UNIT IX: FINANICAL AND INSURANCE IMPLICATIONS

FINANCIAL AND INSURANCE IMPLICATIONS

INTRODUCTION

It is easy for property owners to become complacent about the threat of a natural disaster affecting their buildings. After all, hurricanes and earthquakes are infrequent events—a particular geographic area may escape a major hazard event for 20 or more years. Conversely, residents of a recently affected area may believe that a recurrence is unlikely to happen soon. Complacent attitudes are based on inaccurate assumptions and/or a lack of understanding of natural hazards and their associated risks.

The population and property values along the U.S. coast, meanwhile, are rapidly increasing. Better warning systems have allowed us to reduce the number of fatalities and injuries associated with natural disasters. However, greater numbers and higher values of coastal structures make dramatic increases in property losses likely.

NOTE

NOAA predicts that by 2010, more than 73 million people will be living in hurricane-prone areas.

Before undertaking a coastal construction project, property owners and design professionals should be aware of the financial and insurance implications of siting, design, and construction decisions. Site selection, building location, and design requirements will all influence the costs of construction and insurance.

Previous units of this course provided detailed information about hazards and risks associated with building in coastal areas. In this unit, we will look at general financial implications of siting, design, and construction of residential buildings in high-hazard areas and the benefit/cost of mitigation measures. Information will also be provided about flood, wind, and earthquake insurance that may help offset potential financial losses to residential buildings.

UNIT OBJECTIVES After completing this unit, you should be able to:

9.1 Give examples of the costs and benefits associated with hazard mitigation measures in siting, design, and construction.
9.2 Describe the role of hazard insurance in mitigating potential losses in residential coastal construction.
9.3 Identify factors that affect the availability and cost of hazard insurance.

BENEFIT/COST IMPLICATIONS OF SITING, DESIGN, AND CONSTRUCTION

THE RISK In 1986, the All-Industry Research Advisory Council (an advisory organization for the insurance industry) estimated that two $7 billion hurricanes could occur in the same year. However—

- In 1989, Hurricane Hugo struck South Carolina, causing approximately $9 billion in damage.
- In 1992, Hurricane Andrew caused $15.5 billion in damage to insured properties.

Neither hurricane hit densely populated areas. If they had, losses would have been far greater.

Following Hurricane Andrew, studies were conducted to determine whether the damage suffered was attributable to the intensity of the storm or to the location and type of development in South Florida. The Institute for Business and Home Safety (IBHS) found the following:

> "A 40-year period of relatively benign weather left southern Florida with a false sense of security regarding its ability to withstand hurricanes. This led to a complacency about hurricane risk, leading to 'helter-skelter' development, lackluster code enforcement, building code amendments, shortcuts in building practices, and violations that seriously undermined the integrity of the [building] code and the quality of the building stock. Conservative estimates from claim studies reveal that approximately 25 percent of Andrew-caused insurance losses (about $4 billion) were attributable to construction that failed to meet the code due to poor enforcement, as well as shoddy workmanship. At the same time, concentrations of population and of property exposed to hurricane winds in southern Florida grew many-fold."
>
> —IBHS and Insurance Research Council. *Coastal Exposure and Community Protection: Hurricane Andrew's Legacy* (Boston, MA: 1995)

NOTE

From 1986 to 1992, hurricanes and tropical storms accounted for the major share of all property insurance losses. The proportion of all property damage (e.g., wind, flood, other) caused by various events during this period were:

- Hurricane/tropical storm: 53%
- Tornado/other wind: 35%
- Fire/explosion: 5%
- Earthquake: 3%
- Riot/civil disorder: 2%
- Other: 2%

MANAGING THE RISK

As we have seen in earlier units, studies of past natural disasters have demonstrated that sound siting, design, engineering, construction, and maintenance practices are important factors in the ability of a building to survive a hazard event with little or no damage.

This course—along with the related classroom course *Residential Coastal Construction*—is designed to help property owners manage some of the risk associated with constructing a residential building in a coastal hazard area.

The classroom course (which draws heavily on Volume 2 of the *Coastal Construction Manual*) will provide detailed information about how to site, design, construct, and maintain a building in ways that will help manage risks.

BENEFITS VS. COSTS

Risk management is not simple. It is a continuous process of weighing benefits against costs to arrive at the optimal balance. Here are some examples:

- Constructing to a model building code and complying with regulatory siting requirements will provide a building with a certain level of protection against damage from natural hazards. However, compliance with minimum code and regulatory requirements does not guarantee that a building will be free from danger.

- At the same time exceeding code and regulation minimums provides an added measure of safety, it also adds to the cost of construction. That cost must be weighed against the benefit gained.

- The often minimal initial cost of additional mitigation measures offers **long-term benefits** that will provide a positive life-cycle cost—reducing insurance premiums and better protecting the building and its contents and occupants during a natural hazard event.

Table 9.1 lists examples of flood and wind mitigation measures that can be taken to help a structure better withstand a natural disaster.

Table 9.1. Examples of Flood and Wind Mitigation Measures

Mitigation Measure	Benefits/Advantages	Costs/Disadvantages
Elevation of lowest floor: Add 1 to 2 feet to the required elevation of the lowest floor or lowest horizontal structural member of the building.	Reduces the potential for the structure to be damaged by waves and/or floodwaters.	May conflict with community building height restrictions; may require additional seismic design considerations; longer pilings may cost more.
Embedment depth: Increase embedment depth of pile foundations.	Adds protection against scour and erosion.	Longer pilings may cost more.
Flashing/weather-stripping: Improve flashing and weather-stripping around windows and floors.	Reduces water and wind infiltration into building.	Increases the number of important tasks for contractor to monitor.
Areas below BFE: Install fewer breakaway walls or install more openings in continuous foundation walls.	Decreases potential for damage to understory of structure; reduces amount of debris during storm event.	Reduces the ability to use understory of structure for storage.
Open coastal A zone foundation: Elevate a building in a coastal A zone on an open foundation or use only breakaway walls for enclosures below the lowest floor.	Reduces the potential for the structure to be damaged by waves, erosion, and floodwaters.	Reduces the ability to use understory of structure for storage.
Shutters: Add shutters for glazing protection.	Reduces the potential for damage from windborne debris impact during a storm event and reduces potential for wind-driven rain water infiltration.	Shutters require installation or activation before a storm event.
Shingles: Use asphalt roof shingles with high bond strength.	Reduces shingle blowoff during high winds.	High-bond-strength shingles are slightly more expensive.
Siding: Install wood siding instead of vinyl siding.	Wood siding reduces blowoff on walls during high winds.	Wood siding may cost more than other materials and requires additional maintenance
Connectors: Use metal connectors or fasteners with a thicker galvanized coating or connectors made of stainless steel	Reduces the potential for corrosion of connectors.	Thicker coating and stainless steel are more costly
Roof covering: Install additional roof sheathing fasteners, install additional underlayments, or improve roof covering details as required.	Reduces roof covering and interior wind and water damage from a severe event.	There is minimal increased cost when these tasks are done during a reroofing project

