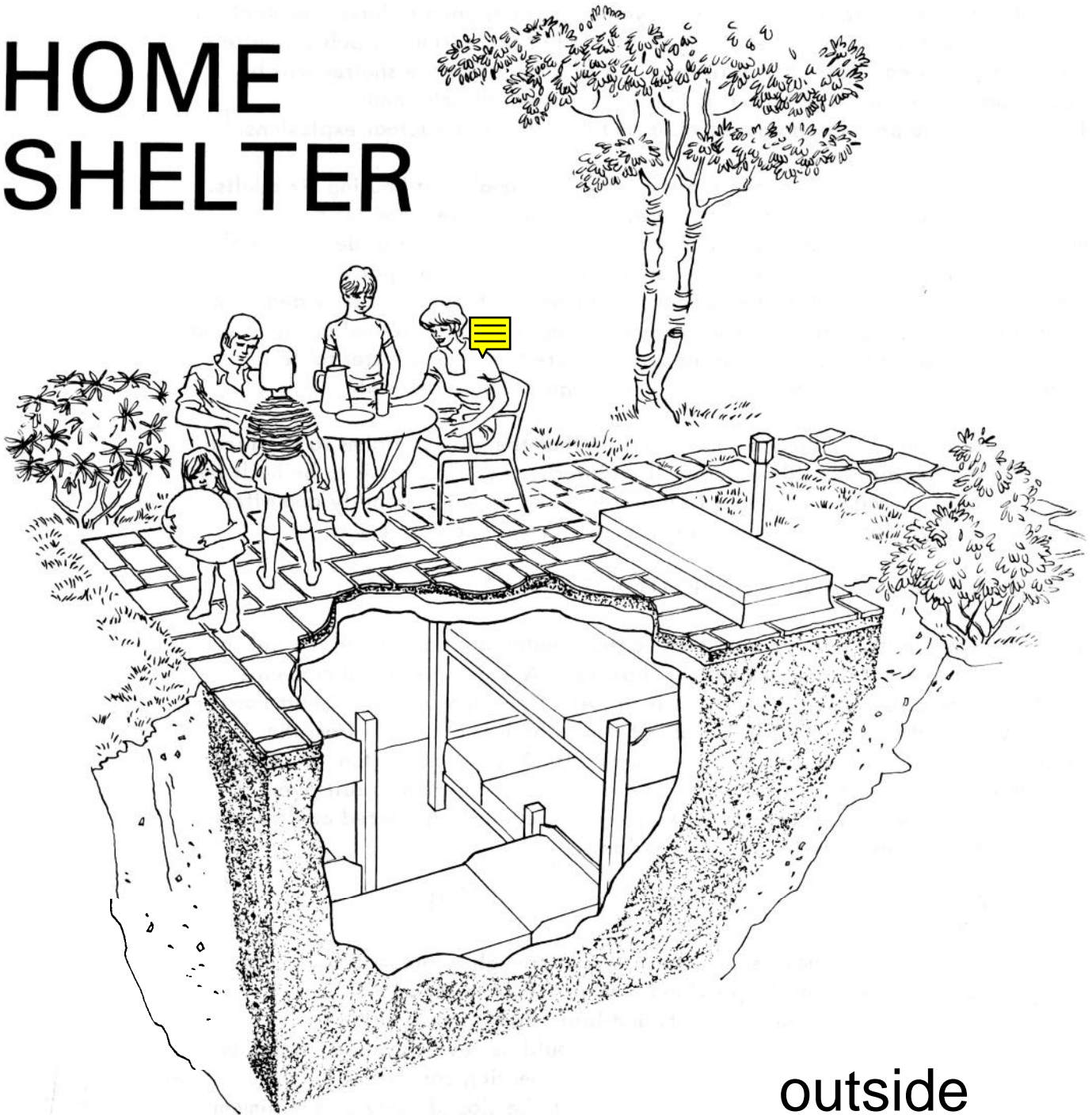


HOME SHELTER



Protection is provided in an outside concrete shelter. The roof of the shelter can be used as an attractive patio.

outside
concrete
shelter

federal emergency
management agency



GENERAL INFORMATION

This family fallout shelter, designed primarily for homes without basements, is a permanent home shelter to be placed in the yard. It is designed to have a protection factor of at least 40, which is the minimum standard of protection for public shelters throughout the United States. This assures that persons inside the shelter will be protected against radioactive fallout following a nuclear attack, and will also have some protection against blast and fire effect of nuclear explosions.¹

