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K3518.N7.N7 1994

New York State Department of State
Division of Coastal Resources and Waterfront Revitalization

Recommendations For Statewide Building Code Changes In Coastal Hazard Areas

309 Project of Special Merit

Performance Report
to the Office of Ocean and Coastal Resources Management
National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

June 1994

INTRODUCTION

This is the final report in a series of 4 performance reports on the progress of activities related to amending the New York State Uniform Fire Prevention and Building Code (Code). The Department of State, Division of Coastal Resources and Waterfront Revitalization (DCRWR) reviewed standards and recommendations from FEMA, NOAA, various coastal states, the scientific and engineering literature and building code organizations to develop the proposed amendment to the Code. This report presents the revised amendment by the Department of State, Codes Division, and highlights major changes that were made to the draft code section contained in Performance Report No. 3. A copy of the transmittal letter from the Department of State to the Division of Housing and Community Renewal (DHCR) for review of the proposed amendment by the Codes Council is enclosed, along with a brief discussion of the process DHCR and the Codes Council must go through before the proposed amendment can be adopted as part of the Code.

DRAFT AMENDMENT REVIEW BY DOS, CODES DIVISION

DCRWR coordinated two reviews of the proposed amendment with Codes Division personnel in the Department of State. The initial review of the draft amendment dealt largely with the format to be used and proper code language. Changes were made to various sections in an attempt to clarify them and eliminate all ambiguities and redundancies. The initial review also focused on which documents should be incorporated as reference standards in the Code. The final review by Codes Division personnel was performed to examine some additions to the structural requirements of the proposed amendment made by DCRWR and to ensure that all changes recommended in the initial review had been satisfactorily made.

CHANGES TO THE PROPOSED AMENDMENT

The following changes have been made to the draft code section contained in Performance Report No. 3:

1. The Coastal Hazard Area Construction Standards section was changed from section 810 to part 1130 because this section falls under the category of special requirements.

2. The design loads to which pile foundations may be subjected are the loads specified in section 803 and the horizontal water loads specified in Appendix D.8 of the FEMA Coastal Construction Manual.

3. Pile analysis shall consider the piles in column action from the bottom of the structure to the stable soil

elevation and shall determine if pile bracing is required to resist the design loads. Acceptable types of pile bracing and bracing placement recommendations are also given.

4. Acceptable materials for piles in coastal hazard areas, minimum sizes for timber piles, and recommendations for pile installation are provided in the structural requirements.

5. Additional recommendations on framing, connecting, and bracing wood framed structures are provided in the structural requirements.

6. Hazardous locations 1, 3, 4, 5 and 7 were deleted from the list of hazardous locations for the purposes of glazing because these locations were not unique to coastal construction and are already contained in section 715 of the Code.

7. Specific language to address the plumbing issues was provided by the Codes Division of the Department of State and has been included in the proposed amendment.

8. The specific draft language developed by DCRWR to address mobile homes located in coastal hazard areas has been deleted. Standards for the construction of mobile homes shall be in accordance with the requirements of section 1221.1 of the Code. Mobile homes located in coastal hazard areas shall be located and installed in accordance with the requirements of part 1223, the structural requirements of part 1131, and part 1133.

PROCESS OF AMENDING THE STATE FIRE PREVENTION AND BUILDING CODE

Executive Law 377 authorizes the State Fire Prevention and Building Code Council (Council) to formulate, periodically review and amend the Code. The Council is part of the Division of Housing and Community Renewal (DHCR). DOS has forwarded the proposed final amendment to DHCR expressing the belief that this amendment will improve construction standards in coastal hazard areas, thus reducing the risk to life and property from severe storms. (See attached transmittal letter.)

Depending on the schedule of the Codes Council, which meets periodically, it may be some time before the proposed amendment comes up for review. The Council is a deliberative body and the review process is likely to involve much discussion and debate of the key items in the section under consideration. The Council may require certain portions of the new section be rewritten and resubmitted. In view of this process, it will probably take more than a year before the proposed amendment is finally adopted as part of the Code.

