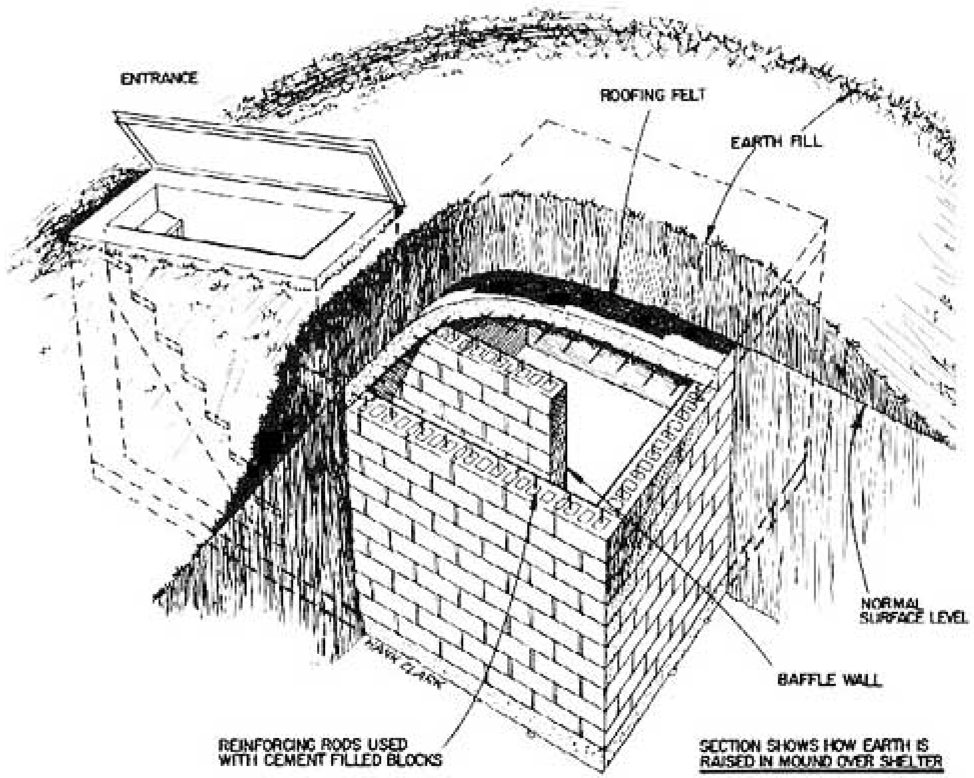
Thanks to: "The Practical Handymans Encyclopedia "

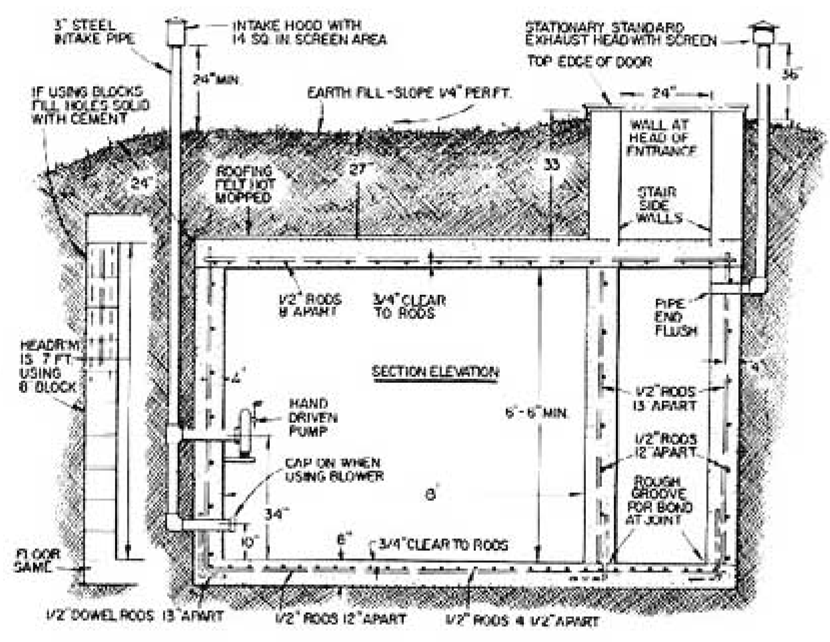
How to Build a Bomb Shelter

Some good suggestions that'll make your job an easier one

If you should want to build your own shelter, how would you go about it? First of all, you need a sharp pencil and a lot of paper. Shelter plans are designed for the average person. You are not the average person. You have special needs,and your shelter will he better suited for you if you design it for those needs.OCDM plans are excellent, but let them be a guide only .You must decide what type of shelter fits your individual needs. Each type of shelter has its own type of plans and problems.

