

REQUEST FOR PROPOSAL

28 July 2043

"Alaskol" Space Settlement Contract

INTRODUCTION

This is a request by the Foundation Society for contractors to propose the design, development, construction, and operations planning of the first space settlement on Earth's Moon Luna.

STATEMENT OF WORK

1. Basic Requirements - Alaskol will be the first Big City on Luna. It will be expected to provide a variety of basic services for a growing variety of smaller lunar communities.

2. Structural Design - Alaskol must provide a safe and pleasant living and working environment for 18,000 full-time residents, plus an additional transient population, not to exceed 1500 at any time, of business and official visitors, residents of other communities buying goods and services, guests of residents, and vacationers. Provide natural views of surrounding lunar terrain.

2.1 On exterior design drawings, identify uses of large enclosed volumes, and show dimensions of major structural components. Show the local terrain and compatibility with it. Identify construction materials used for major structural components. For protection from radiation and extreme thermal conditions, habitable volumes of the settlement will be built into walls of a lunar crater. Excavation is expensive; designate functions for surface structures as much as possible. CASSSCs may be repurposed as building components.

Minimum requirement: overall exterior view of settlement, showing major visible features.

2.2 On interior design drawings, specify uses and dimensions of pressurized and unpressurized enclosed areas both built into crater walls and on the surface, with drawings clearly labeled to designate residential, commercial, warehousing, industrial, agricultural, and other uses.

Minimum requirement: overall map of enclosed land areas, showing usage and sizes of those areas.

2.3 Describe the process required to construct the settlement, by showing the sequence in which excavation will occur, major structural components will be assembled, and interior finishing will be conducted. Identify population and business capabilities available at intermediate phases. Show how Alaskol can be expanded with future increases in population and business interests.

Minimum requirement: drawing(s) showing at least six intermediate steps of construction.

2.4 Alaskol is intended to be a major supplier of commodities to other communities in cis-lunar space, on Luna, and eventually throughout the solar system. Identify locations and sizes of industrial parks that the Foundation Society will manage in and around the city. Each industrial park will host businesses needing similar services, e.g., breathable atmosphere, enclosed vacuum, unenclosed vacuum with thermal control, or access to lunar surface conditions.

Minimum requirement: show where industrial areas will be located, and identify which subcontractors and other types of businesses are expected to operate in each area.

3. Operations and Infrastructure - Describe facilities and infrastructure necessary for building and operating the Alaskol lunar settlement.

3.1 Alaskol will be located in and around Moltke crater, to enable building habitable volumes into the steep crater walls. Identify sources of materials and equipment that will be used in construction and operations, and means for transporting those materials to the Alaskol location.

Minimum requirement: chart or table identifying materials and equipment required for the settlement construction process, and from where and how those materials and equipment are shipped.

3.2 The Alaskol design will show elements of basic infrastructure required for activities of the settlement's residents, including (but not limited to):

- food production and processing (describe dedicated agriculture and "edible landscaping"),

- electrical power distribution (specify kilowatts distributed to habitable areas),
- internal and external communication systems (specify devices and central equipment),
- intra-settlement transportation systems (show routes and vehicles, with dimensions),
- atmosphere (define air composition at 11 psi, and quantity)
- household and industrial solid waste management (trash and garbage), and
- water management (including fresh water distribution).

Power generation will be split between ground solar power collection with Soletta illumination at night, and Solar Power Satellite transmission to a rectenna with energy density averaging 14 watts per square foot (150 Watts per square meter). Include designs of transportation vehicles (showing dimensions) for use inside, and outside within the settlement perimeter. Show methods for preventing surface dust from getting into interior volumes. Define means of access throughout and between facilities, for pedestrians, bicycles, emergency and service vehicles, and robots.

Minimum requirement: drawing(s) showing locations of systems which provide required infrastructure, and, as appropriate, their configurations (e.g., show routings of water and waste services).

3.3 Provide a shipping & receiving facility(ies) where surface vehicles from other communities will deliver commodities, products, and raw materials; and will collect products and commodities from Alaskol businesses to deliver to other communities. Most shipments will arrive and depart in CASSSCs. Provide a passenger terminal for a monorail that will transport people to and from remote launch / landing sites, and eventually will be expanded as a lunar transportation network.

