G194.2 — NFIP Rules and Regulations in Depth

Participant Manual

January 2008

Introduction and Module Overview

Introduce Yourself

- Name
- Community
- Floodplain management concerns/need for improvement
- A hobby or favorite activity

Visual 1

Ground Rules

- Participate
- One person speaks at a time
- All input is honored—no one is trashed
- This is a safe room—what's said here stays here
- Tell the course manager right away about problems he/she can fix

Visual 2

Notes:

Introduction and Module Overview

Your Expectations

What do you hope to come away with at the end of this course?

Visual 3

Resources and References

- Turn to the Regulations: Job Aids tab in your Participant Manual.
- Note that job aids are located under the tab. * will prompt you to find a job aid.
- Optional references:
  - E273, Managing Floodplain Development Through the NFIP
  - FEMA 480, The NFIP Floodplain Management Study Guide and Desk Reference

Visual 4

Notes:

Introduction and Module Overview

An asterisk on a visual is a signal to find a particular job aid.

- E273 is the basic floodplain management course, which many in the class probably have taken.
- FEMA 480 is a comprehensive guide to floodplain management.

This advanced module builds upon the information in E273 and FEMA 480.

Module Objectives

- Describe NFIP floodway/encroachment standards and their implementation.
- Identify NFIP requirements for residential buildings and how to address problems.
- Describe NFIP requirements that apply to:
  - Approximate A zones.
  - Agricultural and accessory structures.
  - Fuel tanks.
  - Recreational vehicles.

Visual 5

Notes:

Introduction and Module Overview (Continued)

Rules and Regulations Basics

- NFIP primary purpose: Reduce potential flood damages to buildings.
- Requirements will reduce but not eliminate damages.
- NFIP standards do not fully address different flooding conditions in all communities.

Visual 6

- Although many NFIP requirements will help protect lives and prevent injuries, their primary purpose is to prevent damages to buildings.
- NFIP regulations are minimum standards that apply nationally, and cannot fully address all of the different flooding conditions in all communities.
- States and communities should review NFIP minimum standards against their flooding conditions and the other characteristics of their floodplains and consider adopting stricter standards where necessary to protect lives and property.

Notes:

Introduction and Module Overview (Continued)

Guidance Documents

- * Find Job Aid 1, NFIP Resource Documents, under the Regulations: Job Aids tab in your Participant Manual.
- Note that the list includes descriptions of the content of different publications.

Visual 7

NFIP Standards in Building Codes

- International Building Codes/other I-codes include NFIP minimum requirements for flood-resistant construction.
- Many communities have requirements both in their building codes and their floodplain management ordinances.
- Your other ordinance/regulations need to cover NFIP requirements (such as for floodways) not covered in the I-codes.

Visual 8

- NFIP minimum floodplain management requirements that relate to construction of flood resistant buildings are now contained in the International Building Code (IBC), International Residential Code (IRC), and the other I-codes. Those requirements are also contained in the NFPA 5000 Building Construction and Safety Code issued by the National Fire Protection Association (NFPA 5000).
- A number of States and thousands of NFIP communities have adopted the International Building Code and some or all of the other I-Codes, and many others are expected to do so in the future. Many communities now have flood-resistant construction requirements in both their Building Codes and Floodplain Management Ordinances.
- NFIP requirements other than those that relate to construction of flood resistant buildings, such as requirements that apply to floodways, subdivisions, and manufactured home parks, are not included in the body of the building code and must be addressed in other ordinances or regulations.

Introduction and Module Overview (Continued)

Covering All NFIP Requirements

- ✱ See the description of "Reducing Flood Losses through the International Code Series" in Job Aid 1.
- This guidance manual includes:
  - Detailed description of NFIP requirements covered/not covered in I-codes.
  - Suggestions on coordinating administration of requirements.

Visual 9

- Incorporation of the flood-resistant construction requirements into the I-codes should improve the overall quality of floodplain construction since the Building Department will now be fully involved in the floodplain development process. The Building Department and the Floodplain Administrator will need to coordinate closely if they are in different departments.
- An NFIP community that has adopted the I-Codes or is considering adopting the I-codes should obtain a copy of *Reducing Flood Losses through the International Codes.* This document contains information on which NFIP requirements are contained in the I-Codes and which will need to be covered by other ordinances and regulations. The manual also includes suggestions on how to coordinate administration of NFIP requirements among departments to assure that all NFIP requirements are met by individual development proposals.

Key Points to Check

- All NFIP requirements are in I-codes or your other codes/ordinances.
- Any local/State code amendments are consistent with NFIP requirements.
- Departments are responsible and have procedures for specific requirements.
- State agency coordination procedures are developed if needed.

Visual 10

Introduction and Module Overview (Continued)

Communities that depend on the I-Codes to meet NFIP requirements need to make sure that:

- All NFIP minimum requirements are contained in the I-Codes or another community code or regulation.
- Any State/local amendments to the I-Codes are consistent with NFIP minimum requirements.
- They have administrative procedures in place to assure coordination among departments involved in administering the I-Codes and other community floodplain management ordinances.
- If a State agency administers the I-Codes for some categories of buildings (i.e., schools), additional coordination procedures may be necessary.

A number of good ideas, or Best Practices (BPs) can improve floodplain management in a community.

Floodplain Management Best Practices

- Actions/activities that make common sense, considering the risk
- Examples:
  - Recommend flood insurance purchase when not required
  - Reduce flood insurance cost through construction techniques (i.e., freeboard)
  - Recommend purchase of sewer backup coverage
  - Educate about impacts of urbanizing watershed

Visual 11

Notes:

Introduction and Module Overview (Continued)

No Adverse Impact (NAI)

- Initiative of the Association of State Floodplain Managers (ASFPM)
- Communities within a watershed cooperate
- Action by one property owner/community does not increase risk of others
- ASFPM web site: www.floods.org
- Other resources: Your State's NFIP State Coordinating Office, State ASFPM Associations

Visual 12

No Adverse Impact (NAI):

- Is an initiative of the Association of State Floodplain Managers (ASFPM).
- Envisions cooperation among all communities in a watershed to ensure that action by one does not increase risk to any other community.

Topics We Will Cover

- Floodway and encroachment requirements
- Requirements for new residential buildings
- Development requirements in Approximate A Zones

Visual 13

Notes:

Introduction and Module Overview (Continued)

Topics We Will Cover (Continued)

- Accessory and agricultural buildings in AE zones
- Fuel storage tanks
- Recreational vehicles
- Typical Compliance Problems

Visual 14

At the conclusion of this module, the class will complete a problem-solving exercise involving four types of single-family residential buildings.

Notes:

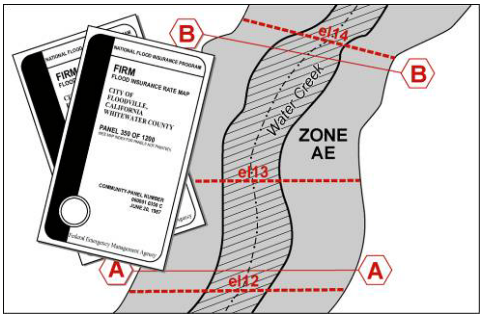
Floodway and Encroachment Requirements

Floodway Review

- ✱ Find Job Aid 2, The Floodway, under the Regulations: Job Aids tab in your Participant Manual.
- The definition includes not increasing the water surface elevation more than a designated height.
- What is the designated height of the increase under the NFIP?

Visual 15

FIRM Showing Floodway



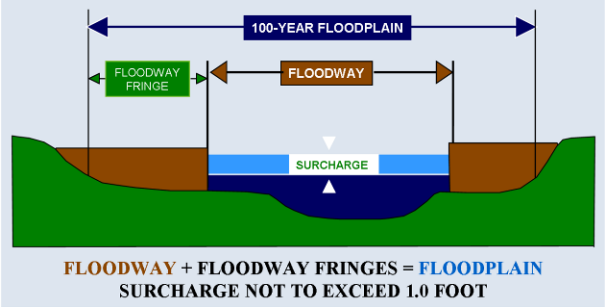
Visual 16

How is the floodplain shown on the Flood Insurance Rate Map (FIRM)? What do the dashed lines represent? What do the lines marked A and B represent?

Notes:

Floodway and Encroachment Requirements (Continued)

Floodway Schematic



Visual 17

This view shows one cross section.

- Note the surcharge area on the visual.
- The 1-foot increase is on top of the BFE. As the area outside of the floodway develops, the actual elevation of the base flood will increase. Communities may wish to adopt a freeboard to account for this increase.

Are there any terms in this schematic that you'd like to review?

Floodway Designation

- A hydraulic computer model (usually HEC-2 or HEC-RASS) identifies the floodplain and floodway.
- The model squeezes the floodplain by removing equal amounts of conveyance from the ends of each cross section.
- FEMA sets the floodway boundary when one cross section rises to the allowable one-foot surcharge.

Visual 18

Floodway and Encroachment Requirements (Continued)

N**ote** that the floodway fringe in the schematic roughly corresponds to the amounts of conveyance removed by the model.

