# ISRU BASED BUILDING CONCEPT FOR PRODUCING MULTIFUNCTIONAL LUNAR BUILDINGS.

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**Summary:** According to the ISRU, during the construction process of Lunar buildings based on our concept the usage of local materials (preferably regolith), and technologies which enables constructing with local materials, should be a primary concern.

**Joining to previous publications:** In our previous publications [1,2,3] we have explained how can structures for industrial or human use with a great inner volume be built in the lunar surface or underground. In this abstract we would like to emphasise, why can these structures be easily built with the utilization of ISRU, unlike other methods which require equipment transported from Earth.

**Our aim:** It is more beneficial to construct Lunar buildings from local materials instead of equipment transported from Earth. During the upcoming Lunar missions, the construction of Lunar buildings with proper functions and designs will be important.

**Practical issues:** Main goals of Lunar building construction: - Industrial activities, - Human habitat. In apropos of these, some of the possible utilizations: - supplemental and other services, for example: storage for a longer or shorter period of time, storage of the machines materials or other equipment used on the surface. - To accomodate the life support systems (energy source, water, oxygen supply units, telecommunications), - Transportation, Placement for the vehicles used in the earth-moon contact, - Equipments for the possible further (Mars or other ) missions.

**The effect of the Lunar enviroment:** During the construction of different buildings the lunar enviromental conditions cannot be overlooked, these conditions are the following: 1/6 earth gravitational field, absence of atmosphere, longer daily cycles (14 days/day and night), dusty lunar surface, which behaves like an electricaly charged fog during daytime, high probability of meteor impacts because of the absence of atmosphere, high level of background (cosmic) radiation.

Structure designs created for the long term human habitat and for the long term industrial activity will be required to calculate with the combined effect of these factors, which will quicken the rate of degradation compared to the usual rate in earth. To accomplish this, one way is to use very resistent materials in the construction of outer walls ceilings and locks. It would require large scale transportation to the moon, and in situ construction, which would be very expensive.

In recent times, the idea of re-using the lander unit as a part of an industrial or human activity is widely known. Also the first modules should be manufactured in the Earth, and after their transportation to the moon, they should be useable immediately, but it gives only temporal solutions. Real solutions can be found with the ISRU methods, which focuse on local materials.

**The essence of our proposal:** The ISRU building concept proposed by us, is that from in situ Lunar materials (regolith) with a construction process applied in the Lunar surface, bricks can be created, and from these bricks the construction of arched structures is possible, even in a larger scale with a span of 60-80 m. these structures could be placed on the surface, but when placed 10-15 below the surface and covered by regolith, an average inner temperature could be achieved. While the surface temperature may fluctuate, the inner temperature will always be about –20 C, with only lesser fluctuations.

The usage of ISRU technologies in our proposal during lunar building procedures: Creation of a building block, Lunar Brick, the used material can be found in the surface (regolith). The used energy (heat) can be acquired via the solar energy the Moon receives without the atmospheres alleviating effects during the long light periods. The 14 day/light period enables the continuous and economical work.

It is an important factor for ISRU to fully utilize the possibilities of the local soil, to use it in the required thickness. The regolith is a good outer layer with good heat insulation abilities, good radiation shading, capable of resisting the micrometeorites which pose a real threat for any Lunar installation. The buildings constructed following our method on or below the surface are using a thick layer of regolith.

**Advantages:** During the construction of these buildings the reusability of most of the equipment is an important issue. Thus we use simple tools like arched supporting units. These could be recovered after the completion of one unit, and repeatedly used throughout the whole procedure. During the first period these cannot be produced in-situ, they have to be transported. But their reusability makes the transportation economical. In the future, these instruments may be manufactured in-situ , thus making the whole method more effective and economical.

**References:** [1] Kummert, Boldoghy et al.: Organizational Concept of Buildings of Levelled Temperature Interior Space on the Moon, SRR VII conf. 2005 (*#2007*), [2] Boldoghy, Kummert et. al.: Construction of a Lunar Architectural Environment with Joint Constraints of Thermal Balance, Economic Technologies, Local Material Using: Strategy, Design and on Site Assembly., 37 LPSC 2006 (#1152), [3] Boldoghy, Kummert et. al.: Feasibility Concept Of Creating Protected Spaces With Great Size And Balanced Interior Temperature For Industrial Activities On The Moon, SRR VIII conf. 2006.