Article 16

Coastal Hazard Area Construction Standards

PART 1130

COASTAL HAZARD AREA CONSTRUCTION STANDARDS

Section 1130.1 Scope. Buildings and structures located within coastal hazard areas, as defined herein, shall conform with the requirements of this article. Provisions of this article shall take precedence over less restrictive provisions of this code with respect to buildings and structures located within coastal hazard areas.

Section 1130.2 Definitions. For the purpose of this part the following shall apply:

(a) *Mean Sea Level (MSL)* - The tidal datum which is the arithmetic mean of hourly water level heights observed over a 19 year period by the National Ocean Service.

(b) *Base Flood Elevation (BFE)* - The peak water elevation in relation to Mean Sea Level (MSL) expected to be reached during a flood having a one percent chance of being equalled or exceeded in any given year. The Base Flood Elevation shall be determined from the FEMA Flood Insurance Rate Map for the coastal area in which the structure is located.

(c) *V-Zone* - Velocity zone subject to coastal flooding and high velocity waters including storm wave wash, as shown by the FEMA Flood Insurance Rate Maps. V-zones are located along the Atlantic Shoreline of New York State, including the shoreline of Long Island Sound and adjacent bays, and the shoreline of Lake Ontario and Lake Erie.

(d) *Coastal Erosion Hazard Area (CEHA)* - Area identified by the New York State Department of Environmental Conservation under Article 34 of the Environmental Conservation Law, Coastal Erosion Hazard Area Act, near the shoreline of the Atlantic Ocean and Great Lakes which has been identified as subject to at least one of the following hazards: (1) Historical or predicted future trends of long term erosion, (2) erosion expected to occur during a coastal storm reaching the base flood elevation, or (3) shoreline fluctuations due to tidal inlets.

(e) *Coastal Hazard Area* - All areas which are located within the V-zone or the coastal erosion hazard area.

(f) *FEMA* - FEMA is the United States Federal Emergency Management Agency. This agency administers the National Flood Insurance Program and publishes the official flood insurance rate maps (FIRMS).

(g) *Lowest Floor* - The lowest floor of the lowest enclosed area (including basement or cellar). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access to storage in an area other than a basement area is not considered a building's lowest floor; provided:

a. That the walls are substantially impermeable to the passage of water and the structural components have the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; or,

b. Construction shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing the entry and exit of flood waters.

PART 1131 STRUCTURAL REQUIREMENTS

Section 1131.1 Piling standards. (a) All buildings located in coastal hazard areas shall be constructed and anchored on pile foundations of sufficient strength to support the design loads to which they may be subjected including loads specified in section 803 and horizontal water loads specified in Appendix D.8 of RS 20-3. Piles shall be designed so the pile size and pile embedment are adequate to support the specified design loads. Pile embedment shall include consideration of the type of soil, method of pile installation, and decreased resistance capacity caused by anticipated scour of soil strata surrounding the piling based on local scour data. In the absence of local scour data, a scour depth of 4.5 feet shall be used for the first row of structures and 2 feet for inland structures. Spread footings and fill shall not be used for structural support purposes. Mat or raft foundations which support columns shall not be permitted where soil investigations indicate that soil material under the mat or raft is subject to scour or erosion from wave-velocity flow conditions.

(b) All pilings within the coastal hazard area shall have a minimum tip penetration of at least 5 feet below MSL or 16 feet below average original grade, whichever results in the deeper penetration.

(c) Pile foundation analysis shall include consideration of the piles in column action from the bottom of the structure to the stable soil elevation and shall determine if pile foundation bracing is required to provide adequate lateral resistance to the specified design loads. Acceptable types of pile foundation bracing include knee bracing, diagonal bracing, truss bracing, and horizontal bracing. Knee braces shall be permitted along pile rows parallel and perpendicular to the shoreline. Knee braces shall be sloped at or near one horizontal to one vertical and shall not extend more than 3 feet below the BFE. Diagonal braces shall be sloped at or near one horizontal to one vertical. Diagonal bracing consisting of wood members shall only be placed along pile rows perpendicular to the shoreline. Diagonal bracing consisting of steel rods or steel cable shall be permitted in any plane. Truss bracing systems providing increased lateral

resistance to pile foundations shall consist of diagonals, struts, and bolted connections and shall be limited to the same locations as diagonal bracing. All connections for pile foundation bracing shall be bolted connections. Information on pile foundation bracing is provided in Appendix B of RS 20-3.