Minimum requirement: illustration(s) of shipping & receiving facility(ies) initially accommodating 30 visiting lunar vehicles simultaneously, and a monorail passenger terminal.

3.4 Alaskol will provide generic services as needed to help grow the global lunar population and economy. These will include medical care, emergency rescue, vehicle repair and maintenance, communication network(s), data collection and storage, and power distribution network.

Minimum requirement: identify city services that will be extended to other lunar locations and, as appropriate, added infrastructure required to extend services to remote locations.

4. Human Factors and Safety - Alaskol will offer attributes available to residents of Earth’s small cities in developed countries. Provide natural views of the lunar surface for residents.

4.1 Alaskol communities will provide facilities for services that residents could expect in a comfortable modern community environment (e.g., medical, parks and recreation, access to fine food and entertainment), variety and quantity of consumables and other supplies, and public areas designed with open space.

Minimum requirement: map(s) and/or illustrations depicting residential, retail, and public areas of the community and locations of amenities/services, with a distance scale.

4.2 Include designs of typical residential homes, clearly showing room sizes. Homes will be excavated into the crater wall, and every home will have windows overlooking the crater from at minimum kitchen, dining area, and daytime activity room(s). The back wall for interior rooms will be curved, to enable easier excavation. Anticipated demographics of the original population are:

Married adults	46%	(average age 38, median age 35)
Single Men	30%	(average age 33, median age 36)
Single Women	23%	(average age 36, median age 32)
Children	1%	(average age 6, median age 5)

Minimum requirement: external drawing and interior floor plan for at least four types of home designs, and the area (preferably in square feet) for all residences.

4.3 Define types of spacesuits (to be acquired by the customer from a different vendor) for use within the settlement perimeter, numbers of each spacesuit type, and storage locations for spacesuits. Establish requirements for spacesuit features to mitigate degrading effects of lunar dust and prevent entry of dust into pressurized areas of the settlement.

Minimum requirement: show location(s) on community map for spacesuit donning / doffing.

4.4 Alaskol will be the place where residents of other lunar communities come to the Big City for medical care, entertainment, and to acquire capital goods (e.g., rovers, construction materials, appliances, clothing, and tools for running their businesses). Describe how emergency medical care

will be made available for all lunar residents.

Minimum requirement: show locations of Big City amenities on community map(s).

5. Automation Design and Services - For each subparagraph, specify numbers and types of computing and information processing devices, multi-function personal electronic tools, servers, network devices, robots, and/or drones to satisfy requirements. Describe types and capacities of data storage media, data security, and user access to computer networks. Show robot and drone designs, clearly indicating their dimensions and illustrating how they perform their tasks. Identify locations and sizes of repair, maintenance, and storage facilities for automation systems.

5.1 Describe automation to aid construction, including monitoring of progress by subcontractors and scheduling transitions between tasks. Describe how humans monitor automated construction processes and progress, and where/how human interaction is required during construction. Consider automation for excavation, transport and delivery of materials and equipment, assembly of surface structures, and finishing the interior.

Minimum requirement: chart or table describing automated construction and assembly devices.

5.2 Specify automation systems for settlement maintenance, repair, and safety functions; show how automation works together with humans to perform these tasks. List parameters that must be monitored and controlled to assure safety of residents, show the control center(s), and define numbers of display and control systems required. Describe when and how human intervention in automated functions is required. Define physical locations of computers and robots for critical functions. Describe means for authorized personnel to access critical data and command computer and robot systems; include descriptions of security measures to assure that only authorized personnel have access, and only for authorized purposes.

Minimum requirement: chart, table, or list(s) of settlement systems and parameters that must be monitored and controlled for safe operations of Alaskol .

5.3 Show automation devices to enhance livability in the community, productivity in workplaces, and convenience in residences. Emphasize use of automation to perform maintenance and routine tasks, and reduce needs for manual labor. Provide for privacy of personal data and control of systems in private spaces. Describe access to community computing assets and robot resources from individuals' homes and workplaces. Describe devices for personal delivery of information, communications services, entertainment, computing, and robot resources. Robots used in homes and public areas will be no taller than 2.5 feet (76 cm) and not anthropomorphic, but may be designed to stack on top of each other for tasks requiring more height.

