ASSISTANT SECRETARY OF DEFENSE
WASHINGTON 25, D. C.

CIVIL DEFENSE

Dear Mr. Difford:

It has been a pleasure for this office to have had the opportunity to assist you in the development of your fallout shelter plans.

The attached drawings show designs which meet the criteria established by this office for fallout shelters:

1. Family fallout shelter - underground type - six persons - DFPA August 15, 1961 - dwg. no. FPS 1.

2. Family fallout shelter - basement type - six persons - DFPA August 15, 1961 - dwg. no. FPS 2.

3. Family fallout shelter - aboveground type - six persons - DFPA August 15, 1961 - dwg. no. FPS 3.

The Douglas Fir Plywood Association is to be commended for its outstanding efforts which we are certain will help in a significant way to emphasize and accelerate the fallout shelter program that is such a vital part of civil defense.

We look forward to continued cooperation between the Douglas Fir Plywood Association and our office in furtherance of the fallout shelter effort.

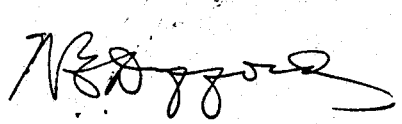
Sincerely,

Steuart L. Pittman

Mr. W. E. Difford
Executive Vice President
Douglas Fir Plywood Association
1119 A Street
Tacoma 2, Washington

PREFACE

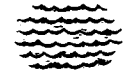
This folder is intended to present, in a clear understandable manner, facts that may save your life in the event of a nuclear attack on the United States and to remove many of the unwarranted fears associated with such an attack without creating a sense of complacency. ■ You will find that it consolidates information from many public organizations such as the Office of Civil Defense, which will answer the nagging questions posed by the prospect of a nuclear catastrophy such as: □ seventy-five percent of the casualties in a nuclear attack would be caused by radioactive fallout following the explosion. *Initial blast, heat and radiation may not pose the greatest threat;* □ what is necessary in the way of food, equipment, and shelter if you are to survive; ■ a complete outline of shelter sanitation procedures; □ how a shelter can be ventilated without exposing your family to fatal doses of fallout. ■ Our best defenses as well as the best deterrents against an enemy attack are a *well informed population* and properly designed shelters. ■ One purpose of this guide is to present the facts about radioactive fallout and associated problems – without hysteria – in the hope that they will help to save the lives of you and your loved ones if a nuclear war should occur. ■ Secondly, this guide shows how Douglas Fir Plywood can be used in constructing three types of family fallout shelters that are financially feasible for the average American family.



W. E. DIFFORD
Executive Vice President
DOUGLAS FIR PLYWOOD ASSOCIATION

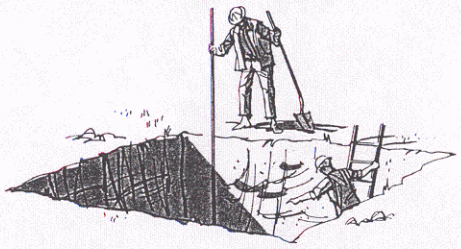
PLAN FPS 1

DFPA PLYWOOD UNDERGROUND SHELTER

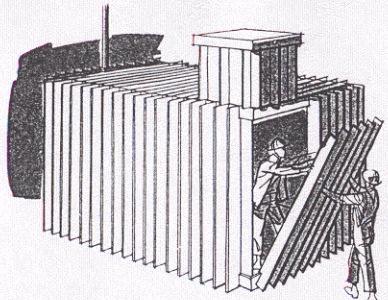
PERFORMANCE – The DFPA Underground Shelter illustrated and detailed on pages 17 and 18 (fold-out) was designed to provide maximum fallout  protection. It offers good protection against blast and thermal effects. ■ With 3 feet of earth cover, its protection factor of 5,000* places the Underground Shelter high in O. C. D. Category A (see page 13). It would offer adequate fallout protection from the heaviest possible attack. ■ This shelter will provide better blast protection than the Above-Ground or Basement Shelters. Assuming a 20 megaton nuclear bomb, one of the largest current weapons, the blast protection of this shelter would be adequate if it were located 7 or more miles from ground zero. The Underground Shelter would not be ignited by thermal radiation from such a blast. This shelter has adequate strength so that cars can be driven or parked over it in normal use without damage. ■ Anyone contemplating an underground shelter should consider the possibility of a high water  table or ground water seepage. For the DFPA shelter, a joint system was designed utilizing special nails, glass fiber tape, and liquid Thiokol. This system was laboratory-tested under a 10 foot head of water. Then, to be absolutely certain, an Underground Shelter was fabricated and installed – intentionally in an area of extremely high water table. In use, the shelter has been subjected to a 7 foot head of water, with no leakage. Outriggers were incorporated in the design to prevent the shelter from "floating" out of its excavation. ■ The prototype shelter includes approximately 65 square feet of livable area – adequate for a maximum of six persons  according to O. C. D. research findings. This shelter can easily be expanded by inserting additional 4 foot panels. ■ Underground shelters are not normally dual-use structures, the exception being the case where the shelter is installed adjacent to the basement in new home construction. Then it is as utilitarian as a basement shelter. In some areas of the country, this shelter could be used as a tornado