Finally, you should make a tour of all suppliers for bids. You will find prices vary from place to place.If you live in or near a large city, check with local wrecking companies. These places offer excellent buys in good used materials at prices far below new products. Check all material for nails and termite damage. Also with all suppliers, have them include delivery,prices with the materials. Many of these items are much too heavy or bulky to be carried by car. Some suppliers deliver free. Others make a charge for every delivery. If the latter is the case, plan your purchases to lower the number of deliveries.





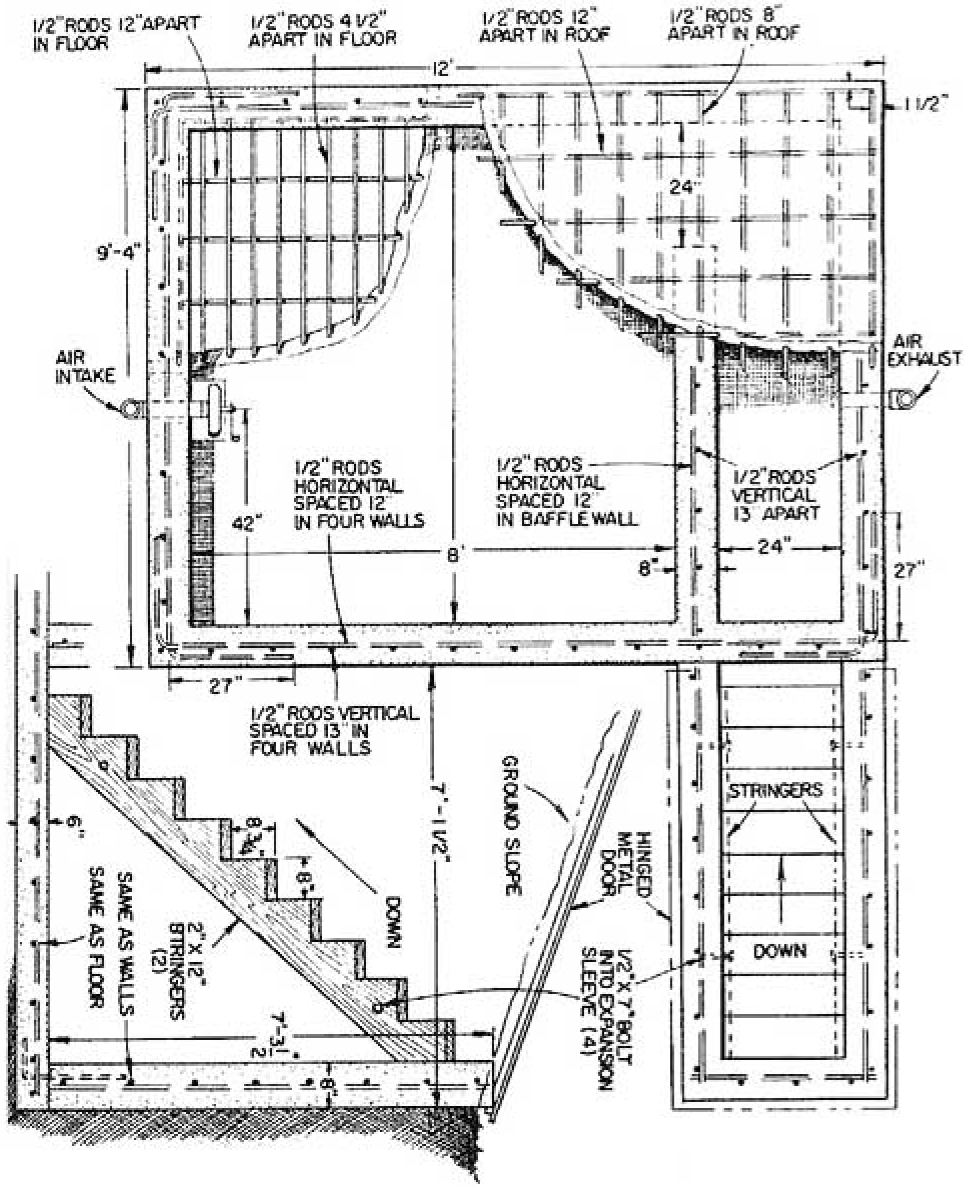
No matter what type of shelter you build, working with concrete will be a major part of the construction. Concrete block are probably the easiest material to use in shelter construction because of their ease of handling and good protection factor. Poured concrete slabs can also be used, with heavy half inch steel rod embedded, for strong roof and wall sections of a shelter, but for the average do-it-yourselfer, it is much easier to build these sections of block and to brace them from within the structure. It is also much cheaper. Standard size for a cinder block is 8x8x12 inches. Solid concrete blocks in standard size is 4x8x16 inches, although many other sizes are available, or you can cut these to a size that is needed. In figuring number of blocks needed, don't forget to allow for space mortar will fill in a series of blocks. A good rule of thumb for walls is that a wall eight blocks high will give you a ceiling just over six feet above your head. A footer row of blocks will be your first problem in building with blocks. If this first row of blocks is to be laid on a cement floor, such as you would have in building a basement shelter, a keyway or slot must be cut in the present basement floor with a chisel. This is cut the width of a cinder block and then dug out to accommodate all but the top of a cinder block. After the keyway has been cleaned out, a layer of black polyethylene 6 mil insulation material should be laid to prevent moisture from seeping up through the floor. Cut this material so it will cover the bottom and both sides of the keyway! and leave an inch or so above the floor level.

