

**CHAPTER 1330**  
**DEPARTMENT OF ADMINISTRATION**  
**MINNESOTA STATE BUILDING CODE**  
**FALLOUT SHELTERS**

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**1330.0100 DEFINITIONS.**

**Subpart 1. Fallout shelter.** "Fallout shelter" means a structure, room, or space that protects its occupants from fallout gamma radiation, with a protection factor of at least 40.

**Subp. 2. Protection factor.** "Protection factor" means a factor used to express the relation between the amount of fallout gamma radiation that would be received by an unprotected person and the amount that would be received by one in a shelter. For example, an occupant of a shelter with a PF of 40 would be exposed to a dose rate 1/40 (or 2-1/2 percent) of the rate to which he would be exposed if his location were unprotected.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.0200 PURPOSE.**

Whenever it has been determined by the Department of Public Safety, Division of Civil Defense and the state architectural engineer that fallout protection is needed for a particular location, the "Technical Requirements for Fallout Shelters" as contained in this chapter shall be complied with.

The purpose of this technical memorandum is to establish official standards for fallout shelters.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.0300 SCOPE.**

The provisions of this code relating to fallout shelters apply only to state-owned buildings. "State-owned buildings" shall mean all buildings and structures financed in whole or in part by state funds and which are under the exclusive jurisdiction and custodial control of one or more state departments or agencies.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**History:** *9 SR 1557*

**1330.0400 RADIATION SHIELDING.**

Computation of protection factors shall be made by methods acceptable to the Office of Civil Defense. In the calculation of the protection factor, the radiation dose contribution to the shelter occupants coming from the entranceways, ventilation ducts, or other openings in the shelter's barriers shall be considered.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.0500 SHIELDING REQUIREMENTS.**

Detailed DoD studies of the lifesaving potential of fallout shelters indicate that for the current time-frame and for the foreseeable future, shelters with a protection factor of 40 could save over 90 percent of those persons who would otherwise die if unprotected against potential lethal radiation levels. Therefore, design and construction objectives are:

A. Shelters for the general population. In modifications to existing buildings and in new construction, protection factors and shelter areas should be maximized to the extent possible, at nominal or no cost, using slanting techniques (See TM 64-2). Although minimum protection for a shelter area should be at least PF 40, the objective is to obtain the best protection factor possible. Computations indicate that decreasing returns in added lives saved per added dollar invested are obtained as PF's are increased significantly above 40. On a nationwide basis, therefore, it would provide better lifesaving potential per dollar, for the same dollar expenditure, to obtain more shelter space of lower PF than only a few shelter spaces with very high PF.

B. Shelters for emergency operational personnel. As it is anticipated that personnel with emergency functions may have to expose themselves to dangerous radiation levels during the performance of their duties, it is desirable to obtain the best possible protection factors for emergency operating centers or shelters housing emergency operational personnel, with an acceptable minimum objective of at least PF 100.

C. Recognizing that in many design and construction projects it may be physically difficult or expensive to attain these minimum shielding objectives, it is still a worthwhile objective to increase protection factors to any level. Under many potential levels of radiation exposure, even these lower protection factors will save lives or minimize illness.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.0600 SPACE AND VENTILATION REQUIREMENTS.**

Ten square feet of shelter floor area per person shall be provided.

At least 65 cubic feet of space per person shall be provided.

If the shelter capacity is based on minimum space requirements, then at least three cubic feet of fresh air per minute per person are required.

Shelter capacity or occupancy time may be limited by the volume of the room and not by its area. This is particularly true if mechanical ventilation is inadequate. When ventilation is limited, the table in part 1330.0700 can be used for determining the relation of space requirements to ventilation.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.0700 RELATION OF SPACE REQUIREMENTS TO VENTILATION.**

Time for One Complete Air Change (Minutes)**	Volume of Space Required per person (cubic feet)
1,000 or more	500
600	450
400	400
200	300
100	200
60	150
35	100
22	65

\*\*Computed as a ratio:

Net volume of space (Cu. Ft.)

Fresh air supply (cfm)

No filters are required on mechanical ventilation systems other than those necessary for the normal daily use of the space.

In general, incremental costs of fixed ventilation equipment to meet shelter requirements shall not exceed \$2.50 per shelter space. The estimated cost of ventilating the shelter with packaged ventilation equipment shall be approved by the Office of Civil Defense.

Note: In geographic areas where temperature or humidity are excessive, the minimum ventilation criteria as included above may require augmentation to improve habitability. Professional judgment should be exercised by the architect or engineer to optimize habitability within budget limitations.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

### 1330.0800 CONSTRUCTION REQUIREMENTS.

**Subpart 1. Materials and methods.** In general, conventional methods of design and construction for concrete, wood, steel, brick, structural tile, and other products will be followed. Allowable stresses and/or load factors as defined in the applicable codes shall be used.

**Subp. 2. Useful life.** The structure shall be designed for a useful life of at least ten years.

**Subp. 3. Access and egress.** At least one unit of access and egress width should be provided for every 200 shelter occupants. A unit width is 22 inches, the space required for free travel of one aisle of persons. In no case shall a single passage width be less than 24 inches; nor shall there be less than two widely separated means of egress from each building. Emergency-type hatchways may be used as a means of egress. The passage shall be designed so that any normal-size adult can readily enter or leave the main shelter chamber.

**Subp. 4. Preventing flotation.** In areas subject to high-ground water conditions, provisions shall be made to prevent flotation of underground shelters.

**Subp. 5. Keeping interior dry.** Provisions shall be made to ensure the shelter interior will remain reasonably dry.

**Subp. 6. Utility line hazards.** To the extent practicable, hazardous utility lines such as steam, gas, etc., should not be located in or near the shelter area unless provision is made to control such hazards before the shelter is occupied.

**Subp. 7. Minimizing fire danger.** All shelters shall be constructed to minimize the danger of fire from both external and internal sources.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

### 1330.0900 SERVICES.

**Subpart 1. Basic supplies.** Provisions shall be made for the storage of basic shelter supplies by allotting 1-1/2 cubic feet per person. This volume may be reduced to 0.6 cubic feet per person if the standard OCD 17-1/2 gallon water drums are not utilized. The live load attributable to placing these supplies should be considered. Fallout shelters with a capacity of 50 or more persons which have been made available to the public should be stocked with:

A. water, to provide each person with a minimum of 3-1/2 gallons of water;

B. food: special crackers, biscuits, or wafers, etc., to provide 10,000 calories per person, deducting comparable food already available in the building;

C. medical care kits;

D. sanitation kits which include toilet tissue, sanitary napkins, toilet

seat and commode chemicals (empty water containers convert to commodes); and

E. radiation detection instruments.

Subp. 2. **Water supply.** An adequate supply of water from a suitable well, water trapped in the piping of the facility, or water storage tanks should be substituted, wherever feasible, for storage of drinking water in the standard OCD 17-1/2 gallon water drums.

Subp. 3. **Sanitation.** Toilets may be provided on the basis of one per 50 occupants. In lieu of subpart 1, item D, other austere provisions based on economic considerations may be made for the disposal of garbage, trash, and human waste. Fifty percent of the toilets may be outside the shelter area, in other parts of the building, provided they are readily accessible without hazardous exposure to fallout gamma radiation.

Subp. 4. **Electrical power.** It is assumed that normal electrical power will be available; therefore, emergency generators are not required. No special lighting levels are required in fallout shelters. The following levels are deemed adequate for emergency occupancies:

A. Sleeping areas, two footcandles at floor level.

B. Activity areas, five footcandles at floor level.

C. Administrative and medical areas, 20 footcandles at desk level.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

### 1330.1000 INTERPRETATION OF PARTS 1330.1100 TO 1330.2100.

Legal basis for the recommendations: Case and statutory law establish clearly that building codes are enacted as city ordinances under authority conferred on the municipality by the legislature to adopt and enforce laws pursuant to the state's police power. They must be reasonable and not arbitrary and must tend to promote the public health, safety, and welfare.

In a legal sense, building code standards may be classified as mandatory because a violation causes specific sanctions or remedies to be invoked to assure compliance. These may take the form of denial of permit, notice to vacate, suit for injunction, or a criminal penalty in the form of a fine. However, standards may be regarded as permissive in the sense that they do not obligate the owner to include spaces or facilities for particular uses in the building to be constructed, but rather, require compliance with building code standards of such spaces or facilities if actually constructed.

Fallout shelter standards as enacted by the proposed codes article are properly classified as permissive since they invoke no legal obligation on the building owner to construct or provide fallout shelter space. The proposed article does establish mandatory, enforceable standards, however, where the owner voluntarily undertakes to construct, designate, or use spaces for fallout shelter purposes. No separate or special penalty provision is made a part of the article, since a violation of it will bring into play the enforcement powers and procedures under the applicable code provisions generally. This approach will not lead to any special enforcement difficulties and is reinforced by a clear statement as to the purpose of the proposed permissive fallout shelter article.

The proposed article is designed especially to meet the obvious need for administrative relaxation of general building code provisions, making them inapplicable to fallout shelter spaces when occupied in time of national emergency.

This objective is achieved by a simple method of expressly confining the scope of the article (and its standards) to those spaces which are constructed, designated, and used for fallout shelter protection in a time of national emergency or reasonable periods of drill and instruction. During such times, the fallout shelter article standards apply exclusively. If the fallout shelter space is used for normal purposes at other times, the appropriate other sections of the code apply with respect to construction and occupancy.

This approach avoids the legal complications inherent in the use of separate provisions authorizing enforcement officials to relax certain code provisions in times of emergency. That alternative presents special problems in defining the circumstances and extent of administrative discretion to be exercised by the variously authorized and organized municipal enforcement offices of the nation.

Achievement of this objective by expressly confining and stating the scope of the shelter article clearly offers the best prospect for legal and uniform administration of building code standards during a national emergency. Coupled with the affirmative statement that no provisions of the shelter article are intended to prohibit dual-occupancy use, this scope provision should encourage, and make legitimate, fallout shelter construction and designation. It also is consistent with the project purpose: to design a permissive article establishing minimum standards as measured by Office of Civil Defense minimum technical requirements.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

### **1330.1100 GENERALIZED PERMISSIVE BUILDING CODE ARTICLE REGULATIONS GOVERNING FALLOUT SHELTERS.**

Parts 1330.1100 to 1330.2100 shall establish the minimum criteria which must be met before a building or building space can be constructed, occupied, used, or designated a fallout shelter. The scope of these parts extends to building spaces designated for use as fallout shelters including periods of drill and instruction for this purpose.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

### **1330.1200 DEFINITIONS.**

**Subpart 1. Dual-use fallout shelter.** A "dual-use fallout shelter" is a fallout shelter having a normal, routine use and occupancy as well as an emergency use as a fallout shelter.

**Subp. 2. Fallout shelter.** A "fallout shelter" is any room, structure, or space designated as such and providing its occupants with protection at a minimum protection factor of 40 from gamma radiation from fallout from a nuclear explosion as determined by a qualified fallout shelter analyst certified by the Office of Civil Defense. Areas used for storage of shelter supplies need not have a protection factor of 40.

**Subp. 3. Protection factor.** "Protection factor" means a factor used to express the relation between the amount of fallout gamma radiation that would be received by an unprotected person and the amount that would be received by one in a shelter.

**Subp. 4. Single purpose fallout shelter.** A "single-purpose fallout shelter" is one having no use or occupancy except as a fallout shelter.

**Subp. 5. Unit of egress width.** A "unit of egress width" is 22 inches.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

### **1330.1300 GENERAL.**

Nothing in these parts shall be construed as preventing the dual use or multiple use of normal occupancy space as fallout shelter space, providing the minimum requirements for each use are met.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

### **1330.1400 MIXED OCCUPANCY.**

The occupancy classification shall be determined by the normal use of the building. When a normal-use space is designed to have an emergency use as a fallout shelter in addition to the normal use, the most restrictive requirements for all such uses shall be met. Occupancy separation: no requirements.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.1500 FALLOUT SHELTERS**

**1330.1500 SPACE AND VENTILATION.**

A minimum of ten square feet of net floor area shall be provided per shelter occupant. Partitions, columns, and area for storage of federal shelter supplies may also be included in net area. A minimum of 65 cubic feet of volume shall be provided per shelter occupant. A minimum of three cubic feet of fresh air per minute per person shall be provided.

Shelter capacity also shall be limited by the volume of the room or space. The table in part 1330.1600 shall be used to determine capacity of room or space in relation to available ventilation.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.1600 CAPACITY IN RELATION TO VENTILATION.**

Time for Complete Air Change (Minutes)*	Volume of Space/ Person (Cubic Feet)
1000 or more	500
600	450
400	400
200	300
100	200
60	150
35	100
22	65

\*Computed as a ratio:

$$\frac{\text{net volume of space (cu. ft.)}}{\text{Fresh air supply (cfm)}}$$

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.1700 EXIT FACILITIES.**

There shall be no fewer than two widely spaced exits from a fallout shelter, leading directly to other spaces of the building or outdoors. Exits from the fallout shelter shall aggregate at least one unit of egress width for every 200 shelter occupants. In no case shall a single exit be less than 24 inches wide.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.1800 FLAME SPREAD RATINGS.**

Flame spread ratings of interior surfaces:

A. Division I, dual-use fallout shelters: no requirement.

B. Division II, single-purpose fallout shelters: interior surfaces shall have a flame spread rating not exceeding 200.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.1900 MINIMUM DESIGN LOADS.**

Subpart 1. **Division I, dual-use fallout shelters.** In the case of dual-use fallout shelters, design live load required for the normal use shall govern, except that concentrated loads shall be considered.

Subp. 2. **Division II, single-purpose fallout shelters.** Minimum live load for floor design in single-purpose fallout shelters shall be 40 pounds per square foot except that concentrated loads shall be considered.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.2000 SANITATION.**

Toilets, either flush type operating from the normal water supply system, or chemical or other types, shall be provided on the basis of one toilet per 50 fallout shelter occupants. Fifty percent of the toilets may be provided outside the fallout shelter area. Empty water containers may be considered as fulfilling this requirement.

**Statutory Authority:** *MS s 16B.59 to 16B.73*

**1330.2100 MISCELLANEOUS.**

**Windows:** no requirements.

**Illumination:** no special lighting levels are required.

**Fire-resistive construction requirements:** no requirements.

**Statutory Authority:** *MS s 16B.59 to 16B.73*