UNIT 5:
THE NFIP FLOODPLAIN MANAGEMENT REQUIREMENTS

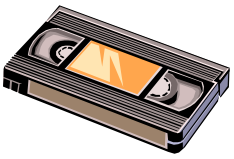
In this unit

Unit 6 reviews more restrictive standards that may be required or recommended for your community. Units 7 through 10 provide guidance on how to administer a program that fulfills the requirements spelled out in this unit.

This unit reviews the NFIP standards for floodplain development, including:

- What maps, base flood elevations and other flood data must be used,
- When permits are required,
- Ensuring that new development does not cause increased flooding elsewhere,
- Standards to ensure that new buildings will be protected from the base flood, and
- Additional requirements for certain types of development.

Materials used in this unit



- Videotape segments: *Federal and State Floodplain Management Requirements* and two of the *Best Build* series
- Video cassette player

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A. THE NFIP'S REGULATIONS

For a community to participate in the National Flood Insurance Program, it must adopt and enforce floodplain management regulations that meet or exceed the minimum NFIP standards and requirements. These standards are intended to prevent loss of life and property, as well as economic and social hardships, that result from flooding.

The NFIP standards work – as witnessed during floods in areas where buildings and other developments are in compliance with them. Nationwide each year, NFIP-based floodplain management regulations help prevent more than $700 million in structural damage.

This unit focuses on the minimum NFIP criteria. In some instances, more restrictive state standards may exist, and they must also be met by communities in the NFIP. They are the subject of the next unit.

44 CFR

The NFIP requirements can be found in Chapter 44 of the *Code of Federal Regulations* (44 CFR). Revisions to these requirements are first published in the *Federal Register*, a publication the Federal Government uses to disseminate rules, regulations and announcements.

Most of the requirements relative to your community's ordinance are in Parts 59 and 60. These are included in Appendix E along with the mapping regulations of Parts 65 and 70.

Figure 5-1 shows how the regulations are organized. The sections are referred to in shorthand, such as 44 CFR 60.1—Chapter 44, *Code of Federal Regulations*, Part 60, Section 1. In this course, excerpts are shown in boxes:

> ***44 CFR 59.2(b)*** *To qualify for the sale of federally-subsidized flood insurance a community must adopt and submit to the Administrator as part of its application, flood plain management regulations, satisfying at a minimum the criteria set forth at Part 60 of this subchapter, designed to reduce or avoid future flood, mudslide (i.e., mudflow) or flood-related erosion damages. These regulations must include effective enforcement provisions.*

As noted in Unit 2, when your community joined the NFIP, it agreed to abide by these regulations. When your community's FIRM was published, it had to submit its ordinance to FEMA to ensure that it met these requirements.

Part 59—General Provisions

Subpart A—General

59.1 Definitions
59.2 Description of program
59.3 Emergency program
59.4 References

Subpart B—Eligibility Requirements

59.21 Purpose of subpart
59.22 Prerequisites for the sale of flood insurance
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59.24 Suspension of community eligibility

Part 60—Criteria for Land Management and Use

Subpart A—Requirements for Flood Plain Management Regulations

60.1 Purpose of subpart
60.2 Minimum compliance with flood plain management criteria
60.3 Flood plain management criteria for floodprone areas
(a) When there is no floodplain map
(b) When there is a map, but not flood elevations
(c) When there are flood elevations
(d) When there is a floodway mapped
(e) When there is a map with coastal high hazard areas
60.4 Flood plain management criteria for mudslide (i.e., mudflow)-prone areas
60.5 Variances and exceptions
60.6 Revisions of criteria for flood plain management regulations
60.7 Definitions

Subpart B—Requirements for State Flood Plain Management Regulations

Subpart C—Additional Considerations in Managing Flood-Prone, Mudslide (i.e., Mudflow)-Prone, and Flood-Related Erosion-Prone Areas

Figure 5-1. 44 CFR Parts 59 and 60

Many state NFIP coordinators have prepared model flood damage prevention ordinances to assist communities in meeting the NFIP requirements, so it is likely that your community adopted an ordinance based on the state model.

NOTE: Periodically, the NFIP regulations are revised to incorporate new requirements or clarify old ones. These changes are published in the *Federal Register*. Some revisions require local ordinance amendments. Your community may or may not have made the amendments needed to stay updated. Before you complete this unit, you should check with your state NFIP coordinator or FEMA Regional Office to verify that your ordinance is currently in full compliance with the latest NFIP requirements.

COMMUNITY TYPES

NFIP regulations identify minimum requirements that communities must fulfill to join and stay in the program. The requirements that apply to a particular community depend on its flood hazard and the level of detail of the data FEMA provides to the community. The specific requirements are in Section 60.3, and apply to communities as follows:

- 60.3(a) FEMA has not provided any maps or data.
- 60.3(b) FEMA has provided a map with approximate A Zones
- 60.3(c) FEMA has provided a FIRM with base flood elevations
- 60.3(d) FEMA has provided a FIRM with base flood elevations and a map that shows a floodway
- 60.3(e) FEMA has provided a FIRM that shows coastal high hazard areas (V Zones)

Two important notes:

The NFIP requirements are minimums. As noted in 44 CFR 60.1(d), "Any floodplain management regulations adopted by a State or a community which are more restrictive than the criteria set forth in this part are encouraged and shall take precedence."

These requirements are cumulative. A 60.3(c) community must comply with all appropriate requirements of sections 60.3(a) and (b). For example, 60.3(a) includes basic requirements for subdivisions and utilities that are not repeated in the later sections. *All* communities in the NFIP must comply with these subdivision and utility requirements.

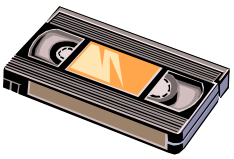
For example, a 60.3(c) community must use the base flood elevations provided on the FIRM. If that community has an approximate A Zone without a BFE, it must comply with the requirements of 60.3(b) for that area.

The rest of this unit explores the requirements of 44 CFR 60.3. It is organized by subject matter, so it will not correspond with the sections in 44 CFR. Where appropriate, the specific section numbers are referenced.

You should be able to identify where the requirements discussed in this unit appear in your ordinance. If you cannot find a specific reference or if you are not comfortable with your ordinance's regulatory language, contact your state NFIP coordinator or FEMA Regional Office. FEMA and your state will expect you to enforce these minimum requirements as agreed to. If you don't think your ordinance language is clear or up to date, you should consider an amendment to remove any doubt.

This unit covers the minimum requirements for participation in the NFIP. As noted, communities are encouraged to enact regulatory standards that exceed these minimums and that are more appropriate for local conditions.

The Community Rating System (CRS) is a part of the NFIP that rewards communities that implement programs that exceed the minimums. It is explained in more detail in Unit 9, Section C. Where provisions that can receive CRS credit are mentioned in this course, they are highlighted with the CRS logo.



VIDEO: *FEDERAL AND STATE FLOODPLAIN MANAGEMENT REQUIREMENTS*

This 19 minute segment summarizes much of the material contained in this unit. Some of the items discussed, such as substantial improvements and variances, are discussed in later units.

The segment is part of a series produced by the Commonwealth of Pennsylvania. There are some references to Pennsylvania agencies and governmental units, but they should not detract from the information's usefulness in other jurisdictions.

After viewing the segment, return to the text. You may rewind the tape.

B. MAPS AND DATA

Flood maps and flood data were discussed in Units 3 and 4. This section builds on that information, covering the NFIP requirements as to when and how a community must use those maps and data.

Basic rule #1: You must use the latest maps and flood data published by FEMA.

NFIP MAPS AND DATA

A community must adopt and enforce floodplain management regulations based on data provided by FEMA (44 CFR 60.2(h)). This includes the floodplain boundaries, base flood elevations, FIRM zones and floodway boundaries shown on your current Flood Insurance Rate Map, Flood Boundary Floodway Map and/or Flood Insurance Study.

> ***44 CFR 60.2(h):*** *The community shall adopt and enforce flood plain management regulations based on data provided by the [Federal Insurance] Administrator. Without prior approval of the Administrator, the community shall not adopt and enforce flood plain management regulations based upon modified data reflecting natural or man-made physical changes.*

This requirement does not prevent a community from adopting and enforcing regulations based on data more restrictive than that provided by FEMA. For example, a community may want to regulate to an historical flood which was higher than the BFEs shown on the FIRM. However, such data must be approved by the FEMA Regional Office before it is used.

This requirement also does not prevent a community from using other technical data to identify and regulate floodprone areas not shown on FEMA maps. For example, many cities and urban counties map and regulate areas on small tributary streams that are not shown on the FIRM.

The community always has a say in what the latest maps and data should be. FEMA will send you proposed revisions to the official FIRM and you will have time to review them and submit your comments to FEMA before they are published. If you disagree with the FEMA data, then you should submit a request for a map revision as noted in Unit 4, Section D, *Maintaining and Revising NFIP Maps.*

Annexations: If a property is in a recently annexed area that does not show up on your community's map, use the county's map and base flood elevations (BFEs) to determine the flood protection requirements. In fact, you should formally adopt the county's FIRM in your ordinance to strengthen your basis for regulating areas not currently shown on your FIRM.

Exceptions: The basic rule does not cover every situation. Four occasions where a community may vary from the data provided by FEMA are:

- When the FEMA data disagree with ground elevations.
- When the FEMA data are insufficient. This occurs in approximate A Zones where base flood elevations and floodway boundaries are not provided with the FIRM.
- When FEMA has provided draft revised data.
- When FEMA provides "advisory" flood hazard data.

These situations are discussed below.

Note: these situations only apply to the use of flood data for floodplain management purposes. Insurance agents and lenders must use the current FIRM when setting insurance rates and determining whether flood insurance is required. If a person wants to vary from the current FIRM to obtain different premium rates or to not have to purchase a flood insurance policy, the FIRM must be officially revised or amended.

WHEN FIRM AND GROUND DATA DISAGREE

The BFEs published in the Flood Insurance Study set the level for flood protection purposes. The maps are a graphic portrayal of that information.

Since FEMA usually does not have detailed topographic mapping to use in preparing the flood maps, the flood boundaries are interpolated. This can result in inaccuracies in drawing the boundaries on the map.

The BFE in relation to the actual ground elevation sets the floodplain limits for regulatory purposes. When ground surveys show that a development site is above the BFE, you should record the data and issue the permit. Then, if the developer or owner wants the property removed from the Special Flood Hazard Area designation, he or she can request a Letter of Map Amendment.

It is up to them to apply for a map change, not you. The procedure is discussed in Unit 4, Section D.

Conversely, if site surveys show that areas considered outside the 100-year floodplain on published maps are in fact below the BFE, you should require protection of new buildings to the BFE. Even though a site may be technically outside the mapped SFHA, you are not doing future occupants any favors by ignoring the known flood hazard.

REGULATING APPROXIMATE A ZONES

The second occasion where you may vary from the data provided by FEMA is in approximate A Zones. Approximate A Zones are those areas not studied by the detailed hydrologic/hydraulic methods. These areas are shown as "unnumbered A zones" on the FIRM and "approximate 100-year flood zones" on the Flood Boundary Floodway Map. The FIS will not contain specific base flood elevations for approximate study areas nor will there be a floodway/fringe designation on the FBFM.

> ***44 CFR 60.3(b)*** *When the Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:…*
>
> ***(3)*** *Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;*
>
> ***(4)*** *Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards …*

Regulating development in approximate or unnumbered A Zones is one of the tougher jobs you'll face, especially in counties that have large areas of such zones. 44 CFR Section 60.3(b)(4) requires that you make every effort to use any flood data available in order to achieve a reasonable measure of flood protection. Further, many states and local ordinances require a base flood elevation before a permit can be issued for any development.

Here are some tips in obtaining data needed for unnumbered A Zones. Whichever method you use, be sure to record on the permit records where the flood elevation came from. This will help you be consistent with future development in the same area.

- Check with your state NFIP coordinator. Some states have regulations or guidance on how to obtain regulatory data. Some have repositories of data or may help conduct a new study.
- Check with local flood control, sanitary or watershed districts. Like state agencies, they may have their own programs for developing new flood data.
- If a body of water forms a boundary between two communities, the community on the other side may have a detailed study. Such base flood data are valid for both sides of a body of water.

- Ask the U.S. Army Corps of Engineers, U.S. Department of Agriculture/Natural Resources Conservation Service, or U.S. Geological Survey if they have knowledge of any flood studies, unpublished reports, or any data that may pertain to the area in question.
- If the property is along a stream that is near state highway structures such as bridges or culverts, the state highway department may have done a flood study to properly size the structure.
- If the property is on a river with a power-generating dam, the dam owner may have had to conduct a study for federal licensing.
- See if your engineer or the developer will conduct a study to calculate BFEs.