BENEFIT/COST MODELS

The need for and benefit of some measures may be difficult to predict.

For example, elevating a building above the DFE could add to the cost of the building. This additional cost must be weighed against the probability of a flood or storm surge exceeding the DFE.

Benefit/cost models are useful tools that provide a reasonable method for determining whether a project is or is not cost-effective.

Basic Model

The chart shown in Figure 9-1 illustrates the comparative relationship between damage, project costs, and benefits associated with a hazard mitigation project. These comparisons are made on a present-value basis over the life of the project. A project-specific benefit/cost analysis will assist in the development of such comparisons.

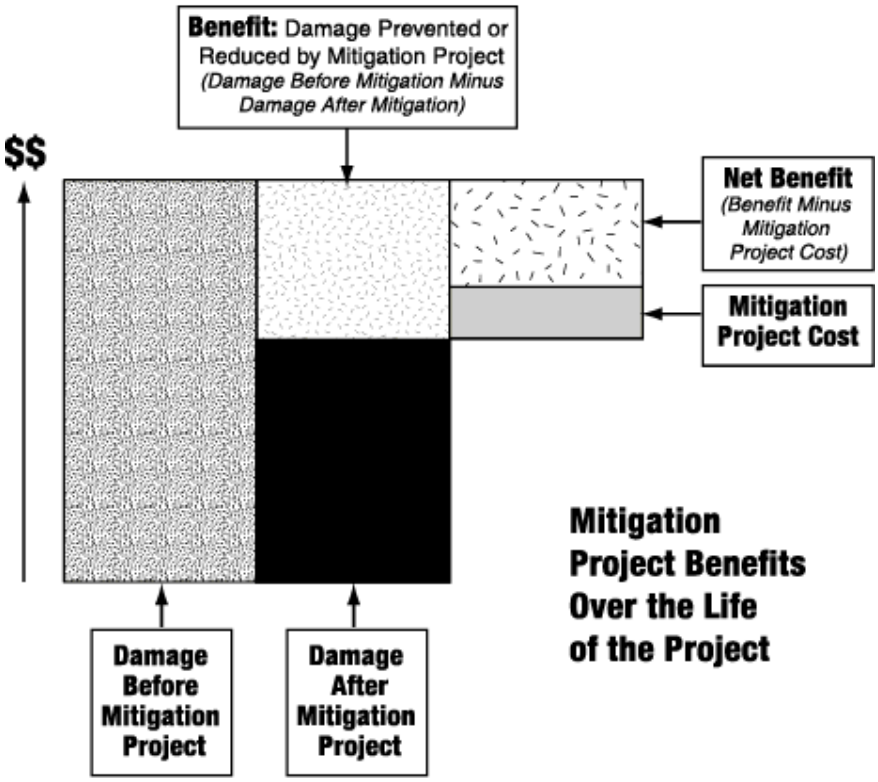

Figure 9-1.
Basic benefit/cost model

WARNING

In general, benefit/cost models do not take into account human suffering (e.g., the emotional stress induced by the loss of irreplaceable items and the trauma of rebuilding after a devastating event).

FEMA's Benefit/Cost Models

NOTE

FEMA benefit/cost models include computer software that can be used to perform calculations.

FEMA has developed benefit/cost models for flood, wind, and seismic hazard mitigation measures. These models can be used to determine the value of measures intended to mitigate against different natural hazards.

The FEMA models measure benefit as the **amount of future damage avoided** as a result of the mitigation measure undertaken. (Note that, although costs can be determined from detailed engineering studies, **benefits are estimated** because the timing and severity of future hazard events can only be probabilistically estimated.)

Types of Data Used. The benefit/cost analysis method is basically the same for each type of hazard mitigation project. The FEMA models use the following types of data to determine the benefit/cost ratio of a given mitigation measure:

- Building type.
- Building location.
- Number of stories or elevation.
- Construction date.
- Building replacement value.
- Value of contents.
- Displacement costs incurred because of damage to the residence.
- Rental/business income.
- Useful life of the mitigation project.
- Mitigation project cost.
- Annual maintenance costs.
- Relocation costs for the mitigation project.
- Hazard data, including the expected number of events at various intensities.

Hazard Data. The only differences among models are in the types of hazard data used in the calculations:

- **Wind:** Wind speed/storm class is used to estimate damage for wind mitigation projects.

- **Flood:** Depth of flooding is used to estimate damage for flood mitigation projects.

- **Earthquake:** Severity of ground shaking is used to estimate damage for earthquake mitigation projects.

WIND MITIGATION Table 9.2 presents the default estimates for damage to a building from high winds used in FEMA's Hurricane Wind Mitigation Benefit/Cost Model. The table indicates the percentage of the building that would be damaged by various storm classes (according to the Saffir-Simpson scale) for different building (engineering) types. Definitions for the building types are given below.

Table 9.2. Default Wind Damage as a Percent of Building Value

	Building Type			
Storm Class (Wind Speed in mph)*	**Non-Engineered Wood**	**Non-Engineered Masonry**	**Lightly Engineered**	**Fully Engineered**
0 (60–73)	0	0	0	0
1 (74–95)	7.5	5	5	2.5
2 (96–110)	20	15	15	5
3 (111–130)	50	40	40	20
4 (131-155)	90	80	80	40
5 (>155)	100	100	100	60

*Wind speed is 1-minute sustained wind speed over land at 33 ft above the ground at a specific building site.

