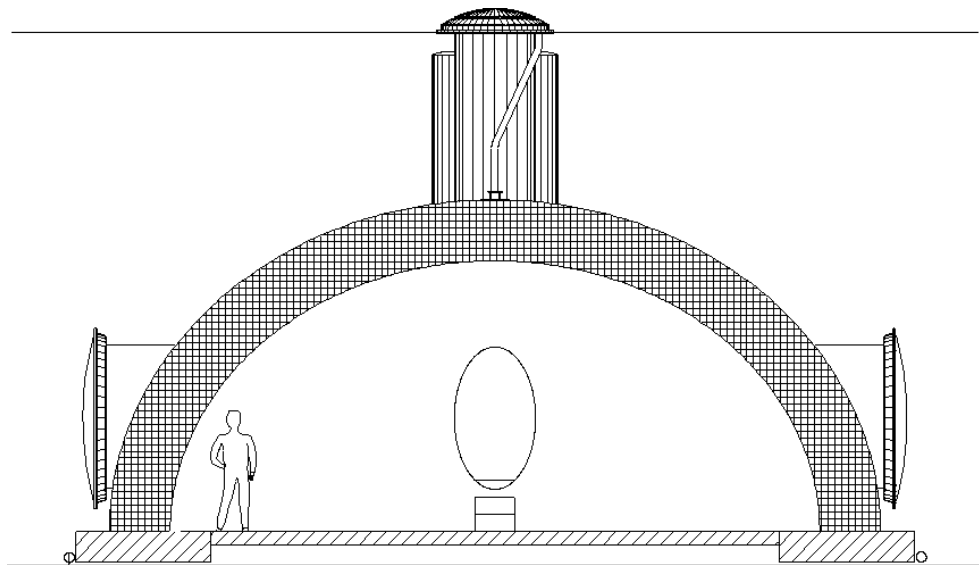
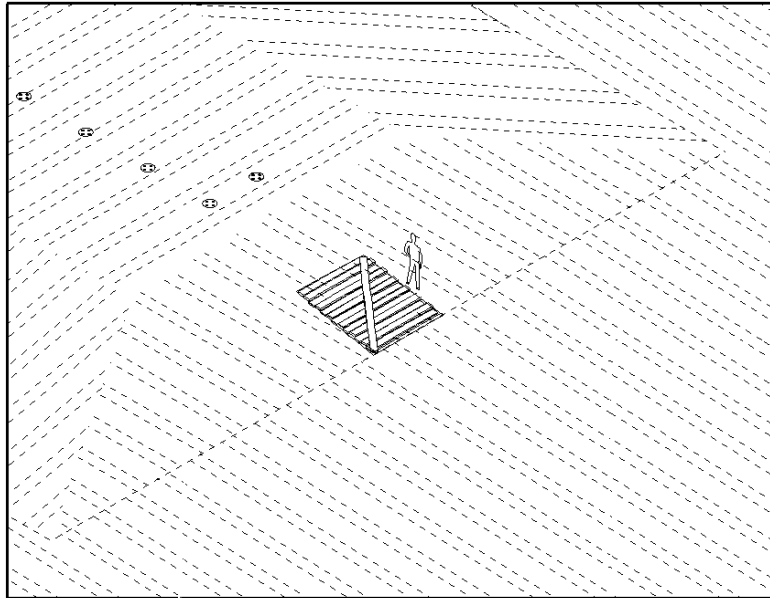


EARTHCOM 32-48 CONDO DISASTER SHELTER



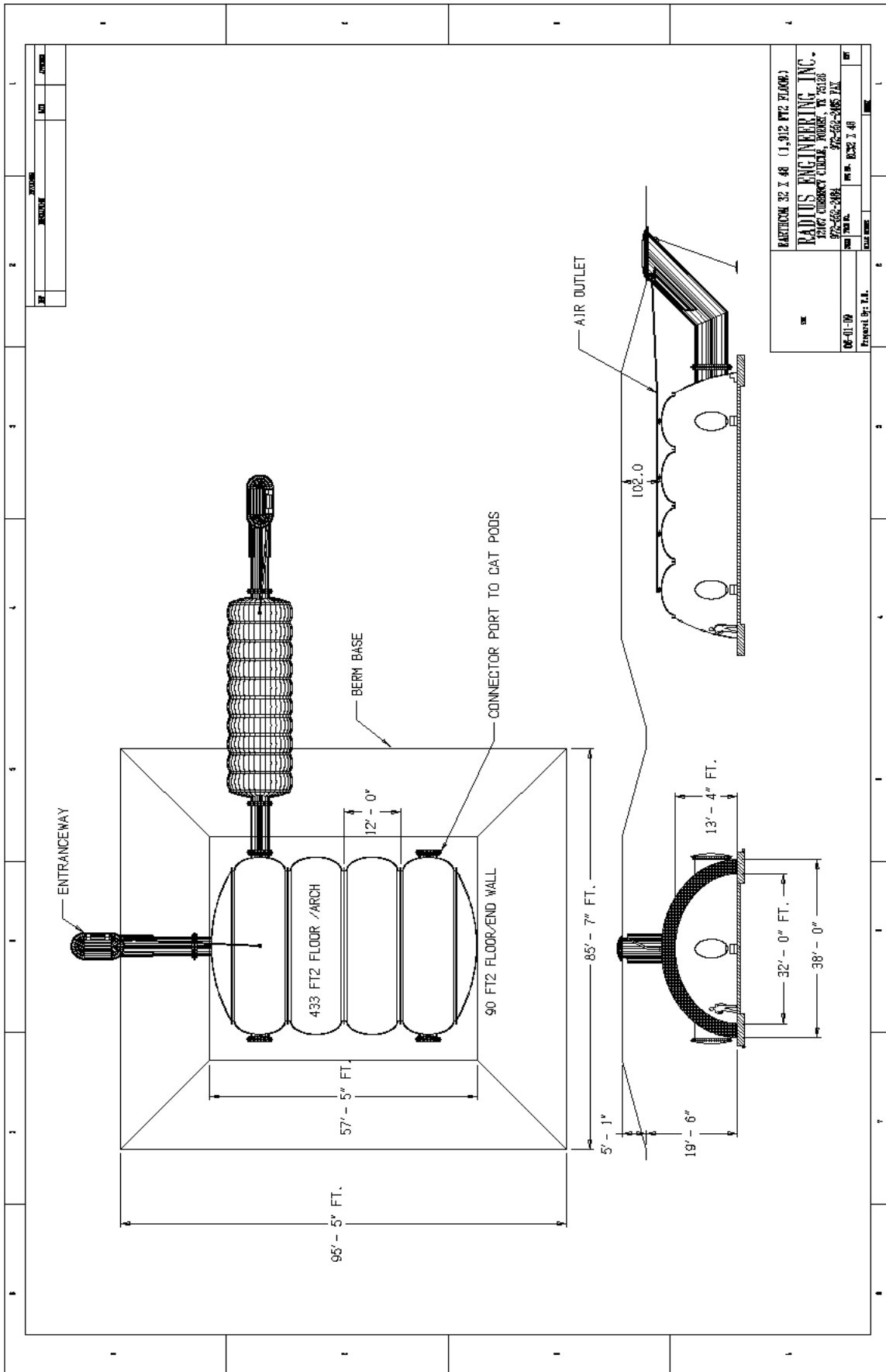
COMPLETELY SELF-CONTAINED-Long Term

- Structural Fiberglass Double Elliptical Arch
- Air Filtration System
- Toilet, Shower and Septic System
- Self-Contained Underground Power Plant
- Decontamination
- Communications System
- Lighting