Minimum requirement: dimensioned drawings of robots and computing systems that people will encounter in Alaskol.

5.4 Provide appropriate automation for operations of retail businesses, industrial parks, shipping / receiving facility(ies), and delivery of city services to remote lunar communities. With human monitoring, autonomous systems will unload and load CASSSCs on cargo hauling vehicles; warehouse operations and most manufacturing will be autonomous. Some agricultural volumes will be hazardous to humans, and will require automated attention to crops.

Minimum requirement: show control room(s) for human monitoring of city operations, with examples of displays to inform and enable human intervention.

6. Schedule and Cost - The proposal will include a schedule for development and occupation of Alaskol, and costs for design through construction phases of the schedule.

6.1 The schedule must describe contractor tasks from contract award (31 July 2043) until the customer assumes responsibility for operations of the completed settlement. Show in the schedule when each subcontractor is starting and completing its tasks.

Minimum requirement: durations and completion dates of major design, construction, and occupation tasks, depicted in a Gantt chart with monthly or smaller increments.

6.2 Specify the costs associated with Alaskol design through construction in U.S. dollars, without consideration for economic inflation. Include estimates of numbers of employees associated with each phase of design and construction in the justification for contract costs to design and build

Alaskol. Do not include costs of consumables shipped and delivered in CASSSCs; do specify number of CASSSC-loads of each commodity required to be shipped to the construction site. Minimum requirement: spreadsheet(s) listing separate costs associated with different phases of construction, and clearly showing total costs that will be billed to the Foundation Society.

7. Business Development - Alaskol will host a variety of commercial and industrial ventures, which may change with time. The basic design must include sufficient flexibility to accommodate development of additional compatible business types with little configuration change. The original configuration must, however, accommodate three major business pursuits:

- Commercial center where residents of other communities come to buy goods and services
 - Retail areas will be larger and more varied than usual for a community of this size
 - Medical services will have regular (and emergency) customers from remote locations
 - Showrooms will feature rovers and other equipment of interest to lunar businesses and communities
 - Provide storage for CASSSCs loaded with commodities ready to ship to customers
 - Provide equipment for loading and unloading CASSSCs on cargo hauling vehicles
 - Banking system must be robust and secure for handling large transactions
- Industrial Park and shipping / receiving center
 - Manufacturing and materials processing businesses will require additional power
 - Valuable goods will require added security
 - Businesses are likely to create goods using proprietary processes; Intellectual Property must be protected
 - Businesses will need vehicles for transporting parts between suppliers and assemblers
 - Convenient transportation to/from residential areas must be provided for employees
- Major tourist destination
 - Opportunities to see the Apollo 11 site; suggest methods for preservation of the site, with assurances that nothing disturbs where Neil and Buzz walked
 - Show examples of indoor and outdoor facilities within the Alaskol perimeter that offer sports and competitive opportunities uniquely suited to the lunar environment.
 - Outfitting businesses will provide guide services and equipment for lunar mountain climbing and sight-seeing

EVALUATION STANDARDS

Evaluation of each design presentation considers four general categories of factors:

A. Thoroughness - Design meets depth and diversity of requirements in the entire Statement of Work (SOW). Graphs, tables, drawings, and compliance matrices aid evaluation of this factor.

B. Credibility - Design addresses requirements, safety, physical laws, and cost/schedule in a believable manner. Errors, impossibilities, omissions, and illogic are penalized.

C. Balance - Proposal places equal emphasis on four technical areas: structural design, operations, livability, and automation. Proposal is organized in a logical, easy-to-follow manner.

D. Innovation - Design demonstrates original thinking to address SOW requirements. Technologies are applied and combined in unique and creative ways.

ADDENDA

An alternate name may be suggested for this community, within the Foundation Society's established naming convention that requires the name to end with the suffix "ol" (settlement is “on Luna”) and begin with the letter “A” (first settlement at an “ol” location).

If a proposal is submitted that has more than the allowed 50 pages, only the first 50 pages will be evaluated by the customer.

Drawings and/or maps included in the proposal must show dimensions consistently in English (feet/miles) or metric (meters/kilometers) notation.