

PHRC Webinar Series  
Tuesday, March 11, 2014 1:00 pm

# Renovation Requirements in Floodplains

Presented by: Katie Blansett, PhD, PE



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Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

This course is registered with AIA



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## Course Description

The IRC requires certain flood protection or flood-resistant construction measures be taken for renovation projects if the structure is located within a 100-year floodplain boundary. A municipality can adopt a Floodplain Ordinance that may include requirements that are different from those in the IRC. Tune into this program to learn about the different types of regulations that apply to renovation in floodplains from the perspective of both the remodeler and the code inspector.



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### Learning Objectives

At the end of the this course, participants will be able to:

1. Understand the basic terminology and common abbreviations associated with floodplain work
2. Create a FIRMette for a project site to determine if it is located in a floodplain
3. Identify the sections of the International Residential Code that are relevant to construction activities in a floodplain
4. Understand how to apply the regulations of flood-resistant construction
5. Identify the differences between the requirements of the IRC and a Floodplain Ordinance that might have been adopted for a specific municipality



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### Agenda

- Definitions
- Are you in a floodplain?
- Regulations related to construction in floodplains
  - IRC
  - UCC
  - Local ordinance

This webinar will NOT address the requirements for coastal flood zones.



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### Floodplain Definitions

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## FEMA & Flood Insurance

- **In 1968 Congress created the National Flood Insurance Program (NFIP)**
  - Intent: reduce future damage and to provide protection for property owners from potential losses through an insurance program
  - Administered under the National Flood Insurance Act of 1968 and applicable Federal regulations promulgated in Title 44 of the Code of Federal Regulations, Subchapter B

(FEMA)



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## FEMA Definitions

- **Floodplain**
  - Any land area susceptible to being inundated by flood waters from any source
- **Regulatory Floodway**
  - The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without increasing the water surface elevation more than a designated height
    - Maximum 1 foot, many areas have smaller height

(FEMA)



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## FEMA & Flood Insurance

- **Flood Insurance Rate Maps (FIRMs)**
  - Show areas subject to flooding
  - Official map of a community on which FEMA has delineated the **Special Flood Hazard Areas (SFHAs)**, the **Base Flood Elevations (BFEs)**, and the risk premium zones applicable to the community.
  - Tool for state and local governments to mitigate the effects of flooding in their communities
  - Risk based on historic, meteorological, hydrologic, and hydraulic, as well as open-space conditions, flood-control works and development

(FEMA)



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## FEMA Definitions

### • Base Flood Elevation (BFE)

- The elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year
- The BFE is shown on the Flood Insurance Rate Map (FIRM) for zones AE, AH, AI-A30, AR, AR/A, AR/AE, AR/AI-A30, AR/AH, AR/AO, VI-V30, and VE.

(FEMA)



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## FEMA Definitions

### • Special Flood Hazard Area (SFHA)

- The area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year
  - 1% annual chance flood = the base flood = 100-year flood
  - IRC → Peak elevation of the 1% annual chance flood is the Design Elevation
  - Zone A, Zone AE, Zone AO,
  - Also Zone AH, Zones AI-A30, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/AI-A30, Zone AR/A, Zone V, Zone VE, and Zones VI-V30

(FEMA)



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## FEMA Zone Descriptions

### A -- Areas subject to inundation by the 1% annual-chance flood event

- Detailed hydraulic analyses have not been performed so no BFEs or flood depths are shown

### AE, AI-A30 -- Areas subject to inundation by the 1% annual-chance flood event determined by detailed methods

- BFEs are shown within these zones
- Zone AE is used on new and revised maps in place of Zones AI-A30

### AO -- Areas subject to inundation by 1% annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are 1-3 feet

- Average flood depths derived from detailed hydraulic analyses are shown, BFE are not shown

(FEMA)



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## Additional FEMA Zone Descriptions

- AH** -- Areas subject to inundation by 1% annual-chance shallow flooding (usually areas of ponding) where average depths are 1–3 feet.
  - BFEs derived from detailed hydraulic analyses are shown in this zone
- AR** -- Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection
- A99** -- Areas subject to inundation by the 1% annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system.
  - Areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes.
  - May be used only when the flood protection system has reached specified statutory progress toward completion.
  - No BFEs or flood depths are shown.