PROTECTION FROM

- Tornadoes and Superstorms
- Nuclear Weapons
- Chemical Weapons/Accidents
- Nuclear Power Plant Accidents
- Nuclear/Chemical Terrorism
- Power Plant Failures
- Forest Fires and Famines

EARTHCOM 32 I 48 CONDO DISASTER SHELTER



EARTHCOM 32-48 CONDO DISASTER SHELTER

THE EC 32 X 48 DISASTER SHELTER

The EC 32 X 48 is a totally self-contained 15 psi elliptical arch condominium disaster shelter designed to protect up to 25 adults for long periods or 50 people for short durations such as during tornadoes. The arches must be assembled on site by a Radius Installer or local contractors. The product was specifically designed and developed to protect people during and after disasters such as tornadoes, hurricanes, earthquakes, storms, forest fires, power failures, nuclear power plant accidents, nuclear/chemical terrorism, and full-scale protracted nuclear, chemical and biological war. A tremendous effort has been made to think of every conceivable incident that shelterists could face in all types of disasters. Many geometrical shapes were experimented with before finalizing the EC 32 X 48. The EC 32 X 48 includes the fiberglass arches, entranceway, emergency escape, MCAS 120 life support system, plans, etc. A SCUPP 400 (Self-Contained Underground Power Plant) is usually also used for long-term shelter durations. With the EC 32 X 48's "state of the art" technology and long-term self-contained independence, it qualifies as a T.H.E.T.A. (Total Human Environment for Terrestrial Attach) underground shelter.

DESIGN

The EC 32 X 48 is a fourth generation disaster shelter designed and developed by Walton W. McCarthy, M.E., author of PRINCIPLES of PROTECTION, U.S. Handbook of NBC Weapon Fundamentals and Shelter Engineering Standards, Fifth Edition, 2002, 489 pp. The American Civil Defense Association, Draper, UT which is the United State's bible on shelter engineering and known in the industry as P.O.P. He is the principle engineer of RADIUS ENGINEERING INC., with over 31 years experience designing "high-tech" disaster shelters. The EC 32 X 48 was designed using CAD (computer aided drafting), CAE (computer aided engineering), and FEAM (3-dimensional finite element analysis and modeling). A shelterist in the EC 32 X 48 under heavy, direct effects from two 1-MT nuclear weapons, has at least the same probability of survival (99.7%) as a person living and working in peacetime. The shape of the EC 32 X 48 allows it to be a true pressure vessel for resistance to high external pressure. The EC 32 X 48 shelter system is based on 20 years field experience with McCarthy's successful P6, and P10 fiberglass underground shelters.

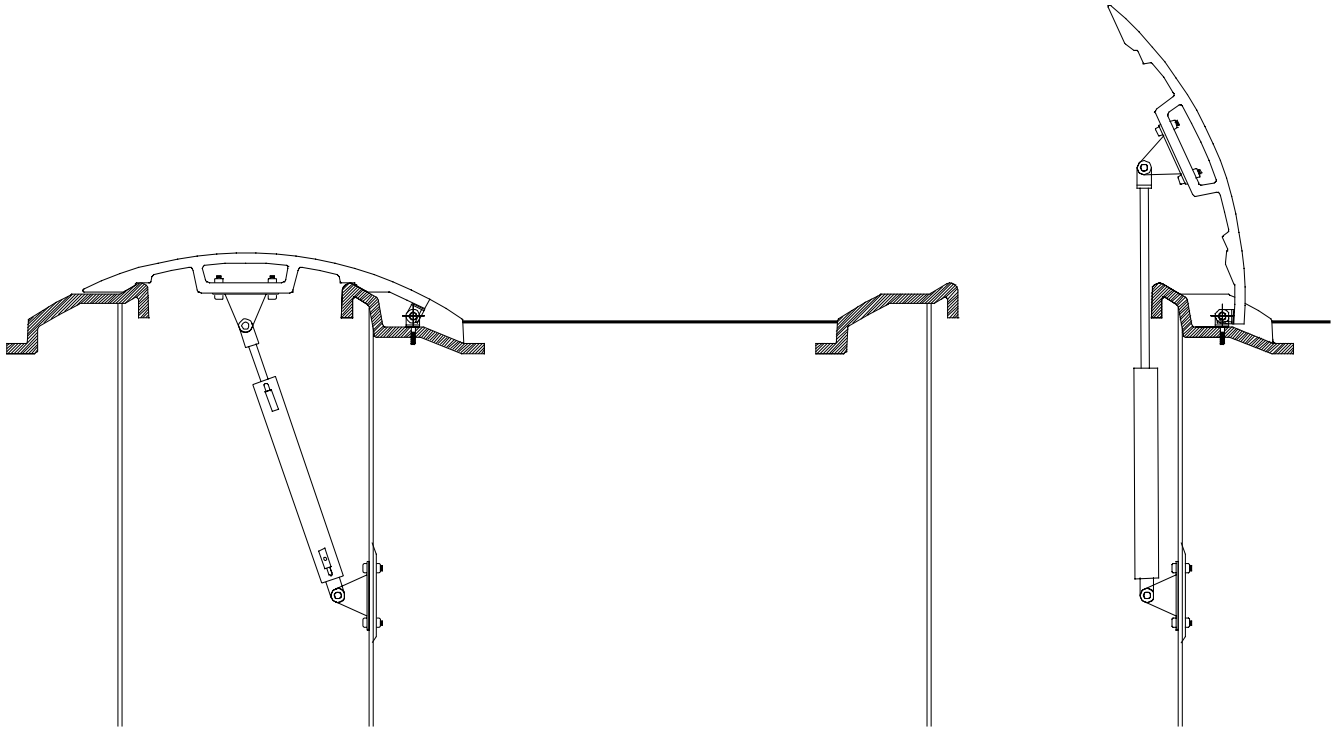
THE CONDO SHELTER CONCEPT

The "Condo Shelter" concept has some advantages over small survival shelters. 1) Shelterists can live in a normal housing environment that they are accustomed to. 2) Shelterists can enter the shelter by walking down a stairwell so they don't have to enter the shelter like a submarine and climb down a ladder. 3) Shelterists are not alone during a disaster. 5) There is enough "extra room" to deal with uninvited friends and relatives during a disaster.

EMERGENCY ESCAPE

In the event that heavy debris falls on the hatch cover and the radios are not able to bring help to clear the hatch, and the debris cannot be burned off, emergency escape procedures can be implemented. The Earthcom 32 uses a battery operated or a hand operated hydraulic pump to power a hydraulic cylinder to force the hatch open. The 12 inch long pump handle will require 100 lbs downward force to generate 14,000 pounds of uplifting force.