- **Non-engineered wood —** These buildings do not receive specific engineering attention. They include single- and multi-family residences, some one- or two-story apartment units, and some small commercial buildings.

- **Non-engineered masonry —** These buildings do not receive specific engineering attention. They include single- and multi-family residences, some one- or two-story apartment units, and some small commercial buildings.

- **Lightly engineered —** These buildings may combine masonry, light steel framing, open-web steel joists, wood framing, and wood rafters. Some parts of these buildings receive engineering attention, while others do not. These buildings include motels, and commercial and light industrial buildings.

- **Fully engineered —** These buildings are usually designed for a specific site and therefore receive individualized design attention. They include high-rise office buildings, hotel buildings, hospitals, and most public buildings.

The default wind-damage information may need to be modified to account for:

- Variations in building height.
- Differences in construction practices, age of the building, or general location in the country.
- Variation in wind exposure and topographic effects.
- Windborne debris.

FEMA's Hurricane Wind Mitigation Benefit/Cost Model can help determine the benefit of implementing a mitigation measure to protect a building from wind damage, as shown in the following example.

EXAMPLE

The addition of storm shutters to a $250,000 house 2 miles from the North Carolina coast can reduce potential damage to a building from over $33,000 to $15,000 over a period of 30 years, adjusted to present value.

After subtracting the project cost (approximately $15,000 for storm shutters), the present-value net benefit to the homeowner is over $17,000, for a benefit/cost ratio greater than 2.

FLOOD MITIGATION

Tables 9.3 and 9.4 present FEMA's Federal Insurance Administration (FIA) damage estimates for various flood depths for site-built buildings in V zones and A zones.

Note the following about these two sets of data:

- Flood depths in Table 9.3 are given in relation to the bottom of the lowest horizontal structural member, whereas flood depths in Table 9.4 are given in relation to the top of the lowest floor.

- All construction types are included in the building categories listed, so one-story houses may include any of several types (e.g., wood-frame or masonry).

- Differences in foundation types, construction practices, and the age of the buildings are not considered.

- Because the information comes from actual claims data, the damage percentage from large flood depths is less reliable, because there is less flood history at these depths.

- The loss data are for flood losses caused by any type of flood hazard—including high-velocity flow, debris flow, and ice flows—and for floods of any duration.

Table 9.3. FIA Depth-Structure Damage Data for V-Zone Buildings (Damage in Percent of Building Replacement Value—1987 FIA Data)

	Building Condition	
Flood Depth[a]	**No Obstruction[b]**	**With Obstruction**
-2	10.0	20.0
-1	12.0	21.5
0	15.0	24.0
1	23.0	29.0
2	35.0	37.0
3	50.0	54.0
4	58.0	60.5
5	63.0	64.5
6	66.5	68.0
7	69.5	70.0
8	72.0	72.0
9	74.0	74.0
10	76.0	76.0
11	78.0	78.0
12	80.0	80.0
13	81.5	81.5
14	83.0	83.0
15	84.0	84.0
16	85.0	85.0
17	86.0	86.0
18	87.0	87.0

[a] Relative to bottom of lowest horizontal structural member.
[b] Obstruction = machinery, equipment, or enclosure below the elevated floor.

Table 9.4. FIA Depth-Structure Damage Data for A-Zone Buildings
(Damage in percent of building replacement value)

	Building Type				
Flood Depth*	One-Story w/o Basement	Two-Story w/o Basement	Split Level w/o Basement	One- or Two-Story w/ Basement	Split Level w/ Basement
-2	0	0	0	4	3
-1	0	0	0	8	5
0	9	5	3	11	6
1	14	9	9	15	16
2	22	13	13	20	19
3	27	18	25	23	22
4	29	20	27	28	27
5	30	22	28	33	32
6	40	24	33	38	35
7	43	26	34	44	36
8	44	29	41	49	44
9	45	33	43	51	48
10	46	38	45	53	50
11	47	38	46	55	52
12	48	38	47	57	54
13	49	38	47	59	56
14	50	38	47	60	58
15	50	38	47	60	58
16	50	38	47	60	58
17	50	38	47	60	58
18	50	38	47	60	58

*Relative to top of lowest floor.

Note: The depth-damage data presented in this table are used in FEMA's Riverine and Coastal A-Zone Flood Mitigation Benefit/Cost Model.

V-Zone vs. A-Zone Buildings

Using the data from Tables 9.3 and 9.4, Figure 9-2 compares the depth-damage relationships for two types of buildings:

- V-zone building with no obstruction below the lowest floor.
- Two-story A-zone building without a basement.

NOTE

The flood depths shown in Figure 9-2 for both V-zone and A-zone buildings are given in relation to the bottom of the lowest horizontal structural member. (The conversion of A-zone depths shown in Table 9.4—which are in relation to the top of the lowest floor—is based on the assumption that the distance between the top of the lowest floor and the bottom of the lowest horizontal structural member is equal to 2 feet.)

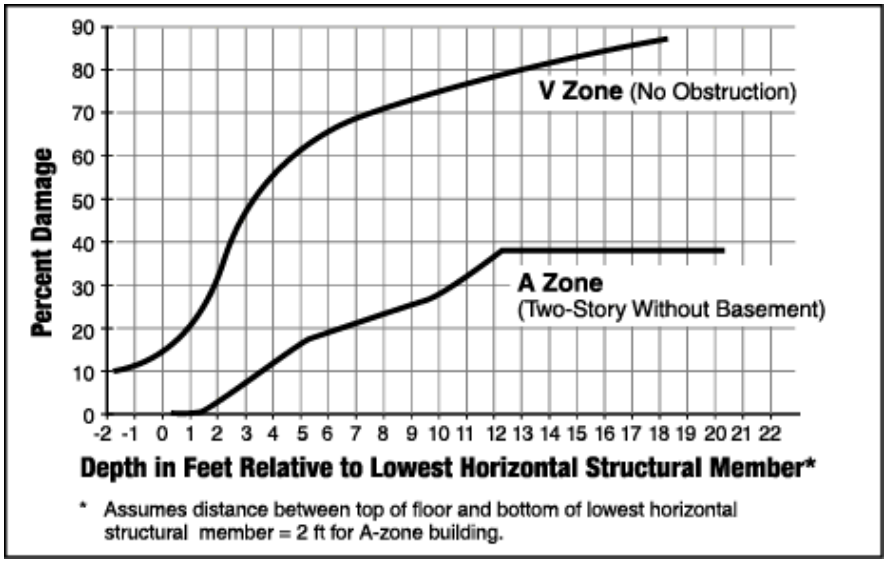

Figure 9-2. Comparison of FIA V-zone and A-zone depth-structure damage functions. No contents damage included.

