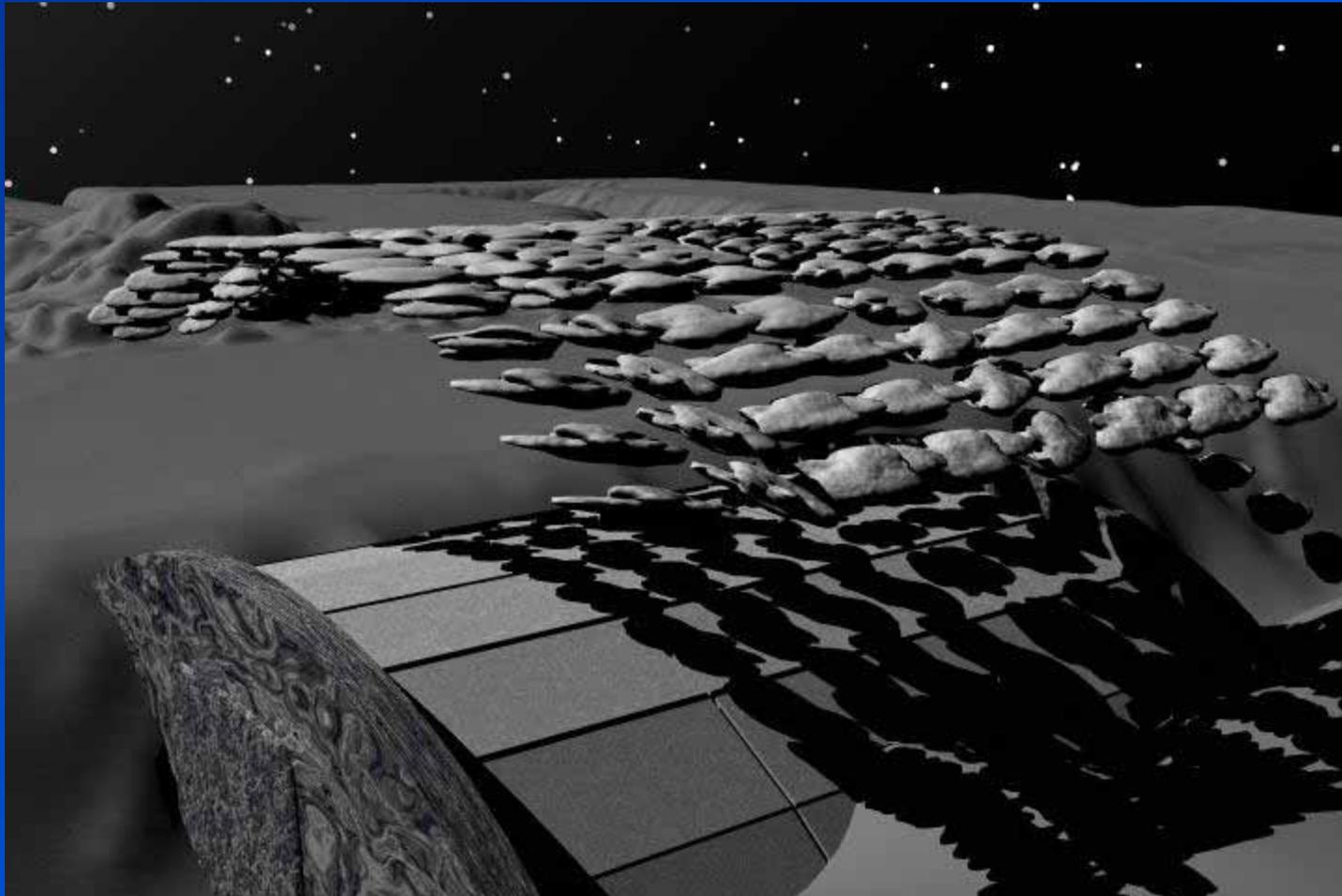
Placement of the building elements and
shaping the arched form