(d) Acceptable materials for piles in coastal hazard areas include wood and reinforced concrete. The minimum sizes for timber piles shall be a tip diameter of 8 inches for round timber piles and 8" x 8" for square timber piles. Concrete piles shall be cast of concrete with a 28 day compressive strength of not less than 5000 psi and shall be reinforced with a minimum of 4 longitudinal steel bars having an area of not less than 1 percent nor more than 4 percent of the gross concrete area.

(e) Piles installed by driving shall be driven by a pile driver or drop hammer that holds the pile in position through the use of leads while the pile is being driven. A protective driving cap shall be utilized to transmit energy from the hammer to the pile during the driving process. Piles installed by jetting shall be designed assuming a loose sand soil condition due to the jetting operation. Piles shall not be driven closer than 2 feet to each other or to an existing structure. Piles shall not be jetted closer than 10 feet to an existing structure unless approved by a design professional. Splicing of foundation piles shall be avoided. Pile splices that are unavoidable shall be constructed to provide and maintain aligment and position of the component parts of the pile and to transfer pile loads across the splice.

Section 1131.2 Elevation standards. (a) The lowest structural member excluding piling and bracing supporting the lowest habitable floor in the coastal hazard area shall be elevated above the base flood elevation (BFE) plus wave height addition.

(b) The wave height addition is determined by the flood water depth (D) under the building using the formula: (See Figure 1)

Wave Height Addition = 0.55 X D

Where D = base flood elevation minus lowest finish grade elevation; or other acceptable methods of wave height determination such as found in "Estimating Wave Heights" (FEMA TD-3) or the Corps of Engineers "Shore Protection Manual" (SPM).

Section 1131.3 Construction, materials, and methods standards. (a) All construction and equipment located below the Base Flood Elevation shall be resistant to flood damage.

(b) Construction of solid walls or partitions below the lowest floor shall not be permitted in coastal hazard areas. Non-supporting breakaway walls are permitted when designed by a registered design professional in accordance with RS 20-3.