Following are detail drawings of the shelter, which is capable of housing six adults. It can be built of poured reinforced concrete, precast concrete slabs, or a combination of concrete blocks and poured concrete. If it is built as detailed with the top near ground level, the roof slab can be used as an outdoor patio. The shelter is accessible by a hatch-door and wood stairway. Fresh air is provided by a hand-operated centrifugal blower and two ventilating pipes that extend above ground level. In areas where there is poor drainage or where the ground water table is close to the surface, the fourth modification on page 5 should be used.

Before starting to build the shelter, make certain that the plan conforms to the local building code. Obtain a building permit if required. If the shelter is to be built by a local contractor, engage a reliable firm that will do the work properly and offer protection from any liability or other claims arising from its construction.

GUIDE TO CONTRACTS AND SPECIFICATIONS

It is generally advisable to have a written contract with your contractor, as well as technical specifications to supplement the drawing. A widely used and convenient contract form for construction of this size is the AIA Document A 107, "Short Form For Small Construction Contract -Stipulated Sum, " which is available from the American Institute of Architects, 1785 Massachusetts Ave., Washington, D. C. 20036. It would be impractical to write a technical specification to suit every local condition; however, the following summary of generally accepted construction materials and practices should be a useful guide.

EXCAVATION

The excavation should have side slopes gradual enough to prevent caving, or appropriate shoring should be provided. Materials used for backfill and embankment should have debris, roots and large stones removed before placement. The subgrade for the floor slab should be level for ease in placing waterproofing membrane and to provide uniform bearing conditions for the structure. The area surrounding the patio should be sloped away at a minimum grade of 1 inch per 10 feet to provide good drainage.

¹ This shelter will withstand overpressures of up to 5psi, and provides excellent protection from tornadoes.

CONCRETE

For details of concrete construction, the "Building Code Requirements for Reinforced Concrete/ (ACI 318 - 71)" should be followed. This publication can be obtained from the American Concrete Institute, Detroit, Michigan 48219.

WATERPROOFING

Waterproofing specifications may be obtained from the nearest FHA (Federal Housing Administration) office, or those of a reputable manufacturer of waterproofing materials may be used.

VENTILATION

The ventilation piping for the shelter should be installed in accordance with the practices outlined in the "National Plumbing Code (ASA A40.8 - Latest Edition). " This publication may be secured from the American Society of Mechanical Engineers, New York, N.Y. 10018. All pipe and fittings shall be galvanized. Suitable ventilating blowers and roof ventilators are available from many sources of supply. Fabrication details and consequently the installation requirements will differ for equipment furnished by the various manufacturers. Positive-displacement blowers having both electric motor and geared hand-crank drives have been manufactured by:

Centaur Forge, Ltd.
P. O. Box 239
117 N. Spring St.
Burlington, Wisconsin 53105

B&B Sales
P. O. Box 86
So. Decatur Street
Marietta, Pa 17547

TEMET USA, Inc.
9417 Brian Jac Lane
Great Falls, VA 22066

Roof exhaust and supply ventilators are manufactured by:

Penn Ventilator Co.
Red Lion and Gantry Rd.
Philadelphia, PA 19115

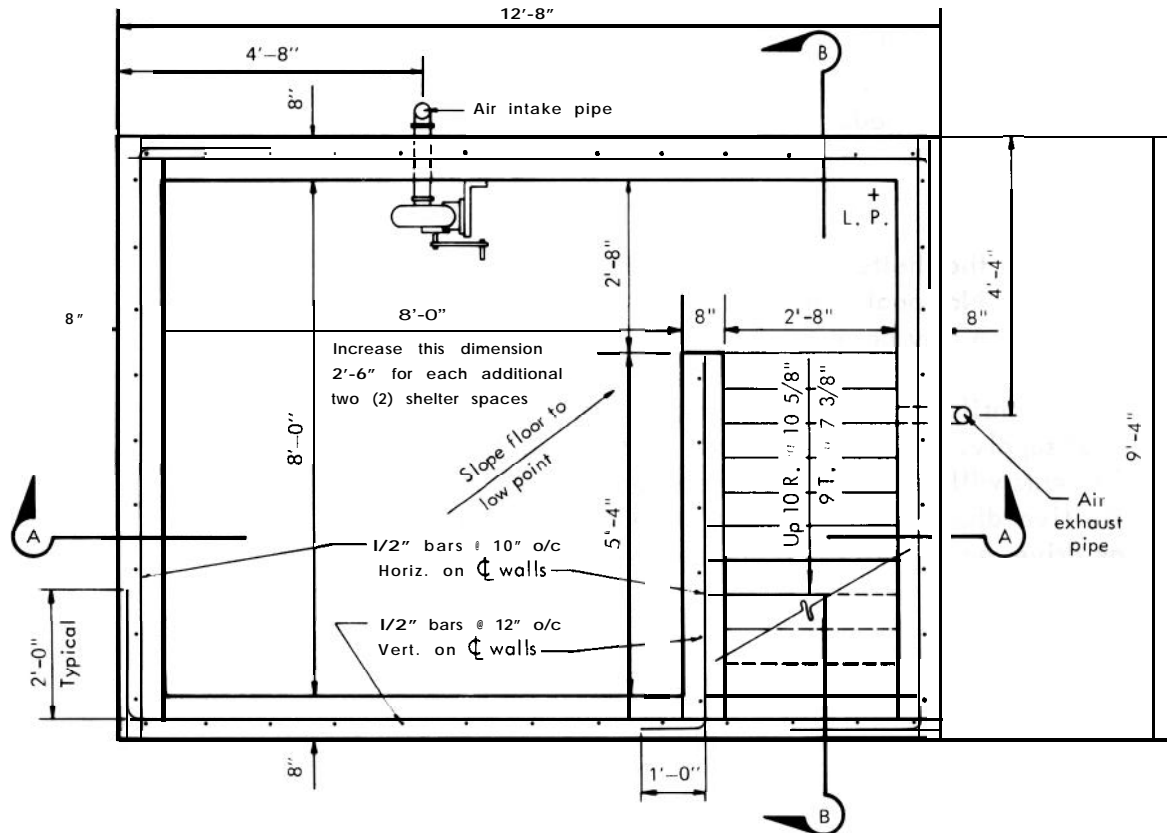
The names of specific manufacturers of equipment are given only as examples, and do not denote a preference for their products.

OPTIONS

To accommodate additional persons, increase the shelter length 2'-6" for each two (2) shelter spaces. Do not increase the 9'-4" width.

Electrical service for lighting and outlets may be installed in the shelter from a separate residence circuit. A branch circuit breaker should be installed inside the shelter. Additional lighting and outlets may be provided from this circuit for the patio above.

An electric motor and pulley may be installed to operate the centrifugal hand-crank blower by virtue of the electrical service option.



NOTES

Exterior walls, roof slab and under floor slab shall be waterproofed with a 3-ply membrane waterproofing system. This provides a continuous blanket which seals the entire area of surface to be protected. The membrane shall be protected from backfill damage and when completing other stages of construction.

Place flagstone or bricks on a sand bed when using the roof slab as a patio.

There are a number of commercially produced metal roof hatches that will adequately serve as a shelter door. However, as long as the door is weatherproof and durable, a job-made, galvanized sheet metal covered wood door is suitable.