Some pictures from the animation of the building technology



Placement the necessary additional parts, e.g.
vertical closing walls

Some pictures from the animation of the building technology



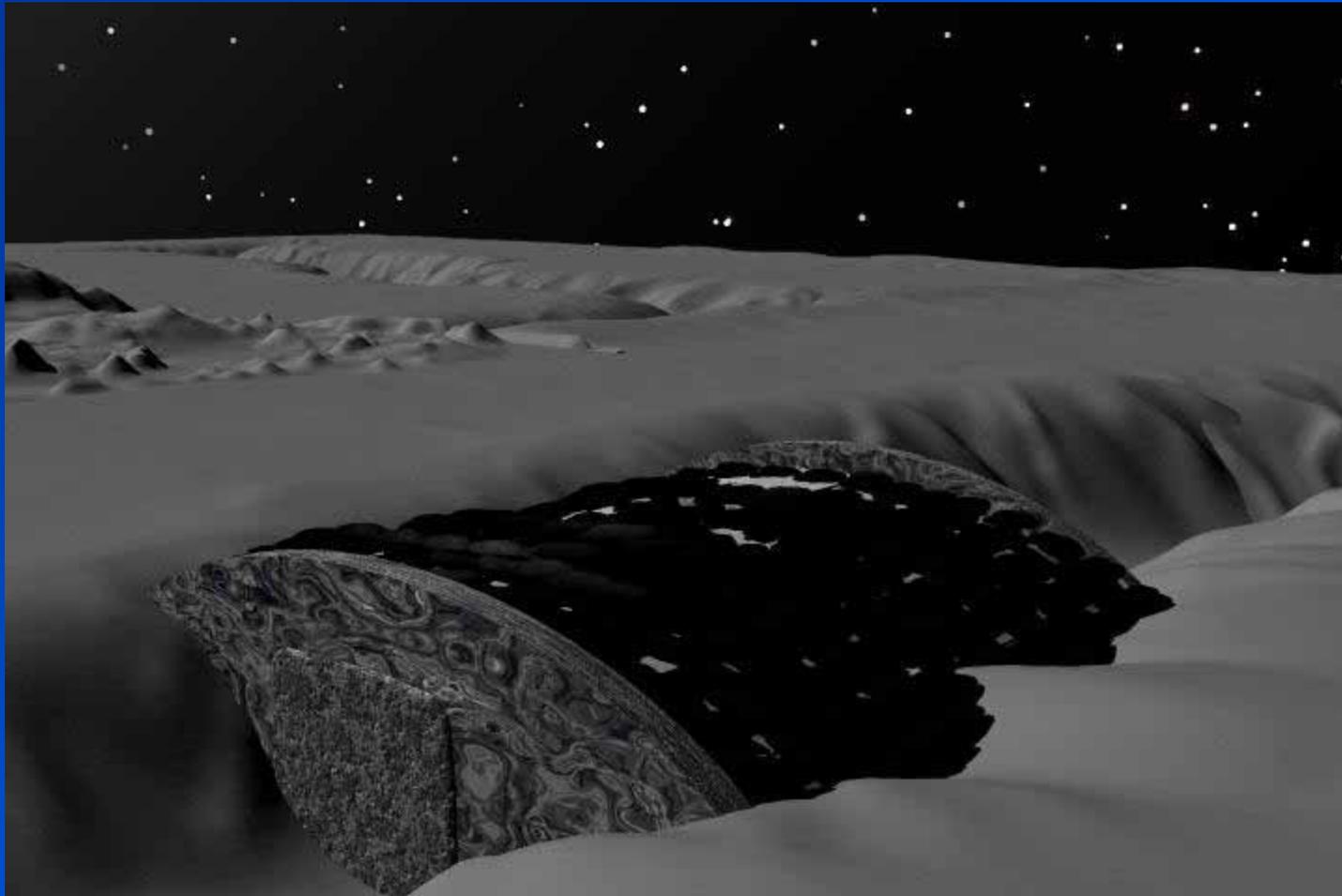
Placement of the bagged regolith for the
outer side of the arched form (Phase 1)