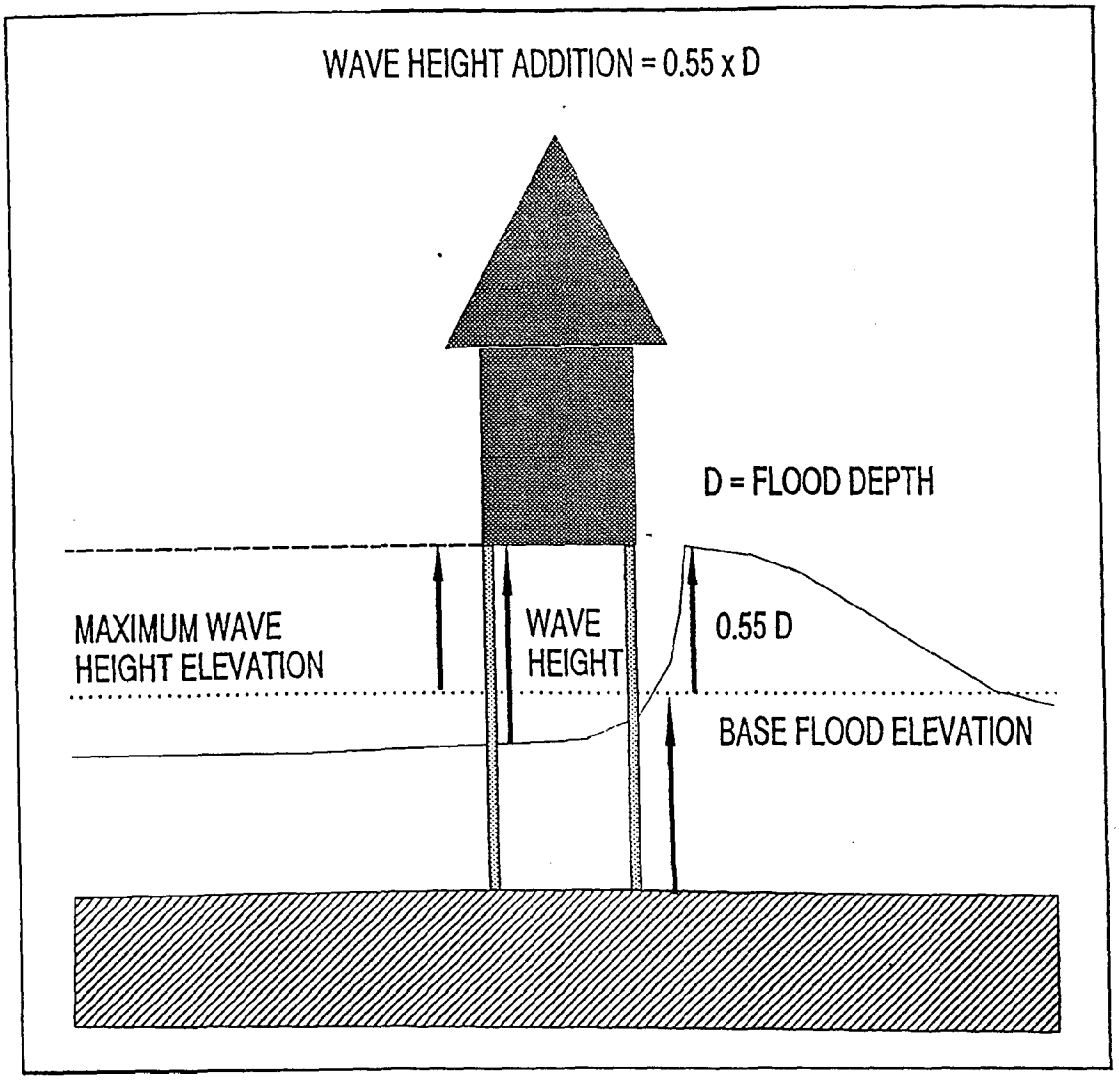


Figure 1 WAVE CONDITIONS ON A PILING SUPPORTED BUILDING

(c) All construction shall be adequately anchored, connected and braced to prevent uplift, floatation, collapse, lateral movement or overturning during design storm conditions. Special attention shall be given to connection between major structural subsystems including but not limited to piling to floor beam, beam to floor joist, joist to exterior side wall diaphragms and side wall to roof joist.

(d) Wood frame construction:

(1) All floor beam splices shall be located directly over the beam supports. Notching of pile tops shall be limited to the minimum amount required to provide ledge support for the framing members and the cross section of the pile shall not be reduced below 50 percent by notching.

(2) Floor joists shall be fastened to floor beams with metal joist anchors or wood connectors. Cross bridging or solid bridging shall be provided for all floor joists at a maximum spacing of 8 feet on center.

(3) Exterior grade plywood not less than 23/32 inches in thickness shall be used for subflooring and attic flooring throughout wood framed structures. Plywood shall be fastened to the joists and beams with annular or spiral thread galvanized nails and a waterproof industrial adhesive. Required plywood thicknesses and methods of attachment shall be as specified in RS 25-3.

(4) Exterior grade plywood wall sheathing and approved anchors shall be used to form a continuous tie between roof framing, wall framing, and floor framing. Wall sheathing shall be continuous from the top wall plate to the floor beam or joist. At all locations where the plywood sheets are not vertically continuous, 2 x 4 nailer blocking shall be provided at all horizontal joints. Exterior grade plywood wall sheathing shall provide bracing to exterior walls to resist racking due to lateral loads. Plywood wall bracing shall occur at all corners, and shall cover the floor joist and header and extend to and cover the top plate of the wall. Bracing shall extend at least 4 feet in each direction from each corner. All plywood sheathing shall be attached with annular or spiral thread galvanized nails. Required plywood thicknesses and methods of attachment shall be as specified in RS 25-3.

