PROMETHEUS COUNCIL

Shelter Design Standards

Most nations have extremely limited numbers of shelters available for the civilian population. Virtually all nations have deemed this option as being far too expensive, given the nature of governments to over spend assets this comes as no surprise. Those shelters that are available stem from the cold war between the democratic and communist doctrines of governmental philosophies. Currently Sweden has shelters for 90-98% of its civilian population, Russia can protect between 11-24%, and the United States has an appalling 0.1% rating.

Within the United States and many of its former allies during the cold war, a considerable amount of time, effort and money was spent to mitigate the effects of a nuclear war. In this line of logic, two essential types of shelters were espoused and the terms used have slowly passed into antiquity and more importantly their meanings have merged into the common person's perception.

Relatively common terms used were the "Fallout Shelter" and the "Protection Factor" (PF). Most citizens erroneously think that these older fallout shelters with a protection factor of 40 or higher will always protect them. In some cases these shelters may provide some limited form of protection, but in the event of an ELE we need to be clear on the semantics used. Misunderstanding these can and will be fatal.

The "fallout shelters" and "protection factor" (PF) are terms, which apply specifically to the particle fallout from nuclear detonations. These types of shelters were designed to provide limited protection from the radiation derived from the fallout. They were not designed for, and DO NOT provide blast protection.

Given the unknown nature of an ELE these "fallout shelters" may be usable, but in other ELE circumstances these shelters would be convenient tombs. Depending upon the specific ELE it is quite likely that peak overpressures in pounds per square inch rating (psi) will become critical. It is vital that these are explained in terms the citizens can comprehend.

Pounds per square inch (psi) is a term used to understand the pressure applied by the mass movement of air moving outward after an explosion, it also includes the return pressure wave of air as it returns back into the proximity of the explosion after its initial ejection. Two other phenomenon that occur are the subterranean shock wave which is earthquake like in its ability to produce a "fluid" ground wave; and the echo or mach effect that results in the outer exiting air striking the upper atmosphere and returning back down to contact the earth. If this phenomenon happens to meet at the same point, peak overpressures can be doubled, tripled or quadrupled.

Modern construction standards for commercial (not civilian) structures call for a Uniform Building Code rating of 40 pounds per square foot structural support. This is misleading, because there are 144 square inches in a square foot, therefore, this should have a rating of 3.6-psi overpressure survivability. Bare in mind this is COMMERCIAL grade building often built with 6-8 inches of steel reinforced concrete or similar materials; civilian homes are nowhere near this rating.

Ordinary homes of typical wood stick construction are destroyed by a 2-psi overpressure; brick homes are severely damaged. An over pressure rating of 5.2-psi is sufficient to collapse brick and concrete buildings including commercial grade buildings, and at 15 psi, structures are reduced to rubble.

A one- (1) mega-ton explosion creates 450-psi out to about 1.5 miles, 7-psi at about 4 miles, and approximately 2-psi at about 8 miles. This is using nuclear detonations, however chemical non-nuclear munitions such as fuel air explosives can create 300-psi over pressures out to fifty meters, 12.8-psi out to about 200 meters, and 6-psi out to about 300 meters.

Two pounds of pressure per square inch if applied to only a 1 square inch section would not produce these devastating results. But two other variables must be considered, (1) the entire area is being affected by 2-psi and (2) this is instantly applied not in a gradual build up. On a simple home exterior wall section of ten feet high and forty feet long gives a total area of approximately (10x40=400 square feet, 400x144 {square inches in a square foot})=57600 square inches of area to be affected. 57600x2=115200 pounds of pressure (approximately 57.6 tons) exerted INSTANTLY. Most structures are simply not designed to handle these types of over pressures.

Modern military blast shelters are considered “hardened” if they can withstand a blast of 300-psi, and “super-hardened” if they can withstand a blast between 1000 and 3000-psi.