Data obtained from one of these other sources should be used as long as they:

- Reasonably reflect flooding conditions expected during the base flood,
- Are not known to be technically incorrect, and
- Represent the best data available.

The FEMA publication *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations* provides information on a number of methodologies for developing BFEs in approximate A zones. These methodologies range from detailed methods that produce BFEs and perform floodway analyses similar to those developed for a Flood Insurance Study to simplified methods that can be used in isolated areas where more costly studies cannot be justified.

If your community has approximate A Zones that are likely to be developed, you should get a copy of this document and have your engineer review it. (The guide includes the Quick-2 software for computing flood elevations.)

Small developments

If the project is an isolated building, such as a single-family home in an undeveloped area, it may not make economic sense to conduct a study to determine the BFE. In these cases, you may want to use a less expensive alternative to determine the flood protection level.

There are two possibilities:

- Use historical records or the flood of record (the highest known flood level for the area). It may be that a recent flood was close to the base flood. If records of the recent flood can be used, base your regulatory flood elevations on them (or add a foot or two to the historical flood levels to provide a margin of error). Before you do this, get a second opinion from your state NFIP coordinator, FEMA Regional Office or other agency that is familiar with the flood data you want to use.

- Require protection to at least five feet above grade.

These methods are not as good as requiring protection to a BFE. However, they may be more appropriate for small projects. The second approach will result in lower flood insurance rates than if the building had no protection, but the rates are not as favorable as they would be if a BFE were calculated. Examples of the possible rates are discussed in Unit 9, Section B.

Larger developments

You are encouraged to discuss the flood hazard as early as possible in discussions with subdividers and developers of large areas. If a subdivision of planned unit development will be partially in the floodplain, there may be ways to avoid building in the flood hazard area, which can save the developer the cost of a flood study.

> ***44 CFR 60.3(b)(3):*** *[Communities must] Require that all new subdivision proposals and other proposed development (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals BFE data.*

Any subdivision that meets this threshold must be evaluated to determine if the proposed site is in an approximate A Zone and whether BFEs are required. If BFEs are required, the developer must conduct the required study (the community, state or other agency may provide assistance). While the study must provide BFEs, you may want to require a floodway delineation and inclusion of other data needed to ensure that the building sites will be reasonably safe from flooding.

BFE data are required for the affected lots in the subdivisions shown in Figure 5-2 and Figure 5-3. Figure 5-2 shows a 76-lot subdivision with several lots clearly affected by an approximate Zone A area. The subdivision depicted in Figure 5-3 is only 12 lots, but BFEs are required because the subdivision covers more than five acres and clearly shows buildable sites affected by an approximate Zone A area.

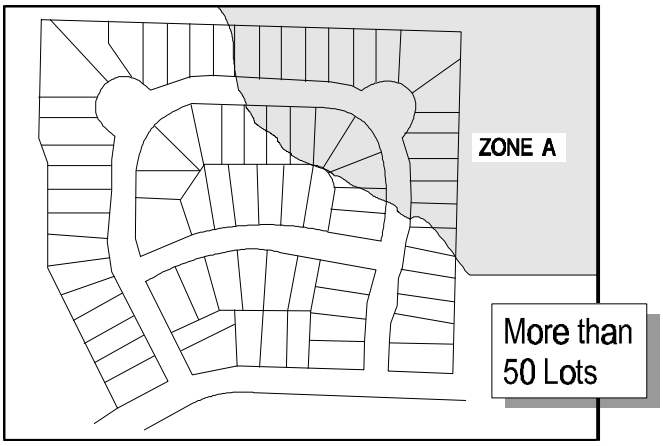


Figure 5-2: Proposed 76-lot subdivision

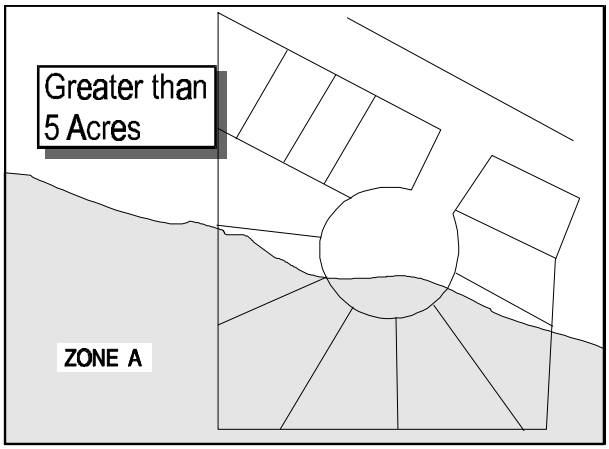


Figure 5-3: Proposed 6.7-acre subdivision

In Figure 5-4, the entire approximate Zone A area is to be left as open space. If the planned subdivision shows the floodplain is contained entirely within an open space lot, it may not be necessary to conduct a detailed engineering analysis to develop BFE data.

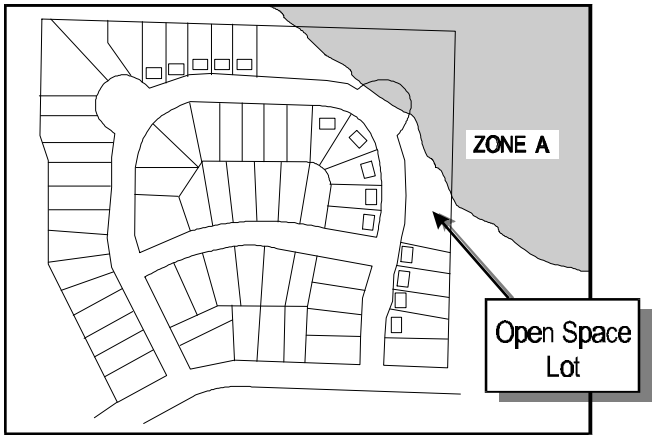


Figure 5-4: Proposed 76-lot subdivision

> ***44 CFR 65.3****: As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator of [map] changes by submitting technical or scientific data in accordance with this part.*

When a developer prepares a detailed flood study in an approximate A Zone, you must submit the new flood information to FEMA within six months. The community can pass that cost on to the developer by requiring that he or she submit of a Letter of Map Revision as a condition of approving the development.

CRS credit is provided if BFEs, floodways and related regulatory data are provided in areas not mapped by the NFIP. This credit can be found in Activity 410, Section 411, of the *CRS Coordinator's Manual* or the *CRS Application*.

DRAFT REVISED NFIP DATA

The third situation where a community may vary from the official FEMA data is when FEMA has sent some preliminary data to the community for review. Communities are required to "reasonably utilize" the data from a draft or preliminary FIRM or flood insurance study.

Four scenarios are possible:

- Where the original FIRM shows an A or V Zone with *no* BFEs: Use the draft information. In the absence of other elevation or floodway data, the draft information is presumed to be the best available.
- Where the original FIRM shows an AE or VE Zone *with* a BFE or floodway and the revision *increases* the BFE or *widens* the floodway: The draft revised data should be used. However, if the community disagrees with the data and intends to appeal, the existing data can be presumed to be valid and may still be used until the appeal is resolved.
- Where the original FIRM shows an AE or VE Zone *with* a base flood elevation or floodway and the revision *decreases* the BFE or *shrinks* the floodway: The existing data should be used. Because appeals may change the draft data, the final BFE may be higher than the draft. If you were to allow new construction at the lower level as shown in the draft, the owners will have to pay higher flood insurance premiums.
- Where the original FIRM shows a B, C or X Zone: NFIP regulations do not require that the draft revised data be used. However, you are encouraged to use the draft data to regulate development, since these areas are subject to a flood hazard.

If the community intends to appeal preliminary data, it must be done during the official appeals period. Otherwise, you will have to wait for the new map to become official and submit a request for a map amendment or revision.

For more information on this issue, see *Use of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98.

CLOMRs: The above four scenarios are also relevant for a Conditional Letter of Map Revision or CLOMR. Note the *conditional* part of a CLOMR. A CLOMR provides that *if* a project is constructed as designed, the BFEs can be revised or modified (or the property in question can be removed from the SFHA) *AFTER* the as-built specifications are submitted *AND* the final LOMR is issued.

A permit should not be based on a lower BFE proposed by a CLOMR until the final LOMR is issued. However, you can issue a permit for that part of the work not dependent on the changes that will result from the LOMR and condition the full permit upon receipt of the final LOMR.

ADVISORY FLOOD HAZARD DATA

Sometimes FEMA issues advisory data after a major flood where it was found that the FIRM and/or flood insurance study underestimated the hazard. This information is provided so communities can ensure that reconstructed buildings are protected from the true hazard, not the one shown on the FIRM.

When you receive such advisory information, you should "reasonably utilize" it. If your community agrees with the information, the ordinance should be revised to adopt it. If it disagrees with the data, you should be ready to explain why the community is not requiring construction and reconstruction to be protected. You and your community are not helping residents if you allow them to rebuild without protection from a known hazard.

For more information on this issue, see *Use of Flood Insurance Study (FIS) Data As Available Data*, FEMA Floodplain Management Bulletin 1-98.

LEARNING CHECK #1

1. What publication has the NFIP requirements for communities?

2. Most of the requirements relative to your community's ordinance are in 44 CFR Parts ____ and ____ .

3. Does your ordinance comply with the latest NFIP requirements?

4. Which part of 44 CFR 60.3 covers the requirements for areas with a FIRM, but no base flood elevations?

5. What is "Basic rule #1" for using maps and data?

6. What map do you use if recently annexed areas do not show up on your community's FIRM?

7. If you find information that shows the ground to be higher than the BFE, can a bank use that data when determining whether a flood insurance policy must be purchased?

8. Site E is in the approximate A Zone of Dean Lake. A developer wants to build a small commercial building on a 3 acre site. Where do you get a base flood elevation for Site E?

9. A developer downstream of Dean Lake wants to build a 40 acre subdivision that crosses Ireland Creek. You need a base flood elevation before you review the plans. What options do you tell the developer he has?

10. A restudy was performed on the Josias River. The preliminary study will not be final for another five months. It shows a new BFE at Site N that is two feet higher than the BFE in your current FIS. Which one do you use to determine the flood protection level for a new home at Site N?

C. PERMIT REQUIREMENTS

Permits are required to ensure that proposed development projects meet the requirements of the NFIP and your ordinance. Once a person applies for a permit, you can review the plans and make sure the project complies.

Basic rule #2: A permit is required for all development in the SFHA shown on your FIRM.

The first step, therefore, is to get people to apply for a permit.

DEVELOPMENT PERMIT

44 CFR 59. *Definitions: "Development" means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.*

The NFIP requirements are keyed to "development" in the floodplain. "Development" means "any man-made change to improved or unimproved real estate." This includes, but is not limited to:

- Construction of new structures
- Modifications or improvements to existing structures
- Excavation
- Filling
- Paving
- Drilling
- Driving of piles
- Mining
- Dredging
- Land clearing
- Grading
- Permanent storage of materials and/or equipment
-

> ***44 CFR 60.3(a)(1)*** *["60.3(a) communities" that do not have a FIRM must] Require permits for all proposed construction or other development in the community, including the placement of manufactured homes, so that it may determine whether such construction or other development is proposed within flood-prone areas;*

If you are a 60.3(a) community, you do not have a FIRM. Consequently, you must require a permit for all development projects throughout your community.

You must review each project's location to determine if it has a flood risk. If it does, the best way to protect a new building from flood damage is to obtain a BFE for the site and require that the building be elevated or protected to or above that BFE.

Building permits

Most communities have long had a system for issuing building permits, but few have a permit system for "development." Regulating all development in floodplains is essential because fill or other material can obstruct flood flows just as structures can.

Because a "building permit" often covers only construction or modifications of buildings, this course uses the term "development permit." You should check your permit system to ensure that in the floodplain, permits are being required for *ALL* projects that meet the definition of development, not just "building" projects. Make sure you regulate the following in addition to the tradition building projects:

- Filling and grading.
- Excavation, mining and drilling.
- Storage of materials.
- Repairs to a damaged building that do not affect structural members.
- Temporary stream crossings
- Activities by other government agencies, such as roads, bridges and school buildings

If your building permit system does not require permits for these activities, you need to revise your system, enact a new type of "development permit" or otherwise ensure that people apply for a permit for these non-building projects.

Small projects

You have some discretion to exempt obviously insignificant activities from the permit requirement, such as planting a garden, farming, putting up a mailbox or erecting a flagpole. You may also want to exempt routine maintenance, such as painting or reroofing.

The key is whether the project will present a new obstruction to flood flows, alter drainage or have the potential to be a substantial improvement. These determinations can only be made by the permit official, not the builder, so make sure your exemptions are clear. There should be no possibility of a misunderstanding resulting in construction of a flood flow obstruction or a substantial improvement without a permit.