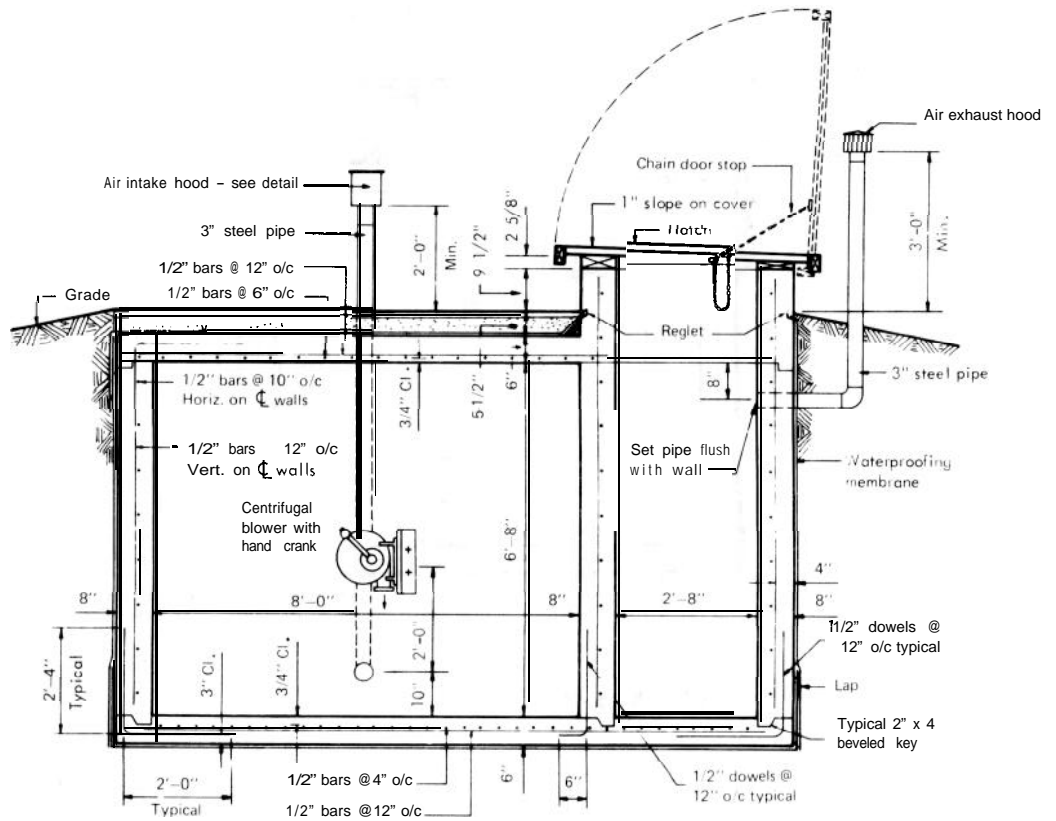
Bevel all exposed corners of concrete 3/4" at 45°.

Structural design data:

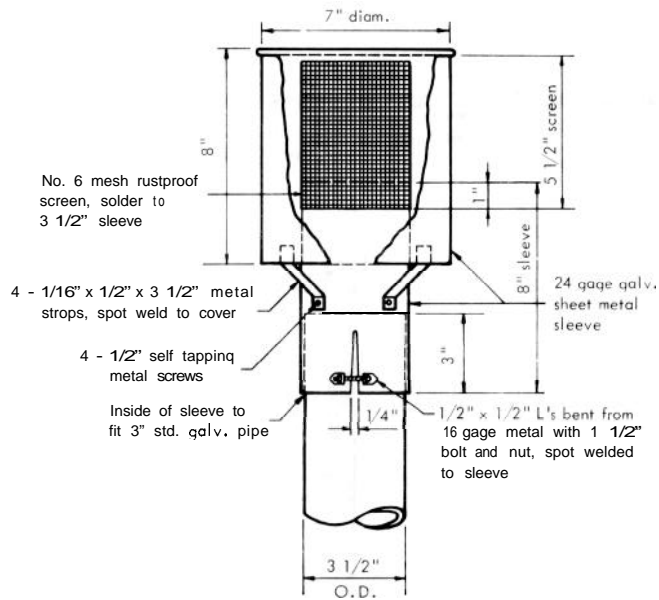
Steel = 20,000 psi

Concrete = 2,500 psi

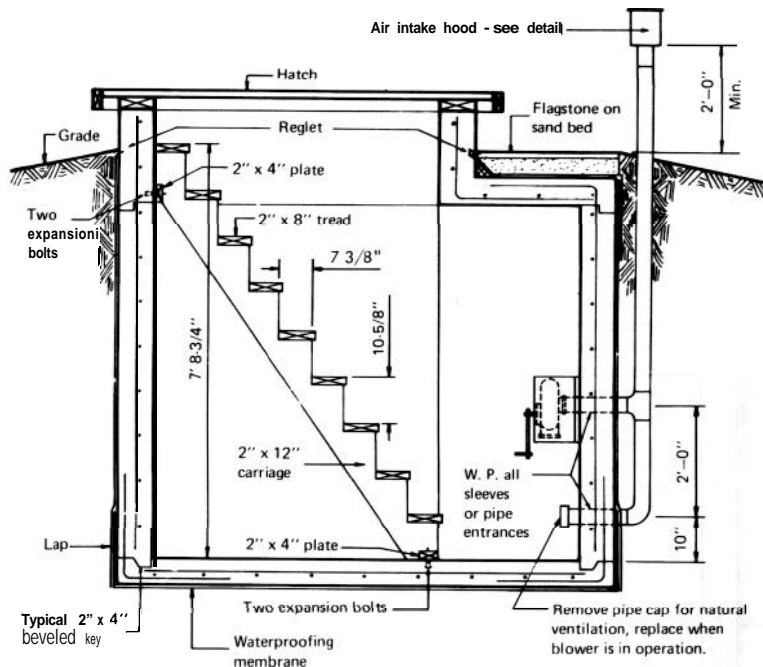
Soil (minimum) = 600 psf, to withstand downward pressure