**Assumes fallout is dumped from hatch cover. (See Decontamination of Structures, Page 11.) If this is not done, the protection factor is 1600, still easily in Category A.*

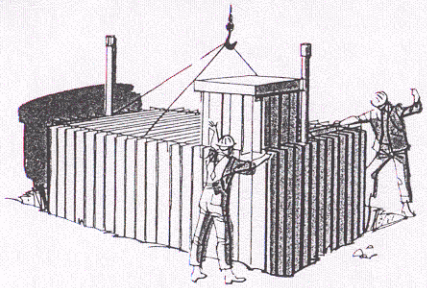
or hurricane cellar. ■ **CONSTRUCTION**—This shelter was designed as simply as possible, using a minimum of material sizes and types. Only 8 foot lengths of 2"x8" lumber and 4'x8' sheets of ½" Exterior type Douglas fir plywood are required. For lasting protection against wood-destroying insects and decay, both lumber and plywood are pressure-treated with wood preservative under American Wood Preservers Association specifications. Government tests on wood treated with waterborne salts, exposed in the ground to severe decay and termite conditions, show a durability in excess of 20 years. **It should be emphasized that dip or brush treatments of preservative are not adequate for this exposure.** ■ Special nails have been specified both for holding strength and to prevent leakage at the nail holes. ■ The DFPA Underground Shelter has been panelized so that it can be readily mass-produced. Thus, local Plywood Fabricator Service firms, Lu-Re-Co prefab or pre-cut home manufacturers, or other specialty manufacturers, may add family fallout shelters to their products. Or, they can be shop-built by carpenter contractors. Detailed shop drawings for this shelter are available for fifty cents from the Douglas Fir Plywood Association, 1119 "A" Street, Tacoma 2, Washington. This shelter may be beyond the ability of all but the more ambitious "do-it-yourselfer." ■ **INSTALLATION** – Installation of the shelter is a simple "One-shot" operation. An excavation contractor or septic tank installer can bring the shelter, already set up, to the site, excavate, lower the shelter into place, and backfill. Or the panels can be assembled by a contractor in the excavated hole. ■ **COST** – In-place costs for the underground shelter will vary because of different labor rates; also, soil and site conditions affect excavating costs. However, based on experience with the prototype, an in-place cost of $1400-$1500, including forced-air ventilation, may be considered for a contractor installation. ■ **A POSSIBLE VARIATION** – In some instances, where it may not be practical to excavate an 11 foot hole for an underground shelter it is still possible to have a maximum protection shelter by installing the Underground Shelter partially above ground, as illustrated in inset at top of page 18. This system offers blast and fire protection and essentially the same fallout protection as the underground installation, with a minimum of excavation, lowering the in-place cost by perhaps $200. This enables a maximum protection shelter to be built where a rock strata lies close to the ground surface, or where ground water conditions make excavating and waterproofing difficult.



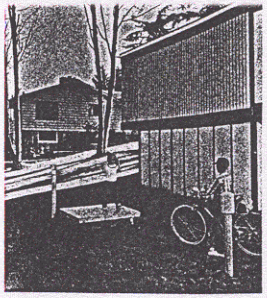
Excavation for underground shelter is nearly eleven feet deep and calls for professional help such as a septic tank contractor or builder who has a backhoe or other mechanical equipment.