Some communities specifically exempt small projects in their ordinances. This is the recommended approach, as it avoids challenges that the permit official arbitrarily decides what projects need permits. Check with your state coordinating agency and/or FEMA Regional Office before you do this. You may be able to exempt projects (other than filling, grading or excavating) valued at less than, say, $500.

PERMITS FROM OTHER AGENCIES

44 CFR 60.3(a)(2) requires all NFIP communities to ensure that other federal and state permits have been obtained. You should not issue your local permit until you are certain that the other agencies' requirements are met.

Some communities allow their permit officials to issue the local permit on the condition that other required permits are obtained. However, this is not as effective as holding the local permit until the applicant can show that the other agencies have issued or will issue their permits.

Otherwise, the project may get under way before you are sure that it meets all legal requirements.

To implement this requirement, you're encouraged to develop a list of what permits are required in your jurisdiction. Your state NFIP coordinator should be able to help.

These development activities may require a state permit:

- Construction in the coastal zone.
- Construction in floodways or other designated areas.
- Stream crossings or projects that affect navigable rivers.
- Installation of septic systems.
- Subdivision standards or subdivision plat or lot filing requirements.
- Manufactured housing (mobile home) park or tie-down requirements.
- Public health facilities, such as hospitals and nursing homes.
- Alteration of sand dunes.
- Operating a landfill or hazardous materials storage facility.

The more common federal regulations that may require a permit include:

- U.S. Army Corps of Engineers Section 404—permits for wetlands filling
- U.S. Army Corps of Engineers Section 10—permits for work in navigable waterways
- U.S. Coast Guard—permits for bridges and causeways that may affect navigation.
- U.S. Fish and Wildlife Service—consultations required under Sections 7 and 10 of the Endangered Species Act of 1973.

You should also check with your county; sewer, sanitary or flood control district; water management district; and any other local or regional agency that may regulate certain types of development in the floodplain.

D. ENCROACHMENTS

Once a permit application is received and the proposed project is ready for review, the next job is to ensure that the project will not impose flood problems on other properties.

Basic rule #3: Development must not increase the flood hazard on other properties.

This is more of a concern in riverine situations where a project may dam or divert flowing water onto other properties or increase flood flows downstream. To prevent this, communities adopt floodways to designate those areas where flood flows are most sensitive to changes brought by development.

Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided BFEs, but no floodway has been designated, the community must review developments on a case-by-case basis to ensure that these increases do not occur.

REGULATORY FLOODWAYS

44 CFR 59.1 *Definitions: "Regulatory floodway" means 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 cumulatively increasing the water surface elevation more than a designated height.*

As explained in Unit 3, Section B, the floodway is the central portion of a riverine floodplain needed to carry the deeper, faster moving water. Buildings, structures and other development activities—such as fill—placed within the floodway are more likely to obstruct flood flows, causing the water to slow down and back up, resulting in higher flood elevations.

A floodway map is included with most riverine Flood Insurance Studies. The community officially adopts its “regulatory floodway” in its floodplain management ordinance.

ENCROACHMENT REVIEW

All projects in the regulatory floodway must undergo an encroachment review to determine their effect on flood flows and ensure that they do not cause problems. Development projects in the flood fringe by definition do not increase flood heights above the allowable level, so encroachment reviews are not needed.

44 CFR 60.3(d)(3): *[In the regulatory floodway, communities must] Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.*

The objective of this requirement and the floodplain management ordinance to ensure that the floodway is reserved to do its natural job: carrying floodwater. The preferred approach is to avoid all development there.

Once your community adopts its floodway, you must fulfill the requirements of 44 CFR 60.3(d). The key concern is that each project in the floodway must receive an encroachment review, i.e., an analysis to determine if the project will increase flood heights or cause increased flooding downstream. Note that the regulations call for preventing ANY increase in flood heights. This doesn't mean you can allow a foot or a tenth of a foot – it means zero increase.

Projects, such as filling, grading or construction of a new building, must be reviewed to determine whether they will obstruct flood flows and cause an increase in flood heights upstream or adjacent to the project site.

Projects, such as such as grading, large excavations, channel improvements, and bridge and culvert replacements, should also be reviewed to determine whether they will remove an existing obstruction, resulting in increases in flood flows downstream.

Your community may conduct the encroachment review, or you may require the developer to conduct it. Most local permit officials are not qualified to make an encroachment review, so most require that this be done by an engineer at the developer's expense.

As the permit reviewer, it is the community's job to ensure that an activity will not cause a problem. You have two options for doing this: For every project you could require the applicant's engineer to certify that there will be no rise in flood heights or you can make the determination for minor projects.

Encroachment certification: To ensure that the encroachment review is done right, you may want to require the developer to provide an encroachment certification. This is often called a "no-rise" certification because it certifies that the development project will not affect flood heights. An example of a form developed by the North Carolina state coordinating agency is shown in Figure 5-5.

The certification must be supported by technical data, which should be based on the same computer model used to develop the floodway shown on the community's map.

"NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of _____

It is further to certify that the attached technical data supports the fact that proposed _____ (Name of Development) will not impact the 100-year flood elevations, floodway elevations, or floodway widths on _____ ___ (Name of Stream) at published sections in the Flood Insurance Study for ___ _____ (Name of Community) dated _____ (Study Date) and will not impact the 100-year flood elevations, floodway elevations, or floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

_____

_____

Date: _____

Signature: _____

Title:_____ {SEAL}

Figure 5-5: Example no-rise certification

Although your community is required to review and approve the encroachment review, you may request technical assistance and review from the FEMA Regional Office or state NFIP Coordinator. If this alternative is chosen, you must review the technical submittal package and verify that all supporting data are included in the package before sending it to FEMA.

Minor projects: Some projects are too small to warrant an engineering study and the certification. Many of these can be determined with logic: a sign post or telephone pole will not block flood flows. A driveway, road or parking lot at grade (without any filling) won't cause a problem, either.

Building additions, accessory buildings, and similar small projects can be located in the conveyance shadow. This is the area upstream and downstream of an existing building or other obstruction to flood flows. Flood water is already flowing around the larger obstruction, so the addition of a new structure will not change existing flood flow.

Determining the limits of the conveyance shadow is illustrated in Figure 5-6. Small structures located completely within the shadow can be permitted without the engineering analysis needed for a no-rise certification.

Note: Just because a small structure can be located in the conveyance shadow, it is still preferable to keep all development out of the floodway. Don't forget: all buildings must be elevated or otherwise protected from the base flood.

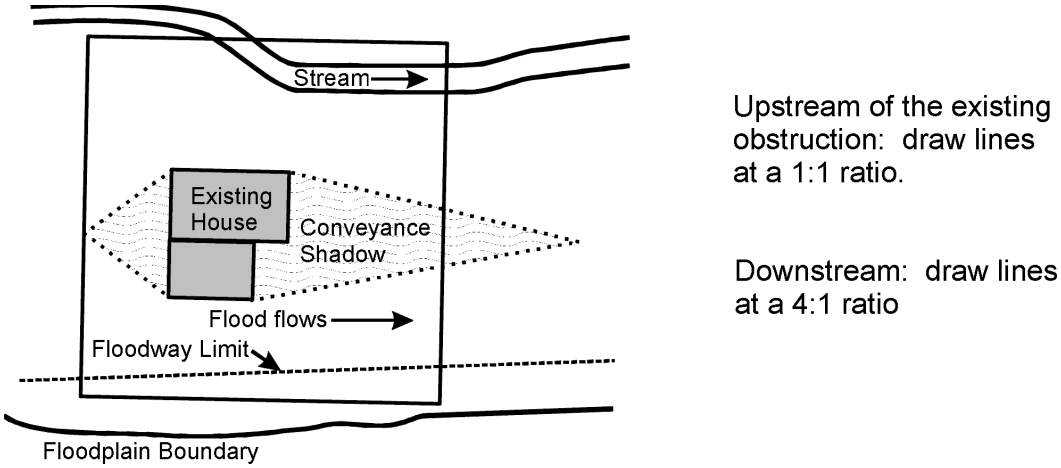


Figure 5-6. Determining the conveyance shadow

STREAMS WITHOUT FLOODWAY MAPS

If your community is subject to 44 CFR Section 60.3(c), you have a FIRM with base flood elevations but no mapped floodway. The following applies to you.

44 CFR 60.3(c)(10): *[Communities must] Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.*

For the purposes of administering your ordinance, you should treat the entire riverine floodplain as a floodway. You should require the same encroachment certification to ensure that a development project will not obstruct flood flows and cause increased flooding on other property. This approach is recommended for all other riverine floodplains without a mapped floodway.

In riverine floodplains where no floodway has been designated, the review must demonstrate that the *cumulative* effect of the proposed development, when combined with all other existing and anticipated development:

- Will not increase the water surface elevation of the base flood more than one foot at any point within the community, and
- Is consistent with the technical criteria contained in Chapter 5 (Hydraulic Analyses) of the Flood Insurance Study: Guidelines and Specifications for Study Contractors, FEMA-37, 1995.

This review must be required for all development projects that may create a one-foot increase in flood flows, such as bridges, road embankments, buildings and large fills.

Note: In some states, floodways are mapped based on allowing flood heights to increase by less than one foot. In those states, the encroachment certification must be based on that more restrictive state standard, not the FEMA standard that allows a one-foot rise.

ALLOWABLE INCREASES IN FLOOD HEIGHTS

In some situations, it may be in the public interest to allow increase in flood heights greater than those allowed under the NFIP regulations.

For example, it would be hard to build a flood control reservoir without affecting flood heights. Because a dam would have a major impact on flood heights, there needs to be a way to permit such projects, especially those that are intended to reduce flooding.

However, when the project will change the flood level, maps must be changed to reflect the new hazard.

> ***44 CFR 60.3(d)(4)*** *Notwithstanding any other provisions of § 60.3, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision, fulfills the requirements for such revisions as established under the provisions of § 65.12, and receives the approval of the Administrator.*

If your community proposes to permit an encroachment in the floodway or the floodplain that will cause increases in the BFE in excess of the allowable level, you're required to apply to the FEMA Regional Office for *conditional* approval of such action prior to permitting the project to occur.

As part of your application for conditional approval, you must submit:

- A complete application and letter of request for conditional approval of a change in the FIRM or a Conditional Letter of Map Revision (CLOMR), along with the appropriate fee for the change (contact the FEMA Regional Office for the fee amount).

- An evaluation of alternatives which, if carried out, would not result in an increase in the BFE more than allowed, along with documentation as to why these alternatives are not feasible.
- Documentation of individual legal notice to all affected property owners (anyone affected by the increased flood elevations, within and outside of the community) explaining the impact of the proposed action on their properties.
- Concurrence, in writing, from the chief executive officer of any other communities affected by the proposed actions.
- Certification that no structures are located in areas which would be affected by the increased BFE (unless they have been purchased for relocation or demolition).
- A request for revision of BFE determinations in accordance with the provisions of 44 CFR 65.6 of the FEMA regulations.

Upon receipt of the FEMA conditional approval of the map change and prior to approving the proposed encroachments, you must provide evidence to FEMA that your community's floodplain management ordinance incorporates the post-project condition BFEs.

LEARNING CHECK #2

1. What is basic rule #2 on what needs a permit in the floodplain?

2. Define “development” as the term is used in your ordinance.

3. Does your community only require building permits? If so, does someone who wants to fill a vacant lot need a permit from the community?

4. The State in which Flood County is situated requires a permit from the state Department of Environmental Protection for development on primary sand dunes. A permit applicant wants to build on one near Site F. Department staff informs you that based on the plans they have seen, they will have to deny the state permit. Should the Flood County permit officer issue a floodplain development permit?

5. What is Basic rule #3 as it relates to encroachments in riverine floodplains?

6. An encroachment review should review projects in a floodway for what two things?

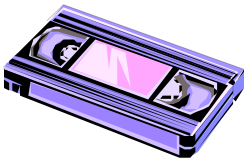
7. A farmer wants to build a dairy barn in the floodway. Will he need to provide you with a “no-rise” certification before you can issue the permit?

8. The same farmer wants to build a small addition onto his farmhouse (also in the floodway). Can this be designed so he won’t have to pay for an engineer’s encroachment review?

9. In a riverine AE Zone with a base flood elevation, what must a developer show in order to demonstrate that he is meeting Basic Rule #3?

10. Does your state have a more restrictive standard than allowing flood heights to increase by one foot?

E. NEW BUILDINGS IN A ZONES



VIDEO: *BEST BUILD: CONSTRUCTING IN A RIVERINE FLOODPLAIN*

Before continuing, please view the 23-minute video segment on construction techniques along rivers and streams. Called *Best Build II: Constructing in a Riverine Floodplain*, it is on the second videotape included in the course materials. Do not rewind the tape.