Some pictures from the animation of the building technology



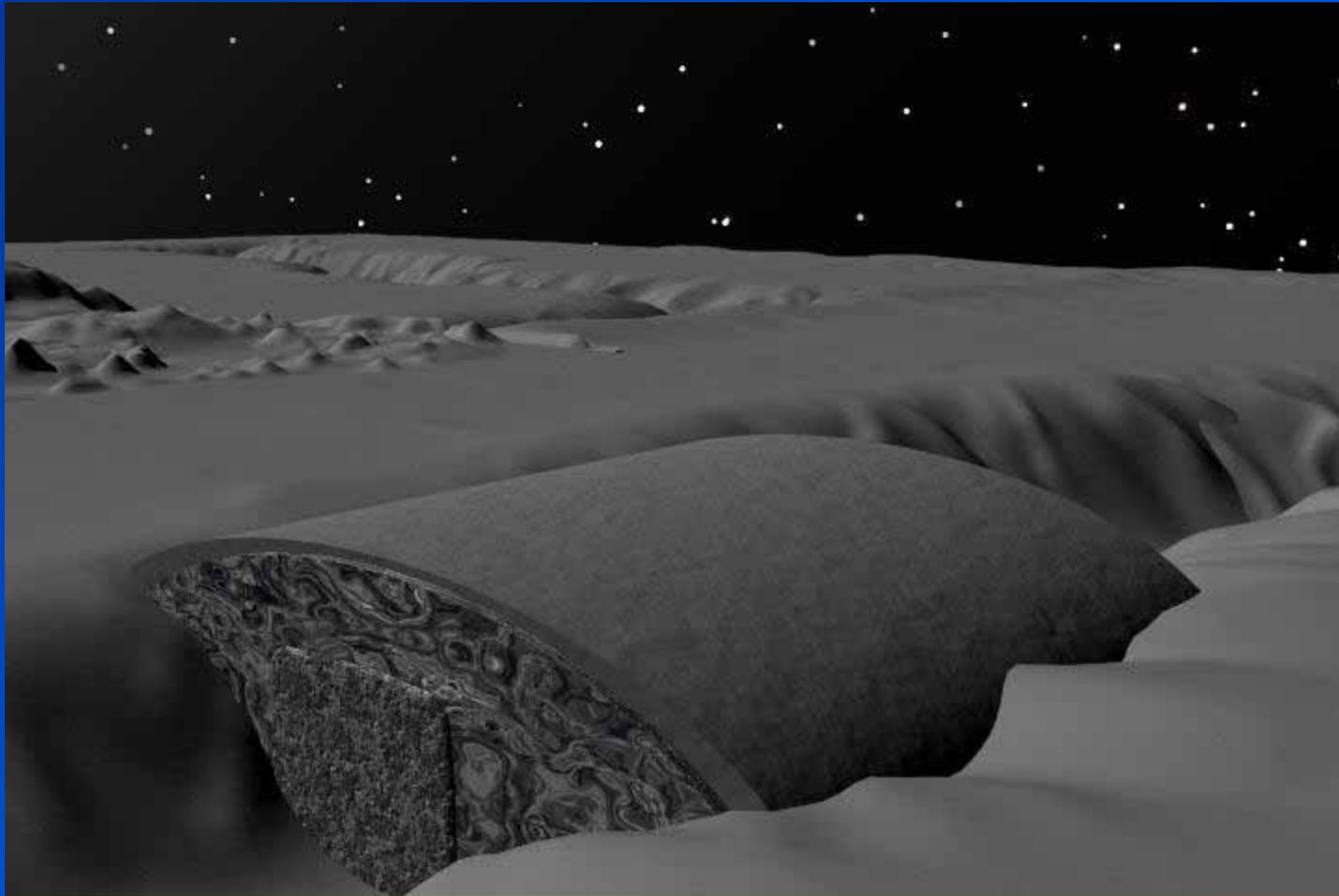
Placement of the bagged regolith for the
outer side of the arched form (Phase 2)

Some pictures from the animation of the building technology



Placement of the bagged regolith for the
outer side of the arched form (Phase 3)

Some pictures from the animation of the building technology



Covering the whole structure with Lunar
regolith

Considerations of the efficiency

The same machinery is usable in several technological processes

E.g. Lunar regolith and dust collecting and transporting devices are necessary for all phases,

- for collecting the raw material of the „brick”
- for collecting and filling the lunar dust to the bags
- for the final outer covering of the building

It results the devices and apparatus are significant minimized to be transported to the Moon.



Further considerations of the efficiency

Questions of size:

What size could economically built from the transported components?