Floodway Purpose

- Allow part of the floodplain to be developed.
- Preserve ability to convey flood discharges.
- 1 foot rise = compromise to balance property owner rights with protection of adjacent and upstream property owners.

Visual 19

Floodway Encroachments

- Encroachments = Fill, new construction, substantial improvements, other development.
- Prohibited unless hydrologic and hydraulic analyses demonstrate no increase in flood levels.
- Variance requests for floodway development that increase flood levels must be denied.

Visual 20

Notes:

Floodway and Encroachment Requirements (Continued)

"Any Increase"

- Any increase = zero increase.
- Small increases from individual developments could have cumulative impact.
- Increase = current model BFE compared to proposed development model BFE.

Visual 21

The hydraulic analysis for the proposed development must use the same model used for the current Flood Insurance Study, if available.

- Most communities require that the permit applicant hire a registered professional engineer to perform the no-rise analysis and submit a no-rise certification.
- The study must be consistent with the technical criteria contained in *Guidelines and Specifications for Flood Hazard Mapping Partners,* Appendix C *Detailed Hydraulic Analyses* (FEMA, April 2003).

Meeting the "No Rise" Requirement

- Any development will generally increase flood elevations.
- Design or modify development so that no obstructions are placed in the floodway.

Visual 22

Notes:

Floodway and Encroachment Requirements (Continued)

Meeting the "No Rise" Requirement (Continued)

- Other options:
  - Replace existing structures with same size structures at exact same locations.
  - Span the floodway.
  - Demonstrate no rise with a hydraulic study.
  - Compensate for rise by modifying the floodway to replace lost flood conveyance.

Visual 23

- Existing structures include buildings, bridges, and culverts.
- Before floodway boundaries can be changed, a community must apply for and obtain a floodway revision from FEMA through the Letter of Map Revision (LOMR) process.

No-Rise Hydraulic Analysis

Steps:

- Obtain a copy of the effective model used to develop the floodway.
- Duplicate results of the effective model.
- Make necessary corrections, such as new cross sections at development site.
- Modify Existing Conditions model to obtain Proposed Conditions model.
- Compare results for increased elevations at existing or new cross sections.

Visual 24

Notes:

Floodway and Encroachment Requirements (Continued)

No-Rise Hydraulic Analysis (Continued)

- If no increase in elevations, prepare and submit to the community:
  - No-rise certification.
  - Supporting technical documentation.
- If elevations increase:
  - Redesign development to avoid the floodway.
  - Compensate for loss of conveyance.
  - Revise the floodway.

Visual 25

- Some communities require submission of a no-rise certification form.
- The certification must be accompanied by documentation to support the finding, including results of the hydraulic study.

No-Rise Certification: Review Points

- Experience of certifying engineer in hydrologic and hydraulic studies.
- Same hydraulic model as for floodway development, if available.
- Analysis consistent with basic hydraulic principles (for example, smooth transition in flood flows between cross sections).

Visual 26

Notes:

Floodway and Encroachment Requirements (Continued)

No-Rise Certification: Review Points (Continued)

- Added cross sections surveyed to model development impacts.
- Land use/hydraulic assumptions realistic (for example, roughness coefficients reflect actual conditions).
- No cumulative impact if other property owners do similar developments.

Visual 27

IF BFEs Available, But No Floodways

- A hydraulic analysis is required for each development in the floodplain.
- No more than a 1-foot rise in flood stage is acceptable from the cumulative effect of:
  - The development under review.
  - All other existing and anticipated development.

Visual 28

- Rivers and streams with BFEs but without floodways also require encroachment analyses. Costs of analyses can be minimized by avoiding development in the entire floodplain, limiting development to backwater areas, or establishing setbacks.
- Hydraulic studies must assume equal encroachments by all property owners, and all documentation related to an analysis must be maintained.
- Floodway revisions and development proposals that exceed the one-foot standard require Letters Of Map Change (LOMCs), which are examined in detail in another Advanced Floodplain Management module.
- Job Aid 2, The Floodway, provides detailed information on encroachment analyses and proposals that require LOMCs.

Floodway and Encroachment Requirements (Continued)

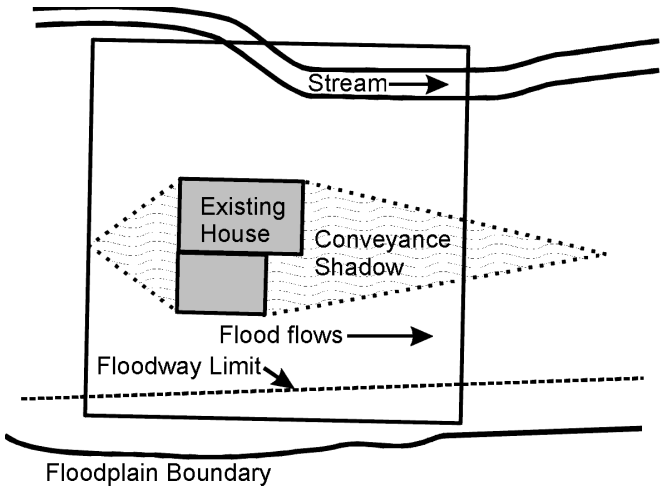
Hydraulic Analyses of Minor Projects

Hydraulic analyses may not be needed for:

- Projects that do not increase natural grade (driveways, parking lots)
- Small, isolated obstructions (mailbox, pitcher's mound, single telephone pole)
- Light-duty fences (barbed wire, chain link)
- Development in hydraulic or conveyance shadow of high ground or another obstruction.

Visual 29

- Some projects within the floodway will require permits, but can be allowed without a hydraulic analysis once the community determines that they are not an obstruction to floodwaters.
- Minor projects are a greater concern on smaller flooding sources. Be careful of cumulative impacts, particularly in the floodplains of smaller streams in developed areas.
- For fences, satisfy yourself that the fence will bend over or break away in floods less than the base flood. Consider using shallow embedments for fence posts.
- Be conservative. If there is any doubt about the impact of a minor project, the community should require a hydraulic analysis.



Upstream of the existing obstruction: draw lines at a 1:1 ratio.

Downstream: draw lines at a 4:1 ratio

Floodway and Encroachment Requirements (Continued)

Hydraulic or Conveyance Shadow

- Conveyance shadow: Areas immediately upstream or downstream of an existing building or other obstruction.
- Floodwaters are already flowing around the existing obstruction.
- Additions or small accessory structures built entirely within the conveyance shadow can be permitted without a no-rise certification.

Visual 30

Legal Implications

- Upheld in courts: Prevent actions by one property owner from harming others.
- Floodway requirements are performance standards.
  - Development is not prohibited.
  - Applicant must demonstrate no increase in flood elevation.

Visual 31

- Federal agencies are subject to Executive Order 11988, *Floodplain Management* and have their own regulations that meet NFIP minimum requirements.
- State agencies also should have their own floodplain management regulations.

Notes:

Floodway and Encroachment Requirements (Continued)

Encroachment: Challenges

- Road/bridge construction by State highway departments
- Railroads
- Stream restoration for environmental purposes
- Can you suggest other challenges involving encroachment?

Visual 32

All floodplain development needs to comply with NFIP encroachment standards, even if a Federal or State agency is exempt from the requirement to obtain local floodplain development permits.

- Communities should contact the agency constructing the project directly and ask to see their encroachment analysis. FEMA Regional Offices and the NFIP State Coordinating Agency are available for assistance.
- Stream restoration projects often need to be undertaken in floodways for fish habitat or to address erosion or sedimentation problems.
  - Most of these projects can be designed so they do not cause an increase in flood stage or will cause only localized increases that do not impact on buildings or other properties.
  - Communities should work with the environmental agencies as they design and build these projects to try to meet the environmental objectives of the project while still meeting NFIP floodway requirements.
  - Communities should have the environmental agencies apply for a floodway revision from FEMA if they think the increases will have adverse impacts on flooding in their community.

Notes:

New Residential Building Requirements

This segment will focus on the requirements that apply to new residential buildings in AE zones.

- We will not cover construction in Coastal High Hazard Areas (VE zones), which have different requirements due to the need to protect buildings from wave impacts. Those who have VE zones in their communities or coastal AE zones subject to waves should take a course specifically on coastal construction.
- Requirements for residential buildings in AO zones generally are the same as for AE zones except that a depth number is used to determine the elevation of the lowest floor of the building instead of a BFE. The depth number is generally 1, 2, or 3 feet and is measured in feet above the highest adjacent natural grade next to the building. AO zones are areas of shallow flooding due to sheet flow or ponding.
- Most requirements for new residential buildings also apply to nonresidential buildings, which in addition have the option of being floodproofed (made watertight) to above the BFE. However, most nonresidential buildings currently being built in floodplains are elevated to or above the BFE rather than being floodproofed.

Requirements Review: New Residential Buildings

- * Find Job Aid 3, New Residential Buildings, under the Regulations: Job Aids tab in your Participant Manual.
- The job aid includes basic information on regulating new residential construction.
- Take 5 to 10 minutes to review the job aid.