According to FEMA's Flood Mitigation Benefit/Cost Model, elevating a new two-story house in South Carolina's coastal A zone 3 feet above the BFE on longer piles would provide a benefit/cost ratio greater than 2, and result in significantly lower flood insurance premiums under the NFIP.

SELF-CHECK REVIEW: BENEFIT/COST IMPLICATIONS OF SITING, DESIGN, AND CONSTRUCTION

Instructions: Answer the following questions. Then turn the page to check your answers. If you answered any items incorrectly, you should review the related material before continuing.

1. Give an example of a mitigation measure that could help protect a structure against coastal hazards, and describe the kinds of cost/benefit factors that could influence the decision whether to use that measure.

2. Give an example of a flood mitigation measure and a wind mitigation measure. List a cost and a benefit associated with each.

   - Flood mitigation measure _____

     Cost: Benefit:

   - Wind mitigation measure _____

     Cost: Benefit:

3. For a V-zone building with no obstructions, what level of damage (percent of building value) would be caused by a 2-foot flood depth? (Use Table 9.3.)

   _____

   For a two-story house without a basement in a coastal A zone, how great a flood depth would it take to cause the same level of damage? (Use Table 9.4.)

   _____

ANSWER KEY

NOTE: Your answers may be slightly different, but they should include the same main points.

1. Give an example of a mitigation measure that could help protect a structure against coastal hazards, and describe the kinds of cost/benefit factors that could influence the decision whether to use that measure.

   Answers will vary. See Table 9.1 for examples.

2. Give an example of a flood mitigation measure and a wind mitigation measure. List a cost and a benefit associated with each.

   (Any examples drawn from Table 9.1, or comparable examples.)

3. For a V-zone building with no obstructions, what level of damage (percent of building value) would be caused by a 2-foot flood depth? (Use Table 9.3.)

   35%

   For a two-story house without a basement in a coastal A zone, how great a flood depth would it take to cause the same level of damage? (Use Table 9.4.)

   10 feet

HAZARD INSURANCE

Insurance should never be viewed as an alternative to damage prevention. However, despite best efforts to manage risk, there is always the potential for structures in coastal areas to be damaged during a natural hazard event. Hazard insurance to offset potential losses, therefore, is an important consideration for homeowners in coastal areas.

INSURANCE CONSIDERATIONS

The availability and cost of hazard insurance will vary with the location of the building and the quality of the design and construction techniques used. Insurance companies base hazard insurance rates on the potential for a building to be damaged by various hazards and the ability of the building to withstand those hazards.

Hazard insurance rates are affected by the following factors:

- Type of building.
- Location of the building.
- Date of construction.
- Existence and effectiveness of a fire department and fire hydrants (or other dependable, year-round sources of water).
- Effectiveness of the building code and building department in place at the time of construction.

Implications for Homeowners

While designers and builders may not be able to control the rates and availability of insurance, they should understand the implications of siting and construction decisions on insurance costs, and they should make homeowners aware of the risk and potential expense associated with owning a house in a high-hazard area.

Insurance considerations can and do affect the placement and height of coastal buildings and the materials used in their construction. Input from an insurance industry representative during the design process—rather than after the completion of the building—can positively influence important decisions in addition to potentially saving homeowners money on insurance premiums.

Coverage

Typical homeowner's insurance coverage is summarized in Table 9.5.

Table 9.5. Typical Coverage Under Standard Policies

Hazard	Coverage
Fire Lightning Hail Explosion Riot Smoke Vandalism Theft Volcanic eruption Falling objects Weight of snow Freezing	Typically covered
Wind	Usually—but not always—covered
Liability	Typically covered
Earthquake	Endorsements may often be added
Flood	Separate policy normally required

A single-family home is covered by a homeowner's policy, and a multi-family building is covered by a dwelling policy—two different types of insurance.

- A **homeowner's policy** is a multi-peril package policy that automatically includes fire and allied lines, theft, and liability coverage.
- With a **dwelling policy**, peril coverages are purchased separately.

This unit focuses on homeowner's insurance. Standard homeowner's insurance policies do not normally cover damage from flood or earth movement (e.g., earthquakes and mudslides).

FLOOD INSURANCE

Flood insurance is offered through the NFIP in communities (e.g., incorporated cities, towns, villages; unincorporated areas of counties, tribes, and parishes) that participate in the program. As discussed in Unit V, the purchase of flood insurance is required as a condition of receiving federally backed, regulated, or insured financial assistance for the acquisition of buildings in the SFHA. This includes almost all mortgages secured by property in an SFHA.

This insurance is not available in communities that do not participate in the NFIP. Most coastal communities do participate in the program, because they recognize the flood hazard and the need for flood insurance.

NFIP RATING FACTORS

The following factors are used in determining flood insurance rates for buildings (not including building contents):

- Building occupancy.
- Building type.
- Flood insurance zone.
- Date of construction.
- Elevation of lowest floor or bottom of the lowest horizontal structural member of the lowest floor.
- Enclosures below the lowest floor.
- Location of utilities and service equipment.

Building Occupancy

The NFIP bases its rates on four types of building occupancy:

- Single-family.
- Two- to four-family.
- Other residential.
- Nonresidential.

Only slight differences exist among the rates for the three types of residential buildings.

NOTE

Condominium policies are also available. Designers may wish to consult knowledgeable insurance agents and the *Flood Insurance Manual* for policy details and exclusions that will affect building design and use. Additional information is available in *Answers to Questions About the National Flood Insurance Program*, FIA-2 (FEMA 1990).