EARTHCOM 32-48 CONDO DISASTER SHELTER

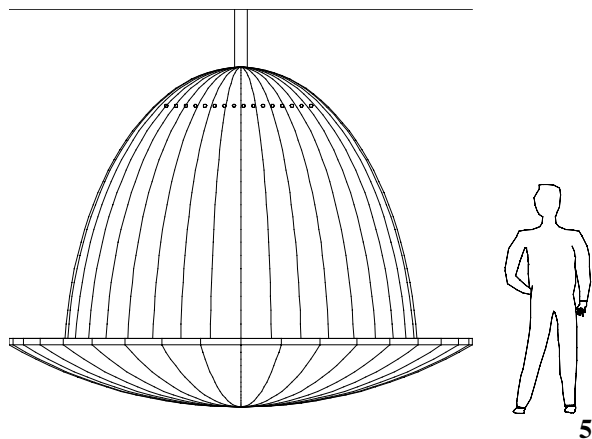


SHELTER CONSTRUCTION

The shelter and entranceway are made of structural fiberglass manufactured to the American Society of Testing and Materials, and shelter engineering standards of PRINCIPLES of PROTECTION. Fiberglass was chosen as the optimum material because of its extremely high resiliency and corrosion resistance plus its ability to be shaped into a compoundly curved structure. The 15 psi (pounds per square inch) external pressure resistance, with no earth arching, is constant over 100 years and does not have to be de-rated like steel each passing year due to corrosion. Fiberglass also forms a complete vapor barrier which provides a dry atmosphere when placed below ground, and it has proven to be sound in the underground storage tank industries. In addition, one of the greatest characteristics of fiberglass is its ability to “remain intact” if overstressed. The inside of the shelter is smooth, curved, and white to create maximum brightness with minimal light. The inside surface of the fiberglass arches are easily cleaned with common detergents and is easily repaired.

LEACHING SEPTIC TANK

The EC 32 is equipped with a high pressure 3000 gallon paraboloid underground structural fiberglass leaching septic tank. The septic tank, with 3000 useful gallons below the leach holes all around the tank, has a duration of more than two years. It is easily pumped out with a manual septic pump from the ground surface by removing the septic tank access plug. Conventional concrete box septic tanks have flat walls and are therefore not able to withstand the external pressure that the EC 32 X 48 is designed for. The fiberglass septic tank has all compound curved surfaces to withstand external pressure. It is easily installed below the water



EARTHCOM 32-48 CONDO DISASTER SHELTER

table with its integral gravity dish. The earth over the gravity dish creates more gravity force than the hydrostatic force (buoyancy) of the empty septic tank.

SHELTER FACILITIES

The EC 32-48 contains 1912 ft² and 19,200 ft³. Ceiling height ranges from 6 feet high to 13' – 3". This allows for normal living and a very spacious feeling. Fresh air enters the shelter by a high pressure reverse curve centrifugal blower delivering 120 cfm 24 hours per day. The fresh air is distributed in the shelter directly from the MCAS 120 or through conventional ducting depending on the floor plan. This supplies many times the breathing volume of air required by adults resulting in a complete air change every 2.6 hours. This system has the advantage of maintaining negative pressure in the air filtration system and positive pressure inside the shelter. This results in constant shelter temperature, constant shelter oxygen levels, constant shelter carbon dioxide levels, and constant shelter moisture levels, plus it prevents overheating in warm climates. Exhausting of hot, moist, spent air is facilitated through the air outlet manifolds in the shelter ceiling. This is the most efficient geometry for exhausting spent air and resisting intruder assaults.

AIR FILTRATION

The air is purified through an MCAS 120 or MCAS 600 air filtration system. This Multiple Chamber Air Sterilization is designed to filter air in severe nuclear-biological-chemical environments. See MCAS-120 brochure. The EC 32 X 48 Owner's Manual details specific safe procedures for replacing contaminated filter sleeves. Both inlet and outlet air manifolds have stainless screens accessible from inside the shelter.

FOOD STORAGE

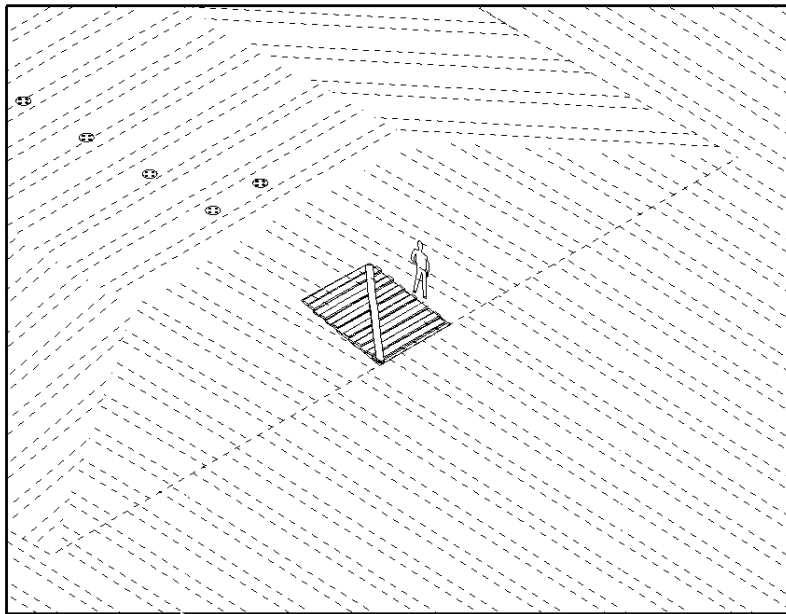
There are three methods of food storage. 1) The conventional method of storing food in common cans can be used but the nutritional value is only good for about year. This requires changing all the canned food each year. 2) Dehydrated or freeze dried food can be used which has a life span of about 25 years. 3) 5 gallon plastic food tanks can be used to store grain, powdered milk, salt, sugar, beans, TVP (textured vegetable protein), honey, etc. Each food storage tank holds approximately 20-50 lbs. of food. The material and thickness of these food tanks allows the much preferred carbon dioxide packing of food as opposed to the nitrogen packing of food. Food packed with carbon dioxide can be stored for over 25 years.

HATCH DOME

The hatch dome at ground level is aerodynamically smooth. The opening accepts large people and some conventional furniture. The hatch dome contains the hatch cover and is designed for severe impact of high speed flying debris. The angle of incidence of the hatch dome is only 10 degrees (2.1 inch rise per foot) to match the berm angle and allow flying debris to glance off. The hatch dome and hatch cover are designed to resist a non-shattering 3-inch diameter hail ball falling straight down at terminal velocity (87 mph) and impacting directly at a full 90-degree angle of incidence. The hatch dome is also designed to resist a non-shattering 3-inch diameter hail ball traveling horizontally at 150 mph. In addition, the hatch dome can resist a solid 2 x 4 wooden stud impacting the hatch dome like a battering ram or javelin at 350 mph. Some debris, depending on the size, shape, angle of incidence, and mass, may cosmetically damage the hatch dome. This can be easily repaired with fiberglass repair kits available at marine and automotive supply stores.

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| Hurricane Scale | | Cat 1 | Cat 2 | Cat 3 | Cat 4 | Cat 5 |
|------------------------------|-------|--------|---------|---------|---------|---------|
| Wind speed (mph) | | 74-95 | 96-110 | 111-130 | 131-155 | 155+ |
| Storm Surge- Ft above normal | | 4-5 | 6-8 | 9-12 | 13-18 | 18+ |
| Tornado F-Scale | F0 | F1 | F2 | F3 | F4 | F5 |
| Windspeed (mph) | 40-72 | 73-112 | 113-157 | 158-206 | 207-260 | 261-318 |



The hatch dome and cover can be camouflaged in many ways including simple 2 x 8 weathered boards. The hatch dome is made of a material called “*Combat Composite™*” which is a structural fire-and bullet-resistant laminate developed by Radius Engineering Inc. The hatch dome is also designed to protect the shelter from a fire reaching 1700°F for one hour while maintaining its structural integrity in compliance to ASTM E119. This design and material makes the EC 32 X 48 hatch is very stealthy. It produces little or no thermal signature, no metallic signature, and no radar signature. When the shelter is installed, all

that can be seen is the hatch dome at ground level. This makes it almost impossible to be detected by modern target acquisition equipment. It is designed to resist 300-mph winds and more than 8.5 on the Richter Scale. Although the hatch dome is not impenetrable, it is specifically designed to resist seven basic assaults from people trying to break into the shelter in compliance to P.O.P. Offensive measures toward intruders are reviewed in the EC-32-40 Owner’s Manual.