Visual 33

Notes:

New Residential Building Requirements (Continued)

Topic Review: Approach

- Course job aids repeat material from the basic floodplain management course.
- At this point, we will highlight some information not covered in depth in the basic course.
- You will have an opportunity to discuss other job aid content after this review.

Visual 34

Highlighted Topics

- Basements
- Stem wall/raised slab foundation
- Regulating high velocity and deep flooding areas
- Materials
- Utilities and service equipment
- Openings
- Crawlspaces

Visual 35

Notes:

New Residential Building Requirements (Continued)

Foundations Used To Elevate Buildings

- Slab-on-fill
- Stem wall/raised slab
- Crawlspace
- Pile, post, piers, or columns
- Elevating a full story on foundation walls
- Combinations of these methods

Visual 36

Each foundation type has advantages and disadvantages depending on flood depths and velocities and the needs or desires of the property owner.

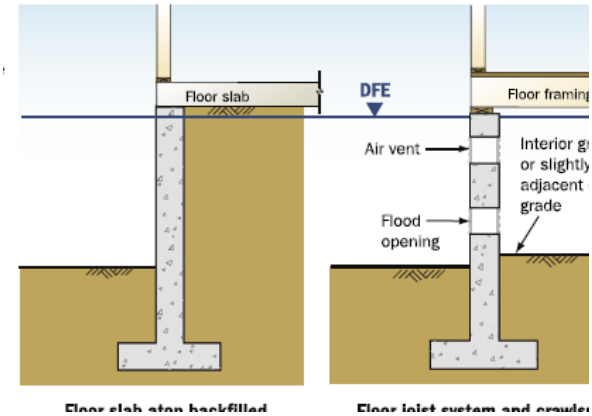
Basements

- Basement floors must be at or above BFE in floodplains.
- Basements below BFE are only allowed via a FEMA exception.
- Only 50 communities nationwide have been granted exceptions.

Visual 37

Notes:

New Residential Building Requirements (Continued)



Stem Wall/Raised Slab Foundation

- Variation of slab on fill.
- In the graphic above, note the differences between the stem wall foundation and crawlspace foundation.

Visual 38

Water will not be trapped in a stem wall foundation and it should withstand higher flood velocities than a crawlspace. However, stem walls are considered retaining walls under building codes and need to be engineered.

New Residential Building Requirements (Continued)

Regulating High Velocity Areas

- Velocities exceeding 5 feet per second cause scour and erosion around foundations.
- Fill must be protected by vegetation or armoring.
- Open foundations (piles, posts, piers, or columns) should be used.

Visual 39

Consider requiring foundation design by registered professional architects or engineers if there are high-velocity floodplains in their communities.

Regulating Deep Flooding Areas

- Floods larger than the base could float the building off the foundation.
- Of special importance: Anchor the building to the foundation.
- Hydrostatic pressures against walls increase, so providing openings is especially important.

Visual 40

Notes:

New Residential Building Requirements (Continued)

Materials

Flood Resistant Materials

- Can withstand direct and prolonged contact with floodwaters without significant damage.
- "Prolonged contact" = At least 72 hours.
- "Significant damage" = Any damage requiring more than low-cost cosmetic repair, such as repainting.

Visual 41

Flood Resistant Materials: Implications

If the top of the floor is elevated to BFE, all components below must be of flood-resistant materials, including:

- Floors and subfloors.
- Joists and beams.
- Insulation (high-density rigid).
- Walls and stairs.

Visual 42

Notes:

New Residential Building Requirements (Continued)

Materials (Continued)

Problems With Materials

- Components beneath the floor in elevated buildings usually are not flood resistant.
- Standard batting insulation will absorb enormous amounts of water.
- Saturated insulation may pull away from floor joists, ripping out wiring or ductwork.
- Goal: After a flood, hose down areas below BFE to remove sediment and do touchup repainting.

Visual 43

While it may be possible to find and use flood resistant materials and protect the building utilities, it is usually easier to elevate the whole floor and joist system to above the base flood elevation.

Are there any topics in the job aid that you'd like to review further?

Notes:

New Residential Building Requirements (Continued)

Utilities and Service Equipment

Problems With HVAC Units

- Most frequent violation: Outside HVAC units placed below BFE.
- The pad or platform top must be at or above BFE.
- The HVAC unit must be securely anchored to the platform.
- Different platform types meet needs for a variety of flood depths.

Visual 44

Examples: HVAC Platforms

Visual 45

- In a recent compliance survey conducted by FEMA, the single most frequent violation identified was outside HVAC units, such as heat pumps and air conditioning condensers placed on the ground next to buildings or on platforms that were below BFE.
- To be compliant, the top of the pad or platform supporting the HVAC unit must be at or above the BFE. There are a variety of types of platforms that can be used in a variety of flood depths.
- As an alternative, the unit can be protected by a small floodwall, but this is not recommended. Make sure you schedule your inspections to make sure HVAC units are properly installed.

Notes:

New Residential Building Requirements (Continued)

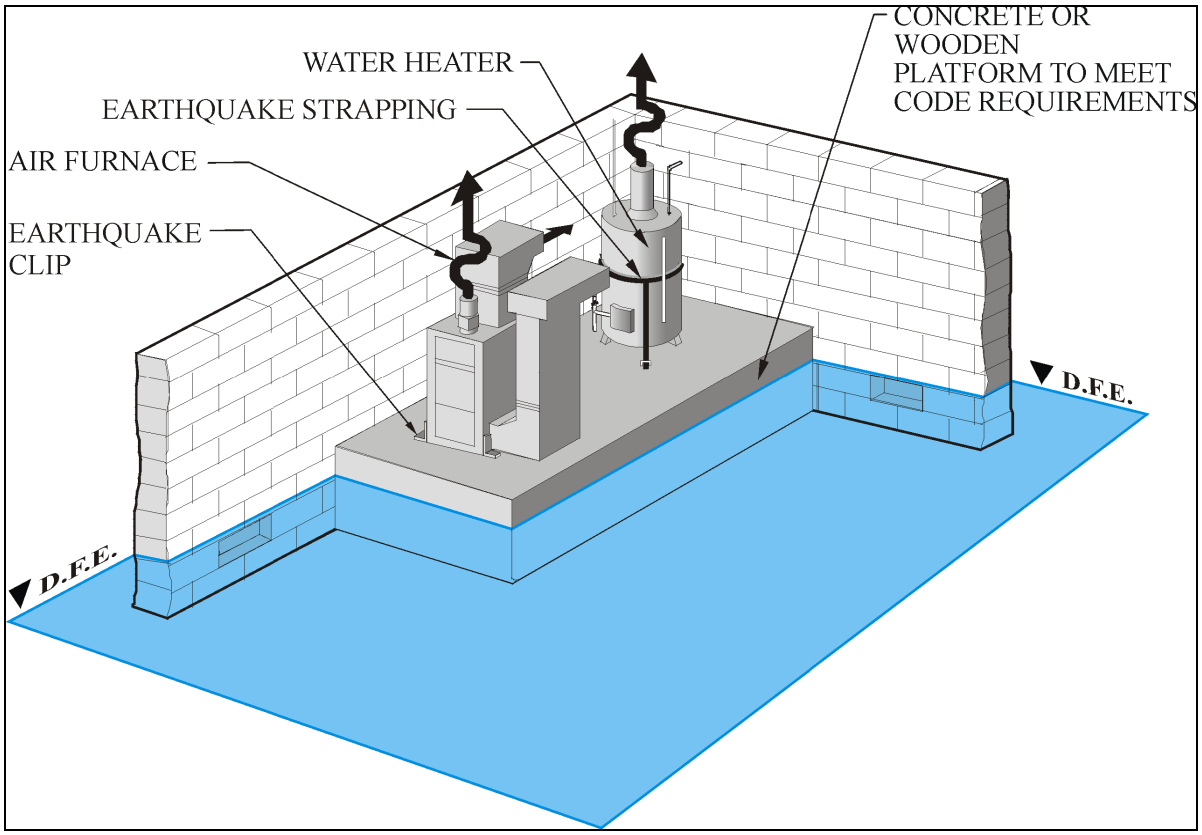
Utilities and Service Equipment (Continued)

Furnaces, Water Heaters/Softeners

- Often placed on platforms in a garage or enclosed area below an elevated building.
- The platform must be at or above the BFE.
- The unit may need to be strapped to the ceiling or placed in the elevated portion of the building.

Visual 46

Note: The acronym D.F.E. stands for Design Flood Elevation.



New Residential Building Requirements (Continued)

Utilities and Service Equipment (Continued)

Electrical Components

- Meters, panels, junction boxes, outlets, and light fixtures/switches should be elevated above BFE.
- Building codes may require a light switch in an enclosure below BFE.
- A switch below BFE should be:
  - Designed for wet locations.
  - On a circuit isolated from the rest of the electrical system.
  - Replaceable if flooded.