Building Type

The NFIP bases its rates on the following building-type factors:

- **Number of floors**—Whether there is one floor or more than one floor.
- **Basement**—Whether there is a basement (i.e., any area having its floor below ground level on all sides).
- **Elevation, and enclosures below the BFE**—Whether the building is elevated (with or without an enclosure below the lowest elevated floor).
- **Manufactured housing**—Whether the building is a manufactured home on a permanent foundation.

NFIP insurance is generally more expensive for buildings with basements and for buildings with enclosures below the BFE.

Flood Insurance Zone

The zones are grouped as follows for rating purposes:

- **V zones (V, VE, and V1–V30)**—The zones closest to the water, subject to "coastal high hazard flooding" (i.e., flooding with wave heights greater than 3 feet). Insurance is most expensive in V zones because of the severity of the hazard. However, the zones are often not very wide, and most coastal buildings are located in A or X zones.
- **A zones (A, AE, AR, AO, and A1–A30)**—In coastal flood hazard areas where the wave heights are less than 3 feet.
- **B, C, and X zones**—The zones outside the 100-year floodplain or SFHA. Insurance is least expensive in these zones and generally not required by mortgage lenders.

FIRMs show areas designated as being within the Coastal Barrier Resources System or "otherwise protected areas." Flood insurance is available for buildings in these zones only if the buildings were walled and roofed before the CBRA designation date shown in the FIRM legend, and only if the community participates in the NFIP.

NOTE

Zones V1–V30, A1–A30, B, and C were used on FIRMs until 1986. FIRMs published since then show VE, AE, and X zones.

Construction in B, C, and X zones is not subject to NFIP floodplain regulations. This summary does not discuss the flood insurance rating of buildings in these zones.

Date of Construction

Pre-FIRM Buildings. In each community participating in the NFIP, buildings constructed on or before the date of the first FIRM for that community (or December 31, 1974—whichever is later) have flood insurance rates that are "grandfathered" or "subsidized." These buildings are charged a flat rate based on:

- Building occupancy.
- Building type.
- Flood insurance zone.

If a pre-FIRM building is substantially improved (i.e., the value of the improvement exceeds 50 percent of the market value of the building before the improvement was made), it is rated as a post-FIRM building.

If a pre-FIRM is substantially damaged (i.e., the true cost of repairing the building to its pre-damaged condition exceeds 50 percent of the value of the building before it was damaged), it too is rated as a post-FIRM building—regardless of the amount of repairs actually undertaken.

NOTE

The local building official or floodplain administrator—not the insurance agent—determines whether a building is substantially improved or substantially damaged.

For additional information about substantial damage, refer to *Answers to Questions About Substantially Damaged Buildings*, FEMA 213 (1991).

Post-FIRM Buildings. The rates for buildings constructed after the date of the first FIRM are based on:

- Building occupancy.
- Building type.
- Flood insurance zone.
- Elevation of the top of the lowest floor (in an A zone) or bottom of the lowest horizontal structural member of the lowest floor (in a V zone).
- Enclosed areas below the lowest floor in an elevated building.

An additional insurance rate table is applied to buildings constructed in V zones on or after October 1, 1981. The table differentiates between buildings with an **obstruction below the elevated lowest floor** and those without such an obstruction.

Elevation of Lowest Floor

The rating for post-FIRM buildings is based on:

- In A zones—elevation of the lowest floor in relation to the BFE.
- In V zones—elevation of the bottom of the lowest horizontal member in relation to the BFE.

The flood insurance rates decrease for buildings elevated above the BFE. The premiums increase significantly for a building rated at 1 foot or more below the BFE.

Openings in Crawlspace Walls. In A zones, a building on a crawlspace must have openings in the crawlspace walls that will allow for the unimpeded flow of floodwaters more than 1 foot deep. If the crawlspace walls do not have enough properly sized openings, the crawlspace will be considered an enclosed floor and the building may be rated as having its lowest floor at the elevation of the grade inside the crawlspace.

Service Equipment. Similarly, if furnaces and other equipment serving the building are below the BFE, the insurance agent must submit more information on the structure to the NFIP underwriting department before the policy's premium can be determined.

WARNING

There are some significant differences between what is permitted under floodplain management regulations and what is covered by NFIP flood insurance. **Building designs should be guided by floodplain management requirements, not by flood insurance policy provisions.**

Enclosures Below the Lowest Floor

In V zones, buildings built on or after October 31, 1981, are rated in one of three ways:

- **Free of obstruction**—A building is rated as "free of obstruction" if there is no enclosure below the lowest floor other than insect screening or open wood latticework. ("Open" means at least 50 percent of the lattice construction is open.)

- **With obstruction**—A building is subject to a more expensive "with obstruction" rate if service equipment or utilities are located below the lowest floor or if breakaway walls enclose an area of less than 300 ft^2 below the lowest floor.

- **Other**—If the area below the lowest floor has more than 300 ft^2 enclosed by breakaway walls, has nonbreakaway walls, or is finished, then the floor of the enclosed area is the building's lowest floor. The insurance agent must submit more information on the structure to the NFIP before the policy's premium can be determined.

COST CONSIDERATION

There may be significant financial penalties associated with the improper design, construction, conversion, or use of areas below the lowest floor.

SFIP The Standard Flood Insurance Policy (SFIP) provides coverage for walled and roofed structures, including certain building components and contents in areas below the elevated floors of elevated buildings. This coverage can even include some items *prohibited* by FEMA/local floodplain management regulations where the NFIP deems the items essential to the habitability of the building.

WARNING

Do not confuse insurability with proper design and construction. Significant financial penalties (e.g., increased flood insurance premiums and increased uninsured losses) may result from improper design or use of enclosed areas below the BFE.

Items Covered Below the BFE

Given the above caveats, buildings insured under the SFIP will have coverage (up to specified policy limits) for items below the BFE as listed in Table 9.6.

