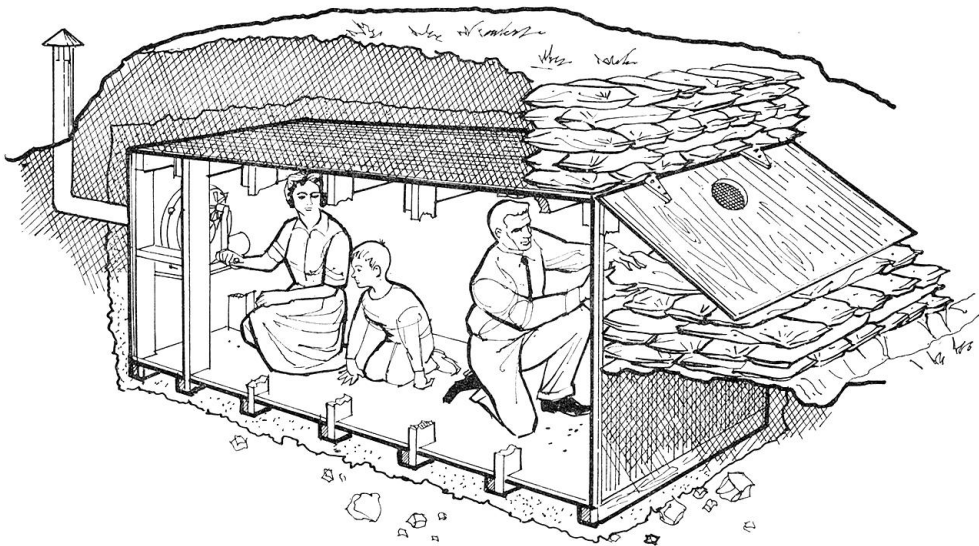




# Outside Semimounded Plywood Box Shelter



## GENERAL INFORMATION

This shelter is designed to provide low-cost protection from the effects of radioactive fallout. Its principal advantages are ready availability of low-cost materials, ease and speed of construction, adequate protection from fallout radiation, and limited blast resistance.

## TECHNICAL SUMMARY

**Space and Occupancy.**—The shelter in this design has 32 square feet of area and 128 cubic feet of space and will house three persons. See "NOTE"

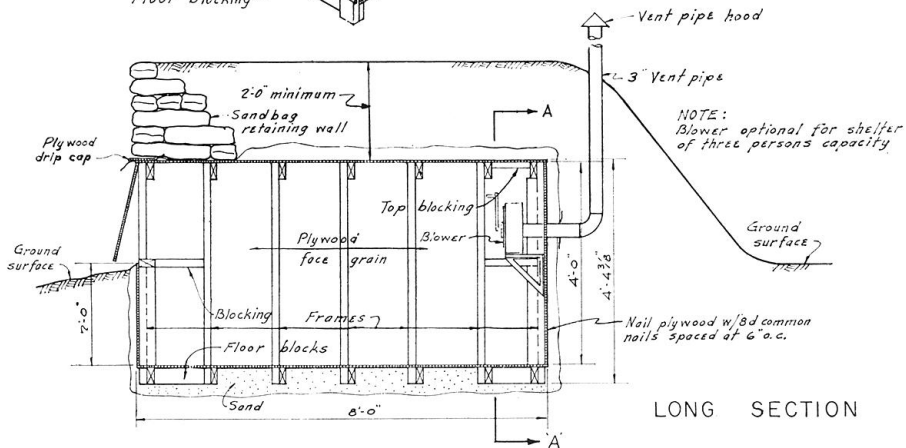
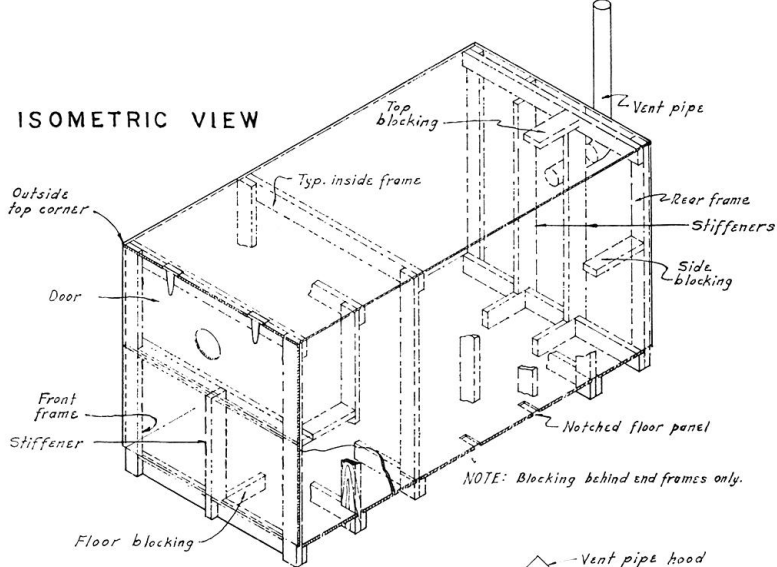
after "Construction Sequence" for description of a size to house more persons.