Visual 47

- Utility companies often require that the center of an electrical meter be no higher than a specified number of feet above the ground to allow meters to be read by company employees.
- The preferred option is to build a platform and stair to provide access for the meter reader. Communities also can encourage the power company to read meters using new remote technologies.
- Communities should allow electric meters below BFE only if the power company commits to replacing the meters immediately after a flood. The objective is to avoid situations in which a house is uninhabitable after a flood solely because the electric meter has been flooded.
- As utility companies move to automatic systems that do not require meter readers, the problem should diminish.

Notes:

New Residential Building Requirements (Continued)

Utilities and Service Equipment (Continued)

Ductwork

- Must be watertight if below BFE.
- If ducts fill with floodwater, the weight can pull down ducts and anything attached to them.
- Mold can grow in ducts unless thoroughly dried and cleaned after flooding.
- Large-diameter watertight pipe can be used for parts of ductwork below BFE.

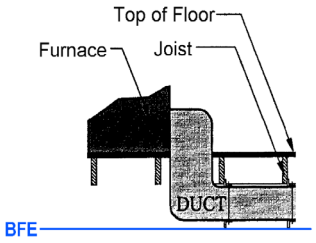
Visual 48

Other alternatives for protecting duct work include:

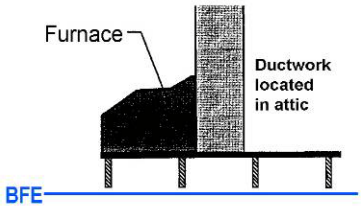
- Elevating the floor system including the ductwork to above the BFE.
- Running the ductwork through the attic of the building.

For standard sheet metal ductwork the practicable alternative is to elevate the ductwork above BFE.

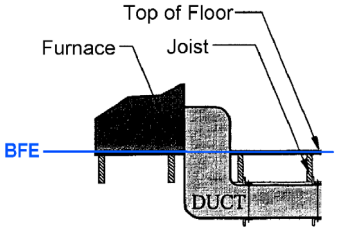
Refer to FEMA 348, *Protecting Building Utilities from Flood Damage*, November 1999 for further information.



Compliant



Compliant



Non-compliant or watertight

New Residential Building Requirements (Continued)

Openings

Solid walls can collapse from hydrostatic pressure if floodwaters get too deep outside the building. To prevent this, an enclosure must have openings to allow floodwaters to enter and leave, thus automatically equalizing hydrostatic flood forces on both sides of the walls.

Openings: Common Violations

- Openings are the second most frequent violation type in a FEMA compliance survey.
- Typical findings:
  - No openings
  - Too few openings
  - Openings too high above grade

Visual 49

The openings requirement is aimed at limiting the differential in flood heights inside and outside of the enclosed area to no more than one foot at any time during the flood.

The opening cover shown in the visual has a grating that is far too fine to be effective.

Requirements Review: Openings

- * Find Job Aid 4, Openings, under the Regulations: Job Aids tab in your Participant Manual.
- The job aid includes basic information on requirements for openings in new residential construction.
- Take about 5 minutes to review the job aid.

Visual 50

New Residential Building Requirements (Continued)

Openings (Continued)

When Openings Are Required

- Enclosed areas below BFE designed to flood
- Residential buildings:
  - Crawlspaces/other enclosed spaces
  - Attached garages with top of floor below BFE
- Detached accessory and small agricultural buildings not elevated above BFE

Visual 51

Opening Types

- Non-engineered: Designs meet prescriptive requirements in the regulation (most buildings).
- Engineered: Designs certified by a registered engineer or architect.
- Manufactured: Designs marketed as meeting/exceeding NFIP standards.

Visual 52

Most buildings use non-engineered openings.

Notes:

New Residential Building Requirements (Continued)

Openings (Continued)

Non-Engineered Openings: Requirements

- Minimum of two openings provided on different sides.
- At least 1 square inch of net opening provided for each 1 square foot of enclosed area.
- Bottom of each opening is no more than 1 foot above the final adjacent grade.
- Louvers, screens, etc., do not block flow of floodwaters in and out of the enclosed area.

Visual 53

- A hole in the wall will work fine as an opening. You can also turn a concrete block on its side.
- Most property owners will want to put some form of cover over the opening to keep out vermin and weather, or for aesthetics.
- If you use screening to keep out vermin, use the largest mesh size possible. Consider designing the screening so that it will pop out as water enters the building.
- Foundation air vents are not a good flood opening because they can be locked in a closed position and generally have fine meshed screening that will collect debris.

Covers Over Openings

- Water must be able to flow automatically into and out of the enclosed area. Some movable louvers only work in one direction.
- The net area of the opening must be calculated by excluding that part of the opening that is blocked.

Visual 54

New Residential Building Requirements (Continued)

Openings (Continued)

- Net areas can sometimes be found on manufacturer's specifications that accompany the product or are available on the Internet.
- If no specifications are available, the building official can measure the net area of each opening or estimate areas if individual measurements would be too difficult.

Engineered Openings

- Certified by registered engineer or architect.
- Typically done when rise of floodwater is much slower than FEMA rate of 5 feet per hour.
- Guidance in Technical Bulletin I-93, Openings in Foundation Walls.

Visual 55

- The engineer cannot reduce the factor of safety built into the calculations.
- The factor of safety is needed in case one or more openings become clogged with debris.

Manufactured Openings

- Several companies manufacture flood openings specifically to meet NFIP requirements.
- Some have certifications from engineers that their openings protect more area than non-engineered openings.
- FEMA cannot endorse, promote, or comment on commercial products.

Visual 56

New Residential Building Requirements (Continued)

Openings (Continued)

- You, as the building official, can review these certifications and take them into account when calculating the number of openings required for a building.
- You have the final say on whether to accept the certification.
- Remember that this certification applies to the effectiveness of the opening itself and not for the specific building you are permitting.
- Before you reduce the number of openings based on a certification, you should evaluate flooding conditions at the site, particularly the rate of rise or fall of floodwaters.

Calculating Number of Openings

- 1,800 square foot crawlspace
- 16” x 16” openings covered with slats
- ***Net area of each opening = 50% of total***
- 16” x 16” = 256 sq. inches per opening
- 256 sq. inches x 50% = 128 sq. inches net area per opening
- How do we get the number of openings?

Visual 57

Doing the Math

- At least 1 square inch of net opening provided for each 1 square foot of enclosed area.
- Enclosed area = 1,800 square feet
- Net area each opening = 128 square inches
- 1,800 ÷ 128 = 14.06, or 14 openings

Visual 58

New Residential Building Requirements (Continued)

Openings (Continued)

- The number of openings will equal the square feet of the crawlspace divided by the net area of each opening.
- 1,800 ÷ 128 = 14.06, or 14 openings.

Activity: Calculate Openings

- Work individually.
- Follow the same process as in the example to determine the number of openings required.

Visual 59

Notes:

New Residential Building Requirements (Continued)

Activity 1

Activity 1: Calculate Openings

Purpose: The purpose of this activity is to practice calculating the number of openings required for an enclosed space.

Instructions:

- Work individually.
- Use the information below to determine the number of openings required for this building.

Situation

A property owner is constructing an elevated home at the shore with a 2,400 square foot enclosure underneath.

- He wants to use a 24” x 16” prefabricated slatted opening.
- The net open area of the opening is 70 percent.

1. What is the net area of each opening?

How many openings are required?

New Residential Building Requirements (Continued)

Openings (Continued)

Key Points About Openings

- Without proper openings, insurance rates rise. Retrofitting usually is not difficult.
- Breakaway walls in coastal AE zones require openings to accommodate smaller floods.
- Manufactured home skirting is cosmetic only and usually does not require openings.

Visual 60

Key Points About Openings (Continued)

Garage doors do not count as openings.

- Leakage around doors may not be sufficient to equalize pressure.
- Opening the garage door prior to a flood is a good idea, but there is no guarantee that the property owner will be there.
- Openings usually can be placed in door panels.

Visual 61

Notes:

New Residential Building Requirements (Continued)

Openings (Continued)

Your Experiences With Opening Requirements

- What experiences have you had enforcing openings requirements?
- Have owners disabled openings by closing or covering them?
- Can you offer tips on how to deal with these situations?

Visual 62

Enclosed Areas

Enclosed areas below BFE can only be used for parking, access, and limited storage, but that some owners finish off these areas without permits after the building is completed and a certificate of occupancy issued.

Sometimes when they finish off an enclosure it is obvious. Sometimes it's not so obvious.

Examples: Finished Enclosed Areas

Photos of obvious/not so obvious finished enclosures.

Visual 63

Notes:

New Residential Building Requirements (Continued)

Enclosed Areas (Continued)

Obvious Finished Enclosure

Not-So-Obvious Finished Enclosure

Note the landscaping in front of the garage doors.

New Residential Building Requirements (Continued)

Enclosed Areas (Continued)

Enforcement Problems: Enclosed Areas

Enforcement strategies:

- Limit enclosure size in your ordinance.
- Require nonconversion agreements or deed restrictions that allow periodic inspection.
- Do not allow construction features such as sliding glass doors or roughed-in plumbing.