Installation of underground plywood shelter offers a wide variety of options: may be trucked to site ready to install; assembled on-site and lowered into excavation; or assembled in the hole.

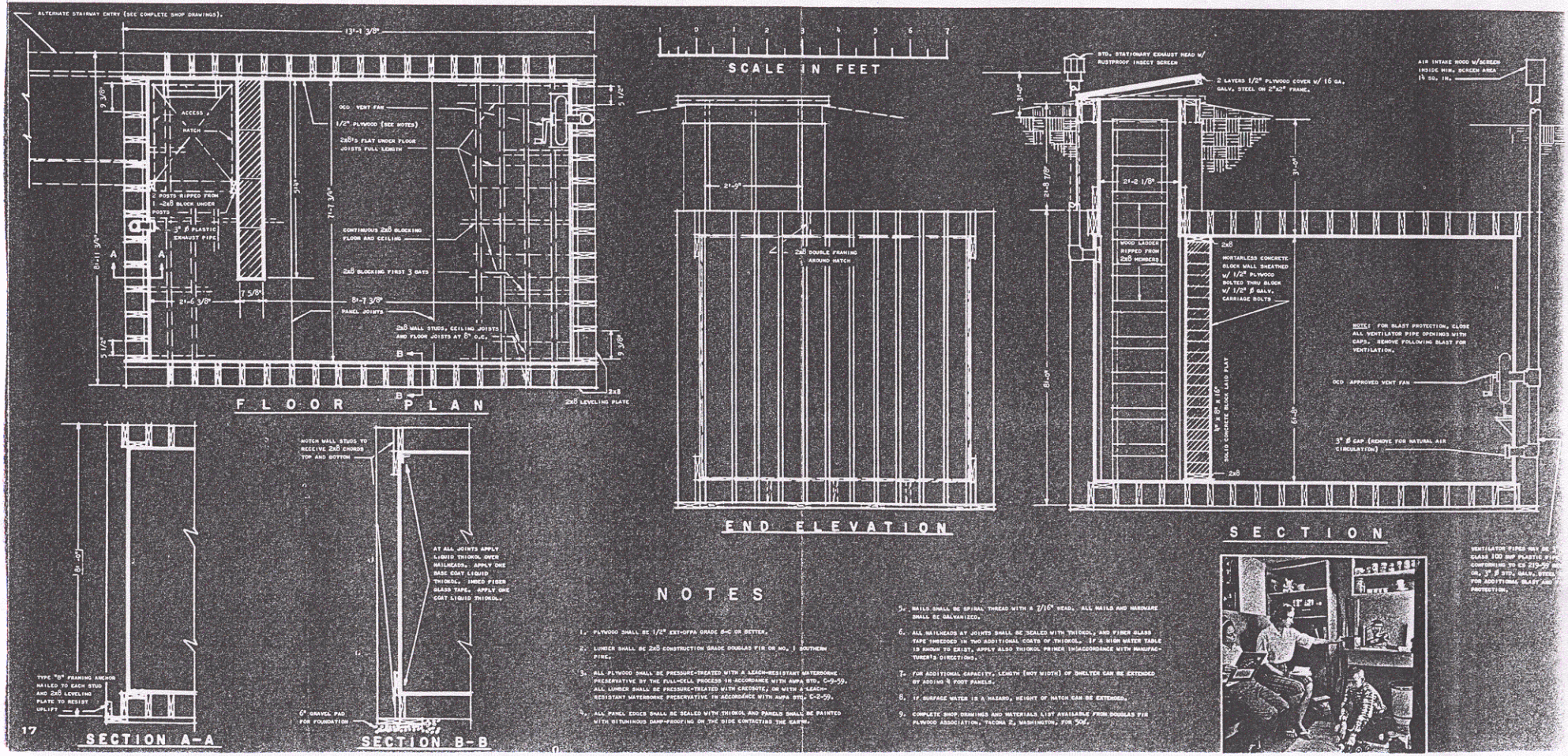


Relatively light weight of the assembled shelter makes it easy to assemble outside the excavation and lower into place with a backhoe – backfilling and covering the roof can then proceed immediately.



The underground shelter causes least disturbance of house and grounds; only visible components are the hatch and two vent pipes. This shelter can be installed inconspicuously in nearly any yard.