Mortar is then poured along this keyway and the first set of blocks set into place. This will make a secure lock for your walls foundation. Many states require that the footing for a block wall be poured as one continuous operation. Additional locking for walls can be had by knocking a hole into the existing basement wall at the end of each row of blocks put up. The end block of each row is then mortared into the existing wall by about half its length.The footer for a row of blocks set into the ground is done much the same way, except it is advisable to place at least two blocks below ground level. This will make walls more secure than using a shallow footing. Mortar used in all concrete construction for a shelter should be a mixture designed for earthquake areas: 1 part masonry cement 1 part portland cement 4-6 parts mortar sand. To mix your mortar, work all the dry ingredients together thoroughly in the proportions above. Then slowly add a little water and mix some more. If too heavy, repeat. It is better to use too little water than even a little bit too much. When ready for use, the mortar should be a workable plastic mixture. If the mortar dries a little faster than you are using it, add a little more water as you need it, and remix. A good test for your mortar is to put a shovel full aside from the mix, and if it stands alone without spreading, and no water runs off, your mortar should be just right.

Don't try to economize on mortar. One fellow used the dirt he was taking from the site of his shelter for the second part of his mix. It was much too coarse. and his project met with disaster. You can build a mortar box for mixing from a sheet of plywood. It is just as cheap and more conveniene to mix in a wheelbarrow. When ready, the mortar can be wheeled to your working site A hoe will be the easiest too to use in making your mlx.Another tool you must have is a long mason's level. Every block you lay must be checked to make sure it is level. Every row of blocks must also he tested to make sure they are level. A 2x4 can be used to tap several blocks down evenly and neatly.Once your footer, or base, for all your walls is in place, and level, you are then ready to start your wall up in rows.

Start laying your first row at a corner, not on the end of a footer row. Place the blocks in the opposite position of the blocks on the footer row. This will put the mortar seams above a solid part of the block below, not above another seam. Alternate the position of the blocks like this in every other row. If your row does not come out the exact length desired, don't worry. Merely trim part of the last block in a row with a mason's hammer. As the row of blocks goes up, use you'll level along the vertical line of the wall to make sure the rows are straight. Excessive mortar should be scraped off blocks with a trowel as soon as possible.A neat job of making a professional-looking joint between two blocks can be done by making a "V" in the mortar with a stick. As the walls to your shelter go up you can get more radiation protection by filling the holes in cinder blocks with dirt. This may not be needed in a basement shelter, but in other types it is highly desirable. Now is the time to use some of the dirt you excavate from your yard. When you have reached the top row of your shelter's wall, either the basement or other types, you can now put inthe supports for your ceiling.

The ceiling will have a great amount of weight, so more than a normal amount of supporting must be done. Steel beams are best, placed close together, as many as you can afford. Next best are wooden beams of at least 2x6. Two 2x6 beams nailed together and set onthe row of blocks will make a support 4 inches wide and six inches high. Spaced four lnches apart, and braced together with lumber, these beams will make a strong support. All space around the ends of the beams on the block wall are then filled with mortar to the top of beams.You are now ready for the first layer of your roof. The easiest thing to use for this is two layers of 1inch plywood sheets. It would be better if these were nailed to the supports. but if you can't reach the centers in a basement shelter you can nail them down along the edges. The weight of the next layer will hold them in place.



