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2010 Florida Building Code

Floodplain Regulations



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Agenda

Introduction

Why we have Floodplain Regulations

Floodplain regulations – the 2010 FBC and the local ordinance

What happens next?

Question and Answers



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Presenters and Panel

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Why we have Floodplain Regulations



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"Floods are 'acts of God,' but flood losses are largely acts of man."

Gilbert F White – the father of Floodplain management

A natural river basin



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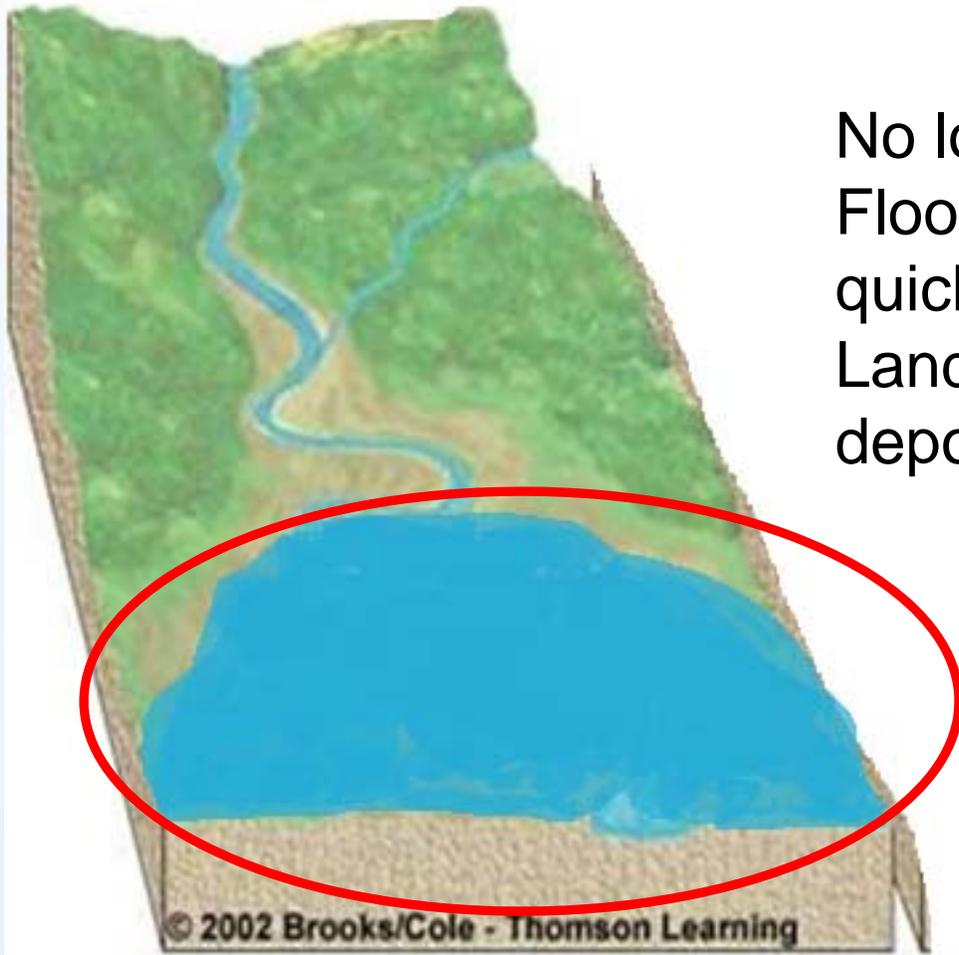


River meanders
gathering water
from surrounding
watershed



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After a Flood

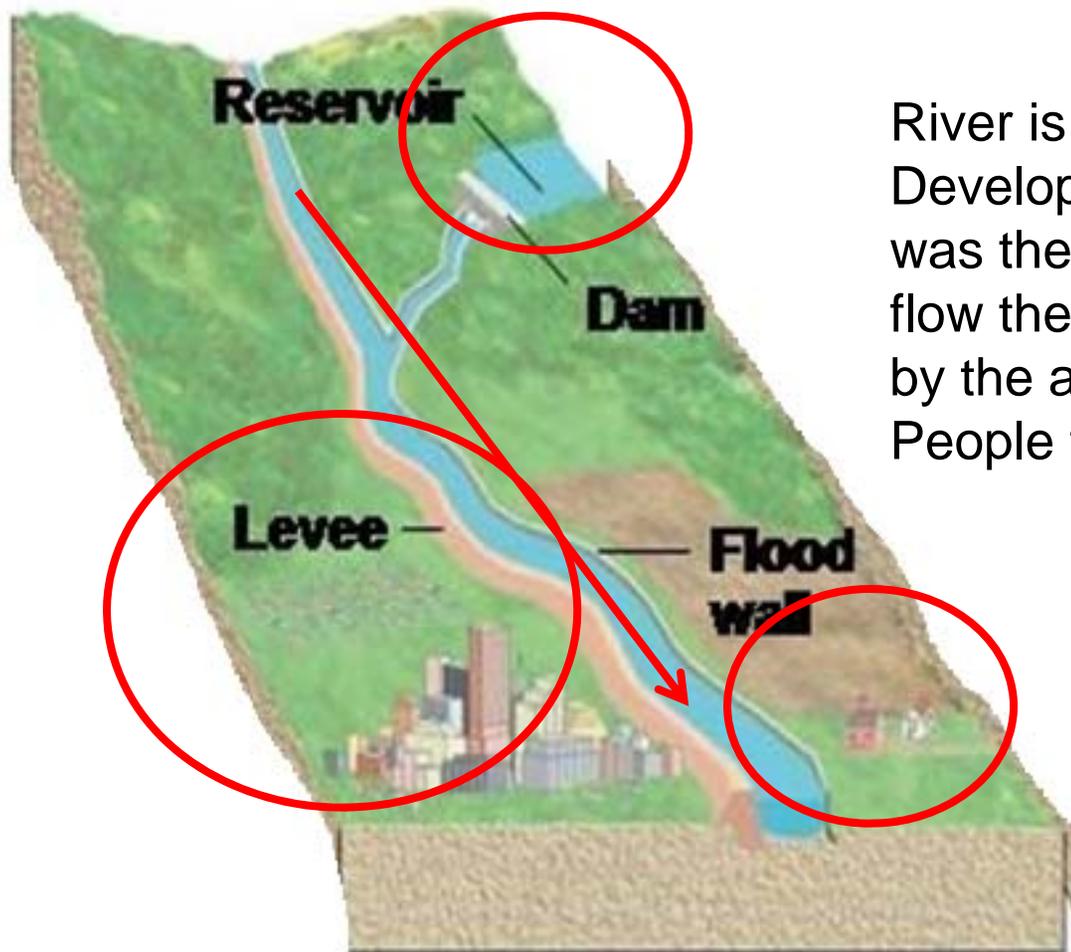


No loss of life or structure.
Flood impact is less and
quickly dissipates.
Land remains fertile due to
deposits of alluvial soil

After Development



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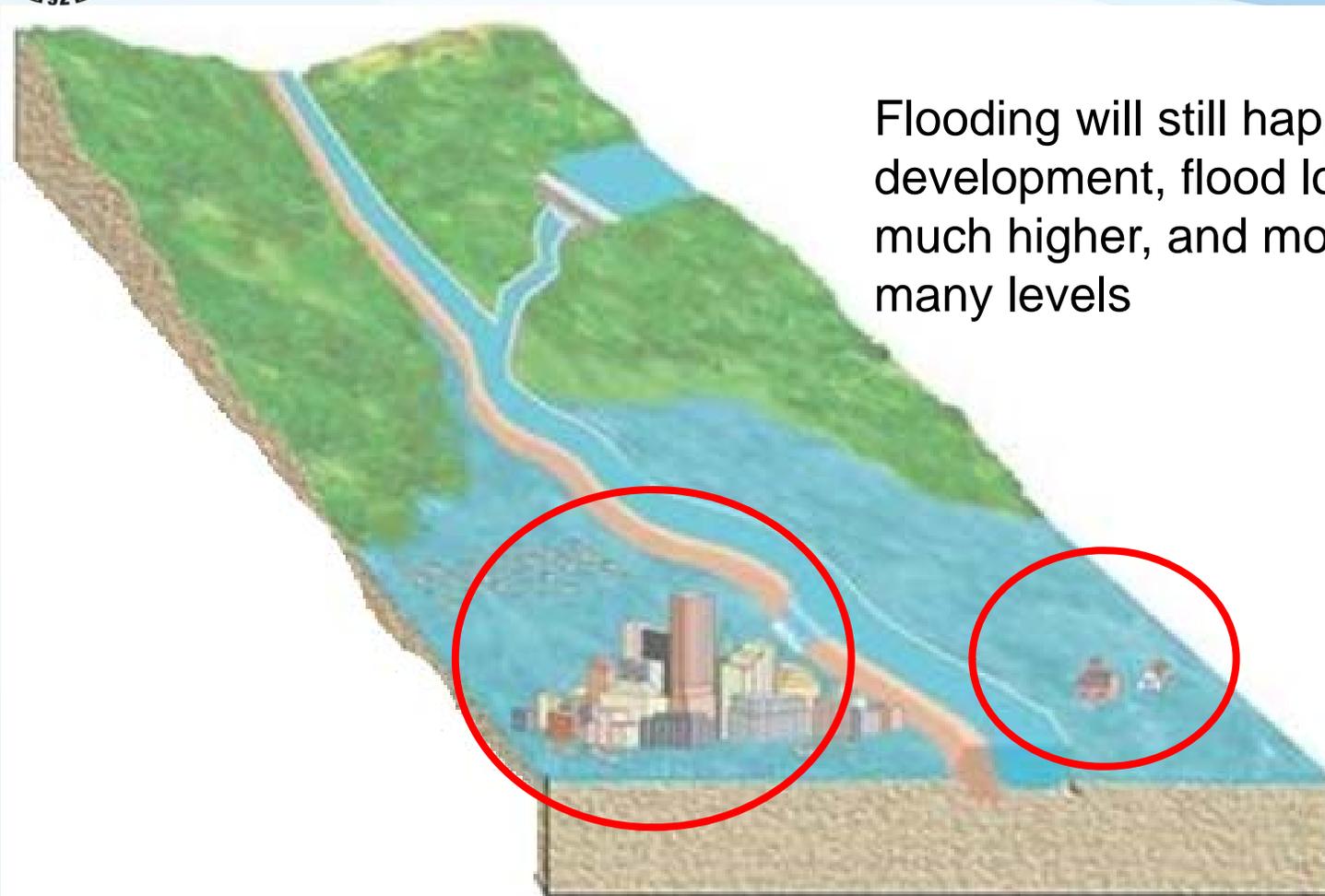


River is contained and controlled. Development has occurred in what was the natural floodplain and the flow the river has been altered by the addition of a reservoir. People think they are protected

After a Flood



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Flooding will still happen – after development, flood losses are much higher, and more costly on many levels

Cost of Flooding



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http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/the_cost_of_flooding.jsp



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Local Statistics

30,609 Policies in force

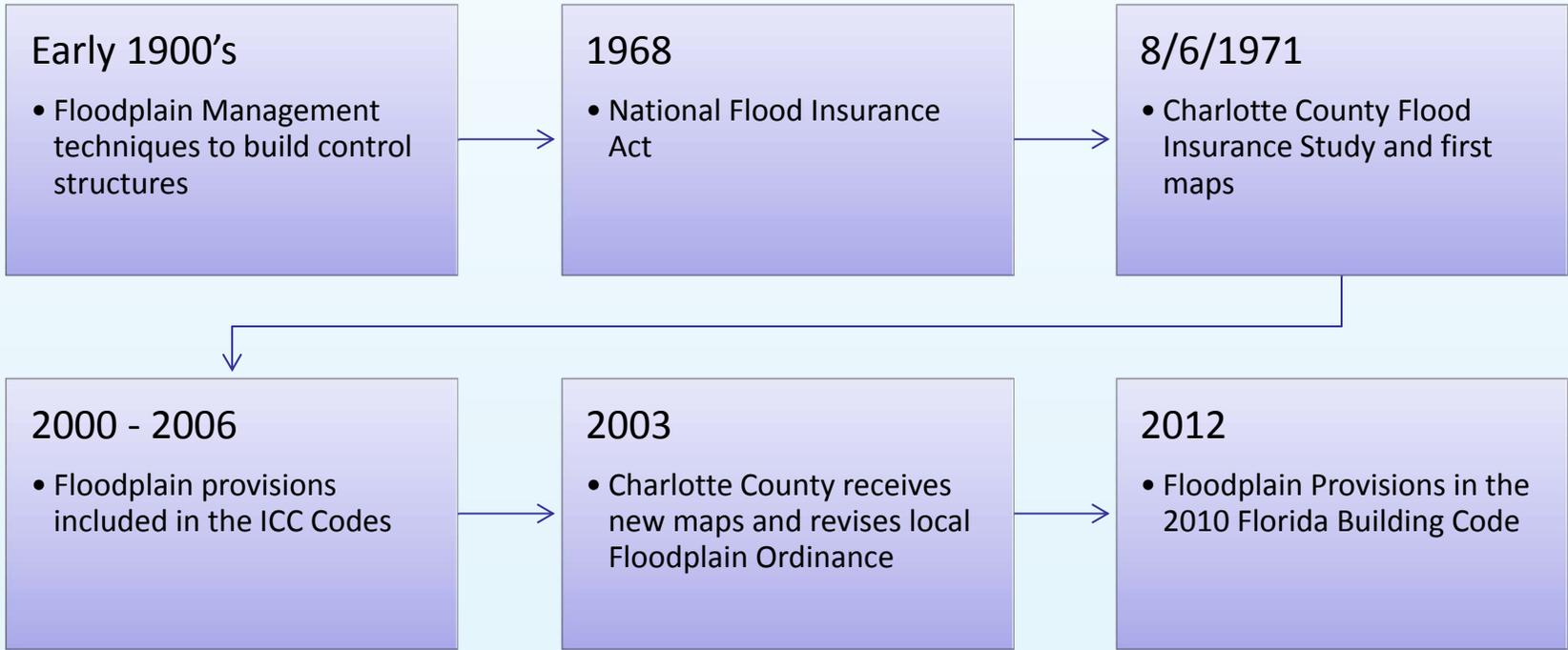
\$7,083,444,200 worth of coverage

Average premium per policy \$670.42

From Jan 1978, 2143 claims, 1086 that have been paid

Total of \$10,020,706.01 paid out

Legislation and Codes





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Common Terms (see handout)

NFIP – National Flood Insurance Program

CRS – Community Rating system

SFHA – Special Flood Hazard Area

BFE – Base Flood Elevation

DFE – Design Flood Elevation

FIRM – Flood Insurance Rate Map

FIS – Flood Insurance Study



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Flood Insurance

Flood Insurance is mandatory for mortgages through federally regulated lending institution in the Special Flood Hazard Area

Premiums and coverage limits are set by FEMA

Premiums are reduced by the County's participation in the Community Rating System

Community Rating System



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21,000 NFIP Communities in the Country

Over 2000 CRS Communities

Charlotte County ranked 8th in the Nation

\$5.8million savings PER YEAR

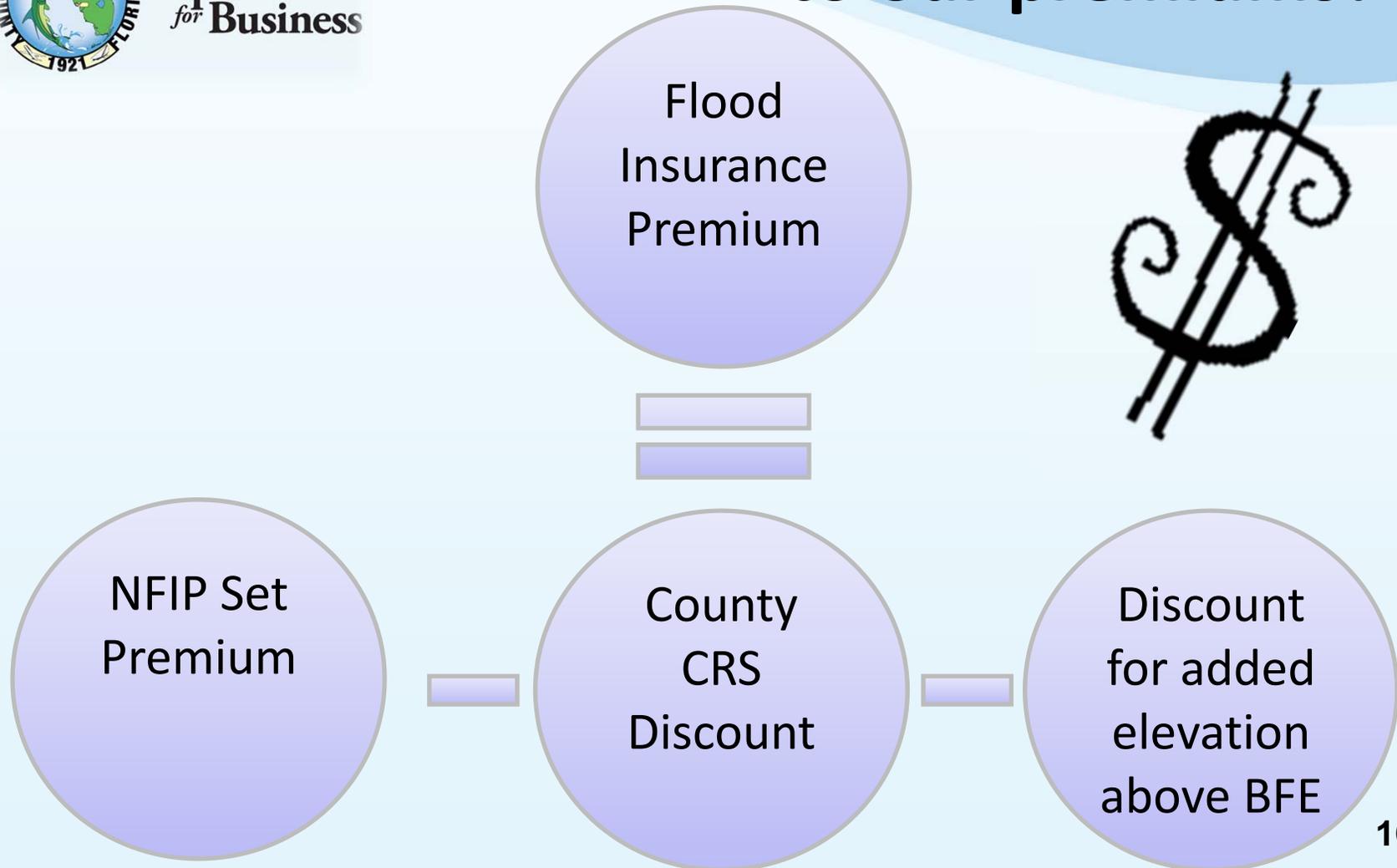
One of 66 Class Five Communities in the Nation

Holistic approach to floodplain management

What does that mean to our premiums?



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Changes to the building code



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Floodplain incorporated in all aspects of the suite of codes

Some Florida amendments included (Specifically High Velocity Hurricane Zones (Miami-Dade and Broward))

Has been deemed by FEMA to be consistent with NFIP

Is the minimum – local floodplain ordinance has higher standards

Local Ordinance still in force



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Chapter 1 - Administration

Defines the purpose and scope of the code

Adds the Floodplain regulations throughout plans review and inspections

NFIP includes ALL development and not just structures

Items that are exempt from the Florida Building Code are NOT exempt from floodplain regulations

Building Code



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Applicable to everything that is not otherwise covered in the Residential, Existing Building or Mechanical, Electrical and Plumbing coded

Chapter 1612 – Flood Loads but references throughout the code

Provides definitions and establishes the floodplain

ASCE 7 -10 – Minimum Design Loads – Includes Flood Loads

ASCE 24-05 – Flood Resistant Design and Construction



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Elevation

Defined by ASCE 24-05

Elevation above Base Flood Elevation determined by risk category and flood zone

Reality – many structures in Charlotte County now have a 1 to 2 ft freeboard as required by the provisions of the Code

Residential structures follow provisions in the residential code – this may refer back to ASCE 24-05



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ASCE 24 - 05

Standard on Flood Resistant Design and Construction

Specifies elevation in specific flood zones for different risk category's of buildings

Design criteria for all aspects of construction in all types of flood zone

Provides specifics and requirements for wet and dry flood proofing



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Residential Code

Applies to 1 & 2 Single Family Dwellings not more than three floors in height

Flood provisions are located throughout the code

Section 322 – Flood Resistant Construction

Equipment must be located at or above the DFE

Equipment cannot be located on, or penetrate a breakaway wall



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Existing Building Code

Once a building has been CO'ed, all alterations, remodels, repairs etc. are covered under the existing building code.

Existing building code has flood plain provisions throughout the code

Addresses Historic Structures (must be on the National Historic Register to be considered Historic)



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Substantial Damage, Substantial Improvement

SUBSTANTIAL DAMAGE. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT. Any repair, reconstruction, rehabilitation, addition or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed.



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Plumbing, Mechanical and Electrical Codes

Basically require equipment (including duct work) to be located above the Design Flood Elevation

Exception “.....designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in accordance with ASCE 24”



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Building Code and Local Floodplain Ordinance

State has developed model floodplain ordinance

Sample language for higher regulatory standards

Technical amendments needed but statutes provide for altered process – technical amendments relating to flood do not sunset.

Changes to administrative chapter one also needed



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Current Higher Regulatory Standards

Incorporated in the local flood plain ordinance

Cumulative Substantial improvement/damage

Enclosure limits (v-zones)

Non-Conversion agreements (v-zones)

Protection of Critical Facilities

Freeboard in AO zones



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Other Options for higher rating

Added Elevation (Freeboard) across all of SFHA

Coastal A Zones

Restrictions on fill – move towards stem wall construction

Restrictions on placement of mobile homes in the floodway

Adding repetitive loss language to facilitate Increased Cost Of Compliance for repetitive loss structures – even if they don't meet the 50%



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What happens next?

Changes to the local Floodplain Ordinance

Changes to Administrative Chapter One

Technical Amendments to incorporate the Higher Regulatory Standards



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QUESTIONS?



Flood Resistant Construction and the 2010 Florida Building Code¹

January 2012

Hurricanes and other storms that result in flooding have caused billions of dollars in damage across all parts of Florida. Local jurisdictions throughout the state recognize, plan for and manage development in flood hazard areas. To participate in the National Flood Insurance Program (NFIP), communities agree to regulate all development in flood hazard areas mapped by the Federal Emergency Management Agency (FEMA).

Once an owner or developer makes a decision to construct, add to or substantially improve a building in a flood hazard area, certain requirements intended to minimize future flood damage must be satisfied. Prior to the 2010 *Florida Building Code* (FBC), those requirements were found only in local floodplain management regulations.

Flood provisions are now in the codes, making it easier for design professionals and builders to address the requirements along with other applicable load and design requirements. For additional background please reference the *Frequently Asked Questions* developed by the Florida Division of Emergency Management (DEM).

The flood provisions of the 2010 FBC achieve two broad objectives:

1. As with the rest of the code, they help fulfill the purpose of safeguarding public health, safety, and general welfare. Many Florida communities and property owners can attest that designing and constructing buildings to account for flood loads and conditions significantly reduce damage. FEMA reports that structures built

New in 2010. The FBC is accessible online through the Commission's webpage, listed under Resources.

Download excerpts of the 2010 FBC flood provisions at DEM's webpage, listed under Resources.

to NFIP criteria experience 80% less damage through reduced frequency and severity of losses. Buildings that sustain less damage are more quickly reoccupied, facilitating recovery.

2. They fulfill some of the requirements necessary for communities that participate in the NFIP. FEMA states the flood provisions of the International Code Series[®], which is the foundation of the FBC, are consistent with the NFIP requirements for buildings and structures. However, NFIP communities are responsible for regulating all development, including activities that are not within the scope of the codes. This is accomplished by the adoption of local floodplain management regulations. A model code-companion floodplain management ordinance designed specifically to coordinate with the 2010 FBC is available on the DEM webpage (See Resources).

Notice. The degree of flood protection afforded by the flood provisions in the FBC is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur, and land outside of mapped flood hazard areas may experience flooding.

Florida law was amended in 2010 to allow communities to adopt local administrative amendments to implement the flood provisions of the FBC (see s. 553.73(5), F.S.). The statute also allows local technical amendments to adopt flood provisions that are more stringent than the FBC (also called "higher standards"). Under some circumstances, local amendments will not sunset. Model language for some higher standards is available on the DEM webpage (see Resources). Contact DEM for guidance on adoption of specific higher standards.

¹**DISCLAIMER** – This piece is intended to give the reader only general factual information current at the time of publication. This piece is **not** a substitute for professional advice and should not be used for guidance or decisions related to a specific design or construction project. This piece is not intended to reflect the opinion of any of the entities agencies or organizations identified in the materials and if any opinions appear are those of the individual author and should not be relied upon in any event. Applicable to 2010 Florida Building Code.

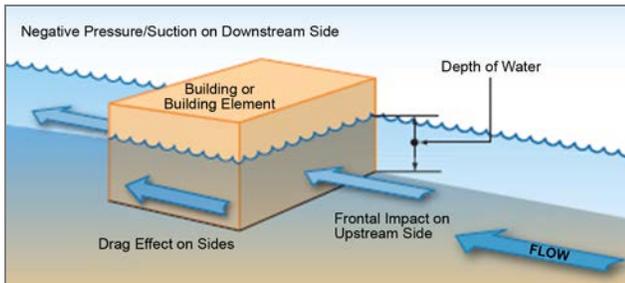
Flood Resistant Construction

The NFIP – and the FBC – requires communities to ensure that new buildings and structures in flood hazard areas are designed and constructed to resist the effects of flood hazards and flood loads. The same requirements apply to existing buildings if proposed work is determined to constitute substantial improvement or repair of substantial damage (both terms are defined in the FBC).

Chapter 16 of the *FBC, Building* requires the designer to develop flood loads, which involves determining flood conditions (flood depth, velocity, scour/erosion, and wave/debris impact). Flood loads and load combinations are described in Chapter 5 of ASCE 7, *Minimum Design Loads for Buildings and Other Structures*.

Although hydrostatic load, a function of water depth, is the most obvious load and the easiest to compute, other loads may be more important to the final design. The other flood conditions necessary to compute hydrodynamic loads are more difficult to determine (see graphic) and may require consultation with engineers who are familiar with how flood maps are prepared. The *FBC, Residential* requires a design professional to prepare designs for homes in coastal high-hazard areas, but not other flood zones. Designers and builders are cautioned to evaluate whether any flood conditions (such as velocities or waves) may warrant a closer look at flood loads.

Other aspects of flood-resistant construction found in the FBC include the use of flood damage-resistant materials and the location of electrical, plumbing, and heating, ventilation, and air-conditioning (HVAC) equipment.



Hydrodynamic loads on a building or building element.

Flood Hazard Areas and Flood Conditions

Flood Insurance Rate Maps (FIRMs) prepared by FEMA are the most common flood hazard maps adopted by Florida communities. Designers and builders should check with individual communities to determine whether a locally-prepared map is used for regulatory purposes. FIRMs identify flood hazard areas associated with the base flood (the 1%-annual-chance or “100-year” flood). Some FIRMs also identify areas subject to flooding by the less frequent 500-year flood.

FEMA labels flood hazard areas as zones:

- Zone A, AE, A1–30, AO, and AH. These zones include flood hazard areas along rivers and streams, in isolated areas where floodwaters accumulate without draining to a waterway and in coastal areas inland of Zone V and along many shorelines.
- Zone V, VE, V1–30, and VO. These zones identify coastal high-hazard areas (the *FBC, Building* calls them “flood hazard areas subject to high velocity wave action”). These zones are found along open coastlines where, during the base flood, waves are expected to be 3 feet and higher.
- Zone X (shaded) identifies areas subject to flooding by the 500-year flood and Zone X (unshaded) identifies land areas that are outside of the 100- and 500-year flood hazard areas.

Coastal A Zone.
Revised FIRMs for coastal communities may have a Limit of Moderate Wave Action (LiMWA) delineated. The area between the LiMWA and the Zone V boundary or the shore is called the “coastal A zone.”

Some site-specific flood conditions can be determined using FIRMs and associated Flood Insurance Studies, while others can be estimated using the best available information (for a general discussion, see Section 5.2 in FEMA P-424, *Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds*):

- Flood depth, used to compute lateral and vertical hydrostatic loads, is determined by subtracting the ground elevation from the base flood elevation (BFE) shown on the FIRM. Lateral hydrostatic loads need not be considered for enclosures below elevated buildings that have flood openings to allow floodwaters to flow in and out. Vertical (buoyant) hydrostatic loads are calculated for elements below the BFE.
- Flood velocity, used to compute hydrodynamic load, may be estimated in riverine areas if the Flood Insurance Study has a floodway data table or by using standard methods for estimating open-channel flow velocities. In coastal areas there is more uncertainty in estimating flood velocity, which is not associated with breaking waves, but is the speed of the mass movement of floodwaters. A number of FEMA references include a graph showing velocity as a function of stillwater flood depth (see FEMA P-55, *Coastal Construction Manual*).
- Debris in moving water can impart a considerable impact load when it collides with buildings. Whether debris is likely to be present, and the types and sizes of debris, cannot be determined from flood maps and studies. ASCE 7, Chapter 5 commentary, provides guidance for consideration of debris impact loads.

- Wave loads, important in coastal areas, depend largely on wave height, which, in turn, is a function of stillwater flood depth, which may be approximated using information in Flood Insurance Studies. The magnitude of wave loads can be 10 times or more higher than wind forces. ASCE 7, Chapter 5 commentary, provides guidance on determining wave loads.
- Erosion and scour may affect the stability of foundations and the loss of supporting soils should be considered because it affects flood loads. Refer to FEMA P-55 for guidance on the effects of erosion and scour.
- Duration of flooding, although not a direct contribution to flood loads, is a condition that warrants consideration. Long-duration flooding is more likely to delay reoccupancy and is a factor in whether dry floodproofing measures can be used for nonresidential buildings (not allowed in Zone V). Also, long-duration flooding is likely to cause nonstructural damage even if flood damage-resistant materials are used.

If BFEs are not shown on the flood hazard map, the FBC gives the building official the authority to require the permit applicant to obtain and use data from another source or to determine the design flood elevation (DFE) using accepted engineering practices. Many communities provide applicants with BFE or flood depth information, and some communities may allow the use of approximation methods, such as interpolating the special flood hazard area boundary based on topographic mapping.

FBC, Building – Chapter 1 Administration

The FBC administrative chapter includes flood provisions in a number of sections:

- The minimum plan review criteria include flood hazard areas, flood zones, DFE, lowest floor elevations, enclosures and flood damage-resistant materials (Sec. 107.3.5).
- As part of required inspections, submission of a certification (prepared by a Florida licensed professional surveyor) of the lowest floor elevation is required upon placement of the lowest floor and prior to further vertical construction. The final (“as-built”) certification is to be submitted as part of the final inspection (Sec. 110.3).
- The certificate of occupancy is to include a statement that the elevation certificate has been provided and is retained in the community’s records (Sec. 111.2).

See flood provisions in Sec. 102.2.5 (certain exemptions that may be adopted by enforcement districts) and Sec. 102.7 (relocation of manufactured buildings).

New in 2010. The codes use DFE, which is the same as the BFE unless the community adopts a map showing a more extensive flood hazard area with higher flood elevations.

FBC, Building

Most, but not all, flood provisions in the *FBC, Building* are found in Sec. 1612, Flood Loads (see Table 1612.1 for a listing of all flood provisions in the FBC). The following highlight the key provisions:

- Detailed specifications for flood-resistant design are not included in the code. Rather, Sec. 1612.4 refers to ASCE 24, *Flood Resistant Design and Construction*, for specific requirements. A number of requirements in ASCE 24 are based on the risk category that is assigned in Sec. 1604.5 (see Table 1604.5).
 - Elevation requirements depend on flood zone, with coastal high-hazard (Zone V) and coastal A zone requirements higher than other flood hazard areas (Zone A). See the summary in *Highlights of ASCE 24* prepared by FEMA. Elevation requirements above the BFE start at +1 foot (Risk Category II) and go up to +3 feet (Risk Category IV in Zone V).
 - The designer is to determine if “coastal A zone” conditions are present. In general, such conditions occur inland of Zone V where waves are between 3 feet and 1.5 feet high. In coastal A zone areas the design requirements are the same as Zone V (plus flood openings in walls of enclosures).
 - Specific requirements for enclosures below elevated buildings are based on flood zone. Enclosures are limited to uses for parking, storage and building access.
 - The use of dry floodproofing (only nonresidential occupancies in Zone A) is limited depending on flood velocities and adequate warning time to implement measures that require human intervention.
 - Utility equipment and machinery that serve buildings are required to be elevated or meet a specific performance expectation. Similar requirements are found in the *FBC, Mechanical*; *FBC, Plumbing*; and *FBC, Fuel Gas*.
- Sec. 1612.5 requires submission of elevation certificates (see Inspections) and, if pertinent to a specific building, certain design documentation to be prepared and sealed by a registered design professional.
- Sec. 1804.4 includes requirements for grading and fill. Where allowed in flood hazard areas, fill shall be placed, compacted, and sloped to be stable under flood conditions.

Special Requirements. Special detailed requirements (Chapter 4) based on use and occupancy include flood provisions in Sec. 419 (hospitals), Sec. 420 (nursing homes), Sec. 423 (educational facilities), and Sec. 424 (pools).

- Sec. 3109 includes requirements for buildings seaward of the Coastal Construction Control Line (CCCL). Areas seaward of the CCCL that are also mapped as flood hazard areas are subject to the more restrictive of the flood requirements and the CCCL requirements. Building officials and designers should pay close attention to the differences.
- Buildings in “high-velocity hurricane zones” (Broward and Miami-Dade counties) are required to comply with the specific provisions for those zones and also the requirements of Sec. 1612, if located in a flood hazard area (Sec. 1601.1).

CCCL and Substantial Improvements. New in 2010, the CCCL definition for substantial improvement is replaced with the definition in Sec. 1612.

FBC, Residential

Most, but not all, flood provisions in the *FBC, Residential* are found in Sec. R322, Flood-Resistant Construction (see Table 1612.1 for a listing of all flood provisions in the *FBC, Residential*). Unlike the *FBC, Building*, which refers to ASCE 24, the *FBC, Residential* includes detailed requirements. The following highlights the key provisions:

- In Table R301.2(1), communities are to identify the date of entry into the NFIP, the date of the current Flood Insurance Study, and the panel numbers and dates of currently effective FIRMs that are adopted in local floodplain management ordinances.
- Sec. R322.1 includes general provisions that apply to dwellings in all flood hazard areas (including Zone A and Zone V):
 - Dwellings proposed in identified floodways are required to be designed and constructed according to ASCE 24. This requirement recognizes that flooding is deeper and usually flows faster in floodways, which include the channel and adjacent lands that should be reserved to convey floodwaters. Obstructing flow in floodways can cause increases in flood depths, which may cause increased damage on adjacent properties.
 - In areas commonly referred to as “approximate Zone A” where FIRMs do not specify BFEs, the building official may require use of data available from another source or may require the applicant to determine flood elevations using accepted engineering practices. Keeping a record of elevations used previously is a good practice so that future permit decisions can be based on the same data.
 - Unfinished enclosures under elevated buildings are limited to uses for parking, building access or limited storage (or crawlspace). Building officials should ensure that plans specify that any enclosed areas are only for those uses. An owner who sub-

sequently modifies an enclosure in any way that alters compliance with these requirements may be subject to higher Federal flood insurance premiums.

- Utility equipment and machinery that serve buildings shall be elevated or meet a specific performance expectation that generally cannot be met by typical installations.
- Use of flood damage-resistant materials is required below the elevations required in R322.2 and R322.3. These materials are capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage. Wood products are to be pressure-preservative-treated or decay-resistant heartwood of redwood, black locust or cedars. FEMA Technical Bulletin 2, *Flood Damage-Resistant Materials Requirements*, is referenced for other materials and installation methods.
- Dwellings seaward of the CCCL that are also in mapped flood hazard areas are subject to the more restrictive of both the flood requirements and the CCCL requirements.

- Sec. R322.2 includes specific requirements that apply in flood hazard areas commonly referred to as “Zone A”:

- Minimum elevation requirements call for the lowest floor to be at or above the DFE. However, if in a Coastal A Zone (delineated by LiMWA), the minimum elevation is the BFE +1 foot, or the DFE, whichever is higher.
- The area below elevated dwellings may be enclosed by foundation walls or framed walls. To minimize damage due to hydrostatic loads, flood openings are required. Flood openings may be prescriptive (providing 1 square inch of net open area for each square foot of enclosed area) or engineered (requires design certification).

Notice. Many Florida communities adopt a requirement that the lowest floor (or the bottom of lowest horizontal structural member) be 1 or 2 feet above the minimum elevation. This added factor of safety is called “freeboard.” Buildings that are higher than the minimum elevation sustain less damage and owners pay lower Federal flood insurance premiums.

- Sec. R322.3 includes specific requirements that apply in coastal high-hazard areas, commonly referred to as “Zone V”:
- Sec. R322.1.1 permits use of ASCE 24 as an alternative to the requirements of Sec. R322.3.
- Minimum elevation requirements call for the bottom of the lowest horizontal structural member

of the lowest floor to be elevated depending on orientation of those members. If the lowest horizontal structural members are oriented such that wave crests could impact them (i.e., perpendicular to the direction of wave approach), an additional foot of elevation is required. Post-flood investigations have determined that even the occasional wave impact can lead to structural damage.

- Foundations are limited to pilings or columns because they present the least obstruction to the passage of waves. Foundation designs are required to be certified by a registered design professional.

- The area under elevated homes must be free of obstruction (see FEMA Technical Bulletin 5, *Free-of-Obstruction Requirements*). The area may be enclosed with insect screening or open lattice or, if enclosed by walls, the walls must be designed to breakaway under flood loads without causing damage to the foundation or elevated building.

Notice. Federal flood insurance is more expensive if Zone V buildings have enclosures below the BFE, even if the walls are compliant breakaway walls. And the insurance is even more expensive if enclosures are larger than 300 square feet.

FEMA Technical Bulletin 9, *Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings*, includes prescriptive requirements for breakaway walls. The code specifies that utility components are not permitted to be mounted on or penetrate breakaway walls because post-flood investigations have determined that walls with such components do not break away cleanly.

- Buildings in flood hazard areas in “high-velocity hurricane zones” (Broward and Miami-Dade counties) are required to comply with the specific provisions for those zones and also the requirements of Sec. R322 (also see Sec. R4401.13.1.1).
- In Zone A, above-ground pools, on-ground pools and in-ground pools that involve placement of fill are allowed without any special requirements unless located in a floodway, in which case documentation must be provided to evaluate the effects of the encroachment on flood elevations. Pools in Zone V are required to conform to the requirements of ASCE 24. For consistency, Chapter 41, Swimming Pools, cross-references to Sec. R322.
- Chapters with specifications for mechanical systems, HVAC systems, duct construction, combustion air, boilers and water heaters, special piping and storage systems, fuel gas, plumbing, plumbing fixtures, sanitary drainage and vent systems all include flood provisions. In general, the pertinent sections refer to Sec. R322.1.6.

FBC, Existing Building

A fundamental premise of the *FBC, Existing Building* is that work on an existing building does not lessen the compliance of the structure. It is important to keep this in mind when considering projects that repair, alter, add to, or otherwise improve buildings in flood hazard areas that were originally built to comply with flood-resistant requirements. For example, the open area under buildings required to be elevated on pilings is permitted to be enclosed by walls only if the walls comply with the flood-resistant construction requirements, including limiting use of the resulting enclosure only to parking, building access or storage.

The first step when considering work on an existing building in a flood hazard area is to determine whether the proposed work constitutes “substantial improvement” (SI) or repair of “substantial damage” (SD). If a proposal is determined to be SI/SD, then the existing building is required to be brought into compliance with the requirements for new construction found in Sec. 1612 of the *FBC, Building*.

Notice. Some Florida communities enforce “cumulative” SI. They keep records and evaluate whether each subsequent proposal to improve or repair a building will trigger the SI requirement to bring buildings into compliance with the requirements for new construction.

The SI/SD determination is made by comparing the cost of all of the proposed work to the market value of the building (excluding land) before the work is undertaken. If the proposal is to repair a damaged building, the market value is the value of the building before the damage occurred. When the cost equals or exceeds 50% of the market value, the work is determined to be substantial improvement or repair of substantial damage. In 2010, FEMA published FEMA P-758, *Substantial Improvement/Substantial Damage Desk Reference*, to summarize extensive guidance.

The flood provisions of the *FBC, Existing Building* are found in each chapter (see Table 1612.1 for a listing of all flood provisions in the *FBC, Existing Building*):

- Repairs. Chapter 5 has a general requirement that requires compliance when the repair of a building in a flood hazard area constitutes substantial improvement (Sec. 501.3). Sec. 506.2.4 also specifies that buildings that have sustained substantial damage shall be brought into compliance with the requirements of Sec. 1612 of the *FBC, Building* for new construction.
- Alterations – Levels 1, 2, and 3. Chapter 6, Alterations – Level 1, has a general requirement that requires compliance when alterations constitute substantial improvement (Sec. 601.3). Because the requirements for alterations are cumulative, the requirement in Chapter 6 also applies to Level 2 alterations (Chapter 7) and Level 3 alterations (Chapter 8).

- Additions. Handling additions is complicated by the fact that some circumstances prompt compliance of the addition as well as the base building. Sec. 1003.5 distinguishes between horizontal additions that are structurally connected and those that are not structurally connected. It also specifies that if vertical additions or foundation work are determined to constitute substantial improvement, then base buildings have to be brought into compliance. DEM's guidance listed in Resources is based on FEMA P-758.
- Historic Buildings. The key to proper enforcement of the flood provision is whether a historic building meets the exception in Sec. 1101.3. The *FBC, Existing Building* defines "historic buildings;" however, the definition is not entirely consistent with the definition used by the NFIP. The NFIP allows historic buildings in flood hazard areas to be improved and repaired without bringing them into compliance provided they are qualified. Importantly, any proposed work must allow such buildings to continue to be listed as historic. FEMA guidance suggests that building officials require applicants to obtain evidence of continued designation from the appropriate authority.
- Relocated or moved buildings. Sec. 1202.6 specifies that buildings relocated or moved into flood hazard areas are required to comply with the flood provisions of Sec. 1612. This means new foundations must meet the elevation and other requirements based on the flood zone of the new location.
- The sections that articulate the prescriptive compliance method for additions, alterations, and repairs each specify that if the work constitutes SI/SD, then the existing building shall be brought into compliance with the requirements for new construction (Chapter 3). Similarly, the performance compliance method includes the same requirement (Chapter 13).

FBC, Mechanical, Plumbing, Fuel Gas

Each of these codes includes similar provisions requiring equipment and systems to be located at or above the elevation specified in Sec. 1612.4 (thus matching the elevation of the building) or to meet a specific performance expectation that generally cannot be met by typical installations. See Table 1612.1 for a listing of all flood provisions in these codes. Of particular note:

- Each of the codes specifies that systems and equipment shall not be mounted on or penetrate walls intended to break away under flood loads (applies in Zone V).
- *FBC, Mechanical* requires ducts to be located above the elevation specified in Sec. 1612.4 or designed and constructed to prevent water from entering or accumulating and to resist flood loads.

Resources:

2010 *Florida Building Code*, International Code Council, Inc. Accessible online at www.FloridaBuilding.org

DEM Local Ordinance & Building Code Resources (www.floridadisaster.org/Mitigation/SFMP/lobc_resources.htm):

Frequently Asked Questions on the Flood Provisions of the 2010 Florida Building Code (October 2011)

Flood Provisions of the 2010 Florida Building Code

Guidance for Additions to Buildings in Special Flood Hazard Areas (June 2010)

ASCE 7, *Minimum Design Loads for Buildings and Other Structures* (2010)

ASCE 24, *Flood Resistant Design and Construction* (2005). See *Highlights of ASCE 24* available at www.fema.gov/rebuild/buildingscience/index.shtm

FEMA P-55, *Coastal Construction Manual* (Fourth Edition, April 2011; www.fema.gov/library/viewRecord.do?id=1671)

FEMA P-424, *Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds* (December 2010; www.fema.gov/library/viewRecord.do?id=1986)

FEMA P-758, *Substantial Improvement/Substantial Damage Desk Reference* (May 2010; www.fema.gov/library/viewRecord.do?id=4160)

NFIP Technical Bulletins: A series that provide guidance on a variety of floodplain management topics (www.fema.gov/plan/prevent/floodplain/techbul.shtm)

Answers to specific questions:

Florida Division of Emergency Management, State Floodplain Program Office: 850-413-9960 or floods@em.myflorida.com

Building Codes and Standards Office/Florida Building Commission: 850-487-1824 or www.FloridaBuilding.org

January 2012

2010 Florida Building Code, Residential

[a compilation of flood resistant provisions, prepared by Florida DEM]

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CHAPTER 1: SCOPE AND ADMINISTRATION

R101.2 Scope. The provisions of the *Florida Building Code, Residential*, shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress and their accessory structures.

Exceptions:

1. Live/work units complying with the requirements of Section 438 of the *Florida Building Code, Building* shall be permitted to be built as one- and two-family dwellings or townhouses. Fire suppression required by Section 438.5 of the *Florida Building Code, Building* when constructed under the *Florida Building Code, Residential* shall conform to Section 903.3.1.3 of the *Florida Building Code, Building*.
2. Existing buildings undergoing repair, alteration or additions, and change of occupancy shall comply with the *Florida Building Code, Existing Building*.

R101.2.1 The provisions of Chapter 1, *Florida Building Code, Building*, shall govern the administration and enforcement of the *Florida Building Code, Residential*.

CHAPTER 2: DEFINITIONS

FLOODPLAIN MANAGEMENT ORDINANCE. An ordinance or regulation adopted pursuant to the authority granted to local governments by Title 44 Code of Federal Regulations, Parts 59 and 60 for participation in the National Flood Insurance Program.

HABITABLE SPACE. A space in a structure for living, sleeping, eating or cooking. Bathrooms, toilet compartments, closets, halls, screen enclosures, sunroom Categories I, II and III as defined in the AAMA/NPEA/NSA 2100, storage or utility space and similar areas are not considered habitable spaces. [Note: this section shown to clarify that some spaces that are not habitable spaces are not permitted below elevated buildings.]

MANUFACTURED HOME Manufactured home means a structure, transportable in one or more sections, which in the traveling mode is 8 body feet (2438 body mm) or more in width or 40 body feet (12,192 body mm) or more in length, or, when erected on site, is 320 square feet (30 m²) or more, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air-conditioning and electrical systems contained therein; except that such term shall include any structure that meets all the requirements of this paragraph except the size requirements and with respect to which the manufacturer voluntarily files a certification required by the secretary (HUD) and complies with the standards established under this title. For mobile homes built prior to June 15, 1976, a label certifying compliance to the Standard for

Mobile Homes, NFPA 501, in effect at the time of manufacture is required. For the purpose of these provisions, a mobile home shall be considered a manufactured home.

CHAPTER 3: BUILDING PLANNING

R301.1 [Design Criteria] Application. Buildings and structures, and all parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, and wind loads as prescribed in this code. The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets all requirements for the transfer of all loads from their point of origin through the load-resisting elements to the foundation. Buildings and structures constructed as prescribed by the code are deemed to comply with the requirements of this section.

Exception: Buildings and structures located within the High Velocity Hurricane Zone shall comply with Sections R302 to R324, inclusive and the provisions of Chapter R44 and section R406. In addition, buildings and structures located in flood hazard areas established in Table R301.2(1) shall comply with Sections R301.2.4 and R322.

R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be as set forth in Table R301.2(1).

Table R301.2(1) Climatic and Geographic Design Criteria

Ground Snow Load	Wind Design		Seismic Design Category ^f	Subject To Damage From			Winter Design Temp ^e	Ice shield under-layment Required ^h	Flood Hazards ^g	Air Freezing Index ⁱ	Mean Annual Temp ^j
	Speed ^d (mph)	Topographic Effects ^k		Weathering ^a	Frost line depth ^b	Termite ^c					
NA	See Fig. R301.2(4)		NA	Negligible	NA	Very Heavy		NA		NA	NA

g. The applicable governing body shall, by local floodplain management ordinance, specify (a) the date of the jurisdiction’s entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of all currently effective FIRM and FBFM, or other flood hazard map adopted by the authority having jurisdiction, as amended.

R301.2.4 Floodplain construction. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with Section R322.

Exception: Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R301.2.4.1 Alternative provisions. As an alternative to the requirements in Section R322.2 for buildings and structures located in whole or in part in flood hazard areas (A Zones) or the requirements of Section 322.3 in coastal high hazard areas (V Zones), ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R301.2.5 Structures seaward of a coastal [control] construction line. Structures located seaward of the coastal construction [control] line shall be designed to resist the predicted forces of a 100-year storm event in accordance with Section 3109 of the *Florida Building Code, Building*. [Note: “coastal construction line” should refer to the “coastal construction control line.”]

R309.5 [Garages and Carports] Flood hazard areas. For buildings located in flood hazard areas as established by Table 301.2(1), garage floors shall be:

1. Elevated to or above the design flood elevation as determined in Section R322; or
2. Located below the design flood elevation provided they are at or above grade on at least one side, are used solely for parking, building access, or storage, meet the requirements of Section R322 and are otherwise constructed in accordance with this code.

SECTION R322 FLOOD-RESISTANT CONSTRUCTION

R322.1 General. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with the provisions contained in this section.

Exception: Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R322.1.1 Alternative provisions. As an alternative to the requirements in Section R322.2 for buildings and structures located in whole or in part in flood hazard areas (A Zones) or the requirements of Section 322.3 in coastal high-hazard areas (V Zones), ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R322.1.2 Structural systems. All structural systems of all buildings and structures shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses from flooding equal to the design flood elevation.

R322.1.3 Flood-resistant construction. All buildings and structures erected in flood hazard areas shall be constructed by methods and practices that minimize flood damage.

R322.1.4 Establishing the design flood elevation. The design flood elevation shall be used to define areas prone to flooding. At a minimum, the design flood elevation is the higher of:

1. The base flood elevation at the depth of peak elevation of flooding (including wave height) which has a 1 percent (100-year flood) or greater chance of being equaled or exceeded in any given year; or
2. The elevation of the design flood associated with the area designated on a flood hazard map adopted by the community, or otherwise legally designated.

R322.1.4.1 Determination of design flood elevations. If design flood elevations are not specified, the building official is authorized to require the applicant to:

1. Obtain and reasonably utilize data available from a federal, state or other source; or
2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas.

Determinations shall be undertaken by a registered design professional who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and approval.

R322.1.4.2 Determination of impacts. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall

demonstrate that the effect of the proposed buildings and structures on design flood elevations, including fill, when combined with all other existing and anticipated flood hazard area encroachments, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

R322.1.5 Lowest floor. The lowest floor shall be the floor of the lowest enclosed area, including basement, but excluding any unfinished flood-resistant enclosure that is useable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the building or structure in violation of this section.

R322.1.6 Protection of mechanical and electrical systems. Electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones). If replaced as part of a substantial improvement, electrical systems, equipment and components; heating, ventilation, air conditioning and plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall meet the requirements of this section. Systems, fixtures, and equipment and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

Exception: Locating electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment is permitted below the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones) provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided they conform to the provisions of the electrical part of this code for wet locations.

R322.1.7 Protection of water supply and sanitary sewage systems. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems in accordance with the plumbing provisions of this code. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into systems and discharges from systems into floodwaters in accordance with the plumbing provisions of this code and in accordance with Chapter 64E-6, *Florida Administrative Code*, Standards for Onsite Sewage Treatment and Disposal Systems.

R322.1.8 Flood-resistant materials. Building materials used below the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones) shall comply with the following:

1. All wood, including floor sheathing, shall be pressure-preservative-treated in accordance with AWP A U1 for the species, product, preservative and end use or be the decay-resistant heartwood of redwood, black locust or cedars. Preservatives shall be listed in Section 4 of AWP A U1.
2. Materials and installation methods used for flooring and interior and exterior walls and wall coverings shall conform to the provisions of FEMA/FIA-TB-2.

R322.1.9 Manufactured homes. In addition to the applicable requirements of the state agency with jurisdiction over installation of manufactured homes, installation of manufactured homes in flood hazard areas is subject to the applicable provisions of the local floodplain management ordinance.

R322.1.10 As-built elevation documentation. A registered design professional shall prepare and seal documentation of the elevations specified in Section R322.2 or R322.3.

R322.1.11 Structures seaward of a coastal [control] construction line. In addition to the requirements of this section, structures located in flood hazard areas and seaward of the coastal construction [control] line shall be designed to resist the predicted forces of a 100-year storm event in accordance with Chapter R44, and the more restrictive provisions shall govern. *[Note: "coastal construction line" should refer to the "coastal construction control line."]*

R322.2 Flood hazard areas (including A Zones). All areas that have been determined to be prone to flooding but not subject to high velocity wave action shall be designated as flood hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1 ½ feet (457 mm) and 3 feet (914 mm) shall be designated as Coastal A Zones. All buildings and structures constructed in whole or in part in flood hazard areas shall be designed and constructed in accordance with Sections R322.2.1 through R322.2.3.

R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas not designated as Coastal A Zones shall have the lowest floors elevated to or above the design flood elevation.
2. Buildings and structures in flood hazard areas designated as Coastal A Zones shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or to the design flood elevation, whichever is higher.
3. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated at least as high above the highest adjacent grade as the depth number specified in feet on the FIRM, or at least 2 feet (610 mm) if a depth number is not specified.
4. Basement floors that are below grade on all sides shall be elevated to or above the design flood elevation.

Exception: Enclosed areas below the design flood elevation, including basements whose floors are not below grade on all sides, shall meet the requirements of Section R322.2.2.

R322.2.2 Enclosed area below design flood elevation. Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria:
 - 2.1. There shall be a minimum of two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings on exterior walls.
 - 2.2. The total net area of all openings shall be at least 1 square inch (645 mm²) for each square foot (0.093 m²) of enclosed area, or the openings shall be designed and the construction documents shall include a statement by a registered design professional that the design of the openings will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters as specified in Section 2.6.2.2 of ASCE 24.
 - 2.3. The bottom of each opening shall be 1 foot (305 mm) or less above the adjacent ground level.

- 2.4. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
- 2.5. Any louvers, screens or other opening covers shall allow the automatic flow of floodwaters into and out of the enclosed area.
- 2.6. Openings installed in doors and windows, that meet requirements 2.1 through 2.5, are acceptable; however, doors and windows without installed openings do not meet the requirements of this section.

R322.2.3 Foundation design and construction. Foundation walls for all buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4.

Exception: Unless designed in accordance with Section R404:

1. The unsupported height of 6-inch (152 mm) plain masonry walls shall be no more than 3 feet (914 mm).
2. The unsupported height of 8-inch (203 mm) plain masonry walls shall be no more than 4 feet (1219 mm).
3. The unsupported height of 8-inch (203 mm) reinforced masonry walls shall be no more than 8 feet (2438 mm).

For the purpose of this exception, unsupported height is the distance from the finished grade of the under-floor space to the top of the wall.

R322.2.4 Pools in flood hazard areas. Pools that are located in flood hazard areas established by Table R301.2(1), including above-ground pools, on-ground pools, and in-ground pools that involve placement of fill, shall comply with Sections R322.2.4.1 or RB322.2.4.2.

Exception: Pools located in riverine flood hazard areas which are outside of designated floodways.

R322.2.4.1 Pools located in designated floodways. Where pools are located in designated floodways, documentation shall be submitted to the building official, which demonstrates that the construction of the pool will not increase the design flood elevation at any point within the jurisdiction.

R322.2.4.2 Pools located where floodways have not been designated. Where pools are located where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed pool will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

R322.3 Coastal high-hazard areas (including V Zones). Areas that have been determined to be subject to wave heights in excess of 3 feet (914 mm) or subject to high-velocity wave action or wave-induced erosion shall be designated as coastal high-hazard areas. All buildings and structures constructed in whole or in part in coastal high-hazard areas shall be designed and constructed in accordance with Sections R322.3.1 through R322.3.6.

R322.3.1 Location and site preparation.

1. New buildings and buildings that are determined to be substantially improved pursuant to the *Florida Building Code, Existing Building* shall be located landward of the reach of mean high tide.
2. For any alteration of sand dunes and mangrove stands the building official shall require submission of an engineering analysis which demonstrates that the proposed alteration will not increase the potential for flood damage.

R322.3.2 Elevation requirements.

1. All buildings and structures erected within coastal high-hazard areas shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, piling, pile caps, columns, grade beams and bracing, is:
 - 1.1 Located at or above the design flood elevation, if the lowest horizontal structural member is oriented parallel to the direction of wave approach, where parallel shall mean less than or equal to 20 degrees (0.35 rad) from the direction of approach, or
 - 1.2 Located at the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher, if the lowest horizontal structural member is oriented perpendicular to the direction of wave approach, where perpendicular shall mean greater than 20 degrees (0.35 rad) from the direction of approach.
- 2 Basement floors that are below grade on all sides are prohibited.
- 3 The use of fill for structural support is prohibited.
- 4 Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.

Exception: Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.4 and R322.3.5.

R322.3.3 Foundations. Buildings and structures erected in coastal high-hazard areas shall be supported on pilings or columns and shall be adequately anchored to those pilings or columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.4. Pilings shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. Slabs, pools, pool decks and walkways shall be located and constructed to be structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour or erosion from wave-velocity flow conditions, unless the buildings and structures and their foundation are designed to resist the additional flood load.

R322.3.3.1 Pools. Pools in coastal high-hazard areas shall be designed and constructed in conformance with ASCE 24.

R322.3.4 Walls below design flood elevation. Walls and partitions are permitted below the elevated floor, provided that such walls and partitions are not part of the structural support of the building or structure and:

- 1 Electrical, mechanical, and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and
- 2 Are constructed with insect screening or open lattice; or
- 3 Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation

system. Such walls, framing and connections shall have a design safe loading resistance of not less than 10 (470 Pa) and no more than 20 pounds per square foot (958 Pa); or

- 4 Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), the construction documents shall include documentation prepared and sealed by a registered design professional that:
 - 4.1. The walls and partitions below the design flood elevation have been designed to collapse from a water load less than that which would occur during the design flood.
 - 4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on all building components (structural and nonstructural). Water loading values used shall be those associated with the design flood. Wind loading values used shall be those required by this code.

R322.3.5 Enclosed areas below design flood elevation. Enclosed areas below the design flood elevation shall be used solely for parking of vehicles, building access or storage.

R322.3.6 Construction documents. The construction documents shall include documentation that is prepared and sealed by a registered design professional that the design and methods of construction to be used meet the applicable criteria of this section.

CHAPTER 4: FOUNDATIONS

R401.1 [General] Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for all buildings. In addition to the provisions of this chapter, the design and construction of foundations in areas prone to flooding as established by Table R301.2(1) shall meet the provisions of Section R322. Wood foundations shall be designed and installed in accordance with AF&PA PWF.

Exceptions: *[partial]*

2. Buildings and structures located within the High-Velocity Hurricane Zone shall comply with the provisions of Chapter 44 and, as applicable, Section R322 in flood hazard areas.

R401.2 [General] Requirements. Foundations shall be capable of resisting all loads from roof uplift and building overturn. Foundation uplift for light-frame wood or steel buildings shall be calculated or determined from Table R401.1. Masonry buildings within the dimensional scope of Table R401.1 shall be assumed to be of adequate weight so as not to require uplift resistance greater than that provided by the structure and any normal foundation. Foundation construction shall also be capable of accommodating all gravity loads according to Section R301 and of transmitting the resulting loads to the supporting soil. Fill soils that support footings and foundations shall be designed, installed and tested in accordance with accepted engineering practice. Gravel fill used as footings for wood and precast concrete foundations shall comply with Section R403.

R401.3 [General] Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection that does not create a hazard. Lots shall be graded so as to drain surface water away from foundation walls. The grade shall fall a minimum of 6 inches (152 mm) within the first 10 feet (3048 mm).

Exception: Where lot lines, walls, slopes or other physical barriers prohibit 6 increase (152 mm) of fall within 10 feet (3048 mm), drains or swales shall be constructed to ensure drainage away from the structures. Impervious surfaces within 10 feet (3048 mm) of the

building foundation shall be sloped a minimum of 2 percent away from the building.

R408.6 [Under-Floor Space] Finished grade. The finished grade of under-floor surface may be located at the bottom of the footings; however, where there is evidence that the groundwater table can rise to within 6 inches (152 mm) of the finished floor at the building perimeter or where there is evidence that the surface water does not readily drain from the building site, the grade in the under-floor space shall be as high as the outside finished grade, unless an approved drainage system is provided.

R408.7 [Under-Floor Space] Flood resistance. For buildings located in areas prone to flooding as established in Table R301.2(1):

1. Walls enclosing the under-floor space shall be provided with flood openings in accordance with Section R322.2.2.
2. The finished ground level of the under-floor space shall be equal to or higher than the outside finished ground level on at least one side.

Exception: Under-floor spaces that meet the requirements of FEMA/FIA TB 11-01.

CHAPTER 5: FLOORS

R506.2.1 [Concrete Floors (on Ground)] Fill. Fill material shall be free of vegetation and foreign material. The fill shall be compacted to assure uniform support of the slab, and except where approved, the fill depths shall not exceed 24 inches (610 mm) for clean sand or gravel and 8 inches (203 mm) for earth.

M1301.1.1 [General Mechanical System Requirements; General] Flood-resistant installation. In areas prone to flooding as established by Table R301.2(1), mechanical appliances, equipment and systems shall be located or installed in accordance with Section R322.1.6

M1401.5 [Heating and Cooling Equipment; General] Flood hazard. In areas prone to flooding as established by Table R301.2(1), heating and cooling equipment and appliances shall be located or installed in accordance with Section R322.1.6

M1601.4.9 [Duct Construction; Duct installation] Flood hazard areas. In areas prone to flooding as established by Table R301.2(1), duct systems shall be located or installed in accordance with Section R322.1.6.

M1701.2 [Combustion Air; General] Opening location. In areas prone to flooding as established by Table R301.2(1), openings shall be located at or above the elevation required in Section R322.2.1 or R322.3.2.

M2001.4 [Boilers and Water Heaters] Flood-resistant installation. In areas prone to flooding as established in Table R301.2(1), boilers, water heaters and their control systems shall be located or installed in accordance with Section R322.1.6.

M2201.6 [Special Piping and Storage Systems; Oil tanks] Flood resistant installation. In areas prone to flooding as established by Table R301.2(1), tanks shall be installed at or above the elevation required in Section R322.2.1 or R322.3.2 or shall be anchored to prevent flotation,

collapse and lateral movement under conditions of the design flood.

G2404.7 (301.11) [Fuel Gas; General] Flood hazard. For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located at or above the design flood elevation and shall comply with the flood-resistant construction requirement of Section R322.

Exception: The appliance, equipment and system installations regulated by this code are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation and shall comply with the flood-resistant construction requirements of Section R322.

P2601.3 [General Plumbing Requirements; General] Flood hazard area. In areas prone to flooding as established by Table R301.2(1), plumbing fixtures, drains, and appliances shall be located or installed in accordance with Section R322.1.6.

P2602.2 [Individual Water Supply and Sewage Disposal] Flood resistant installation. In areas prone to flooding as established by Table R301.2(1):

1. Water supply systems shall be designed and constructed to prevent infiltration of floodwaters.
2. Pipes for sewage disposal systems shall be designed and constructed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

P2705.1 [Plumbing Fixtures, Installation] General. The installation of fixtures shall conform to the following: *[partial]*

7. In areas prone to flooding as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R322.1.6.

P3001.3 [Sanitary Drainage; General] Flood-resistant installation. In areas prone to flooding as established by Table R301.2(1), drainage, waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

P3101.5 [Vent Systems] Flood resistance. In areas prone to flooding as established by Table R301.2(1), vents shall be located at or above the elevation required in Section R322.1 (flood hazard areas including A Zones) or R322.2 (coastal high-hazard areas including V Zones). *[Note: referenced sections should be R322.2.1 and R322.3.2, in which elevations are specified.]*

CHAPTER 41 SWIMMING POOLS

R4101.4.2.1. [Private Swimming Pools] Flood hazard areas. Pools installed in flood hazard areas established in Section R322 shall comply with Section R322.2.4 (A Zones) or R322.3.3.1 in coastal high-hazard areas (V Zones).

CHAPTER 43: REFERENCE

FEMA-TB-2-08	Flood Damage-Resistant Materials Requirements In Special Flood Hazard Areas [<i>Note: this reference omitted.</i>]	R322.1.8
FEMA TB-11-01	Crawlspace Construction for Buildings Located In Special Flood Hazard Areas	R408.7

CHAPTER 44: HIGH-VELOCITY HURRICANE ZONE

R4403.7.8 [Wind Loads] Load combination. The safety of structures shall be checked using the provisions of 2.3 and 2.4 of ASCE 7 with commentary. Flood Load F_a mentioned in these load combinations shall be in accordance with Chapter 5 of ASCE 7.

R4403.13.1.1 [Flood Resistance] Flood resistance. Where the building or structure is located in a flood hazard area established in Table 301.2(1), the building or structure, including enclosures below elevated buildings, shall be designed and constructed in accordance with Section R322 and this section.

HIGHLIGHTS OF ASCE 24-05 *Flood Resistant Design and Construction*

ASCE 24 is a referenced standard in the *International Building Code*[®]. Any building or structure that falls within the scope of the IBC that is proposed in a flood hazard area is to be designed in accordance with ASCE 24. The *International Residential Code*[®] requires that dwellings in floodways be designed in accordance with ASCE 24, and the 2009 edition of the IRC will include an alternative that allows communities to require homes in V zones to be designed in accordance with ASCE 24. Purchase a copy of ASCE 24 at www.asce.org.



ASCE 24 tells the designer the minimum requirements and expected performance for the design and construction of buildings and structures in flood hazard areas. It is not a restatement of all of the NFIP regulations, but offers additional specificity, some additional requirements, and some limitations. Buildings designed according to ASCE 24 are better able to resist flood loads and flood damage.

Highlights of ASCE 24 that complement the NFIP minimum requirements include:

Building Performance

- Freeboard is required as a function of the nature of occupancy and the flood zone (see table below). Dwellings and most other buildings have 1-foot of freeboard; certain essential facilities have 2-3 feet; only agricultural facilities, temporary facilities and minor storage facilities are allowed to have their lowest floors at the BFE.
- Flood loads and other loads are those specified in ASCE 7.
- Performance of foundations exposed to flood loads and load combinations is specified; soil characteristics and underlying strata, including soil consolidation, expansion or movement, erosion and scour, liquefaction and subsidence must be considered.
- Fill is required to be stable under conditions of flooding, including rapid rise and rapid drawdown, prolonged inundation, and erosion and scour; structural fill compaction is specified or an engineering report is required, side slopes are required to be no steeper than 1:1.5.
- Specifications for slabs-on-grade are listed depending on the purpose and location of the slabs.
- Two alternatives are specified for flood openings to allow for the automatic entry and exit of floodwaters in below-BFE enclosures: nonengineered openings which do not require certification (1 sq in per sq ft of enclosed area) and engineered openings which must be certified by a registered design professional.
- Stairs and ramps shall be designed and constructed to resist flood loads and to minimize transfer of flood loads to foundations, or to break away without causing damage.
- In V Zones and Coastal A Zones:
 - . Structures shall be supported on piles, columns or shear walls.
 - . Foundation depth shall take into account erosion and scour.

- . Specifications are provided for pile foundations, attachments to piles, different types of piles (wood, steel H, concrete-filled steel pipe, prestressed concrete, precast concrete, cast-in-place concrete).
- . Specifications are provided for pile design (capacity, capacity of supporting soils, minimum penetration, spacing, pile caps, connections, splicing, and mixed and multiple types of piles).
- . Specifications are provided for footings, mats, rafts, and slabs-on-grade; grade beams; bracing; and shear walls.
- . Walls designed to breakaway shall not produce debris that is capable of damaging structures (breakaway walls in Coastal A Zones require openings).
- . Mechanical, heating, ventilation, and air conditioning elements shall be located on the landward side of structures.
- . Erosion control structures (bulkheads, seawalls, revetments) shall not be attached to buildings or focus or increase flood forces or erosion impacts on structures.
- . Decks, concrete pads, and patios shall be structurally independent of buildings and constructed to break away without producing damaging debris.
- . Pools shall be elevated, designed to breakaway without producing damaging debris, or sited to remain in the ground without obstructing flow that causes damage.
- Dry floodproofed nonresidential buildings and non-residential portions of mixed-use buildings are:
 - . Not permitted in V Zones, Coastal A Zones, where flood velocities exceed 5 ft/sec, where conformance with certain human intervention limits cannot be achieved.
 - . Required to have at least one exit door above the design flood elevation.
 - . Allowed where warning time is a minimum of 12 hours unless a community warning system provides a minimum warning time sufficient to accomplish certain activities related to dry floodproofing.
 - . Required to have a flood emergency plan, posted in at least two conspicuous locations, that addresses specified elements and actions.

Flood-Damage Resistant Materials

- Flood-damage resistant materials shall be used below the lowest floor elevations, including freeboard (see table below).
- Requires structural steel exposed to salt water, salt spray, or other corrosive agents to be hot-dipped galvanized after fabrication; other metal components shall be stainless steel or hot-dipped galvanized.

Utilities and Service Equipment

- Utilities and attendant equipment that is elevated shall not be located below the lowest floor elevations, including freeboard (see table below).
- Fuel supply lines shall be equipped with float operated automatic shut-off valves.

- Tanks that are below the design flood elevation and that are attached to or beneath buildings shall be installed and anchored to resist at least 1.5 times the potential buoyant and other flood forces assumed to act on empty tanks.
- Elevator cabs that descend below the design flood elevation shall be equipped with controls that prevent the cab from descending into floodwaters.

Siting Considerations

- Structures shall not be built in:
 - . Areas subject to flash flooding (floodwaters rise to 3' or more above banks in less than 2 hours).
 - . Erosion-prone areas (determined by analyses) unless protected.
 - . High velocity flow areas (faster than 10 ft/sec) unless protected.
- Buildings in proximity to flood protective works (dams, levees, floodwalls, diversions, channels) shall not have adverse effects on, or conflict with, maintenance and repairs of those protective works.
- In-ground and above-ground pools shall be designed to withstand flood loads and load combinations; pools that are structurally connected to structures are to be designed to function as a continuation of foundations.

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See next page for description of Categories →

		Category I	Category II	Category III	Category IV
Elevation of Lowest Floor (A Zone: Table 2-1)	All A Zones not identified as Coastal A Zones: elevation of lowest floor	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
Elevation of Bottom of Lowest Horizontal Structural Member (V Zone: Table 4-1)	All V Zones and Coastal A Zones: where the lowest horizontal structural member is parallel to direction of wave approach	DFE	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher
	All V Zones and Coastal A Zones: where the lowest horizontal structural member is perpendicular to direction of wave approach	DFE	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
Elevation Below Which Flood-Damage-Resistant Materials Shall be Used (Table 5-1)	All A Zones not identified as Coastal A Zones	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	All V Zones and Coastal A Zones: where the lowest horizontal structural member is parallel to direction of wave approach	DFE	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	All V Zones and Coastal A Zones: where the lowest horizontal structural member is perpendicular to direction of wave approach	DFE	BFE +2 ft or DFE, whichever is higher	BFE +3 ft or DFE, whichever is higher	BFE +3 ft or DFE, whichever is higher
Minimum Elevation of Utilities and Equipment (Table 7-1)	All A Zones not identified as Coastal A Zones	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	All V Zones and Coastal A Zones: where the lowest horizontal structural member is parallel to direction of wave approach	DFE	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	All V Zones and Coastal A Zones: where the lowest horizontal structural member is perpendicular to direction of wave approach	DFE	BFE +2 ft or DFE, whichever is higher	BFE +3 ft or DFE, whichever is higher	BFE +3 ft or DFE, whichever is higher
Dry Floodproofing of non-residential structures and non-residential portions of mixed-use buildings (Table 6-1)	All A Zones not identified as Coastal A Zones: elevation to which dry floodproofing extends	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	All V Zones and Coastal A Zones: dry floodproofing not allowed	Not permitted	Not permitted	Not permitted	Not permitted

**TABLE 1-1. Classification of Structures for Flood-Resistant Design and Construction
(Classification same as ASCE 7, Ref. [1])**

Nature of Occupancy	Category
<p>Structures that represent a low hazard to human life in the event of failure including, but not limited to:</p> <ul style="list-style-type: none"> ▪ Agricultural facilities^a ▪ Certain temporary facilities ▪ Minor storage facilities^b 	I
<p>All structures except those listed in Categories I, III and IV</p>	II
<p>Structures that represent a substantial hazard to human life in the event of failure including, but not limited to:</p> <ul style="list-style-type: none"> ▪ Buildings and other structures where more than 300 people congregate in one area ▪ Buildings and other structures with day-care facilities with capacity greater than 150 ▪ Buildings and other structures with elementary school or secondary school facilities with capacity greater than 250 ▪ Buildings and other structures with a capacity greater than 500 for colleges or adult education facilities ▪ Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities ▪ Jails and detention facilities ▪ Power generating stations and other public utility facilities not included in Category IV <p>Buildings and other structures not included in Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing sufficient quantities of hazardous materials considered to be dangerous to the public if released.</p> <p>Buildings and other structures containing hazardous materials shall be eligible for classification as Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2^c that a release of the hazardous material does not pose a threat to the public.</p>	III
<p>Structures designated as essential facilities including but not limited to</p> <ul style="list-style-type: none"> ▪ Hospitals and other health-care facilities having surgery or emergency treatment facilities ▪ Fire, rescue, ambulance, and police stations and emergency vehicle garages ▪ Designated earthquake, hurricane, or other emergency shelters ▪ Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response ▪ Power generating stations and other public utility facilities required in an emergency ▪ Ancillary structures (including, but not limited to, communication towers, fuel storage tanks, cooling towers, electrical substation structures, fire water storage tanks or other structures housing or supporting water, or other fire-suppression material or equipment) required for operation of Category IV structures during an emergency ▪ Aviation control towers, air traffic control centers, and emergency aircraft hangars ▪ Water storage facilities and pump structures required to maintain water pressure for fire suppression ▪ Buildings and other structures having critical national defense functions <p>Buildings and other structures (including but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing extremely hazardous materials where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction.</p> <p>Buildings and other structures containing extremely hazardous materials shall be eligible for classification as Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2^c that the extremely hazardous material does not pose a threat to the public. This reduced classification shall not be permitted if the buildings or structures also function as essential facilities</p>	IV

^aCertain agricultural structures may be exempt from some of the provisions of this Standard – see section C.4.3.

^bFor the purposes of this standard, minor storage facilities do not include commercial storage facilities.

^cSection 1.5.2 reference is made to ASCE Standard 7-05, not this standard.

2010 Florida Building Code, Residential

[a compilation of flood resistant provisions, prepared by Florida DEM]

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CHAPTER 1: SCOPE AND ADMINISTRATION

R101.2 Scope. The provisions of the *Florida Building Code, Residential*, shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress and their accessory structures.

Exceptions:

1. Live/work units complying with the requirements of Section 438 of the *Florida Building Code, Building* shall be permitted to be built as one- and two-family dwellings or townhouses. Fire suppression required by Section 438.5 of the *Florida Building Code, Building* when constructed under the *Florida Building Code, Residential* shall conform to Section 903.3.1.3 of the *Florida Building Code, Building*.
2. Existing buildings undergoing repair, alteration or additions, and change of occupancy shall comply with the *Florida Building Code, Existing Building*.

R101.2.1 The provisions of Chapter 1, *Florida Building Code, Building*, shall govern the administration and enforcement of the *Florida Building Code, Residential*.

CHAPTER 2: DEFINITIONS

FLOODPLAIN MANAGEMENT ORDINANCE. An ordinance or regulation adopted pursuant to the authority granted to local governments by Title 44 Code of Federal Regulations, Parts 59 and 60 for participation in the National Flood Insurance Program.

HABITABLE SPACE. A space in a structure for living, sleeping, eating or cooking. Bathrooms, toilet compartments, closets, halls, screen enclosures, sunroom Categories I, II and III as defined in the AAMA/NPEA/NSA 2100, storage or utility space and similar areas are not considered habitable spaces. [*Note: this section shown to clarify that some spaces that are not habitable spaces are not permitted below elevated buildings.*]

MANUFACTURED HOME Manufactured home means a structure, transportable in one or more sections, which in the traveling mode is 8 body feet (2438 body mm) or more in width or 40 body feet (12,192 body mm) or more in length, or, when erected on site, is 320 square feet (30 m²) or more, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air-conditioning and electrical systems contained therein; except that such term shall include any structure that meets all the requirements of this paragraph except the size requirements and with respect to which the manufacturer voluntarily files a certification required by the secretary (HUD) and complies with the standards established under this title. For mobile homes built prior to June 15, 1976, a label certifying compliance to the Standard for

Mobile Homes, NFPA 501, in effect at the time of manufacture is required. For the purpose of these provisions, a mobile home shall be considered a manufactured home.

CHAPTER 3: BUILDING PLANNING

R301.1 [Design Criteria] Application. Buildings and structures, and all parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, and wind loads as prescribed in this code. The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets all requirements for the transfer of all loads from their point of origin through the load-resisting elements to the foundation. Buildings and structures constructed as prescribed by the code are deemed to comply with the requirements of this section.

Exception: Buildings and structures located within the High Velocity Hurricane Zone shall comply with Sections R302 to R324, inclusive and the provisions of Chapter R44 and section R406. In addition, buildings and structures located in flood hazard areas established in Table R301.2(1) shall comply with Sections R301.2.4 and R322.

R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be as set forth in Table R301.2(1).

Table R301.2(1) Climatic and Geographic Design Criteria

Ground Snow Load	Wind Design		Seismic Design Category ^f	Subject To Damage From			Winter Design Temp ^e	Ice shield under-layment Required ^h	Flood Hazards ^g	Air Freezing Index ⁱ	Mean Annual Temp ^j
	Speed ^d (mph)	Topographic Effects ^k		Weathering ^a	Frost line depth ^b	Termite ^c					
NA	See Fig. R301.2(4)		NA	Negligible	NA	Very Heavy		NA		NA	NA

g. The applicable governing body shall, by local floodplain management ordinance, specify (a) the date of the jurisdiction’s entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of all currently effective FIRM and FBFM, or other flood hazard map adopted by the authority having jurisdiction, as amended.

R301.2.4 Floodplain construction. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with Section R322.

Exception: Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R301.2.4.1 Alternative provisions. As an alternative to the requirements in Section R322.2 for buildings and structures located in whole or in part in flood hazard areas (A Zones) or the requirements of Section 322.3 in coastal high hazard areas (V Zones), ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R301.2.5 Structures seaward of a coastal [control] construction line. Structures located seaward of the coastal construction [control] line shall be designed to resist the predicted forces of a 100-year storm event in accordance with Section 3109 of the *Florida Building Code, Building*. [Note: “coastal construction line” should refer to the “coastal construction control line.”]

R309.5 [Garages and Carports] Flood hazard areas. For buildings located in flood hazard areas as established by Table 301.2(1), garage floors shall be:

1. Elevated to or above the design flood elevation as determined in Section R322; or
2. Located below the design flood elevation provided they are at or above grade on at least one side, are used solely for parking, building access, or storage, meet the requirements of Section R322 and are otherwise constructed in accordance with this code.

SECTION R322 FLOOD-RESISTANT CONSTRUCTION

R322.1 General. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with the provisions contained in this section.

Exception: Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R322.1.1 Alternative provisions. As an alternative to the requirements in Section R322.2 for buildings and structures located in whole or in part in flood hazard areas (A Zones) or the requirements of Section 322.3 in coastal high-hazard areas (V Zones), ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R322.1.2 Structural systems. All structural systems of all buildings and structures shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses from flooding equal to the design flood elevation.

R322.1.3 Flood-resistant construction. All buildings and structures erected in flood hazard areas shall be constructed by methods and practices that minimize flood damage.

R322.1.4 Establishing the design flood elevation. The design flood elevation shall be used to define areas prone to flooding. At a minimum, the design flood elevation is the higher of:

1. The base flood elevation at the depth of peak elevation of flooding (including wave height) which has a 1 percent (100-year flood) or greater chance of being equaled or exceeded in any given year; or
2. The elevation of the design flood associated with the area designated on a flood hazard map adopted by the community, or otherwise legally designated.

R322.1.4.1 Determination of design flood elevations. If design flood elevations are not specified, the building official is authorized to require the applicant to:

1. Obtain and reasonably utilize data available from a federal, state or other source; or
2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas.

Determinations shall be undertaken by a registered design professional who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and approval.

R322.1.4.2 Determination of impacts. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall

demonstrate that the effect of the proposed buildings and structures on design flood elevations, including fill, when combined with all other existing and anticipated flood hazard area encroachments, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

R322.1.5 Lowest floor. The lowest floor shall be the floor of the lowest enclosed area, including basement, but excluding any unfinished flood-resistant enclosure that is useable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the building or structure in violation of this section.

R322.1.6 Protection of mechanical and electrical systems. Electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones). If replaced as part of a substantial improvement, electrical systems, equipment and components; heating, ventilation, air conditioning and plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall meet the requirements of this section. Systems, fixtures, and equipment and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

Exception: Locating electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment is permitted below the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones) provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided they conform to the provisions of the electrical part of this code for wet locations.

R322.1.7 Protection of water supply and sanitary sewage systems. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems in accordance with the plumbing provisions of this code. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into systems and discharges from systems into floodwaters in accordance with the plumbing provisions of this code and in accordance with Chapter 64E-6, *Florida Administrative Code*, Standards for Onsite Sewage Treatment and Disposal Systems.

R322.1.8 Flood-resistant materials. Building materials used below the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones) shall comply with the following:

1. All wood, including floor sheathing, shall be pressure-preservative-treated in accordance with AWP A U1 for the species, product, preservative and end use or be the decay-resistant heartwood of redwood, black locust or cedars. Preservatives shall be listed in Section 4 of AWP A U1.
2. Materials and installation methods used for flooring and interior and exterior walls and wall coverings shall conform to the provisions of FEMA/FIA-TB-2.

R322.1.9 Manufactured homes. In addition to the applicable requirements of the state agency with jurisdiction over installation of manufactured homes, installation of manufactured homes in flood hazard areas is subject to the applicable provisions of the local floodplain management ordinance.

R322.1.10 As-built elevation documentation. A registered design professional shall prepare and seal documentation of the elevations specified in Section R322.2 or R322.3.

R322.1.11 Structures seaward of a coastal [control] construction line. In addition to the requirements of this section, structures located in flood hazard areas and seaward of the coastal construction [control] line shall be designed to resist the predicted forces of a 100-year storm event in accordance with Chapter R44, and the more restrictive provisions shall govern. *[Note: "coastal construction line" should refer to the "coastal construction control line."]*

R322.2 Flood hazard areas (including A Zones). All areas that have been determined to be prone to flooding but not subject to high velocity wave action shall be designated as flood hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1 ½ feet (457 mm) and 3 feet (914 mm) shall be designated as Coastal A Zones. All buildings and structures constructed in whole or in part in flood hazard areas shall be designed and constructed in accordance with Sections R322.2.1 through R322.2.3.

R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas not designated as Coastal A Zones shall have the lowest floors elevated to or above the design flood elevation.
2. Buildings and structures in flood hazard areas designated as Coastal A Zones shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or to the design flood elevation, whichever is higher.
3. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated at least as high above the highest adjacent grade as the depth number specified in feet on the FIRM, or at least 2 feet (610 mm) if a depth number is not specified.
4. Basement floors that are below grade on all sides shall be elevated to or above the design flood elevation.

Exception: Enclosed areas below the design flood elevation, including basements whose floors are not below grade on all sides, shall meet the requirements of Section R322.2.2.

R322.2.2 Enclosed area below design flood elevation. Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria:
 - 2.1. There shall be a minimum of two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings on exterior walls.
 - 2.2. The total net area of all openings shall be at least 1 square inch (645 mm²) for each square foot (0.093 m²) of enclosed area, or the openings shall be designed and the construction documents shall include a statement by a registered design professional that the design of the openings will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters as specified in Section 2.6.2.2 of ASCE 24.
 - 2.3. The bottom of each opening shall be 1 foot (305 mm) or less above the adjacent ground level.

- 2.4. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
- 2.5. Any louvers, screens or other opening covers shall allow the automatic flow of floodwaters into and out of the enclosed area.
- 2.6. Openings installed in doors and windows, that meet requirements 2.1 through 2.5, are acceptable; however, doors and windows without installed openings do not meet the requirements of this section.

R322.2.3 Foundation design and construction. Foundation walls for all buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4.

Exception: Unless designed in accordance with Section R404:

1. The unsupported height of 6-inch (152 mm) plain masonry walls shall be no more than 3 feet (914 mm).
2. The unsupported height of 8-inch (203 mm) plain masonry walls shall be no more than 4 feet (1219 mm).
3. The unsupported height of 8-inch (203 mm) reinforced masonry walls shall be no more than 8 feet (2438 mm).

For the purpose of this exception, unsupported height is the distance from the finished grade of the under-floor space to the top of the wall.

R322.2.4 Pools in flood hazard areas. Pools that are located in flood hazard areas established by Table R301.2(1), including above-ground pools, on-ground pools, and in-ground pools that involve placement of fill, shall comply with Sections R322.2.4.1 or RB322.2.4.2.

Exception: Pools located in riverine flood hazard areas which are outside of designated floodways.

R322.2.4.1 Pools located in designated floodways. Where pools are located in designated floodways, documentation shall be submitted to the building official, which demonstrates that the construction of the pool will not increase the design flood elevation at any point within the jurisdiction.

R322.2.4.2 Pools located where floodways have not been designated. Where pools are located where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed pool will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

R322.3 Coastal high-hazard areas (including V Zones). Areas that have been determined to be subject to wave heights in excess of 3 feet (914 mm) or subject to high-velocity wave action or wave-induced erosion shall be designated as coastal high-hazard areas. All buildings and structures constructed in whole or in part in coastal high-hazard areas shall be designed and constructed in accordance with Sections R322.3.1 through R322.3.6.

R322.3.1 Location and site preparation.

1. New buildings and buildings that are determined to be substantially improved pursuant to the *Florida Building Code, Existing Building* shall be located landward of the reach of mean high tide.
2. For any alteration of sand dunes and mangrove stands the building official shall require submission of an engineering analysis which demonstrates that the proposed alteration will not increase the potential for flood damage.

R322.3.2 Elevation requirements.

1. All buildings and structures erected within coastal high-hazard areas shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, piling, pile caps, columns, grade beams and bracing, is:
 - 1.1 Located at or above the design flood elevation, if the lowest horizontal structural member is oriented parallel to the direction of wave approach, where parallel shall mean less than or equal to 20 degrees (0.35 rad) from the direction of approach, or
 - 1.2 Located at the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher, if the lowest horizontal structural member is oriented perpendicular to the direction of wave approach, where perpendicular shall mean greater than 20 degrees (0.35 rad) from the direction of approach.
- 2 Basement floors that are below grade on all sides are prohibited.
- 3 The use of fill for structural support is prohibited.
- 4 Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.

Exception: Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.4 and R322.3.5.

R322.3.3 Foundations. Buildings and structures erected in coastal high-hazard areas shall be supported on pilings or columns and shall be adequately anchored to those pilings or columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.4. Pilings shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. Slabs, pools, pool decks and walkways shall be located and constructed to be structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour or erosion from wave-velocity flow conditions, unless the buildings and structures and their foundation are designed to resist the additional flood load.

R322.3.3.1 Pools. Pools in coastal high-hazard areas shall be designed and constructed in conformance with ASCE 24.

R322.3.4 Walls below design flood elevation. Walls and partitions are permitted below the elevated floor, provided that such walls and partitions are not part of the structural support of the building or structure and:

- 1 Electrical, mechanical, and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and
- 2 Are constructed with insect screening or open lattice; or
- 3 Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation

system. Such walls, framing and connections shall have a design safe loading resistance of not less than 10 (470 Pa) and no more than 20 pounds per square foot (958 Pa); or

- 4 Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), the construction documents shall include documentation prepared and sealed by a registered design professional that:
 - 4.1. The walls and partitions below the design flood elevation have been designed to collapse from a water load less than that which would occur during the design flood.
 - 4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on all building components (structural and nonstructural). Water loading values used shall be those associated with the design flood. Wind loading values used shall be those required by this code.

R322.3.5 Enclosed areas below design flood elevation. Enclosed areas below the design flood elevation shall be used solely for parking of vehicles, building access or storage.

R322.3.6 Construction documents. The construction documents shall include documentation that is prepared and sealed by a registered design professional that the design and methods of construction to be used meet the applicable criteria of this section.

CHAPTER 4: FOUNDATIONS

R401.1 [General] Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for all buildings. In addition to the provisions of this chapter, the design and construction of foundations in areas prone to flooding as established by Table R301.2(1) shall meet the provisions of Section R322. Wood foundations shall be designed and installed in accordance with AF&PA PWF.

Exceptions: *[partial]*

2. Buildings and structures located within the High-Velocity Hurricane Zone shall comply with the provisions of Chapter 44 and, as applicable, Section R322 in flood hazard areas.

R401.2 [General] Requirements. Foundations shall be capable of resisting all loads from roof uplift and building overturn. Foundation uplift for light-frame wood or steel buildings shall be calculated or determined from Table R401.1. Masonry buildings within the dimensional scope of Table R401.1 shall be assumed to be of adequate weight so as not to require uplift resistance greater than that provided by the structure and any normal foundation. Foundation construction shall also be capable of accommodating all gravity loads according to Section R301 and of transmitting the resulting loads to the supporting soil. Fill soils that support footings and foundations shall be designed, installed and tested in accordance with accepted engineering practice. Gravel fill used as footings for wood and precast concrete foundations shall comply with Section R403.

R401.3 [General] Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection that does not create a hazard. Lots shall be graded so as to drain surface water away from foundation walls. The grade shall fall a minimum of 6 inches (152 mm) within the first 10 feet (3048 mm).

Exception: Where lot lines, walls, slopes or other physical barriers prohibit 6 increase (152 mm) of fall within 10 feet (3048 mm), drains or swales shall be constructed to ensure drainage away from the structures. Impervious surfaces within 10 feet (3048 mm) of the

building foundation shall be sloped a minimum of 2 percent away from the building.

R408.6 [Under-Floor Space] Finished grade. The finished grade of under-floor surface may be located at the bottom of the footings; however, where there is evidence that the groundwater table can rise to within 6 inches (152 mm) of the finished floor at the building perimeter or where there is evidence that the surface water does not readily drain from the building site, the grade in the under-floor space shall be as high as the outside finished grade, unless an approved drainage system is provided.

R408.7 [Under-Floor Space] Flood resistance. For buildings located in areas prone to flooding as established in Table R301.2(1):

1. Walls enclosing the under-floor space shall be provided with flood openings in accordance with Section R322.2.2.
2. The finished ground level of the under-floor space shall be equal to or higher than the outside finished ground level on at least one side.

Exception: Under-floor spaces that meet the requirements of FEMA/FIA TB 11-01.

CHAPTER 5: FLOORS

R506.2.1 [Concrete Floors (on Ground)] Fill. Fill material shall be free of vegetation and foreign material. The fill shall be compacted to assure uniform support of the slab, and except where approved, the fill depths shall not exceed 24 inches (610 mm) for clean sand or gravel and 8 inches (203 mm) for earth.

M1301.1.1 [General Mechanical System Requirements; General] Flood-resistant installation. In areas prone to flooding as established by Table R301.2(1), mechanical appliances, equipment and systems shall be located or installed in accordance with Section R322.1.6

M1401.5 [Heating and Cooling Equipment; General] Flood hazard. In areas prone to flooding as established by Table R301.2(1), heating and cooling equipment and appliances shall be located or installed in accordance with Section R322.1.6

M1601.4.9 [Duct Construction; Duct installation] Flood hazard areas. In areas prone to flooding as established by Table R301.2(1), duct systems shall be located or installed in accordance with Section R322.1.6.

M1701.2 [Combustion Air; General] Opening location. In areas prone to flooding as established by Table R301.2(1), openings shall be located at or above the elevation required in Section R322.2.1 or R322.3.2.

M2001.4 [Boilers and Water Heaters] Flood-resistant installation. In areas prone to flooding as established in Table R301.2(1), boilers, water heaters and their control systems shall be located or installed in accordance with Section R322.1.6.

M2201.6 [Special Piping and Storage Systems; Oil tanks] Flood resistant installation. In areas prone to flooding as established by Table R301.2(1), tanks shall be installed at or above the elevation required in Section R322.2.1 or R322.3.2 or shall be anchored to prevent flotation,

collapse and lateral movement under conditions of the design flood.

G2404.7 (301.11) [Fuel Gas; General] Flood hazard. For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located at or above the design flood elevation and shall comply with the flood-resistant construction requirement of Section R322.

Exception: The appliance, equipment and system installations regulated by this code are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation and shall comply with the flood-resistant construction requirements of Section R322.

P2601.3 [General Plumbing Requirements; General] Flood hazard area. In areas prone to flooding as established by Table R301.2(1), plumbing fixtures, drains, and appliances shall be located or installed in accordance with Section R322.1.6.

P2602.2 [Individual Water Supply and Sewage Disposal] Flood resistant installation. In areas prone to flooding as established by Table R301.2(1):

1. Water supply systems shall be designed and constructed to prevent infiltration of floodwaters.
2. Pipes for sewage disposal systems shall be designed and constructed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

P2705.1 [Plumbing Fixtures, Installation] General. The installation of fixtures shall conform to the following: *[partial]*

7. In areas prone to flooding as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R322.1.6.

P3001.3 [Sanitary Drainage; General] Flood-resistant installation. In areas prone to flooding as established by Table R301.2(1), drainage, waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

P3101.5 [Vent Systems] Flood resistance. In areas prone to flooding as established by Table R301.2(1), vents shall be located at or above the elevation required in Section R322.1 (flood hazard areas including A Zones) or R322.2 (coastal high-hazard areas including V Zones). *[Note: referenced sections should be R322.2.1 and R322.3.2, in which elevations are specified.]*

CHAPTER 41 SWIMMING POOLS

R4101.4.2.1. [Private Swimming Pools] Flood hazard areas. Pools installed in flood hazard areas established in Section R322 shall comply with Section R322.2.4 (A Zones) or R322.3.3.1 in coastal high-hazard areas (V Zones).

CHAPTER 43: REFERENCE

FEMA-TB-2-08	Flood Damage-Resistant Materials Requirements In Special Flood Hazard Areas [<i>Note: this reference omitted.</i>]	R322.1.8
FEMA TB-11-01	Crawlspace Construction for Buildings Located In Special Flood Hazard Areas	R408.7

CHAPTER 44: HIGH-VELOCITY HURRICANE ZONE

R4403.7.8 [Wind Loads] Load combination. The safety of structures shall be checked using the provisions of 2.3 and 2.4 of ASCE 7 with commentary. Flood Load F_a mentioned in these load combinations shall be in accordance with Chapter 5 of ASCE 7.

R4403.13.1.1 [Flood Resistance] Flood resistance. Where the building or structure is located in a flood hazard area established in Table 301.2(1), the building or structure, including enclosures below elevated buildings, shall be designed and constructed in accordance with Section R322 and this section.

2010 Florida Building Code, Existing Building

[a compilation of flood resistant provisions, prepared by Florida DEM]

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CHAPTER 1 ADMINISTRATIVE

101.1 Title. These regulations shall be known as the *Florida Building Code, Existing Building*, hereinafter referred to as "this code." In addition to the provisions of this chapter, the provisions of Chapter 1, *Florida Building Code, Building*, shall govern the administration and enforcement of this code.

101.2 Scope. The provisions of the *Florida Building Code, Existing Building* shall apply to the repair, alteration, change of occupancy, addition, and relocation of existing buildings.

Exception: For the purpose of public educational facilities and state licensed facilities, see Chapter 4, Special Occupancy, of the *Florida Building Code, Building*.

101.3 Intent. The intent of this code is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety and welfare insofar as they are affected by the repair, alteration, change of occupancy, addition and relocation of existing buildings.

101.4 Applicability. This code shall apply to the *repair, alteration, change of occupancy, addition* and relocation of all *existing buildings*, regardless of occupancy, subject to the criteria of Sections 101.4.1 and 101.4.2.

101.4.1 Buildings not previously occupied. A building or portion of a building that has not been previously occupied or used for its intended purpose in accordance with the laws in existence at the time of its completion shall comply with the provisions of the *Florida Building Code, Building* or *Florida Building Code, Residential*, as applicable, for new construction or with any current permit for such occupancy.

101.4.2 Buildings previously occupied. The legal occupancy of any building existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in this code, the *Florida Fire Prevention Code*, or as is deemed necessary by the *code official* for the general safety and welfare of the occupants and the public.

101.5 Compliance method. The repair, alteration, change of occupancy, addition or relocation of all existing buildings shall comply with one of the methods listed in Section 101.5.1 through 101.5.3 as selected by the applicant. Application of a method shall be the sole basis for assessing the compliance of work performed under a single permit unless otherwise approved by the code official. Sections 101.5.1 through 101.5.3 shall not be applied in combination with each other.

Exception: Subject to the approval of the code official, alterations complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code unless the building is undergoing more than a limited structural alteration as defined in Section 807.4.3. New structural members added as part of the repair or alteration shall comply with the *Florida Building*

Code, Building. Alterations of existing buildings in flood hazard areas shall comply with Section 601.3.

CHAPTER 2 DEFINITIONS

ADDITION. An extension or increase in floor area, number of stories, or height of a building or structure.

ALTERATION. Any construction or renovation to an existing structure other than a repair or addition. Alterations are classified as Level 1, Level 2, and Level 3.

CHANGE OF OCCUPANCY. A change in the purpose or level of activity within a building that involves a change in application of the requirements of this code.

EXISTING BUILDING. A building or structure or portion of a building or structure which has been previously legally occupied or used for its intended purpose.

EXISTING STRUCTURES (for flood hazard areas). See Section 1612.2 of the *Florida Building Code, Building*.

FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year.
2. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

HISTORIC BUILDING. See Section 1102.

LOCAL FLOODPLAIN MANAGEMENT ORDINANCE. An ordinance or regulation adopted pursuant to the authority granted to local governments by Title 44 Code of Federal Regulations, Parts 59 and 60 for participation in the National Flood Insurance Program.

REHABILITATION. Any work, as described by the categories of work defined herein, undertaken in an existing building.

REPAIR. The patchint, restoration and/or minor replacement of materials, elements, components, equipment and/or fixtures for the purposes of maintaining such materials, elements, components, equipment and/or fixtures in good or sound condition.

SUBSTANTIAL DAMAGE. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT. Any repair, reconstruction, rehabilitation, addition or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to assure safe living conditions.

2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

CHAPTER 3 PRESCRIPTIVE COMPLIANCE METHOD

302.2 [Additions] Flood hazard areas. For buildings and structures in flood hazard areas established in Section 1612.3 of the *Florida Building Code, Building*, any addition that constitutes substantial improvement of the existing structure, as defined in Section 1612.2 of the *Florida Building Code, Building*, shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design. For buildings and structures in flood hazard areas established in Section 1612.3 of the *Florida Building Code, Building*, any additions that do not constitute substantial improvement or substantial damage of the existing structure, as defined in Section 1612.2 of the *Florida Building Code, Building*, are not required to comply with the flood design requirements for new construction.

303.2 [Alterations] Flood hazard areas. For buildings and structures in flood hazard areas established in Section 1612.3 of the *Florida Building Code, Building*, any alteration that constitutes substantial improvement of the existing structure, as defined in Section 1612.2 of the *Florida Building Code, Building*, shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design. For buildings and structures in flood hazard areas established in Section 1612.3 of the *Florida Building Code, Building*, any alterations that do not constitute substantial improvement or substantial damage of the existing structure, as defined in Section 1612.2 of the *Florida Building Code, Building*, are not required to comply with the flood design requirements for new construction.

304.5 [Repairs] Flood hazard areas. For buildings and structures in flood hazard areas established in Section 1612.3 of the *Florida Building Code, Building*, any repair that constitutes substantial improvement of the existing structure, as defined in Section 1612.2 of the *Florida Building Code, Building*, shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design. For buildings and structures in flood hazard areas established in Section 1612.3 of the *Florida Building Code, Building*, any repairs that do not constitute substantial improvement or substantial damage of the existing structure, as defined in Section 1612.2 of the *Florida Building Code, Building*, are not required to comply with the flood design requirements for new construction.

SECTION 308 HISTORIC BUILDINGS: SEE CHAPTER 11

CHAPTER 5 REPAIRS

501.3 Flood hazard areas. In flood hazard areas, repairs that constitute substantial improvement shall require that the building comply with Chapter 1612 of the *Florida Building Code, Building*.

501.3.1 Structure seaward of a coastal construction line. Structures located seaward of the coastal construction line shall be designed to resist the predicted forces of a 100-year storm event in accordance with Section 3109 of the *Florida Building Code, Building*.

506.2.4 [Structural] Flood hazard areas. In flood hazard areas, buildings that have sustained substantial damage shall be brought into compliance with Section 1612 of the *Florida Building Code, Building*.

CHAPTER 6 ALTERATIONS – LEVEL 1

601.3 Flood hazard areas. In flood hazard areas, alterations that constitute substantial improvement shall require that the building comply with Section 1612 of the *Florida Building Code, Building*.

CHAPTER 7 ALTERATIONS – LEVEL 2

701.2 Alteration Level 1 compliance. In addition to the requirements of this chapter, all work shall comply with the requirements of Chapter 6.

CHAPTER 8 ALTERATIONS – LEVEL 3

801.2 Compliance. In addition to the provisions of this chapter, work shall comply with all of the requirements of Chapters 6 and 7. The requirements of Sections 703, 704, and 705 shall apply within all work areas whether or not they include exits and corridors shared by more than one tenant and regardless of the occupant load.

CHAPTER 9 CHANGE OF OCCUPANCY

901.1 Scope. The provisions of this chapter shall apply where a change of occupancy occurs, as defined in Section 202, including:

1. Where the occupancy classification is not changed, or
2. Where there is a change in occupancy classification or the occupancy group designation changes.

Section 907 Structural

[see text on other loads: gravity, snow and wind, and seismic]

CHAPTER 10 ADDITIONS

1001.1 Scope. An addition to a building or structure shall comply with the *Florida Building Codes* as adopted for new construction without requiring the existing building or structure to comply with any requirements of those codes or of these provisions, except as required by this chapter. Where an addition impacts the existing building or structure, that portion shall comply with this code.

1003.1 Compliance with *Florida Building Code*.

1003.5 Flood Hazard Areas. Additions and foundations in flood hazard areas shall comply with the following requirements:

1. For horizontal additions that are structurally interconnected to the existing building:
 - 1.1 If the addition and all other proposed work, when combined, constitute substantial improvement, the existing building and the addition shall comply with Section 1612 of the *Florida Building Code, Building*.

- 1.2 If the addition constitutes substantial improvement, the existing building and the addition shall comply with Section 1612 of the *Florida Building Code, Building*.
2. For horizontal additions that are not structurally interconnected to the existing building:
 - 2.1 The addition shall comply with Section 1612 of the *Florida Building Code, Building*.
 - 2.2 If the addition and all other proposed work, when combined, constitute substantial improvement, the existing building and the addition shall comply with Section 1612 of the *Florida Building Code, Building*.
3. For vertical additions and all other proposed work, when combined, that constitute substantial improvement, the existing building shall comply with Section 1612 of the *Florida Building Code, Building*.
4. For a new, replacement, raised, or extended foundation, if the foundation work and all other proposed work, when combined, constitute substantial improvement, the existing building shall comply with Section 1612 of the *Florida Building Code, Building*.

CHAPTER 11 HISTORIC BUILDINGS

1101.3 Flood hazard areas. In flood hazard areas, if all proposed work, including repairs, work required because of a change of occupancy, and alterations, constitutes substantial improvement, then the building shall comply with Section 1612 of the *Florida Building Code, Building*.

Exception: If the program that designated the building as historic determines that it will continue to be an historic building after the proposed work is completed, then the proposed work is not considered to be substantial improvement. For the purposes of this exception, an historic building is:

1. Individually listed in the National Register of Historic Places; or
2. A contributing resource within a National Register of Historic Places listed district; or
3. Designated as historic property under an official municipal, county, special district or state designation, law, ordinance or resolution either individually or as a contributing property in a district, provided the local program making the designation is approved by the Department of the Interior (the Florida state historic preservation officer maintains a list of approved local programs); or
4. Determined eligible by the Florida State Historic Preservation Officer for listing in the National Register of Historic Places, either individually or as a contributing property in a district.

HISTORIC BUILDING. For the purposes of this code and the referenced documents, an historic building is defined as a building or structure that is:

1. Individually listed in the National Register of Historic Places; or
2. A contributing resource within a National Register of Historic Places listed district; or
3. Designated as historic property under an official municipal, county, special district or state designation, law, ordinance or resolution either individually or as a contributing property in a district; or
4. Determined eligible by the Florida State Historic Preservation Officer for listing in the National Register of Historic Places, either individually or as a contributing property in a district.

CHAPTER 12 RELOCATED OR MOVED BUILDINGS

1202.6 Flood hazard areas. If relocated or moved into a flood hazard area, structures shall comply with Section 1612 of the *Florida Building Code, Building*.

CHAPTER 13 PERFORMANCE COMPLIANCE METHOD

1301.1 Scope. The provisions of this chapter shall apply to the alteration, repair, addition and change of occupancy of existing structures, including historic and moved structures, as referenced in Section 101.5.3. The provisions of this chapter are intended to maintain or increase the current degree of public safety, health and general welfare in existing buildings while permitting repair, alteration, addition and change of occupancy without requiring full compliance with Chapters 4 through 12, except where compliance with other provisions of this code is specifically required in this chapter.

1301.3 Acceptance. For repairs, alterations, additions, and changes of occupancy to existing buildings that are evaluated in accordance with this section, compliance with this section shall be accepted by the code official.

1301.3.3 Compliance with flood hazard provisions. In flood hazard areas, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the *Florida Building Code, Building* if the work covered by this section constitutes substantial improvement.

2010 Editions of Florida Building Code, Mechanical, Plumbing, and Fuel Gas

[a compilation of flood resistant provisions, prepared by Florida DEM]

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2010 Florida Building Code, Mechanical

DESIGN FLOOD ELEVATION. The elevation of the “design flood,” including wave height, relative to the datum specified on the community’s legally designated flood hazard area map.

M301.13 [General Regulations] Flood hazard. For structures located in flood hazard areas, mechanical systems, equipment and appliances shall be located at or above the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment.

Exception: Mechanical systems, equipment and appliances are permitted to be located below the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

M301.13.1 High-velocity wave action. In flood hazard areas subject to high-velocity wave action, mechanical systems and equipment shall not be mounted on or penetrate walls intended to break away under flood loads.

M401.4 [Ventilation, General] Intake opening location. Air intake openings shall comply with all of the following:

4. Intake openings on structures in flood hazard areas shall be at or above the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment.

M501.2.1 [Exhaust Systems, General] Location of exhaust outlets. The termination point of exhaust outlets and ducts discharging to the outdoors shall be located with the following minimum distances:

4. Exhaust outlets serving structures in flood hazard areas shall be installed at or above elevation required by Section 1612.4 of the *Florida Building Code* for utilities and attendant equipment.

M602.4 [Duct Systems, General] Flood hazard. For structures located in flood hazard areas, plenum spaces shall be located above the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the plenum spaces during floods up to such elevation. If the plenum spaces are located below the elevation required by

Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment, they shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

M603.13 [Duct Construction and Installation] Flood hazard areas. For structures in flood hazard areas, ducts shall be located above the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the ducts during floods up to such elevation. If the ducts are located below the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment, the ducts shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.

M1206.9.1 [Hydronic Piping, Piping installation] Flood hazard. Piping located in a flood hazard area shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the elevation required by Section 1612.4 of the *Florida Building Code, Building*.

M1305.2.1 [Fuel Oil System Installation] Flood hazard. All fuel oil pipe, equipment and appliances located in flood hazard areas shall be located above the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment or shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.



2010 Florida Building Code, Plumbing

DESIGN FLOOD ELEVATION. The elevation of the “design flood,” including wave height, relative to the datum specified on the community’s legally designated flood hazard map.

FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any given year.
2. The area designated as a flood hazard area on a community’s flood hazard map or as otherwise legally designated.

P309 FLOOD HAZARD RESISTANCE

P309.1 General. Plumbing systems and equipment in structures erected in flood hazard areas shall be constructed in accordance with the requirements of this section and the *Florida Building Code, Building*.

P309.2 Flood hazard. For structures located in flood hazard areas, the following systems and equipment shall be located and installed as required by Section 1612.4 of the *Florida Building Code, Building*:

Exception: The following systems are permitted to be located below the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment provided that the systems are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to the design flood elevation.

1. All water service pipes.
2. Pump seals in individual water supply systems where the pump is located below the design flood elevation.
3. Covers on potable water wells shall be sealed, except where the top of the casing well or pipe sleeve is elevated to at least 1 foot (305 mm) above the design flood elevation.
4. All sanitary drainage piping.
5. All storm drainage piping.
6. Manhole covers shall be sealed, except where elevated to or above the design flood elevation.
7. All other plumbing fixtures, faucets, fixture fittings, piping systems and equipment.
8. Water heaters.
9. Vents and vent systems.

309.3 Flood hazard areas subject to high-velocity wave action. Structures located in flood hazard areas subject to high-velocity wave action shall meet the requirements of Section 309.2. The plumbing systems, pipes and fixtures shall not be mounted on or penetrate through walls intended to break away under flood loads.



2010 Florida Building Code, Fuel Gas

DESIGN FLOOD ELEVATION. The elevation of the “design flood,” including wave height, relative to the datum specified on the community’s legally designated flood hazard map.

FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year.
2. The area designated as a flood hazard area on a community’s flood hazard map, or otherwise legally designated.

NOTE: FB301.11 shown below is found in the Florida Supplement to the IFBC.

FG301.11 [General] Flood hazard. For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located at or above the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment and shall comply with the flood-resistant construction requirements of the *Florida Building Code, Building*.

Exception: The appliance, equipment and system installations regulated by this code are permitted to be located below the elevation required by Section 1612.4 of the *Florida Building Code, Building* for utilities and attendant equipment provided that they are

designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.