Above-ground version underground shelter described on page



NOTES

1. PLYWOOD SHALL BE 1/2" EXT-DFPA GRADE B-C OR BETTER.
2. LUMBER SHALL BE 2x8 CONSTRUCTION GRADE DOUGLAS FIR OR NO. 1 SOUTHERN PINE.
3. ALL PLYWOOD SHALL BE PRESSURE-TREATED WITH A LEACH-RESISTANT WATERBORNE PRESERVATIVE BY THE FULL-CELL PROCESS IN ACCORDANCE WITH AWPA STD. C-9-59. ALL LUMBER SHALL BE PRESSURE-TREATED WITH CREOSOTE, OR WITH A LEACH-RESISTANT WATERBORNE PRESERVATIVE IN ACCORDANCE WITH AWPA STD. C-2-59.
4. ALL PANEL EDGES SHALL BE SEALED WITH THIOKOL AND PANELS SHALL BE PAINTED WITH BITUMINOUS DAMP-PROOFING ON THE SIDE CONTACTING THE EARTH.
5. NAILS SHALL BE SPIRAL THREAD WITH A 7/16" HEAD. ALL NAILS AND HARDWARE SHALL BE GALVANIZED.
6. ALL NAILHEADS AT JOINTS SHALL BE SEALED WITH THIOKOL, AND FIBER GLASS TAPE IMBEDDED IN TWO ADDITIONAL COATS OF THIOKOL. IF A HIGH WATER TABLE IS KNOWN TO EXIST, APPLY ALSO THIOKOL PRIMER IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS.
7. FOR ADDITIONAL CAPACITY, LENGTH (NOT WIDTH) OF SHELTER CAN BE EXTENDED BY ADDING 8 FOOT PANELS.
8. IF SURFACE WATER IS A HAZARD, HEIGHT OF HATCH CAN BE EXTENDED.
9. COMPLETE SHOP DRAWINGS AND MATERIALS LIST AVAILABLE FROM DOUGLAS FIR PLYWOOD ASSOCIATION, TACOMA 2, WASHINGTON, FOR 50¢.

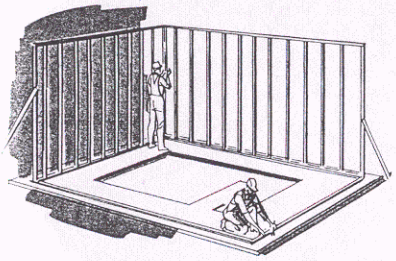
VENTILATOR PIPES ONLY 36" 3" CLASS 100 SDP PLASTIC PIPE CONFORMING TO ES 219-59 OR 3" ø STD. GALV. STEEL FOR ADDITIONAL BLAST PROTECTION.

PLAN
FPS 2

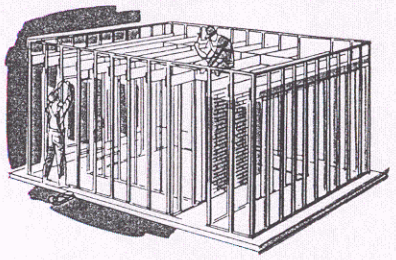
DFPA FIR PLYWOOD BASEMENT SHELTER

PERFORMANCE – This shelter, illustrated and detailed on pages 21 and 22 (fold-out) was designed to provide substantial fallout protection at low cost. ■ Basements in themselves offer some protection. Assuming frame house construction with brick veneer walls and a fully excavated basement, the plywood Basement Shelter has a calculated protection factor of about 200  (O. C. D. Category C). This would give about 20 times the protection of the basement itself (protection factor approximately 10). With this shelter many lives would be saved even in the areas of heaviest fallout. ■ The same Basement Shelter built in the below-ground corner of a daylight basement with two walls above ground has a calculated protection factor of about 150. This offers 30 times the protection of this basement itself (protection factor approximately 5). ■ Structurally, the shelter is designed to withstand severe earthquake loadings and, of course, the imposed dead load. It does not have the blast and fire resistance of the DFPA Underground Shelter. An ordinary frame house  (and consequently its basement shelter) would probably "weather" the blast of a 20 megaton explosion centered 15 miles or more away. Resistance of the house itself to conflagration within this area would be problematical. It is doubtful if the shelter would be usable if the house is destroyed. ■ The plywood Basement Shelter can be considered a basement improvement project. Dual-usage of a basement shelter is easily realized. It can double as a storage area,  a photography darkroom,  a workshop,  a room for other hobbies, or a "doghouse"  for dad. It should be emphasized, though, that the room is primarily a fallout shelter, so that unessential equipment should be easily and quickly removable. ■ Another advantage of the basement shelter is that storage space outside of the shelter can be utilized. Items for the "long pull" can be stored there. They can be brought into the shelter when