Depending upon the type of ELE the air can literally be sucked out from shelters from the vacuum created from firestorms or blast effects resulting in complete asphyxiation of the occupants. Of the shelters listed below only those equipped with blast doors and the appropriate air filtration systems will avoid this. The air filtration systems need to have seal able end caps, which need to be readily available and are easily installed or mechanically activated by pulling a level, which stops airflow from incoming to avoid rapid over pressurization or rapid depressurization.

Some shelters are often called “Fallout Shelters” as in the United States, and others are underground subway systems designated as bomb shelters as in most European countries. Neither is practical nor functional from an operational standpoint of the project. Most are simply too old and not serviceable any longer, indeed most are borderline condemnable from an occupational perspective. They are certainly not provisioned; no food, water, clothing, bedding, sanitation, or self-protection exists. And certainly nothing exists in the means to rebuild after an ELE.

Emergency shelters that are used, are often local school gymnasiums, local schools collectively, local churches and buildings that are considered substantial structures. Current United States (and most project host nations) has specific construction guidelines for federal and scholastic buildings. This is in part a very limited effort to provide some type of shelters within communities. Unfortunately, these shelters are for extremely limited use only such as in short-term localized disasters and not practical nor functional for an ELE.

Civilian Shelters (CS) have two major classifications. Type One (1) are above surface, and is predominately used in post ELE, and Type Two (2) are below surface and are used primarily for pre and during ELE. Within these two major classifications, several styles have been developed, each designated by a letter to ease in standardization and reference.

Type 1 Model A, is called the Viking Earth Shelter, and is a linear triangular, above ground, made of wood and covered by sod.

Type 1 Model B, is called the Scottish Stone Shelter, and has lower base walls of stone or rammed earth with roofs, which are thatched, or sod covered.

Type 1 Model C, is called Wood Pole Palisade, that has wood poles set vertically in the ground, and the inside has simple wood or sod structures.

Type 1 Model D, is called Wood Block House that is built of wood, with the upper portion extended out over the lower portion with a wood shingle roof. These can be built independently or on the corners of the Wood Pole Palisade.

Type 1 Model E, is called a Hogum, (after the southwestern Indian sweat lodges). It is hexagon (six sided), built of logs; the roof is staggered on the respective corners, creating a self-closing dome roof. The roof is then covered in sod.

Type 1 Model F, is military grade general-purpose canvas tents with liners.

Type 1 Model G, is called Metal Conical Expandable Shelter (MCES), which is made of light weight metal and is fanned opened with the pivot point in the ceiling apex. It is placed on a concrete base and anchored with lag bolts, or it can be placed directly on the ground. The bottom has a ten-foot diameter base. These can be equipped with blast doors and ventilation systems.

Type 1 Model H, is a Concrete conical (Shot-Crete) (not Dome) structure with a forty-foot diameter bottom. These can be equipped with blast doors, ventilation systems and septic systems.

Type 1 Model I, is a Shot-Crete DOME, the shelter apex is fifteen feet high and twenty-one feet in diameter. It has windows that have internal metal blast shutters, contains an air filtering system and septic system and can have blast doors installed.

Type 1 Model J, is called a “Fox Hole” with overhead cover, that is six feet long, three feet wide and six to seven feet deep with overhead cover being logs of four to six inch diameter, covered with a plastic membrane and this is covered by at least six inches of soil.

Type 2 Model A, is a circular hole three feet in diameter and seven feet deep dug in the ground and encased with concrete, with a metal lockable lid cover. The walls have a series of re-bar steps.

Type 2 Model B, is a one-piece polymer molded unit complete with stairway. The shelter is circular, eight feet in diameter, and height at the apex of eight feet. Blast door configurations are available. It has an air filtering system, and is installed by cut and fill techniques.

Type 2 Model C, is called a Storm Shelter, is square, made of concrete and each side is ten feet. The concrete roof is sod covered, and it has an air filtering system. With simple modification, blast doors and sanitation facilities can be added.