Table 9.6. SFIP Coverage

Items Covered	Items Not Covered
• Required utility connections • Footings, foundation, posts, pilings, piers, or other foundation walls and anchorage system as required for the support of the building • Stairways and staircases attached to the building that are not separated from the building by an elevated walkway • Elevators, dumbwaiters, and relevant equipment (except for such relevant equipment installed below the BFE on or after October 1, 1987) • Building and personal property items (e.g., air conditioners, fuel tanks, furnaces, hot water heaters, washers, and dryers) that are necessary for habitability of the building, connected to a power source, and installed in their functioning location—as long as the building and personal property coverage has been purchased • Debris removal, where such debris was generated during a flood	• Breakaway walls and enclosures that do not provide support to the building • Non-structural slabs beneath an elevated building • Walks, decks, driveways, and patios located outside the perimeter of the exterior walls of the building • Underground structures and equipment, including wells, septic tanks, and septic systems • Equipment, machinery, appliances, and fixtures not deemed necessary for the habitability of the building • Fences, retaining walls, seawalls, and revetments • Indoor and outdoor swimming pools • Structures over water, including piers, docks, and boat houses • Personal property • Loss of land and landscaping

INSURABILITY UNDER NFIP

To be insurable under the NFIP, a "building" must be walled and roofed with two or more rigid exterior walls and must be more than 50 percent above grade. Examples of structures that are **NOT** insurable because they do not meet this definition are:

- Gazebos and pavilions.
- Docks.
- Campers and tents.
- Underground storage tanks.
- Swimming pools.
- Fences.
- Retaining walls, seawalls, and bulkheads.
- Septic tanks.

Buildings constructed entirely over water or seaward of mean high tide after October 1, 1982, are not eligible for flood insurance coverage. Certain parts of boathouses located partially over water (e.g., the ceiling and roof over the area where boats are floated) are not eligible for coverage.

PREMIUMS

The premium paid is based on the rating factors previously discussed, plus the following:

- An expense constant.
- A Federal policy fee.
- The cost of Increased Cost of Compliance (ICC) Coverage.
- The amount of deductible chosen by the insured.

Community Rating System

If a community elects to exceed the minimum NFIP requirements, it may apply for a classification under the NFIP Community Rating System (CRS). Based on its floodplain management program, the community could receive a CRS classification that provides up to a 45 percent premium discount for property owners within the community. Approximately 900 communities participate in the CRS, representing over 65 percent of all flood insurance policies.

Impact of Zone and Elevation on Premiums

Tables 9.7 and 9.8 illustrate differences in premiums because of zone and elevation in relation to the BFE.

Table 9.7 lists sample NFIP premiums for a post-FIRM, one-story, single-family residence without a basement in an A zone with different elevations of the lowest floor. For buildings in A zones, premiums rise when proper flood openings are not provided in enclosed areas or when service equipment or utilities are located below the BFE.

Table 9.8 makes the same kinds of comparisons for a V-zone building, with and without obstruction. For buildings in V zones, premiums rise somewhat for structures with breakaway obstructions, and premiums rise dramatically for structures with obstructions (e.g., service equipment, utilities, or non-breakaway walls) below the lowest floor.

Table 9.7. Sample NFIP Flood Insurance Premiums for Buildings in A Zones (Coverage: $200,000 Building / $100,000 Contents)

Flood Zone	Elevation of Lowest Floor Above/Below the BFE (ft)	Annual Premium[a]	Savings
AE	-1	$3,093	$-2,376
AE	0	$717	0
AE	+1	$531	$186
AE	+2	$440	$277
AE	+3	$420	$297

Table 9.8. Sample NFIP Flood Insurance Premiums for Buildings in V Zones — With and Without Obstructions Below the Lowest Floor[b] (Coverage: $200,000 Building / $100,000 Contents)

Flood Zone	Elevation of the Lowest Floor Above or Below the BFE (ft)	Annual Premium[a] w/ No Obstruction	Savings	Annual Premium[a] w/ <300ft^2 Obstruction	Savings
VE	-2	$4,850	-$2,150	$5,430	-$2,010
VE	-1	$3,610	-$910	$4,250	-$830
VE	0	$2,700	0	$3,420	0
VE	+1	$2,010	$690	$2,810	$610
VE	+2	$1,430	$1,270	$2,290	$1,130
VE	+3	$1,110	$1,590	$2,050	$1,370
VE	+4	$990	$1,710	$1,950	$1,470

[a]Rates as of May 1998.
[b]For buildings with >300 ft^2 obstruction, premium to be determined by NFIP underwriting department from information provided by insurance agent.

SELF-CHECK REVIEW: FLOOD INSURANCE

Instructions: Answer the following questions. Then turn the page to check your answers. If you answered any items incorrectly, you should review the related material before continuing.

1. Insurance considerations can affect the height of coastal buildings.

   True False

2. When is the best time to involve an insurance industry representative?

   a. As soon as the building is completed.
   b. During construction.
   c. During design.
   d. When the building is walled and roofed.

3. Flood insurance is typically part of standard homeowner's insurance policies.

   True False

4. In most areas, earthquake insurance is not available.

   True False

5. Gazebos, swimming pools, and seawalls are insurable under NFIP.

   True False

6. What impact are the following likely to have on insurance premiums? (Mark one column for each.)

	Increase	Decrease	No Impact
a. Participate in the Community Rating System			
b. Locate the lowest floor of elevated building in a V-zone below the BFE			
c. Build in an X zone rather than an A zone.			
d. Eliminate breakaway walls in a V-zone design.			
e. Build in a V zone rather than an A zone.			
f. Eliminate openings in the enclosed area below the BFE in an A zone.			
g. Locate the furnace in the space below an elevated building in a V zone.			
h. Add freeboard.			

The Answer Key for the preceding Self-Check Review is located on the next page.

ANSWER KEY

NOTE: Some of your answers may be slightly different, but they should include the same main points.

1. Insurance considerations can affect the height of coastal buildings.

   True

2. When is the best time to involve an insurance industry representative?

   c. During design.