One or two buildings in a reasonable size, enough for the first steps.

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What preparations are required for a longer term (1-2 years) expeditions?

Hangars, storage areas and shelters will be required in a larger size.

Some of them should be built on the lunar surface, others should be placed in sheltered valleys, ditches or underground.

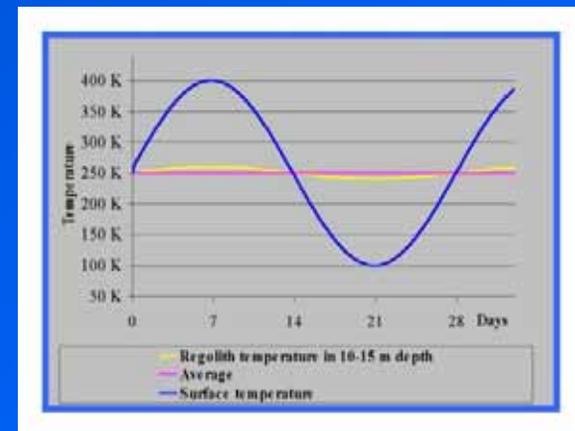
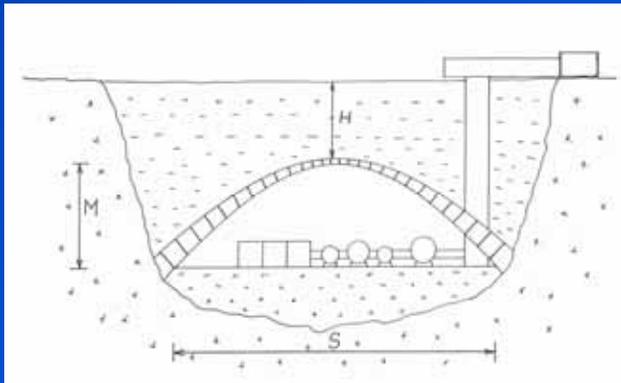
The advantages of our proposal:

The technology proposed by us enables the creation of buildings (depending on the brick size) from a span of 8-10 m to 20-30 m or even 60 80 m with an arbitrary length.

It has got a low technology requirement, and few components should be transported from Earth

All of the required components can be found under lunar circumstances, and the building can be easily created.

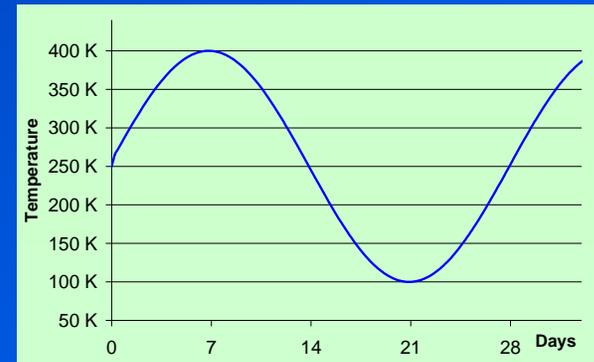
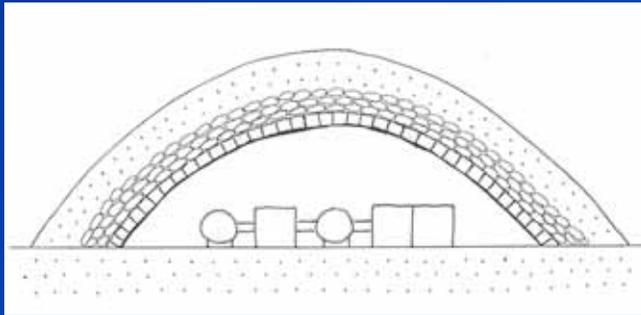
Protects from cosmic radiation, meteor impacts, and from the heavy radiations of the Sun.



When placed in lunar valleys or ditches, and the upper part is covered by regolith, it provides an inner space with a balanced temperature.

The advantages of our proposal:

When it is built on the surface, the inner temperature is changing as the surface temperature, but it still keeps its protective characteristics.



The technology of our proposal enables the building of hangars and storages in a massive scale, for long time periods.

These can be used both for human or industrial purposes.

Thank you for your attention!