HATCH COVER INTERIOR AND EXTERIOR LOCK

The EC 32 hatch opens and closes hydraulically powered by a 12- volt hydraulic power unit located under the counter. The remote radio controlled transmitter has a button to open or close the hatch. When inside the shelter, the hatch can be closed by standing on the floor and activating the pocket transmitter. The hatch cover is designed to resist -5 psi (24,480 lbs.) of uplifting force caused by the negative pressure of a tornado or explosion and 40 psi (195,840 lbs) of overpressure. The average time it takes for untrained or inexperienced people to enter the shelter is approximately 5-10 seconds per person.

EARTHCOM 32-48 CONDO DISASTER SHELTER

The hatch dome and hatch cover are manufactured according to The National Institute of Justice NIJ standards from Class 0 (standard on EC 32 X 48) up to Class IV to resist penetration by various threats. The material and thickness vary as the threat level increases. The classes listed below are based on resisting 90% of all of the bullet types at various velocities listed known as (V-90). The barrel length, feet per second (fps) or meters per second (mps) for the test are noted.

| NIJ Threat Level | Hatch Material (V-90) | Threat/Bullet Type | Barrel Length (inches) | fps | mps |
|-------------------------|---|--|--|--|--|
| Class 0 | Structural Fiberglass-self-extinguishing (standard) | Light Hammer and hatchet assaults, 3 in. dia. Hail @ 87-mph vertical, 150-mph horizontal 2 x 4 stud @ 30-mph | NA | NA | NA |
| Class I | Combat Composite self-extinguishing | .22 Cal. 40 Gr. LR .25 Cal Auto 71 Gr. FMJ .32 Cal. Auto 71 Gr. FMJ .380 Cal. Auto 88 Gr. JHP .38 Cal Special Lead 158 Gr. RN .38 Cal Special 158 Gr. SWC 2 x 4 stud @ 70-mph | 6 2 4 4 6 6 -- | 1050 810 905 990 850 850 | 320 247 276 302 259 259 |
| Class II | Combat Composite self-extinguishing | .41 Mag. 210 Gr. JSP .44 Mag. 240 Gr. JSP .44 Mag. 240 Gr. Lead SWC .357 Mag. 125 Gr. JHP .357 Mag. 110 Gr. JHP .357 Mag. 158 Gr. JSP .357 Mag. 158 Gr. Hornady 19mm 175 Gr. Silvertip 9mm 124 Gr. FMJ 9mm 115 Gr. Silvertip 2 x4 stud @ 100-mph | 4 4 4 4 4 6 6 5 5 5 -- | 1300 1180 1200 1450 1550 1395 1445 1225 1175 1170 | 397 360 366 442 473 425 441 372 358 355 |
| Class III | Combat Composite self-extinguishing | 7.62 NATO Ball 150 Gr. M-80 steel Jack 7.62 NATO Ball 150 Gr. m-80 FMJ 30.06 PSP 180 Gr. .30 Carbine 110 Gr. FMJ 12-Gauge Rifled Slug .223 (5.56mm) 55 Gr. FMC 7.62 x 39 Ball 2 x4 stud @ 200-mph | 28 28 24 18 18 20 22 22 22 -- | 2750 2750 2750 1950 1550 3075 2400 | 838 838 824 595 473 938 732 |
| Class IV | Combat Composite self-extinguishing | 30.06 A.P. M-2 7.62 mm NATO A.P. 308 Win SS 109 FN NATO .223 (5.56mm) 7.62 x 39 Russian/Chinese A.P.I. 2 x4 stud @ 350-mph | 26 24 20 22 -- | 2850 2750 3090 2550 | 868 838 942 778 |

EARTHCOM 32-48 CONDO DISASTER SHELTER

SHELTER DEFENSE

The EC 32 X 48 is not impenetrable but is difficult to break into while shelterists are inside.

| INTRUDER ASSAULT | EC 32 X 48 RESISTANCE |
|--|---|
| 1. Intruder trying to break into hatch using sledgehammer, hatchets, and guns. | Class 0 Hatch resists light hammer and hatchet assaults Class I-IV Hatch resists all assaults |
| 2. Intruder trying to clog the air intake/outlet to suffocate the shelterists thus forcing them outside. | Shelterists can open up hatch and reach over to unclog air intake or wait in safety in the shelter for many hours in sealed shelter atmosphere while the intruder is exposed to the outside danger. |
| 3. Intruder trying to suffocate shelterists by creating fire on top of the hatch thus forcing the shelterists outside. | All classes of the hatch are resistant to fire and the shelterists can breath normally inside the shelter based on sealed shelter atmosphere. |
| 4. An intruder trying to run over the shelter or hatch with an automobile or truck. | If this vehicle becomes a threat, the Emergency Escape Manway can be used. |
| 5. An intruder trying to drown shelterists by forcing water or gasoline into the air inlet/outlet manifolds. | The air inlet and outlet manifolds are baffled to prevent this type of assault. The fluid simply drains into the ground. |
| 6. An intruder trying to attach rope onto the hatch or air manifolds to damage or pull out of ground. | The hatch dome is a smooth design with no projections to easily attach to. |
| 7. An intruder using a cutting torch to cut the hatch open. | The hatch is impervious to a cutting torch. |
| All attacks above | Release of tear gas through hatch. Details are available only to actual customers. |