3. Flood insurance is typically part of standard homeowner's insurance policies.

   False

4. In most areas, earthquake insurance is not available.

   False

5. Gazebos, swimming pools, and seawalls are insurable under NFIP.

   False

6. What impact are the following likely to have on insurance premiums? (Mark one column for each.)

	Increase	Decrease	No Impact
a. Participate in the Community Rating System		**x**	
b. Locate the lowest floor of elevated building in a V-zone below the BFE	**x**		
c. Build in an X zone rather than an A zone.		**x**	
d. Eliminate breakaway walls in a V-zone design.		**x**	
e. Build in a V zone rather than an A zone.	**x**		
f. Eliminate openings in the enclosed area below the BFE in an A zone.	**x**		
g. Locate the furnace in the space below an elevated building in a V zone.	**x**		
h. Add freeboard.		**x**	

WIND INSURANCE Sources of Wind Insurance

Homeowner's Policy. Wind insurance coverage is generally part of a homeowner's insurance policy.

Insurance Pools. Underwriting associations (or "pools") provide last-resort insurance to homeowners in coastal areas who cannot obtain coverage from private companies. States that have beach and windstorm insurance plans include Alabama, Florida, Louisiana, Mississippi, New York, North Carolina, South Carolina, and Texas.

Wind-MAP. New Jersey operates the Windstorm Market Assistance Program (Wind-MAP) to help residents in coastal communities find homeowner's insurance on the voluntary market. When Wind-MAP does not identify an insurance carrier for a homeowner, the New Jersey FAIR Plan may provide a policy for windstorm, hail, fire, and other events; it does not cover liability.

Rating Factors

Wind is only one part of the rating system for multi-peril insurance policies such as a homeowner's insurance policy.

The following factors are considered in rating a homeowner's (HO) insurance policy:

- Form (e.g., HO2, HO3, which determines the type of coverage).
- Territory.
- Fire protection class.
- Building code effectiveness.
- Construction type.
- Protective devices.

Premiums can also vary because of other factors (e.g., amount of coverage and deductible) not related to building construction. Some companies adjust their higher optional deductible credit according to construction type, giving more credit to more fire-resistant concrete and masonry buildings.

Most companies rely on the Homeowner's Multistate General Rules and State-specific exceptions manual of the Insurance Services Office (ISO) as the benchmark for developing their own manuals. (ISO stresses that its rules are advisory and that it is up to each company to decide what to use and charge.)

The ISO publishes a homeowner's manual in every State except Hawaii, North Carolina, and Washington (where State-mandated insurance bureaus operate), and in Texas (where the ISO Homeowner's Program has been under development).

Territory. Wind coverage credit varies by "territory." An entire State may be one territory. Some States—such as Florida—are broken down into county and sub-county territories. In Florida, the Intracoastal Waterway is frequently used as the boundary line.

Fire Protection Class. ISO publishes a public protection classification for each municipality or fire district based on an analysis of the local fire department, water system, and fire alarm system. This classification does not affect wind coverage, but it is an important part of the rate setting.

Building Code Effectiveness Grading Schedule. ISO also publishes a Building Code Effectiveness Grading Schedule (BCEGS) that rates communities on factors such as the adopted building codes and enforcement of these codes. The schedule focuses on natural hazard mitigation and is used only in the determination of wind, hail, and earthquake coverage. Credit is based on the building code adopted and the relative degree of commitment the community has to code enforcement. In Florida, the BCEGS grading can provide a credit of as much as 11 percent.

BCEGS is a **voluntary** program, and not all insurance companies have adjusted their premiums to reflect the community's BCEGS class.

BCEGS—while not fully implemented—is expected to have all States graded by the end of the year 2000. The schedule applies only to buildings constructed during the year of ISO's grading or later.

Construction Type. To simplify insurance underwriting procedures, buildings are identified as being in one of four categories:

Frame	Exterior walls of wood or other combustible construction, including stucco and aluminum siding.
Masonry Veneer	Exterior walls of combustible material, veneered with brick or stone.
Masonry	Exterior walls of masonry materials, floor and roof of combustible materials. (Because it is hard to differentiate masonry veneer from masonry, they are often given the same rating.)
Superior	"Non-combustible," "masonry non-combustible," or "fire resistive." Not many single-family homes qualify as "superior," which qualifies for a 15 percent credit off the masonry rates. A home of this type may also qualify for a wind credit because some insurers believe that buildings with walls, floors, and roofs made of concrete products offer good resistance to windstorms and Category 1 hurricanes. Therefore, a fire-resistive home may get a wind-resistive credit.

ISO's dwelling insurance program allows companies to collect data from the owner, the local building department, or their own inspectors to determine whether a house can be classified as "wind-resistive" or "semi-wind-resistive" for premium credit purposes.

Protective Devices. Protective devices are not considered basic factors, but items that may deserve some credits. This approach is more common for fire and theft coverages which, for example, credit sprinklers and fire and/or burglar alarms tied to the local fire or police stations.

ISO's rules do not address wind protective devices, except in Florida.

FLORIDA

In Florida, a premium credit is given if "…exterior wall and roof openings [other than roof ridge and soffit vents] are fully protected with storm shutters of any style and material that are designed and properly installed…" to:

(1) Meet the latest ASCE 7 engineering standard adopted by Dade County and

(2) Withstand impact from windborne debris in accordance with standards set by

   (a) The municipality or
   (b) If there are no local standards, by Dade County.

The rules also provide specifications for alternatives to storm shutters, such as windstorm protective glazing material.

EARTHQUAKE INSURANCE

Earthquake insurance is an addition to a regular homeowner's insurance policy. Earthquake insurance carries a very high deductible—usually 10 or 15 percent of the value of the house.

In most States, ISO has developed advisory earthquake loss costs based on a seismic model used to estimate potential damage to individual properties in the event of an earthquake. The model is based on:

- Seismic data.
- Soil types.
- Damage information from previous earthquakes.
- Structural analysis of various types of buildings.

Based on this model, postal ZIP codes have been assigned to rating bands and loss costs developed for each band. The number of bands varies within each State and, at times, within a county.

In California, the California Earthquake Authority (CEA), a State-chartered insurance company, writes most earthquake policies for homeowners. These policies cover the dwelling and its contents and are subject to a 15 percent deductible. CEA rates are also based on a seismic model used to estimate potential damage to individual properties in the event of an earthquake.

SELF-CHECK REVIEW: WIND AND EARTHQUAKE INSURANCE

Instructions: Answer the following questions. Then turn the page to check your answers. If you answered any items incorrectly, you should review the related material before continuing.