(FEMA)



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## SFHA – High Risk

- **Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgagee**
- **Federal floodplain management regulations and mandatory flood insurance purchase requirements apply in these zones**

(FEMA)



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## FEMA Definitions

- **Basement (different than IRC)**
  - Any area of the building, including any sunken room or sunken portion of a room, having its floor below ground level (subgrade) on all sides

(FEMA)



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# Are you in a Floodplain?

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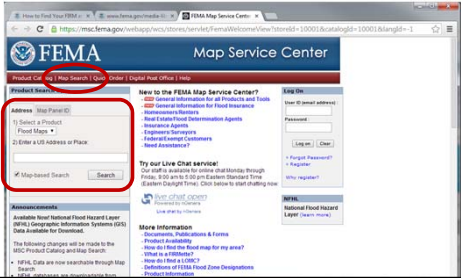
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## FEMA Map Service Center

<http://msc.fema.gov>



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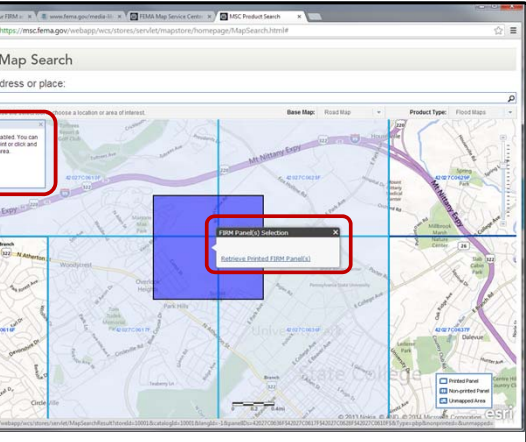
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### Map Search

Enter an address or place:



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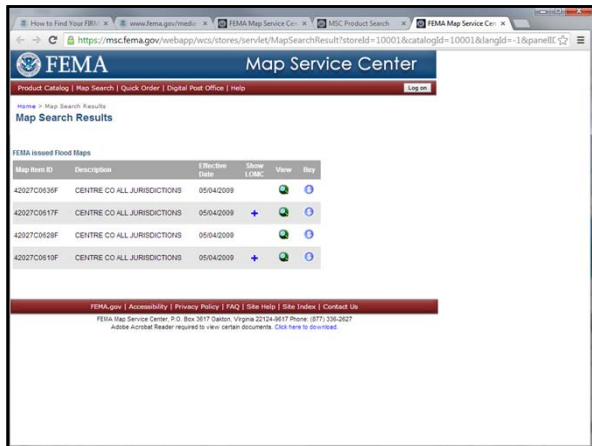
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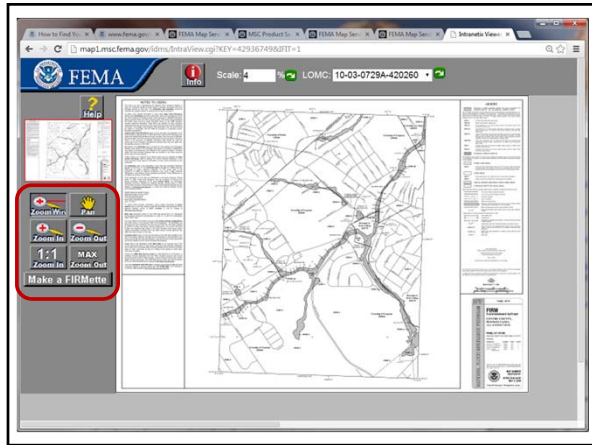
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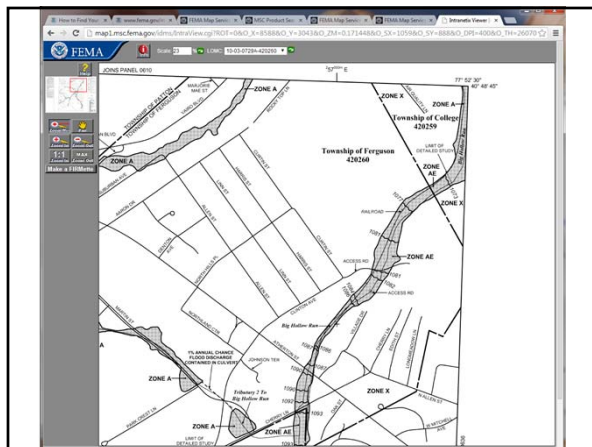
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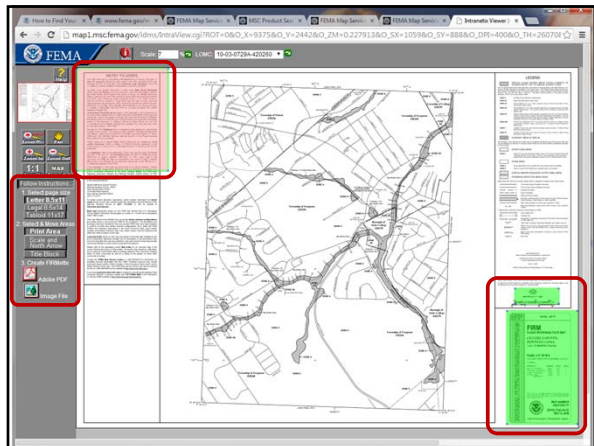
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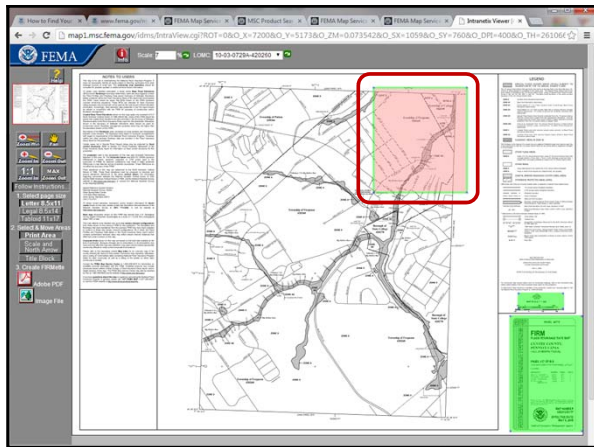
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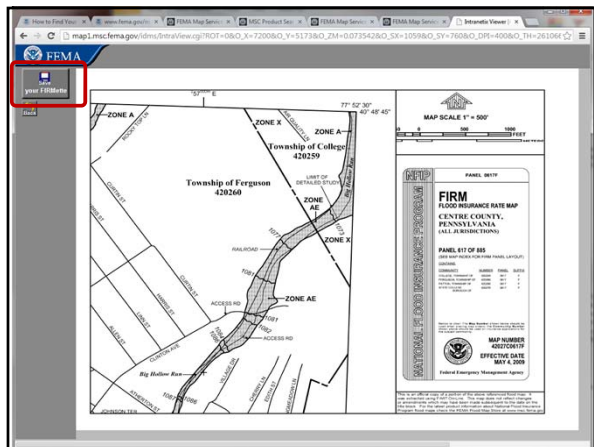
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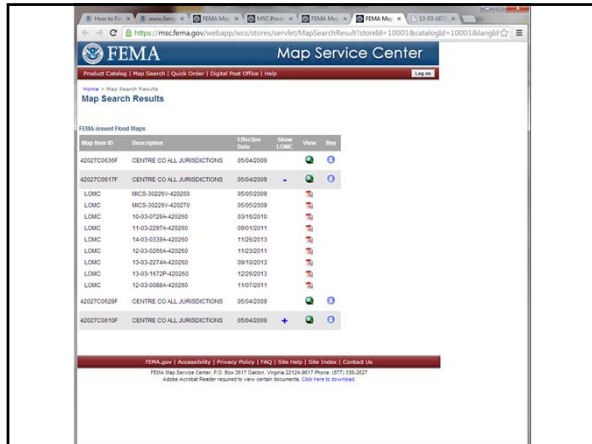
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# Changes to FEMA Maps (LOMC)

- Map Revision**
  - A change in the FHM or FIRM for a community which reflects revised zone, base flood, or other information
- Letter of Map Amendment (LOMA)**
  - An amendment to the currently effective FEMA map which establishes that a property is not located in a Special Flood Hazard Area
- Letter of Map Revision (LOMR)**
  - An official amendment to the currently effective FEMA map
  - Changes flood zones, delineations, and elevations

(FEMA)

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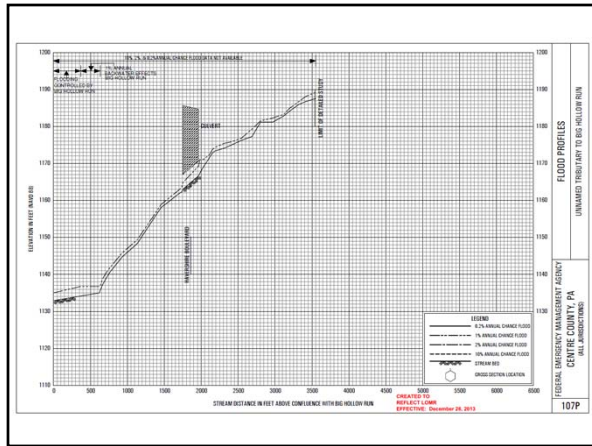
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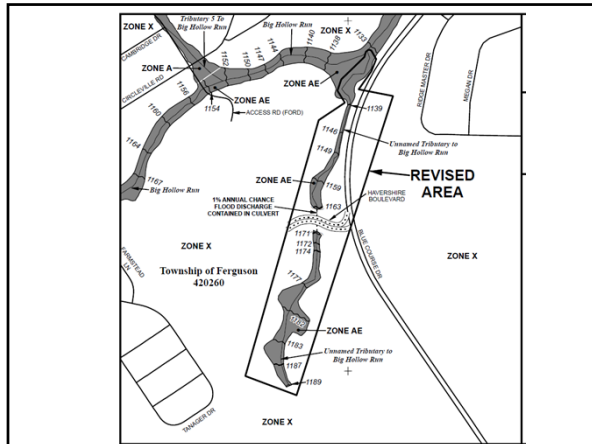
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## FIRMette Tutorial

- **How to Find Your FIRM and Make a FIRMette**
  - <http://www.fema.gov/media-library-data/62dde0f608bc2517c84529abd9e46/How+to+Find+Your+FIRM+and+Make+a+FIRMette.pdf>




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## Regulations for Construction in Floodplains:

# IRC

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## Flood Resistant Construction

- **Section 322**

- Additional requirements for buildings or structures located in flood hazard areas (SFHA)
- Exception: ASCE 24 Flood Resistant Design and Construction
  - "Highlights of ASCE 24-05 Flood Resistant Design and Construction (2010)"
    - [http://www.fema.gov/media-library-data/20130726-1643-20490-4974/asce24\\_highlights\\_dec2010.pdf](http://www.fema.gov/media-library-data/20130726-1643-20490-4974/asce24_highlights_dec2010.pdf)

IRC: R322.1



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## Flood Resistant Construction

- **Structures in flood hazard areas must be designed, constructed, and anchored to resist flotation, collapse or permanent lateral movement from the forces of the design flood**
- **Structures in flood prone areas must be constructed to minimize flood damage**

IRC: R322.1.2  
R322.1.3



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## Design Flood Elevations

- **Design flood elevation is higher of:**
  - Peak elevation of flooding for the 1% flood
  - Elevation on the flood hazard map adopted by community

IRC: R322.1.4



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## Design Flood Elevations

- **If design elevations not specified, the building official may require:**
  - Use of data from federal, state, or other sources
  - Determination of the design flood elevation by a registered design professional using standard hydrologic and hydraulic methods
- **Resources for building code officials:**
  - State NFIP coordinator (Governor's Center for Local Government Service)
  - "FEMA 265, Managing Flood Plain Development in Approximate Zone Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations"
    - <http://www.fema.gov/media-library/assets/documents/1911?id=1526>