(5) Conventional rafter and ceiling joist construction shall be installed so the joists provide a continuous tie across the rafters. Roof rafters and ceiling joists shall be securely fastened at their intersections and shall be fastened to the wall top plate with metal connectors or wood connectors.

(6) The design of metal plate connected wood roof trusses shall comply with RS 25-27. Roof trusses shall be adequately braced and anchored to the wall top plate with metal connectors at all points of bearing. Roof trusses shall be braced and installed in accordance with RS 25-32. Design drawings for individual roof trusses shall include bracing and anchoring details and shall be sealed by a Professional Engineer.

(7) Gable roof framing shall be reinforced by installing 2 x 4 blocking at 2 feet on center between trusses or rafters for a minimum of 8 feet at each end of the structure.

(8) Roof sheathing shall be exterior grade plywood or board lumber not less than 15/32 inches in thickness. Sheathing shall be fastened to supports with screws or annular or spiral thread nails. Methods of attachment and required plywood thicknesses shall be as specified in RS 25-3. All fasteners for roof coverings shall be galvanized or of corrosion resistant material.

(e) All cantilevers and projecting members shall be anchored and braced to withstand forces due to the specified design loads.

(f) Construction documents shall show details of foundation support and connection components used in meeting the requirements of Section 1131.3(c) and shall be sealed by a design professional.

(g) In the coastal hazard area, all metal connectors and fasteners outside of conditioned spaces shall be hot dip galvanized steel after fabrication and meet the requirements of RS 20-2. Exposed metal connectors such as tie down straps on porches, decks, and areas under the structure shall be minimum of 3/16 inch thick and shall be hot dip galvanized after fabrication and meet the requirements of RS 20-1 or RS 20-2. Metal connectors of approved equivalent corrosion resistant material may be accepted. See Table A.

Section 1131.4 Records and certifications. (a) Plans or specifications submitted in connection with a building permit application shall be sealed by a Professional Engineer and shall certify that the building is designed in compliance with Section 1131.1.

(b) The construction documents shall be accompanied by a statement bearing the signature of the registered design professional indicating that the design and proposed methods of construction are in accordance with all applicable provisions of section 1131.2.

(c) The actual elevation required by Section 1131.2 shall be determined by a Registered Land Surveyor or Professional Engineer. The actual elevation of the first floor shall be certified by a Registered Land Surveyor or Professional Engineer before construction is continued above the first floor level.

TABLE A
CORROSION RESISTANCE

(Applies Only to Structures Located in Coastal Hazard Areas)

	OPEN (exteriors, porches, underhouse)	VENTED/ENCLOSED (attic, floor trusses, enclosed crawl spaces and stud cavity)	CONDITIONED (heated/cooled living areas)
Nails, staples, screws	Hot Dip galvanized	Hot dip galvanized	-----
Nuts, bolts washers, tie rods	Hot Dip galvanized	Hot Dip galvanized	-----
Steel connection plates & straps (3/16" minimum thickness)	Hot Dip galvanized after fabrication	Hot Dip galvanized	-----
Sheet metal connectors, wind anchors, joists hangers, steel joists and beams	Stainless Steel or Hot Dipped galvanized after fabrication	Hot dip galvanized after plate fabrication	Hot dip galvanized
Truss plates	Stainless Steel or Hot Dipped galvanized after fabrication	Hot dip galvanized after fabrication or stainless steel within 6'-0" of a gable louver or soffit vent. Otherwise in accordance with TIP-78 of the Truss Plate Institute	Standard galvanized

PART 1132 GLAZING

Section 1132.1 Glazing standards. (a) Each light shall bear the manufacturer's label designating the type and thickness of glass. When approved by the Code Enforcement Official, labels may be omitted from other than tempered glazing materials providing an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with the approved plans and specifications.

(b) Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed. Tempered spandrel glass is exempted from permanent labeling. This type of glass shall be identified with a removable paper label by the manufacturer.