Note: The NFIP rules have changed since this video was made. It shows a garage door being used as an opening to allow water under the elevated building. This is no longer allowed – all openings must be permanent or automatic. Allowable openings could include vents in garage doors, but cannot include doors that need a person present to open them.

Basic rule #4: New, substantially improved or substantially damaged buildings must be protected from damage by the base flood.

BUILDINGS

In this course, the term "building" is the same as the term "structure" in the NFIP regulations. Your ordinance may use either term.

> ***44 CFR 59.1*** *Definitions: "Structure" means, for flood plain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.*

The term "building" or "structure" does not include open pavilions, bleachers, carports and similar structures that do not have at least two rigid walls and a roof.

How to determine if a building is substantially improved or substantially damaged is discussed in Unit 8. In this unit, consider the term "building" as an all-encompassing term that includes substantial improvements and repairs of substantial damage to a building.

Residential and nonresidential buildings are treated differently. A residential buildings must have a higher level of protection—if it is to be built in the floodplain, it must be elevated above the BFE. Nonresidential buildings, on the other hand, may be elevated or floodproofed.

ELEVATION

> ***44 CFR 60.3(c)(2)*** *[Communities must] Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level…*

In Zones A1-A30, AE and AH, all new construction and substantial improvements of residential structures must be elevated so that the lowest floor (including the basement) is elevated to or above the BFE. This can be done in one of three ways:

- Elevation on fill.
- Elevation on piles, posts, piers or columns.
- Elevation on walls or a crawlspace.

Fill

NFIP regulations allow fill to be used, but restrictions apply in floodways where fill would cause an increase in flood heights.

Many communities also limit the use of fill in the flood fringe to protect flood storage capacity or require compensatory storage, which is discussed in Unit 6, Section C.

Where fill is the method of choice, it should be properly designed, installed in layers and compacted. Simply adding dirt to the building site may result in differential settling over time.

The fill should also be properly sloped and protected from erosion and scour during flooding. To provide a factor of safety for the building and its residents, it is recommended that the fill extend 10 – 15 feet beyond the walls before it drops below the BFE.

Figure 5-7. These two new buildings elevated on fill were not damaged by this 100-year flood.

Piles, posts, piers or columns

Piles, piers, posts or columns are appropriate where there is deeper flooding and fill is not feasible. Where flooding is likely to have high velocities or to create waves, elevation with no lower area enclosure is preferred. As illustrated in Figure 5-8, this permits unrestricted flow of floodwater under buildings and causes little, if any, impact on flood heights.

Figure 5-8. Elevation on piers

Walls or crawlspace

The third elevation technique is to build on solid walls. In shallower flooding areas, this elevation technique is the same as creating a crawlspace—a foundation of solid walls that puts the lowest floor above the flood level.

When solid walls are used, care must be taken to ensure that hydrostatic or hydrodynamic pressure does not damage the walls. As discussed in Unit 1, Section B, these water pressures can break a solid wall.

There are two ways to prevent this:

- Stem walls can be used on two sides parallel to the flow of water. The other two sides are kept open (Figure 5-9). This minimizes the obstruction to floodwaters and lessens pressure on the foundation.
- The walls can have openings large enough to allow floodwaters to flow in and out, preventing differential pressures on the walls. This is discussed in more detail in the later section on enclosures.

Figure 5-9: Building elevated on parallel stem walls.

Figure 5-10: Building elevated on crawlspace with openings.

How high?

NFIP regulations require that the lowest floor of a building must be elevated above the BFE. Note three things about this minimum requirement:

1. The term "lowest floor" includes a basement because all usable portions of a building must be protected from flood damage.

44 CFR 59.1. *Definitions: "Lowest Floor" means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of section 60.3.*

2. The minimum requirement is to elevate to the BFE. In the next unit, we will discuss freeboard, an extra margin of protection that requires the lowest floors to be one or more feet above the BFE.

3. In A Zones, under the minimum NFIP requirement, the lowest floor is measured from the top of the floor (Figure 5-11). However, it is recommended that buildings on elevated foundations, such as piles or a crawlspace, have supporting beams or floor joists above the BFE to protect them from flood damage.

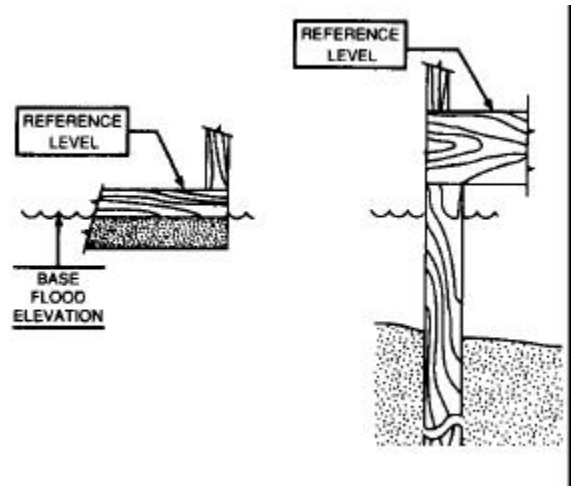


Figure 5-11. In A Zones: the top of the floor is the reference level

Elevation Certificate

Because most new buildings built in the floodplain are residences, elevating them is one of the most important requirements of the NFIP. To ensure that a building is elevated above the BFE, the lowest floor is surveyed and a surveyor's elevation certificate is obtained and kept by the local permit office. This is discussed in more detail in Unit 7, Section G.

ENCLOSURES

Enclosures are areas created by a crawlspace or solid walls below the BFE. They deserve special attention for two reasons:

- The walls of enclosed areas are subject to flood damage from hydrostatic and hydrodynamic forces.
- People are tempted to convert floodable enclosures into areas that can sustain damage in a flood.

Does an enclosure under an elevated floor just go to waste? It need not.

NFIP regulations allow certain uses in enclosures below the BFE because they are subject to minimal flood damage. Three uses are allowed:

- building access
- vehicle parking
- storage.

The floodplain regulation requirements can be easier to accept if owners and builders are encouraged to think about the enclosed lower areas as usable space. If a building has to be elevated, say, five feet above grade, the owner should be encouraged to go up eight feet. This allows the lower area to be used for parking—and provides three extra feet of flood protection.

However, if the lower area is enclosed, there is a tendency for the owner to forget about the flood hazard and convert the enclosure to a bedroom or other finished room. This must be prevented.

The lower area on an elevated building must be floodable—it must be built of flood-resistant materials (see the next section on what materials are acceptable). Not allowed are finishings such as carpeting, paneling, insulation (both cellulose and fiberglass) and gypsum wallboard (also known as drywall).

Utilities that serve the upper level also must be protected from flood damage. Consequently, a furnace cannot be put in an enclosure unless it is above the BFE. This is explained in more detail in *Engineering Principles and Practices for Flood Damage-Resistant Building Support Utility Systems*, which is due to be published in late 1998.

The lower area must provide access to the upper level. A stairway can easily be designed that provides access yet is resistant to flood damage. Installing an elevator is tricky, but there are ways to design and install an elevator that will face minimal flood damage, as explained in *Elevator Installation for Buildings Located in Special Flood Hazard Areas*, FIA-TB-4, FEMA 1993.

Openings

As noted in Unit 1, solid walls can collapse if floodwaters get too deep. To prevent this, the enclosure must have openings to allow floodwaters to enter and leave, thus automatically equalizing hydrostatic flood forces on the walls.

You can be sure the openings are adequate by using one of two methods.

The first method is to require the builder to have the design certified by a registered professional engineer or architect.

44 CFR 60.3(c)(5) *[Communities must] Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.*

The second method is to have the design meet or exceed the following three criteria:

1. The bottom of the openings must be no higher than one foot above grade (see Figure 5-12).

2. The openings should be installed on at least two walls of the enclosure to ensure that at least one will work if others get blocked or plugged.

3. Provide a minimum of two openings having a net area of not less than one square inch for every square foot of enclosed area that is subject to flooding. If the area of the enclosure is 1,000 square feet, the area of the openings combined must total at least 1,000 square inches.

   A standard crawlspace vent for block walls is 8” x 16” or 128 square inches (see Figure 5-12). To determine how many would be needed, divide the square footage of the floor area by 128.

   Example 1: $\frac{\text{1,280 square foot house}}{\text{128 square inches/vent}} = 10$ 10 vents will be needed

   Example 2: $\frac{\text{2,000 square foot house}}{\text{128 square inches/vent}} = 15.62$ 16 vents will be needed

Openings may be equipped with screens, louvers, valves or other coverings or devices to keep animals out of the enclosure. However, any covering must permit the automatic flow of floodwater in both directions.

The opening sizes in the previous examples and in Figure 5-12 are based on standard crawlspace vents, which most building codes require to be installed in a crawlspace for ventilation purposes. Often these are located close to the floor in order to circulate air around the floor joists.

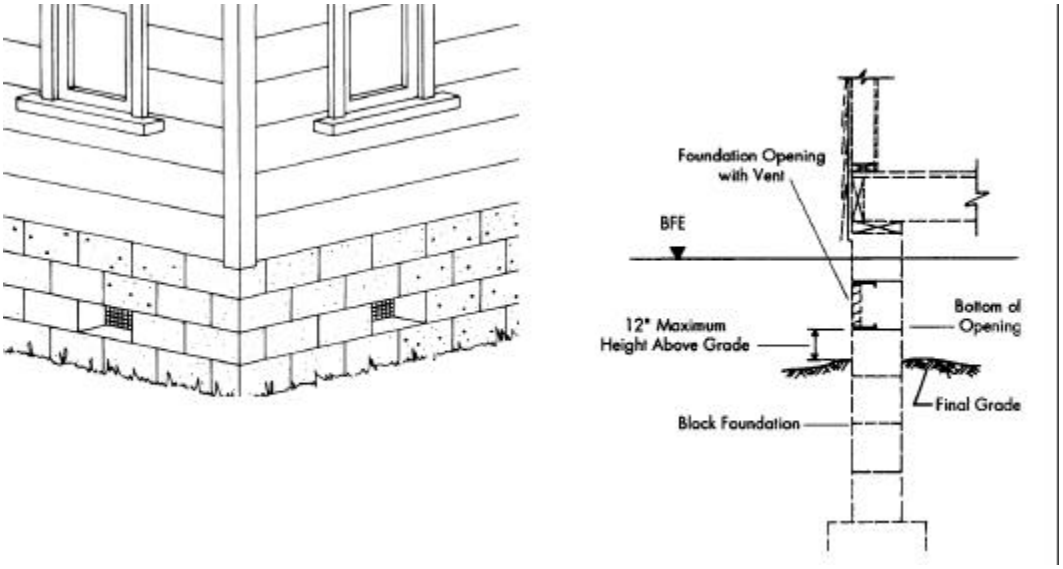


Figure 5-12. Opening location in solid foundation wall

Such vents are well above the ground in an elevated house and would not meet the NFIP requirement that the bottom of the opening be within one foot of grade. However, NFIP requirements and building codes can be satisfied by the same vents if they meet the three criteria listed above.

Garage doors cannot be used to satisfy this requirement because they do not permit the automatic flow of floodwaters. However, garage doors may have vents in them that meet the above criteria.

Openings are not required for stem wall foundations that have been backfilled for pouring of a concrete floor slab.

For further guidance, refer to *Openings in Foundation Walls*, FIA-TB-1 (FEMA 1993).

Use

Enclosed areas must be floodable and used only for parking vehicles, storage or entry to a living area—uses that are subject to little flood damage.

The type of storage permitted in an enclosed lower area should be limited to that which is incidental and accessory to the principal use of the structure. For instance, if the structure is a residence, the enclosure should be limited to storage of lawn and garden equipment, snow tires, and other low damage items which can be conveniently moved to the elevated part of the building.

The interior portion of an enclosed area should not be partitioned or finished into separate rooms, except to enclose storage areas.

If a building is elevated eight feet or more, regulating the use of the enclosure presents special problems. Over time, the owner may forget the flood hazard and want to convert the floodable area into a finished room. Such an action would increase the flood damage potential for the building and violate the conditions of the building permit.

However, because the room is hidden behind walls, it can be very hard for the permit office to catch such a conversion. You should carefully check new building plans for signs, such as roughed in plumbing and sliding glass doors, that indicate that the owner may expect to finish the area in the future.

One way to help prevent conversions is to have the owner sign a nonconversion agreement. An example developed by the North Carolina State NFIP Coordinator is in Figure 5-13.