On top of the plywood, lay two rows of solid conclete blocks (4x8x16), to make a radiation shield 16 inches thick. These blocks are merely laid tightly into place.There is no need to mortar them together.Inside support for walls can be had by bolting 4x4's up the entire height of the wall. Let the top ends of these vertical supports wedge under the roof supports. If this job is done before mortar has completely set it will be much easier to position bolts and they will be locked tighter into the wall by the still wet mortar. These vertical supports can also be used later to hang bunks and storage shelves, but make certain plenty of support under these additions is provided to keep strain off wall support, and thus defeating their purpose. Basement shelters have some special design problems of their own. If doors and windows in the basement are blocked by sandbags, air filtering for this type of shelter will not be necessary. To provide a good air supplier, leave a row of small holes along the second row of wall blocks from the floor level. Also, a second false wall, to act as a radiation baffle, can be construct a part of the shelter across the door. This can be left open to allow passage of air. When planning your basement shelter, try to make it a dual-purpose room. If head room is sufficient, a TV room, playroom, den, or darkroom can be had by adding inside paneling to the walls. The size of a basement shelter is not too important. It will depend upon how much of your basement you are willing to turn over for this purpose, and upon how many people must be sheltered. A 10 x10-foot shelter is designed to accommodate six people. Earth covered shelters present a number of probiems that are not met in the construction of a basement shelter. Let us look at each of these problems separately:

(A) Excavate or Tunnel? If your house has a basement this will be the first decision you must make. Should the shelter be attached to the house through the basement, or should it be completely away from the house. The preshaped shelter which is built at least partially above ground be- cause of a high water table or a rock condition to solve the problem for you. It would be most difficult to connect it with the house basement. The underground shelter is a different matter. Here you have a choice. Actually, it makes little difference. It might be more convenient to attach the shelter to the basement by means of a connecting tunnel, but your shelter will be just as effective wlth an outside entrance. An inside entrance from your basement, however, will probably be a little cheaper to build. The method you use to dig out the ground for your underground shelter may also cause you to ponder. You can either removre the dirt from above ground, by digging down, or you can tunnel below ground from your basement. You may want to tunnel if you don't want to tear up the lawn, or if a number of large trees are over the spot you elect for a shelter. If you do tunnel, be extremely careful about cave ins. Shore up as you work and tunnel only small areas at a time. This method will be much slower and will cost some more than cutting down from the surface. If you do dig down from the surface you can do the work by hand, but it will require a lot of shoveling and time.If the extra money is unavailable, it would be much faster and less labor involved to hire a tractor scoop to come in and do the job within a few hours time. Any connection you may decide to make between your house and your shelter, such as air vents, water lines, or electricity, should be put in place before dirt is replaced.

(B) Heat: A small wood burning stove in your shelter would be ideal to supply heat and for cooking. A hot water heater type available from Sears or Wards would be a good choice. But in either an underground or basement shelter, a stove of this type must be vented to keep fumes from filling the shelter. A vent pipe should be run out of the shelter before construction has been completed, if a stove is considered. The outside of the vent pipe should have a gooseneck hood to prevent radioactive fallout from coming down vent pipe. Aluminium vents would be better for underground use because of rusting danger with other metals. To prevent a fire hazard make sure vent pipe does not touch any wood.

(C) Water: This item of survival is your most pre~io~s one. Men have lived for days without food, but only for hours without water. A simple, yet excellent supp~y of water can be had by driving a pipe down throu~h the floor of the shelter until water is reached. Then fasten an old fashioned hand pump to the pipe. But don't forget to have several gallons of water on hand to prime this type of pump. You must pour water down from the top and pump it back up to start the operation of the pump. A pump of this type can be had from either Sears or Wards.

(D) Waterproofing and Drainage: This is the problem common with all earth covered shelters. You must keep water from seeping or running into the shelter after heavy rains or melting snows begin. If you do a careful preventive job while your shelter is under construction, you should not have a problem. There are three lines of attack against moisture. You should use all three: 1. Ditching: Around each wall of your shelter, dig a trench one foot wide and one foot deep. Fill this trench with six inches of gravel and rock. Then, from each corner of the shelter, run clay drain pipes for at least S2X feet away from foundation. Make sure you slant them down and away from your foundation. If you dig a hole at the end of each rain and fill this with rock, it will also help. 2. Paint: Special waterproofin~ paint should then be applied to both the inside and outside surfaces of the walls3. Vapor Barlier: Black polyethylene 6 mil insulating plastic sheets can help stop water from entering through the floor and loof. As a final touch these cracks.

(E) Roof: With a combination of weight from earth and concrete blocks on it. An earthcovered shelters roof must be extra strong. It must also be waterproof. The same roof as was outlined for the basement shelter can be used here for maximum blast and radiation protection, but at least three feet of earth must also cover it. Supports for this roof must be at least equal to those described for the basement shelter. Added strength can be gained by running another concrete wall through the center of the shelter for added center support of the roof. Over the solid concrete blocks a large sheet of black polyethylene should be laid, with the edges overlapping the edge of the blocks by at least a foot. On top of this place sheets of corrugated aluminium of at least .019 inches in thickness. Steel would do as well, but would rust Before dirt is filled in on top of shelter,add another layer of polyethylene.