(c) Regular plate, sheet or patterned glass in jalousies and louvered windows shall be no

thinner than nominal 7/32 inch and no longer than 48 inches. When other glass types are used, design shall be submitted to the Code Enforcement Official for approval. Exposed glass edges shall be smooth. Wired glass with wire exposed on longitudinal edges shall not be used in jalousies or louvered windows.

(d) Individual glazed areas in hazardous locations including but not limited to those indicated in section 1132.1 (e) shall pass the test requirements of RS 20-4, or by comparative test shall be proven to produce at least equivalent performances.

EXCEPTIONS:

1. Polished wire glass for use in fire doors, fire windows and view panels in 1-hour or less fire resistant walls shall comply with RS-6.

2. Approved plastic materials used as glazing in hazardous locations shall comply with RS-6.

(e) The following shall be considered specific hazardous locations for the purposes of glazing.

1. Glazing in fixed and sliding panels of sliding type doors (patio and mall type).

2. Glazing, operable or inoperable, adjacent to a door in all buildings and within the same wall plane as the door whose nearest vertical edge is within 12 inches of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface.

(f) The following products, materials and uses are exempt from the above hazardous locations:

1. Openings in doors through which a 3-inch sphere is unable to pass.

2. Leaded glass panels where no individual piece of glass has an area greater than 30 square inches.

3. Glazing materials used as curved glass panels in revolving doors.

4. Commercial refrigerated cabinet glazed doors.

5. Faceted and decorative glass.

(g) Maximum sizes of single regular (annealed) glass may be determined directly from Table II.1132. Maximum sizes of other glass types may be determined by first dividing the wind load determined in section 803.4 and by the factors in Table I.1132. Table II.1132 is applicable for rectangular glass firmly supported on all four edges. When approved by the Code Enforcement Official, alternate means for selecting glass may be used in place of Table I.1132 and Table II.1132.

(h) Glass supports such as sash members, glazing stops or glazing clips shall be considered firm when deflection of the support at design load does not exceed 1/175 of the span. Where other than firm support on all sides is provided, (three sides, two sides, cantilever, or highly flexible, for example), detailed shop drawings, specifications and rational analysis and/or test data assuring safe performance for the specific installation shall be prepared by engineers experienced in this work and shall be submitted for and receive, if warranted, formal approval by the Code Enforcement Official.

TABLE I.1132
RELATIVE RESISTANCE TO WIND LOAD

GLASS TYPE	FACTOR[1]
Laminated[2]	0.75
Wired	0.5
Heat Strengthened	2.0
Fully Tempered	4.0
Insulating glass[3] - 2 panes	1.7
- 3 panes	2.55
Patterned[4]	1.0
Sandblasted[5]	0.4
Regular (annealed)	1.0

[1] Wind pressure determined from section 803.4 should be divided by this factor for use with Table II.1132.

[2] Applies when two plies are identical in thickness and type; use total glass thickness, not thickness of one ply.

[3] Applies when each glass pane is the same thickness and type; use thickness of one pane.

[4] Use minimum glass thickness, i.e., measured at the thinnest part of the pattern; interpolation of Table II.1132 may be required.

[5] Factor varies depending upon depth and severity of sand blasting; value shown is minimum.

PART 1133 UTILITIES

Section 1133.1 Utility connections. (a) Water supply and drainage piping for buildings or structures located in coastal hazard areas shall be designed to minimize infiltration and damage by flood waters. Above ground piping shall be securely fastened to sides of interior piles or piers away from the ocean front or be located within a protective floodproof enclosure not more than 2' wide unless designed by a Professional Engineer or Architect.