FLOODPROOFING

Nonresidential buildings must be elevated or floodproofed. If they are elevated, they must meet the same standards as for residential buildings that were just reviewed. Elevation is the preferred method because it is more dependable. Elevated commercial and industrial buildings can often be designed so that they can continue to operate during a flood reducing or eliminating business disruptions.

44 CFR 59.1. *Definitions: "Flood proofing" means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.*

44 CFR 60.3(c)(3) *[Communities must] Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH zones on the community's firm (i) have the lowest floor (including basement) elevated to or above the base flood level or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;*

44 CFR 60.3(c)(4) *[Communities must] Provide that where a non-residential structure is intended to be made watertight below the base flood level, (i) a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and (ii) a record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under §59.22(a)(9)(iii);*

This DECLARATION made this ___ day of _____, 19__, by _____ _____ ("Owner") having an address at _____ .

WITNESSETH:

WHEREAS, the Owner is the record owner of all that real property located at _____ in the City of _____ in the County of _____, designated in the Tax Records as _____.

WHEREAS, the Owner has applied for a permit or variance to place a structure on that property that either (I) does not conform, or (2) may be noncompliant by later conversion, to the strict elevation requirements of Article _____ Section _____ of the Floodplain Management Ordinance of _____ ("Ordinance") and under Permit Number _____ ("Permit").

WHEREAS, the Owner agrees to record this DECLARATION and certifies and declares that the following covenants, conditions and restrictions are placed on the affected property as a condition of granting the Permit, and affects rights and obligations of the Owner and shall be binding on the Owner, his heirs, personal representatives, successors and assigns.

UPON THE TERMS AND SUBJECT TO THE CONDITIONS, as follows:

1. The structure or part thereof to which these conditions apply is: _____ _____ .

2. At this site, the Base Flood Elevation is _____ feet above mean sea level, National Geodetic Vertical Datum.

3. Enclosed areas below the Base Flood Elevation shall be used solely for parking of vehicles, limited storage, or access to the building. All interior walls, ceilings and floors below the Base Flood Elevation shall be unfinished or constructed of flood resistant materials. Mechanical, electrical or plumbing devices shall not be installed below the Base Flood Elevation.

4. The walls of the enclosed areas below the Base Flood Elevation shall be equipped and remain equipped with vents as shown on the Permit.

5. Any alterations or changes from these conditions constitute a violation of the Permit and may render the structure uninsurable or increase the cost for flood insurance. The jurisdiction issuing the Permit and enforcing the Ordinance may take any appropriate legal action to correct any violation.

6. Other conditions: _____

_____

In witness whereof the undersigned set their hands and seals this _____ day of _____, 19 __.

_____ _____ (Seal)
Owner

_____ _____ (Seal)
Witness

Figure 5-13: Example Nonconversion agreement

For the purposes of regulating new construction, floodproofing is defined measures incorporated in the design of the building so that below the BFE:

- Walls are watertight (substantially impermeable to the passage of water),
- Structural components can resist hydrostatic and hydrodynamic loads and effects of buoyancy, and
- Utilities are protected from flood damage.

Most floodproofing is appropriate only where floodwaters are less than three feet deep, since walls and floors may collapse under higher water levels.

A registered professional engineer or architect must prepare the building plans and certify the floodproofing measures, preferably using the FEMA Floodproofing Certificate form. This is discussed in more detail in Unit 7, Section G.

Floodproofing techniques that require human intervention are allowed but should be discouraged. Human intervention means that a person has to take some action before the floodwater arrives, such as turn a valve, close an opening or switch on a pump. There are many potential causes of failure for these techniques, including inadequate warning time, no person on duty when the warning is issued, the responsible person can't find the right parts or tools, the person is too excited or too weak to install things correctly, and/or the electricity fails.

Before you approve plans for a building that relies on human intervention to be floodproofed, you should make sure that there are plans and precautions to keep such problems from occurring. Techniques that rely on human intervention should only be allowed in areas with adequate warning time and in situations where there will be someone present who is capable of implementing or installing the required measures.

More information on floodproofing can be found in FEMA's Technical Bulletin 3-93, *Non-Residential Floodproofing Requirements and Certification for Buildings Located in Special Flood Hazard Areas* (FIA-TB-3. 1993)

How high?

The minimum NFIP requirement is to floodproof a building *to the BFE*. However, when it is rated for flood insurance, one foot is subtracted from the floodproofed elevation. Therefore, a building has to be floodproofed *to one foot above the BFE* to receive the same favorable insurance rates as a building elevated to the BFE. Unit 9, Section B, discusses this in more detail.

BASEMENTS

The definition of the “lowest floor” includes basements and the definition of “basement” includes any floor level below grade.

> ***44 CFR 59.1*** *Definitions: "Basement" means any area of the building having its floor subgrade (below ground level) on all sides.*

Note that “walkout basements,” "daylight basements" or "terrace levels" are usually subgrade on only three sides, with the downhill side at or above grade. Thus, they are not considered basements for either floodplain management or flood insurance rating purposes (but they are still the lowest floor of a building for floodplain management and insurance rating purposes). If these areas are used only for parking, access, or storage and they meet other ordinance requirements, they can be regulated as enclosures below an elevated building and not be considered the lowest floor of the building.

On the other hand, cellars, the lower level of a split-level or bi-level house, garden apartments and other finished floors below grade are considered basements under NFIP regulations.

Since the lowest floor of a residential building must be above the BFE, the only way to build a residential basement in the floodplain is if it is elevated and surrounded by fill. Floodproofed non-residential basement are allowed, though.

A few communities have obtained exceptions to the NFIP regulations that allow them to permit floodproofed residential basements. The soil types and flooding conditions in these communities allow construction of floodproofed basements that are not subject to damage by hydrostatic or hydrodynamic forces.

A community may apply for an exception to allow floodproofed residential basements if it can demonstrate flood depths are less than five feet, velocities are less than five feet per second, there is adequate warning time for the site and it has appropriate construction requirements. This exception is explained in 44 CFR 60.6(c).

Buildings with floodproofed basements must have their design certified by a registered engineer or architect and are more difficult to construct than buildings elevated above the BFE. Improperly designed or constructed basements can collapse or otherwise fail resulting in major damage to the structure.

ANCHORING

> ***44 CFR 60.3(a)(3)*** *…If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy…*

Both elevated and floodproofed buildings must be properly anchored to stabilize them against flood forces. This means anchoring the building to its foundation and ensuring that the foundation won't move. Therefore, you need to make sure there is adequate protection against hydrostatic and hydrodynamic forces and erosion and scour that can undercut the foundation.

In areas of shallow flooding and low flood velocities, normal construction practices suffice. Additional anchoring measures, such as using extra bolts to connect the sill to the foundation or installing rods to connect the cap to the sill, should be required in three situations:

- Where the flood flows faster than five feet per second.
- In coastal areas subject to waves and high winds.
- In manufactured or mobile homes.

In some areas it may be necessary to use foundations such as piles or piers which provide less resistance to floodwaters.

If your community has any of these conditions, you should see if there are state standards that take these into account, such as state coastal construction or manufactured housing (mobile home) tie-down regulations. If not, it is recommended that the builder's architect or engineer sign a statement saying the design of the building includes "anchoring adequate to prevent flotation, collapse and lateral movement" during the base flood.

FLOOD-RESISTANT MATERIAL

Whether a building is elevated or floodproofed, it is important that all parts exposed to floodwaters be made of flood-resistant materials (Figure 5-14).

> ***44 CFR 60.3(a) (3)*** *…If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (ii) be constructed with materials resistant to flood damage…*

"Flood-resistant materials" include any building product capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage. "Prolonged contact" means at least 72 hours, and "significant damage" is any damage requiring more than low-cost cosmetic repair (such as painting).

- Concrete, concrete block or glazed brick
- Clay, concrete or ceramic tile
- Galvanized or stainless steel nails, hurricane clips and connectors (in areas subject to saltwater flooding)
- Indoor-outdoor carpeting with synthetic backing (do not fasten down)
- Vinyl, terrazzo, rubber or vinyl floor covering with waterproof adhesives.
- Metal doors and window frames.
- Polyester-epoxy paint (do not use mildew-resistant paint indoors, especially on cribs, playpens or toys because it contains an ingredient that is toxic)
- Stone, slate or cast stone (with waterproof mortar)
- Mastic, silicone or polyurethane formed-in-place flooring. Styrofoam insulation
- Water-resistant glue
- Pressure treated (.40 CCA minimum) or naturally decay resistant lumber, marine grade plywood

Figure 5-14: Flood-resistant materials

For further details on flood-resistant material requirements, refer to FEMA Technical Bulletin 2-93, *Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*.

ACCESSORY STRUCTURES

Certain accessory structures may not qualify as "buildings." For example, open structures, such as gazebos and picnic pavilions that do not have at least two rigid walls, are not "buildings" and do not have to be elevated or floodproofed.

In some cases, low-cost accessory buildings may not have to be elevated or dry floodproofed. These structures would include detached garages, boathouses, small pole barns and storage sheds. Such structures must meet these three requirements:

- The owner must obtain a variance (contact your FEMA Regional Office on procedures for this type of variance),
- The building has the required openings to allow floodwaters in, and
- The building is <u>wet</u> <u>floodproofed</u>.

Wet floodproofing involves using flood-resistant materials below the BFE and elevating things subject to flood damage above the BFE. Items that can be in-

stalled above the BFE include electrical boxes, switches and outlets. Only the minimum amount of electrical equipment required by code may be located below the BFE, and that equipment must be flood damage resistant.

For additional guidance, see *Wet Floodproofing Requirements*, FIA-TB-7, FEMA 1994, and *Engineering Principles and Practices for Flood Damage-Resistant Building Support Utility Systems*, (due to be published in late 1998).

MANUFACTURED HOMES

> ***44 CFR 59.1*** *Definitions: "Manufactured home" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle".*

A manufactured home includes a building that is transportable, a mobile home or a "double wide" under the NFIP regulations.

Elevation

Generally, manufactured homes must meet the same flood protection requirement as "stick built" or conventional housing. Since they are usually residential buildings, they must be elevated so the lowest floor is above the BFE.

> ***44 CFR 59.1*** *Definitions: "Manufactured home park or subdivision" means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.*
>
> ***44 CFR 60.3(c)(12****) Require that manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A-1-30, AH, and AE on the community's FIRM that are not subject to the provisions of paragraph (c)(6) of this section be elevated so that either (I) the lowest floor of the manufactured home is at or above the base flood elevation, or (ii) the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.*

44 CFR Section 60.3(c)(12) allows for a limited exemption to elevating to the BFE in pre-FIRM manufactured housing (mobile home) parks. In such older parks, a newly placed manufactured home chassis may be elevated only three feet above grade provided it "is supported by reinforced piers or other foundation elements of at least equivalent strength."

This exemption does not apply to new manufactured housing (mobile home) parks, expansions to existing parks, to manufactured housing located outside a pre-FIRM park, or to repairing or replacing a manufactured home in a pre-FIRM park substantially damaged by a flood.

This exemption is a compromise that tries to balance the flood hazard against the severe economic impacts on some manufactured home park owners that would result if elevation to the BFE were required. The exemption may not be necessary or appropriate for your community, especially if manufactured home parks are able to meet the requirement to elevate to the BFE. In other areas, the flood hazard may be so severe that the exemption may put lives and property at too great a risk. Many states have not included this exemption in their model ordinances and it may not be in your regulations.

Anchoring

> *44 CFR 60.3(c)(6) …[Manufactured homes must] be elevated on a permanent foundation … and be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement.*

A "permanent foundation" means more than a stack of concrete blocks. It should include a below-grade footing capable of resisting overturning, the depth needs to account for frost depth and expected scour, the footing must be sized appropriately for the site's soil bearing capacity, and the design needs to account for seismic and other hazards.

The following types of permanent foundations should be used:

- Reinforced piers,
- Posts,
- Piles,
- Poured concrete walls,
- Reinforced block walls, or
- Compacted fill.

"Adequately anchored" means a system of ties, anchors and anchoring equipment that will withstand flood and wind forces. The system must work in saturated soil conditions. Usually this means over-the-top or frame tie-downs in addition to standard connections to the foundation.

Most states have manufactured home tie-down regulations. Check with your state NFIP coordinator to see if your state's regulations also meet the NFIP anchoring standard. If so, you need only make sure that the state requirement is met for each new manufactured home installed in your floodplain.

If not, see FEMA's *Manufactured Home Installation in Flood Hazard Areas*, FEMA-85, for additional guidance on anchoring.

The anchoring requirement does apply in an existing (pre-FIRM) manufactured housing or mobile home park. Even if not elevated above the BFE, the owner must still certify that the anchoring system will still withstand the forces of a flood over the first floor.