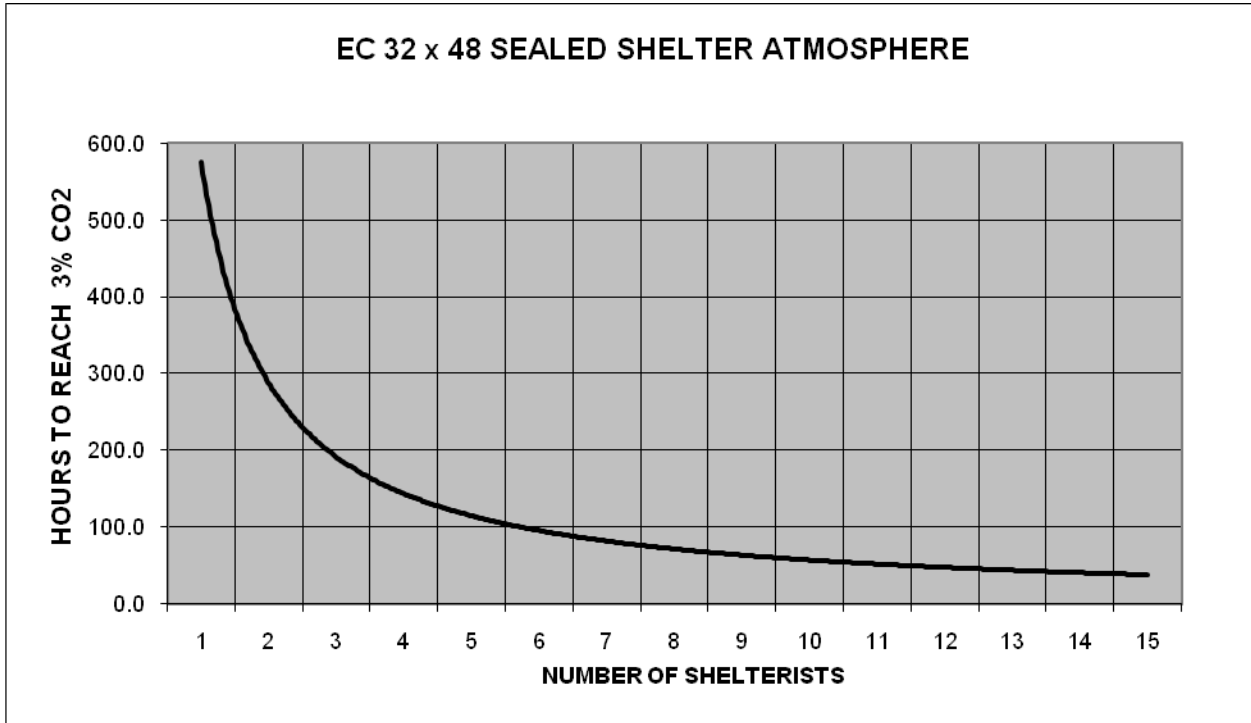
SEISMIC JOINT

The entranceway is connected to the shelter fiberglass end wall by a fiberglass seismic joint. The entranceway is subject to ground shock and frost heave and responds to these forces differently than the shelter. A triple axis seismic joint is therefore employed to allow the entranceway free and independent movement from the main shelter in three directions plus translation. The entranceway is located within the frost line, while the shelter is well below the frost line. This creates tremendous stresses during winter months when the entranceway is forced up 0.5 - 1.25 inches due to frozen ground. The seismic joint removes these stresses by allowing movement of the entranceway while maintaining structural integrity and water tightness during ground movement and ground shock.

SEALED SHELTER ATMOSPHERE

When ground fires are present around the hatch, the air blower should not be turned on to bring in fresh air. During this time, the shelterists must breathe in a *sealed shelter atmosphere*. The safe duration time is based on a 3% carbon dioxide (CO₂) limit. The time it takes for the shelter atmosphere to reach this limit is a function of the number of shelterists, degree of physical activity of the number of shelterists, and the volume of the shelter above the floor. This duration is shown above for adults performing mild work.

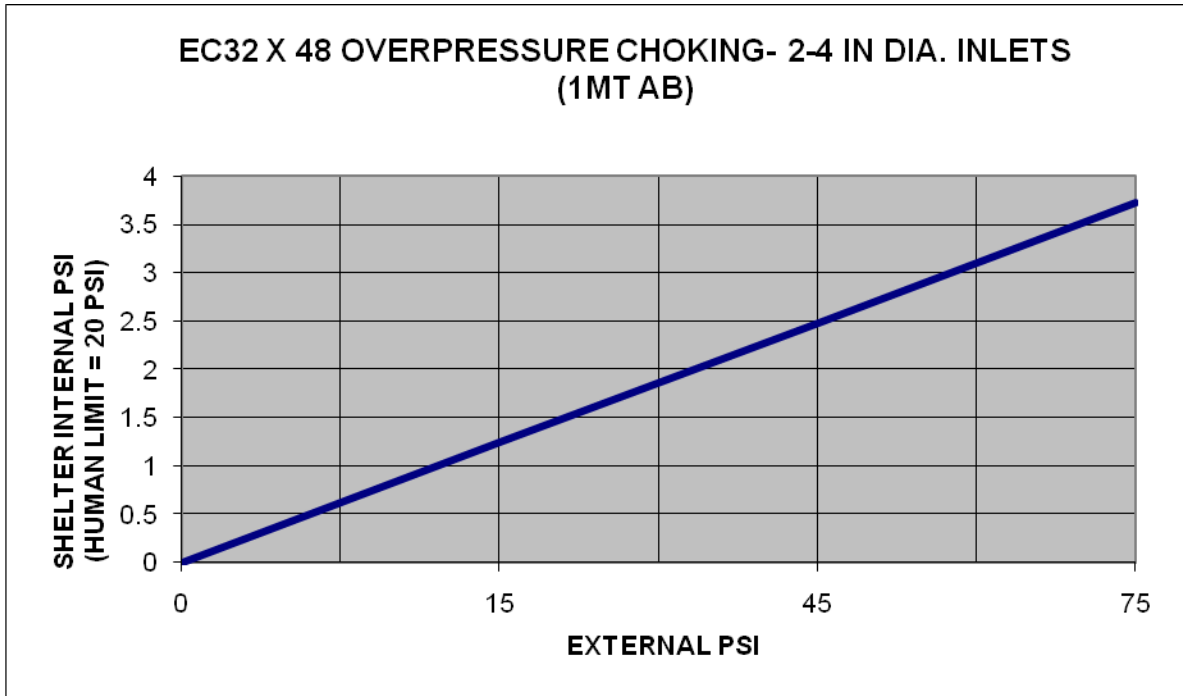
EARTHCOM 32-48 CONDO DISASTER SHELTER



OVERPRESSURE CHOKING

The EC 32 X 48 does not use blast valves. Instead, it uses the “overpressure choking” which has no moving parts. The inlet air pipe and outlet air pipe are sized to prevent excessive pressure from developing inside the shelter during a nuclear blast. This is a combination of what is known as the Ideal Gas Law combined with Bernoulli’s Law. These two theories combined, state that two volumes of air (outside air volume and shelter air volume) with differing pressure will reach equilibrium or "equilibrate" over a period of time. This period of time depends on the level of overpressure, volume of the shelter, diameter and length of the air inlet and outlet pipe, resistance of air filter, and duration of the overpressure which is very short and constantly decreasing. Simply stated; the air inlet and outlet are sized so that there is not enough time for the two volumes of air to equilibrate. The outside pressure at maximum duration is simply not able to equilibrate through sixteen 6-inch diameter air outlet manifolds, two air inlet manifolds, and two generator exhaust manifolds within the overpressure duration time.

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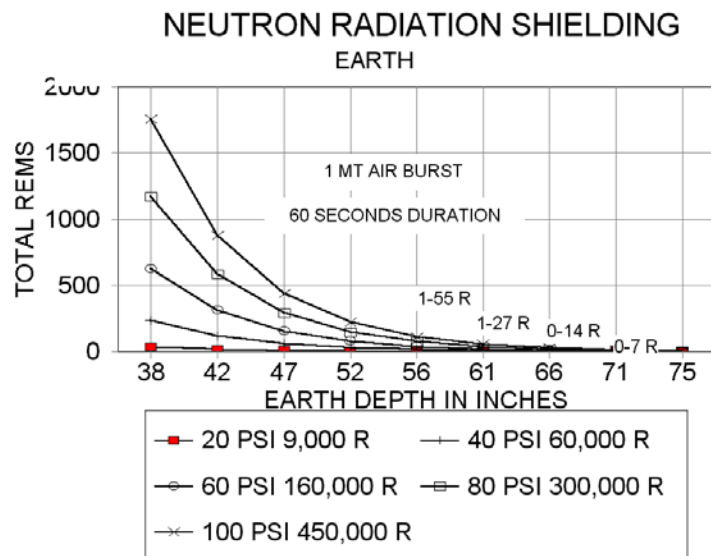
PLUMBING SYSTEM

The EC 32 X 48 uses a conventional plumbing system with toilets, sinks, shower, and septic system. The sewage and all gray water is pumped up to the leaching septic tanks by electrical high pressure pumps.