R322.I.4.1



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## Determination of Impact

- **If design flood elevations are specified for river or stream but floodways have not been designated:**
  - the applicant shall demonstrate that the effect of the building 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 ft at any point in the jurisdiction

IRC: R322.I.4.2



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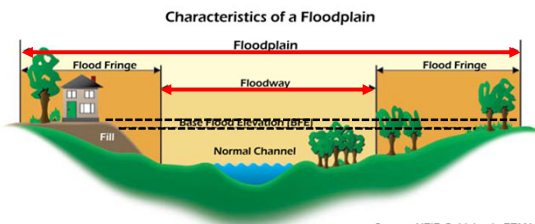
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## Floodplain & Floodway



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## Elevation Requirements

- **Buildings and structures in flood hazard areas shall have the lowest floor elevated to or above the design flood elevation**
- **Basement floors that are below grade on all sides shall be elevated to or above design flood elevation**
- **AO Zones – areas of shallow flooding**
  - No elevation is defined
  - Depth of shallow flooding is usually defined
  - Elevated to at least the depth of flooding above the highest adjacent grade, or least 2 feet if depth is not specified

IRC: R322.2.1



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## What is the “Lowest Floor”?

- **The floor of the lowest enclosed area**
  - Includes basement
  - Excludes any unfinished flood-resistant enclosure that is usable solely for parking, building access, or limited storage

IRC: R322.1.5  
R322.1.10



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## As-Built Elevation Documentation

- **Design elevation must be prepared and sealed by a registered design professional**
  - “FEMA National Flood Insurance Program Elevation Certificate and Instructions”
    - <http://www.fema.gov/media-library/assets/documents/160?id=1383>
- **Floodplain Inspection (IRC)**
  - Upon placement of the lowest floor, including basement, the building official shall require submission of documentation prepared and sealed by a registered design professional, of the elevation of the lowest floor

IRC: R322.1.10  
R109.1.1



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**Elevation Exception**  
**Enclosed Areas Below Design Flood Elevation**

- **Enclosed areas including crawl spaces that are below the design flood elevation shall:**

- Be used solely for parking of vehicles, building access, or storage
- Be provided with flood openings
  - See Section R322.2.2 for details of flood openings
  - "FEMA FIA-TB #1 Openings in Foundation Walls and Walls of Enclosures Below Elevated Buildings in Special Flood Hazard Areas in accordance with the National Flood Insurance Program"
    - [http://www.fema.gov/media-library-data/20130726-1502-20490-9949/fema\\_tb\\_1\\_1.pdf](http://www.fema.gov/media-library-data/20130726-1502-20490-9949/fema_tb_1_1.pdf)

IRC: R322.2.2



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**Below Design Elevation Requirements**  
**Flood-Resistant Materials**

- **Materials used below the design elevation**

- All wood (including floor sheathing) shall be pressure-preservative treated in accordance with AWP A UI or be decay-resistant heartwood of redwood, black locust, or cedars
- Materials and installation methods used for flooring, interior walls, exterior walls, and wall coverings shall conform to FEMA/FIA-TB-2
  - "FEMA/FIA-TB-2 Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program"
    - [http://www.fema.gov/media-library-data/20130726-1502-20490-4764/fema\\_tb\\_2\\_rev1.pdf](http://www.fema.gov/media-library-data/20130726-1502-20490-4764/fema_tb_2_rev1.pdf)



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**Foundation Design & Construction**

- **Based on analysis of loads imposed on foundation walls, the height of some types of walls must be limited. Unless designed in accordance with Section 404:**

- Unsupported height of 6" plain masonry walls shall be no more than 3'
- Unsupported height of 8" plain masonry walls shall be no more than 4'
- Unsupported height of 8" plain masonry walls shall be no more than 8'

IRC: R322.2.3



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## Protection of Mechanical & Electrical Systems

- **Electrical systems, equipment and components; heating, ventilation, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above design elevation**

IRC: R322.1.6



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## Exception

### Protection of Mechanical & Electrical Systems

- **Equipment associated with mechanical & electrical systems can be below the design elevation if designed and installed to prevent water from entering or accumulating within the components and will resist the loads & stresses associated with flooding**
  - ASCE 24
  - “FEMA 348 Protecting Building Utilities from Flood Damage”
    - [http://www.fema.gov/media-library-data/20130726-1514-20490-7165/p\\_348.pdf](http://www.fema.gov/media-library-data/20130726-1514-20490-7165/p_348.pdf)

IRC: R322.1.6



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## Protection of Water Supply and Sanitary Systems

- **Water supply system**
  - Designed to minimize or eliminate infiltration of flood waters into the system in accordance with the plumbing provisions of the code
- **Sanitary sewage system**
  - Designed to minimize or eliminate infiltration of flood waters into the system and discharge from systems into floodwaters in accordance with the plumbing provisions of the code

IRC: R322.1.7



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Regulations for Construction in  
Floodplains:  
**UCC**

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**Uniform Construction Code  
Ch 403. Administration**

- **403.62a Permit Application**
  - (d) A permit applicant for a building or structure located in a flood hazard area under the National Flood Insurance Program shall submit the following information with the construction documents:
    - (1) Delineation of flood hazard areas, floodway boundaries and flood zones and the design flood elevation, as appropriate.
    - (2) The elevation of the proposed lowest floor including basement and the height of the proposed lowest floor including basement above the highest adjacent grade is to be included in the documents if the building or structure is located in areas of shallow flooding (Zone AO).
    - (3) Design flood elevations contained on the municipality's Flood Insurance Rate Map produced by the Federal Emergency Management Agency. The building code official and the applicant shall obtain and reasonably utilize design flood elevation and floodway data available from other sources if this information is not contained on the municipality's Flood Insurance Rate Map.

UCC: 403.62a 

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Regulations for Construction in  
Floodplains:  
**Local Ordinance**

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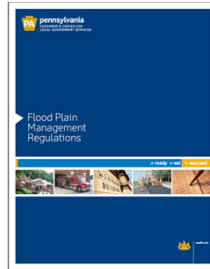
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## Floodplain Management Regulations

- **PA Floodplain Management Act (Act 166 of 1978)**
  - [http://www.newpa.com/webfm\\_send/1550](http://www.newpa.com/webfm_send/1550)



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## Local Ordinances

- **Can be different from municipality to municipality**
- **Options for addressing**
  - Floodplain Management (FPM) Ordinance
  - Amending other ordinances (zoning, building code, etc)



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## FPM Ordinance

- **Governor's Center for Local Government Services**
  - State Coordinating agency for the NFIP
    - <http://www.newpa.com/local-government/insurance>
  - Provides technical and financial assistance to PA's municipalities enrolled in the NFIP
  - Reviews municipal FPM Ordinance to ensure the compliance with FEMA regulations
  - To assist municipalities in drafting FPM Ordinances, the Center has developed Suggested Provisions that meet state and federal floodplain regulations
    - A Level -- [http://www.newpa.com/webfm\\_send/1811](http://www.newpa.com/webfm_send/1811)
    - B Level -- [http://www.newpa.com/webfm\\_send/1805](http://www.newpa.com/webfm_send/1805)
    - C Level -- [http://www.newpa.com/webfm\\_send/1806](http://www.newpa.com/webfm_send/1806)
    - D Level -- [http://www.newpa.com/webfm\\_send/1807](http://www.newpa.com/webfm_send/1807)



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# Summary

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## Summary

- **How to determine if a site is in a Special Flood Hazard Area (SFHA)**
  - <http://msc.fema.gov>
- **Regulations related to construction in floodplains**
  - IRC, UCC, Local ordinance
  - Design elevation determined by a registered design professional



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## References

FEMA. (2003). "How to Read a Flood Insurance Rate Map Tutorial." [http://www.fema.gov/media-library-data/20130726-1550-20490-1950/or\\_firm.pdf](http://www.fema.gov/media-library-data/20130726-1550-20490-1950/or_firm.pdf).

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## Resources & Reports, Part I

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## Questions & Evaluations

Next webinar:  
**Tuesday, April 8 at 1:00pm**  
**Stormwater 101**



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