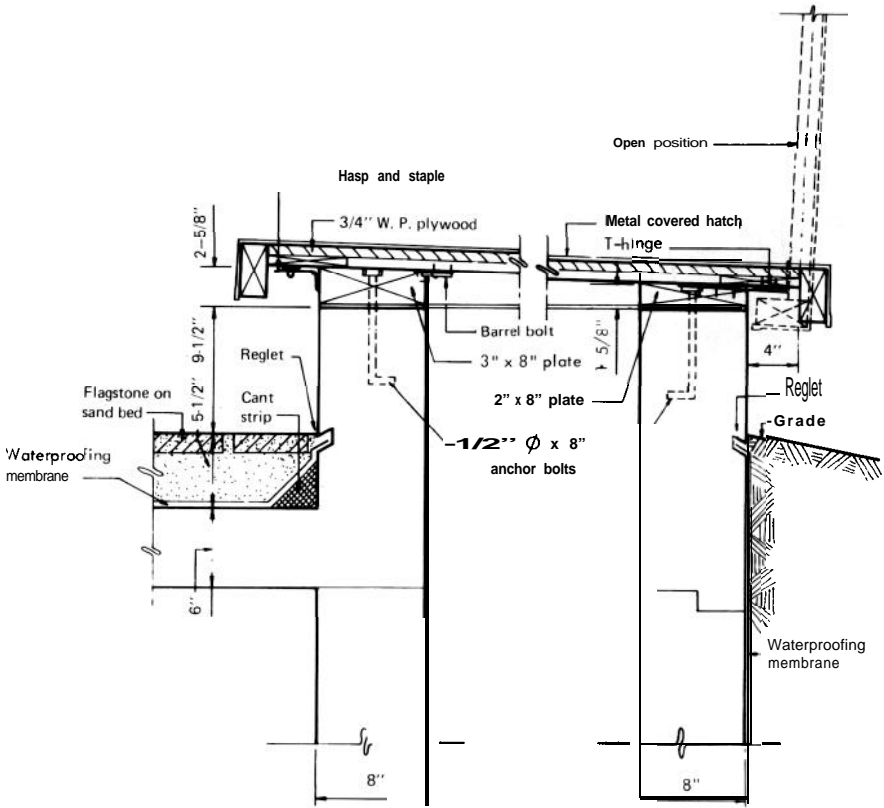
SECTION A- A



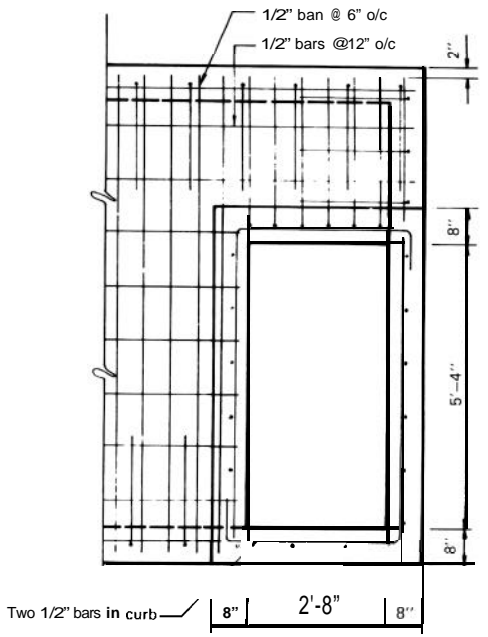
AIR INTAKE HOOD DETAIL



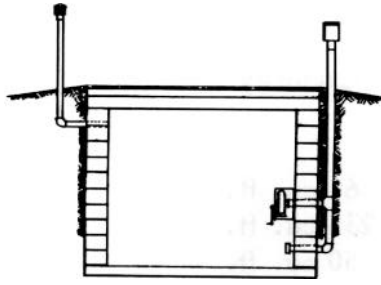
SECTION B-B



HATCH DETAIL



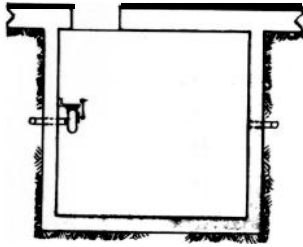
HATCH FRAMING



SECTION

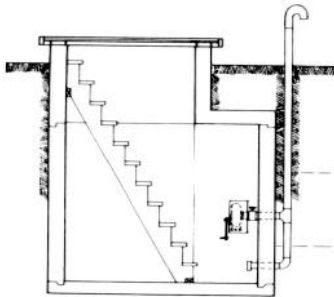
MODIFICATIONS

This first modification utilizes 12-inch concrete masonry units for walls instead of reinforced concrete. The floor, roof and entranceway are the same as in the basic shelter, and the amount of protection provided is essentially the same.



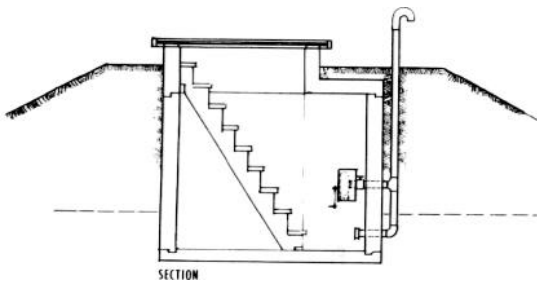
PLAN

If a basement is available, the shelter may either be separate from it, or attached. In this modification, an attached shelter is entered through the basement of the house, thereby permitting dual use of the shelter space. Other advantages of this modification include flexibility of shape and design to conform to the house design and the use of the same kind of building materials as used in the construction of the house.



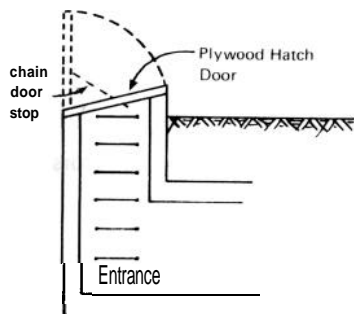
SECTION

If the topography permits, the shelter can be built into a hillside or embankment. This modification increases the protection factor by the addition of an earth mound over the shelter. A maximum of 3 feet of earth cover is recommended.



SECTION