(F) Air: When the door of an underground shelter, or the door on a preshaped earth-covered shelter closes, radiation is closed out, but so is the vital air supply needed for human life. Some means must be provided to get safe ventilation to the people inside these types of shelters. Plansissued by the OCDM for shelters of this type provide for the intake of fresh air through vertical pipest reaching upward through the roof of a shelter. Attached to the end of the vent, inside the shelter, is a hand-operated blower to suck the air into the shelter through filters. There is a question, however whether these projection air vents would not be snapped off in the high winds and pressures that would be encountered near a 20-megaton blast. It is not until you get 15 miles away from such a blast that the winds subside to 80 mph speed that is considered dangerous in a hurricane. Pressure from the blast at this range will be down to 2.3 psi. The situation is much better at 20 miles where winds are then down to 40 mph a mere breeze when compared with those encountered from 15 mph on in toward the blast. Pressure at 20 miles has also dropped to about 1.3 psi.

Official Atomic Energy Commission tests held in Nevada in 1950 showed that in the area where pressures reached 30 pounds per inch, a one-half-inch pipe was bent to the ground and the valve handle, stem, and bonnet were blown off. At the same locationt two 4-inch ventilating pipes were sheared off just below ground level. Pressures up to 30 plsi are encountered from a 20-megaton blast up to three miles away from ground zero. vertical vents on shelters as shown in CD plans, would have a good chance of being cut off or bent to the ground, leaving the occupant of the shelter with no air supply. If your shelter is to be located within 20 miles of a potential target, it seems prudent to this author that the owner of such a shelter install a type of ventilating system that would be protected from such hazards. A system of retractable vents would work nicely, but the Atomic Energy Commission has advised that the cost for a safe system of this type would be much too high for the average shelter owner.

A relatively inexpensive method for providing air through a ventilating system safe from high winds and pressures is an underground type. By using a natural embankment, or making one at the edge of your yard, you have a vent come into your shelter under the ground. This vent is of the type used on hot-air furnaces, and it can be made of aluminium by any metal shop. Aluminium should be used to prevent rusting of the buried unit. A large diameter pipe could also be Used but there are two reasons for the rectangular type. A coal chute door of steel can be attached to the outside end of the vent. This can be shut from the inside during the most severe conditions; it can then be opened from the inside to allow air to enter the shelter. It will also accommodate a fiberglass filter used on furnaces. You can have the vent made as large as you like, but a 20x25-inch opening should be the limit. Of course, the larger the Vent the larger the air flow. The entire vent system is braced at least three feet underground by a frame of 2x4's. Attached to the frame is a series of pulleys for opening the steel door from inside the shelter by a 4-inch steel rope. Another steel rope runs down inside the vent to close it.

Another use for the vent might be for an emergency escape hatch, in the event the shelter door was damaged by blast, or was blocked by debris. The steel rope, normally used to close the steel vent door, would then be used to allow a person to pull himself up through the vent. The vent would enter the shelter near the floor level, and a similar vent, near the ceiling of the shelter, could be used to carry off stale air, smoke, or fumes. This second vent could easily be a round stovepipe made from aluminium, and available from suppliers ready made. The exhaust vent should also have an air filter on it, too. The outside ends Or all vents should be shielded from above to keep fallout from coming down the vents line. Fallout particles are about the size of an average drain of salt or sugar, reduced in size from one tenth to one half. They are in the shape of small spheres of teardrop shaped cinders or ashes. These particles settle to earth the same as dust and enter the same places dust can. To keep these specks of radioactive dust from enteringthe shelter with pure air, a filtering system is needed. Filters of glass fiber block or other fibrous material is very effective for this job. Inexpensive filters of fiberglass that are used for a home furnace are of this type. Filters are also commercially available which have been designed for shelter use. A blower, either hand operated or electrically driven can be attached in the shelter to pull air in at a faster rate than will normally flow into the shelter.

(G) Doors: The door of your shelter must he considered one of the most important pieces of equipment for the shelter. In a quote from the Atomic Energy Com- mission points this out "This is the first line of defense against blast and radiation; failure to lock the door could be disastrous.The size and the type of door you pick for your shelter will depend upon several factors, but whatever your choice is, you must pick a steel door that can be locked from the inside by some type of bolt, and it must be hung in a steel and cement frame.The door is all important!