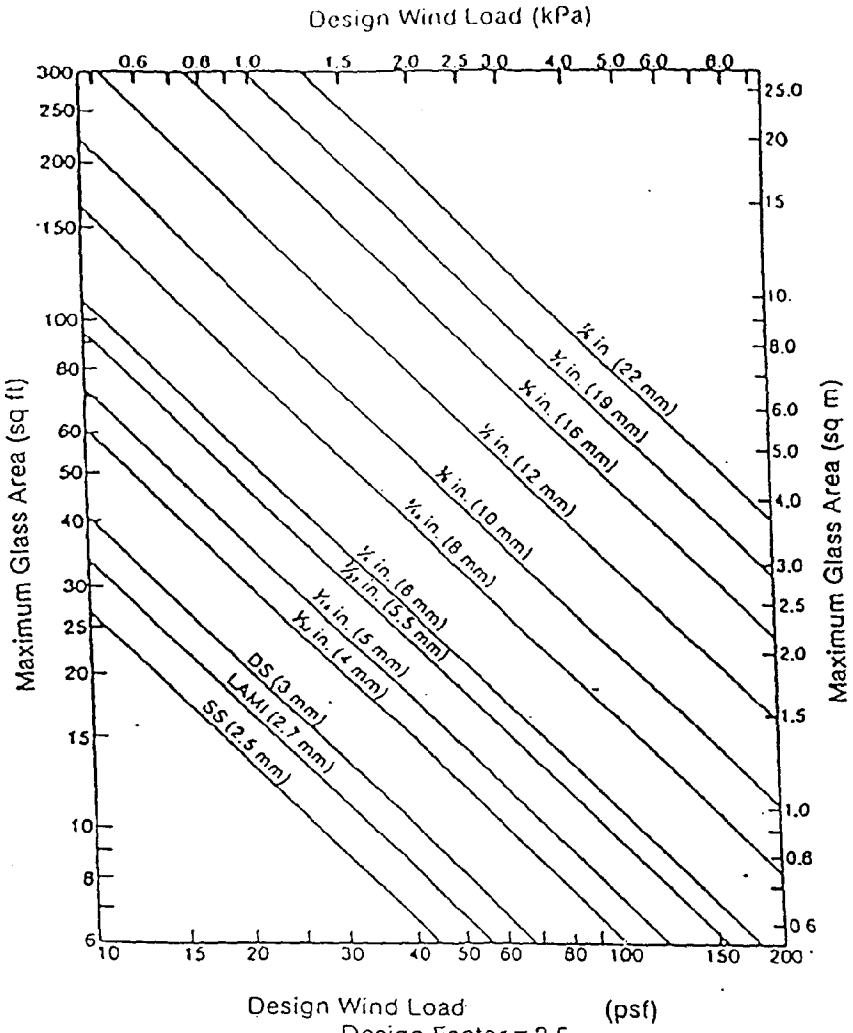
(b) All floor and wall penetrations for plumbing, mechanical and electrical systems shall be made water tight to prevent flood water seepage through spaces between the penetration and wall construction materials.

(c) Sanitary sewer systems that have openings below the base flood elevation shall be provided with shutoff valves or closure devices to prevent back-water flow during conditions of flooding.

PART 1134 MOBILE HOMES

Section 1134.1 Mobile home requirements. Mobile homes located within the coastal hazard area shall be located and installed in accordance with the requirements of part 1223, the structural requirements of part 1131, and part 1133 except Part 1131.3(d).

WIND LOAD CHART



Design Factor = 2.5

Chart Applies for Width-to-Length Ratios from 1:5 to 1:1

Based on Minimum Glass Thickness Allowed in Federal Specification DD-G-451D

TABLE II.1132 WIND LOAD CHART

STRUCTURAL REFERENCE STANDARDS (to be added)

RS No.	Issued by	Title
RS 20	OCE	Flood Proofing Regulations EP-11652314, June 1992
RS 20-1	ASTM	Standard Specification for Zinc Hot Dip Galvanized Coating on Iron and Steel Products A123-89A
RS 20-2	ASTM	Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware A153-87
RS 20-3	FEMA	Design and Construction Manual for Residential Buildings in Coastal High Hazard Areas (Coastal Construction Manual) FEMA-55, February, 1986
RS 20-4	FEMA/CPSC	Consumer Product Safety Commission Architectural Glazing Materials, Federal Register 16-77 CFR Part 1201 Category II
RS 25-32	TPI	Bracing Wood Trusses Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses BWT-76

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