**Availability and Cost of Materials.**—Most of the materials needed to build this shelter are obtainable at lumberyards. The nationwide average for cost of materials is about \$75 per shelter, not including ventilation equipment.

**Fallout Protection Factor.**—A protection factor of about 500 is obtained if the earth cover is 2 feet deep, and a 2-foot thick entranceway shield is formed with bags of sand.

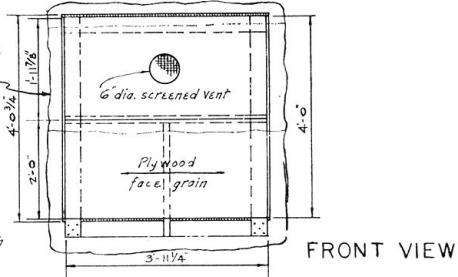
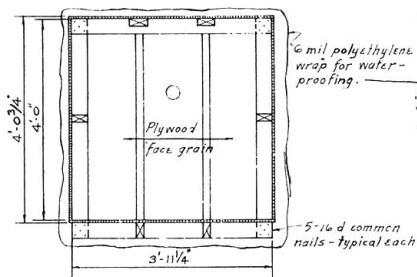
**Blast Protection.**—The shelter should be able to withstand a limited blast overpressure of 5 pounds per square inch.

# ISOMETRIC VIEW

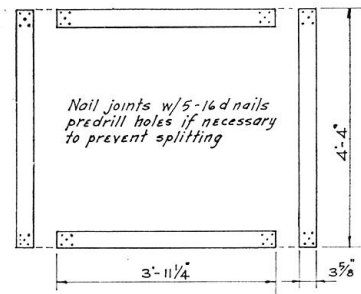


## LONG SECTION

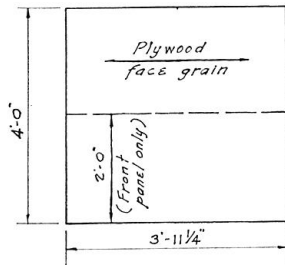
## SECTION A-A



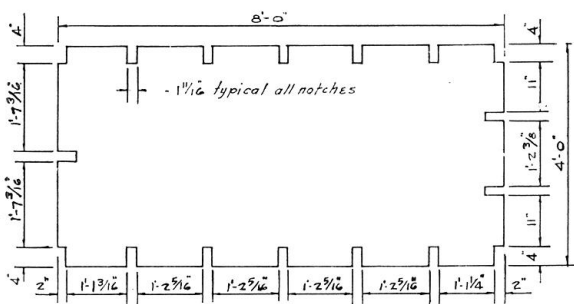
## FRONT VIEW



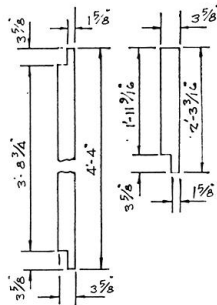
FRAME DETAIL



END PLYWOOD DETAIL



FLOOR PANEL DETAIL



STIFFENER DETAILS

**Ventilation.**—A 3-inch vent at the rear of the structure provides an essential opening to which a pipe extension can be attached. Hand-operated ventilation equipment should be used for more than three persons. The additional cost may be from \$30 to \$50. Air is exhausted through the airspace left in the entranceway closure.