Type 2 Model D, is a linear concrete tube. The tube diameter is ten feet, and each section is ten feet long. Thus, more can be added by placing the sections together. As a standard, these are fifty feet long, and contain two three-foot diameter vertical enter/exit shafts, or it can be fitted with a staircase leading down with right angles, or a direct horizontal access with a right angle turn. All entrance/exit portals are blast doors. These shelters are buried with at least five feet of soil covering them and contain air filtering and septic systems. Standard installations are by cut and fill techniques.

Type 2 Model E, is a linear metal circular tube. Each tube is ten feet in diameter and sections are five feet wide. It is identical to the Type 2 Model D, with the exception of using metal instead of concrete.

The various civilian shelters can be purchased and installed by individuals or companies with minimal construction knowledge if they so choose. The major intent is to have plans which the layman can construct some type of shelter for their own use.

In the event of a known ELE an average person can build some of the Type 2 shelters with nothing more than a shovel, some wooden forms and concrete. For the more complex shelters people may require heavy equipment or intensive and large amounts of manual labor, but these are shelters that can be built economically and quickly as long as people are not paying for them.

None of these shelters are designed to withstand a dedicated attack against it specifically. They are designed to provide shelter from proximity events.

Stocking Shelters

1. Citizens must bring food, water, clothing, sanitary items and some type of bedding such as blankets, sleeping bags and cots. Citizens will likely bring perishable food products, these must be eaten first.

2. Have on hand eating and cooking utensils including a wheat grinder and tortilla press.
3. Food items should focus on canned food such as canned /potted meats, vegetables, potatoes, and crackers, sacks of wheat, dehydrated milk, honey, salt and sugar.
4. If they have children, they should bring coloring books, paper, pencils and games.
5. Sanitation supplies can be simple five-gallon buckets with tight fitting lids, deodorizer, disinfectant, lime, toilet paper, feminine hygiene items, brooms and dust pans.
6. Water needs to be calculated at a minimum of two-gallons per person, per day. And this is ONLY for drinking, it does not include bathing and sanitation needs. This water can be mixed with the dehydrated milk for variation. Allow for a minimum of fourteen days ration of water per person.
7. AM/FM hand cranked power generation radios should be on hand, as well as solar powered battery charger and rechargeable batteries.
8. Pioneer tools including axes, picks, shovels, hammers, saws, manual drills with bits, nails, rope, canvas, 2x2 and 2x4.
9. Fire prevention supplies should be buckets of sand.
10. Manually cranked generators should provide power and light. Light will substantially reduce the fear and apprehension levels of the occupants. Even candles can provide some comfort, and a large supply should be kept on hand with several lighters.
11. Basic medical supplies need to be available.
12. Citizens should consider bringing weapons; generally focus on shotguns and long guns. Handguns are not overly useful in shooting game for food. They are fine for self-defense, but long guns should be the focus and naturally ammunition.

Most citizens have no clue what to do let alone what to bring. Most will simply show up and be in destitute condition. As quickly as possible, these people must be organized into a functional sub-community complete with duties and jobs to perform, supplies to be organized, and taught to function as a team. Stressing their very lives depend upon it.

Occupancy

A minimum of 10 square feet of floor area and 65 cubic feet of net volume needs to be provided per occupant, and a minimum of 6.5 feet of headroom in the central portion needs to be available.

A minimum of 3 cubic feet of fresh air per minute per occupant needs to be provided to prevent oxygen depletion and carbon dioxide buildup. The temperature must be kept around 75-80 degrees, and the volume of fresh air per minute may go well over the 3 cfm in order to keep the temperature this low. People inside a shelter will give off large amounts of heat, and it will often be necessary to increase the airflow to reduce the heat. Seldom will it be necessary to heat a shelter if it is full of occupants.

People should survey their surrounding area for field expedient shelters; however these will come with their own inherent limitations and even dangers. Some expedient shelters that could be used in a pinch include:

Large sewage lines
Storm water runoff ducts
Maintenance tunnels
Underground garages
Horizontal mine shafts
Road tunnels that may have to be sealed
Jail or prisons that have solid wall construction
Brick, stone and concrete structures (e.g. banks, government buildings, schools, fire departments etc.)

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