Fittings- Two NPTF fittings are located in the hatch dome so HAM and Scanner antennas can be installed from inside the shelter. Plugs are provided to be in place when antennas are not in place.

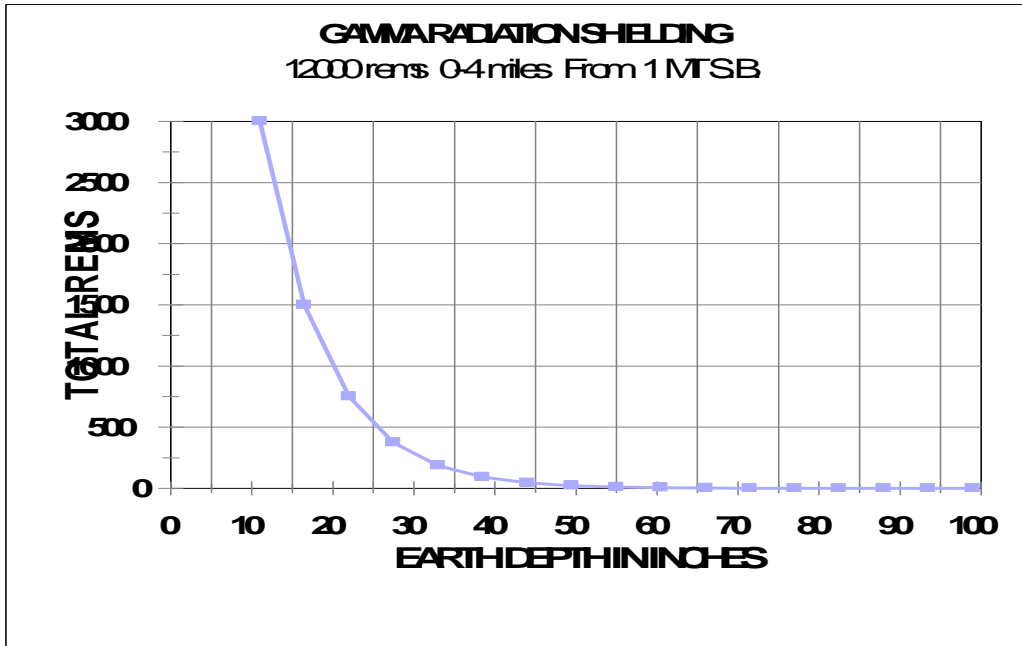
RADIATION SHIELDING

Radiation shielding from overhead in the EC 32 X 48 is provided by a minimum of 8.5 feet of earth at the crown of the shelter ceiling. With a TRS (Total Rems in Shelter) of 1-15, (1 rem @ 15 psi) a person would receive a maximum acute radiation dose from overhead and through the entranceway for neutron and gamma radiation equivalent to a mammography x-ray. This dose is based on a 500 KT air burst nuclear weapon, which produces a higher neutron radiation dose than the larger MT weapons, plus fallout doses from a 1 MT surface burst nuclear weapon to maximize the fallout gamma radiation dose.



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Based on the worst cancer cases (leukemia) from the Hiroshima and Nagasaki victims, a 10-rem dose may increase the cancer rates from the current rate of 352/100,000 up to 355/100,000. It should be kept in mind that the Hiroshima victims were totally unprepared and uneducated. They were malnourished and already suffering from many diseases during a critical wartime period where food, medical supplies, and other necessities were in short supply. In addition, they were not only exposed to heavy, acute external radiation doses but also internal radiation doses from eating contaminated food and inhaling radioactive fallout. Educated shelterists can avoid such damaging effects and can determine the radiation levels with a simple radiation survey meter.



HYDROSTATIC PRESSURE

When the shelter is installed under a full water table, the hydrostatic pressure (buoyancy) will reach 1,198,080 pounds if the water table rises to the ground surface. This hydrostatic force is resisted by earth above the shelter. When the shelter is installed with no berm with a full water table, the earth will develop 1,501,920 pounds of gravity per arch over the four arches. If the shelter is installed with a 5 ft berm, the gravity will be much greater. The total gravity forces exceed the total hydrostatic force by 1.2 making the shelter stable in high water table area. Each end wall dome adds 93 ft² to the floor plan and generates 38,681 lbs hydrostatics pressure and the earth over this dome provides 81,520 lbs of gravity.