Visual 64

Enforcement strategies include:

- Limit the size of the enclosures allowed by your ordinance. For example, limit the size to what is needed for a 2- or 3-car garage, storage for garden equipment, and a small entryway.
- Require nonconversion agreements before permitting the construction of the enclosure. Some agreements used by communities allow for periodic inspection of the enclosure by the community.
- Do not allow sliding glass doors, roughed-in plumbing, and other construction features that aid in converting the space to habitable use.

The flood insurance consequences of a finished enclosure below BFE include:

- There is no coverage for contents in enclosures.
- Building coverage is limited to the required utility connections and the foundation and anchoring system necessary to support the building.
- A surcharge is added to the flood insurance rate because of added risk to the remainder of the building.

Notes:

New Residential Building Requirements (Continued)

Enclosed Areas (Continued)

Your Experiences With Enclosed Areas

- What are your experiences enforcing enclosure requirements?
- Do you use other methods to discourage enclosures from being converted to habitable use?

Visual 65

Notes:

New Residential Building Requirements (Continued)

Crawlspaces

Crawlspaces

- Must meet enclosure requirements (flood-resistant materials/openings).
- Floors not above the lowest adjacent grade to the building are considered basements.
- Not recommended for areas with flood velocities greater than 5 feet per second.

Visual 66

- Crawlspaces must be constructed using flood resistant materials and have openings in their walls that meet minimum requirements.
- Crawlspaces must have their floors at or above lowest adjacent grade to the building or they are considered basements.
- Crawlspace foundations are not recommended for areas with flood velocities greater than 5 feet per second unless the design is reviewed by a qualified design professional such as a registered professional engineer or architect.

Below-Grade Crawlspaces

- Standard practice in some areas: Build crawlspaces with floors 1 to 2 feet below grade.
- Hydrostatic pressures increase on below-grade foundations and could cause failure.

Visual 67

New Residential Building Requirements (Continued)

Crawlspaces (Continued)

Below-Grade Crawlspaces (Continued)

To adopt regulations allowing below-grade crawlspaces:

- Review FEMA Technical Bulletin FIA-TB-11 *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas.*
- Amend floodplain management ordinances to include Technical Bulletin requirements.
- Before adopting the requirements, consult the NFIP State Coordinator or FEMA Region.

Visual 68

A surcharge is added to the flood insurance rate for a building with a below-grade crawlspace to reflect the increased risk to the building from hydrostatic pressure and from water ponding under the building. A better building practice is to ensure that the crawlspace floor is at or above the lowest adjacent grade to the building.

Summary: New Residential Building Requirements

Imposing Restrictive Residential Building Requirements

- Does your community go beyond the NFIP minimum?
- What are the requirements, and what is their purpose?
- Are there more restrictive requirements your community could impose?

Visual 69

Many of these more restrictive building requirements receive credit under the NFIP's Community Rating System (CRS). Citizens of communities participating in CRS can obtain discounts on their flood insurance premiums.

Development in Approximate A Zones

What Is An Approximate A Zone?

- Are floodplain boundaries mapped?
- Have detailed engineering studies been conducted?
- Are BFEs determined?

Visual 70

- Most approximate A zones are in rural areas with little development.
- Development eventually occurs in many of these areas, and communities will have to regulate the development.

Approximate A Zone Regulations

- * Find Job Aid 5, Approximate A Zone Regulations, under the Regulations: Job Aids tab in your Participant Manual.
- In what area is your community advised to go beyond NFIP minimum requirements?

Visual 71

Notes:

Development in Approximate A Zones (Continued)

As you review Job Aid 5, note that two situations require BFE data in Zone A:

- Subdivisions and other proposed developments greater than 50 lots or 5 acres must include BFE data.
- Communities must obtain, review, and reasonably utilize any available BFE and floodway data.

Going Beyond the Subdivision Threshold

- When established in the mid-1970's:
  - Engineering studies were expensive.
  - The value of buildings in a small subdivision did not justify study costs.
- Now:
  - A variety of hydraulic computer programs calculate BFEs at reasonable cost.
  - The value of buildings, even in a small subdivision, is significant.

Visual 72

- The 50-lot/5 acre thresholds were established during the mid-1970s before the widespread use of personal computers.
- It is not unreasonable to require a developer to spend several thousand dollars to conduct a hydraulic study to ensure that the development is protected from flood damage.

Notes:

Development in Approximate A Zones (Continued)

Obtaining BFE Data

- Over your regulatory threshold: Obtain, review, and reasonably utilize any available BFE and floodway data.
- * Find Job Aid 6, Obtaining BFE Data in Approximate A Zones, in the Regulations: Job Aids tab in your Participant Manual.
- The job aid gives you tips on obtaining BFEs from available data sources.

Visual 73

- Use of an arbitrary number of feet above grade is discouraged unless the community can show that there is some relation between this number and the base flood.
- The Flood Insurance Manual provides lower flood insurance rates for buildings 2 feet above grade (although not nearly as low as for buildings elevated above BFE).
- In most floodplains 2 feet is not enough to protect the building from the base flood and is not adequate for floodplain management purposes.

BFE and Floodway Data

- Conduct a search for BFE data for the entire community.
- Maintain data on file for future use.
- Periodically contact agencies active in your community for updated/new data.
- Adopt data as part of your ordinance for future development.

Visual 74

Notes:

Development in Approximate A Zones (Continued)

Requirements: No BFEs Available

- Some communities require all permit applicants to develop BFEs.
- Others must meet NFIP requirements for construction in flood-prone areas:
  - Adequately anchored
  - Materials resistant to flood damage
  - Constructed to minimize flood damage
  - No flood water entering or accumulating within utilities

Visual 75

The best way to meet the requirements is to:

- Develop BFEs.
- Require that buildings be elevated to or above the BFEs.

Your Community's Procedures

- * Find Job Aid 7, Regulating Small Developments in Approximate A Zones, in the Regulations: Job Aids tab in your Participant Manual.
- The job aid gives you tips on establishing BFEs for isolated buildings or small developments.
- How does your community handle permit applications in an Approximate A Zone with no BFEs available?

Visual 76

Notes:

Development in Approximate A Zones (Continued)

Requiring Applicants to Obtain BFEs

- What are the advantages?
- What are the disadvantages?

Visual 77

If a community is unsure whether or not to require that a BFE be obtained (assuming a BFE is not mandated by the NFIP minimums and the ordinance):

- Officials should require the information needed to support an informed decision for high value projects.
- If hundreds of thousands of dollars are being spent for construction, then to pay an additional several thousand for a study may not seem unreasonable.
- Additionally, if the project is a place of employment or is close to the ordinance threshold for submitting BFE, then maybe the community should require BFE data.

Notes:

Development in Approximate A Zones (Continued)

Your Experiences

- Have you had an unusual or challenging situation involving an Approximate A Zone?
- How was the situation resolved?

Visual 78

Notes:

Accessory and Agricultural Buildings

Accessory Building

- On the same parcel of property as the principal structure.
- Use is incidental to the use of the principal structure.
- Examples:
  - Detached garages
  - Small boat houses
  - Sheds to store lawn equipment

Visual 79

Agricultural Building

Small farm storage structures such as:

- Pole barns
- Prefabricated metal buildings
- Grain bins
- Corn cribs
- General purpose barns for temporary feeding of livestock, if open on one side

Visual 80

Notes:

Accessory and Agricultural Buildings (Continued)

- All accessory and agricultural buildings in the floodplain require permits.
- Some nonresidential structures do not require elevation or floodproofing, because the NFIP does not consider them structures for floodplain management purposes (although the same buildings may be considered structures for insurance purposes).
- Accessory and agricultural buildings with four solid walls and a roof do require either elevation or floodproofing.

Nonresidential Structures: Requirements

Elevation/floodproofing

- Required: Buildings with 4 solid walls and a roof.
- Not required: Buildings not considered structures for floodplain management purposes.

Visual 81

Buildings Not Considered Structures

- Screened gazebos
- Carports
- Sheds open on one or more sides
- Agricultural buildings open on one or more sides (for hay storage, farm equipment storage, etc.)

Visual 82

Although these buildings do not have to meet NFIP elevation or floodproofing requirements, it is highly recommended that they be constructed using flood resistant materials and are adequately anchored so that they do not become debris. Remember, these buildings are still “development” and are subject to floodway requirements.

Accessory and Agricultural Buildings (Continued)

NFIP regulations require that nonresidential buildings be dry-floodproofed (made watertight) to or above the BFE, but that some low-value buildings may be exceptions.

Dry vs. Wet Floodproofing

Dry floodproofing means that the structure is made watertight to or above the BFE.

What is wet floodproofing?

Visual 83

Variances for Accessory Buildings

- Wet floodproofing may be an option for low-value sheds and accessory buildings.
- Potential flood damages are limited.
- Currently wet floodproofing is allowed through a variance procedure.
- Check with your Regional Office for further guidance on this type of variance.