1. Wind insurance coverage is generally part of a homeowner's insurance policy.

   True False

2. The Building Code Effectiveness Grading Schedule is a voluntary rating program that focuses on natural hazard mitigation.

   True False

3. Earthquake insurance is generally part of a homeowner's standard insurance policy.

   True False

4. Give three examples of factors that affect wind insurance rates.

The Answer Key for the preceding Self-Check Review is located on the next page.

ANSWER KEY

NOTE: Some of your answers may be slightly different, but they should include the same main points.

1. Wind insurance coverage is generally part of a homeowner's insurance policy.

   True

2. The Building Code Effectiveness Grading Schedule is a voluntary rating program that focuses on natural hazard mitigation.

   True

3. Earthquake insurance is generally part of a homeowner's standard insurance policy.

   False

4. Give three examples of factors that affect wind insurance rates.

   Any of the following:
   - **Form of coverage**
   - **Territory**
   - **Fire protection class**
   - **Building code effectiveness**
   - **Construction type**
   - **Protective devices**

UNIT IX EXERCISE

Instructions: Use this Unit Exercise to test how well you learned the material presented in Unit IX. When you complete the exercise, check your answers against those in the Answer Key that follows. If you answered any questions incorrectly, be sure to review the corresponding section of the unit before proceeding to the Final Test.

1. Name a benefit and a cost of using connectors that have thicker galvanized coating or that are made of stainless steel.

   Benefit: _____

   Cost: _____

2. Name another mitigation measure and a potential benefit and cost of using that measure.

   Mitigation measure: _____

   Benefit: _____

   Cost: _____

3. The initial costs of additional mitigation measures are often offset by long-term benefits.

   True False

4. Match the types of insurance on the left with the descriptions on the right.

____ Flood insurance	a. Typically covered under homeowner's policy
____ Wind insurance	b. Usually covered under homeowner's policy
____ Earthquake insurance	c. Usually requires a separate endorsement
____ Coverage for lightning, hail, and freezing	d. Separate insurance available in communities that participate in NFIP

5. Factors used to determine NFIP insurance rates include building occupancy and building type. Name two other factors.

   (1) _____

   (2) _____

6. What can change the insurance rate for pre-FIRM buildings?

7. List two examples of items below the BFE that typically are not covered under a Standard Flood Insurance Policy.

   (1) _____

   (2) _____

8. Explain how zone and elevation affect flood insurance premiums.

9. Two factors used to determine wind insurance rates include territory and fire protection class. Name two other factors.

   (1) _____

   (2) _____

The Answer Key for the preceding Unit Exercise is located on the next page.

UNIT IX EXERCISE — ANSWER KEY

NOTE: Some of your answers may be slightly different, but they should include the same main points.

1. Name a benefit and a cost of using connectors that have thicker galvanized coating or that are made of stainless steel.

   Benefit: **Reduces potential for corrosion**

   Cost: **Thicker coating and stainless steel are more costly.**

2. Name another mitigation measure and a potential benefit and cost of using that measure.

   (Answers will vary; see Table 9.1.)

3. The initial costs of additional mitigation measures are often offset by long-term benefits.

   True

4. Match the types of insurance on the left with the descriptions on the right.

d	Flood insurance	a.	Typically covered under homeowner's policy
b	Wind insurance	b.	Usually covered under homeowner's policy
c	Earthquake insurance	c.	Usually requires a separate endorsement
a	Coverage for lightning, hail, and freezing	d.	Separate insurance available in communities that participate in NFIP

5. Factors used to determine NFIP insurance rates include building occupancy and building type. Name two other factors.

   Any of the following:
   - **Flood insurance zone**
   - **Date of construction**
   - **Elevation of the lowest floor or bottom of the lowest horizontal structural member of the lowest floor**
   - **Enclosures below the lowest floor**
   - **Location of utilities and service equipment**

6. What can change the insurance rate for pre-FIRM buildings?

   Substantial improvement or substantial damage

7. List two examples of items below the BFE that typically are not covered under a Standard Flood Insurance Policy.

   (Answers will vary; see Table 9.6.)

8. Explain how zone and elevation affect flood insurance premiums.

   Premiums tend to be higher in V zones than A zones. Premiums for buildings in B, C, and X zones are the least expensive. Elevating a building above the BFE lowers the premium, with greater savings for greater freeboard.

9. Two factors used to determine wind insurance rates include territory and fire protection class. Name two other factors.

   Any of the following:
   - **Building code effectiveness**
   - **Construction type**
   - **Protective devices**

A NOTE ABOUT RELATED COURSES AND THE COASTAL CONSTRUCTION MANUAL

This independent study course has drawn heavily from Volume I of the *Coastal Construction Manual*. The related classroom course, "Residential Coastal Construction," is available as a 5-day resident course presented at the National Training Center of the Emergency Management Institute (EMI) in Emmitsburg, Maryland, as well as a 2-day nonresident course presented at field locations.

The classroom course draws heavily from Volume II of the *Coastal Construction Manual*, which covers the following topics:

- **Determining site-specific loads**—dead, live, snow, flood, tsunami, wind, tornado, and seismic loads and load combinations.

- **Designing the building**—carrying out the design process, including (1) determining loads, (2) applying loads to the building, (3) determining forces at connections and stresses, (4) developing connections at each link, and (5) selecting building materials. Detailed information is also provided on design of the building envelope, utilities/mechanical equipment, and appurtenant structures.

- **Constructing the building**—key issues related to constructing the foundation, structural frame, and building envelope. Information is also provided about accessory structures and utility/mechanical equipment.

- **Maintaining the building**—effects of the coastal environment, building elements that require frequent maintenance, and maintenance techniques required for natural hazards. Information is also provided on retrofit opportunities and costs.

Volume III of the *Coastal Construction Manual* contains a wide array of supplemental information, including FEMA, NFIP, and CZMA contact information; examples of State and community coastal erosion studies and hazard zone maps; FEMA technical bulletins; and other guidance. Many of the technical bulletins referenced in this independent study course are provided in Volume III.

All three volumes of the *Coastal Construction Manual* are provided to course participants.