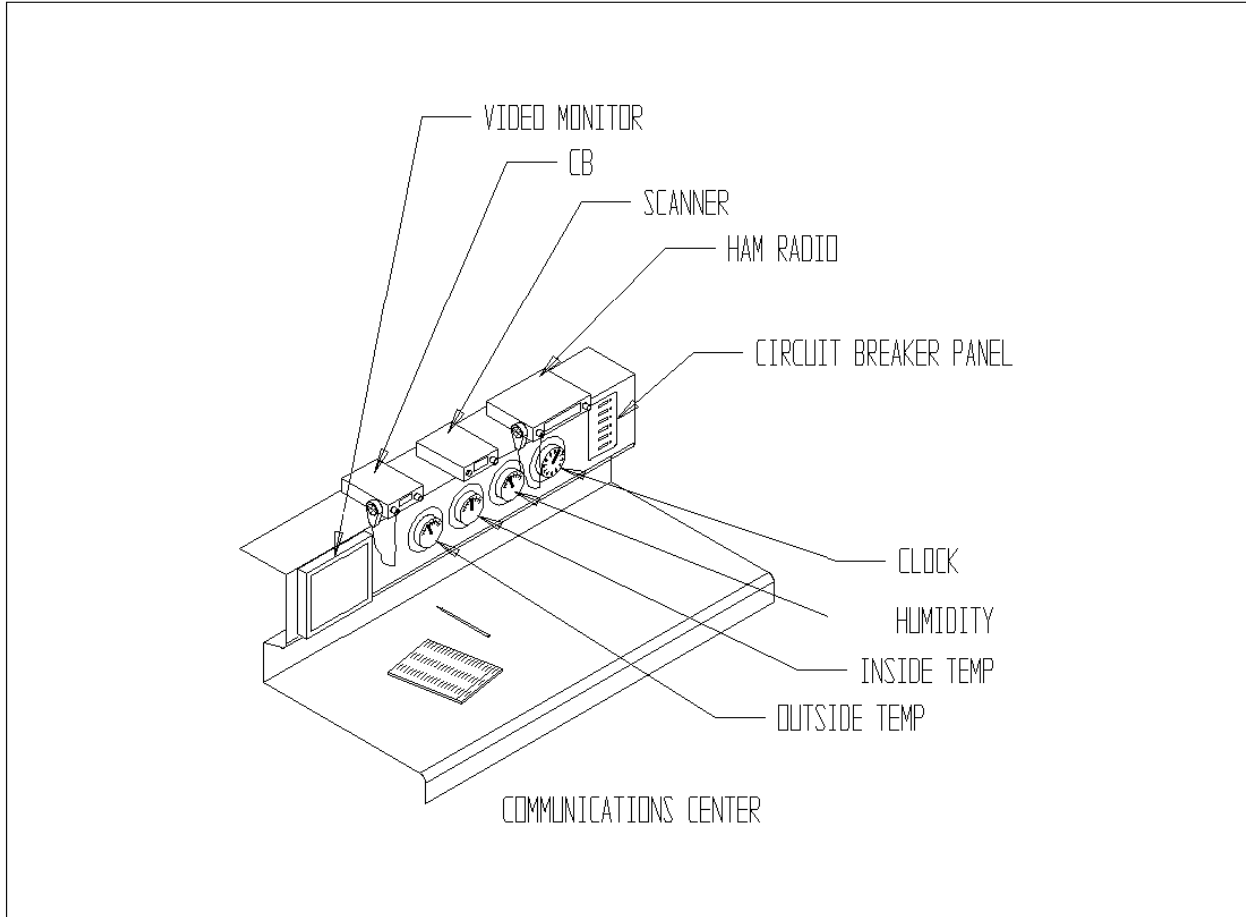
WATER TIGHTNESS

The floor of the EC 32 X 48 is located up to 19'-6" below ground level. This results in 8+ psi of water pressure at the base of the shelter. To insure that the shelter remains dry, a perforated pipe is installed all around the perimeter of the footing which is connected to a sump pump in a sump well located at the base of the entranceway. When water in the sump rises, the sump pumps automatically pump any water up to the surface away from the shelter.

EARTHCOM 32-48 CONDO DISASTER SHELTER

COMMUNICATIONS

The COM Center allows communications from various sources. The scanner allows scanning of frequencies for AM, FM, police, highway patrol, aircraft, search and rescue, weather, fire, business bands, etc. The HAM radio allows direct communications for local and very long distance, the video monitor allows views of the shelter exterior, the gages report inside temperature, outside temperature, humidity, and time.



INSTALLATION AND SHIPPING

U.S. citizens have a legal right to install a shelter. Under the second amendment of the United States Constitution, U.S. citizens are guaranteed the right to bear arms to provide protection in life threatening situations. Tornadoes, earthquakes, nuclear, biological, and chemical warfare fall under this amendment as life threatening forces. A disaster shelter falls under this classification as a defensive arm. It will require 5 low bed tractor trailer loads to deliver the arches, end walls, entranceway, and septic tank to the job site.

EXCAVATION

A contractor is hired to dig a hole with a base dimension of approximately 44 ft wide x 60 ft long x 20 ft deep (2,000 yd³). The top dimension should be at least 8 feet wider all around. At this depth, the shelter with 8.5 feet of earth over the shelter crown will result in the shelter berm being 5 ft. above ground level. The excavation will require approximately 3 days. A 64,000 pound excavator or larger should be used to dig the hole.

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A crane or excavator is used to lift the EC 32 X 48 arches off of the truck and onto the slab for assembly. If the shelter is located in a flood zone, the shelter should be installed by berming at a height above ground so the hatch is at least one foot above the 100-year flood plain or storm surge. Berming can also be used if the shelter is installed in a location which has ledge.

SHELTER ASSEMBLY (summary)

1. A **local surveyor** inspects the shelter site and determines the 100 year flood plain or storm surge. It is this level that will ultimately determine the depth of the hole. The surveyor marks the corners of the hole and the location of the septic tank.
2. **Temporary fencing** is installed all around the perimeter of the site to prevent children or animals from falling into the hole.
3. An excavator is used to **dig the hole** with a truck ramp. This will require the excavator to load into a dump truck to move the spoil away and out of the hole.
4. The **well** is drilled per plan using a rotary drill, not the hammer type.
5. A contractor pours the **concrete footings**.
6. A concrete contractor pours the **floor**.
7. A **24 hour security** guard service is employed on site to watch the site during the next 30 to 60 days while the concrete is curing.
8. **Arches and end wall domes are delivered.**
9. One **end wall dome is craned off the truck** and gaskets are applied. The end wall is then craned into position at the far end of the slab and bolted to the footing using a concrete drill and bolts supplied.
10. One set of **arches are craned off the truck** and bolted together. Gaskets are applied and the arch is craned into position and bolted to the end wall dome and then to the concrete footing. The process is repeated for the rest of the arches.
11. All **inside materials** such as lumber and sheet rock for the inside partitions, and tile are delivered and placed in the center of the floor.
12. The end dome with the entranceway and seismic joint are craned off the truck, gaskets are applied and the end wall dome is craned into position and bolted to the arches and footing.
13. The **entranceway** is craned into place and bolted to the end wall dome.
14. Install **entranceway tie down cable** and gravity dome.
15. **Perforated pipe** is positioned around the perimeter of the concrete footing and connected to the sump well on the entranceway. The **sump pump underground hose** is connected and curled up and laid out to the discharge location. Gravel is placed over the pipe and under and over the sump pump discharge hose.
16. **Install video cables** –run underground cables to video camera position.
17. **Check** the video cables, septic hoses, sump hose are connected and laid out.
18. The shelter is **backfilled** with sifted spoil and crushed stone in 2 ft increments and tamped with a Jumping Jack style compactor or wheel compactor. Only crushed stone should be in contact with the structure. This will require an excavator and small loader. The sump pump hose, video cables, and septic hose will have to be adjusted constantly as the backfill level rises..
19. When the backfill reaches near the crown of the shelter the **air outlet manifolds** and seismic joints are installed.
20. **Backfill** continues per berm plan in 2 ft. increments and compacted.
21. A small dozer is used to **grade** the berm to plan.

EARTHCOM 32 - 48 CONDO DISASTER SHELTER

22. An excavator **digs septic hole** 16 ft wide, x 16 ft long x 14 ft deep. The septic tank is put in place using the excavator and leveled and the plumbing is connected. Crushed stone (60 yd³) is placed all around the septic tank. Earth is placed over the crushed stone leach bed and graded.
23. Excess **spoil is spread around** the area and graded with the dozer.
24. Wild grass **seed** and fast growing grass seed is spread all over the berm and over the septic tanks.
25. **Fresh air blower and ducts** are installed and made operational with HEPA filter.
26. Carpenters **frame all walls** inside the shelter.
27. Electricians **install all wiring**.
28. Plumbers **install all plumbing** including water system from well.
29. **Sheet rock** is installed and taped and finished.
30. **Painting** walls and ceiling
31. **Flooring** is installed, tile only, no wall to wall carpet. Brick can be used in the central hall.
32. **Install doors**, windows, and all trim.
33. **Cabinets** are delivered and installed.
34. **Electricians and plumbers finish**.
35. **Radius check-out** and SATS (surface attack trials).