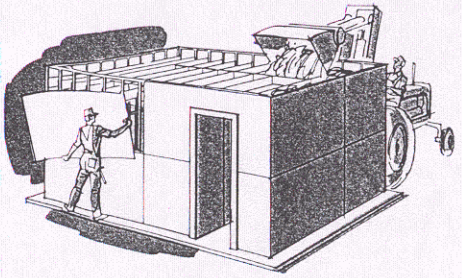
decrease in outside radioactivity permits brief emergence, probably after 48 hours or so. ■ **CONSTRUCTION**— The Douglas fir plywood Basement Shelter is tailor-made for the do-it-yourselfer. It utilizes concrete blocks  for shielding, laid dry, and securely held in place with Interior type  Douglas fir plywood panels. The plywood facing of both sides of the block provides a suitable paint  surface, or the natural beauty of real wood. Racks, hangers, and built-ins can be easily fastened or anchored to the plywood wall surface. Plywood waste from any DFPA shelter can readily be used in making built-ins. ■ Again, in constructing the basement shelter, a minimum of different sizes and types of materials are needed. In this case, the plywood will be permanent without preservative treatment. ■ Because of the variation among basement shapes and sizes, the plan details on pages 21-22 may not apply in all cases. Like the DFPA Underground Shelter, this design provides the minimum space suggested by O. C. D. for occupancy by  six persons. If more space is desired, the 8′ 9¾″ distance can be expanded without major change in the structure. Or, the 8′ 5⅜″ distance can be increased to 11′ 0″ with 2x8 joists; and to 14′ 0″ with 2x10 joists. ■ **COST** — Assuming a shelter similar in design and size to the basic plan on pages 21-22, the cost of materials would be about $250. On a  do-it-yourself basis, the cost of the DFPA Basement Shelter is among the lowest quoted for any design. ■ **PLANNING** — If a basement shelter is contemplated, careful planning will result in maximum protection and convenience, and lowest cost. An area of at least 10 square feet per occupant should be provided. The shelter should be placed in a corner with full soil height outside, and away from windows. If a window necessarily falls in the shelter, it should be protected with sandbags, books, or concrete block. Planter boxes may also be used for additional protection. The hot water  tank should be easily reached from the shelter, as this is an excellent source of good water. The entrance should be accessible to other parts of the house and to other basement rooms to be used when radioactivity decreases. Proximity to outdoor entrance is desirable in case an emergency requires evacuation. If headroom available dictates filling between existing joists, areas without heat ducts or other obstructions should be selected. 



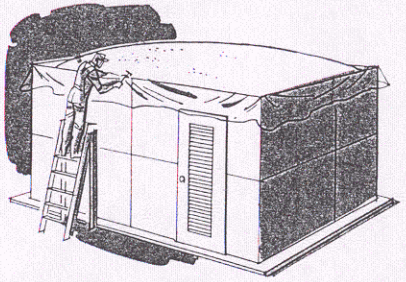
Level ground for shelter area, sloping to drain ground water away from your shelter. Then install concrete leveling pad and steel hardware. Bolt plates to pad and proceed as if building concrete forms.



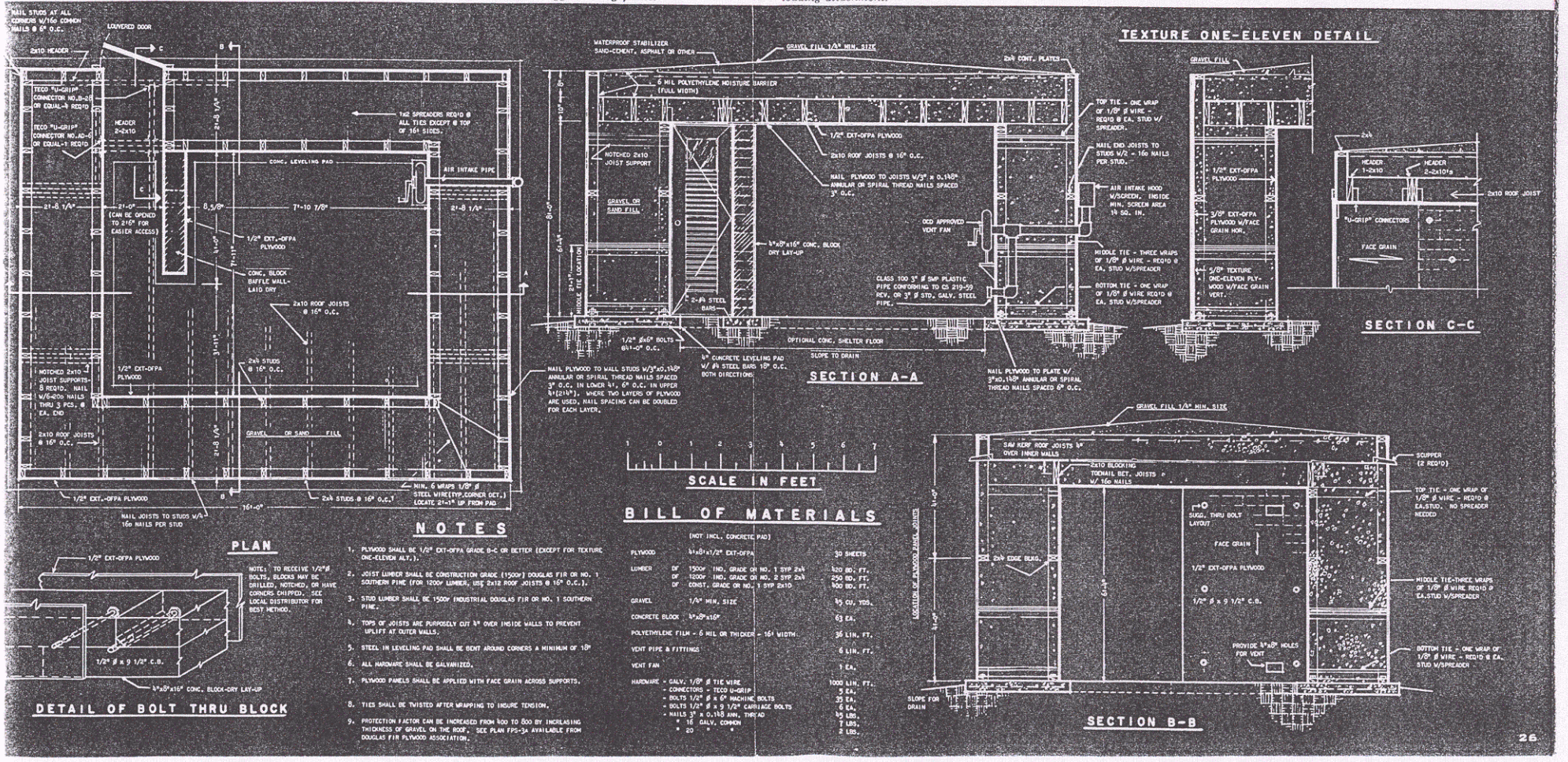
Complete outer wall and brace temporarily. Install inner wall and nail spreaders in place to outer wall. Tie together as with a concrete form – top, bottom and center – then you are ready to install roof joists, ceiling and sheath walls. Stagger ceiling joints.



Before sheathing, install complete ventilating system including vent fan and pipes. Then proceed with sheathing and fill walls between joists with sand or gravel, using a rubber tired tractor equipped with loading attachment.



Install moisture barrier over joists and up wall, fill with gravel and cover with moisture barrier. Mound gravel over this and fix with some appropriate stabilizer such as asphalt, cement or tar.



PLAN

DETAIL OF BOLT THRU BLOCK

NOTES

1. PLYWOOD SHALL BE 1/2" EXT-DFPA GRADE B-C OR BETTER (EXCEPT FOR TEXTURE ONE-ELEVEN ALT.).
2. JOIST LUMBER SHALL BE CONSTRUCTION GRADE (1500f) DOUGLAS FIR OR NO. 1 SOUTHERN PINE (FOR 1200f LUMBER, USE 2x12 ROOF JOISTS @ 16" O.C.).
3. STUD LUMBER SHALL BE 1500f INDUSTRIAL DOUGLAS FIR OR NO. 1 SOUTHERN PINE.
4. TOPS OF JOISTS ARE PURPOSELY CUT h" OVER INSIDE WALLS TO PREVENT UPLIFT AT OUTER WALLS.
5. STEEL IN LEVELING PAD SHALL BE BENT AROUND CORNERS A MINIMUM OF 18".
6. ALL HARDWARE SHALL BE GALVANIZED.
7. PLYWOOD PANELS SHALL BE APPLIED WITH FACE GRAIN ACROSS SUPPORTS.
8. TIES SHALL BE TWISTED AFTER WRAPPING TO INSURE TENSION.
9. PROTECTION FACTOR CAN BE INCREASED FROM 600 TO 800 BY INCREASING THICKNESS OF GRAVEL ON THE ROOF. SEE PLAN FPS-3a AVAILABLE FROM DOUGLAS FIR PLYWOOD ASSOCIATION.

BILL OF MATERIALS

(NOT INCL. CONCRETE PAD)

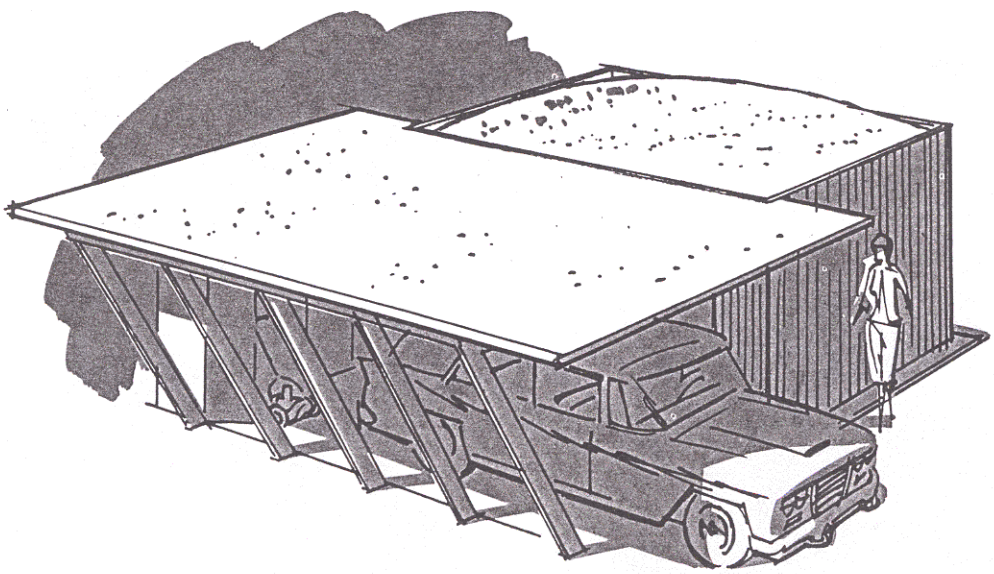
PLYWOOD	h"x8'x1/2" EXT-DFPA	30 SHEETS
LUMBER	DF 1500f IND. GRADE OR NO. 1 SYP 2x4	420 BD. FT.
	DF 1200f IND. GRADE OR NO. 2 SYP 2x4	250 BD. FT.
	DF CONST. GRADE OR NO. 1 SYP 2x10	900 BD. FT.
GRAVEL	1/4" MIN. SIZE	4½ CU. YDS.
CONCRETE BLOCK	h"x8"x16"	63 EA.
POLYETHYLENE FILM - 6 MIL OR THICKER - 16' WIDTH		36 LIN. FT.
VENT PIPE & FITTINGS		6 LIN. FT.
VENT FAN		1 EA.
HARDWARE - GALV. 1/8" ø TIE WIRE		1000 LIN. FT.
- CONNECTORS - TECO U-GRIP		9 EA.
- BOLTS 1/2" ø x 6" MACHINE BOLTS		33 EA.
- BOLTS 1/2" ø x 9 1/2" CARRIAGE BOLTS		6 EA.
- NAILS 3" x 0.148" ANN. THREAD		4½ LBS.
" 16 GALV. COMMON		7 LBS.
" 20 " "		2 LBS.

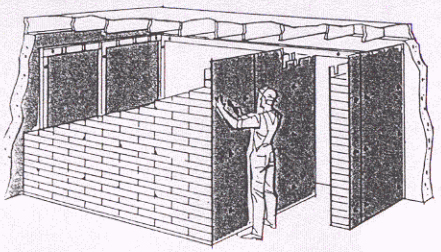
PLAN FPS 3

DFPA ABOVE-GROUND FIR PLYWOOD SHELTER

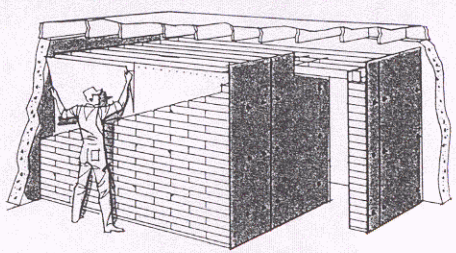
PERFORMANCE— The DFPA Above-Ground Shelter is illustrated on foldout pages 25 and 26. This shelter offers excellent fallout  protection. Its protection  factor of about 400 is intermediate between the DFPA Basement Shelter and the Underground Shelter. As indicated by Table on page 13, most lives would be saved by this shelter, even in heavy fallout. ■ An

objection to above-ground family shelters is that they can, and frequently do, detract from the appearance of the property. This is not the case with the DFPA Above-Ground Shelter. Attractive appearance plywood grades, such as Texture One-Eleven, can be applied to the outside walls, and finished to suit. As illustrated at bottom of page, this shelter could be built in combination with a carport and  garden storage area. ■ Again, approximately 64 square feet of livable area is provided; however, the above-ground shelter can be expanded without major structural change by lengthening the 16 foot sides. ■ **CONSTRUCTION** – This shelter has been designed with a minimum of concrete work, and with untreated Exterior type Douglas fir plywood and lumber. It can be built on the site by a carpenter contractor; or a skillful  amateur craftsman, possibly with a little professional help, could handle it. ■ It is ideal for homes without basements (60% of U. S. homes) or for greater fallout protection than the Basement Shelter offers. It would have blast and fire resistance about equal to that of the Basement Shelter. Additional fire resistance can be gained by painting the outside white. Tests have shown that white paint applied to the exterior walls will repel heat, and thus help to prevent fire. ■ The walls and roof were designed to carry an assumed snow load (30 psf) in addition to the dead load of the gravel fill. ■ **COST**– The material cost for this shelter would be approximately $500, depending upon local price variations and on the material used for the outside walls. Thus, it is likely that this shelter could be contract-built for about $1,000. 

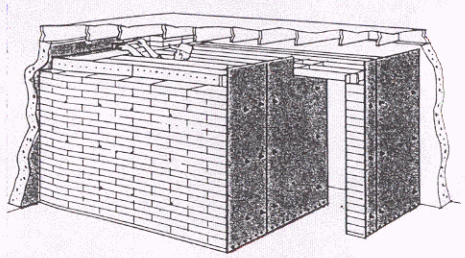




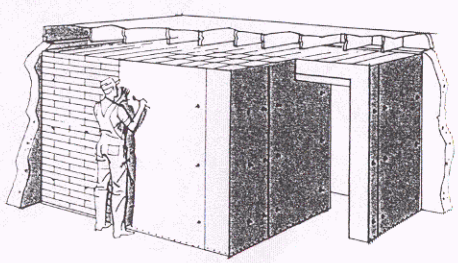
Lay out shape of shelter with floor plates grouted in place. Install header (with "U" grip joist hangers in place) and columns on rear wall. Grout double joists onto side wall.



Build up two end block walls, continuing around corner and starting sidewall (be sure to place blocks with chipped corners at approximate wall sheathing bolt locations). Barrier wall can be completed by putting plywood on inside, then drilling holes through notched blocks for bolts.



Lay ceiling joists, nail inside sidewall plywood sheathing to outside of last joist and inside of floor plates. Complete laying block for side wall but do not sheath outside of wall with plywood until you have installed ceiling block.



Place one two-foot strip of plywood over ceiling joists and install cement blocks over. Do this two feet at a time until ceiling is completed. You can then lay the last course of sidewall blocks; install and bolt outside sidewall sheathing.