**Construction Time.**—Tests have shown that one man working with simple excavating and construction tools can perform all necessary work in 20 man-hours. This time will be lessened by about 5 hours if lumberyards provide prefabricated plywood panels and sections.

**Structural Life Expectancy.**—The range is from 5 to 10 years depending on the humidity in the area, drainage characteristics of the terrain, and the effectiveness of the wood treatment (dip preferred) and the plastic wrapping.

## CONSTRUCTION SEQUENCE

1. Cut plywood and lumber to size and notch before treating.
2. Dip lumber for 2 minutes or more in water repellent. A trough can be fashioned from a piece of polyethylene film and scrap lumber. Dip plywood in water repellent or give thorough brush treatment. Double brush-coat all cut edges.
3. Assemble the seven frames. (See longitudinal section drawing.)
4. Select a well-drained site. Excavate hole deep enough so that shelter floor will be at least 2 feet below ground surface and wide enough to permit nailing of plywood sides to frames from outside. Slope bottom of the trench so that shelter will be 2 inches higher at entrance than at rear. Lay a 2-inch sandbed for polyethylene moisture barrier.

5. Place polyethylene moisture barrier in excavation and cover bottom with a 4-inch layer of sand to prevent frames from breaking barrier. (Sec. A-A, Front View.)
6. Cut three floor blocks to size and tack to underside of floor panel. Place the seven frames approximately in place, imbedded so that the sand will be flush with the underside of the floor panel. Then pass the floor panel inside the frames and nail in place.
7. Toe the end and side panels on the edges of floor panel and nail securely; then nail the side and top blocking, and finally, nail the top panel overlapping both the side and end panels.
8. Pad the outside top corners of the shelter to prevent damage to the polyethylene moisture barrier. Wrap the shelter with the polyethylene.
9. Backfill with 2 feet of earth cover after forming a sandbag retaining wall over the entrance (see longitudinal section) and alongside entranceway.
10. Provide enough filled sandbags or solid concrete blocks for a closure 2 feet thick in the entrance.
11. As an alternative to digging a large hole as described in step 4 above, a somewhat smaller hole can be used if the shelter is assembled above ground and lowered gently into the hole. The shelter weighs approximately 400 pounds complete, or 260 pounds without ends and top. Care must be taken to avoid puncturing the polyethylene moisture barrier.
12. If blower is installed, it should be supported by blocking, or by a frame attached to the end panel with 2" x 4" stiffeners.

*NOTE:* The size of the shelter may be increased in width and height. There is no arbitrary limit to length but the plywood sheets must butt each other at a frame. To increase the width from 4' to 6' use 2" x 6" ceiling joists. To increase the width from 6' to 8' use 2" x 8" ceiling joists. To increase the height from 4' to 6' use 2" x 6" wall studs and floor joists. When increasing height or width the ceiling joists should rest directly on the wall studs and be secured to them by means of nailed 3/8-inch plywood gussets. Ceiling joists require a gusset on one side only. Floor joists require a gusset on each side. Use 12 sixpenny nails in each gusset. Six nails should be used in each of the joined pieces.

## BILL OF MATERIALS

(For 4' x 8' size)

<i>Item</i>	<i>Quantity</i>
3/8" exterior plywood (Federal specification CS 45-60) or	5 sheets.
1/2" exterior plywood (Federal specification CS 122-60, group 1 or 2).	
2" x 4" x 10' construction grade Douglas fir or equal-----	8 pieces.
2" x 4" x 8' construction grade Douglas fir or equal-----	8 pieces.
4" x 4' plywood lumber (drip cap)-----	1 piece.
9 mil polyethylene film (16' width)-----	20 feet.
Water repellent (5 percent pentachlorophenol or equal), toxic to wood-destroying fungi and insects.	2 gallons.
Eightpenny galvanized common nails-----	4 pounds.
Sixteenpenny galvanized common nails-----	3 pounds.
3" diameter galvanized vent pipe-----	3 1/2 feet.
Vent pipe cap-----	1.
3" diameter 90° elbows-----	2.
Galvanized hinges-----	1 pair.
Flyscreen 7" x 7"-----	1.
Sandbags-----	58.
Dry sand-----	3 tons.
Blower (optional, to be used with vent pipe, for 3-person size).	1.
Soil or sand (for shelter cover)-----	5 cubic yards.