The principal advantage of this shelter modification is that it can be erected with a minimum of excavation in locations where there is poor drainage or where the ground water table is close to the surface. However, the exposure of the shelter above ground requires the addition of earth mounding around all sides.



This shelter modification permits the design and construction of a shelter with a fairly small hatch entry. The iron rungs placed in the concrete wall will also maximize the useable shelter area.

MATERIAL LIST

Item	Quantity
Concrete:*	
floor	60 cu. ft.
wal ls	235 cu. ft.
roof	50 cu. ft.
	345 cu. ft.
	Total
	13 cu. yds.
Steel Reinforcing:	
floor	580 lin. ft.
wal ls	945 lin. ft.
roof	260 lin. ft.
	Total
	1,785 lin. ft.
Miscellaneous:	
tie wire - 6" coils	2
hand blower w/mounting bracket	1
3" galv. steel pipe	16 lin. ft.
3" galv. ells	2
3" galv. tee	1
3" galv. cap	1
intake hood, w/screen	1
exhaust hood, w/screen	1
wood carriages, 2" x 12" x 10'	2
wood treads, 2" x 8" x 2'-8"	9
wood plates, 2" x 4" x 2'-8"	2
hatch door, metal covered	1
wood plate, 2" x 8" x 7'	1
wood plate, 3" x 8" x 14'	1
T-hinges, 8" x E. H., galv.	3
hasp and staple, galv.	1
chain door stop, galv.	1
anchor bolts, 1/2" ϕ x 8"	8
expansion shields and bolts, 3/8" ϕ x 4"	4
waterproofing membrane	715 sq. ft.
flagstone	100 sq. ft.
sand	1.5 cu. yds.
cant strip	12 lin. ft.

*Form work not included.

Distribution:

FEMA Regions and Staff College
State & Local Civil Preparedness Directors