Evacuation: In some areas, there is adequate warning time to remove a manufactured home from harm's way. Protecting such property should not be discouraged, so FEMA allows an evacuated manufactured home to be put back on the original site without having to meet the requirements for siting a new building. An existing manufactured home can be returned after an evacuation without being elevated provided it is not enlarged or altered.

RECREATIONAL VEHICLES

> ***44 CFR 59.1*** *Definitions: "Recreational vehicle" means a vehicle which is:*
>
> *(a) built on a single chassis;*
>
> *(b) 400 square feet or less when measured at the largest horizontal projection;*
>
> *(c) designed to be self-propelled or permanently towable by a light duty truck; and*
>
> *(d) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.*

A recreational vehicle placed on a site in an SFHA must:

- Meet the elevation and anchoring requirements for manufactured homes,
- Be on the site for fewer than 180 consecutive days, OR
- Be fully licensed and ready for highway use. "Ready for highway use" means that it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and has no permanently attached additions.

The purpose of this requirement is to prevent recreational vehicles from being permanently placed in the floodplain unless they are as well protected from flooding as a manufactured home.

AO AND AH ZONES

AO Zones are shallow flooding areas where FEMA provides a base flood depth. Since there is no BFE, the rules read a little differently.

All new construction and substantial improvements of residential structures shall have the lowest floor (including basement) elevated above the highest adjacent grade:

- At least as high as the depth number specified in feet on the community's FIRM, or
- At least two feet if no depth number is specified.

All new construction or substantial improvements of nonresidential structures shall meet the above requirements or, together with attendant utility and sanitary facilities, be floodproofed to the same elevation.

AH Zones are sheet flow areas. In AO and AH Zones, adequate drainage paths are required around structures on slopes to guide floodwater around and away from proposed structures. (Requiring this throughout the community is a good idea, as it will prevent local drainage problems from causing surface flooding.)

A99 AND AR ZONES

An A99 Zone is an SFHA that will be protected by a Federal flood control project that is currently under construction and which meets specified conditions.

An AR Zone is an SFHA that used to be a B, C or X Zone that used to be protected by an accredited flood control system. The system has been decertified but is in the process of being restored to provide protection to the base flood level.

When the flood control systems are completed or restored, the areas in A99 and AR Zones are expected to be remapped and taken out of the SFHA. Until then, they are treated as SFHA for insurance purposes and there are some floodplain management requirements.

A99 and AR Zones are special situations—few exist. If you have one, you should contact your state NFIP coordinating agency or FEMA Regional Office for guidance on regulatory requirements for you situation.

LEARNING CHECK #3

1. What does Basic rule #4 say about new buildings in A Zones?

2. Where would elevation on piles or columns be preferred?

3. Can a basement be considered the “lowest floor?”

4. If a residence is elevated above the BFE in an A Zone, where do you measure how high the building is?

5. What can be allowed under the lowest floor of an elevated building?

6. Mr. Jones shows you plans for a house elevated on a concrete block crawl-space. The area of the crawlspace will be 1,750 square feet.

   a. How many standard 8” x 16” vents will be needed?

   b. How high can they be above ground level?

   c. Can Mr. Jones put his hot water heater in the crawlspace?

7. Mrs. Smith is elevating a house in the AE Zone 8’ above grade. How can you make sure that the area below the lowest floor won’t be improved, finished or otherwise turned into living space?

8. What three things do you need to check for to ensure that a building is flood-proofed?

9. Can a new home in the flood fringe be floodproofed?

10. What’s the NFIP definition of “basement?”

11. If a building is proposed to be located in a riverine floodplain with flood velocities of 12 –15 feet per second, what should you ask the builder to provide to assure you that the building won’t get washed away during a flood?

12. The builder of a house to be elevated on concrete columns wants to use wood for the stairway. He is concerned that wood will swell and warp if it gets wet during a flood. Can a portion of the house below the BFE be built of wood?

13. How is a manufactured home outside of a manufactured housing park treated differently from a conventional “stick built” home?

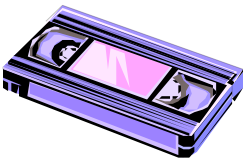
14. How is a 600 square foot motor home that is permanently attached to a reinforced block wall foundation treated differently from a manufactured home?

F. NEW BUILDINGS IN V ZONES

Zones V1-30, VE and/or V identified on FIRMs designate high hazard areas along coastlines that are subject to high water levels and wave action from strong storms and hurricanes. The winds, waves and tidal surges associated with these storms cause water of high velocity to sweep over nearby land. Many V Zones are also subject to erosion and scour which can undercut building foundations.

Basic rule #5: V Zones have special building protection standards in addition to the requirements for A Zones.

This section identifies only those building protection requirements that differ from the A Zone criteria. Unless mentioned in this section, all A Zone standards apply for new and substantially improved buildings in V Zones.



VIDEO: *BEST BUILD: CONSTRUCTING A SOUND COASTAL HOME*

Before continuing, please view the 20-minute video segment on construction techniques in coastal areas. Called *Best Build I: Constructing a Sound Coastal Home*, it is on the second videotape included in the course materials. Do not rewind the tape.

BUILDING LOCATION

New or substantially improved buildings in V Zones cannot be over water. They must be located landward of mean high tide. In fact, it's best to be as far back from the shore as possible in order to avoid the more dangerous areas subject to waves and erosion.

Avoid areas of sand dunes and mangroves. Human alteration of sand dunes and mangrove stands within V Zones is prohibited unless it can be demonstrated that such alterations will not increase potential flood damage.

Both of these natural features are protected against alteration because they are important first lines of defense against coastal storms and can do much to reduce losses to inland coastal development.

Generally, you can assume that any removal or other alteration of a sand dune will increase flood damage. The burden should be placed on the permit applicant to demonstrate that this will not occur. This will require a report by a coastal engineer or geologist.

ELEVATION ON PILES OR COLUMNS

All new construction and substantial improvements to buildings in V Zones must be elevated on pilings, posts, piers or columns.

> ***44 CFR 60.3(e)(4)*** *[The community must] Provide that all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level…*

Elevation—on fill, solid walls or crawlspaces—and floodproofing are prohibited because these techniques present obstructions to wave action. The force of a breaking wave is so great that these types of foundations would be severely damaged, resulting in collapse of the building.

Construction on piles or columns allows waves to pass under the building without transmitting the full force of the waves to the building's foundation. A special case is made for installing breakaway walls between the pilings or columns, but such walls are not supporting foundation walls.

While fill is not allowed for structural support for buildings within V Zones because of the severe erosion potential of such locations, limited fill is allowed for landscaping, local drainage needs, and to smooth out a site for an unreinforced concrete pad.

How high? Within V Zones, the controlling elevation is the bottom of the lowest horizontal structural member of the lowest floor. (In comparison, within A Zones, the controlling elevation is the *top* of the lowest floor.) This is to keep the entire building above the anticipated breaking wave height of a base flood storm surge.

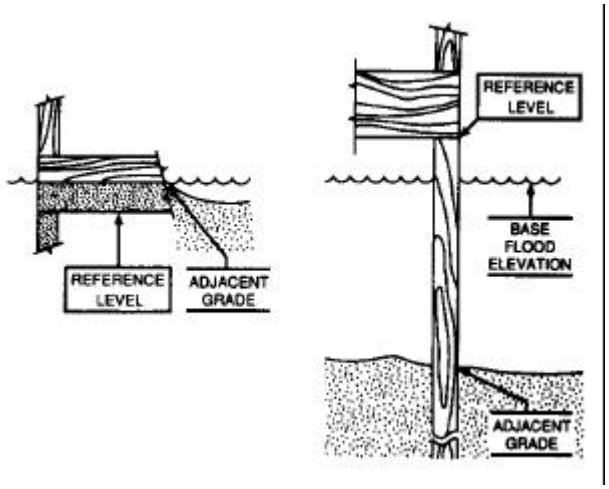


Figure 5-15: In V Zones, the lowest floor is measured from the bottom of the lowest horizontal structural member

Wind and water loads

The design of the supporting foundation must account for wind loads in combination with the forces that accompany the base flood. As noted in the video, cross bracing and proper connections are key to this.

> ***44 CFR 60.3(e)(4)*** *…(ii) [The community must ensure that] the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of (e)(4)(i) and (ii) of this section.*

Posts of wood, steel, or pre-cast concrete are preferred over block columns and similar foundations that are less resistant to lateral forces. Pilings are preferred in areas subject to erosion and scour, but it is critical that they be embedded deep enough (Figure 5-16).

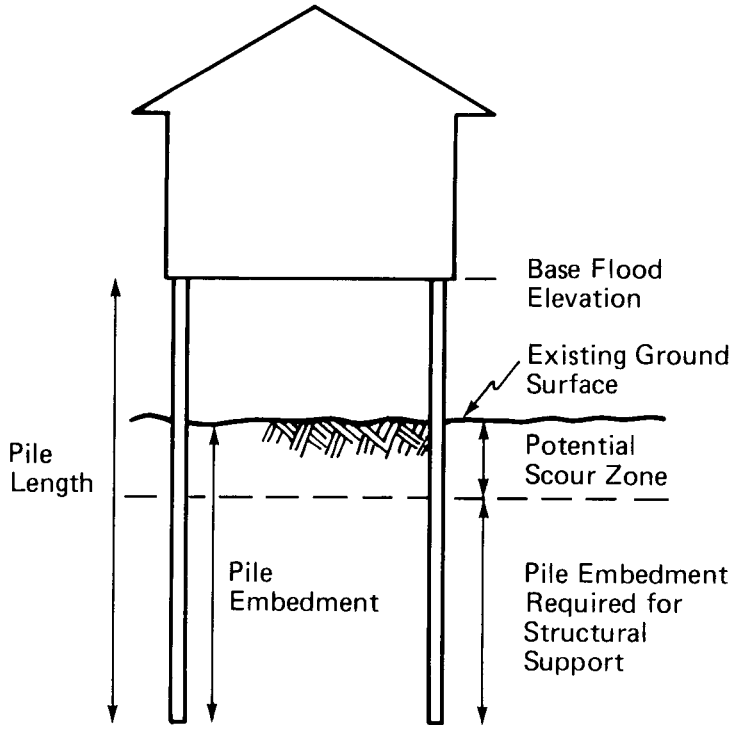


Figure 5-16: Piles must be embedded well below the scour depth

Figure 5-17: This house had inadequate pile embedment and cross bracing

Certification

A registered professional engineer or architect must develop or review the structural design, specifications and plans for the construction, and certify that the design and planned methods of construction are in accordance with accepted standards of practice for meeting the above provisions.

You must maintain a copy of the engineer's or architect's certification in the permit file for all structures built or substantially improved in the V Zone.

The North Carolina Division of Emergency Management has prepared a V-Zone certification form (Figure 5-18) to ensure that these requirements are met. This is provided as an example. Check with your state NFIP coordinator to see if your state has developed a V Zone certification form.

BREAKAWAY WALLS

Any walls below the lowest floor in a building in a V Zone should give way under wind and water loads without causing collapse, displacement or other damage to the elevated portion of the building or the supporting pilings or columns.

Any enclosed space below the lowest floor must be free of obstruction, or constructed with nonsupporting breakaway materials such as open wood latticework or insect screening. Just as in A Zones, this space is to be used solely for parking of vehicles, building access or storage, and must be constructed of flood-resistant material.

44 CFR 60.3(e)(5) *[The community must] Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:*

Solid breakaway wall panels are allowed, as are garage doors that meet the same breakaway requirements.

The area enclosed by solid breakaway walls should be limited to less than 300 square feet because:

- Flood insurance rates increase dramatically for enclosures larger than 300 square feet.
- Larger areas encourage conversion to habitable living areas, which are difficult to detect and enforce as violations.

For further information see *Coastal Construction Manual*, FEMA-55 (1986), and *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*, FIA-TB-5 (FEMA 1993).

V-Zone Certification

Property Information	For Insurance Company Use
Name of Building Owner	Policy Number
Building Address or Other Description	
City	State Zip Code

SECTION I: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Note: to be obtained from appropriate FIRMs

Community Number	Panel Number	Suffix	Date of FIRM Index	FIRM Zone

SECTION II: ELEVATION INFORMATION

Note: This form is not a substitute for an Elevation Certificate. Elevations should be rounded to nearest tenth of a foot.