Visual 84

Notes:

Accessory and Agricultural Buildings (Continued)

Wet Floodproofing Requirements

- Issue floodplain development permit
- Meet floodway or encroachment requirements
- Use for parking or limited storage only (not commercial or industrial storage)
- Install openings
- Use flood-resistant materials

Visual 85

Wet Floodproofing Requirements (Continued)

- Adequately anchor to resist flotation, collapse, or lateral movement (especially important for small, lightweight buildings)
- Elevate or floodproof utility/ electrical/heating equipment
- See FEMA Technical Bulletin 7-93, *Wet Floodproofing Requirements for Buildings Located in Special Flood Hazard Areas*

Visual 86

Notes:

Accessory and Agricultural Buildings (Continued)

Variance Process

- Meet variance criteria in 44 CFR 60.6(a).
- FEMA generally will not question a variance of this type that meets requirements in Technical Bulletin 7-93.
- Variance is in the type of flood protection, not the level of flood protection.

Visual 87

Refer to the variance criteria in 44 CFR 60.6(a).

(3) Variances shall only be issued by a community upon (i) a showing of good and sufficient cause, (ii) a determination that failure to grant the variance would result in exceptional hardship to the applicant, and (iii) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances;

(4) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

Types of Buildings Covered

Technical Bulletin 7-93 limits variances for wet floodproofing to:

- Accessory buildings.
- Agricultural buildings.
- ***Not included:*** Poultry/dairy barns and similar buildings that permanently house animals.

Visual 88

Dead animals pose a health and cleanup problem after a flood. These buildings can also contain expensive mechanical equipment.

Accessory and Agricultural Buildings (Continued)

Wet Floodproofing Decisions

What factors should be considered when deciding whether or not to wet floodproof an accessory or agricultural building?

Visual 89

Notes:

Anchoring Fuel Storage Tanks

- Anchoring fuel storage tanks is often overlooked. Buildings can be otherwise compliant, but have propane or fuel oil tanks that are not strapped down or otherwise anchored.
- The same anchoring requirements apply to fertilizer storage tanks on farms.

What's Wrong With This Picture?

Visual 90

Runaway Fuel Storage Tanks

Retrieving runaway fuel storage tanks and cleaning up contamination from fuel oil is a significant problem after most floods.

Visual 91

"A gas or liquid storage tank that is principally above ground" is considered a structure under the NFIP.

Notes:

Anchoring Fuel Storage Tanks (Continued)

Fuel Storage Tank Requirements

- As a structure, elevated above BFE or watertight if below BFE (44 CFR 59.1).
- Adequately anchored to prevent flotation, collapse, or lateral movement (44 CFR 60.3(a)(i)).
- As part of the building's heating system, designed and/or located to prevent water from entering/accumulating (44 CFR 60.3(a)(iv)).

Visual 92

Purpose of Requirements

- Keep the fuel tank in place and prevent breaks in fuel lines connecting the tank to the building.
- Prevent fuel from escaping from the tank.
- Prevent floodwaters from entering the fuel tank and contaminating fuel oil or gasoline.

Visual 93

Notes:

Anchoring Fuel Storage Tanks (Continued)

Fuel Storage Tank Categories

- Pressurized tanks such as propane and natural gas tanks.

  Main concerns: Keep tank anchored in place and keep fuel lines from breaking.

- Nonpressurized tanks such as fuel oil and gasoline tanks.

  Main concerns aside from anchoring: Ensure the vent pipe is above BFE, and that the fuel cap is above BFE or has a screw-on cap with a gasket to prevent floodwaters from entering.

Visual 94

Guidance

- FEMA 348, *Protecting Building Utilities from Flood Damage*
- Includes:
  - Guidance on protecting fuel storage tanks and the fuel lines connecting the tank to the building.
  - Information on calculating buoyancy forces and on various anchoring techniques.

Visual 95

Notes:

Anchoring Fuel Storage Tanks (Continued)

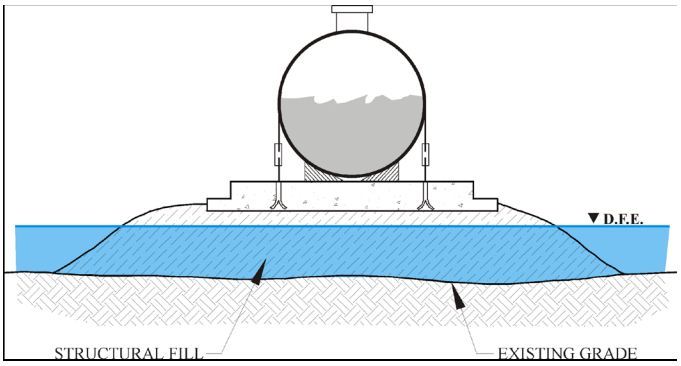
Protecting Fuel Storage Tanks

- In areas of low and moderate flood velocities: Elevate on fill above BFE and anchor to withstand buoyancy.
- Elevate above BFE on a foundation and anchor the tank to the foundation.
- Below BFE, anchor to a concrete slab or to counterweights on both sides.
- Bury the tank and anchor to concrete counterweights.

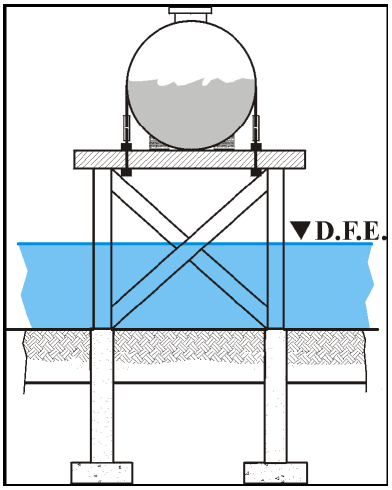
Visual 96

The graphics below illustrate two methods to elevate fuel storage tanks:

- Elevating the fuel storage tank on fill so that it is above the BFE in areas with low and moderate flood velocities. The tank must still be anchored to withstand buoyancy in case floods larger than the base flood occur. (The acronym D.F.E. in the graphic stands for Design Flood Elevation.)
- Elevating the tank above BFE on a foundation and anchoring the tank to that foundation. Velocity flow, scour, and debris impact need to be taken into account when designing the foundation.



Fuel Tank on Structural Fill

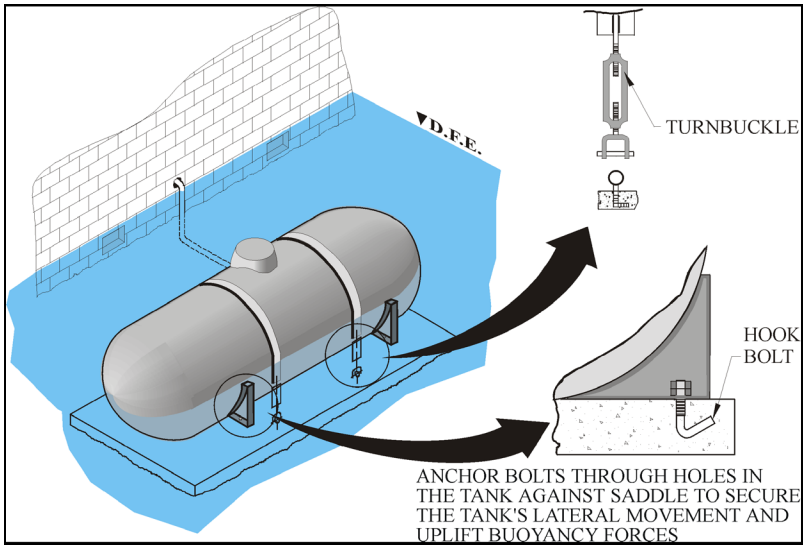


Elevated Fuel Tank

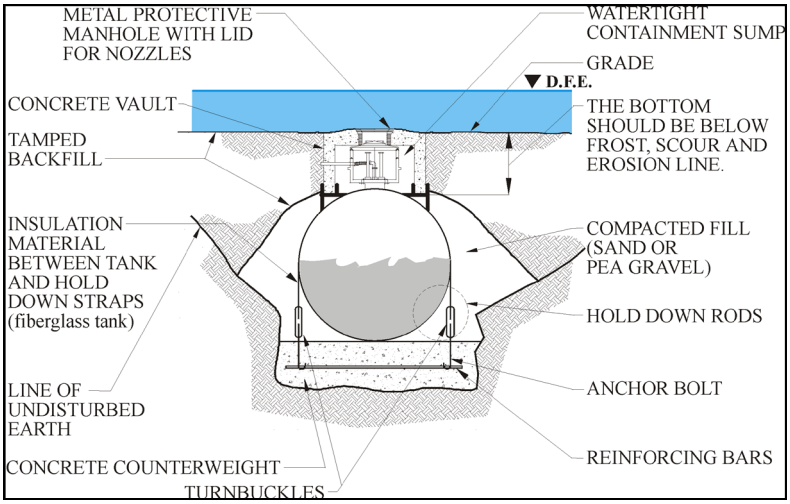
Anchoring Fuel Storage Tanks (Continued)

The graphics below illustrate two protection methods used below BFE:

- Placing the tank below BFE, but anchoring it to a concrete slab or to counterweights on both sides of the tank. For nonpressurized tanks the vent pipe must be above BFE and the fill cap must be above BFE or leak proof.
- Burying the tank and anchoring the tank to concrete counterweights. The counterweights and the weight of the backfill and the tank itself must counteract the affects of buoyancy from an empty or partially full tank. For nonpressurized tanks the vent pipe must be above BFE and the fill cap must be above BFE or leak proof.



