It is important to remember that this 2012 Underground Shelter guide is only a ***starting point*** in the comprehensive development of a Client Specific 2012 Shelter Protection Program.

To discuss your specific requirements, please call us for a free confidential consultation.

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General Space Requirements:

The shelter is anticipated to incorporate the following spaces: Bedrooms, Bathrooms, Air Locks, Decontamination Room, Kitchen, Den, Communal Space, Store Rooms, HVAC Equipment Room, Battery Room, 2-Emergency Escape Tunnels, Power Control Room with Generator, Firearms/Ammunition Vault and required fresh air intakes and exhausts.

Structural Requirements:

The shelter must be designed to withstand 3-Bars, or 45 psi of applied blast overpressure. The shelter must retain structural integrity as it moves laterally or vertically underground. All penetrations thru the shelter envelope must utilize blast valves and blast doors. Concrete admixtures for moisture control and water penetration will be required as well as additional reinforcing detailing at all penetrations. A Mat-type 5000 psi cast-in-place concrete foundation is envisioned with concrete walls between 2'-00" to 4'-00" thick. A cast in place concrete ceiling approximately 3'-00" to 6'-6" thick is anticipated. A Blast suspension system is typically not incorporated.

Mechanical Requirements:

1. The shelter must be designed to operate "off the grid" without outside utility support. The shelter will be connected to the existing electrical service and shall operate using utility electrical power when available.

a. The main electrical power should be used to keep the Facility ready for occupation.

b. Primary power of approximately - 16 to 25Kw is required and should be geothermal water or radiator cooled generators. Possible future surface installations may need power for development, generator size determined after component selection.

c. Small scale power generation will need to be provided to keep the Battery Banks charged during lock down.

d. Alternative Energy production shall be included i.e., P.V. Wind .etc...

e. All internal systems should be run on 12-24or 48 Volt D.C and should be designed accordingly where possible, appliances should be duel fuel.

f. All Power transfer, Generation and Inverters and Batteries must be protected by a Ferias cage from EMP surge of 1,000,000 volt minimum. All these components and internal appliances must be surge protected.

g. All Critical systems must have a manually operated Back up.

h. De humidification of the air within the facility is a main consideration in all design and equipment choices. Humidity will degrade NBC and CO2 air supply filters at a ratio of 10to1, a filter good for 90 days at 5% humidity will only work at 95% humidity for as little as 9 days.

i. All external Ducts, Cables and Pipes need to be bonded into the ground system before any wall penetrations to protect internal environments and equipment from EMP Surge.

j. Manual power generation capabilities shall be incorporated into the design.

k. Independent Isolated Battery Back up system shall be designed into the system.

2. Air from external sources must be assumed to not always be available

a. During a closed circuit operation CO2 absorption will require an internal recirculation system to return air to HVAC room for treatment. ”90 Day”.

b. All internal air is to be Heated, Cooled, Dehumidified, Filtered, HEPPA and or UV.

c. All valves must have a fast acting closure mechanism capable of protection during complete submersion. Drainage for all system enclosures shall be provided.

d. All air within the shelter should be capable of being completely replaced within a 5 min period for evacuation after a possible internal fire.

e. All air locks are to have less than a 4 min cycle rate - 4 Full volume Exchanges.

f. Two supply systems will be required One during NBC Lockdown Fully Protected, this system should have the option of CO2 exchange. The second system will be for Non – NBC filtered air. This system is for Blast protected and Filtered air for those times when the external air is suitable for breathing. Sensors will need to be installed to immediately close the system as soon as a threat is perceived. NOTE: It is cost prohibitive to provide NBC protected air for a full year without considerable expense.

g. 10Cm Per Hour is the recommended minimal air required for each inhabitant.

h. Ambient temperatures of 72 to 78 Deg should be used as a goal.

i. We do not recommend that any air be introduced into the living spaces above 36” from floor height.

j. Air exchange Valves between rooms are recommended to be between Head height and lowest ceiling level.

k. Air pick-ups for recirculation of air recommended to be within the Drop ceiling.

l. Relative humidity is recommended to be kept under 10% at all times and 5% during Lockdowns.

m. If heat exchange wells can’t be installed then adequate coils will be placed on the up hill side of the structure during backfill for HVAC systems.

n. All external Ducts, Cables and Pipes need to be bonded into the ground system before any wall penetrations to protect internal environments and equipment from EMP Surge.

o. The Cooling and Aspiration air required by the Generator must be kept completely separate from that of the shelter areas especially during discharge.

p. There must be secure access to the generator room for maintenance and repairs.

3. Potable/Drinking water should be supplied from a deep well within the Structure.

a. All internal systems should be operated on 12-24or 48 Volt D.C whenever possible.

b. Internal and external Water Supply tanks should be considered for heat exchangers to bring water supply closer to a useful temperatures.

c. Hand operated Back up systems should be included during design , for supply.

d. Filtration and treatment equipment is to be included in the design of the water supply system in case future contamination occurs.

e. A minimum of 5 Gallons per person per day is recommended.

f. Sewer pipes and air vents are to be protected from back pressure.

g. Grey water is recommended to be used to improve grounding potential of soils surrounding shelter.

h. All external Ducts, Cables and Pipes need to be bonded into the ground system before any wall penetrations to protect internal environments and equipment from EMP Surge.

i. 30 Days of Water should be stored in an external tank allowing gravity feed into shelter for use during power outages. Hand pumping must be an option.

j. Water must be monitored for contamination: Radiological Chemical and Biological before storage and distribution network.

k. Drinking water wells will not be used for, or encroached on within 40’ of Geo Thermal wells If available a different depth for Drinking water (The Deepest) should be used from those of equipment cooling.

l. All sewer drain lines must be located below structure for gravity feed.

m. An option of a secondary Grey water disposal system for back up which should include a water treatment system for use in toilets and for wash down requirements if water becomes in short supply.