1. Elevation of the Bottom of Lowest Horizontal Structure Member ..... _____ feet
2. Base Flood Elevation ..... _____ feet
3. Elevation of Lowest Adjacent Grade ..... _____ feet
4. Approximate Depth of Anticipated Scour/Erosion Used for Foundation Design ..... _____ feet
5. Embedment Depth of Pilings or Foundation Below Lowest Adjacent Grade ..... _____ feet
6. Datum Used: _____ NGVD '29 _____ NAVD '88 _____ Other

SECTION III: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Note: This section must be certified by a registered professional engineer or architect

I certify that I have developed or reviewed the structural design, plans and specifications for construction and that the methods of construction to be used are in accordance with accepted standards of practice for meeting the following provisions:

a) The bottom of the lowest horizontal structure member of the lowest floor (excluding the pilings or columns) is elevated to or above the BFE; and,

b) The pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of the wind and water loads acting simultaneously on all building components. Water loading values used are those associated with the base flood including wave action. Wind loading values used are those required by the applicable State or local building code. The potential for scour and erosion at the foundation has been anticipated for conditions associated with the flood, including wave action.

SECTION IV: FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Note: This section must be certified by a registered professional engineer or architect

I certify that I have developed or reviewed the structural design, plans and specifications for construction and that the design and methods of construction to be used for the breakaway walls are in accordance with accepted standards of practice for meeting the following provisions:

c) Breakaway collapse shall result from water load less than that which would occur during the base flood; and,

d) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (wind and water loading values defined in Section III)..

SECTION V: CERTIFICATION

(Check: Section III ____ and/or Section IV _____)

Name of Certifier	Title	
Firm Name		License Number
Street Address		Phone Number ( )
City	State	Zip Code
Signature		Date

Figure 5-18: Sample V Zone certification

G. OTHER REQUIREMENTS

The primary thrust of the NFIP regulations is to protect insurable buildings and reduce future exposure to flood hazards. However, there are some additional requirements that help ensure that the buildings stay habitable and additional flood problems are not created.

SUBDIVISIONS

As noted in Section B of this unit, once you obtain base flood elevations for a subdivision or other large development, new buildings must be properly elevated or floodproofed. These developments must also be reviewed to ensure their infrastructure is reasonably safe from flood damage.

> ***44 CFR 60.3(a)(4)*** *[The community must] Review subdivision proposals and other proposed new development including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a floodprone area, any such proposals shall be reviewed to assure that (i) all such proposals are consistent with the need to minimize flood damage within the floodprone area, (ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and (iii) adequate drainage is provided to reduce exposure to flood hazards;*

This review applies to subdivisions and other development, such as apartments, parks, shopping centers, schools and other projects.

If one is floodprone, the builder should:

- Minimize flood damage by locating structures on the highest ground.
- Have public utilities and facilities located and constructed so as to minimize flood damage.
- Provide adequate drainage for each building site.

The site plans of new development and proposed plats for subdivisions can usually be designed to minimize the potential for flood damage while still achieving the economic goals of the project. For example, lot size could be reduced and the lots clustered on high ground, with homesites having views of the floodplain.

WATER AND SEWER SYSTEMS

> ***44 CFR 60.3(a)(5)*** *[The community must] Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and*

> ***44 CFR 60.3(a)(6)*** *[The community must] Require within flood-prone areas (i) new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and (ii) onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.*

The objective of these requirements is to ensure that a building that is protected from flood damage can still be used after the flood recedes.

In most instances, these criteria can be met through careful system design. Manholes should be raised above the 100-year flood level or equipped with seals to prevent leakage. Pumping stations should have electrical panels elevated above the BFE.

On-site waste disposal systems should be located to ensure they are accessible during a flood, and that they will not release contamination in a flood. The first objective should be to locate the system outside the flood hazard area, if that is feasible. At a minimum, an automatic backflow valve should be installed to prevent sewage from backing up into the building during flooding.

WATERCOURSE ALTERATIONS

> ***44 CFR 60.3(b)(6)*** *[The community must] Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the [Federal Insurance] Administrator;*

The community must notify adjacent communities and the appropriate state agency prior to altering or relocating any river or stream within its jurisdiction. Copies of such notifications must be submitted to the FEMA Regional Office.

> ***44 CFR 60.3(b)(7)*** *[The community must] Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained;*

Any alteration or relocation of a watercourse should not increase the community's flood risks or those of any adjacent community. This could happen if the watercourse's capacity to carry flood flow is reduced because a smaller or less-efficient channel is created, or by modifications to the floodway as a result of the project.

After altering a watercourse, the developer has created an artificial situation and must assume responsibility for maintaining the capacity of the modified channel. Otherwise, flooding is likely to increase as the channel silts in, meanders or tries to go back to its old location.

For any significant alteration or relocation, you should consider requiring the applicant to have an engineer certify that the flood-flow carrying capacity is maintained and that there will be no increase in flood flows downstream.

Federal and state permits may be required for any alteration or relocation activity. It is recommended that the community require the submittal and approval of a CLOMR from FEMA for large-scale proposals (see CLOMR procedures discussion in Unit 4, Section D).

LEARNING CHECK #4

1. What does Basic rule #5 say about new buildings in V Zones?

2. Can a new building be built in the V Zone elevated on a crawlspace?

3. Where is the lowest floor measured in a V Zone?

4. What's the best way for a permit official to be sure that a V Zone building will be adequate to resist the wind and water loads?

5. What's the best way to deal with those pesky sand dunes in a V Zone development site?

6. If a subdivider makes sure that all building sites are above the BFE, does he need to do anything more to meet the NFIP requirements?

7. How can you protect a sewer system from flooding?

UNIT LEARNING EXERCISE

1. In what part of the Code of Federal Regulations would you find the definition for “development.?”

2. Where do I find the NFIP requirements for areas mapped with V Zones?

3. If a community has a FIRM that shows floodways and V Zones, which parts of 44 CFR 60.3 must it abide by?

4. If your community follows the requirements of 44 CFR 60.3(d), does it have to worry about what’s in 44 CFR 60.3(b)?

5. A building officials finds it easier to read an old flood map prepared on an aerial photograph by the Corps of Engineers. He doesn’t want to use the current FIRM because it doesn’t show all the buildings and features that the photograph does. Can he make permit decisions based on the Corps map instead of the FIRM?

6. A developer wants to build in an area mapped as an approximate A Zone on Ireland Creek. He conducts a detailed flood study which is approved by the Town Engineer. It shows that several lots in the A Zone are actually higher than the BFE calculated in the study.

   a. Can you issue permits for building on those sites and treat them as C Zone sites?

   b. Will the buyers of the properties have to buy flood insurance policies?

7. Joe Deerslayer wants to build a small hunting cabin on a lake in an approximate A Zone. It will be the only building within two miles. There are no known sources of a base flood elevation. The cabin will cost less than $10,000 and he does not want to pay $2,000 for an engineering study to develop a BFE. What can you do to make sure the property is protected from flooding?

8. Will a developer in an approximate A Zone have to prepare a detailed study to calculate base flood elevations if the development is:

   a. 4 acres?

   b. 60 lots?

   c. Reserving all the SFHA as open space?

9. A restudy was performed on the Rocky River. The preliminary study will not be final for another five months. It shows a new BFE at Site B that is two feet lower than the BFE in your current FIS. Which one do you use to determine the flood protection level for a new home at Site A?

10. Does dredging a creek to make it deeper to reduce flood levels need a floodplain permit?

11. Does replacing an old manufactured home with a new one on the same foundation need a permit?

12. If an old manufactured home is replaced with a new one on the same foundation, will the new one have to be elevated above the BFE?

13. If a project will involve filling a wetland, is it likely that a federal or state permit will be needed?

14. A builder wants to put a house in the floodway. How much can his project increase the base flood elevation (in feet)?

15. Will paving a dirt street in the floodway need an engineer's "no-rise" certification?

16. A city councilman complains that the NFIP floodway regulations prevent construction of a flood control dam that will protect people from flooding. What can you tell him?

17. Does a substantial improvement to an existing building have to meet the same requirements as construction of a new building?

18. Can a new nonresidential building be built:

    a. On fill in the flood fringe?

    b. On fill in the floodway?

    c. On fill in the V Zone?

    d. At grade, but floodproofed in the flood fringe?

    e. At grade, but floodproofed in the V Zone?

19. A builder wants to build an apartment building on stem walls parallel to the flow of water with the lowest floor 8' above grade. Can the lower area be used as a parking lot?

20. What's the best record to keep to be sure that a house was elevated high enough?

21. How many standard 8" x 16" vents are needed for a building that will have a 2,250 square foot crawlspace?

22. Can the owner store garden tools in a floodable crawlspace?

23. A business on the Mississippi River wants to build a floodproofed warehouse in the flood fringe. The plans are to have the walls built of reinforced concrete up to the BFE. Several garage doors will be open at grade to allow trucks in and out, but the design includes movable shields that can be put in place before floodwaters arrive. There would be no other openings below the BFE. The warehouse will have a 24-hour security force that will be trained on how to install the shields. The design engineer will certify that the building will be floodproofed (with human intervention) up to the base flood elevation. Can you approve these plans?

24. A builder wants to build a “bi-level” house where the lowest floor is three feet below grade. The lowest floor has large windows and includes three bedrooms and a bathroom. Because it is habitable space, the owner does not consider this a “basement.” Does the NFIP consider this a “basement?”

25. The area below a planned elevated house in the V Zone will have a 260 square foot enclosure to house the entryway and storage closets. The builder wants to insulate the area and finish it with wallboard, wallpaper and carpeting. He says it’s OK because the area is under 300 square feet. What do you tell him?

26. Where can you find standards for tying down manufactured homes?

27. A new house is planned to be built in an SFHA marked “Zone AO (depth 3 feet).” How high should the lowest floor be?

28. Why are pilings and posts preferred in V Zones?

ANSWERS TO THE LEARNING CHECKS

Learning check #1

1. What publication has the NFIP requirements for communities?

   Chapter 44 of the Code of Federal Regulations

2. Most of the requirements relative to your community's ordinance are in 44 CFR Parts ____ and ____ .

   59 and 60

3. Does your ordinance comply with the latest NFIP requirements?

   Check with your FEMA Regional Office or State NFIP Coordinator

4. Which part of 44 CFR 60.3 covers the requirements for areas with a FIRM, but no base flood elevations?

   44 CFR 60.3(b)

5. What is "Basic rule #1" for using maps and data?

   You must use the latest maps and flood data published by FEMA.

6. What map do you use if recently annexed areas do not show up on your community's FIRM?

   The FIRM for the county or the community the property used to be in.

7. If you find information that shows the ground to be higher than the BFE, can a bank use that data when determining whether a flood insurance policy must be purchased?

   No. Insurance agents and lenders must use the current FIRM when setting insurance rates and determining whether flood insurance is required. If a person wants to vary from the current FIRM to obtain different premium rates or to not have to purchase a flood insurance policy, the FIRM must be officially revised or amended.

8. Site E is in the approximate A Zone of Dean Lake. A developer wants to build a small commercial building on a 3 acre site. Where do you get a base flood elevation for Site E?

   Try these sources (in order of preference):

— *Check with your state NFIP coordinator, local water-related districts, the Corps of Engineers, etc. to see if there are any existing studies.*

— *It is possible that the highway agency did a study of the stream when the Turnpike bridge was built.*

— *See if the Town Engineer or the developer's engineer will conduct a study.*

— *Use the flood of record plus a margin of protection*

9. A developer downstream of Dean Lake wants to build a 40 acre subdivision that crosses Ireland Creek. You need a base flood elevation before you review the plans. What options do you tell the developer he has?

   — *He can conduct a flood study and produce the BFEs at his expense or*

   — *He can set the A Zone aside as open space and not conduct a flood study.*

10. A restudy was performed on the Josias River. The preliminary study will not be final for another five months. It shows a new BFE at Site N that is two feet higher than the BFE in your current FIS. Which one do you use to determine the flood protection level for a new home at Site N?

    The draft revised data should be used unless the community disagrees with the data and intends to appeal it.

Learning check #2

1. What is basic rule #2 on what needs a permit in the floodplain?

   A permit is required for all development in the SFHA.

2. Define "development" as the term is used in your ordinance.

   Your ordinance should have a definition that reads very much like: "'Development' means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials."

3. Does your community only require building permits? If so, does someone who wants to fill a vacant lot need a permit from the community?

   Depends on the community. If the answer is not "yes," then you need to revise your ordinance and permit procedures.

4. The state in which Flood County is situated requires a permit from the state Department of Environmental Protection for development on primary sand dunes. A permit applicant wants to build on one near Site F. Department staff informs you that based on the plans they have seen, they will have to deny the state permit. Should the Flood County permit officer issue a floodplain development permit?

   No. The local permit should not be issued until staff are certain that the other agencies' requirements are met. If it is just a question of time and a state permit is expected to be issued, a local permit could be issued conditioned on obtaining a state permit. However, if it is clear that the project violates the state regulations, a local permit should not be issued until the matter is settled.

5. What is Basic rule #3 as it relates to encroachments in riverine floodplains?

   Development must not increase the flood hazard on other properties.