Typical Tie Down Strap Configuration



Underground Fuel Tank

Refer to FEMA 348, *Protecting Building Utilities from Flood Damage,* for further information on these techniques.

Anchoring Fuel Storage Tanks (Continued)

Problems: Unprotected Fuel Tanks

What problems can be caused by:

- Runaway fuel tanks?
- Broken fuel lines?
- Spilled fuel oil?
- Contaminated fuel oil?

Visual 97

Notes:

Anchoring Fuel Storage Tanks (Continued)

Building Fire During Flooding

Visual 98

Retrofitting Fuel Storage Tanks

- NFIP minimum standards do not retroactively apply.
- No requirement that fuel storage tanks serving existing buildings be anchored.
- Communities may wish to:
  - Adopt more restrictive requirements for existing fuel storage tanks.
  - Establish a program to assist homeowners to voluntarily anchor their fuel tanks.

Visual 99

Notes:

Regulating Recreational Vehicles

In general, campgrounds and RV parks are considered a good use of the floodplain.

Recreational Vehicle (RV) Topics

- Purpose of NFIP requirements
- RV definition
- 180 day/ready for highway use requirements
- Park trailers
- Requirements for campgrounds and RV parks

Visual 100

RVs: NFIP Perspective

- Good use for many floodplains
- Readily moveable from campgrounds or RV parks
- Able to evacuate from the floodplain with sufficient warning
- Not a structure, not eligible for NFIP flood insurance
- Relatively low value compared to a building

Visual 101

Notes:

Regulating Recreational Vehicles (Continued)

RVs Can Become Buildings

- No longer moveable
- Often have decks, Florida rooms, and other additions
- Look like stick-built residences

Visual 102

- The NFIP requirements for RVs are intended to keep them moveable and prevent them from becoming permanent buildings. We want them to be moved out of the floodplain if at all possible upon a flood warning and want to minimize any damages that would occur.
- Before the requirements were established there were many instances where the wheels were removed from RVs and they were placed on permanent foundations, Florida rooms and other additions added, and, in some instances, the RV was altered so that it looked and functioned like a residential building.

Examples: RVs With Wheels Removed

Visual 103

Notes:

Regulating Recreational Vehicles (Continued)

RV Definition

- Built on a single chassis.
- 400 square feet or less measured at largest horizontal projection.
- Self-propelled or towable by a light-duty truck.
- Temporary living quarters for recreational, camping, travel, or seasonal use.

Visual 104

Types of RVs include:

- Camping trailers
- Fifth-wheel trailers
- Motor homes
- Park trailers
- Travel trailers
- Truck campers

Examples: Types of RVs

Fifth-Wheel Trailer

Park Trailer

Travel Trailer

Visual 105

Park trailers pose special problems, and will be discussed in detail later.

Regulating Recreational Vehicles (Continued)

NFIP: RV Options

- Short-term options: Community choice which to use.
  - First option: On site fewer than 180 consecutive days, OR
  - Second option: Fully licensed and ready for highway use.
- Third (long-term) option: Meet elevation and anchoring requirements for manufactured homes.

Visual 106

- The intent of this requirement is to exempt recreational vehicles from floodplain management requirements when they are placed on a site only seasonally, or used only for camping and other short-term occupancies.
- Communities may choose to use both the first and second short-term options.
- Once an RV is permanently placed on a site, its usage and risk is much the same as for a manufactured home and the RV must meet the same elevation and anchoring requirements.

Reasons for Short-Term Options

- Give the community flexibility on how to implement requirements for short-term use.
- Either "180 days" or "fully licensed" requirement achieves the purpose: keeping RVs mobile.

Visual 107

Notes:

Regulating Recreational Vehicles (Continued)

The community's choice depends on:

- Climatic conditions.
- How local recreational vehicle parks and campgrounds traditionally conduct their businesses.
- Park and campground clientele.

For example, campgrounds providing short-term rentals to tourists are different than destination condominium campgrounds and RV resorts.

"Fully Licensed/Ready for Highway Use"

- * Find Job Aid 8, Regulating RVs, under the Regulations: Job Aids tab in your Participant Manual.
- Review the "Fully Licensed" and the "Ready for Highway Use" sections.
- How does your community monitor the 180-day or fully licensed/ready for highway use criteria?

Visual 108

Notes:

Regulating Recreational Vehicles (Continued)

Park Trailers

- Typically come narrow or wide:
  - 8.5 feet or less in width
  - 12 or 14 feet in width
- Width >8.5 feet: Usually need a special highway permit and services of a commercial mover.

Visual 109

Examples: Narrow and Wide Park Trailers

Narrow Park Trailer

Wide Park Trailer

Visual 110

Notes:

Regulating Recreational Vehicles (Continued)

Park Trailer Characteristics

- Stay on a site several years or more, so must be regulated as manufactured homes.
- Not streamlined, not intended for highway use.
- Often placed on permanent foundations.
- Often have stairs, decks, screen porches, and Florida rooms attached.

Visual 111

Park trailer manufacturers have their own national association separate from the Recreational Vehicle Industry Association.

Park trailers will generally have to be regulated as manufactured homes. They usually will be on a site for greater than 180 consecutive days and will not be fully licensed and ready for highway use.

Park trailers:

- Usually require special permits and haulers to be transported on highways.
- Do not have quick disconnect utilities because they have fully functional bathrooms and kitchens.
- Are equipped with welded, tie-down brackets, and can be secured to a site.

Some communities define park trailers as manufactured homes for the purposes of their floodplain management ordinance.

Notes:

Regulating Recreational Vehicles (Continued)

Regulating Park Trailers

- Do you have park trailers placed in your community?
- How do you regulate them?
- Do you treat them as manufactured homes?

Visual 112

Foundations and Anchoring

- Travel trailers and fifth-wheel trailers are not designed to be elevated and anchored on permanent foundations.
- A manufactured home installer needs to adapt manufactured home foundations per FEMA 85.

Visual 113

The title of FEMA 85 is “Manufactured Home Installation in Flood Hazard Area.”

Notes:

Regulating Recreational Vehicles (Continued)

Anchoring Park Trailers

- Park trailer design facilitates anchoring on permanent foundations.
- Manufacturer's instructions should include installation on a permanent foundation.
- The installer will need to adapt elevated manufactured home foundations and anchoring techniques from FEMA 85.

Visual 114

RV Parks and Campgrounds

Review proposals against "reasonably safe from flooding" standard.

- Damages within floodprone area minimized.
- Public utilities/facilities (sewer, water, electrical, etc.) located and constructed to minimize flood damage.
- Adequate drainage provided.

Visual 115

Floodplain management requirements for RVs support the need to address personal safety risks.

- Requiring the units to be removable is an incentive for occupants to move out of harm's way before it is too late to leave.
- Additionally, the regulations are designed to avoid having the units become debris, by becoming buoyant.

Notes:

Regulating Recreational Vehicles (Continued)

RV Park/Campground Requirements

- Fill must comply with floodway requirements.
- Buildings must be elevated to/above BFE (or floodproofed if nonresidential).
- RV parks and campgrounds are not grandfathered like manufactured home parks.

Visual 116

- RV parks and campgrounds do not need to be grandfathered. These facilities have the options of using the site for vehicles for fewer than 180 days or restricting the site to vehicles that are fully licensed and ready for highway use.
- Several communities in Florida have been granted exceptions from FEMA to grandfather existing RV parks. Park trailers in these parks are elevated on 36-inch reinforced piers.

Notes:

Regulating Recreational Vehicles (Continued)

Issues: RV Parks and Campgrounds

- NFIP requirements do not:
  - Prevent flood damage to RVs.
  - Address public safety issues of placing RV parks and campgrounds in the floodplain.
- What issues should you consider when reviewing proposals to establish RV parks/campgrounds in the floodplain?

Visual 117

RVs Trapped in a Flash Flood

Visual 118

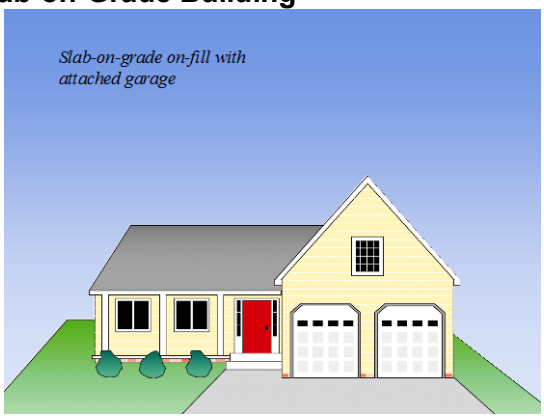
Notes:

Typical Compliance Problems

We are now going to look at four common building types and discuss:

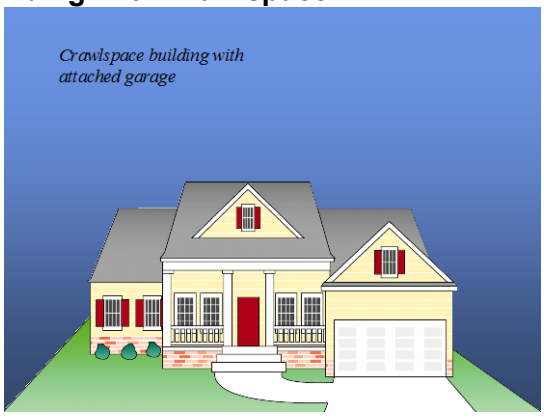
- Requirements that apply to the building type.
- Typical problems with this type of building in your community.
- How to prevent problems.

