NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

RHODE ISLAND

FLOODPROOFING MEASURE

(No.)

CODE 714

DEFINITION

A combination of changes or the addition of features to an existing building to minimize flood damage.

PURPOSE

A floodproofing measure minimizes flood damages to a building and/or contents. Floodproofing reduces the susceptibility of a building and/or contents to flood damage as opposed to reducing the flood levels.

CONDITIONS WHERE PRACTICE APPLIES

A floodproofing measure is, or becomes, an integral part of the building being protected.

A floodproofing measure is either independent or dependent. An independent measure is one that does not depend on human intervention to put flood protection into effect. A dependent measure requires a flood warning, or forecast, and action to put flood protection into effect.

Typical floodproofing measures are flood shields, permanently blocking low opening, filling basements, raising buildings, relocating utilities above flood levels, providing relief drainage with pumps, and sealing walls.

A floodproofing measure is used to protect residential, commercial, industrial, or other buildings from serious flood damage when:

1. Depth (D) of flood water at the building is six feet or less above existing ground, and
2. Velocity (V) of floodwater at the building is ten feet per second or less, and
3. Sufficient warning time for installation and operation of a dependent floodproofing measure is ensured, and a warning system is in place or will be implemented with the dependent floodproofing measure.

There are limitations on the applicability of a flood-proofing measure for buildings in a high hazard area. A high hazard area is an area where one or more of the conditions in Table A are met for the one percent chance flood.

Table A

Safety Consideration	Depth (D)	Velocity (V) feet/sec	Product (DV)
People[1]	3 ft.	5	7
Structural	6 ft.	10	15
Animals	0.5[2]	5	--

[1]The values in this table are maximum criteria for adults. Lower values may be used based on the population composition and state or local laws. Buildings with overnight occupancy that are located in a high hazard area shall not be floodproofed unless flood-free or other than high hazard access is provided. Buildings with overnight occupancy are buildings with sleeping accommodations. This includes residential buildings, medical facilities, special care facilities (handicapped, elderly, etc.) and some commercial buildings such as hotels and motels. Commercial buildings may be exempted from this limitation if:

1. an attendant is on duty 24-hours per day, and
2. sufficient means for warning and warning time for evacuation exists.

[2]Depth for animals shall be determined by multiplying the appropriate animal height by 0.5.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service, West Warwick, Rhode Island. (http://www.ri.nrcs.usda.gov/).

A floodproofing measure may be applicable to situations outside the above limits of this standard. These cases require special design considerations. Normally a dike or relocation is more appropriate.

This standard does not apply to dikes (356), buildings that are to be relocated, or new building.

CRITERIA

Height

The minimum design height of the floodproofing measure shall be the water elevation associated with the one percent chance flood. Appropriate freeboard shall be included consistent with site conditions and anticipated wave height due to wind, storm surge, boats, or vehicles.

Loading

A floodproofing measure and the floodproofed building shall withstand all anticipated loads with an appropriate factor of safety. Loadings include lateral earth, hydrostatic, and hydrodynamic loads, hydrostatic uplift, concentrated surface loads, and impact loads.

Structural Design

An analysis of the structural adequacy of the building to be floodproofed shall be made to insure that a floodproofing measure does not increase the potential structural damage. After floodproofing, the building and floodproofing measure shall be structurally sound. All modifications shall be in accordance with local and state building codes.

Service Life

A floodproofing measure shall be planned, designed, and installed to provide a minimum service life of 25 years. Materials shall be selected based upon anticipated service life, initial and replacement costs, and operation and maintenance.

CONSIDERATIONS

The limitations of floodproofing high hazard residential buildings are based on the concern for creating a false sense of security for the occupants. Floodproofing of existing buildings located in a designated floodway is permitted by this standard, but consideration should be given to removing the structure.

This standard bases high hazard area determination on a one percent chance flood. A larger flood may be appropriate for critical facilities such as hospitals or where major environmental risk is involved such as hazardous materials storage facilities.

PLANS AND SPECIFICATIONS

Plans and specifications for a floodproofing measure shall be in keeping with this standard. Construction inspection plans shall be prepared to assure that proper and timely construction inspection can be accomplished.

OPERATION AND MAINTENANCE

Operation and maintenance shall be in accordance with an operation and maintenance plan developed for each floodproofed building. The plan shall include those actions required to maintain, operate, replace, and ensure the proper functioning of the installed floodproofing measure. The plan shall include provisions for periodic inspections and for scheduling sessions to practice installing the flood-proofing measures.

The operation and maintenance plan for a dependent floodproofing measure shall contain additional details for notifying building occupants or owners of a flood warning or forecast; installation requirements and procedures; time, equipment, and personnel requirements; and any other actions needed to make the dependent floodproofing measure operational in a timely manner.

The operation and maintenance plan shall be transferred to the new owners when the property ownership changes.

REFERENCES

Coastal Construction Manual
F.E.M.A.-55, Federal Emergency Management Agency, Washington, D.C., June 2000.

Engineering Principles and Practices of Retrofitting Flood-Prone Residential Structures
F.E.M.A. 259, Federal Emergency Management Agency, Washington, D.C., June 2001.

Elevated Residential Structures
F.E.M.A.-54, Federal Emergency Management Agency, Washington, D.C., March 1984.

Flood Proofing Bibliography
U.S. Army Corps of Engineers, National Flood Proofing Committee, Washington, D.C., June 1988.

Flood Proofing Regulations
E.P. 1165-2-314, U.S. Army Corps of Engineers, Washington, D.C., December 1995.