SHELTERS BUILT ON SITE VS. COMMERCIAL SHELTERS

Advantages of purchasing a commercial underground shelter:

- 1) With shelters built on site, cost overruns are the rule, not the exception. Many well-intended handymen and contractors have constructed shelters which ended up running well over budget and still did not produce an operable shelter. When a shelter is built on site using conventional technology, you really don't know what you will end up with. The EC 32 X 48 shelter allows people to deal with known costs and a proven shelter system.
- 2) Shelters built on site require extensive, time consuming, and expensive research to develop a "shelter system" capable of providing dependable life support—fresh filtered air, blast protection, clean water, light, corrosion resistance, toilet facilities, air filtration for radioactive fallout, chemical and biological agents, etc., all of which should meet - PRINCIPLES of PROTECTION, U.S. Handbook of NBC Weapon Fundamentals and Shelter Design Standards, by Walton McCarthy, is available for \$75.00 from The American Civil Defense Association, (TACDA) Draper, UT (800-425-5397). Even good architects or mechanical and civil engineers, do not have the expertise to develop a good dependable shelter system especially when it must function without local electricity. The EC 32 X 48 shelter system is based on the ES10 and P10 shelter, which has over 15 years proven field experience and complies with all P.O.P. standards.
- 3) Shelters built on site require a building permit and confirmation by a local professional engineer because it involves actual construction, including a septic design. The EC 32 X 48 is a commercially available, professionally engineered disaster shelter with a formal Owner's Manual reviewing all operations. If required, it is much easier to secure a building permit for installing and assembling the EC 32 X 48 shelter than it is for constructing a shelter on site.
- 4) Shelters built on site often require many days or weeks to complete construction. During this time, children are exposed to the danger of falling in the hole and curiosity seekers are afforded ample time to see what is being constructed. The EC 32 X 48 can be installed and bermed in approximately 6 weeks.

EARTHCOM 32-48 CONDO DISASTER SHELTER

- 5) Shelters built on site have no established market value. The EC 32 X 48 has a known commercial value which allows financing by banking institutions.

WARRANTY

Radius Engineering Inc. Warranties that the fiberglass parts of the EC 32 X 48 Disaster Shelter will not leak, corrode, or structurally fail for a period of 20 years provided that 1) the shelter is not exposed to excessive overpressure 2) The structural parts of the shelter are not modified 3) The shelter is inspected, off-loaded, assembled, backfilled and installed in accordance with the company's installation instructions. The warranty does not apply to the parts and equipment that Radius Engineering Inc. does not manufacture. These items are covered by the individual manufacturers. Radius Engineering Inc. is continuously improving its product and therefore reserves the right to change any specification without notice. Our liability under this warranty shall be limited to, at our option, repair of the shelter, or delivery of a replacement shelter to the point of original delivery, or refund of the original purchase price. We shall not be liable for any indirect or consequential damages, labor, or installation costs.

EC 32 X 48 TECHNICAL DATA

| 1 MT AIR/SURFACE BURST | *Notes | Units | 20 psi | 40 psi | 60 psi |
|--------------------------------|--------|---------|--------|--------|--------|
| Distance From Ground Zero | ~1 | miles | 1.4 | 0.85 | 0.7 |
| Radiation Dose-Neutron | ~2 | rems | 9000 | 60000 | 160000 |
| Radiation Dose-Initial Gamma | ~3 | rems | 3250 | 20750 | 45000 |
| Radiation Dose-Fallout Gamma | ~4 | rems | 12000 | 12000 | 12000 |
| Overhead Dose-Neutron (inside) | ~5 | rems | <1 | 2 | 5 |
| Overhead Dose-Gamma (inside) | ~6 | rems | 2 | 4 | 7 |
| Radiation Dose-HEPA (inside) | ~7 | rems | 0 | 0 | 0 |
| Entranceway Gamma+Neutron | ~8 | rems | 2 | 5 | 14 |
| Emergency Escape Tunnel | ~8 | rems | .13 | .33 | 0.9 |
| Maximum Blast Wind | ~8 | mph | 410 | 800 | 1200 |
| Total Rems In Shelter-at away | ~10 | rems | 4-20 | 11-40 | 26-60 |
| Shelter Internal Pressure | ~11 | psi | 1.3 | 2.4 | 3.2 |
| Displacement-Horizontal | ~13 | inches | 0.57 | 1.25 | 1.41 |
| Seismic Equivalent | ~14 | Richter | 8.5 | 8.5+ | 8.5+ |
| Probability Of No Excessive OP | ~15 | % | 96.2 | 96.8 | 97.1 |

* PRINCIPLES of PROTECTION, U.S. Handbook of NBC Weapon Fundamentals and Shelter Engineering Standards, Fifth Edition, 2002, 489 pp.

EARTHCOM 32-48 CONDO DISASTER SHELTER

EC 32 X 48 SPECIFICATIONS

| | |
|--|---|
| Air blower life | 40,000 hours, 2 backup blowers |
| Air blower type..... | 8in dia. Reverse curve centrifugal |
| Air blower volume..... | 120 cfm @ 1 in S.P. |
| Air filter..... | HEPA 99.99% @ .3 u |
| Air filter-carbon-activated residence time | 0.4 sec |
| Air filter-carbon-Whetlerite residence time..... | 0.4 sec |
| Air Outlet Manifold..... | 4 in dia. (4) |
| Antenna Fittings | 1 and 1.5 inch NPTF accessible internally |
| Arch beam dimensions | 32 ft inside span, 13'-3 " high, 12 ft wide |
| Arch and end wall assembly time on site..... | 3 days |
| Arch weight | 18,000 lbs x 4 |
| Backfill material required | gravel or ¾- in. crushed stone 100 yds |
| Berm Slope..... | 0-10 deg. |
| Capacity-adults..... | 25 |
| Ceiling Height | 6 to 13-'3" |
| Door Outside | elliptical hatch dome-Radius |
| Earth Berm Cover at crown..... | 8.5 ft |
| Emergency escape manway | manual hydraulic pump-14,000 lb lift |
| Entranceway size | 4 x 7 ft ellipse |
| End wall dome..... | 9000 lbs each |
| Fire resistance..... | ASTM E-119 1 hr @ 1700 F. mechanical |
| Floor material | concrete |
| Floor space | 1912 ft ² |
| Gravity..... | 1,501,920 lbs no berm |
| Hatch exterior lock | special |
| Head room..... | 6 ft min, |
| Hatch Dome/Hatch Cover | Combat Composite™ |
| Hull material..... | structural fiberglass |
| Hydrostatic pressure (buoyancy) | 1,098,080 lbs |
| Implosion type..... | non-catastrophic |
| Installation time..... | 1 month |
| Interior color..... | white, flame of 25-50 Type II, ASTM E84 |
| Land Size Min. | 100 x 100 (1/4 acre) |
| Life support duration | 30 days to 4 years depending on SCUPP model |
| Lighting | 110 volt LED |
| Max .wind..... | 300 mph |
| Outside electrical connection..... | thru hull coupling |
| Outside phone connection | thru hull coupling |
| Outside water connection | thru hull coupling e |
| Outside sewer connection..... | thru hull coupling |
| Outside video connection | 4 for 360 view on monitor-supplied locally |
| Overpressure – allowable | 15 psi |
| Sealed shelter atmosphere- | see graph |
| Septic Tank..... | 3000 gallon external fiberglass paraboloid |
| Septic lift station..... | ½ hp supplied locally |
| Shape | double elliptical compound curved beam |
| Shipping weight..... | 80,000 lbs. ,five trucks |
| Stairs..... | 9.5 in tread, 9.5 in rise |
| Sump Pump | 0.4 HP stainless 20 gpm@25 ft |
| TRS (Total Rems in Shelter) | 1-15 |
| Volume-Total | 19,200 ft ³ |
| Volume per shelterist..... | 25 shelterists- 768 ft ³ |

EARTHCOM 32-48 CONDO DISASTER SHELTER

Water heater electric 30 gal supplied locally
Water supply 5 gpm 110 v submersible pump supplied locally
Water Tank..... 20 Gal internal pressure tank supplied locally

EARTHCOM 32-48 CONDO DISASTER SHELTER