6. An encroachment review should review projects in a floodway for what two things?

   Whether the project will obstruct flood flows and cause an increase in flood heights upstream or adjacent to the project site and

   Whether the project will remove an existing obstruction, resulting in increases in flood flows downstream.

7. A farmer wants to build a dairy barn in the floodway. Will he need to provide you with a “no-rise” certification before you can issue the permit?

   Yes

8. The same farmer wants to build a small addition onto his farmhouse (also in the floodway). Can this be designed so he won’t have to pay for an engineer’s encroachment review?

   Yes, if it is located in the conveyance shadow of the farmhouse.

9. In a riverine AE Zone with a base flood elevation, what must a developer show in order to demonstrate that he is meeting Basic Rule #3?

   He must conduct an encroachment review that demonstrates that the cumulative *effect of the proposed development, when combined with all other existing and anticipated development:*

   — *Will not increase the water surface elevation of the base flood more than one foot at any point within the community, and*

   — *Is consistent with the technical criteria contained in Chapter 5 (Hydraulic Analyses) of the Flood Insurance Study: Guidelines and Specifications for Study Contractors, FEMA-37, 1995.*

10. Does your state have a more restrictive standard than allowing flood heights to increase by one foot?

    Depends on the state. Some states have more restrictive encroachment standards, such as 0.5’ or 0.1’.

Learning check #3

1. What does Basic rule #4 say about new buildings in A Zones?

   New, substantially improved or substantially damaged buildings must be protected from damage by the base flood.

2. Where would elevation on piles or columns be preferred?

   In areas where flooding is likely to have high velocities or waves.

3. Can a basement be considered the "lowest floor?"

   Yes.

4. If a residence is elevated above the BFE in an A Zone, where do you measure how high the building is?

   At the top of the lowest floor.

5. What can be allowed under the lowest floor of an elevated building?

   Only building access, vehicle parking, and storage.

6. Mr. Jones shows you plans for a house elevated on a concrete block crawlspace. The area of the crawlspace will be 1,750 square feet.

   d. How many standard 8" x 16" vents will be needed?

      14. 1,750 divided by 128 = 13.67, rounded up to 14 vents

   e. How high can they be above ground level?

      The bottom of the vents must be no higher than one foot above grade.

   f. Can Mr. Jones put his hot water heater in the crawlspace?

      No. Unless the water heater can be entirely above the BFE.

7. Mrs. Smith is elevating a house in the AE Zone 8' above grade. How can you make sure that the area below the lowest floor won't be improved, finished or otherwise turned into living space?

   Require that the lower area must be kept open or require the owner to sign a nonconversion agreement (requiring large openings will also help).

8. What three things do you need to check for to ensure that a building is floodproofed?

   Below the BFE:

   — *Walls are watertight (substantially impermeable to the passage of water),*

   — *Structural components can resist hydrostatic and hydrodynamic loads and effects of buoyancy, and*

   — *Utilities are protected from flood damage.*

9. Can a new home in the flood fringe be floodproofed?

   No. Elevation is the only method allowed for new residential buildings in the SFHA.

10. What's the NFIP definition of "basement?"

    "Basement" means any area of the building having its floor subgrade (below ground level) on all sides.

11. If a building is proposed to be located in a riverine floodplain with flood velocities of 12 –15 feet per second, what should you ask the builder to provide to assure you that the building won't get washed away during a flood?

    A statement from an architect or engineer that the design of the building includes "anchoring adequate to prevent flotation, collapse and lateral movement" during the base flood.

12. The builder of a house to be elevated on concrete columns wants to use wood for the stairway. He is concerned that wood will swell and warp if it gets wet during a flood. Can a portion of the house below the BFE be built of wood?

    Yes, provided it is pressure treated (.40 CCA minimum), naturally decay resistant lumber or marine grade plywood

13. How is a manufactured home outside of a manufactured housing park treated differently from a conventional "stick built" home?

    They are both treated the same. They must meet the same construction and elevation requirements.

14. How is a 600 square foot motor home that is permanently attached to a reinforced block wall foundation treated differently from a manufactured home?

    They are both treated the same. They must meet the same construction and elevation requirements.

Learning check #4

1. What does Basic rule #5 say about new buildings in V Zones?

   There are special building requirements in addition to the building protection requirements for buildings in A Zones.

2. Can a new building be built in the V Zone elevated on a crawlspace?

   No. It can only be elevated on pilings, posts, piers or columns to avoid obstructions to the wave action.

3. Where is the lowest floor measured in a V Zone?

   At the bottom of the lowest horizontal structural member.

4. What's the best way for a permit official to be sure that a V Zone building will be adequate to resist the wind and water loads?

   Have an engineer certify that the design and planned methods of construction are in accordance with accepted standards of practice to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components.

5. What's the best way to deal with those pesky sand dunes in a V Zone development site?

   Don't touch them. They provide important flood protection by breaking waves during coastal storms. If they are to be disturbed, the permit applicant should have an engineer's or geologist's report that their removal will not increase flood damage.

6. If a subdivider makes sure that all building sites are above the BFE, does he need to do anything more to meet the NFIP requirements?

   The subdivider also needs to make sure that:

   — *All public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and*

   — *Adequate drainage is provided to reduce exposure to flood hazards;*

7. How can you protect a sewer system from flooding?

   Through careful system design. Manholes should be raised above the 100-year flood level or equipped with seals to prevent leakage. Pumping stations should have electrical panels elevated above the BFE.

Unit Learning Exercise

1. In what part of the Code of Federal Regulations would you find the definition for "development.?"

   44 CFR 59.1 Definitions

2. Where do I find the NFIP requirements for areas mapped with V Zones?

   44 CFR 60.3(e)

3. If a community has a FIRM that shows floodways and V Zones, which parts of 44 CFR 60.3 must it abide by?

   All parts up through 60.3(e)

4. If your community follows the requirements of 44 CFR 60.3(d), does it have to worry about what's in 44 CFR 60.3(b)?

   Yes. The requirements are cumulative in Section 60.3.

5. A building officials finds it easier to read an old flood map prepared on an aerial photograph by the Corps of Engineers. He doesn't want to use the current FIRM because it doesn't show all the buildings and features that the photograph does. Can he make permit decisions based on the Corps map instead of the FIRM?

   No. The community must use the latest maps and data provided by FEMA. If the other map shows a higher BFE and a larger floodplain, the community may adopt it in its ordinance as the regulatory floodplain and exceed the minimum NFIP requirements. The map must be approved by the FEMA Regional Office before this is done.

6. A developer wants to build in an area mapped as an approximate A Zone on Ireland Creek. He conducts a detailed flood study which is approved by the Town Engineer. It shows that several lots in the A Zone are actually higher than the BFE calculated in the study.

   c. Can you issue permits for building on those sites and treat them as C Zone sites?

      Yes, as long as the Town Engineer assures you that the developer's study

      — *Reasonably reflects flooding conditions expected during the base flood,*

      — *Is technically correct, and*

      — *Represents the best data available.*

d. Will the buyers of the properties have to buy flood insurance policies?

Yes, unless a map amendment or Letter of Map Amendment (LOMA) is issued by FEMA.

7. Joe Deerslayer wants to build a small hunting cabin on a lake in an approximate A Zone. It will be the only building within two miles. There are no known sources of a base flood elevation. The cabin will cost less than $10,000 and he does not want to pay $2,000 for an engineering study to develop a BFE. What can you do to make sure the property is protected from flooding?

   Require that the lowest floor of the cabin be at least five feet above grade.

8. Will a developer in an approximate A Zone have to prepare a detailed study to calculate base flood elevations if the development is:

   d. 4 acres? *No*

   e. 60 lots? *Yes*

   f. Reserving all the SFHA as open space? *No*

9. A restudy was performed on Rocky River. The preliminary study will not be final for another five months. It shows a new BFE at Site B that is two feet lower than the BFE in your current FIS. Which one do you use to determine the flood protection level for a new home at Site B?

   When the BFE in the new study is lower than the BFE in the existing study, the existing FIS data should be used until the new study is final.

10. Does dredging a creek to make it deeper to reduce flood levels need a floodplain permit?

    Yes. It is considered development and all development needs a permit.

11. Does replacing an old manufactured home with a new one on the same foundation need a permit?

    Yes

12. If an old manufactured home is replaced with a new one on the same foundation, will the new one have to be elevated above the BFE?

    Yes, unless it is in an existing manufactured home park. Then the owner has the option of elevating either above the BFE or 36" above grade on reinforced piers.

13. If a project will involve filling a wetland, is it likely that a federal or state permit will be needed?

    Yes. The U.S. Army Corps of Engineers requires a Section 404 permit for most wetland filling activities. A local permit should not be issued until it is clear that the project does not violate Section 404 rules.

14. A builder wants to put a house in the floodway. How much can his project increase the base flood elevation (in feet)?

    Zero. A project in a floodway is not allowed to cause any increase in floodwaters.

15. Will paving a dirt street in the floodway need an engineer's "no-rise" certification?

    No, as long as the grade of the street is no higher than it was before the paving project.

16. A city councilman complains that the NFIP floodway regulations prevent construction of a flood control dam that will protect people from flooding. What can you tell him?

    The community can apply for a conditional letter of map revision if it can provide the following:

    — *An evaluation of alternatives which, if carried out, would not result in an increase in the BFE more than allowed, along with documentation as to why these alternatives are not feasible.*

    — *Documentation of individual legal notice to all affected property owners (anyone affected by the increased flood elevations, within and outside of the community) explaining the impact of the proposed action on their properties.*

    — *Concurrence, in writing, from the chief executive officer of any other communities affected by the proposed actions.*

    — *Certification that no structures are located in areas which would be affected by the increased BFE (unless they have been purchased for relocation or demolition).*

    — *A request for revision of BFE determinations in accordance with the provisions of 44 CFR 65.6 of the FEMA regulations.*

17. Does a substantial improvement to an existing building have to meet the same requirements as construction of a new building?

    Yes

18. Can a new nonresidential building be built:

    a. On fill in the flood fringe? *Yes*

    b. On fill in the floodway? *Probably not. It would be hard to show that the fill does not cause an increase in flood heights.*

    c. On fill in the V Zone? *No*

    d. At grade, but floodproofed in the flood fringe? *Yes*

    e. At grade, but floodproofed in the V Zone? *No*

19. A builder wants to build an apartment building on stem walls parallel to the flow of water with the lowest floor 8' above grade. Can the lower area be used as a parking lot?

    Yes

20. What's the best record to keep to be sure that a house was elevated high enough?

    A FEMA Elevation Certificate. Any surveyor's or engineer's record of the elevation of the lowest floor meets the NFIP requirements, but the FEMA form is recommended.

21. How many standard 8" x 16" vents are needed for a building that will have a 2,250 square foot crawlspace?

    18. 2,250 divided by 128 = 17.57, rounded up to 18.

22. Can the owner store garden tools in a floodable crawlspace?

    Yes, if there is enough warning time to move it.

23. A business on the Mississippi River wants to build a floodproofed warehouse in the flood fringe. The plans are to have the walls built of reinforced concrete up to the BFE. Several garage doors will be open at grade to allow trucks in and out, but the design includes movable shields that can be put in place before floodwaters arrive. There would be no other openings below the BFE. The warehouse will have a 24-hour security force that will be trained on how to install the shields. The design engineer will certify that the building will be floodproofed (with human intervention) up to the base flood elevation. Can you approve these plans?

    Yes, assuming there is adequate warning time to install the shields, which there probably is on the Mississippi River.

24. A builder wants to build a “bi-level” house where the lowest floor is three feet below grade. The lowest floor has large windows and includes three bedrooms and a bathroom. Because it is habitable space, the owner does not consider this a “basement.” Does the NFIP consider this a “basement?”

    Yes and the lowest floor (i.e., the basement) must be above the BFE.

25. The area below a planned elevated house in the V Zone will have a 260 square foot enclosure to house the entryway and storage closets. The builder wants to insulate the area and finish it with wallboard, wallpaper and carpeting. He says it’s OK because the area is under 300 square feet. What do you tell him?

    It’s not OK. Any enclosed space below the lowest floor must be built of flood resistant materials and free of obstruction, or constructed with nonsupporting breakaway materials such as open wood latticework or insect screening.

26. Where can you find standards for tying down manufactured homes?

    Check first to see if there are state regulations. If not, see FEMA’s Manufactured Home Installation in Flood Hazard Areas, *FEMA-85.*

27. A new house is planned to be built in an SFHA marked “Zone AO (depth 3 feet).” How high should the lowest floor be?

    At least 3 feet above the highest adjacent grade.

28. Why are pilings and posts preferred in V Zones?

    They can better withstand the wind and water loads.