Slab-on-Grade Building



Visual 119

Building With Crawlspace

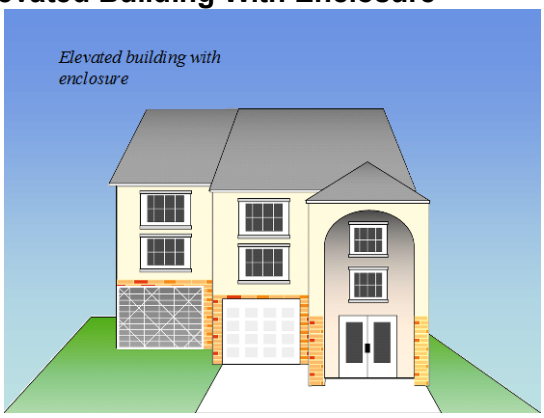


Visual 120

Notes:

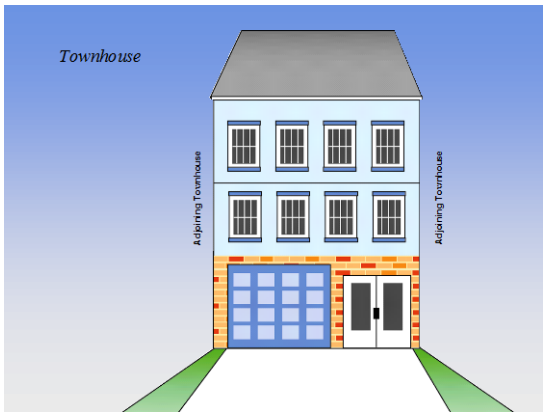
Typical Compliance Problems

Elevated Building With Enclosure



Visual 121

Townhouse



Visual 122

Notes:

Typical Compliance Problems (Continued)

Activity: Solving Typical Problems

- The instructor will assign your group to work on one of four building types.
- Recommend solutions to the typical problems encountered with your assigned building example.

Visual 123

Notes:

Typical Compliance Problems (Continued)

Activity 2

Activity: Solving Typical Problems

Purpose: The purpose of this activity is to practice calculating the number of openings required for an enclosed space.

Instructions:

- The instructor will assign your group to work on one of the following building types:

  ___Building Type #1
  ___Building Type #2
  ___Building Type #3
  ___Building Type #4

- Work with your group to recommend solutions to the problems for your assigned building type.

Building Type #1

Description: Slab-on-grade building with attached garage in an AE Zone.

Typical Compliance Problems (Continued)

Activity 2: Solving Typical Problems (Continued)

Building Type #1 (Continued)

Requirements:

- The top of the slab must be at or above BFE.
- The top of the pad or platform for the HVAC unit must be at or above BFE.
- If the attached garage is below BFE:
  - It must have adequate openings,
  - Any portions of the garage below BFE must be constructed using flood resistance materials, and
  - Furnace or hot water heater in the garage must be on a platform at or above BFE.

Instructions: With your group, discuss measures that a community can take to:

- Prevent each of the following typical problems.
- Deal with this type of violation if discovered after a building is constructed.

1. Problem: Top of the slab is several inches to a foot below BFE.
   - Prevention:

   - Post-construction:

   Problem: Attached garage floor is below BFE, but there are no openings.

   - Prevention:

   - Post-construction:

Typical Compliance Problems (Continued)

Activity 2: Solving Typical Problems (Continued)

Building Type #2

Description: Crawlspace building with attached garage in an AE Zone.

Requirements:

- The top of the floor of the house must be at or above BFE.
  - Joists, floor beams, and insulation must be flood resistant materials or elevated to above BFE.
  - Ductwork and electrical junction boxes must be watertight or elevated to above BFE. The better option is to elevate these building components to above BFE.
- The crawlspace must have the proper openings.
- The dirt or concrete floor of the crawlspace must be at or above lowest adjacent grade. (It can only be below grade if the community adopts and enforces the requirements contained in a Technical Bulletin.)
- The pad or platform for the HVAC unit must be at or above BFE.
- If the attached garage is below BFE:
  - It must have adequate openings (calculate separately from crawlspace),
  - Any portions of the garage below BFE must be constructed using flood resistance materials, and
  - Furnace or hot water heater in the garage must be on a platform at or above BFE.

Typical Compliance Problems (Continued)

Activity 2: Solving Typical Problems (Continued)

Building Type #2 (Continued)

Instructions: With your group, discuss measures that a community can take to:

- Prevent each of the following typical problems.
- Deal with this type of violation if discovered after a building is constructed.

1. Problem: Flooring, subflooring, floor joists, floor beams and insulation are below BFE and not made of flood resistant materials.
   - Prevention:
   - Post-construction:

   Problem: The crawlspace does not have adequate openings.
   - Prevention:
   - Post-construction:

Typical Compliance Problems (Continued)

Activity 2: Solving Typical Problems (Continued)

Building Type #3

Description: Elevated building with a below BFE enclosure in an AE zone. For the purposes of this exercise, it does not matter if the building is elevated on piles or columns or on extended foundation walls as long as it is elevated a full story above ground and has an enclosure below BFE.

Requirements:

- The top of the floor of the house must be at or above BFE.
  - Joists, floor beams, and insulation must be flood resistant materials or elevated to above BFE.
  - Ductwork and electrical junction boxes must be watertight or elevated to above BFE.
- The enclosed area must only be used for parking, access, or storage. Bathrooms, family rooms, workshops, and similar uses are not permitted.
- The pad or platform for the outside HVAC unit must be at or above BFE.
- The enclosed area and other portions of the building below BFE must:
  - Have adequate openings,
  - Any portions of the enclosure below BFE must be constructed using flood resistance materials, and
  - Any furnace, hot water heater, or other equipment in the enclosure must be on a platform at or above BFE.

Typical Compliance Problems (Continued)

Activity 2: Solving Typical Problems (Continued)

Building Type #3 (Continued)

Instructions: With your group, discuss measures that a community can take to:

- Prevent each of the following typical problems.
- Deal with this type of violation if discovered after a building is constructed.

For buildings with enclosures, consider two types of issues. You need to make sure that:

- The building is compliant when built.
- The enclosed area is not later converted for uses other than parking, access, or storage.

For buildings elevated a full story above an enclosure, the main floor is usually above the BFE as is the flooring, subflooring, floor joists, floor beams, ductwork, and insulation for the main floor. The problems tend to be with the enclosure.

1. Problem: Enclosure floor is below BFE, but there are no openings and flood resistant materials are not used below BFE.

   - Prevention:

   - Post-construction:

   Problem: Air conditioning condenser unit or heat pump pad is on the ground next to the enclosure or on a platform and is below BFE. Furnace or hot water heater in the enclosure is below BFE.

   - Prevention:

   - Post-construction:

Typical Compliance Problems (Continued)

Activity 2: Solving Typical Problems (Continued)

Building Type #4

Description: Townhouse or row house building in an AE Zone. Townhouses are becoming an increasingly common type of construction in flood hazard areas. Townhouses have the advantage of generally having their main living areas well above the BFE, but can have other compliance problems.

Requirements:

Must meet the same standards as an elevated building with an enclosure.

Typical Compliance Problems (Continued)

Activity 2: Solving Typical Problems (Continued)

Building Type #4 (Continued)

Instructions: With your group, discuss measures that a community can take to:

- Prevent each of the following typical problems.
- Deal with this type of violation if discovered after a building is constructed.

1. Problem: No openings or not enough openings. There are only two walls on which to place openings in a townhouse and these walls must usually accommodate a double garage door and two entry doors.

   - Prevention:

   - Post-construction:

   Problem: Finished entryway. The entryway must be constructed using flood resistant materials.

   - Prevention:

   - Post-construction:

3. Problem: Ground floor includes a finished room used for other than parking, building access, or storage.

   - Prevention:

   - Post-construction:

Typical Compliance Problems (Continued)

Common Themes

What approaches were common to solving problems for most of the building types?

Visual 128

Notes:

Summary

Job Aid/Resources

- * Find Job Aid 9, References, under the Regulations: Job Aids tab in your Participant Manual.
- The job aid lists references for NFIP regulations.

Visual 129

You have learned about and received resources to help with the following regulatory subjects:

- Floodway and Encroachment Requirements
- New Residential Building Requirements
- Development in Approximate A Zones
- Accessory and Agricultural Buildings
- Anchoring Fuel Storage Tanks
- Regulating RVs
- Typical Compliance Problems

Notes: