STORM GUIDANCE FOR FLORIDA'S HISTORIC PROPERTIES

PDP

MARCH 2023

This *Storm Guidance* document was prepared as a component of the Florida Department of State, Division of Historical Resources, Florida Disaster Risk, Mitigation, and Recovery Guidance Project.

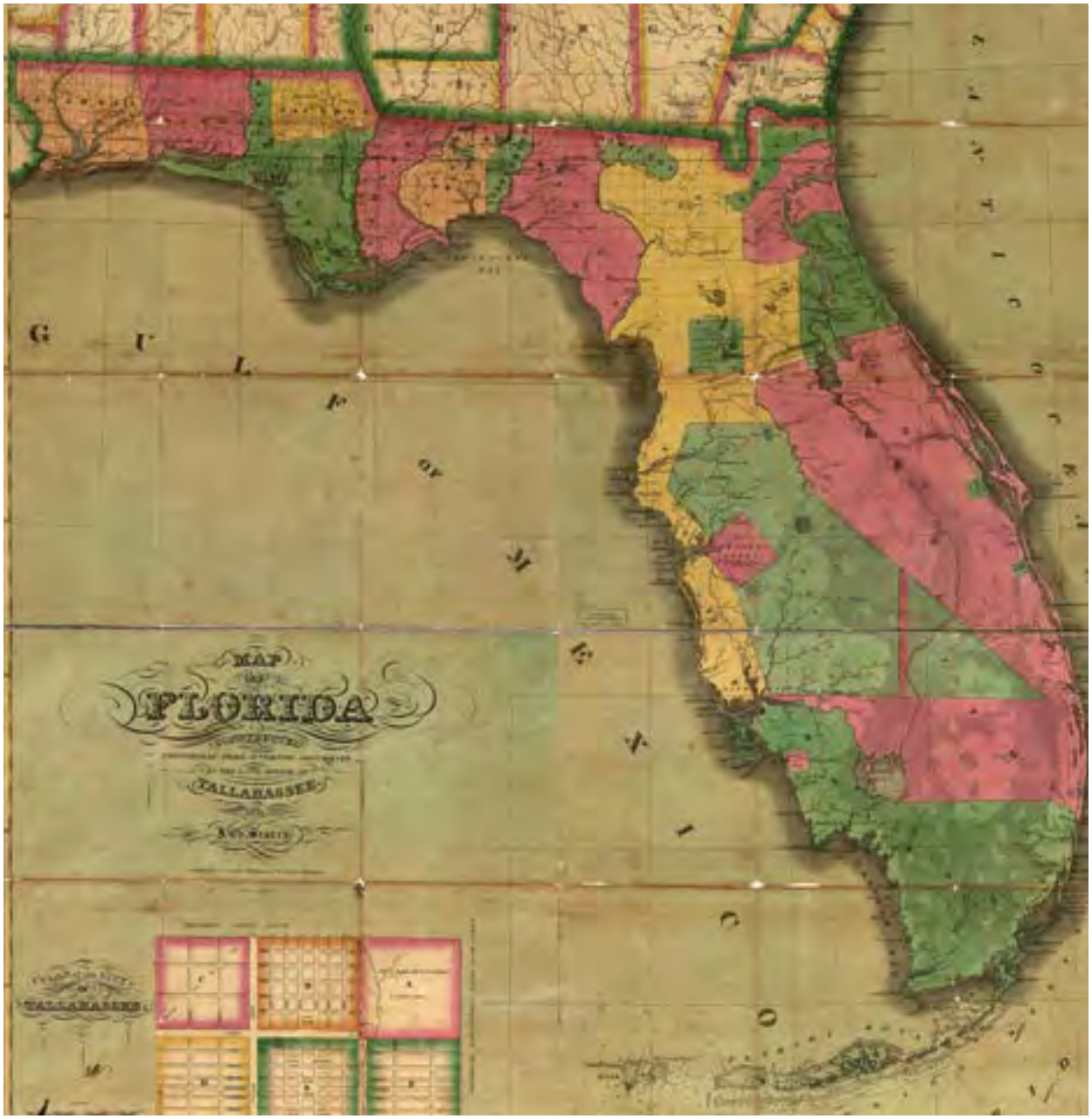
This material is based upon work assisted by a grant from the Department of the Interior, National Park Service. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Department of the Interior.

We would like to express our appreciation to the Florida Department of State, Division of Historical Resources, for their support in the completion of this project.

All components of the *Storm Guidance for Florida's Historic Properties* including all text, graphic design, photography and illustrations unless noted otherwise were prepared by Dominique M. Hawkins, FAIA, LEED AP and Jennifer Wolfe, AICP with the assistance of Jacob Elisii.

Preservation Design Partnership, LLC
Philadelphia, Pennsylvania
www.pdparchitects.com

TABLE OF CONTENTS



Map of Florida constructed principally from authentic documents in the land office at Tallahassee I.G. Searcy and F. Lucas, Jr. 1829 (Florida Memory)

Orlando ca. 1880 flooding (Florida Memory)

INTRODUCTION

PURPOSE

This document is intended to serve as a planning tool in advance of a severe storm event. It should be used to guide the decision-making process in a manner that allows users to identify effective mitigation options that minimize the impact of flood and wind damage while preserving historic character. The information is presented in a series of stand-alone chapters with cross-references to pertinent information. The appendices include references to additional information and a glossary to explain unfamiliar terminology.

Severe storms, climate change, and sea level rise impact properties across Florida with its extensive coastline, water bodies, and other geographic features. Historic buildings and structures were constructed without modern building codes and are often located near waterways making them particularly vulnerable. Across Florida, flood and storm events are increasing in frequency and intensity over historic trends due to climate change. The alterations to reduce storm impacts often result in radical change that conflicts with traditional preservation practices. The resulting changes frequently reduce the historic integrity of individual buildings and a community's unique character.

Preservation stakeholders face a challenge to find solutions among complex and sometimes contradictory policies, regulations, and practices. To help bridge the gap between disaster management and historic preservation, the Florida Division of Historical Resources (DHR) sought to create this resource for property owners, local preservation officials, and design professionals.

PROJECT BACKGROUND

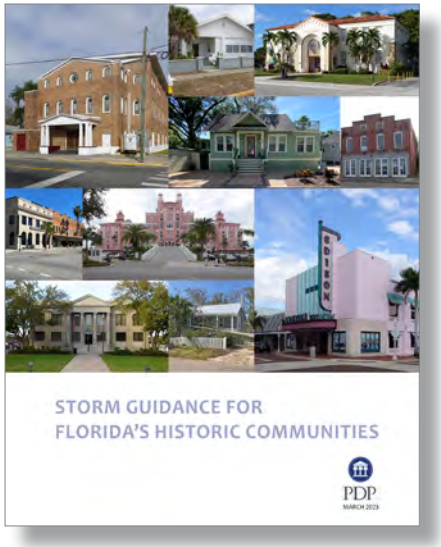
The project was designed to provide guidance for storm mitigation and recovery efforts for Florida's historic properties that expands upon the 2006 publication titled "Disaster Planning for Florida's Historic Properties" and other similar guidance. Financial assistance was provided by the National Park Service (NPS) pursuant to the Hurricanes Harvey, Irma, and Maria (HIM) Emergency Supplemental Historic Preservation Fund (ESHPF) Grant Program.

Three guidance documents are available as part of this project: one addressing the needs of individual properties, one for Florida's local governments, and one for state agencies. To develop a comprehensive assessment of the impacts of flood and storm events on historic preservation, multiple subject matter experts gathered information to contribute to each document. While *Storm Guidance for Florida's Historic Properties* addresses the needs of individual properties, the other documents address the following:

- Regulatory processes
- Disaster related agencies and departments
- Community needs and mitigation measures
- Archaeological heritage at risk
- Economic impacts of storm and flood events on historic communities

All documents and related appendices are available on the DHR web site. *(www.dos.myflorida.com/historical)*

Warm Mineral Springs, located in Northport, was damaged from wind and flooding due to Hurricane Ian, which struck the area on September 28, 2022.



Local Government Guide

State Guide

STORM GUIDANCE FOR HISTORIC PROPERTIES SUMMARY

The goal of this document is to assist users in identifying the most effective property mitigation or adaptation strategy to address flood and wind damage that minimizes the impact on a property's historic integrity.

Basic flood insurance and floodplain management requirements are first described to provide a regulatory context that must be considered with any project. Wind mitigation is described from the perspective of retrofitting existing buildings. Building maintenance and mitigation recommendations follow and include information for both residential and non-residential historic properties.

This *Storm Guidance* document was organized to allow users to quickly access information most relevant to their needs. Information is cross-referenced, providing more detailed explanations of terminology or requirements located in other sections. The content and organization of this document may also serve as a model for communities to develop their own local guidance document or refer to this as a best practices approach when evaluating public and private projects. An overview of preservation regulations and their benefits is also provided.

USING THIS DOCUMENT

This document is intended to serve as a planning tool in advance of a storm event. It should be used to guide the decision-making process in a manner that allows users to identify effective mitigation options that minimize the impact of flood and wind damage while preserving historic character. It recognizes that each property has unique characteristics and vulnerabilities and that accepted mitigation options will vary between communities. Information in this Storm Guidance document should be considered as a supplement to consultation with architects and engineers; local officials; local building codes, the Florida Building Code; and, where applicable, the local design review board processes. *(Refer to Chapter 9: Review Requirements for Historic Buildings, to identify potential requirements for a potential project.)*

The anticipated users of this Storm Guidance document include:

- Historic residential and commercial property owners, tenants, and managers
- Architects and design professionals
- Local preservation review boards and staff
- Local government representatives including building officials, floodplain management officials, municipal planners, and code enforcement officers

PROPERTY OWNERS/TENANTS/MANAGERS

This Storm Guidance document provides an overview of the regulatory floodplain management, wind retrofit projects, and various improvements that can be implemented to reduce the impacts of severe storms. Although some complex improvements will require the assistance of an architect, engineer, or contractor, there are numerous simpler improvements identified that will improve resilience. For complex projects, clear explanations can aid conversations with design professionals during the decision-making process with the goal of promoting preservation-friendly outcomes.

ARCHITECTS AND DESIGN PROFESSIONALS

Architects and design professionals can use this Storm Guidance document to design preservation-friendly mitigation solutions that minimize the impact on the historic building and its context. The document provides a tool to discuss options and requirements with property owners during the development of resilient designs.

LOCAL PRESERVATION REVIEWERS

This Storm Guidance document provides a reference for local and county preservation boards, commissions, and regulatory authorities during evaluations of storm mitigation projects. While guidance documents work best when tailored specifically to a community's characteristics and vulnerability, Florida has common patterns of traditional architecture and shared vulnerabilities described in the following sections.

Historic preservation considerations are included at the end of many chapters. If used in a regulatory manner, the local agency will need to provide clarifications for property owners if there are conflicts with local requirements.

LOCAL GOVERNMENT OFFICIALS/REPRESENTATIVES

Local government officials can use this document to discuss storm mitigation options and requirements with property owners. It can also provide information to local officials in the development of policies, programs, and initiatives that protect historic resources. Care should be taken to identify any conflicts with local requirements.

GUIDANCE DOCUMENT FORMATTING

Bold Text

Within the narrative portion of this document, certain words or phrases are emphasized in bold to call the reader's attention to an important fact, citation, or to identify items in a list.

Italicized Text

Resources for more information and cross-references to other sections of the document are distinguished using italicized text in parentheses.

Sidebars

Shaded text boxes are provided throughout the document to highlight specific information. These will include at-a-glance information and definitions.

Chapter End Summaries

Shaded text boxes with check boxes provide summaries of preservation considerations at the end of each chapter to consolidate information into an at-a-glance resource for the contents of the chapter.

DOCUMENT ORGANIZATION

01 STORM VULNERABILITY

The first step in assessing a historic property's vulnerabilities is identifying the potential types of storm and flood events that may occur.

02 FLOODPLAIN MANAGEMENT AND MITIGATION

Government agencies are responsible for administering flood insurance programs, reducing community risk with laws and policies, and recognizing historic properties. Construction activities and insurance eligibility will be impacted by these programs.

03 WIND RETROFITTING

Historic buildings can be adapted to withstand greater wind forces. Implementing wind resistant measures in a planned renovation project can improve resilience and reduce insurance costs.

04 BASIC IMPROVEMENTS

Building maintenance is continually necessary for historic buildings. Routine maintenance can help a property withstand flood and wind impacts. Planned maintenance should evaluate all building components, monitor for signs of damage, and prepare for each storm season.

05 LANDSCAPE IMPROVEMENTS

A building's site, topography, and surrounding plantings can impact a property's flood and wind vulnerability. Careful landscape planning and design may reduce storm damage.

06 WET FLOODPROOFING

Wet floodproofing is flood mitigation approach allowing water to pass freely into and out of a building. There are multiple considerations that require evaluation including existing building materials, building uses, and the historic streetscape.

07 DRY FLOODPROOFNG

Dry floodproofing is a flood mitigation approach that requires significant intervention to prevent floodwater from entering a building. This option applies to masonry and concrete non-residential buildings. Residential properties can undertake dry floodproofing projects, but they will not receive the financial benefits of reduced flood insurance premiums or relief from regulatory mandates.

08 ELEVATING OR RELOCATING

Building elevation and relocation are flood mitigation approaches that require the greatest physical building alteration and potential impact to historic buildings and/or streetscapes. Specific considerations and examples illustrate compatible methods to preserve the building's historic character to the greatest degree possible. Accessibility requirements make this option more common for small residential properties and challenging for non-residential properties.

09 REVIEW REQUIREMENTS FOR HISTORIC BUILDINGS

Local, state, and federal historic preservation regulations may apply to any construction project in addition to standard building requirements. These could include historically designated properties or older properties meeting certain criteria.

10 EMERGENCY RESPONSE

A storm mitigation plan requires a specific strategy for confronting a flood or severe wind event in the context of emergency management. Information is presented in three sections: planning, pre-storm activities, and storm recovery witch checklists of recommended actions.

A STORM VULNERABILITY CHECKLISTS

Information is consolidated into easy reference guides that can facilitate a property review. The review can identify conditions requiring maintenance or that increase storm vulnerability. Checklists describe various conditions and suggest possible repairs.

B ORGANIZATIONS AND RESOURCES

Contacts and informational resources are provided to identify local, state, and federal agencies and organization that have a role in flood and wind mitigation.

C APPENDIX: GLOSSARY

Terminology used in this document is defined as related to flood and wind mitigation requirements and programs in addition to basic historic preservation terms.

Hurricane of 1896 in Cedar Key (Library of Congress)

1 STORM VULNERABILITY

VULNERABILITY

[Vulnerability is the] susceptibility of human settlements to the harmful impacts of natural hazards.

This susceptibility has implications at the individual, household, and community levels, and potentially harmful outcomes such as injuries, deaths, damage to housing and infrastructure, and destruction of businesses and livelihoods. It is therefore important to capture both the physical/exposure and social/human dimensions.

[FEMA]

Weather has significant impacts on Florida's historic buildings and environments. ***Although hurricane season extends from June 1st through November 30th each year, Florida's severe weather often extends from early spring to late fall. The largest weather impacts on historic buildings are flooding and wind. Secondary storm vulnerabilities at historic properties include fire and lightning strikes, as well as the possibility of sinkholes, shifting shorelines, and erosion. The rate and intensity of all of these vulnerabilities are increasing due to climate change.***

While all historic properties may be exposed to severe weather, carefully selected improvements to mitigate or reduce weather impacts can reduce a property's vulnerability. Historic buildings were not built to meet the stringent requirements of current building codes and inherently lack the benefits of modern construction. Yet, historic building materials are often more resilient than modern building materials.

FLOODING

There are two basic types of flooding: persistent flooding and event flooding. Each type of flooding can cause significant damage, but when an area plagued by persistent flooding is struck by an event flood, such as a hurricane or flash flood, the combined effect can be devastating. Persistent flooding, also referred to as nuisance flooding, is typically minor flooding that results in traffic problems, road closures, overwhelmed storm drains, and occasionally infrastructure damage. These often cause public inconvenience and business interruptions. Persistent flooding can occur when there is a combination of a normal high tide and a significant moon phase. When there are high water tables, soils can become spongy or soggy. This is particularly true along the banks of waterways and low-lying, flatter areas.

Persistent flooding can alter the ecosystem of an area. This may disrupt an area's ability to support farming and other activities depending on the flooding frequency and water salt content. As its frequency and severity worsen, persistent flooding can also impact the drinking water supply for those relying on well water.

Event flooding is occasional flooding that has a specific cause, typically a weather event that occurs from natural sources like storms, precipitation, and all types of waterbodies. Low-lying and flood-prone areas adjacent to or near waterways, called floodplains, are more vulnerable to these weather events. The Federal Emergency Management Agency (FEMA) identifies floodplains on maps to provide an indicator of potential flooding. Event flooding can be unpredictable, such as sudden infrastructure failures like collapsed water pipes, clogged storm drains, and deferred maintenance.

Hurricane Dennis, 2005, flooded Apalachicola streets and vulnerable historic commercial areas.

FLOOD OR FLOODING

A general and temporary condition of partial or complete inundation of normally dry land from:

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

[FBC]

Floods occur naturally and can happen almost anywhere. They may not even be near a body of water, although river and coastal flooding are two of the most common types. Heavy rains, poor drainage, and even nearby construction projects can create risk for flood damage.

[FEMA]

FLOODING SOURCES

Flooding in Florida is most often associated with storm events that occur during hurricane season. Depending upon the path and severity of the storm, these events can be limited to a specific area or can occur along the entire path. Other sources of flooding may occur from high-wind seasonal storms, heavy rains, stormwater infrastructure failures, and increasingly high tides. Across the state, particularly in coastal communities, it is not uncommon for all of these sources to contribute to a flood. Understanding a property's vulnerability to various flood types is key to developing a mitigation strategy.

COASTAL FLOODING

"The rate of increase for flood events is accelerating at most locations along the East and Gulf Coasts." *(National Oceanic and Atmospheric Administration, 2021. Tides and currents: CO-OPS derived product API, www.noaa.gov)* Storm surge, tidal shifts, waves, and sea level can all influence coastal flooding. Due to increased sea levels and storm severity, coastal areas are experiencing more flooding events as evidenced by breaches of natural and man-made shoreline protection, pooling of water in streets and in low-lying areas, and destruction of natural landscapes from saltwater intrusion. Shorelines have also been impacted by development and by management interventions of coastal resource agencies.

Low-lying coastal communities with high water tables are especially at risk to infrastructure failure from high tide events that compromise water and sewer gravity flow.

SEVERE STORMS

Severe storms with significant rainfall can also result in flooding. The types of storms resulting in flooding can be the remnants of anticipated storms such as hurricanes, tropical storms, or high-wind seasonal storms; or an unpredictable intense rainfall, known as a flash flood. Properties with limited natural landscape areas to absorb rain water often divert storm water to the street, adjacent parcels, or directly into the storm water system. ***When there is a heavy storm, the rain water can overwhelm stormwater system and can cause flooding by raising waterbodies or backflowing onto private property.***

STORMWATER INFRASTRUCTURE

Many Florida communities have a history of infrastructure-related flooding. This is often due to water flowing backwards in storm drains, floor drains, sewers, septic systems, and water supply piping or drainage that is deteriorated or over capacity. Combined stormwater and sanitary sewer systems are of particular concern since any backups may bring contaminated water with the flood water. A common priority among Florida's local governments is obtaining funds for maintenance and implementation of upgrades for stormwater infrastructure systems to separate the sanitary and sewer discharge. ***Property owners or tenants who believe the source of their flooding may be connected to their drainage system or water supply should contact their water utility or public works department***.

DEVELOPMENT OF NATURAL AREAS

Florida experienced a building and land development boom in the early-20th century and continues to suffer from the lack of a comprehensive land management program. In many communities, new development does not require the preservation of natural areas through mandated planning for a net-zero impact to historic stormwater flows. Florida's past and current development includes the filling of marshes; draining and channelizing of water bodies; and increasing impervious surfaces; undermining nature's ability to absorb water into the ground. As a result, local communities that do not implement appropriate restrictions on new development may experience increased flooding.

RIVERINE

As development increases, more of the natural watersheds are covered with buildings and paved surfaces, increasing runoff into adjacent rivers and water ways. The additional volume of water causes rivers to rise and flow faster and culverts to be overwhelmed. When the height of the water body rises and overflows its banks, riverine flooding occurs. The fast-flowing water can be dangerous to pedestrians and moving vehicles, and can cause unsecured objects to become floating projectiles. Although riverine flooding can be devastating, there is often sufficient notice to allow individuals to protect their property and to safely relocate to higher ground.

Davis Islands in Tampa is an example of land reclamation projects that occurred during the Florida Land Boom. (ca. 1927, Florida Memory)

WIND AND TORNADOES

While flood vulnerability is typically associated with a building's proximity to water, buildings throughout Florida are potentially vulnerable to wind damage from natural events. Severe storms, such as hurricanes and tropical storms with significant sustained winds and gusts, will cause damage, with the added danger of flying debris. Tornadoes can have wind speeds greater than hurricanes, and usually develop in association with severe thunderstorms. Secondary damage can also occur from downed trees, which can fall on buildings or power lines. This can start a fire or block a roadway, hindering emergency vehicle access.

Wind damage can cause failure to the following building components:

- Roofs,
- Window and door openings,
- Structural systems,
- Siding materials, and
- Appendages, such as chimneys, porches, and carports.

There are several improvements that a property owner can implement to reduce the potential damage from high winds, including trimming trees, protecting windows, and improving structural reinforcing. *(Refer to Chapter 3: Wind Retrofitting, and Chapter 4: Basic Improvements)*

SECONDARY THREATS

FIRE AND LIGHTNING

Following Hurricane Michael in 2018, piles of debris and downed trees remained across the Florida panhandle. Three years later, the debris and trees ignited wildfires that ravaged 34,000 acres. Wildfire activity is linked with temperature and precipitation patterns. Florida is greatly affected by the El Niño–Southern Oscillation occurrence during winter and spring months that overlap the traditional wildfire season, increasing this risk. *(Florida Climate Center: www.climatecenter.fsu.edu)*

- Typical wildfire season is March through June (hurricane season occurs annually June 1st through November 30th)
- Lightning is one of the most hazardous and life threatening impacts of a storm event and difficult to forecast

Lightning struck one of the identical roof towers of this historic church. Fortunately the impact was limited to one tower roof.

- Warm temperatures and water will produce thunderstorms and generate lightning

Fire can also occur in the aftermath of a flood when fuel containers are damaged or electrical sources, such as downed electrical lines, that come in contact with flood water. Flood water or debris blocking roadways can hinder fire-fighting efforts, allowing the fire to continue to spread.

SHIFTING LANDSCAPES: SINKHOLES, SUBSIDENCE, AND EROSION

Florida's geography and geology contribute to challenges that are exacerbated by climate change. *(Refer to Climate Change, page 1.6.)* Much of the underground rock in Florida is limestone, which is soft and dissolves in water. These underground areas of limestone are known as Karst regions. As Karst regions are exposed to water, either through more frequent flooding or seepage into the rock, the limestone erodes, forming underground caves or streams.

University of South Florida's Dr. Lori Collins studied the 2017 Pasco County sinkhole at Lake Padgett comparing the 1952 USDA aerial with current imagery.

> ***"Florida's geographic position and latitudinal range mean that the state is situated such that it encompasses both temperate and sub-tropical climate regimes" and "Florida's karst system of sinkholes, submerged caves and springs depend on the connection between the surface and the underground, with even slight changes in soil moisture, elevation, and temperature causing profound effects."***
>
> [Beth Stys, et al.]

SINKHOLES

Due to Florida's geology, the Florida Department of Environmental Protection (DEP) has identified the increased likelihood of sinkholes. The soil on top of underground caves and streams in Karst regions can collapse, forming sinkholes. Sinkholes could theoretically form anywhere in Florida although some regions are higher risk. High-risk areas include those where limestone is close to the surface, or areas with deeper limestone but with contributing factors of the water table elevation, soil composition, and aquifer characteristics. Sinkholes can be triggered from drought, construction with heavy blasting and land transformation, flooding, heavy rainfall, and heavy groundwater pumping. There may or may not be any advance warning, so it is important to monitor a property for development of any sinkholes. Contact a professional engineer and local authorities if a sinkhole develops.

SUBSIDENCE

Land areas near shorelines are slowly sinking–a gradual process known as subsidence. With subsidence, the negative impacts of rising seas and storm events are increasing. This is getting worse with climate change. *(Refer to Climate Change, page 1.6.)* As a peninsula, Florida is almost surrounded by bodies of water and is experiencing different rates of subsidence all over the state.

Subsidence can also compromise natural shoreline protection including marshes, beaches, mangrove stands, coral reefs, and oyster beds, reducing their effectiveness. Invasive species, pollutants, and development can also contribute to increased rates of shoreline loss. Waterfront property owners can encourage the growth and preservation of natural shoreline protection by understanding its function and limiting activities that are harmful. *(Refer to Natural Shoreline Protection, page 5.5.)*

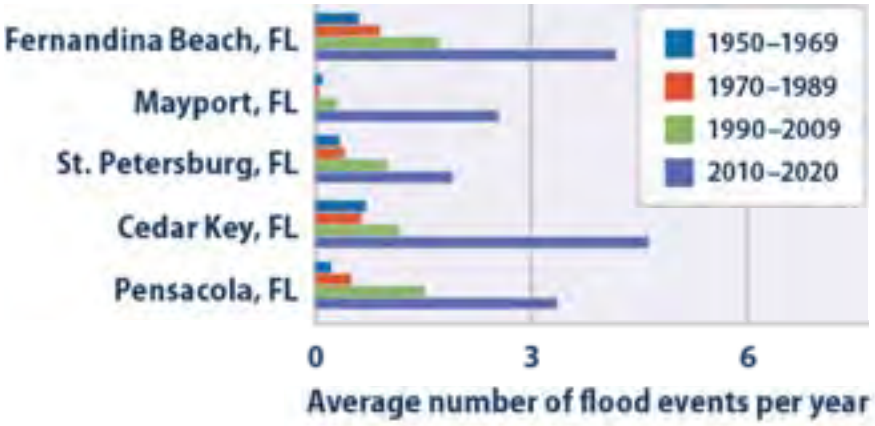
EROSION

Lands along waterbodies can gradually erode from slow consistent waves or currents over hundreds and thousands of years. However, more significant and noticeable erosion is occurring at an accelerated rate from increasing severe storms and sea level rise.

> **Flood-Related Erosion:** The collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding.
>
> [NFIP]

Erosion can impact coastal waterfront properties, historic maritime resources such as lighthouses, and the archaeological remains of some of Florida's Native American populations and earliest settlers.

Developers influenced land reclamation projects in the Florida Everglades in support of agriculture and the Florida Land Boom. (ca. 1960 Florida Memory)



The average number of coastal flood events per year from 1950 to 2020. (US Environmental Protection Agency, www.epa.gov)

CLIMATE CHANGE

National and international climate scientists, governments, and non-governmental organizations recognize that Florida's climate is changing, as evidenced by rising temperatures and seas. *(What Climate Change Means for Florida, US Environmental Protection Agency, 2016.)* Floridians and visitors experience more severe storms, increased flooding occurrences, and changes in biodiverse ecosystems. The 2022 report from the Intergovernmental Panel on Climate Change uses Florida as an example of a state at-risk for sea level rise and flooding from both natural geography and the impacts of development along all coasts. Residents in communities not at high risk for flooding may experience indirect affects with population increases. The state as a whole may see an influx of new residents particularly with the increase in remote workers choosing to be located in Florida. These population increases can stress infrastructure and social resources already at capacity.

Historic development patterns and archaeological sites provide evidence of climate adaptation over time. Traditionally people chose settlement areas that were on high ground and within reasonable distance to natural resources. With an increasing population and demand for waterfront property, more development is occurring in vulnerable areas.

INCREASING SEVERITY AND OCCURRENCE

Communities in Florida are experiencing an increase in the rate and intensity of flooding and high winds over historical trends. Roads can now become impassable more frequently, temporary ponds form after heavy rains, and property owners have to address new and more frequent–or more severe–flooding of their homes and businesses. Increased precipitation attributed to climate change is a contributing factor, made worse when accompanied by high tides or winds of a strong storm. These factors can occur separately or together, and stress infrastructure systems that have already begun to fail due to age and/or lack of maintenance.

Severe hurricane winds and changing wind patterns contribute to more frequent coastal flooding and higher storm surge, while high water tables can decrease the soil's ability to absorb a downpour. Significant increases in rainfall can overwhelm rivers, waterways, and stormwater systems and lead to flash flooding.

While disruptive to property owners, businesses, and visitors, there is also a substantial economic toll on Florida's historic communities and a growing threat to its historical and cultural resources.

Tallahassee's Lakeview Neighborhood in 1959. (Florida Memory)

2 FLOODPLAIN MANAGEMENT AND MITIGATION

FLOODING AND INSURANCE

The Special Flood Hazard Area (SFHA) is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. In most cases the property owner is financially responsible for necessary repairs following a flood, using their flood insurance or other means. Federal Emergency Management Agency (FEMA) funding is only available to those who meet limited criteria.

FEDERAL FLOOD REGULATIONS

NATIONAL FLOOD INSURANCE PROGRAM

Established in 1968, the National Flood Insurance Program (NFIP) offers repair assistance for flood-damaged properties, provides maps of floodplain areas, delineates zones of risk, and makes flood insurance available to property owners.

The intent of the NFIP was to:

- Allow property owners to purchase flood insurance from the federal government where private insurance was unavailable or cost prohibitive;
- Provide a national insurance funding pool to distribute the risk across a larger geographic area, thus reducing premium costs; and
- Provide incentives for flood risk management and reduce the overall costs of flooding.

In many ways, flood insurance works like other types of insurance. In exchange for the payment of a premium, the insurance provider guarantees compensation or partial compensation for a covered loss. Insurance premiums vary with the level of risk. For example, less flood-prone properties may have lower premiums than those in more vulnerable locations. With flood insurance, a property owner or tenant can receive financial assistance to offset recovery costs from a flood event. Flood insurance is typically available to cover damage to both the buildings and contents (i.e. furnishings and objects). If a community participates in the Community Rating System, property owners and tenants are eligible for discounted flood insurance premiums. *(Refer to Community Rating System, sidebar page 2.5)*

FLOOD INSURANCE COVERAGE

Flood insurance is available for tenants and property owners from the National Flood Insurance Program (NFIP) for buildings and contents at qualified properties in the following coverage amounts:

	Building	Contents
Residential	$250,000	$100,000
Renter	$0	$100,000
Commercial	$500,000	$500,000

Flood insurance is also available from private companies, although amounts may vary.

FLOODSMART

FloodSmart, administered by FEMA, is the official website of the National Flood Insurance Program (NFIP). It is a valuable resource for property owners and includes information regarding flood risk, flood insurance, and reducing flood risk. *(www.floodsmart.gov)*

Flood damage can be extensive to interior finishes and furnishings. (City of Jacksonville)

Commercial buildings sharing structural walls are challenging to mitigate when damaged or destroyed.

PROPERTY FLOOD INSURANCE

In communities that participate in the National Flood Insurance Program, flood risk is considered when calculating NFIP insurance rates. ***Flood insurance is required for some properties, such as mortgaged properties located within high-risk areas, but it should be considered by owners of all properties at risk for flooding. In cases where flood insurance is not required, each property owner must assess their property's level of risk and their ability to financially recover from a flood event when declining coverage. In addition, all property owners and tenants should consider flood insurance for their contents. In the event of a flood, any flood-related damage not covered by insurance is largely the responsibility of the owner and/or tenant.***

To qualify for flood insurance or maintain coverage, alterations may be required to protect a property from flooding (e.g., wet floodproofing, dry floodproofing, elevating, or relocating) and to achieve lower insurance premiums. In some cases, these alterations conflict with best practices for historic preservation. The key is to balance the extent of change required for flood protection with the desire to maintain historic character. *(Refer to Chapter 6: Wet Floodproofing, Chapter 7: Dry Floodproofing, and Chapter 8: Elevating or Relocating.)* ***Alterations can jeopardize the historic character and integrity of a building, property, and setting. If the changes cause the building to no longer meet the definition of a "historic structure," full floodplain management requirements must be met.*** All contributing properties in National Register Historic Districts and locally designated historic districts, in addition to all individually landmarked properties within a local preservation ordinance, meet the criteria of "historic structures" under the NFIP. *(Refer to Local Floodplain Management Regulations, page 2.9, Historic Property Mitigation Considerations, page 2.11, and Chapter 9: Review Requirements for Historic Buildings)*

Some historic cottages in Cedar Key are situated right along the water's edge.

NATIONAL FLOOD INSURANCE RATING METHODS

Property owners should make themselves aware of any proposed changes to Flood Insurance Rate Maps (FIRMs). *(Refer to Flood Insurance Rate Maps, page 2.6)* These maps are available through the Federal Emergency Management Agency (FEMA) or from the local floodplain manager or building official. Many Florida communities are currently proposing or have recently adopted revised FIRMs. Preliminary maps with proposed changes from the current regulated floodplains to the proposed regulated floodplains are provided on FEMA's Map Service Center. *(www.fema.gov)* With any map revision, properties may be added or removed from the Special Flood Hazard Area (SFHA), which can affect flood insurance rates.

In 2021, FEMA updated the rating methodology for flood insurance policies with a program called Risk Rating 2.0 - Equity in Action.

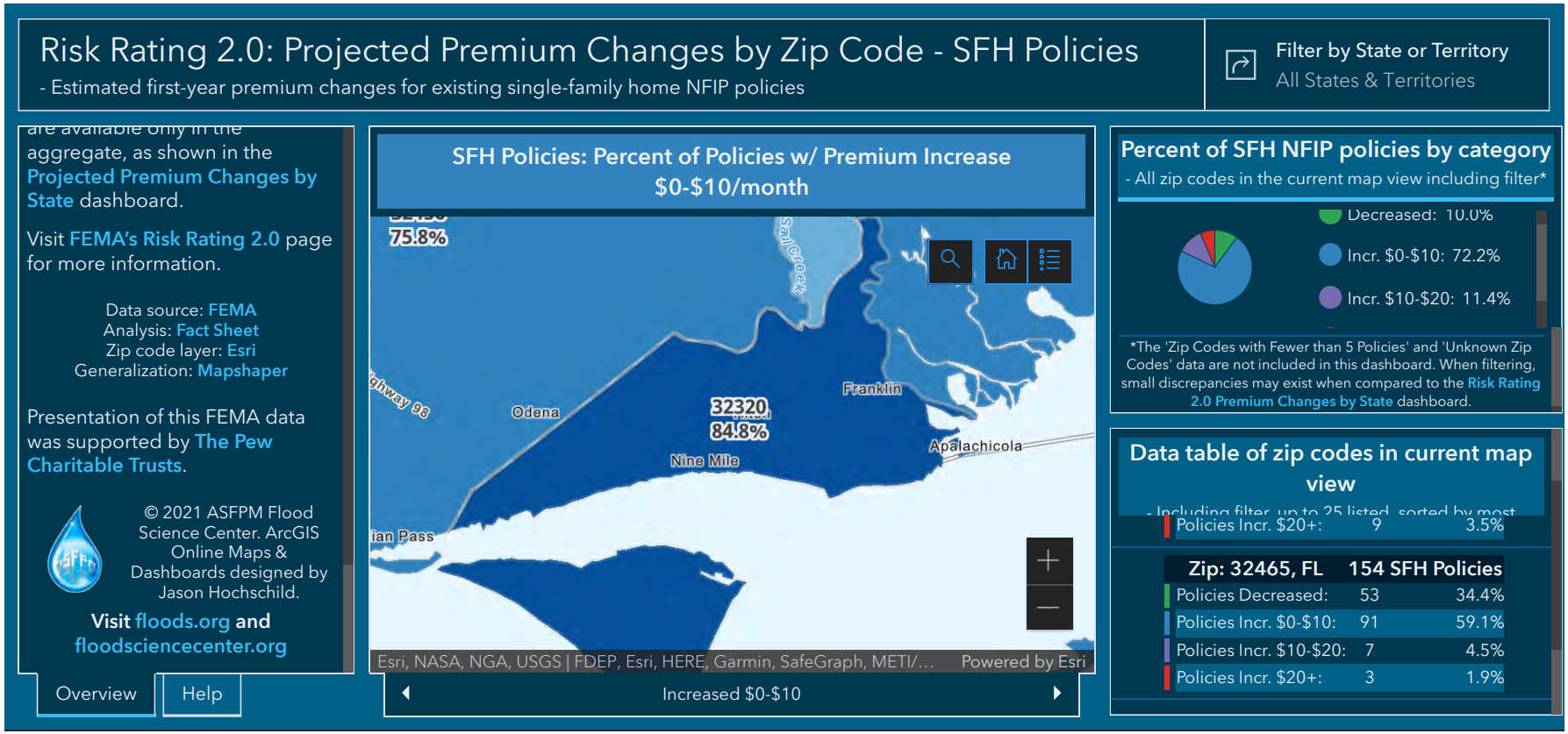
> ***To provide more equity, FEMA now has the capability and tools to address rating disparities by incorporating more flood risk variables. These include flood frequency, multiple flood types–river outflow, storm surge, coastal erosion, and heavy rainfall–distance to a water source and property characteristics such as elevation and the cost to rebuild.***
>
> [FEMA, press release April 1, 2021]

As part of the update, flood zones are no longer factored into flood rates; instead, a number of property specific factors are used. Phased implementation of the new policies began in October 2021; remaining policies subject to renewal after April 2022 are being updated.

The following types of considerations contribute to FEMA's Risk Rating 2.0 - Equity in Action flood insurance rates under the revised program:

- Geographic rating factors (distance to coast and associated flood type [storm surge, riverine])
- Quality of levees, if applicable
- Property characteristics (number of stories and first floor height)
- Hierarchy of associated hydrological feature (watershed, drainage area, river)
- Non-single family homes that have unique elements and historical loss ratios
- Ratio of coverage limit to coverage replacement cost

The iconic Don CeSar Hotel sits on a barrier island in St. Pete Beach with less than 400 feet of sandy beach between the building and the Gulf of Mexico.



FEMA's Risk Rating 2.0 Interactive Map provides information on projected flood insurance rates by zip code. In addition, the website includes a detailed report on the impacts of Risk Rating 2.0 for the state and a rate comparison using the old method of calculation and the Risk Rating 2.0 calculation method. (www.fema.gov)

Elevating mechanical systems is recommended and can reduce flood insurance costs.

Historic buildings may qualify for flood insurance for flood premium discounts.

BASIS FOR FLOOD INSURANCE RATE CALCULATION UNDER FEMA RISK RATING 2.0:

Property owners should contact their policy representative to find out how their specific policy is affected. The information provided here is a general summary for informational purposes only.

- Community Rating System (CRS) discount, if applicable: Expands the single-family home discount to non-single family homes regardless of location within or outside of a Special Flood Hazard Area (SFHA) *(Refer to Community Rating System, sidebar, at right)*
- A standard discount factor used for machinery and equipment elevated above the first floor
- A first floor height based on one of four foundation types with each foundation type having a different factor *(Refer to Building Foundations, page 8.14)*
- Maximum building rate of $15 per thousand dollars of Building Value multiplied by the Insurance to Value factor and a maximum contents rate of $15 per thousand dollars of Contents Value multiplied by the Insurance to Value factor
- Prior claims, including flood losses within 20 years prior to the policy period, which will have a surcharge based on the claim value and Insurance to Value factor
- An evaluation of each of the factors that establishes a maximum ceiling and floor rate for each unique portion of the rating plan (e.g. peril and segment)

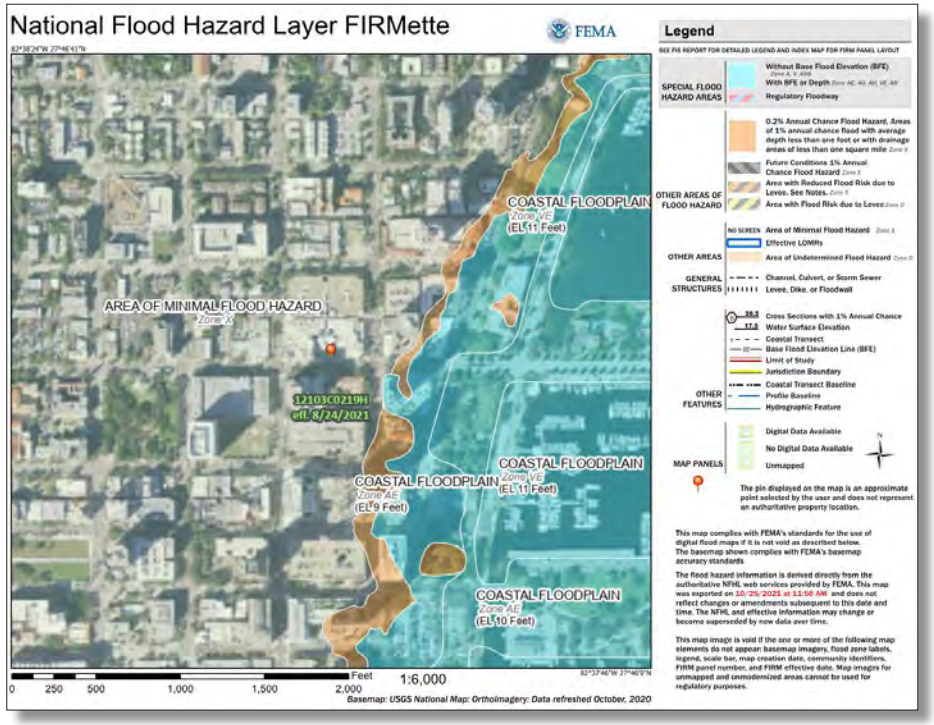
WHAT IS NOT CHANGING:

- Most annual rate increases will be less than 18%
- FEMA flood maps will still be used for mandatory purchase and floodplain management *(Refer to Flood Insurance Rate Maps, page 2.6)*
- Premium discounts for pre-FIRM and newly mapped properties, transferable discounts, and CRS discounts *(Refer to Pre-Firm Structures, page 2.10, and Community Rating System, sidebar below)*

COMMUNITY RATING SYSTEM

The Community Rating System (CRS) is a voluntary program that recognizes and encourages community floodplain management activities that exceed NFIP requirements. A goal of the CRS is to reduce a property's vulnerability to flooding. One of the ways that municipalities achieve this goal is to require buildings to be elevated, constructed above the Base Flood Elevation (BFE), or other mitigation measures be implemented, lessening the potential damage from flood impacts.

The Florida Building Code has established a Design Flood Elevation (DFE) that is one foot above the BFE. The additional height requirement is referred to as freeboard. ***Property owners within Florida's municipalities that participate in the Community Rating System benefit from reduced flood insurance premiums due to the state's higher standards.*** The rating will vary to reflect flood protection measures implemented by the municipality and regular NFIP audits.



The blue on this Flood Insurance Rate Map (FIRMette) of St. Petersburg, Florida, indicates the Special Flood Hazard Areas (SFHAs). The SFHA (also known as the 1% annual chance flood, 100-year flood, and base flood zone), has historically been subject to a 1% chance of flooding during any given year. In this case, the SFHA is primarily defined as Zone AE and VE, in which the base flood elevations are determined. The tan portions represent areas of historically 0.2% annual chance flood (also known as the 500-year flood zone). Areas of map without color have been determined to be outside of the historically 0.2% annual chance floodplain. It is important to highlight that these categories do not include future conditions due to climate change or other factors. (Map obtained through FEMA's Map Service Center at www.msc.fema.gov)

FLOOD INSURANCE RATE MAPS

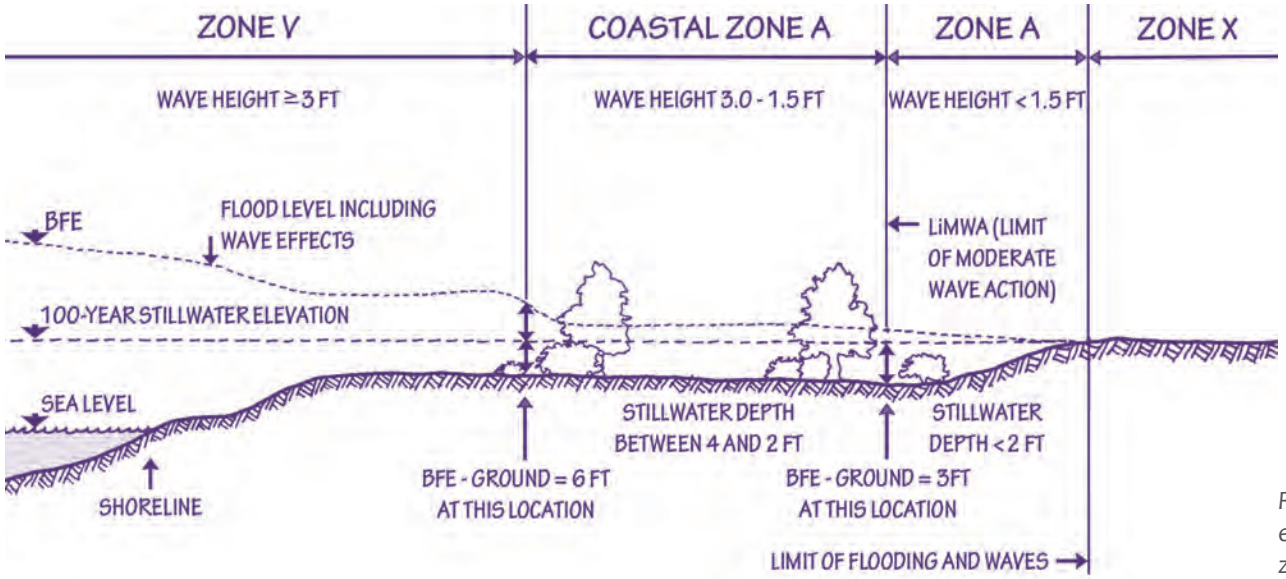
Information regarding a property's flood vulnerability can be found by street address on FEMA's Flood Insurance Rate Maps (FIRMs), available online through FEMA's Flood Map Service Center. *(www.msc.fema.gov)* FIRMs serve as the basis for floodplain regulation and management, and a tool for determining the level of risk. ***However, FIRMs are based upon historical or current flood data and do not address future threats such as subsidence and sea level rise. They identify the extent of the 1% floodplain of the ground, also known as the 100-year floodplain, or Special Flood Hazard Area (SFHA), representing the properties at the greatest risk of flooding.*** Buildings outside of the SFHA with levels below grade, such as crawlspaces and garages, may be equally vulnerable to flooding, while buildings that are a few steps above the ground are less vulnerable. In addition, properties outside of designated floodplains may experience flooding during major storm events, such as hurricanes, tropical storms, and severe downpours.

SEA LEVEL RISE

Over the course of a 30-year mortgage, sea levels are projected to rise an average of 10-12 inches in Florida. *(2022 Sea Level Rise Technical Report, NOAA)*. Potential impacts from increased sea levels can be viewed using NOAA's "Sea Level Rise Viewer" that illustrates the scale of potential flooding relative to mean higher high water. *(www.noaa.gov)* Mean higher high water (MHHW) is the average of the high water height of each tidal day. Property owners should use this information as a supplement to the FIRMs to assess potential flood risk to their property.

FIRM REVISIONS

FIRM's are periodically updated to reflect known flood risk based upon historical data. Development impacting flood vulnerability is routinely updated and may result in a boundary change or even an increase in Base Flood Elevations (BFE). This may change a property's designation and include it within the Special Flood Hazard Area (SFHA).



Relationship between the stillwater elevations, BFE, wave effects, and flood hazard zones. (Base diagram obtained from FEMA)

NFIP: FLOOD INSURANCE RATE MAP TERMINOLOGY

Flood Insurance Rate Map: Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community.

Special Flood Hazard Areas (SFHAs): An area having special flood, mudflow or flood-related erosion hazards and shown on a Flood Hazard Boundary Map (FHBM) or a Flood Insurance Rate Map (FIRM) Zone A, AO, A1-A30, AE, A99, AH, AR, AR/A, AR/AE, AR/AH, AR/AO, AR/A1-A30, V1-V30, VE or V. The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.

Base Flood Elevation (BFE): The elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM) for zones AE, AH, A1–A30, AR, AR/A, AR/AE, AR/A1– A30, AR/AH, AR/AO, V1–V30 and VE.

Coastal High Hazard Area (V Zone): Special Flood Hazard Areas (SFHAs) along the coasts that have additional hazards due to wind and wave action. These areas are identified on Flood Insurance Rate Maps (FIRMs) as Zones V, V1-V30 and VE.

AE Zone: The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.

AH Zone: Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

AO Zone: River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.

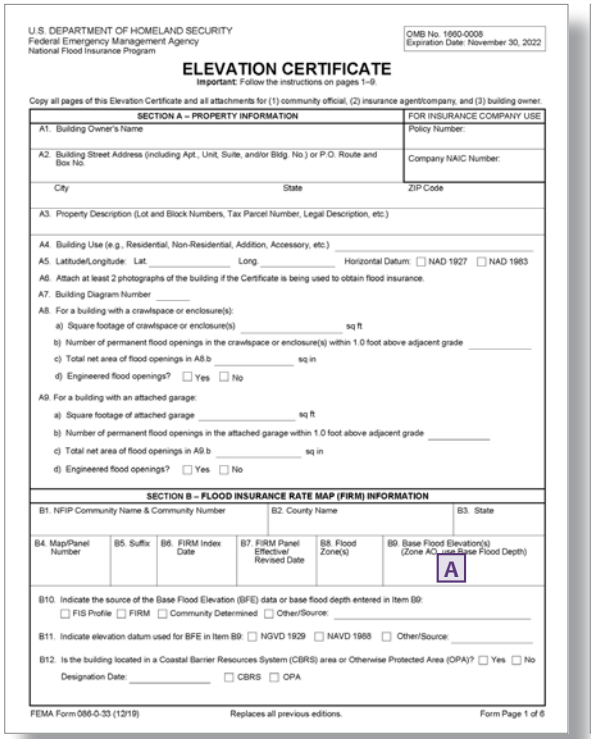
Coastal A Zone: The portion of the Special Flood Hazard Area (SFHA) starting from a Velocity (V) Zone and extending up to the landward Limit of the Moderate Wave Action (LiMWA) delineation. Where no V Zone is mapped the Coastal A Zone is the portion between the open coast and the landward Limit of the Moderate Wave Action delineation. Coastal A Zones may be subject to wave effects, velocity flows, erosion, scour, or a combination of these forces. Construction and development in Coastal A Zones is to be regulated the same as V Zones/Coastal High Hazard Areas.

Florida defines the Design Flood Elevation (DFE) as one-foot higher than the Base Flood Elevation (BFE). An Elevation Certificate is the official form documenting a building's position relative to sea level. To meet the state's floodplain management requirements in designated 'A' flood Zones, the top of the bottom floor (typically the first floor) (B) must be at least one-foot higher than the Base Flood Elevation (A). Local requirements may require a higher elevation. The height of the first floor above the ground is calculated as the difference between the top of the bottom floor and highest adjacent grade next to the building (B minus C). *(Refer to Historic Property Flood Mitigation Considerations, page 2.11)*

ELEVATION CERTIFICATE

The best way to obtain an accurate flood risk assessment for a specific property is to hire a professional to prepare an Elevation Certificate. Licensed surveyors, architects, and engineers can complete this form. The Elevation Certificate will identify the height of the lowest floor relative to the Base Flood Elevation (BFE) or the SFHA. ***The height of the lowest occupied floor can be used to calculate flood insurance rates and to determine the height to which the building must be protected to comply with local floodplain management regulations.***

Elevation Certificates are required when constructing a new building or an addition to an existing building to ensure compliance with local floodplain regulations. They are also required for residential buildings after they are elevated or after completing a Wet Floodproofing project. To take advantage of a potential flood insurance rate reduction, property owners within a floodplain whose lowest occupied floor is above the BFE may choose to commission an Elevation Certificate as documentation. *(Refer to Chapter 9: Review Requirements for Historic Properties)*



U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB No. 1660-0008
Expiration Date: November 30, 2022

ELEVATION CERTIFICATE
Important: Follow the instructions on pages 1–9.

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A – PROPERTY INFORMATION | FOR INSURANCE COMPANY USE

A1. Building Owner's Name — Policy Number:

A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. — Company NAIC Number:

City — State — ZIP Code

A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)

A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.)

A5. Latitude/Longitude: Lat. _____ Long. _____ Horizontal Datum: ☐ NAD 1927 ☐ NAD 1983

A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.

A7. Building Diagram Number _____

A8. For a building with a crawlspace or enclosure(s):
a) Square footage of crawlspace or enclosure(s) _____ sq ft
b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade _____
c) Total net area of flood openings in A8.b _____ sq in
d) Engineered flood openings? ☐ Yes ☐ No

A9. For a building with an attached garage:
a) Square footage of attached garage _____ sq ft
b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade _____
c) Total net area of flood openings in A9.b _____ sq in
d) Engineered flood openings? ☐ Yes ☐ No

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number | B2. County Name | B3. State

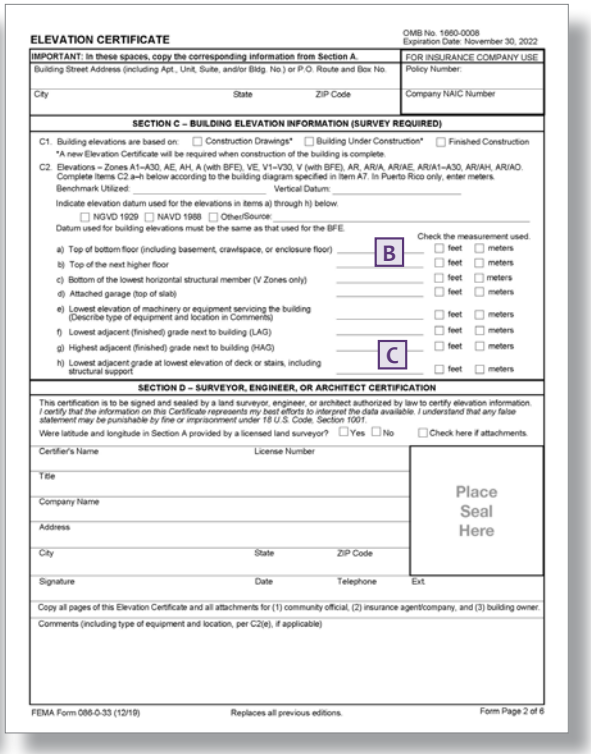
B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/ Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use Base Flood Depth)
					A

B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9:
☐ FIS Profile ☐ FIRM ☐ Community Determined ☐ Other/Source:

B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source:

B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☐ No
Designation Date: _____ ☐ CBRS ☐ OPA

FEMA Form 086-0-33 (12/19) — Replaces all previous editions. — Form Page 1 of 6



ELEVATION CERTIFICATE

OMB No. 1660-0008
Expiration Date: November 30, 2022

IMPORTANT: In these spaces, copy the corresponding information from Section A. | FOR INSURANCE COMPANY USE

Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. — Policy Number:

City — State — ZIP Code — Company NAIC Number

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Complete Items C2.a–h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters.
Benchmark Utilized: _____ Vertical Datum: _____
Indicate elevation datum used for the elevations in items a) through h) below.
☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____
Datum used for building elevations must be the same as that used for the BFE.

Check the measurement used.

a) Top of bottom floor (including basement, crawlspace, or enclosure floor)	B	☐ feet	☐ meters
b) Top of the next higher floor		☐ feet	☐ meters
c) Bottom of the lowest horizontal structural member (V Zones only)		☐ feet	☐ meters
d) Attached garage (top of slab)		☐ feet	☐ meters
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)		☐ feet	☐ meters
f) Lowest adjacent (finished) grade next to building (LAG)		☐ feet	☐ meters
g) Highest adjacent (finished) grade next to building (HAG)		☐ feet	☐ meters
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	C	☐ feet	☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information. *I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.*

Were latitude and longitude in Section A provided by a licensed land surveyor? ☐ Yes ☐ No ☐ Check here if attachments.

Certifier's Name — License Number — Place Seal Here
Title
Company Name
Address
City — State — ZIP Code
Signature — Date — Telephone — Ext.

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments (including type of equipment and location, per C2(e), if applicable)

FEMA Form 086-0-33 (12/19) — Replaces all previous editions. — Form Page 2 of 6

FLOODPROOFING CERTIFICATE

A Floodproofing Certificate is required for all non-residential properties prior to issuance of a Certificate of Occupance or Certificate of Completion. *(Refer to Chapter 9: Review Requirements for Historic Properties.)*

> Documentation of certification by a registered professional engineer or architect that the design and methods of construction of a nonresidential building are in accordance with accepted practices for meeting the floodproofing requirements in the community's floodplain management ordinance. This documentation is required for both floodplain management requirements and insurance rating purposes.
>
> For insurance rating purposes, a building's floodproofed design elevation must be at least one foot above the Base Flood Elevation (BFE) to receive full rating credit for the floodproofing. If the building is floodproofed only to the BFE, the flood insurance rates will be considerably higher.
>
> [FEMA]

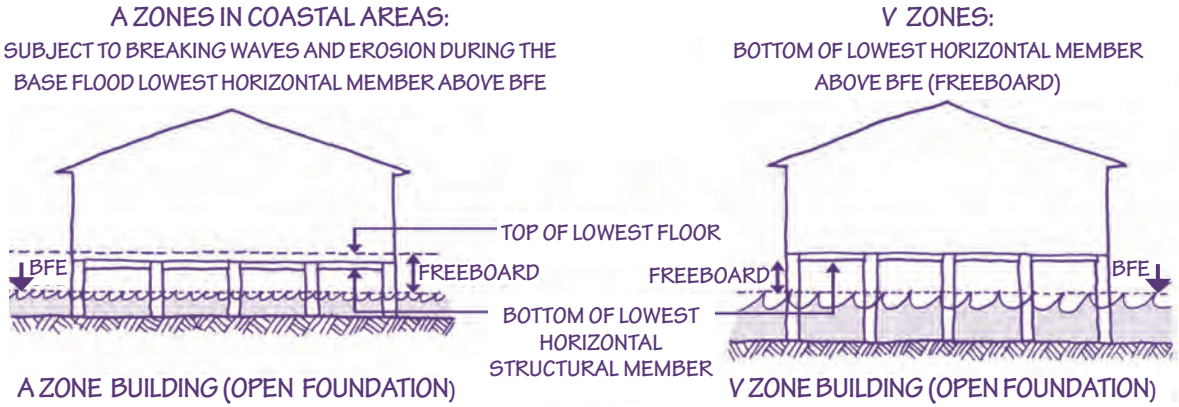
LOCATION DEFINITIONS

Base Flood Elevation (BFE): The elevation of the base flood, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the Flood Insurance Rate Map (FIRM).
[FBC]

Design Flood Elevation (DFE): The elevation of the "design flood," including wave height, relative to the datum specified on the city's legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where the depth number is not specified on the map, the depth number shall be taken as being equal to two (2) feet.
[FBC]

Freeboard: An additional amount of height above the Base Flood Elevation used as a factor of safety (e.g., two feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations.
[NFIP]

Lowest Floor: The lowest floor of the lowest enclosed area of a building or structure, including basement, but excluding any unfinished or flood-resistant enclosure, other than a basement, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of the non-elevation requirements of the Florida Building Code or ASCE 24.
[FBC]



NFIP minimum elevation requirements: A Zones–elevate top of lowest floor to or above BFE; V Zones–elevate bottom of lowest horizontal structural member to or above BFE. (Refer to Flood Insurance Rate Maps, page 2.6, and FEMA Technical Fact Sheet No. 1.2, Summary of Coastal Construction Requirements and Recommendations, for more information about NFIP minimum requirements in A Zones and V Zones. Base diagram obtained at www.fema.gov)

LOCAL FLOODPLAIN MANAGEMENT REGULATIONS

Floodplain management requirements are intended to reduce the risk to human life, property, and building contents related to flooding. Regulations established by the NFIP provide the baseline for minimum standards; local governments can adopt more restrictive policies and procedures. Usually the municipal building department administers the floodplain management regulations that have been adopted by the local government. The adoption of local floodplain management requirements allows a municipality to participate in the National Flood Insurance Program (NFIP), thus allowing its residents to apply for flood insurance and the community to receive assistance in the event of a disaster. *(Refer to National Flood Insurance Program, page 2.1)* The NFIP establishes minimum requirements for floodplain management; state and municipal regulations can be more stringent, encouraging increased protection for local properties and expedited recovery in the event of a flood. *(Refer to Community Rating System, sidebar page 2.5)* One of the ways state and local governments establish more stringent regulations is to require property owners to adhere to a Design Flood Elevation (DFE) that is higher than the Base Flood Elevation (BFE) to comply with floodplain management requirements. Requirements for the state's DFE (currently, one foot) can be found in the Florida Building Code (FBC) while local requirements are often identified in a floodplain management ordinance.

Property owners are encouraged to implement floodplain management requirements proactively and as part of minor construction and repair projects. Some construction activities require building code compliance. Construction improvements within a SFHA must comply with all applicable local code requirements, including the floodplain management regulations. *(Refer to Chapter 9: Review Requirements for Historic Buildings)*

The use of areas below the Base Flood Elevation will be limited to those that meet code and insurance requirements including a entrance, parking, and storage.

Camp Helen State Park's historic cottages are constructed of concrete block and suffered minor exterior damage from Hurricane Michael.

PRE-FIRM STRUCTURES

A building for which construction or substantial improvement occurred on or before December 31, 1974 or before the effective date of an initial Flood Insurance Rate Map (FIRM).

[NFIP]

Most historic buildings are pre-FIRM structures. Buildings constructed or substantially improved after the community's initial FIRM should have been constructed in compliance with the local floodplain ordinance that was in effect at the time of construction. The Florida Building Code (FBC) has established more rigorous requirements over time. Many municipalities have requirements that exceed the FBC and may mandate compliance with local floodplain management requirements for all buildings, including pre-FIRM structures.

There are many types of work subject to floodplain management regulations that are applicable to all properties, including those designated as historic. *(Refer to Chapter 9: Review Requirements for Historic Buildings)*

Examples include, but are not limited to:

- Modifying or adding any building system or equipment, including electrical, plumbing, heating, air conditioning, and generators *(refer to Relocation of Critical Systems and Equipment, page 4.5, and Back Flow Prevention, page 4.6)*;
- Installing finishes, doors, and windows vulnerable to flooding *(refer to Use of Flood Damage-Resistent Materials, page 4.8)*;
- Limiting the use of basements and flood-prone areas to parking, building access, and storage *(refer to Chapter 6: Wet Floodproofing);*
- Undertaking Substantial Improvements to existing structures *(refer to Substantial Improvement, page 9.3)*;
- Constructing an addition to an existing structure; and
- Erecting a new building.

Some property improvements will not require compliance with floodplain management regulations unless locally mandated. *(Refer to Chapter 4, Basic Improvements)* Property owners should contact the local floodplain administrator to determine the applicable regulations and to understand the permit review process. In addition, numerous resources are available from state and federal organizations and agencies. *(Refer to Chapter 9: Review Requirements for Historic Buildings, and Appendix B: Organizations and Resources)*

To the extent possible, modifications of existing buildings to improve flood resistance should also include wind retrofit improvements to maximize the property protection and project value. *(Refer to Chapter 3: Wind Retrofitting)*

MITIGATION REQUIREMENTS FOR HISTORIC PROPERTIES

The NFIP allows municipalities to waive compliance with floodplain management regulations for designated historic structures. However, this does not lessen their flood vulnerability nor reduce flood insurance premiums. Municipalities may mandate compliance with local floodplain management requirements for all buildings, including pre-FIRM structures. *(Refer to Chapter 9: Review Requirements for Historic Buildings)*

MITIGATION IMPACT ON HISTORIC INTEGRITY

It is important to keep in mind that the practice of flood mitigation has not traditionally taken a building's historic character into account. Flood mitigation strategies require change, often radical change, that can damage or destroy the integrity or character of historic properties. If a property is altered to the point it is no longer eligible to be designated as historic, the owner must comply with the municipality's floodplain management ordinance. When selecting flood mitigation options, every effort should be made to minimize the impacts on the building's historic integrity. *(Refer to Historic Property Flood Mitigation Considerations, at right)*

GUIDELINES FOR FLOOD ADAPTATION FOR REHABILITATING HISTORIC BUILDINGS

In 2021, the National Park Service released the *Guidelines for Flood Adaptation for Rehabilitating Historic Buildings*, providing further direction for communities, property owners, and tenants considering the impact of flood mitigation projects. *(www.nps.gov)*

The left building received a height variance from the floodplain ordinance when it was rehabilitated.

New construction, compliant with the NFIP, can alter the scale and character of a historic streetscape.

HISTORIC PROPERTY FLOOD MITIGATION CONSIDERATIONS

Mitigation projects are sometimes undertaken as protective measures in anticipation of potential flooding. More often, mitigation projects are reactions to flooding following the recovery process.

After a flood, it is normal for property owners to want to return to "normal" pre-flood conditions. Although an emotionally comfortable response, reinstating a condition that is prone to flood damage is not necessarily in a property owner's or community's best long-term interest. Mitigation options allow a community and its constituents to be forward-thinking, particularly in considering increasing flood vulnerability associated with increased precipitation and development in the floodplain.

There is a wide range of mitigation measures that can be implemented to address flooding of various types and extents. ***Community-wide mitigation options tend to be larger and more beneficial to an extended area, and may alleviate the need for individual property mitigation. By contrast, property-specific mitigation options are initiated by an owner or tenant and are typically limited to reducing flood impact at a single parcel.***

Property-specific mitigation options can be implemented by individual owners or tenants. They must comply with the requirements of local zoning, floodplain ordinances, and building codes, and, where applicable, the local design or historic review board. If the property-mitigation receives federal or state funding, review by Florida's Department of Historic Resources (DHR) may also be required. *(Refer to Chapter 9: Review Requirements for Historic Buildings)* Implementation of property mitigation measures may have the added benefit of reducing flood insurance rates if compliant with the National Flood Insurance Program (NFIP).

Flood vulnerability is largely based upon a building's location. A house at the bottom of a hill will be more vulnerable than a similar one at the top of the hill.

***House A** is above the Design Flood Elevation (DFE) and elevation is not required, although it may be prudent to abandon the basement and relocate the building equipment and systems. **House B** was slightly vulnerable, but the extreme elevation, removal of the porch and chimney and addition of the garage doors significantly impacts its historic integrity. **House C** has been elevated to a level of safety with minimal visual impact with the exception of a raised porch. **House D** required the greatest elevation to reduce its vulnerability, requiring an extended foundation and the reorientation of the stairs to provide access, but the remainder of the historic features are retained, minimizing the impact on its historic integrity.*

FLOOD WATER PRESSURE AND FORCES

Flood water can put pressure on a building's structural elements in a variety of ways:

- **Lateral pressure** represents the horizontal weight of flood water or saturated soil on a basement, foundation wall, or support piers with the greatest pressure at the deepest depths
- **Water currents** from storm surge or high winds can knock a building or an appendage like a porch or carport off its foundation and direct water-borne projectiles into building walls *(refer to Porches and Carports, page 3.14)*
- **Buoyancy**, or uplift, can raise building slabs and lift a building or a porch off its foundation

Historic buildings around this lake are subject to frequent flooding. Individual and community level mitigation projects are underway.

Some of the considerations when evaluating flood mitigation options for historic properties include:

- **Level of flood vulnerability:** The level of a building's flood vulnerability can be determined by documenting the height of floodwater at a building during a prior storm event, consulting a Flood Insurance Rate Map (FIRM), or obtaining an Elevation Certificate. *(Refer to Flood Insurance Rate Maps, page 2.6, and Elevation Certificate, page 2.8)* It should be noted that FIRMs identify the flood risk at the ground on which a building sits based on historical data. Elevation Certificates more accurately identify the vulnerability at the lowest habitable floor level. Basic improvements may be sufficient to protect buildings with lower vulnerability, while those with higher vulnerability may need to be Wet Floodproofed, Dry Floodproofed (non-residential), elevated, or relocated to protect from flooding.
- **Size and setbacks of parcel:** Floodproofing measures should protect a property without increasing the potential for flooding on adjacent parcels. Larger parcels with generous setbacks tend to facilitate stormwater absorption and increased options for floodproofing. Additionally, if considering building elevation, it is easier to add extended access stairs and ramps at large parcels. *(Refer to Stair and Ramp Configurations, page 8.36)*
- **Historic configuration:** At free-standing buildings, property owners can pursue the flood mitigation measures they feel are most appropriate. At attached or semi-attached buildings with party wall(s), mitigation is typically not effective unless all of the neighbors agree to work together.
- **Building type and style:** The type, style, and massing of a building helps to determine elevation options. For example, slab-on-grade construction tends to be more challenging to elevate than a building supported by piers.
- **Historic building materials:** Wood-framed buildings cannot be wet or dry floodproofed, nor are they good candidates for temporary barriers and shields, but they are easier to elevate. Masonry and concrete buildings may be good candidates for Wet Floodproofing, Dry Floodproofing (non-residential), elevation, or relocation.
- **Building use:** Eliminating residential use from a vulnerable building or portions of a building may reduce the level of required for floodplain management compliance. If permitted by local zoning, the first floor of a building may be converted to commercial use with residential above.
- **Potential for flood insurance premium reduction:** Residential property owners are eligible for flood insurance rate reductions for an approved building elevation or wet floodproofing project. *(Refer to Floodproofing Certificate, page 2.8.)* In addition to building elevation and wet floodproofing, non-residential property owners can receive flood insurance rate reductions from dry floodproofing. Basic improvements can reduce damage from floodwater for both residential and non-residential properties but typically do not result in insurance premium reductions. *(Refer to Chapter 4: Basic Improvements)*
- **Implementation costs:** Many of the basic repairs that can reduce the impact of flooding are relatively inexpensive, although the more complex options, such as wet and dry floodproofing, and building elevation and relocation are significantly more costly. *(Refer to Funding Sources, sidebar page 2.20)*

RESIDENTIAL FLOOD MITIGATION OPTIONS

There are three general categories of flood mitigation options for residential properties, all of which should factor in compatibility with the historic building and its setting.

- **Basic Improvements:** ***Simple, low-impact strategies that can be applied to almost all properties and are relatively easy and inexpensive to complete***

  Basic improvements typically do not require the services of a design professional. Locating building systems and equipment above floodwater or first floor levels is required for both building elevation and wet floodproofing. Basic improvements on their own can reduce the impact of flooding and facilitate recovery, however, it is unlikely that they will result in reduced flood insurance premiums. *(Refer to Chapter 4: Basic Improvements)*

- **Landscape Improvements:** ***Mitigation options that occur within a site and focus on managing stormwater and providing shoreline protection***

  Except for dense, urban environments, individual properties often include a combination of land and one or more buildings or structures. Many of the landscape measures are geared towards managing stormwater onsite and are scalable to different property sizes. They include stormwater absorption, shaping open lands into swales or berms, and improving shorelines. *(Refer to Chapter 5: Landscape Improvements)*

- **Building Mitigation:** ***Strategies in this category are often more complex, likely require the assistance of a design professional, and typically have the greatest impact on the integrity of historic properties***

  Proposed mitigation measures at designated historic properties may be subject to review by the local architectural or historic review board. A scope of work may include wet floodproofing, building elevation, and/or relocation. A local historic property tax exemption program may be available to recoup some construction costs after the work is approved and completed. *(Refer to Funding Sources, sidebar page 2.20, Chapter 6: Wet Floodproofing, and Chapter 8: Elevating or Relocating)*

  It should be noted that dry floodproofing and perimeter barriers are not approved for residential properties under the NFIP and are therefore ineligible for flood insurance discounts. *(Refer to Chapter 7: Dry Floodproofing)*

Multiple property owners cooperated to build a front property wall with driveway door dams that can be installed in advance of a severe storm.

Variances for building setbacks may be required to construct stair and deck areas to access building entries at an elevated structure.

Accommodating elderly and accessibility-challenged parishioners is an important but sometimes difficult task for religious institutions.

NON-RESIDENTIAL FLOOD MITIGATION OPTIONS

There are three general categories of flood mitigation options for commercial and other non-residential properties, all of which should factor in compatibility with the historic building and its setting.

- **Basic Improvements:** ***Simple, low-impact strategies that can be applied to almost all properties and are relatively easy and inexpensive to complete***

  Basic improvements typically do not require the services of a design professional. Locating building systems and equipment above floodwater or first floor levels is required for both building elevation and wet floodproofing. Basic improvements on their own can reduce the impact of flooding and facilitate recovery, however, it is unlikely that they will result in reduced flood insurance premiums. *(Refer to Chapter 4: Basic Improvements)*

- **Landscape Improvements:** ***Mitigation options that occur within a site and focus on managing stormwater and providing shoreline protection***

  Except for dense, urban environments, individual properties often include a combination of land and one or more buildings or structures. Many of the landscape measures are geared towards managing stormwater onsite and are scalable to different property sizes. They include stormwater absorption, shaping open lands into swales or berms, and improving shorelines. *(Refer to Chapter 5: Landscape Improvements)*

- **Building Mitigation:** ***Strategies in this category are often more complex, likely require the assistance of a design professional, and typically have the greatest impact on the integrity of historic properties***

  Proposed mitigation measures at designated historic properties may be subject to review by the local architectural or historic review board. A scope of work may include dry or wet floodproofing, perimeter barriers, building elevation, or relocation. When evaluating elevation of a non-residential building, consideration should be given to compliance with the Americans With Disabilities Act (ADA) and the potential requirement to include an elevator or a lift. A local historic property tax exemption program and/or the Federal Historic Preservation Tax Credit may be available to recoup some construction costs after the work is approved and completed. *(Refer to Funding Sources, sidebar page 2.20, Chapter 6: Wet Floodproofing, Chapter 7: Dry Floodproofing, Chapter 8: Building Elevation or Relocation, and Historic Preservation Boards, page 9.7.)*

DESIGN PROFESSIONALS

Given the unique characteristics of each property, some mitigation options will be more effective than others. Consultation with a licensed architect or engineer can identify a mitigation strategy best suited to a property's conditions and needs. The National Flood Insurance Program (NFIP) has established specific compliance requirements for flood mitigation projects. In addition to complying with the Florida Building Code (FBC), alterations to buildings located within locally designated floodplains must also comply with the floodplain management and historic property regulations found in local ordinances.

The review process for floodproofing, elevation, or relocating requires the preparation of drawings by a licensed architect or structural engineer. Improperly constructed floodproofing or elevation alterations can result in significant damage to an existing building and prevent owners from benefitting from reduced flood insurance premiums. To expedite the review process, consultation with an architect or structural engineer who has specific experience with flood mitigation alterations and local buildings requirements is highly recommended. *(Refer to Chapter 9: Review Requirements for Historic Properties.)*

A licensed architect, engineer, or surveyor is also required to prepare an Elevation Certificate to take advantage of reduced flood insurance rates. *(Refer to Elevation Certificate for residential buildings, and Floodproofing Certificate for non-residential buildings, page 2.8.)*

HISTORIC BUILDING FLOOD MITIGATION OPTIONS MATRIX

The following matrix is intended to provide a brief overview of potential property needs and impacts associated with the flood mitigation options presented in this Guidance document. The most appropriate mitigation or adaptation strategy is the one that minimizes impacts to historic integrity while effectively increasing resilience. Refer to the last page of Chapters 4 through 8 for detailed preservation benefits and challenges of each strategy.

STRATEGY	POTENTIAL DESIGN OPTION	POTENTIAL NEEDS	ADDITIONAL CONSIDERATIONS
Wet Floodproofing (Chapter 6)	Abandon basement level if below DFE	• Modification of basement to allow floodwater to enter and drain from building • Installation of flood openings and potentially ventilation • Modification of basement window and door openings to accommodate floodproofing • Relocation of building systems and equipment	• Basement windows and doors must be modified • Flood and ventilation openings must be provided • Elevation of exterior and interior systems and equipment may require alteration of interior spaces or new construction to house the equipment
	Raise first floor level above DFE while maintaining exterior walls at existing elevation	• Modification of basement and first floor structures to address lateral and buoyancy forces • Installation of raised first floor level – Modification of stairs and potential addition of a ramp • Modification of windows and doors at basement and potentially first floor • Installation of flood openings and potentially ventilation • Replacement of existing materials with flood damage-resistant materials • Relocation of building systems and equipment	• Basement windows and doors must be modified • Flood and ventilation openings must be provided • Existing materials must be removed and replaced with flood-damage-resistant materials • Exterior systems and equipment must be elevated
	Abandon basement and first floor	• Modification of basement and first floor structures and first floor walls to address lateral and buoyancy forces • Removal of all functions with the exception of storage, garage, and entry at residences • Modification of windows and doors at basement and first floor • Installation of flood openings and potentially ventilation • Replacement of historic materials with flood damage-resistant materials • Relocation of building systems and equipment	• Basement and first floor windows and doors must be modified • Garage doors may be added • Flood and ventilation openings must be installed • Historic materials may be removed and replaced with flood damage-resistant materials that do not retain the appearance, workmanship, etc. of the original material • Exterior systems and equipment must be elevated

STRATEGY	POTENTIAL DESIGN OPTION	POTENTIAL NEEDS	ADDITIONAL CONSIDERATIONS
Dry Floodproofing (Chapter 7 - Not NFIP complaint at residences)	Sealing walls and slabs	• Possible requirement to trench building perimeter to apply sealer material below-grade • May require a new basement slab with secondary drainage system below • Structural reinforcement to address lateral and buoyancy forces • Application and maintenance of joint sealers at all openings and penetrations • Relocation of building systems and equipment	• Trenching may damage or destroy archaeological resources • Wall sealers may trap moisture in wall system or promote condensation • Windows and doors may require modification to withstand lateral loads and prevent seepage • Exterior systems and equipment must be elevated
	Window and door barriers and shields	• Pre-installation of anchors or channels adjacent to each affected opening • Storage of barriers and shields in an accessible location • Installation training and practice in preparation for flooding, and regular inspection and maintenance of anchors, channels, and panels • Emergency operations plan to address installation in advance of flood event and protocol for building evacuation • Access to sufficient materials, assembly, and proper installation of temporary sandbags in advance of flood event	• Channels and anchors can be visible at building exterior • Sandbags can become hazardous waste requiring proper handling and disposal if floodwater is contaminated
	Fenestration modification	• Installation of waterproof infill in openings or portions of openings able to withstand force of lateral loads	• Alteration of window and door openings can impact the historic integrity of the building and may cause more damage to the building if they fail
Perimeter Barrier (Chapter 7 - Not NFIP complaint at residences)	Site walls and levees	• Sufficient available land around building(s) and structure(s) • Sufficient soil capacity to withstand water forces • Limestone subsoil can allow floodwater to percolate up • All vulnerable openings for walkways or driveways require installation of barriers or shields in advance of flood event • Secondary drainage system with emergency power to remove seepage during flood event	• Historic landscapes and archaeological resources may be affected • Site wall or levee might not be appropriate in historic context • Stormwater may be trapped at perimeter of building foundation, degrading materials
	Temporary barriers	• Effectiveness generally limited to two feet • Installation required in advance of flood event	• Sandbags can become hazardous waste requiring proper handling and disposal if floodwater is contaminated

STRATEGY	POTENTIAL DESIGN OPTION	POTENTIAL NEEDS	ADDITIONAL CONSIDERATIONS
Elevating (Chapter 8)	Elevate building or structure	• Size, configuration, or materials may make elevation cost prohibitive • Vertical extension of building foundation and building elements such as chimneys • Extension of building systems, equipment, and associated connections – Removal of abandoned equipment and hazardous materials • Abandonment of former basements – Potential need for infill and grading or wet floodproofing and removal of windows and doors • Extension of access stairs and potential addition of a ramp, lift, or elevator • Challenge for non-residential buildings that must comply with the Americans with Disabilities Act (ADA)	• Level of alteration required for effective/desired implementation might compromise historic integrity • Relationship between building and ground plane as well as adjacent buildings will be altered • Elevation should be limited to height required for safety • Significant elevation change can alter stylistic proportions • More foundation will be exposed • Basement-level openings will be lost • Modification of stairs, ramps, stoops, and potentially porches and chimneys necessitated • Excavation around foundation to accommodate cribbing and elevation equipment may damage or destroy archaeological resources
	Elevate ground plane with building or structure	• Sufficient area required around building to berm-up to raised foundation or construct retaining walls to provide a "plinth" • Grading to prevent runoff onto adjacent parcels • Vertical extension of building foundation and masonry building elements such as chimneys • Extension of building systems, equipment, and associated connections • Removal of abandoned equipment and hazardous materials • Abandonment of former basements with potential need for infill and grading or wet floodproofing as well as removal of windows and doors • Removal and reinstallation of paving at new elevated grade	• Relationship between building and adjacent buildings will be altered • Site regrading may impact historic landscapes or archaeological resources • Berming or retaining walls may be inconsistent with historic context • Minimal impact to archaeological resources if fill is brought in from off-site

STRATEGY	POTENTIAL DESIGN OPTION	POTENTIAL NEEDS	ADDITIONAL CONSIDERATIONS
Relocating (Chapter 8)	Relocate on same or different parcel	• Preparation of new building location, foundation, and utility hook-ups • Clearance of a path to move building • Logistical challenge of moving building • Abandonment of former location with removal of utilities, hazardous materials, foundations, and paving • New paving and landscaping at new location	• Building will be severed from historic context, which may be difficult to recreate at new site • Loss of building at former site may create a "hole" in the streetscape • Historic landscapes and archaeological resources may be affected • Secondary buildings and structures might not be relocated, altering historic relationship • Features like fences and walls might not be relocated, altering historic relationship
Demolishing	Site Abandonment	• Abandonment of location, removal of utilities, hazardous materials, foundations, and paving – provide appropriate landscaping	• In some cases can serve as a mitigation measure for neighboring buildings • Historic resource will be lost • Historic context, particularly along a streetscape, will be lost
	Replacement with compliant building	• New construction meeting all regulatory requirements	• Compliant building might be incompatible within historic context • Floodplain requirements may necessitate elevated first floor for residential use
Do Nothing (Not Mitigation)	Limited to properties not required to have flood insurance	• Financial burden for flooding rests with property owner	• Existing conditions are maintained until potential flood impact or change of ownership • Likelihood is increased for more significant damage if and when flooding occurs

HISTORIC PRESERVATION CONSIDERATIONS FOR FLOODPLAIN MANAGEMENT AND MITIGATION

- ❑ Retain historic building and site features
- ❑ Salvage and reuse features that cannot be retained
- ❑ Reconstruct features that cannot be salvaged, including foundation transitional features such as wood skirt boards and masonry water tables
- ❑ Minimize alteration of character defining features
- ❑ Replace historic materials in-kind whenever possible
- ❑ Integrate required new design elements that are visually appropriate for the historic character

FUNDING SOURCES

POTENTIAL FUNDING SOURCES

Flood Mitigation Assistance Program: Grant funds available to a community for projects to reduce or eliminate the risk of repetitive flood damage to public and private buildings insured by the NFIP in a community that has a Local Mitigation Strategy.

Local Mitigation Strategy: Projects prioritized on the Local Mitigation Strategy can be funded when hazard mitigation funds become available. Funds are allocated to the community following a FEMA Notice of Funding Opportunity (NOFO) after a disaster event which can include private property (administered by Florida Department of Emergency Management).

Florida Department of Economic Opportunity (DOE): The DOE administers Community Development Block Grant — Disaster Recovery Program for housing, infrastructure, economic development, and mitigation needs after other resources are exhausted and also routinely has other grant opportunities for public and private property mitigation.

Federal Historic Preservation Tax Credit Program: The Federal Historic Preservation Tax Incentives program encourages private sector investment in the rehabilitation and re-use of historic buildings. A 20% income tax credit is available for the rehabilitation of historic, income-producing buildings that are determined by the Secretary of the Interior, through the National Park Service (NPS), to be "certified historic structures." The Florida Division of Historical Resources (DHR) and the NPS review the rehabilitation work to ensure that it complies with the Secretary of the Interior's Standards for Rehabilitation. The Internal Revenue Service defines qualified rehabilitation expenses on which the credit may be taken. Owner-occupied residential properties do not qualify for the federal rehabilitation tax credit. A 10% tax credit is available for the rehabilitation of non-historic buildings placed in service before 1936. The building must be rehabilitated for non-residential use. *(www.nps.gov)*

PRESIDENTIAL DISASTER DECLARATION FUNDING

The federal government provides financial assistance only in the event of a Presidential Disaster Declaration.

Most incidents of flooding do not warrant the declaration and even with a disaster declaration, not every impacted property will qualify for assistance. In both cases the property owner would be financially responsible for necessary repairs through flood insurance or other means.

Following a Presidential Disaster Declaration, federal funding may be available from the entities listed below:

- **Individuals and Households Program (IHP):** Administered by FEMA, IHP provides financial and direct services to eligible individuals and households affected by a disaster who have uninsured or under insured necessary expenses and serious needs. In 2021, the IHP program grant limit was increased to $36,000. *(www.fema.gov)*
- **U.S. Small Business Administration (SBA):** The SBA makes long-term, low-interest loans for both residential and commercial use through its Disaster Loan Assistance program to address both physical and economic damage from a declared disaster. *(www.sba.gov)*
- **U.S. Department of Housing and Urban Development (HUD):** HUD can provide funding through its Community Development Block Grant Disaster Recovery (CDBG-DR) Program. To be eligible for funding, the proposed project must be a CDBG eligible activity and meet a CDBG national objective. *(www.hudexchange.info)*

Florida Division if Historical Resources (DHR) review is required for projects receiving state or federal in an effort to minimize the impacts on historic properties. *(Refer to Florida Division of Historical Resources, sidebar page 9.13)*

Miami, 1926. (Florida Memory)

3 WIND RETROFITTING

WIND RETROFITS FOR EXISTING BUILDINGS

Wind retrofits consist of voluntary mitigation actions taken on existing buildings. For a building retrofit to be effective, the building needs to achieve the performance level selected by the building owner or operator (the target performance level) and be commensurate with the level of the wind event for which the retrofit was designed.

[FEMA]

The impacts of severe weather events such as tropical storms and hurricanes can extend well beyond flooding. The entire state of Florida is vulnerable to strong winds. ***High winds, which often accompany severe storms, can have a significant impact on a building's materials and structure.***

Wind damage can occur through:

- High wind pressure and suction;
- Wind-driven rain; and
- Wind-borne debris.

Wind damage, such as a window shattered by wind-borne debris, can create openings for rain to enter a building, damaging the building and its contents. In addition, the opening in the window can result in increased internal air pressure and suction in the building, potentially compromising a building's structure. ***Wind retrofitting, as a supplement to regular building and property maintenance, can reduce the potential damage from high winds.***

Winds from Hurricane Michael caused significant damage across Panama City and other panhandle communities.

HISTORIC BUILDINGS AND WIND VULNERABILITY

Winds during a storm can be constant and gusty. Exterior building elements can be damaged by strong winds, providing an opportunity for wind pressure to build up inside of a building, causing further damage.

Most of Florida's high-wind events, such as hurricanes and tropical storms, are accompanied by significant rainfall. Wind-driven rain can enter any opening in a building. Openings in roofs, windows, and walls can provide pathways for stormwater that can cause damage similar to flooding.

In 2001-2002, the State of Florida began mandating nationally-recognized codes and requirements to mitigate wind damage. (The 2020 Florida Building Code [FBC] includes the current requirements) Historic buildings were not constructed to meet these current wind requirements. However, wind retrofit projects can often be implemented in a manner that minimizes the impact on the historic character of the building.

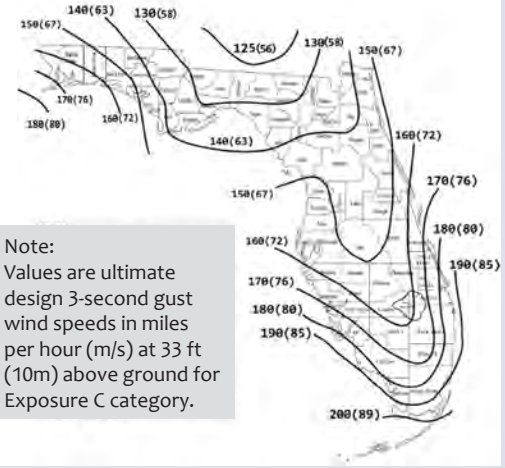
ELEMENT	POTENTIAL WIND VULNERABILITY
Roof Covering	• Roof covering can blow off
Roof Structure	• Roof structure can blow off or collapse • Tree limbs can fall on roof structure
Roof Ventilation	• Water intrusion during high winds
Soffits	• Uplift from wind pressure • Water intrusion at soffit vents
Glazing	• Cracking from wind-borne debris • Cracking from wind pressure
Skylights	• Cracking from wind-borne debris or tree impact • Cracking from wind pressure
Roll-Up Garage Doors	• Collapse from wind pressure
Gable Ends	• Structural collapse
Porches / Balconies / Carports	• Detachment from building
Structural Connections	• Detachment of building elements
Chimneys	• Structural collapse
Exterior Wall Coverings	• Siding can blow off • Brick or stone veneer can blow off
Fallen Trees	• Limbs can crash on buildings • Blocked roads, downed power lines
Rooftop / Wall-Mounted Equipment	• Can blow off
Fences	• Can become dislodged and air-borne
Gravel / Shell Paving	• Can become air-borne
Outdoor Furnishings	• Can become air-borne

HURRICANE WIND SCALE

Florida's coastal areas and the southern part of the state are in Wind-Borne Debris regions. Wind speeds and gusts in the Wind-Borne Debris regions can exceed a Category 5 Hurricane. These areas are subject to stronger code requirements.

CATEGORY	WIND SPEED	DAMAGE AT LANDFALL
1	74-95 mph	Minimal
2	96-110 mph	Extensive
3	11-129 mph	Devastating
4	130-156 mph	Catastrophic
5	157+ mph	Catastrophic

The Saffir-Simpson Hurricane Wind Scale. [NOAA]



Ultimate design wind speeds in Florida. The exact location of wind speed lines is established by local ordinance. [7th Edition (2020) update to the Florida Building Code]

NOAA captured Hurricane Ian engulfing Florida on September 28, 2022. Category 4 winds were recorded at landfall.

The best option for some properties are hurricane shutters. They should remain open when not needed for protection.

CONSIDERATIONS FOR WIND RETROFITTING PROJECTS

There is no single-solution for wind retrofitting projects: Each must be based upon the level of risk, building conditions, and the property owner's desired level of protection. Multiple retrofit measures will likely be required to reduce potential wind damage vulnerability.

When reviewing wind retrofit options, there are several factors to consider:

- **Level of Risk:** Properties located along the coast or in Wind-Borne Debris regions will experience higher wind speeds and gusts. *(Refer to Hurricane Wind Scale, sidebar at left)*
- **Physical Construction:** Florida's historic buildings are constructed of a variety of materials in different configurations. Variations in construction can impact the potential success of a wind retrofit project.
- **Building Condition:** A well-maintained building will be more likely to withstand stronger winds. Minimizing or securing site features that can become air-borne will reduce potential impact damage. *(Refer to Maintenance, page 4.3)*
- **Level of Desired Protection:** Individual property owners will determine whether it is worthwhile to invest in wind retrofit projects unless mandated as part of a larger project. Considerations will include cost, level of disruption, and the level of perceived vulnerability.

WIND INSURANCE

Severe winds can cause damage to buildings directly, and indirectly, via falling tree limbs and air-borne debris. Unlike flood insurance, in the state of Florida wind storm insurance is generally required to be included as part of a typical homeowner's insurance policy *(Florida Statute 627.712)*. Residential and non-residential property owners should verify the adequacy of their coverage.

For homes built prior to the 2001 Florida Building Code, wind mitigation credits may be applied to a property insurance policy depending on current construction details for the following features:

- Roof covering;
- Nail spacing patterns;
- Roof-to-wall connections;
- Roof shape;
- Water barriers (Secondary Water Resistance); and
- Shutters.

Property owners should contact their insurance policy representative to learn the specific opportunities and requirements for wind credits based upon their building's conditions. A licensed contractor, architect, engineer, or local building inspector is authorized to inspect a property to identify potential mitigation measures and verify completed improvements. *(Refer to Design Professionals, sidebar page 2.15)*

Tobacco barn damaged by high winds in Gadsden County, 1961. (Florida Memory)

Fallen trees can cause damage to building and site features.

FLORIDA WIND INSURANCE SAVINGS CALCULATOR

The Florida Wind Insurance Savings Calculator can approximate insurance savings for building features and improvements. It also identifies the anticipated wind speed and areas of Wind-Borne Debris regions for an area based upon its location and terrain. *(Florida Flood Insurance Rate Calculator, apps.floridadisaster.org/wisc)*

LOCAL WIND REQUIREMENTS

Local building code requirements should be reviewed before beginning a wind retrofit project, particularly in Wind-Borne Debris regions. *(Refer to Hurricane Wind Scale, sidebar page 3.3, and Chapter 9: Review Requirements for Historic Buildings)*

Existing buildings are generally permitted to remain in their current condition regardless of building code changes. However, replacement of a building element, due to damage or other reasons, may be subject to the requirements of the Florida Building Code (FBC) including wind resilience. This may also be the case if there is a change in use or in instances of Substantial Damage of Substantial Improvement. *(Refer to Substantial Improvement and Substantial Damage, pages 9.3 and 9.4)*

Buildings should be checked routinely for maintenance needs and to identify mitigation options prior to storm season.

QUALIFIED WIND ASSESSMENT PROFESSIONALS

A qualified professional should be retained by property owners to identify potential wind retrofit projects that may be effective given the unique property characteristics. Qualified professionals should have experience with historic building construction and with meeting the wind mitigation requirements of Florida and local jurisdictions, as applicable. In addition to architects and engineers, qualified professionals can include evaluators certified to meet Florida's wind retrofit program requirements. *(Refer to Design Professionals, page 2.15)*

PROPERTY MAINTENANCE

A well-maintained property can reduce potential damage in a high wind event or storm. Refer to *Maintenance, page 4.3 and Appendix A: Storm Vulnerability Checklists* for additional improvements and maintenance items that can reduce potential wind damage at a property.

FEMA'S WIND RETROFIT GUIDE FOR RESIDENTIAL BUILDINGS

Information presented in this section is largely based on FEMA's *Wind Retrofit Guide for Residential Buildings.* [FEMA P-804 / December 2010, *www.fema.gov*.]

WIND RETROFIT ASSESSMENT

An assessment by a qualified professional can identify whether a "Wind Mitigation Package" will improve a building's wind resilience. *(Refer to Qualified Wind Assessment Professionals, sidebar at left)* Sharing documentation related to the original construction or later improvements can improve the accuracy of the assessment. Information that should be shared when available includes:

- Photographs of prior renovations or additions;
- Building plans or drawings;
- Building foundation construction information or later repairs;
- Roof age or replacement date (check for invoice, cancelled check, or building permit);
- Installation of secondary water barrier at roof and its age;
- Installation of insulating foam at underside of roof and insulation type;
- Termite inspection reports within last 12 months; and
- Impact-rated products installed such as windows, shutters, skylights, entry doors, and garage doors (include any documentation of impact rating including labels and manuals). *(Refer to Labeled Wind-Resistant Products, sidebar page 3.9)*

The assessor should perform a detailed review of the building to identify maintenance items that will impact the success of a wind retrofit project, and to recommend one or more of the three FEMA Mitigation Packages. The evaluator should prepare a detailed report documenting their findings, which should include:

- A description of building's construction;
- Identification of any maintenance items to be completed prior to a wind retrofit project;
- A preliminary recommendation on which wind Mitigation Package to consider; and
- Identification of how invasive a potential Wind Mitigation Package will be to implement, such as removal of siding to improve structural connections.

FEMA'S WIND RETROFIT PACKAGES FOR EXISTING BUILDINGS

High winds, which often accompany severe storms, can have a significant impact on a building's materials as well as its structure. One of the primary concerns is that wind damage can create an opening for rain to enter a building, resulting in damage to a building and its contents.

The parts of a building that are particularly vulnerable to high winds include:

- Roofing;
- Windows and skylights;
- Doors, including garage doors;
- Structural system connections;
- Exterior wall coverings;
- Chimneys; and
- Roof or wall mounted equipment.

FEMA's *Wind Retrofit Guide for Residential Buildings* breaks down wind retrofit projects into three "Mitigation Packages" that define the types of building improvements. The assessment should identify which Mitigation Package may be effective based on building conditions.

- **Basic Mitigation Package:** Securing roof; providing secondary roof water barrier; strengthening roof vents, soffits, and overhangs; and protecting windows, skylights, doors, and garage doors from wind-borne debris and large openings from wind pressure.
- **Intermediate Mitigation Package:** Protecting windows, skylights, doors, and garage doors from wind-borne debris and large openings from wind pressure; bracing gable end walls over 4-feet tall; and strengthening connections of attached structures such as porches and carports.
- **Advanced Mitigation Package:** Developing a continuous load path from the top of the roof to the foundation; and protecting windows, skylights, doors, and garage doors from wind-borne debris and large openings from wind pressure.

All of the Mitigation Packages include the protection of window and door openings, with greater protection above the Basic level. The Mitigation Packages can be completed all at once or sequentially to improve a building's level of protection, with the Advanced Mitigation Package completed after the Basic and Intermediate Packages.

Wind retrofitting should be considered when modifying an existing building or replacing exterior elements such as roofing or windows. However, the costs associated with the wind retrofit projects will be included by the local building official in their determination of Substantial Improvement or Substantial Damage. The costs of required maintenance work undertaken prior to the wind retrofit may also be included. *(Refer to Maintenance, page 4.3, Substantial Improvement, page 9.3 and Substantial Damage, page 9.4)*

Siding is blown off a storefront in downtown Tallahassee from Hurricane Alma, 1966. (Florida Memory)

Protecting windows is an essential element of all FEMA Wind Mitigation Packages.

ROOF REPLACEMENT

Full roof replacement is needed to achieve the highest level of wind protection for a roof. As part of a roof replacement project, all roofing and underlayments should be removed to the roof deck, which is typically plywood. Once the deck is exposed, the following steps should be undertaken:

- Replace damaged deck material;
- Add additional fasteners between the roof deck and structure below;
- Install a secondary water barrier (SWB) meeting local wind requirements and compatible with deck and finished roof materials;
- Install a drip edge and flashing at eaves and gable ends;
- Replace damaged or worn flashing at roof penetrations such as chimneys and vent pipes or where roofing abuts a wall or similar element; and
- Install historically-appropriate roofing at visible locations to meet local wind speed requirements. (Solar heat gain can be reduced with light-colored or reflective roof coatings at flat roof surfaces that are not visible)

Greater reductions in wind insurance premiums are more likely with roof replacement than with roof retrofit projects. *(Refer to Wind Insurance, page 3.4)*

CLAY AND CONCRETE TILE ROOF REPLACEMENT

When installing clay or concrete roof tiles, it is important to verify the local design wind speed and exposure category with the local building official. In addition, to improve wind resilience it is generally preferable to use nails or foam installations instead of mortar set.

[FEMA P-804]

When repairing damaged roofs, property owners should consider retrofit options.

Historic roof materials require special attention to materials and fastener, gutter, and flashing systems.

BASIC MITIGATION PACKAGE

Most of the Basic Mitigation Package addresses the roof system, including improvements to structural connections, and minimizing the potential for stormwater intrusion; it also includes protecting roof vents and overhangs. Some of the greatest damage to a building during a major storm generally occurs as a result of high winds that compromise the roof system by uplift, causing the entire roof, or components such as tiles or shingles, to blow off. Owners of historic buildings are encouraged to increase protection from these threats when repairing or replacing an existing roof. *(Refer to Roof Replacement, sidebar, at left)*

ROOF RETROFIT

Property owners may elect not to replace a roof as part of a wind retrofit project. This may be because the existing roof has five or more years of useful life, or due to the associated expense. When retrofitting an existing roof deck, most of the work will occur at the underside of the roof within the attic. When the attic is not accessible, the ability to complete wind retrofit projects will be limited.

Roof deck retrofit requires the application of spray polyurethane foam (SPF) to the underside of the roof deck at the joints between plywood panels, and on both sides of framing members (rafters) supporting the deck. The SPF between the deck panels and around penetrations (such as chimneys or plumbing stacks) can prevent water seepage into the attic. The SPF between the rafters and the roof deck provides additional resistance to uplift of the roof deck in high winds. It is important to use a two-component SPF system approved to reduce wind uplift.

Homes with flatter roofs may have wider eaves or overhangs as part of the roof structure.

Gable vents in older homes allow attic ventilation and are not just decorative features.

Masonry chimneys and flashing needs to be maintained to prevent wind and water damage.

ROOF VENTS, SOFFITS, AND OVERHANGS

A roof replacement project provides the opportunity to install ventilation systems that are designed to withstand high winds and minimize wind-driven rain intrusion. Roof vents can include soffits, ridge vents, and gable-end vents. Many ventilation openings are not strong enough to be effective in high wind events.

Soffits and overhangs, which are roof extensions, are also vulnerable to wind uplift. All soffits, overhangs, and vents should be strengthened, whether retrofitting or replacing an existing roof. If disassembly is required to improve the resilience of a soffit, there may be an opportunity to strengthen the connection between the roof and wall framing. *(Refer to Advanced Mitigation Package, page 3.15)* Roof overhangs can generally be strengthened by extending the overhang framing within the attic roof framing.

WINDOWS AND DOORS

Windows and doors are highly vulnerable to impact damage from wind. At a minimum, temporary protection (such as plywood panels) should be installed. *(Refer to Window and Door Protection, page 3.9)*

ROOF CONSIDERATIONS

The items below should be considered when completing a Basic Mitigation Package.

- Repointing chimneys when roof access is available *(refer to Chimneys, page 3.17)*
- Installing metal roofing and flashing with double-lock seams and edges and closely spaced, high-strength fasteners
- Fastening gutters and downspouts securely to the building
- Avoiding the use of gravel or other loose materials on a rooftop that could become air-borne during a storm
- Securing roof-mounted equipment to prevent uplift in high winds *(refer to Exterior Equipment, page 3.17)*

WINDOW AND DOOR REPLACEMENT

Windows and doors are critical components of a historic building's character. Care must be used in selecting replacement windows or door systems that are visually similar to historic types and configurations. Consultation with the local historic preservation board is recommended early in the replacement window or door selection process because there may be design limitations. *(Refer to Historic Preservation Boards, sidebar page 9.7)*

Across Florida, properties located within one mile of the coast where wind speeds are 130 mph, and all properties where the potential wind speed is 140 mph or greater, are required to have impact-resistant windows, doors, or other protective coverings to meet the Florida Building Code (FBC). These areas are referred to as Wind-Borne Debris regions and local jurisdictions may have specific information on the location of the wind speed line in a particular area. When making alterations to properties that do not already meet the requirements, it is possible the local jurisdiction will require compliance with current wind protection requirements. Protective coverings and hurricane shutters must meet technical specifications to be qualified as impact resistant.

LABELED WIND-RESISTANT PRODUCTS

New window and door assemblies intended for hurricane regions are tested for wind-borne degree impacts and for specified wind pressure. Historic windows, and those without labels, may not provide sufficient protection. In addition to windows and doors, hurricane shutters, skylights, garage doors, and glazed patio doors should be tested. The label should be permanently mounted and information regarding labeled elements should be shared with the assessor. *(Refer to Wind Retrofit Assessment, page 3.5)*

INTERMEDIATE MITIGATION PACKAGE

The Intermediate Mitigation Package largely addresses window and door protection. It also includes the structural bracing of gable ends and strengthening attached structures such as porches and carports.

WINDOW AND DOOR PROTECTION

Windows and doors are key components of a building's historic character. Window and door assemblies and their glass components provide protection against flying debris, but may also be responsible for quickly shifting air pressure inside a structure. If a window or door fails, the wind pressure inside a building will increase, applying pressure and suction forces to interior surfaces causing interior and structural damage. It can also cause other window and door openings to fail from increased pressure that needs to be equalized.

The types of windows and doors are key to understanding their wind resilience. Traditional historic residential windows are wood and single-glazed, with one piece of glass in each window frame or in each lite (or light) if there are multiple window panes in a single frame. Mid-century windows and storefronts are typically single-glazed with metal frames. Modern windows are often double-glazed, made with sandwiched panes of glass. Double-glazed windows can have decorative muntins applied to the outside or inside of the glass, or lattice installed between the panes of glass to simulate traditional windows. *(Refer to Glass, sidebar page 3.11)*

Historic doors can include traditional pedestrian doors, paired French doors, or large sliding doors. They can be made of wood, steel, or aluminum and often include glass.

Fasteners may need to be permanently installed to allow proper anchoring of window protection.

Traditional window pattern with six lites (lights) on the upper sash and one below.

There are a number of protective measures that can be taken to improve historic window and door resilience, including keeping them in place.

TRADITIONAL SHUTTERS

Historically, shutters were important features of a building for their functional benefit of protecting openings and providing shade and privacy. Shutters were primarily mounted flanking windows, and in fewer cases, doors. Their design matched the overall character of the building and were historically made of wood.

In some cases shutters were used for decoration. Decorative shutters are typically too small to cover windows or doors when closed and are often fastened directly to the wall.

Traditional wood shutters are designed to close and fully cover window openings and can provide protection from air-borne debris. Also note storm window with the center rail aligning with the window meeting rail.

Bahama-type shutters can be made of wood or a composite material. They may be appropriate at coastal vernacular buildings.

Traditional shutters do not require the removal of historic windows or doors and can be easily secured in advance of a storm. To be effective, shutters must fully cover window openings when closed. Hinges should be firmly secured to the building and have fully functional latches or locking hardware.

Modern shutters can be manufactured to match historic shutters in a variety of materials. They may be made from composite materials and rated for storm protection.

- **Traditional wood shutters** are mounted on hinges at both sides of window or door openings. They may be historically appropriate for Victorian-era or Colonial Revival homes.
- **Bahama shutters** are hinged at top of window and opened from the bottom with an extension arm. They are generally not historically appropriate in Florida except on coastal vernacular buildings.

HURRICANE SHUTTERS

Hurricane shutters are typically made from aluminum or PVC and are mounted to the outside of a building. They typically include exterior metal tracks to guide the shutters into position. Hurricane shutters that are permanently mounted are not recommended for historic buildings. To minimize their appearance, they should not be installed at the front elevation and alternative protection should be considered. In addition, the color of tracks and shutters should be selected to match the wall color or painted to match. The shutters should remain in the open position when not needed for storm protection.

- **Accordion shutters** are folding metal panels installed in permanent tracks at the top and bottom of windows, and close horizontally.
- **Roll-up shutters** include an exterior housing at the tops of windows or doors that encloses aluminum or PVC shutters that roll down along tracks on both side of the opening.

Roll-up shutters can be easily opened when not in use. The tracks and shutters should be painted the color of the window or adjacent wall whenever possible. Shutters should be open when not required for protection.

GLASS

Glass can easily shatter and is one of the most vulnerable parts of a window or glazed door. Shattered glass can become air-borne, injuring people and property. In some cases, glass can be upgraded in existing windows and doors to reduce the likelihood of shattering. The additional weight and depth of impact-resistant glazing and double glazing can make installation in a historic window or door more difficult.

- **Tempered glass** fractures into small fragments rather than shards, reducing the potential for wind-driven damage. It can be installed in historic or new windows or doors.
- **Glazing films** are clear structural films applied to glass so it performs like tempered glass. The films do not make the glass unbreakable, but they can minimize the shards that will become air-borne.
- **Impact-resistant glazing** is composed of two panes of glass with an internal sandwiched film that holds cracked glass together. Impact-resistant glazing is thicker and heavier than traditional single-paned glass. Some historic windows can be retrofitted for impact-resistent glazing, although the wood sash and frame must also be able to withstand the wind force to be effective.
- **Double-glazing** is composed of two panes of glass separated by a sealed internal spacer. Due to the thickness and weight, double-glazing is typically only installed at new windows and doors. Double-glazing can be manufactured to be impact-resistent. *(Refer to Window and Door Replacement, sidebar page 3.9)*

STORM WINDOWS

There are a range of storm windows that can be installed to protect historic windows. Exterior storm windows typically have wood, aluminum, or vinyl frames and can include clear panels and woven wire insect screening. The clear panels can be glass or various types of plastic. Wind and debris resilience varies depending on the fabrication and materials of the frame and the clear panel. *(Refer to Glass, sidebar at left)*

As an alternative to operable storm windows, clear polycarbonate sheets can be cut to fit any window opening. Although typically permanently installed as a storm panel, they can be effective in the protection of decorative glass, such as stained glass. However, they do not allow windows to operate for ventilation and can trap moisture if not properly ventilated.

To minimize the visual impact of storm windows, the frames should be painted to match the color of the window trim. In addition, the horizontal center rail of an operable storm window should align with the window rail, and small holes (weep holes) should be located along sealant at the bottom of the storm window to allow moisture to escape.

Storm windows can include tempered glass or impact-resistant glazing to provide protection from wind-borne debris. The storm window frame aligns with window configuration.

Screen doors can be modified to include impact-resistant glazing or tempered glass to provide hurricane protection.

STORM DOORS

Similar to storm windows, storm doors can be fabricated of wood, vinyl, or aluminum with either impact-resistant glazing or woven wire screening. For historic buildings, the style of storm doors should include a simple, large opening with a surround painted to match the color of the door or frame. The installation of security grilles and unpainted aluminum finishes should be avoided.

Fabric panels are an option for temporary protection that can be easily stored.

FABRIC STORM CURTAINS

When shutters are not present or were not a part of the historic character of the building, fabric storm curtains may be an option. Fabric storm curtains are stretched and attached to pre-installed fasteners mounted to the building and/or ground. The fasteners are generally smaller than a quarter, and can be covered with plugs to match the wall color when not in use, resulting in minimal visual impact on historic buildings. The panels can be small, protecting individual windows, or large, protecting groups of windows, storefront windows, sliding doors, porches, and building elevations. Depending on the manufacturer, the panels can protect against wind and debris impact. Curtains also have the advantage of being lightweight and easy to store and install in advance of a storm event. The condition of the curtains will need to be monitored and replaced when damaged.

HURRICANE PANELS

Hurricane panels are intended for temporary window protection and installed in advance of a storm. The panels can be small or large and made from aluminum, steel, or polycarbonate. The panels are often mounted to tracks that are permanently installed on the building. When not in use, the panels must be stored in an accessible location. Depending on the material, the panels can be heavy and difficult to install, particularly at second and third floors. To minimize the historic impact, mounting channels should be painted to match the color of the wall surface and panels should be removed once the storm threat has passed.

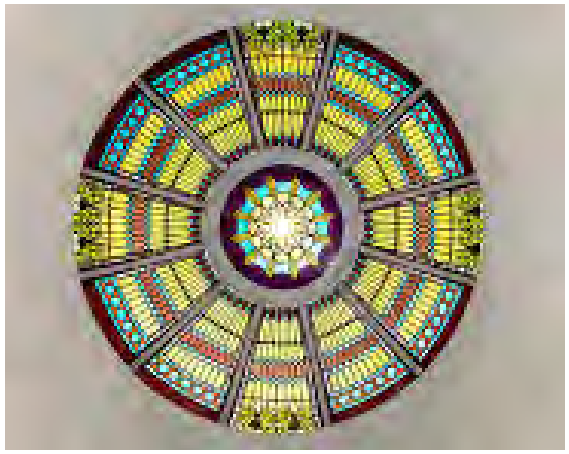
Plywood panels can be painted to blend with the adjacent wall surface if installed for a long period of time after a storm.

Aluminum panels can be difficult to store, awkward, and heavy, making installation challenging.

PLYWOOD PANELS

Plywood can be cut to fit any opening and is often screwed directly into window and door frames or walls, ideally in a manner that minimizes damage to wood frames. At large openings, such as garage doors, it may be necessary to install a stud wall to support the plywood. Exterior-grade plywood, typically 5/8" or greater, is more resistent to water than standard plywood. Plywood panels are heavy and prevent light and ventilation at a building's interior, but they can be an affordable protection option.

Plywood is often the most flexible and affordable choice for window protection.



Florida's historic Capitol Building has an ornate stained glass dome. (Floridahistoriccapitol.gov)

SKYLIGHTS

Skylights that are not rated for hurricanes should also be protected from wind damage. *(Refer to Labeled Wind Resistent Products, sidebar page 3.9)* A broken skylight can allow stormwater to enter directly or be directed into a building.

French doors may benefit from vertical bolts into the door frame to help secure openings.

DOOR HARDWARE

Since they are operable, doors are vulnerable to damage from high winds and hardware and seals must be protected. Weather stripping can reduce air movement around a door and prevent wind-driven rain from entering a building and causing damage.

Improving door attachments can increase the likelihood they will remain in place during high winds. Doors should include three hinges fastened with long screws. At the locking side, doors should have deep throws, the portion of the lock that extends into the door frame. To provide added protection, side latch bolts can be added to the top and bottom of doors of the locking side of a door. For paired doors, such as French doors, vertical bolts can be added to the top and bottom of each operable door that fasten into the frame at the top of the door and the threshold at the floor.

Historic commercial buildings often have aluminum storefronts. The large windows and glazed doors are highly vulnerable to air-borne debris. Glass protection and enhanced hardware can improve wind resilience.

Garage doors are more historically more prevalent at post-WWII buildings. Historic wood doors can be reinforced from the interior to improve wind resilience.

GARAGE DOORS

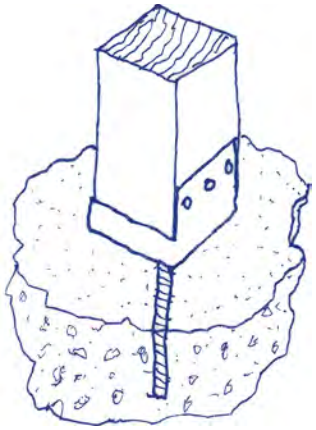
Historic garage doors can be either roll-up doors or hinged paired doors made of wood, steel, or aluminum. Larger, double garage doors are more vulnerable to wind damage than smaller doors.

Historic garage doors are not pressure-rated for wind protection, but they can be retrofitted from the interior to improve their wind resilience. Options for retrofit include installing an interior steel track system that is well-anchored into the wall. This can allow the historic garage and exterior trim to remain. Steel wind braces can also be added to doors with horizontal panel systems to improve rigidity. If garage doors include windows, then tempered glass, glazing film, or impact-resistant glazing can be installed to reduce potential air-borne debris damage. *(Refer to Glass, sidebar page 3.11)*

Older homes have more steeply pitched gable roofs and taller gable-ends that are at risk from damage and collapse from wind pressure. The front porch is also subject to wind uplift that may cause it to collapse of not properly anchored and connected to the building framing.

Carports may be attached to or detached from the primary roof framing of the building. If the carport is not properly secured to the building and ground, strong winds can pull the carport away, damaging the house. Also note the shallow roof slope and low gable-end.

The traditional iron post connection should be replaced with a hurricane-rated connector.



Columns and posts can be anchored to the ground to reduce potential damage from high winds. Some anchors raise the base of the post or column slightly above the ground or sidewalk, reducing potential damage from rising or moving storm water.

GABLE-END BRACING

Many historic buildings, particularly residences, have gable roofs. Gable-end buildings look like an "A," while hipped roofs are sloped in all directions.

Gable ends, particularly gable ends that are more than four feet in height, can collapse in high winds. A gable-end collapse can compromise the roof structure and provide an opening for storm water to enter a building. Bracing can be added to the gable-end within an attic to improve wind resilience. In addition, gable-end vents should be covered to prevent wind-driven rain from entering a building. *(Refer to Roof Vents, Soffits, and Overhangs, page 3.8)*

PORCHES AND CARPORTS

Porches and carports are examples of structures that are attached to a building. These attached structures are fastened to a building wall and rest on piers or a foundation. The most vulnerable portions of porches and carports are often the connections of the roof to the building, and connections to piers or foundations.

Roof rafters can be secured to the building using metal straps or lag bolts. Columns, posts, and carport walls can be anchored directly to masonry or concrete foundations to prevent uplift. Improving foundation connections may also improve resilience to moving floodwater.

A large renovation exposing the structure is an opportunity to implement FEMA's Advanced Mitigation Package.

CONTINUOUS LOAD PATH

The overall structure must be designed for the sum of all lateral and uplift pressures; and individual parts must be designed to resist the outward and inward pressure concentrations, and must be connected to supporting members (beams, columns, walls, foundation) to form a continuous resistance path. Forces are also generated on structures by air-borne missiles that vary in size from roofing gravel to entire sections of roofs.

[FEMA]

FEMA's Basic and Intermediate Mitigation Packages addressing roofing, windows, and porches should be completed prior to an Advanced Mitigation Package.

Roof damage from high winds can cause significant interior damage with additional wind and water intrusion.

ADVANCED MITIGATION PACKAGE

The Advanced Mitigation Package establishes a continuous load path from the top of a building's roof to its foundation.

Hurricane winds or tornados can impose extreme wind forces on a building in any direction. Strong winds can damage a building or structure through:

- Uplifting the structure;
- Racking or twisting the building frame;
- Sliding or overturning the structure from its foundation;
- Creating a void or an opening, such as an opening in a roof, that allows storm water to penetrate the building;
- Blowing an element such as a balcony, gallery, porch, or carport off of a building, creating a void or opening; and
- Causing flying debris.

In addition to potential wind damage, flooding can damage a building and/or structure through:

- Sliding the structure off of its foundation; and
- Introducing storm water to building materials leading to rot, mold, and/or deterioration.

Many buildings in Florida have wood framing for the roof and floors even if the walls are masonry. Wood-framed portions of a structure are more likely to be damaged by the effects of a significant storm. In some historic buildings, the connections between wood elements are nailed together with some earlier types of construction including pegged or mortised joints. The movement of a building in high wind tends to loosen connection joints, compromise the structural integrity of a building, and lead to possible increased damage from a strong, sustained wind or wind gusts.

A continuous load path provides hurricane-rated connections between structural elements to resist wind forces and keep a building intact during hurricanes and other extreme storms. The important connections that should be addressed are illustrated to the right and listed below:

A. Across roof ridges

B. Roof to walls

C. Upper to lower walls between floors

D. Lower walls to wall sill plate

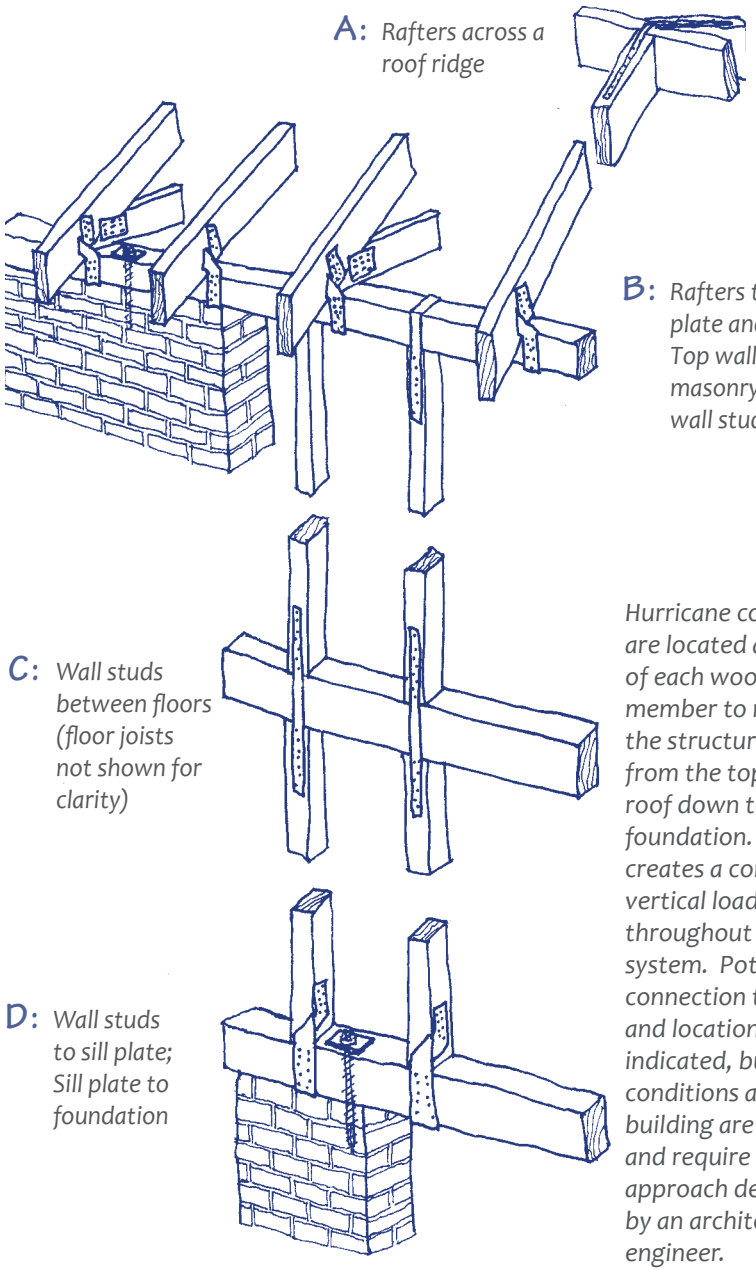
D. Wall sill plate to masonry or concrete foundation

DESIGN PROFESSIONALS FOR WIND RETROFITS

There are several methods of improving a building's wind resilience. Specific construction assemblies vary, and the diagram to the right is for general reference only. Consultation with an architect or engineer is highly recommended. In addition, it is important that masonry walls, foundations, and piers are well-maintained and repointed since wind load and storm water can weaken mortar joints. *(Refer to Design Professionals, page 2.15, and Maintenance, page 4.3)* In addition, not all contractors are familiar with the installation of hurricane connectors. Improper installation can be ineffective and hazardous in the event of a storm.

METAL CONNECTORS

The type of metal used for the connectors should be considered based upon the building's location and conditions. Galvanized metal straps, connectors, nails, and screws are less likely to rust than steel. Along coastlines where there is the potential for salt water to cause corrosion, it may be worthwhile to consider stainless steel connectors. They are more expensive, but the cost of removing wall surfaces to replace rusted or corroded connectors should be considered when evaluating costs.



Hurricane connectors are located at the end of each wood framing member to reinforce the structural link from the top of the roof down to the foundation. This creates a continuous vertical load path throughout the wall system. Potential connection types and locations are indicated, but the conditions at each building are different and require a custom approach designed by an architect or engineer.

Hurricane Ian struck Florida September 28, 2022, causing significant property damage. As part of the cleanup, debris piles lined roadways in Fort Myers.

ADVANCED MITIGATION PACKAGE IMPLEMENTATION

Implementing an Advanced Mitigation Package requires access to the structural members within walls. Access to structural members typically requires the removal of either exterior wall finishes and potentially plywood sheathing, or interior wall finishes. As a result, it is a very invasive process that is typically implemented as part of a large-scale storm recovery project. Implementing an Advanced Mitigation Package could trigger a Substantial Improvement determination. *(Refer to Substantial Improvement, page 9.3)*

However, if conducting a project that provides access to structural members, such as roof replacement or constructing an addition, it is worthwhile to add structural brackets and straps to improve the building's wind resilience.

The Basic and Intermediate Mitigation Packages should be completed either prior to or in conjunction with the Advanced Mitigation Project. *(Refer to Basic Mitigation Package, page 3.7, and Intermediate Mitigation Package, page 3.9)*

ADDITIONAL MITIGATION CONSIDERATIONS

In addition to FEMA's Wind Mitigation Packages, there are several improvements that can be made to improve a building's wind resilience.

CHIMNEYS

Chimneys are often character defining features of historic buildings. Chimneys that are poorly maintained and missing mortar can collapse in high winds. In addition, chimneys that are very tall or very skinny can also topple, damaging the roof. Chimneys should be properly maintained, which includes regular repointing. They can also be braced with metal rods to provide additional stability. *(Refer to Maintenance, page 4.3)*

EXTERIOR WALL COVERINGS

Exterior wall coverings such as wood, fiber-cement, vinyl, and aluminum siding; shingles; and brick veneer can blow off a building during high wind events. Maintaining proper attachment can prevent wall covering materials from becoming air-borne.

FALLEN TREES

Fallen tree limbs can crash into a building, block roads, and knock down power lines causing a fire hazard. Diseased or rotted trees should be removed and limbs overhanging buildings or electrical lines should be cut back. *(Refer to Chapter 5: Landscape Improvements)*

EXTERIOR EQUIPMENT

All roof-mounted or wall-mounted equipment should be securely fastened to the building to prevent it from becoming air-borne debris. *(Refer to Relocation of Critical Systems and Equipment, page 4.5)*

HISTORIC PRESERVATION CONSIDERATIONS FOR WIND RETROFITTING

ROOFS

- ❑ Retain historic roof coverings whenever possible or replace in-kind
- ❑ Replace the roof surface with a matching material or a material with similar pattern and size
- ❑ Install clay or concrete tiles with nails or foam installation to improve wind resilience
- ❑ Consider alternate roof materials that are light colored or reflective only at less visible locations and flat roofed areas
- ❑ Install structural anchors connecting roof and wall framing to reduce uplift
- ❑ Maintain the original shape and pitch of the roof
- ❑ Ensure roof covering and flashing materials are chemically compatible

ROOF VENTS, SOFFITS, AND OVERHANGS

- ❑ Strengthen soffits, overhangs, and vents at the connections between the roof and wall framing in a manner that minimizes visibility
- ❑ Design exterior reinforcements, when necessary, to avoid obscuring the historic material or decorative details
- ❑ Paint any new exterior vents, soffits, and reinforcement materials to blend with adjacent wall or trim colors

WINDOWS AND DOORS

- ❑ Select replacement doors and windows that maintain the size, trim profiles, and materials when available
- ❑ Install period-appropriate, operable shutters with secure locking hardware where stylistically compatible
- ❑ Limit installation of Bahama shutters to coastal vernacular buildings
- ❑ Install inconspicuous anchors for cloth or rigid hurricane protection
- ❑ Avoid leaving temporary protection permanently or semi-permanently installed
- ❑ Vent exterior storm panels to reduce condensation
- ❑ Paint permanent tracks and fasteners of hurricane shutters to match window and door trim or adjacent wall surface
- ❑ Install wind-resilient storm windows and doors with frame painted to match window or door trim–Avoid storm windows or doors with interior grills or decorative elements
- ❑ Improve historic door resilience with supplemental hardware

SKYLIGHTS

- ❑ Avoid using reflective coatings on skylights visible from the right-of-way

GARAGE DOORS

- ❑ Retrofit historic garage doors at the interior to improve wind resilience

PORCHES AND CARPORTS

- ❑ Install hurricane-rated straps on vertical posts and columns
- ❑ Anchor the bottoms of columns and posts to the ground with masonry or concrete footers
- ❑ Install inconspicuous anchors for cloth or rigid hurricane protection

STRUCTURAL CONNECTIONS

- ❑ Replace wall coverings in-kind if removed for improvements to structural connections

CHIMNEYS

- ❑ Repoint missing and eroded mortar joints with mortar that matches the existing color and strength
- ❑ Install metal bracing rods that will not cause corrosion or spalling

EXTERIOR WALL COVERINGS

- ❑ Replace damaged materials in-kind and avoid wholesale replacement

New Smyrna Beach, 1925 (Florida Memory)

4 BASIC IMPROVEMENTS

Basic improvements are generally simple, low-impact strategies that are relatively easy and inexpensive to complete. The services of a design professional may or may not be required depending on local regulations and complexity. Although basic improvements often will improve flood and wind resilience, they typically will not reduce flood insurance premiums. *(Refer to Chapter 9: Review Requirements for Historic Buildings for regulatory considerations)*

Several relatively low-cost basic improvements can improve resilience and recovery and can be completed by property owners through general building maintenance. These basic improvements are relatively easy to complete with little to no impact on the building's historic fabric if there is careful attention to the details. ***The completion of multiple basic improvements can significantly improve both building resilience and recovery speed after a flood or severe storm.***

BASIC IMPROVEMENT REQUIREMENTS

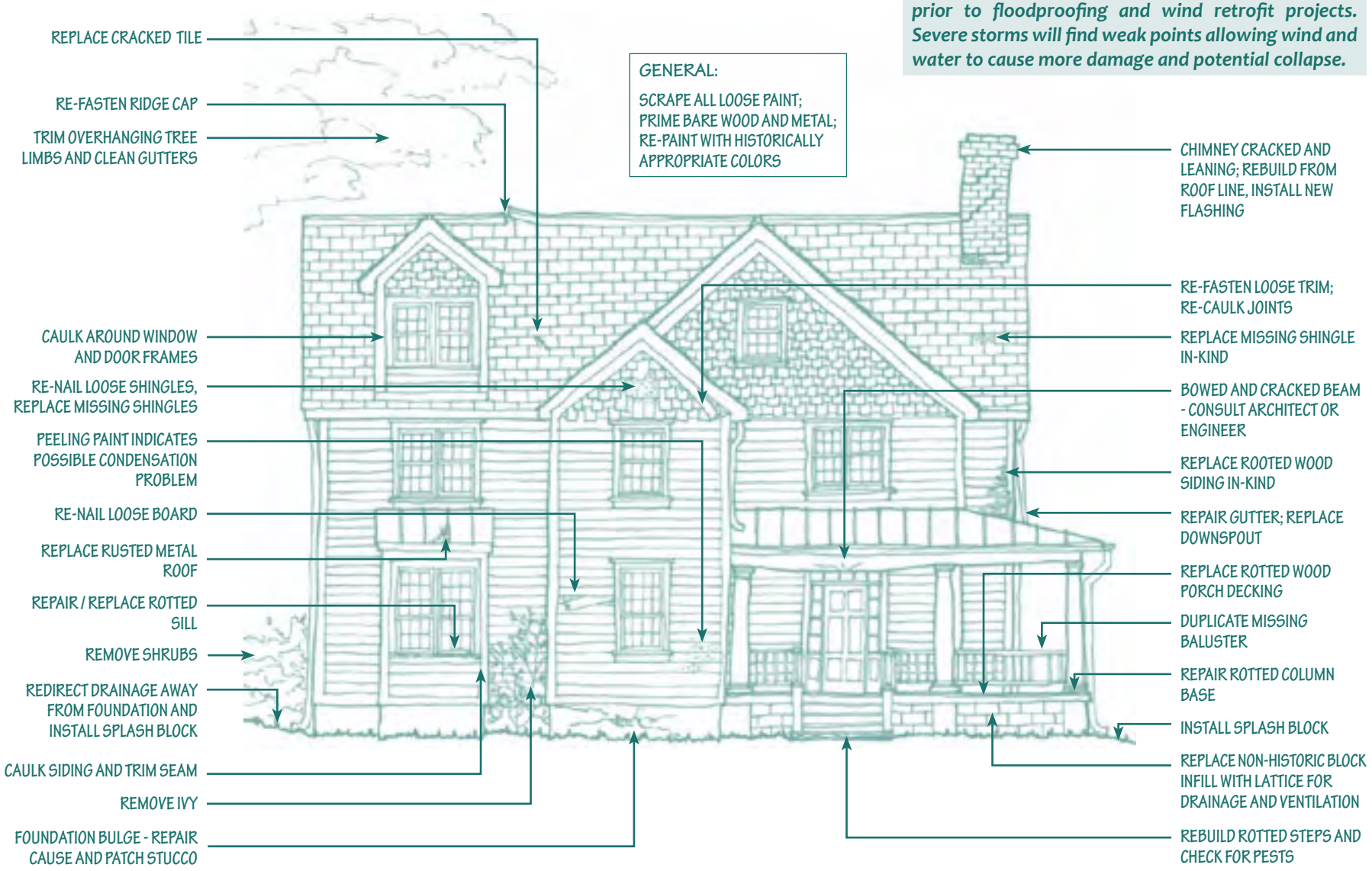
Some basic improvements are required as part of building elevation, wet floodproofing, or dry floodproofing project. This may include the location of systems and equipment above the Design Flood Elevation (DFE) and use of flood damage-resistent materials.

These activities may require a building permit:

- Roof replacement
- Window replacement
- Installation of building systems and equipment
- Installation of back-flow preventers
- Installation of solar panels and generators

TYPICAL WOOD-FRAMED / RESIDENTIAL BUILDING MAINTENANCE NEEDS

Regular maintenance is an important factor in the long-term protection of all buildings and structures. Poorly maintained buildings and those that are structurally compromised will need additional work prior to floodproofing and wind retrofit projects. Severe storms will find weak points allowing wind and water to cause more damage and potential collapse.



Basic improvements can include:

- Maintenance of historic resources and properties
- Relocation of critical systems and equipment above the Design Flood Elevation (DFE)
- Installation of a back flow preventer
- Installation of secondary power sources to allow electrical independence in the aftermath of a storm
- Use of flood damage-resistant materials in flood-prone locations
- Selection of flood-resilient furnishings and storage
- Installation of temporary door and window barriers
- Roof replacement
- Installation of roof structural improvements
- Landscape improvements

Additional improvements to reduce wind damage can be found in *Chapter 3: Wind Retrofitting*.

Removing excess vegetation, repairing or replacing the roof, and checking siding and windows for deterioration should be a part of general building maintenance.

MAINTENANCE

Regular maintenance helps to:

- Preserve buildings, structures, and properties;
- Protect real estate values and investments;
- Protect buildings, structures, and properties from flood and wind damage; and
- Keep a community an attractive place to live, work, and visit.

Flooding is often accompanied by secondary factors, such as high winds, and can be followed by fire. *(Refer to Chapter 3: Wind Retrofitting)* There are simple maintenance measures that can reduce the vulnerability of historic buildings, including:

- ❑ Grading land to promote positive drainage away from historic buildings (contact local officials for any required review and approval of potential impacts on neighboring properties, sidewalks, archaeology, or roadways)
- ❑ Trimming overhanging tree limbs and removing rotted trees that might crash through a roof, take down electric and telephone lines, or block a roadway in a wind storm
- ❑ Clearing site debris that might become water-borne or air-borne in high winds; clog storm drains; provide fuel for a fire; harbor pests; and damage the historic building or surrounding building
- ❑ Ensuring oil and propane tanks, including those for outdoor grills, ovens, or kilns, and associated connections, are well maintained and anchored to prevent flotation
- ❑ Removing clutter and unnecessary storage in a building, particularly if items are hazardous, highly flammable, or located in a flood-prone area
- ❑ Maintaining roofing, flashing, gutters, and downspouts to direct stormwater away from buildings and allow absorption on the property
- ❑ Reinforcing roof framing to support wind loads
- ❑ Repointing masonry and repairing stucco, including chimneys, walls, foundations, and piers, to prevent collapse and stormwater infiltration
- ❑ Replacing or securing missing or dislodged siding to prevent stormwater infiltration and potential for wind-borne debris
- ❑ Replacing cracked window glass that can shatter in a wind storm and allow water infiltration
- ❑ Sealing openings between building components or around penetrations such as hose bibs or conduits through walls
- ❑ Maintaining shutters in an operational condition to protect windows from air-borne debris in a wind storm
- ❑ Replacing cracked pipes to prevent plumbing leaks or sewer failure
- ❑ Replacing batteries in smoke and carbon monoxide detectors to provide notification of a fire or gas leak
- ❑ Locating a fire extinguisher in an accessible location

TYPICAL MASONRY / COMMERCIAL BUILDING MAINTENANCE NEEDS

GENERAL:

SCRAPE ALL LOOSE PAINT; PRIME BARE WOOD AND METAL; RE-PAINT WITH HISTORICALLY APPROPRIATE COLORS

REATTACH OR REPLACE DOWNSPOUT. VERIFY WHETHER SUFFICIENTLY SIZED FOR FLOW

REGULARLY REPAINT WOOD WINDOWS WITH HISTORICALLY APPROPRIATE COLORS AND REPLACE SEALANT AT MASONRY JOINTS

REPLACE INAPPROPRIATE WINDOW WITH 2/2 WINDOW TO MATCH HISTORIC CONFIGURATION

RESTORE ROTTED CORNICE AND REPLACE MISSING BRACKET

REGULARLY REPAINT EXTERIOR WOODWORK WITH HISTORICALLY APPROPRIATE COLORS

RECONNECT DOWNSPOUT TO BOOT - REPLACE DAMAGED BRICKS AND REPOINT OPEN JOINTS USING HISTORICALLY APPROPRIATE MORTAR

REMOVE PLANT GROWTH, CLEAR GUTTER AND VERIFY SLOPE TO DRAIN

RESTORE ROTTED CORNICE AND REPLACE MISSING BRACKET

CRACKING FROM CORNERS OF WINDOWS CAN INDICATE SIGNIFICANT PROBLEM - CONSULT ARCHITECT OR ENGINEER

REPOINT OPEN JOINTS USING HISTORICALLY APPROPRIATE MORTAR

RESTORE DAMAGED WOODWORK AND REPAINT

REPLACE DAMAGED BRICK AND REPOINT OPEN JOINTS USING HISTORICALLY APPROPRIATE MORTAR

Elevated utilities can be screened with landscaping or fencing. Provide access for ventilation and maintenance.

Commercial utility systems are often located in alleys, service roads, and rooftops.

PROTECTING BUILDING SYSTEMS

FEMA Publication P-348, Edition 2, *Protecting Building Utility Systems From Flood Damage Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems* (February 2017) provides guidance on the protection of residential systems and equipment. *(www.fema.gov)*

RELOCATION OF CRITICAL SYSTEMS AND EQUIPMENT

Damage to building systems and equipment can be a costly effect of flooding. Traditionally, building systems, and equipment are often located in a crawlspace, on the first floor, or at exterior grade. ***Even short-term exposure to flood water can permanently damage any of these systems, making them useless in the flood recovery process.*** In addition, relocating equipment to a higher elevation level may reduce a potential environmental hazard by preventing gas, oil, and chemicals from mixing with flood water, and reduce the chances of electrocution.

The types of systems and equipment that could be impacted include the items listed below.

- Heating
- Hot water
- Air conditioning
- Duct work and ventilation
- Electrical / security / communications
- Kitchen / laundry appliances

Relocation will often require raising the systems and equipment to the Design Flood Elevation (DFE) at a minimum. This includes major equipment and raising secondary elements such as electrical outlets, junction boxes, switches, disconnects, panels, and utility meters. Relocation can provide an opportunity to identify locations where improvements are needed to wind damage to the roof and windows. *(Refer to Chapter 3: Wind Retrofitting)*

All relocated equipment should be installed in a manner that meets the current Florida Building Code (FBC), local ordinances, and the manufacturers' requirements including clearances, access, and ventilation. At the interior of a building, the equipment and appliances can be placed on raised platforms or located on upper floors. Equipment and appliances include boilers, kitchen appliances, water heaters, electrical panels, washers, and dryers.

Relocation of exterior equipment may require mounting on roofs, freestanding platforms, or wall platforms. Every effort should be made to minimize the visibility of all equipment from both the public right-of-way and neighboring properties by selecting a visually inconspicuous location and screening with materials such as shrubs and fencing. *(Refer to Foundation Screening, page 8.16.)* In addition, equipment mounted on rooftops or building walls should be securely fastened to prevent displacement in high winds. *(Refer to Exterior Equipment, page 3.17)*

Commercial scale back flow preventer systems are larger than residential systems.

BACK FLOW PREVENTION

During a heavy rain or storm conditions, sewer system flow may exceed the available capacity making plumbing fixtures vulnerable to backups. This is particularly true in municipalities with combined storm water and sewer systems. In addition, the fresh water supply can become contaminated if inundated with flood water or where the infrastructure has already been weakened or damaged from salt water exposure.

To minimize the potential for sewage backup through floor drains, toilets, and sinks, it is prudent to have drainage systems and associated vent pipes cleaned on a regular basis. To protect water supply lines, a back flow preventer, or a backwater valve, can be installed. A back flow preventer is a device that is installed on pipes to allow water to flow in one direction but never in the opposite direction. This prevents the water supply from becoming contaminated with sewage. Property owners should comply with local requirements for protection and inspections. It is also prudent to inspect and remove visible debris from any outdoor drains.

Solar panels located on the parking shade structure in the Key West City Hall parking lot and a large generator is raised above the parking median. The secondary power sources provide electricity to City Hall when needed.

Local regulations may require locating back flow preventers close to the city utility lines.

INSTALLATION OF SECONDARY POWER SOURCES

Loss of power often occurs as the result of flooding, especially when accompanied by high winds. This could include power loss at a single building or multiple properties. An independent power source, such as solar collectors or a generator, can facilitate recovery after a flood. It can allow equipment, such as sump pumps and fans, to remain operational during a storm event. Like the relocation of critical systems, every effort should be made to minimize the visibility of secondary power sources and propane tanks.

Care should be taken when repowering building systems after a flood event. Water-logged power sources or lodged debris can be hazardous and cause accidental injury, electrical overload, and damage systems and equipment. *(Refer to Chapter 10: Emergency Response)*

Solar panels can be installed with minimal impacts to a historic building and its setting.

Cleaning and drying out interior spaces should be conducted methodically to salvage historic finishes.

Stuart's House of Refuge takes precautions when storing sensitive items and technology equipment in the attic.

A waterline remains visible on the walls and furnishings years after Hurricane Irma flooded the Everglades National Bank building.

FURNISHINGS AND STORAGE

Property owners and tenants should consider selecting furnishings, equipment, and display merchandizing that can be easily moved or cleaned and disinfected if exposed to flood water.

RESIDENCES

- Support kitchen cabinets, appliances, bookcases, dressers, chairs, sofas, etc., on metal legs instead of resting directly on the floor
- Minimize fabrics and soft materials near floors such as rugs, cloth chairs, sofas, bed linens, and drapes

RETAIL STORES

- Utilize metal and/or plastic wall-mounted and free-standing merchandise displays

OFFICES

- Locate all equipment, including computers, servers, printers, and associated power supplies above flood prone areas
- Store valuable papers above floodprone areas
- Maintain electronic copies of files and papers off-site

RESTAURANTS

- Mount kitchen equipment on wheels to allow relocation to higher ground
- Install quick-release valves at gas connections to allow quick relocation of equipment
- Select easily-cleaned, lightweight chairs that can stack on tables
- Utilize concrete or other solid surfaces for bars and banquettes for easy cleaning

STORAGE

- Limit storage and equipment in flood-vulnerable areas, particularly valuable papers, photographs, heirlooms, laundry machines, and retail merchandise
- If flood-vulnerable storage is the only option, elevate items above the floor on shelves or raised surfaces and secure them in plastic bins to protect them if the container is dislodged and floats in the water

EXTERIOR FURNISHINGS

- Select exterior items (including tables, chairs, umbrellas, potted plants, barbecue grills, and outdoor ovens) that are light enough to move above flood water height or easily secured to prevent flotation or displacement in high winds

USE OF FLOOD-DAMAGE RESISTANT MATERIALS

Certain building materials are less affected than others when submerged in water. When planning a renovation or during storm recovery, evaluate whether the existing materials can withstand a flood event. Building materials are categorized by FEMA, ranking their potential resistance to flood water. Levels range from materials that require a constant dry environment to those that can withstand high flood exposure. Contrary to their perceived water resistance, several historic interior materials are rated "unacceptable" by FEMA for flood resistance, including solid wood doors and flooring, linoleum tile, and regular plywood.

Contractors and design professions should be familiar with FEMA's material classifications and the overall assembly systems. Brick, which is a common exterior material for historic buildings, is classified as having "acceptable" flood resistance without the application of any coatings. However, material ratings assigned by FEMA recognize individual materials rather than wall and floor assemblies. Therefore, each component in an assembly should be evaluated for flood resistance. Individual bricks may be acceptable but the brick walls can only provide protection if all components of the wall assembly are FEMA-acceptable and properly maintained. This includes ensuring that mortar joints are repointed and that joints and penetrations are sealed.

Options to consider include:

- **Floors:** Select floor finishes that are easy to clean and disinfect such as a solid-surface material like tile or polished concrete flooring, instead of carpet or wood laminate.
- **Walls:** Drywall (gypsum board) walls, and to a lesser extent plaster walls, are vulnerable to the effects of flooding, particularly if exposed to flood water for long periods of time. The material may deteriorate and the inside of the wall cavity can grow mold. One method to reduce mold is to remove any standing water and ventilate the room and wall cavity as quickly as possible. Installing baseboards and cornices to allow easy removal and utilizing dehumidifiers and fans for air circulation aid in recovery.

HISTORIC ENGLAND'S APPROACH

To best preserve historic building components, Historic England recommends deploying a slow, temperature-controlled, and carefully monitored process of drying-out. Although they acknowledge that there will be some material degradation, particularly for high floods or if the flood water contains salts or other contaminants, they argue that many historic materials can be saved with proper care. This approach may be an appropriate alternative to material replacement where not otherwise required for NFIP compliance. *(Refer to Historic England - Flooding and Historic Buildings, sidebar, at right)*

Removable baseboards may allow ventilation and reduce damage to historic finishes.

FEMA FLOOD-RESISTANT MATERIALS

Materials identified by FEMA as flood resistant and available in the two documents listed below.

FEMA Technical Bulletin 2: *"Flood Damage-Resistant Material Requirements"* (2008)

FEMA Technical Bulletin 7: *"Wet Floodproofing Requirements and Limitations"* (2022)

Compliance with NFIP non-structural elevation wet floodproofing requirements may necessitate replacement of historic materials with alternative flood damage resistant materials below the BFE/DFE as required by the local ordinance.

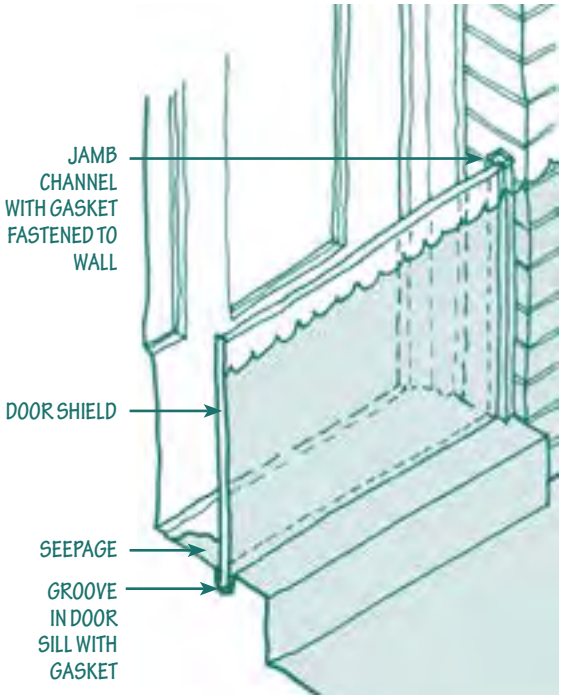
HISTORIC ENGLAND - FLOODING AND HISTORIC BUILDINGS

Although relatively resistant to flood damage, historic-building materials can all suffer some degradation and may need appropriate treatment. These materials include stone, solid brick-and-mortar walls, timber frames, wattle-and-daub panels, timber boarding and paneling, earthen walls and floors, lime-plaster walls and ceilings and many decorative finishes.

Organic materials such as timbers swell and distort when wet and suffer fungal and insect infestations if left damp for too long. If dried too quickly and at temperatures that are too high, organic materials can shrink and split, or twist if they are restrained in panels. Inorganic porous materials do not generally suffer directly from biological attack.

Significant damage can occur when inherent salt and water (frost) crystals carried through the substrate are released through inappropriate drying or very cold conditions.

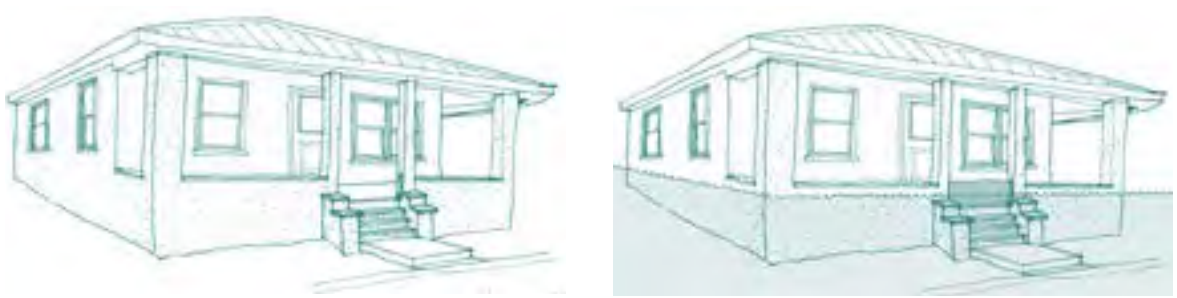
[Historic England, 2015 - www.historicengland.org]



Door shields can provide temporary protection from rising flood water. Simpler versions can be fabricated with channels permanently mounted in sealant to the door jambs with a groove cut into the sill. The panel, which can be metal or marine grade plywood, slots into the channel and groove. Water seepage can be reduced by a gasket installed at the perimeter of the panel.

FILLING CREVICES AND JOINTS

For barriers and shields to be effective, all crevices and joints must be filled to minimize flood water seepage into a building. In addition to sealing around the barrier or shield, attention should be paid to all wall penetrations, such as pipes or wires, and where dissimilar materials, such as masonry and door frames, join together. *(Refer to Joint Sealers, page 7.4)*



Although not compliant with the National Flood Insurance Program for residences, temporary shields can be installed at openings in masonry porches on masonry buildings in lieu of sandbags. To maximize effectiveness, the height of the shield should be similar to the height of the knee wall and similar barriers should be added to all low openings, such as back doors. Similar to the door example, at left, a gasketed channel should be installed on the porch piers and a groove cut into the top landing. Flood shields should be installed immediately in advance of the flood.

DOOR AND WINDOW SHIELDS

Even a few inches of flood water entering a building can have a devastating impact, necessitating costly repairs. To protect masonry and concrete buildings from low-level flooding, temporary shields can be installed at vulnerable door and window openings. ***Although not compliant with the NFIP at residential buildings, and therefore not eligible for a reduction in flood insurance premiums, temporary barriers and shields can reduce flood damage.*** A comprehensive system of barriers, shields, and waterproofing, also known as dry floodproofing, is accepted by the NFIP at non-residential buildings. Barriers and shields can be engineered to withstand several feet of flood water for long durations of time. *(Refer to Chapter 7: Dry Floodproofing)*

Sandbags are often used for door and window protection. Sandbags must be obtained and positioned prior to a flood event, must be properly stacked to prevent water seepage, and must be disposed of as contaminated waste if they come in contact with flood water. As an alternative to sandbags, it may be possible to install a metal plate shield at vulnerable door and window openings. ***If properly fitted and sealed, these barriers can be effective to relatively low flood water heights of a couple of feet, for relatively short durations of time before seepage becomes serious.*** *(Refer to Flood Water Pressure and Forces, sidebar page 2.12)*

To minimize potential seepage, barrier and shield systems typically include gaskets at the junction of components and where they meet the building wall, door or window sill, or ground surface. To be effective, the installation of barriers and shields should be combined with the sealing of openings at the perimeter of the building including open mortar joints and crevices around penetrations such as garden hose bibs and conduits, as well as regular maintenance. It is prudent to have a sump pump available to remove any seepage. *(Refer to Filing Crevices and Joints, sidebar at left, Maintenance, page 4.3, and Secondary Drainage System, page 7.7)*

HISTORIC PRESERVATION CONSIDERATIONS FOR BASIC IMPROVEMENTS

MAINTENANCE

- ❑ Consult with a professional if hazardous building materials are present
- ❑ Hire a qualified contractor for work that is potentially dangerous

SYSTEMS AND EQUIPMENT

- ❑ Relocate all building systems and equipment out of flood prone areas to an inconspicuous location
- ❑ Secure equipment to prevent it from becoming water-borne or air-borne
- ❑ Screen ground-mounted systems and equipment with landscaping or fencing to minimize visibility

SECONDARY POWER SOURCES

- ❑ Locate secondary power sources out of flood prone areas to an inconspicuous location
- ❑ Locate roof or wall-mounted secondary power sources in a manner that minimizes visibility
- ❑ Screen ground-mounted secondary power sources with landscaping or fencing to minimize visibility
- ❑ Minimize visibility of solar panels from public sidewalks and roads

FLOOD-RESISTENT MATERIALS

- ❑ Retain historic materials to the extent possible
- ❑ Limit the use of replacement flood-resistent materials to vulnerable areas
- ❑ At locations where flood-resistant materials are required, select alternatives that are visually compatible to historic materials

DOOR AND WINDOW SHIELDS

- ❑ Install channels, grooves, and other attachment mechanisms in a manner that minimizes their visibility
- ❑ Install caulk and sealants at vulnerable crevices and openings that are colored to match adjacent wall surface

Tampa, 1927 (Florida Memory)

5 LANDSCAPE IMPROVEMENTS

LANDSCAPE IMPROVEMENT GOALS

The primary goals of landscape improvements are capturing stormwater on site to prevent it from running into a street drain or onto a neighboring property and stabilizing and protecting shorelines. As more absorption occurs in a community, the demands on the local stormwater system and run-off into waterways can be decreased. Shorelines are often vulnerable to storm surge and erosion, which decrease land area. The cumulative result of reduced runoff in a neighborhood and shoreline stabilization may mitigate a community's flood vulnerability.

Landscape improvements can be relatively low impact, inexpensive to implement, and integrated into a designed landscape, particularly in new development. In dense historic districts there may be very little land area that is not covered by buildings, sidewalks, parking lots, walkways, patios, driveways, and swimming pools. As a result, the opportunity to use landscape improvements to enhance flood resilience may be limited. At larger parcels, there is a greater opportunity to implement landscape improvements to improve stromwater absorption and protect the water's edge. These improvements can increase flood resilience.

To a lesser extent, landscape improvements can improve wind resilience. Reducing gravel in Wind-Borne Debris regions can reduce the likelihood of shattering glass. Similarly, trimming overhanging tree limbs and removing rotted trees can reduce the potential for building damage in high winds.

The asphalt has been removed from the edge of this parking area to provide a landscaped area that collects and absorbs stormwater runoff.

IMPERVIOUS SURFACES

Impervious surfaces will prohibit or limit the ability of stormwater to be absorbed into the ground. ***Reducing impervious surfaces and increasing permeable surfaces will increase absorption on-site and decrease stormwater runoff.*** Rainfall will become water runoff as it sheets off the impervious surfaces and increases the likelihood of neighborhood flooding. Impervious surfaces reduce absorption into the ground, reducing the replenishment of aquifers and increasing discharge into local stormwater systems. Impervious surfaces include roofed buildings and structures, roadways, parking areas, swimming pools, and paved surfaces. An alternative strategy to reduce the impact of runoff is to slope roadways and paved surfaces towards landscaped areas or drainage ditches, in lieu of curbed asphalt that discharges into a stormwater system.

Pervious pavers can decrease stormwater runoff and promote absorption into the ground.

The spaces between the pavers absorb stormwater. Regular cleaning is requiring to remove debris.

HIGH WIND CONSIDERATION

In areas prone to high winds, gravel and crushed stone used for driveways and walkways can become air-borne projectiles that can damage or shatter glass. *(Refer to Chapter 3: Wind Retrofitting)*

Xeriscape landscapes can be low maintenance once installed. Materials should be held in place against wind and water impacts.

LANDSCAPE OPTIONS

Many landscape improvements either preserve or mimic natural landscape systems. Native plant species, diverse wildlife, and rich soils from the decomposition of plants and trees facilitate both shallow and deep absorption of stormwater.

- **Swales** are either natural or man-made depressed landscaped channels used to manage stormwater runoff and promote water absorption. Similar to levees and berms, they can be effective across multiple sites, or on a single parcel, where they are often constructed to direct stormwater away from building foundations. They can also direct stormwater towards a wetland area, drywell, or rain garden to promote natural infiltration.
- **Berms** can be planted with trees to provide a vertical feature while increasing stormwater absorption.

Retaining walls can be decorative and used to elevate the ground surface below and around a building, reducing its flood risk.

- **Retaining walls** are structural walls that can be used to hold back soil and raise the height of the grade around a building or a landscaped lot.
- **Rain gardens** often use native plants located in depressed areas of land, typically near paved surfaces, that collect stormwater runoff and promote natural water absorption. However, they are not effective in areas with higher water tables and may promote mosquitos if not properly maintained.

Landscape areas can be planted and formed to direct stormwater to retaining areas with native plants are more likely to absorb stormwater.

TREE SPECIES (DIAMETER AT PLANTING)	GALLONS OF WATER INTERCEPTED IN YEAR 1	GALLONS OF WATER INTERCEPTED IN YEAR 15	GALLONS INTERCEPTED OVER 15 YEARS
4" Live Oak	481	7,283	48,375
8" Live Oak	1,491	9,349	71,949
12" Live Oak	2,843	11,507	98,772
4" Yaupon Holly	155	486	5,676
8" Yaupon Holly	548	548	8,226

Planting trees and shrubs can aid in stormwater absorption by intercepting water through their root systems. (Resilient Heritage, City of St. Augustine, 2020, page 39.)

- **Shade trees** can promote stormwater absorption and reduce runoff and ambient temperature. *(Refer to table above)* If tree limbs shade a roof, they can also reduce interior temperatures. Trees should be positioned to minimize the potential for limbs to damage buildings during high winds. In addition, rotted trees are vulnerable to toppling in high winds and should be removed as part of regular site maintenance.
- **Native plants** absorb water to a greater degree than non-native plants, require less maintenance, and tolerate the range of temperature extremes from very wet to very dry soil, as well as salt water exposure. Lawns with grass not native to Florida require regular care.
- **Rain barrels** can be located to collect stormwater from roof surfaces through downspouts. This water can then be used to water gardens rather than being directed to storm drains. Rain barrels should not be located in the right-of-way where they block the pedestrian flow on sidewalks. To the extent possible, limit their visibility from the public right-of-way.

REGULATORY REQUIREMENTS

Many municipalities have ordinances that prohibit or restrict stormwater runoff from one parcel to an adjacent parcel to protect structures on neighboring properties. Similarly, some communities limit runoff from a property to a street to reduce the potential of overwhelming the municipal stormwater system during a heavy rain. Consult with local agencies prior to altering stormwater patterns. *(Refer to Chapter 9: Review Requirements for Historic Buildings)*

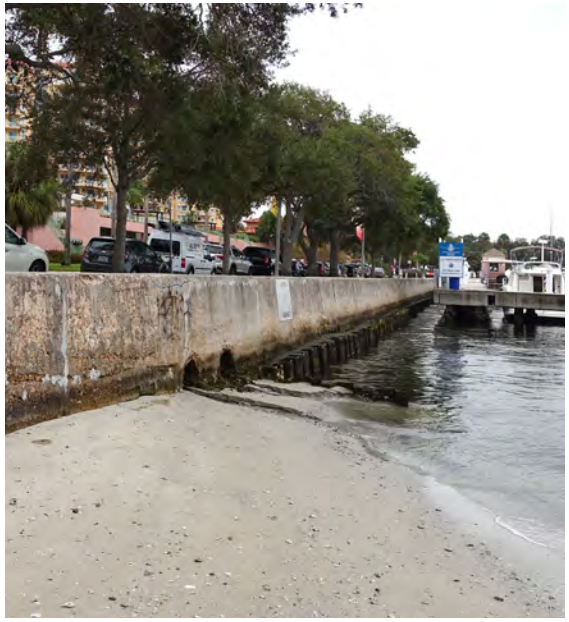
SHORELINE PROTECTION

Shorelines occur along all bodies of water, including oceans, bays, canals, rivers, and streams. During flood events, water levels will typically rise and sometimes be compounded by wave action, storm surge, or high-velocity water flow threatening adjacent properties. A range of shoreline protection measures can provide protection for individual properties. These generally fall within two broad categories: those that are constructed, "hard," or "armored" adaptations; and; "soft," "natural," or "landscape" adaptations that emulate natural processes.

To be most effective, shoreline protection should be continuous along the edge of a waterway. If not, the unprotected properties will be vulnerable as the water seeks a place to go. Ideally, shoreline protection is best completed on a municipal level or by multiple adjacent properties with similar vulnerabilities. If considered by an individual property owner, communication with adjacent property owners is recommended.

There are several types of shoreline protection that can be implemented by individual property owners. However, environmental impact reviews may be required, particularly for structural protection measures.

The shoreline at the historic Edison and Ford Estates includes stabilizing stone and natural mangroves.



Bulkeads act as retaining walls at the water's edge. They may not provide storm surge protection and are often inadequate to address sea level rise.

STRUCTURAL SHORELINE PROTECTION

Hard adaptations are structural elements constructed to protect shorelines from wave impact-induced erosion, as well as high-velocity flow of flood water. These elements can be located immediately at or along the shoreline. In order to dissipate wave action, these can be located offshore and are typically installed by a government entity. Seawalls, bulkheads, and revetments are all examples of shoreline (or coastal) armoring that can be installed by a either property owner or the government. Shoreline armoring protects development by reinforcing the shoreline to prevent it from retreating or eroding.

There are a number of structural protective measures that can be constructed parallel to a shoreline to fortify it against potential flood-related damage:

- **Seawalls** are vertical walls constructed along a shoreline to provide protection from waves on one side and retain earth on the other, possibly extending above existing grade. They are constructed to reflect incoming wave energy back out towards the water. They do not necessarily protect the land at the base of the wall from erosion and can accelerate damage to unprotected adjacent shorelines.
- **Bulkheads** are like seawalls in that they are vertical walls that extend along a shoreline and retain soil. However, unlike sea walls, bulkheads provide minimal protection from waves. They do not necessarily prevent shoreline erosion, but can also create erosion in adjacent unprotected areas (lacking bulkheads).
- **Revetments and rip-rap** are fortified slopes or banks made of boulders or chunks of concrete that disperse wave energy upon impact. They can prevent erosion and improve the structural stability of soil slopes.

Mangroves are native coastal plants that help to provide structure to shorelines and reduce erosion.

NATURAL SHORELINE PROTECTION

Natural shoreline protections, also known as nonstructural or "soft" measures, are based on emulating the natural ecosystem of an area. Natural shoreline protection can be the basis for flood-resilient design. In considering the treatment options, it is important to have a clear understanding of the local natural environmental conditions and how water is managed in the local watershed or water management district. Environmental or coastal review staff from the Florida Department of Environmental Protection (DEP), or local natural estuarine resource staff, university partnerships, or water management district staff can provide more specific information.

Natural shoreline protection utilizes natural materials to absorb rainfall and intense storm surge. It can be more effective and less costly than structural measures, but requires larger land areas and regular maintenance.

There are several natural protective measures that can be constructed parallel to a shoreline to fortify it against potential flood-related damage:

- **Wetland reclamation** seeks to reestablish wetlands that have been removed or reduced over time. Wetlands are areas that are saturated with water that support a distinct ecosystem for vegetation and fauna. This vegetation has the ability to filter water and promote ground absorption. In a flood event, it can store flood water and reduce the impacts of storm surge.
- **Mangrove habitat establishment** involves planting young mangroves along a sheltered portion of a shoreline. As the mangroves grow and expand, they establish aerial roots that can provide effective shoreline stabilization and erosion control. A mature mangrove stand can mitigate wave height and storm surge, reducing the impacts of seasonal wind events like nor'easters, tropical storms, and hurricanes.
- **Floodplain restoration** involves increasing the surface area to distribute water and increase storage adjacent to a water body or channel. This could be a river, stream, lake, or dry creek bed that is subject to flooding during a heavy rain or flood event. Floodplain restoration, which often requires a reduction in impervious surface coverage, facilitates water absorption, and potentially reduces the velocity of water flow, downstream flooding, and flash floods.

Natural shoreline protection uses native, regionally appropriate materials, reduces the visual impact of the interventions, and promotes biodiversity. Wetlands and floodplains also provide water storage, promote absorption, and reduce potential downstream flooding. However, both require large land areas to be effective, reducing potential developable land.

Living shorelines, which include marsh grasses and mangrove stands, can reduce the impact of storm surge. In this example, concrete barriers protect the marsh grass as the roots become more established and take hold.

HISTORIC PRESERVATION CONSIDERATIONS FOR LANDSCAPE IMPROVEMENTS

IMPERVIOUS SURFACES

- ❑ Minimize impervious surfaces on parcels such as driveways, parking areas, walkways, and patios
- ❑ Consider use of historic paving options that allow stormwater filtration such brick pavers, structured landscape parking pavers, pervious asphalt, and crushed shells or stones
- ❑ Remove loose gravel and crushed shells in Wind-Borne Debris Regions
- ❑ Slope paved areas towards depressed landscape areas to collect and promote absorption of stormwater

LANDSCAPE OPTIONS

- ❑ Utilize landscape elements such as swales and berms to direct stormwater away from building foundations and adjacent parcels and promote absorption
- ❑ Install retaining walls in a manner to hold back soil and prevent water runoff onto adjacent parcels
- ❑ Install rain gardens or depressed landscape areas adjacent to paved surfaces to collect stormwater runoff
- ❑ Plant native shade trees to reduce heat and to improve stormwater absorption in locations that minimize potential building wind damage – select species that have large leaf surfaces and rough textures for maximum water interception; other preferred qualities include low water requirements, native species, and those that are in-leaf during peak rainfall season
- ❑ Plant native shrubs and plants to minimize need for watering and fertilizers
- ❑ Install rain barrels in an inconspicuous manner at the base of downspouts, and screen with shrubs or fencing to minimize visibility

SHORELINE PROTECTION

- ❑ Provide natural shoreline protection that is compatible with the historic context
- ❑ Consider the potential visual impact of seawalls and the property's relationship with the water
- ❑ Select materials for seawalls that are compatible with the historic context

Fort Lauderdale, 1947 (Florida Memory)

6 WET FLOODPROOFING

WET FLOODPROOFING

Wet floodproofing includes permanent or contingent measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing floodwaters to enter the structure or area. Generally, this includes properly anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls.

[NFIP]

Wet floodproofing is a flood mitigation alternative that may comply with floodplain management requirements for residential and non-residential buildings. ***Wet floodproofing allows flood waters to enter an enclosed area of a building and rise at the same rate, and to the same levels, as flood waters outside of the building.*** Flood water must move in and out unimpeded through flood openings so the lateral and buoyancy forces remain equal and limit opposing forces against a building's structure. *(Refer to Flood Water Pressure and Forces, sidebar page 2.12, and Building Foundations, page 8.14)*

To be compliant with the National Flood Insurance Program (NFIP), wet floodproofing relies on the free flow of flood water in and out of a building. ***In addition, spaces located below the flood protection elevation are considered "wet," meaning use of these spaces should be limited to non-residential functions. For residences, potential uses include parking; building access, including stairs and elevators; and incidental, low-value storage. Owners and tenants should consider the flood risk for both the building and its contents and make every effort to minimize a potential future loss.*** *(Refer to Chapter 4: Basic Improvements)*

Wet floodproofing is often utilized for new residential as well as non-residential buildings. Wet floodproofing is typically the best alternative for existing masonry or concrete buildings that are required to comply with NFIP design criteria and are technically difficult to elevate or relocate. This can include very large or complex buildings, or slab-on-grade buildings. One consequence of this alternative is that it may require abandoning or limiting the use of a portion of a building. Also, newly constructed additions must comply with floodplain management requirements and is subject to compliance with local ordinances and the Florida Building Code (FBC). *(Refer to Chapter 9: Review Requirements for Historic Buildings)* In a historic district or setting, additional considerations and regulations may apply. *(Refer to Wet Floodproofing in a Historic Context, page 6.4)*

At all properties, building materials that will be exposed to flood water should be selected for durability and their ability to be cleaned and disinfected. Building systems and equipment should be located above the Design Flood Elevation (DFE) so they are not compromised. *(Refer to Use of Flood-Damage Resistent Materials, page 4.8, and Relocation of Critical Systems and Equipment, page 4.5)* These criteria apply to all wet floodproofed floor levels, including basements and crawlspaces.

The building size and free water flow area of openings are key when determining the number of required flood vents. This can be more difficult to calculate with historic flood openings.

FLOOD OPENINGS

Flood openings can reduce both buoyancy and lateral pressures by allowing the flood waters to pass in and out of a building without mechanical intervention such as sump pumps. *(Refer to Flood Water Pressure and Forces, page 2.12)* Some flood vents are designed to allow ventilation and can eliminate the need for additional vents. Flood vents must be of sufficient size, number, and location to be able to quickly equalize interior and exterior water levels. They will typically be located around the perimeter of a building or foundation, close to the adjacent exterior grade height. Flood vents may also be needed between adjacent, enclosed spaces, such as in interior foundation walls. Any modification to, or covering of, flood openings such as louvers, screens, netting, or shrubs adjacent to foundations should be installed in a manner that does not impede the free flow of flood water. ***In the case of a filled or abandoned crawlspace or basement, the installation of flood vents and drainage through the grade slab may be required.***

Many manufactured flood openings are metal louvers or vents; some are designed to be more in keeping with the architectural character of historic buildings. In addition to allowing the free flow of water, they may prevent animal and insect infestation.

In addition to providing openings for the transfer of flood water, it is important to ensure that all building spaces are well ventilated after a flood. Secondary damage after a flood such as mold and rot can be reduced with adequate ventilation. Operable windows can typically be used to ventilate inhabited spaces, while ventilation of abandoned basements or areas below raised, finished floors can be more challenging.

FEMA FLOOD OPENING REQUIREMENTS

Every enclosed area is required to have at least two flood openings on exterior walls. Flood openings should be installed in at least two sides of each enclosed area to decrease the chance that all openings will be blocked by floating debris and to allow for more even filling and drainage of enclosed areas than if openings are installed on only one side.

FEMA recommends that openings be distributed around the perimeter of enclosed areas unless there is clear justification for putting all of the openings on only one or two sides, such as in townhouses with limited exterior walls and buildings set into sloping sites. If openings are not distributed around the perimeter, an imbalance in flood loads could result in damage to or collapse of walls.

In some situations, openings in interior walls or partitions are necessary to ensure that flood water can reach all enclosed areas and minimize unbalanced hydrostatic loads on interior and exterior walls. When openings are used in interior walls, the total number of openings and their net open area should be based on the size of the enclosed area. Openings in interior walls are not counted toward the total opening requirement based on the exterior measurement of the enclosed area. To maintain safe fire separation, flood openings should not be placed in the wall separating a garage from living spaces and crawlspaces unless devices used as flood openings that are designed to satisfy fire-separation requirements are used.

[FEMA NFIP Technical Bulletin 1 / March 2020]

Areas at lower levels of wet floodproofed buildings may only be used for parking, storage, and building entrances.

USES BELOW DESIGN FLOOD ELEVATION

To be considered wet floodproofed, there are limited allowable uses for the space below the finished floor level for residences. *(Refer to Relocation of Critical Systems and Equipment, page 4.5)* Permitted uses at residential buildings include building entrances, storage, and parking. At all wet floodproofed buildings, building systems must be located above the DFE and all building elements should be well maintained. *(Refer to Chapter 4: Basic Improvements)* Modifications to comply with wet floodproofing techniques will usually require work at any below-grade levels and first floor levels. Secure fastening of wood framing to masonry or concrete foundation walls or piers may also be required. *(Refer to Advanced Mitigation Package, page 3.15)*

POTENTIAL LOWER LEVEL MODIFICATIONS

- **Allow flood water to freely enter and leave the building.** This might include adding flood openings in the walls and providing openings for flood water to filter into the soil through the floor slab. In addition, a sump pump with a secondary power supply above the flood protection-elevation should be considered to remove water. *(Refer to Building Foundations, page 8.14, Installation of Secondary Power Sources, page 4.6, and Secondary Drainage System, page 7.7)*
- **Modify lower level window and door openings.** Depending on their location, lower level windows and doors might require modification to allow drainage or provide ventilation to facilitate drying after a flood.

POTENTIAL FIRST FLOOR MODIFICATIONS

- **Raise the floor.** If sufficient first floor ceiling height is available, raise the floor level above the DFE. This may require the interior modification of stairs, adjustment of interior doors, and may alter the relationship between the floor height and the windows.
- **Limit residential first floor use.** If the floor level is below the DFE and sufficient floor to ceiling height is not available to raise the floor, the use of the first floor of residences are limited to a building entrance, parking, and storage. This may require reconfiguration of upper building floors to accommodate formerly first floor public spaces, such as living rooms and kitchens in homes.
- **Change of use:** For masonry or concrete residential buildings that are difficult to floodproof, such as those with attached party walls, it may be possible to change the building use to non-residential if permitted by the local zoning code. Potential non-residential uses include offices or storefronts.

The interior floor has been elevated above the DFE at this former warehouse.

WET FLOODPROOFING IN A HISTORIC CONTEXT

The goal of preservation in flood vulnerable areas is to retain historic buildings that have been modified to the extent required for safety. New construction within a historic district can have a significant impact on a visual sense of place and should acknowledge the historic design context. The following design principles should be considered for new construction when compared to neighboring buildings:

- **Scale; height and width:** The proportions of the new building;
- **Building form and massing:** The three-dimensional relationship and configuration of the new building, walls, and roof;
- **Setback:** The distance between the new building to the street and between adjacent property lines;
- **Orientation:** The location of the primary entrance door or front façade;
- **Architectural elements and projections:** The size, shape, proportions, and locations of entrances, porches, carports, chimneys, dormers, and elements that contribute to an overall building's shape and silhouette;
- **Alignment, rhythm, and spacing:** The effect the new building will have on the existing patterns on its block;
- **Façade proportions:** The size, shape, and location of window and door patterns on the building façade and relationship of building elements to each other;
- **Trim and detail:** The moldings, decorative elements, and features of a building that are secondary to major surfaces such as walls and roofs; and
- **Materials:** The substance of which something is composed or constructed.

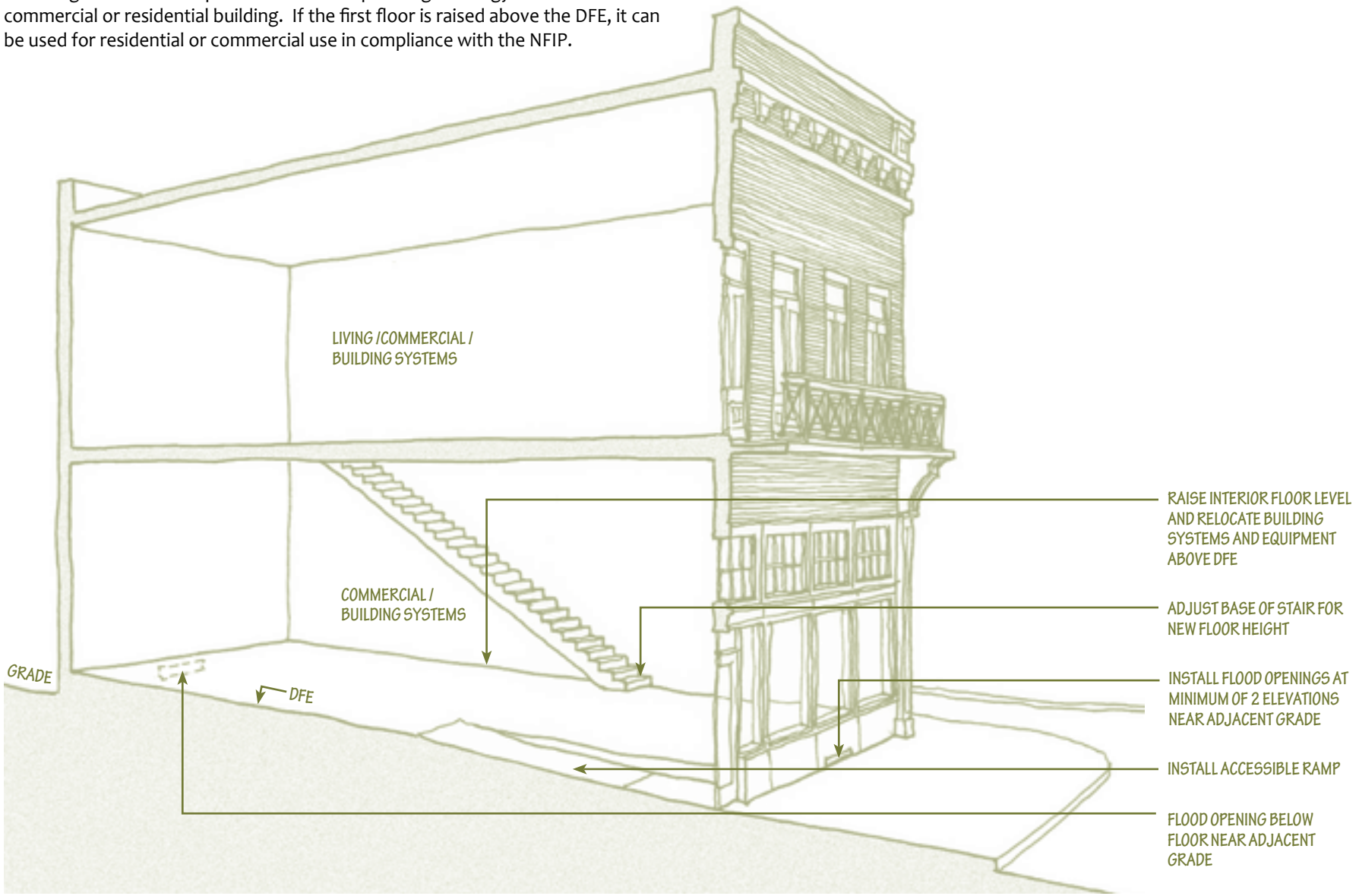
Local historical boards and commissions may have requirements regarding the appropriateness of specific styles within the context of a locally regulated historic district. *(Refer to Historic Preservation Boards, sidebar page 9.7)*

In this example of wet floodproofing of a new residence in St. Augustine's Lincolnville historic district, the front elevation (at left) is compatible with scale, form, and stylistic components of many of the neighboring houses. The ground level parking area is accessed from the rear and could be largely concealed with additional vegetation or fencing.

The French doors provide a rhythm and scale that should be maintained in any alteration.

WET FLOODPROOFING OPTION

The diagram below depicts a wet floodproofing strategy for an attached commercial or residential building. If the first floor is raised above the DFE, it can be used for residential or commercial use in compliance with the NFIP.



HISTORIC PRESERVATION CONSIDERATIONS FOR WET FLOODPROOFING

EXISTING FEATURES

- ❑ Maintain existing walls, porches, carports, chimneys, and bays
- ❑ Maintain the historic configuration of windows, storefronts, and door openings
- ❑ Obscure street-facing glazing to minimize visibility of first floor storage areas and garages
- ❑ Consider the potential impact on the building façade and window openings of a raised first floor level
- ❑ Maintain the principal exterior building access features including stairs, ramps, stoops, and porches
- ❑ Maintain historic landscape elements such as walkways, fences, and walls
- ❑ Maintain mature trees and shrubs
- ❑ Limit on-site driveways and parking

SYSTEMS AND EQUIPMENT

- ❑ Relocate all building systems and equipment out of flood-prone areas to an inconspicuous location
- ❑ Screen systems and equipment with landscaping or fencing to minimize visibility

FLOOD OPENINGS

- ❑ Install flood openings on side elevations when possible
- ❑ Install metal louvers and flood vents that are compatible in color with the wall to minimize their visual impact

PARKING AT EXISTING BUILDING

- ❑ Install flood openings below the BFE to be compatible with NFIP requirements (garage doors do not meet the requirements of flood openings)
- ❑ Orient garage doors away from the primary building façade

CHANGE IN USE

- ❑ Convert first floor level of houses below the DFE to non-residential use, if permitted by zoning, and implement alternative flood protection measures such as dry floodproofing *(Refer to Chapter 7: Dry Floodpoofing)*

ADDITIONS AND NEW BUILDINGS

- ❑ Avoid building on fill
- ❑ Construct additions that comply with floodplain management requirements in an unobtrusive manner to compensate for lost interior space
- ❑ Construct new buildings in a manner that is compliant with wet floodproofing requirements and compatible with the character of the surrounding historic context including limiting the overall building height and integrating front porches
- ❑ Avoid installing parking or garages in a manner that is visible from the primary elevation or front façade

Jacksonville, 1903 (Florida Memory)

7 DRY FLOODPROOFING

DRY FLOODPROOFING

Dry floodproofing refers to a combination of measures that make a building and attendant utilities and equipment watertight and substantially impermeable to flood water, with structural components having the capacity to resist flood loads.

The NFIP regulations do not permit the use of dry floodproofing for residential buildings in Zone A, and dry floodproofing is not permitted for any buildings in SFHAs that are subject to high velocity wave action, called coastal high hazard areas and identified on FIRMs as Zone V.

[NFIP]

Dry floodproofing is accepted at some non-residential buildings but not at any residential buildings. Dry floodproofing is not approved at any non-residential property in Coastal High Hazard Areas identifies as Zone V on FIRM maps. *(Refer to Flood Insurance Rate Maps, page 2.6)* ***At residences, dry floodpoofing is not compliant with the Florida Building Code (FBC) or the National Flood Insurance Program (NFIP).*** Properties located in Coastal High Hazard Areas, those in Zone V, and residences with dry floodproofing applications will not benefit from reduced flood insurance premiums, although potential flood vulnerability may be reduced. To be effective, dry floodproofing must keep all, or almost all, water out of a building. Essentially, dry floodproofing provides a "wet suit" at exterior flood-prone areas of the building to prevent infiltration through:

- Wall surfaces;
- Floor slabs;
- Window and door openings; and
- Joints and gaps at pipe penetrations and between different materials.

The implementation of a dry floodproofing program requires a well-maintained building and sufficient advanced notice for trained personnel to install the required barriers. Staff members must be regularly trained and be available for installation, even after-hours. *(Refer to Maintenance, page 4.3)*

The potential depth and duration of flooding and the characteristics of the building need to be considered when evaluating whether dry floodproofing is a viable option. In a flood event, standing water and saturated soil exert two types of forces: lateral (side to side) and buoyancy (up and down). There may be additional forces imposed by wave action or debris impact from flowing water. The type and method of construction must be able to withstand the anticipated forces in order for dry floodproofing to be considered a feasible alternative. *(Refer to and Dry Floodproofing Considerations, page 7.3, and Chapter 3: Wind Retrofitting)*

Dry floodproofing is only viable as an option in situations that meet the following criteria:

- The depth of flood waters is relatively low, typically no higher than two to three feet, to limit lateral forces on the building unless significant engineering measures are undertaken;
- The exterior building and foundation walls can withstand the lateral forces, wave action, flood-borne debris impact forces, and severe winds, limiting viable wall materials to load-bearing masonry and concrete *(refer to Flood Water Pressures and Forces, sidebar page 2.12)*;
- The building or foundation slab is water tight and can resist upward buoyancy forces;
- Window and door openings subject to flooding can be effectively sealed to protect against the anticipated lateral force of the flood water and to prevent infiltration for the flood's duration *(refer to Barriers and Shields - Windows and Doors, page 7.5)*;
- Minor openings such as pipe penetrations and crevices can be effectively sealed to minimize seepage *(refer to Joint Sealers, page 7.4)*;
- The duration of flooding is limited, since the rate of seepage often increases as materials are exposed to water for longer periods of time; and
- Water seepage can be removed until flood waters recede, requiring a sump-pump or other mechanical system that will remain operational to remove flood water even with a power failure. *(Refer to Secondary Drainage System, page 7.7, and Installation of Secondary Power Sources, page 4.6)*

Condition assessments are essential to understand whether a historic building can withstand potential flood loads and dry floodproofing can be considered.

DRY FLOODPROOFING - A DESIGN PROFESSIONAL'S ROLE

Effective dry floodproofing is very complex and requires the services of a qualified engineer or architect. *(Refer to Design Professionals, sidebar page 2.15)*

The following tasks are included in the design process:

1. Determine flood design class
2. Determine the flood protection level
3. Determine flood loads
4. Perform a condition assessment (for existing structures)
5. Design or check structural components for resistance to flood loads
6. Evaluate building utility systems and equipment
7. Design and specify flood shields
8. Design waterproofing system
9. Design interior drainage
10. Certify the design and satisfy requirements for plans

[FEMA NFIP Technical Bulletin 3 / January 2021, *www.fema.gov*]

Industrial facilities such as the Maxwell House factory in Jacksonville may be better candidates for automated dry floodproofing mechanisms due to their massive size and the number of openings requiring protection.

Most concrete is porous. Long-duration standing water may seep through the walls and floor slab–damaging the building's interior.

DRY FLOODPROOFING CONSIDERATIONS

The feasibility of dry floodproofing is site-specific. It requires an evaluation by a registered architect or structural engineer to determine the soundness of the building and whether it can withstand flood-related forces. *(Refer to Design Professionals, sidebar, page 2.15)*

CONSTRUCTION TYPES

As a general rule, only masonry bearing wall and concrete buildings are potential candidates for dry floodproofing:

- **Masonry buildings** include stone, brick, and block construction, and have walls composed of masonry units bonded with mortar, grout, or sealant. The wall composition tends to be continuous from the roof to the foundation. Sufficient structural capacity must be present to withstand the lateral force of water, or the structure must be capable of being reinforced. Irregular surfaces, such as rough stone foundations, can be difficult to waterproof. They often have openings or voids through which water might pass–either designed, such as weep holes, or openings that have developed over time through deterioration or lack of maintenance. They typically require significant preparation prior to waterproofing.
- **Concrete buildings** and slabs might appear to be waterproof but concrete is a very porous material and typically allows water seepage. In addition, concrete may be vulnerable to seepage at transitions between structural members or between installation "pours." Because of concrete's relatively smooth surface, applying a waterproof membrane can often be readily accomplished. Another consideration is the capacity of concrete to resist loads. The structural capacity of concrete to resist lateral and buoyancy forces is influenced by thickness of the concrete, the size and configuration of reinforcing, the manner in which the building was constructed, and the current condition.
- **Wood-framed buildings or additions**, typically those constructed of wood studs with exterior clapboard, shingles, siding, and potentially stucco are generally porous, with many small holes and crevices that allow water seepage. In addition, wood-framed structures are vulnerable to water penetration at the connection between the foundation and the wall framing. As a result, effective dry floodproofing of wood-framed buildings is challenging and limited to those with a continuous masonry or concrete foundation or basement.

Repointing of open joints can reduce interior damage from wind-driven rain and flood water and should be completed prior to sealer application.

WALL AND SLAB SURFACE SEALERS

To prevent infiltration through masonry and concrete walls and slabs, the surfaces must be sealed. Wall and slab sealants generally fall into two categories, either asphalt-based coatings that can be brush or spray applied, or heavy-duty rubber membranes. It is generally most effective to seal a building at the exterior wall, foundation wall, or slab surface to prevent prolonged saturation of building materials during a flood event.

Because the building's "wet suit" needs to be continuous, or as continuous as possible, this method can present challenges at existing buildings in which foundations need to be exposed to apply the protection. Additionally, floor slabs may need to be replaced to allow installation of an underlying sealant barrier.

Wall sealers and water repellents can discolor and/or harm historic materials. Above-ground, where there are concerns about specific building materials or aesthetic considerations such as historic preservation regulations, options may be limited for the application of wall sealant systems. In these cases, it may be necessary to rely on joint sealers to minimize infiltration.

The structural integrity of masonry walls should be verified prior proceeding with dry floodproofing. All sealers should be concealed by soil or historically appropriate material based upon location.

Concrete buildings are generally good candidates for dry floodproofing. They often have the ability to withstand loads and their smooth surface facilitates the application of sealers. However, many sealers are colored or discolor over time. Their use should be limited to below-grade applications.

JOINT SEALERS

Many buildings have joints or gaps at penetrations where dissimilar materials meet or where different elements are joined. To improve the effectiveness of dry floodproofing, all crevices and gaps must be sealed to provide a continuous barrier at the wall and slab.

Joint sealers generally come in two categories, sealants and gaskets. Sealant is typically a flexible, putty-like material that adheres to surfaces and forms a watertight seal. Gaskets are generally rubber and are compression fit to form a water-resistant seal between two materials. While sealants adhere to adjacent materials, gaskets can be utilized as a sealer between two joining parts, such as around an operable door or window, or between components of a flood gate or barrier. *(Refer to flood gate diagram, page 4.9)*

One of the difficulties associated with sealants and gaskets is that they tend to degrade and to fail relatively quickly. As they begin to fail, they can become brittle, crack, and lose their water tightness, lowering their effectiveness as a water barrier. As a result, they require frequent replacement and are a long-term maintenance obligation.

Sealing openings around penetrations such as hose bibs is recommended to reduce flood water seepage.

After persistent flooding, the restaurant owner installed a flood barrier at the inside of the entrance door. Prior to an anticipated flood, panels are inserted into the channel and glass doors are opened to prevent the water pressure from shattering the glass.

Metal flood barriers must be stored in an accessible location to allow quick installation by trained personnel prior to a flood.

BARRIERS AND SHIELDS - WINDOWS AND DOORS

Barriers and shields can provide temporary protection against flood water entering doors and windows, and are installed immediately preceding an anticipated flood event. The range of barriers and shields includes sandbags, drop-in or roll-up barriers, shields at door openings, floating barriers, and engineered barriers secured to building walls and the ground. With the exception of the engineered barriers, the other forms of protection are typically limited structurally to a approximately two feet of flood water. *(Refer to Door and Window Shields, page 4.9)*

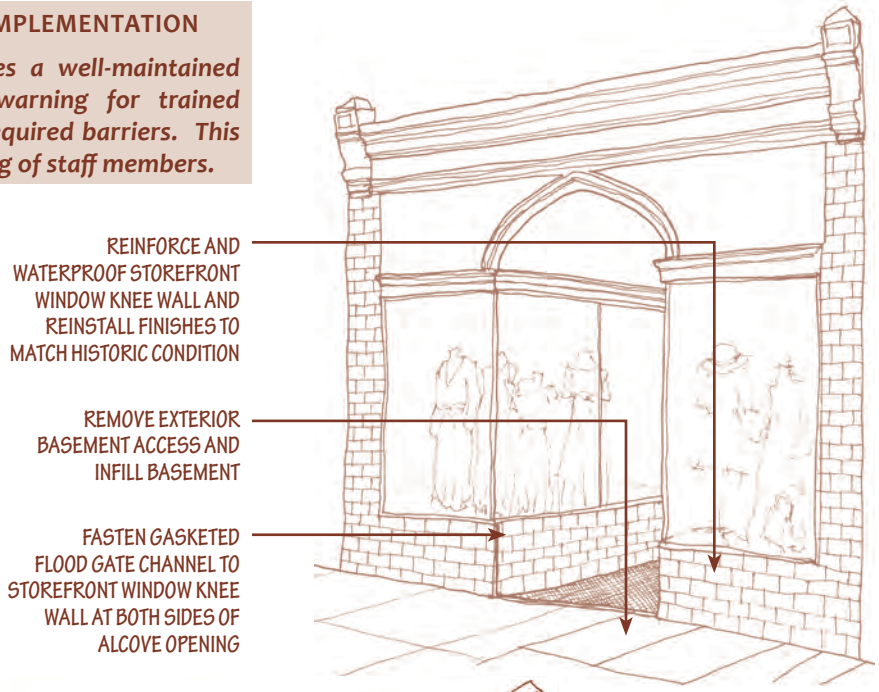
Shields and barriers are generally constructed of metal, with heavier gauges for engineered applications. To minimize potential seepage, the shields and barrier systems typically include gaskets at the junction of components and where they meet the building wall or ground surface. Although not NFIP compliant at residences, the installation of window and door barriers and shields can provide a relatively inexpensive protection from low-level flooding when combined with regular maintenance. At a minimum, regular maintenance should include repointing and re-sealing of open joints and crevices.

Property owners and planners should consider the following factors when contemplating utilizing barriers and shields at windows and doors:

- ***Most drop-down or roll-up barriers; window and door shields; and engineered barriers, are dependent on people to install them immediately preceding an event (with the exception of floating flood barriers). Sufficient trained manpower must be available and in place for the implementation.*** *(Refer to Deployable Perimeter Barriers, page 7.9)* Therefore, this approach is most effective when there are a limited number of openings requiring protection, people available to complete the installation, and sufficient advance notice. Consequently, this approach is less effective in locations prone to flash floods.
- Since many exit doors typically swing out, barriers and shields that prevent doors from operating should only be installed after a building has been completely evacuated. As an alternative, an emergency egress door can be installed at or above the DFE. However, every effort should be made to locate it on a secondary elevation and design it in a manner that is compatible with the historic character of the building.
- If deployable flood barriers are an option, the National Flood Barrier Testing and Certification Program website should be consulted and certified barriers selected in lieu of untested, non-certified barriers. *(Refer to Deployable Perimeter Barriers, page 7.9)*
- Sandbags require substantial available materials; onsite, trained personnel to stack, and appropriate hazardous material disposal methods if they come in contact with flood water.

DRY FLOODPROOFING - IMPLEMENTATION

Dry floodproofing requires a well-maintained building and sufficient warning for trained personnel to install the required barriers. This will require regular training of staff members.



The metal frames flanking the window and door openings are used to hold flood barriers in place.

Large-scale Dry Floodproofing measures must be engineered to withstand the force of flood water.

FENESTRATION MODIFICATION

An alternative to installing a barrier or shield at existing window and door openings would be to modify low-lying openings to prevent flood water infiltration. In the case of very low openings, this could mean infilling the opening. For windows and unused doors with sill heights vulnerable to flooding, it might mean infilling the lower portion of the opening and raising the sill.

In either case, the infill material must provide a watertight seal and have sufficient structural capacity to withstand the lateral force of flood water. This generally suggests infilling with masonry, concrete, or potentially glass block. However, permanent modification of windows and doors can dramatically change the exterior appearance of a building; if locally designated, work may be subject to additional approvals. *(Refer to Historic Preservation Boards, sidebar page 9.7)*

Following multiple floods, the bottom of the first floor windows has been modified to prevent flood water from entering the store. The original masonry window sills remain in place.

Flood water seepage collected in the floor drain is removed by the sump pump at the right side of the photograph.

SECONDARY DRAINAGE SYSTEM

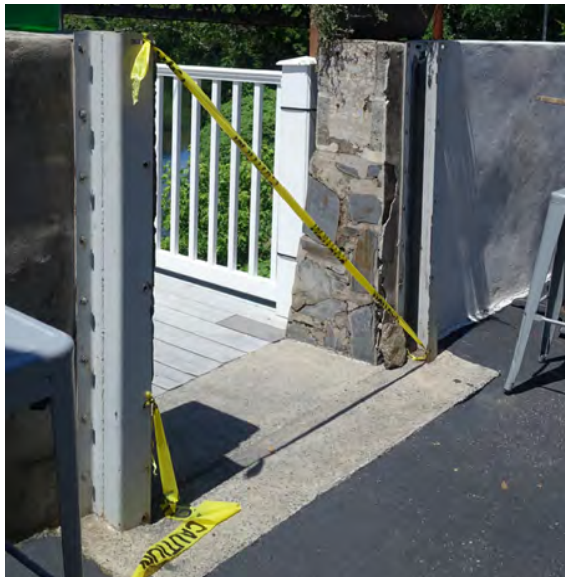
No matter how effective a dry floodproofing system is, some water will seep into the building through the walls, joints, and the underlying slab. Therefore, it is prudent to have a drainage and under drainage system with a sump pump to evacuate any accumulated water. Pumps may require a secondary power source in the event of flood damage to the power supply. *(Refer to Installation of Secondary Power Sources, page 4.6)* In addition, building systems should be installed in a manner that they will not be damaged by seepage.

DRY FLOODPROOFING MAINTENANCE

One of the key requirements of a dry floodproofing option is a well-maintained building. *(Refer to Maintenance, page 4.3)* During a flood event, the force of the water can easily undermine a compromised structural system. In addition, any small gap or opening can provide a path for water seepage. Therefore, for dry floodproofing to be effective, it is critical to ensure that:

- Structural framing is sufficient to resist forces;
- Masonry and concrete walls have sufficient lateral load capacity;
- Flood barriers and gates are routinely inspected and deteriorated gaskets replaced;
- Masonry walls are fully pointed; and
- All joints are properly sealed, including around window and door frames, pipe penetrations, etc.

Masonry buildings may have multiple components that can separate and allow water intrusion making them poor candidates for dry floodproofing.



Channels have been installed on both sides of the perimeter barrier landscape wall to the left. Flood water seepage is present with flood gates installed during a high water event, at right. Flood gates can provide temporary protection from rising flood water. The panels must be engineered by design professionals and installed prior to flooding. Water seepage can be reduced by maintaining gaskets and ensuring a tight perimeter seal. *(Refer to Window and Door Shields, page 4.9)*

PERIMETER BARRIERS

An alternative to wet or dry floodproofing is providing a continuous barrier to keep the flood water away from the perimeter of a building or group of buildings, either permanently or immediately preceding a flood event. These barriers can be permanent or deployable immediately preceding a flood event. Due to Florida's porous limestone subsoil, the effectiveness of perimeter barriers for long durations of time may be limited since water can percolate up through the ground. *(Refer to Shifting Landscapes: Sinkholes, Shorelines, and Erosion, page 1.4)*

PERMANENT PERIMETER BARRIERS

Permanent barriers include masonry or concrete floodwalls or levees (in some cases, existing masonry site walls can be modified to have sufficient strength to act as a floodwall). Because levees are constructed of sloped earth, they are significantly wider than floodwalls. To be effective, both options should be engineered to assure that they:

- Are located in soils that are impermeable and can withstand flood water forces;
- Are of sufficient height to provide protection during a flood event;
- Have sufficient structural capacity to withstand the lateral force of flood water;
- Include temporary barriers to seal off openings at walkways and driveways;
- Are watertight above and below grade to minimize seepage; and
- Include a secondary drainage system within the perimeter to remove groundwater, rain, or seepage. *(Refer to Secondary Drainage System, page 7.7)*

An important consideration for a permanent barrier system is that many of the same mechanisms used to prevent water from approaching a building during a flood event will tend to trap or collect water adjacent to a building. Prolonged periods of soil saturation can have long-term ramifications for building materials.

DEPLOYABLE PERIMETER BARRIERS

Temporary barrier systems can include water-filled rubber tubes or structural wall systems installed immediately preceding a flood event. Empty tubes are laid on the ground and filled with water; these might provide up to two feet of protection depending on the contour of the land and whether joints between sections are properly sealed. Temporary structural wall systems typically require installation into pre-mounted anchors on the ground and can provide protection to higher elevations. Both of these options rely on human intervention to establish a continuous perimeter barrier and do not necessarily include a secondary drainage system to evacuate water collected within the barrier. The National Flood Barrier Testing and Certification Program tests and certifies flood barrier products used for floodproofing. *(www.floodsciencecenter.org)*

Vizcaya, located in Miami, uses deployable barriers to protect its historic architectural and landscape features from flooding. (Courtesy of Adrienne Burke)

A high school in Everglades City uses a concrete perimeter wall and a flood gate that deploys with the rising flood waters.

DRY FLOODPROOFING: CAUTIONS FOR HISTORIC MATERIALS

Although dry floodproofing can provide protection from water infiltration during a flood event, the application of permanent or semi-permanent sealers and waterproof membranes can lead to discoloration and deterioration of building materials. They can trap moisture or promote condensation, both of which can lead to material degradation of masonry, concrete, and wood. In the case of wood, increased moisture can promote rot, mold, and insect infestation, such as termites and carpenter ants, in both exterior wall elements and in other parts of the building such as floor framing and interior finishes. As with any project, some communities may require additional design review or building permit approvals for the application of sealers and membranes to historic buildings materials. *(Refer to Chapter 9: Review Requirements for Historic Buildings)*

HISTORIC PRESERVATION CONSIDERATIONS FOR DRY FLOODPROOFING

EXISTING FEATURES

- ❑ Maintain existing building features
- ❑ Maintain the historic configuration of window and door openings
- ❑ Complete all required maintenance on the existing building to improve structural resistance and minimize flood water seepage including masonry repointing with compatible mortar
- ❑ Consider the potential impact on the building façade if window and door openings are modified to reduce flood water intrusion

SYSTEMS AND EQUIPMENT

- ❑ Relocate all building systems and equipment out of flood prone areas to an inconspicuous location
- ❑ Screen systems and equipment with landscaping or fencing to minimize visibility

SURFACE SEALERS

- ❑ Locate wall sealers below grade to minimize visibility
- ❑ Avoid clear sealers on exposed surface since they can trap moisture in a wall, be shiny in appearance, and discolor over time
- ❑ Water repellents can discolor or harm historic materials over time and should only be used only after a period of testing in a discrete area

JOINT SEALERS

- ❑ Install joint sealers colored to match adjacent features

BARRIERS AND SHIELDS

- ❑ Locate attachment mechanisms for barriers and shields as unobtrusively as possible and paint to match adjacent wall or trim material
- ❑ Identify a convenient and accessible location to store window and door barriers and shields when not in use
- ❑ Remove barriers and shields when not required for flood protection

PERIMETER BARRIERS

- ❑ Design permanent barriers, such as a surrounding levee or landscape wall, so they do not alter the historic building context
- ❑ Install secondary drainage at permanent barriers to allow for drainage away from the protected building, and prevent trapped moisture near the foundation that can potentially leading to damage of historic materials

IMPLEMENTATION

- ❑ Conduct periodic drills with on-site personnel on the installation of window and door shields
- ❑ Establish a protocol for after-hours implementation

MAINTENANCE

- ❑ Develop a maintenance plan to address any structural issues and openings vulnerable to flooding
- ❑ Conduct annual inspections of barrier and shield mounting brackets or channels, hardware, and gaskets
- ❑ Regularly inspect and reapply joint sealers and replace gaskets as needed

Live Oak, 1964 (Florida Memory)

8 ELEVATING OR RELOCATING

ELEVATED BUILDING

A building that has no basement and that has its lowest elevated floor raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns. Solid (perimeter) foundations walls are not an acceptable means of elevating buildings in V and VE zones.

[NFIP]

Elevating buildings is one of the most dramatic flood mitigation options for a historic building. While wet and dry floodproofing are relatively "invisible," elevating a building can significantly impact the historic character of individual properties and surrounding areas. Similarly, relocating a building involves many of the same challenges as elevating with the added complication and expense of the move to a new site.

Property owners of residential or small commercial buildings commonly opt to elevate a building for improved flood resilience. Elevating is the process of raising the habitable portion of a building above the anticipated flood level to minimize the potential for future loss. ***Although costly to implement, one of the benefits of properly completed building elevations are that they can significantly decrease future flood damage and flood insurance premiums.*** *(Refer to National Flood Insurance Program, page 2.1)*

ELEVATION OPTIONS

There are four general categories for elevating buildings:

- **Non-structural elevation** abandons flood-vulnerable areas of a building and relocates uses to higher, non-vulnerable areas. This could be as simple as abandoning portions of the basement or vulnerable first floor areas;
- Elevating the building and supporting it on **piers or piles**;
- Elevating the building and supporting it on **higher foundation walls**; and
- Elevating the **site and building**.

Each of these elevation categories may reduce flooding independently or may work in tandem depending on the flood vulnerability and the building's form and setting. The type of building elevation that is appropriate for a building will depend on several factors, including:

- Building location;
- Type and level of flood vulnerability;
- Building and parcel configuration;
- Building materials; and
- Building use.

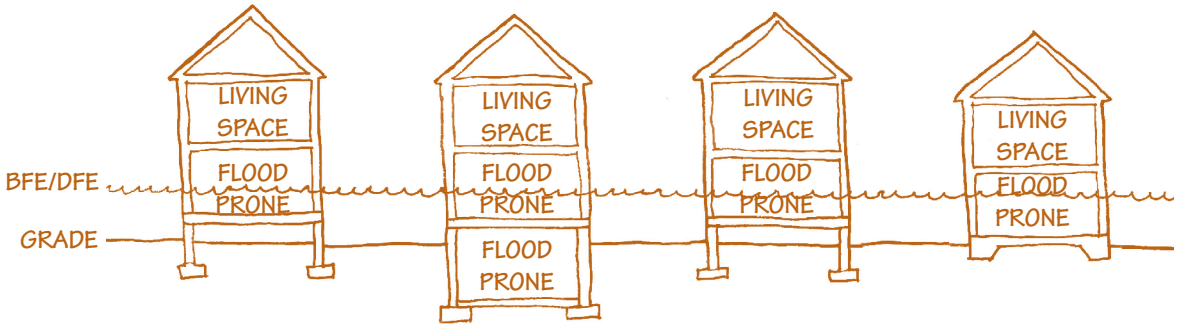
(Refer to Historic Property Elevation Considerations, page 8.9, and Building Elevation Case Studies, page 8.17) In each case, all equipment and systems should be raised above the BFE/DFE which can be done by wall-mounting or relocation to a higher floor level. Relocating equipment within a building would have the least impact on the exterior of the building but this may be technically infeasible. *(Refer to Relocation of Critical Systems and Equipment, page 4.5)*

ZONE A ELEVATION OPTIONS

CRAWL SPACE | BASEMENT | PIERS / PILINGS | SLAB-ON-GRADE

PRE-ELEVATION FOUNDATION TYPES

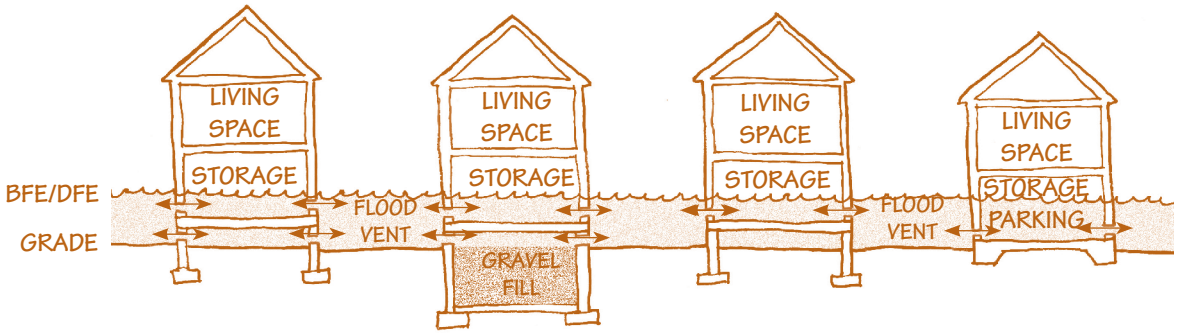
FLOOD-PRONE LOWER PORTION OF BUILDING



Areas below BFE/DFE are more vulnerable to flooding. Higher insurance premiums would apply to properties with occupied areas below the BFE.

NON-STRUCTURAL ELEVATION

LIMIT USE BELOW BFE/DFE; FREE PASSAGE OF FLOOD WATER THROUGH BUILDING



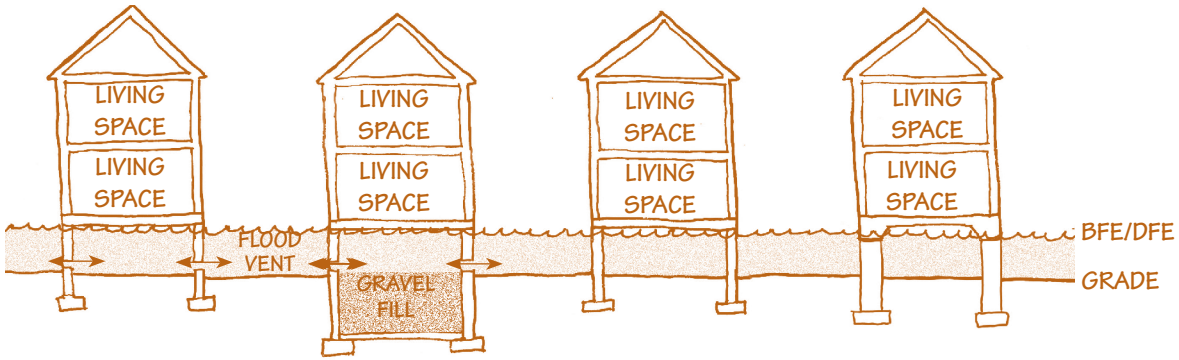
The abandonment of flood-vulnerable areas of residences reduces the habitable space and limits the use below the BFE/DFE to entry, storage, and parking. Flood vents are installed to allow the free flow of water in and out of the building, and basements are often infilled with gravel to prevent potential wall collapse.

ZONE A ELEVATION OPTIONS

CRAWL SPACE | BASEMENT | PIERS / PILINGS | SLAB-ON-GRADE

INCREASE PIER AND FOUNDATION HEIGHT

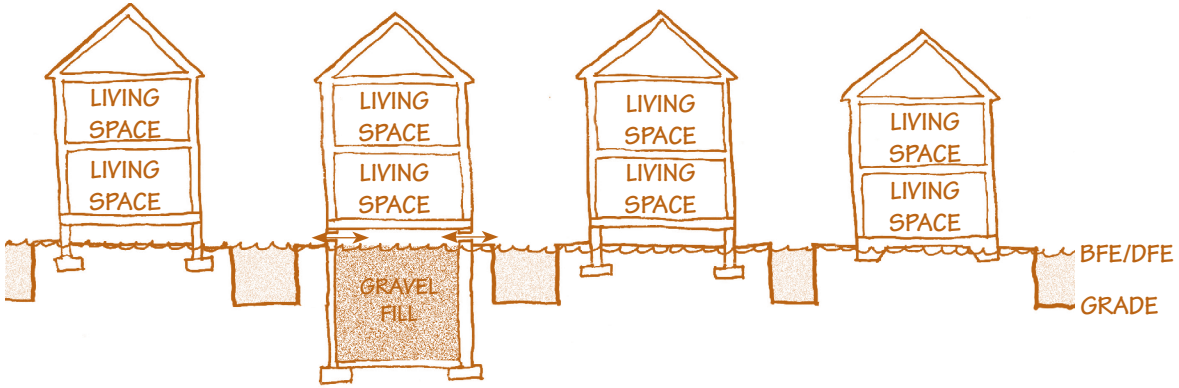
ELEVATE LIVING SPACE ABOVE BFE/DFE AND ABANDON BASEMENT



Supporting the building on higher piers, piles, or foundation walls can reduce vulnerability at habitable spaces.

ELEVATE BUILDING AND SITE

RE-GRADE BUILDING PERIMETER AND RELOCATE HOUSE AT HIGHER HEIGHT



The proportion of vertical distance between the grade level and the existing building walls should be maintained when raising a building to help retain the building's historic context to the site. Elevating a building and site is typically only feasible at larger parcels.

ELEVATED BUILDING

Elevated Building — A non-basement building

(i) built, in the case of a building in an Area of Special Flood Hazard, to have the top of the elevated floor or, in the case of a building in a Coastal High-Hazard Area or Coastal A Zone, to have the bottom of the lowest horizontal structural member of the elevated floor, elevated above the base flood elevation plus freeboard by means of piling, columns (posts and piers), or shear walls parallel to the flow of the water, and

(ii) adequately anchored so as not to impair the structural integrity of the building during a flood up to the magnitude of the base flood.

In an Area of Special Flood Hazard "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of flood waters. In Areas of Coastal High Hazard and Coastal A Zones "elevated buildings" also includes a building otherwise meeting the definition of "elevated building" even though the lower area is enclosed by means of breakaway walls.

[FEMA]

FUNDING FOR ELEVATION

For potential funding for building elevation projects, refer to *Funding Sources, sidebar page 2.20.*

Elevation height will be affected by the Design Flood Elevation and allowable building height.

Two adjacent buildings were elevated to different heights.

Traditional porch features and access will be impacted by the elevation height.

SELECTING A BUILDING ELEVATION HEIGHT

Individual property owners will make personal determinations regarding whether to elevate their building and how high to elevate, unless there are local requirements. As a result, some buildings will be elevated while adjacent buildings will remain at their original height or be elevated to a different height. One of the greatest challenges when considering elevating buildings within a historic context is selecting a height that balances community preservation priorities and achieves property owner safety.

Some considerations to evaluate height include:

- Local ordinances regulate maximum building height and how height is measured, which will affect the allowable elevation height. *(Refer to Chapter 9: Review Requirements for Historic Properties)*
- All additions to existing residential buildings, new residences, and substantially improved residences, are required to have their lowest habitable floors elevated to or above the DFE; or be wet floodproofed unless granted a variance as a historic property. *(Refer to Substantial Improvement, page 9.3, and Chapter 6: Wet Floodproofing)*
- At non-residential buildings, compliance with the Americans with Disabilities Act (ADA) will likely require the installation of an accessible ramp or lift. It is important to note that as the height of the building increases, the length of the ramp extends. Lifts require regular maintenance and can be prone to rusting in coastal environments. *(Refer to Accessibility, sidebar page 8.11, and Stair and Ramp Configurations, page 8.36)*

To the extent possible, elevated ranch houses should maintain low proportions.

- Significant elevation, such as raising a one-story cottage by a full story, can dramatically impact its historic integrity and dwarf its neighbors. Extreme elevations negatively impact the character of the surrounding streetscape particularly in neighborhoods with smaller parcels.

Achieving a measure of consistency between building elevation heights and neighborhood design parameters can improve the outcome. Applying a height standard consistent with the first floor height relative to the BFE/DFE for new construction will limit the "lollipop" – singular, taller – houses that often loom over smaller-scale historic residences. This is particularly relevant in neighborhoods with one-story residences on smaller parcels.

PRESERVATION RECOMMENDATIONS

- ❑ Limit elevation of the first floor of existing buildings to the DFE + one-foot
- ❑ Limit the first floor height of potential new construction or additions within a historic district or context that must meet floodplain requirements to the DFE + one-foot

A residence before and after elevation. As part of the elevation, the original open front porch was restored, steps were maintained on center with the entrance door, and unobtrusive foundation screening was added at the rear of support piers.

MAINTAINING HISTORIC CHARACTER

Owners of historic properties need to balance the practical implications of elevating a building with maintaining the historic character of the historic area. The first step is to identify clear parameters that accommodate to appropriate flood mitigation measures that will not destroy the building's historic integrity or neighborhood character. These parameters consider localized flood risk; floodplain management requirements; parcel site limitations; and building type, style, and materials.

There are numerous administrative and design factors in this decision-making process, some of which may be conflicting. An understanding of the varying requirements can help assess the benefits and challenges of different elevation options. *(Refer to Chapter 9: Review Requirements for Historic Buildings)*

Proposed alterations should be considered holistically for their impact on the individual building as well as the larger neighborhood context. To the extent possible, proposed alterations to historic buildings should retain:

- The overall building proportions, appropriate to typology and style;
- Historic access and orientation for all people including those using ramps or lifts;
- The composition of character-defining building elements;
- Historic building features, including appendages such as porches, carports, bays, and chimneys; and
- Character-defining materials and features.

When original features need to be altered and cannot be retained in place, it may be feasible to salvage character-defining elements for sensitive reuse. Where salvage is not feasible, historic elements can be reconstructed in an integrated manner with the elevation to match the original.

As appropriate, design elements and features of the existing building should be thoughtfully copied, complemented, or otherwise distinguished to accommodate the increased building height.

PRESERVATION DEFINITIONS

Historic character refers to all visual aspects and physical features that comprise the appearance of historic properties and extends to the setting of historic properties to include a building's relationship to the environment and adjacent streets and buildings, landscape plantings, views, and the presence of accessory features.

Historic integrity is the authenticity of a property's identity, evidenced by the survival of physical characteristics that existed during the property's historic period including evaluation of any changes that may have occurred through time which could contribute to the building's later-acquired historic character and significance. An overall sense of past time and place are evident in the composite of seven qualities: location, design, setting, materials, workmanship, feeling, and association.

Historic period is the primary time line for which the historic building derived its historic association with an event, person, place, pattern of development, or other historic context.

PRESERVATION RECOMMENDATIONS

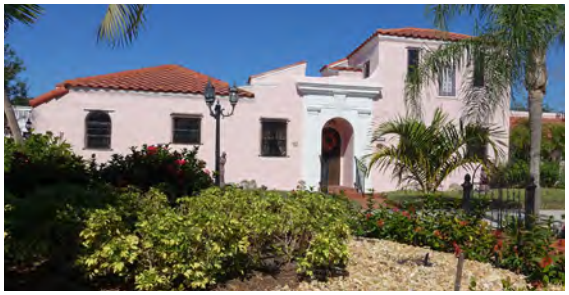
- ❑ Identify building type and style (the municipality may have information available regarding the type and style of buildings in local and National Register Historic Districts)
- ❑ Understand the building's character-defining features, characteristics, and context
- ❑ Identify examples that are appropriate within the historic context

This wood frame vernacular building acquired additions over time.

Folk vernacular architecture may include elements from various styles and emphasize skills of the builder.

Victorian-era buildings may be grand in size with corner towers, bay windows, and wrapping porches.

This early wood frame vernacular building has wood siding, wrap-around porch, and a metal roof.



Mediterranean Revival buildings often have tile roofs, plaster details, and a stucco finish.

Colonial Revival is often symmetrical with varying levels of detail that may include classic elements.

TYPE VERSUS STYLE

A building type addresses the overall size, shape, and proportions of a building. Style refers to the decorative elements applied to a specific form, such as brackets or a type of window or door. Style is often associated with specific construction periods. A front-gabled house can have an Italianate bracketed cornice, a Greek Revival Frieze, or a Colonial Revival pedimented door surround.

RESIDENTIAL BUILDING TYPES AND STYLES

Florida's historic building types include everything from grand vacation houses, to bungalows and shotgun houses. Residences were constructed of a range of materials including native and imported stone, brick, concrete block, stucco, and wood. Historic building styles include Queen Anne, Italianate, Colonial Revival, Mediterranean Revival, and Mid-Century Modern, and in some areas, more vernacular typologies depending on settlement patterns. The characteristics of these historic residential building types vary in size, height, form, and appendages that include porches, carports, bays, and chimneys.

In most cases, elevating buildings alters the relationship of the building to the ground, especially at small buildings. Some buildings have a vertical emphasis built in, such as a three-story Queen Anne with a corner tower, and may be easier to sensitively elevate than a one-story cottage.

Although it is not possible to identify every elevation option, a framework for selecting appropriate alterations can help property owners make appropriate choices for their homes. Examples provided in the *Building Elevation Case Studies* address a variety of residential building types, strategies, and contexts. *(Refer to Building Elevation Case Studies, page 8.17)*

The Bank of Everglades, Everglades City, built 1926, in the Classical Revival style.

The Italianate Simovitz Building, Ybor City, was built in 1909.

St. Luke's Episcopal Church, Jacksonville, built 1958, is an example of Mid-Century Modern design. It is easier to elevate a free-standing building and to accommodate required accessibility features like ramps or lifts.

NON-RESIDENTIAL BUILDING TYPES AND STYLES

Almost any building can be elevated, regardless of its size or materials. Florida's historic non-residential buildings comprise a wide range of types – retail stores, restaurants, hotels, professional offices, schools, libraries, city halls, court houses, houses of worship, train stations, and recreational structures. Like residential buildings, each building type can be constructed of a variety of materials in a wide range of architectural styles.

Unlike residential buildings, non-residential buildings often have additional regulatory requirements that may make elevation prohibitive. Perhaps the most challenging is the requirement for compliance with the Americans with Disabilities Act (ADA). The ADA requires non-residential buildings and some multi-residence buildings to provide equal access for all visitors. This typically includes adding a ramp or a lift. This can be difficult when the building footprint occupies the majority of a parcel. It tends to be easier when the building is surrounded by landscaping or parking areas, and the proposed elevation height is limited. It is also possible to elevate groups of buildings, such as those with attached party walls on a Main Street. When elevating adjacent buildings, access features, including ramps, lifts, and accessible parking with an elevated walkway can be shared to provide entry into individual businesses. *(Refer to photograph, page 8.10, and Accessibility, sidebar page 8.11)*

PRESERVATION RECOMMENDATIONS

- ❑ Identify a property's character-defining elements
- ❑ Retain or integrate key elements or features into elevation strategy
- ❑ Minimize destruction of archaeological resources

RESIDENTIAL PARCEL CONFIGURATIONS

Each row in the diagram at the right depict the same sized house on three parcel sizes: large, medium, and small. To show different levels of flood risk, each house is elevated to 2'-4", 4'-8", or 7'-0" above grade. It becomes more challenging to install extended stairs as parcels and setbacks become smaller and elevation heights increase. Depending on the parcel configuration, it may become necessary to reorient access to the side or rear. *(Refer to Stair and Ramp Configurations, page 8.36)*

LARGE PARCEL WITH LARGE SETBACKS

ACCESS: WALKWAY AND DRIVEWAY

Large parcels with generous setbacks provide greater flexibility for maintaining stair alignments and incorporating intermediate landings and accessible ramps.

FIRST FLOOR BFE/DFE HEIGHT ABOVE GRADE

MEDIUM PARCEL WITH SMALL SETBACKS

ACCESS: WALKWAY

At sites with limited front yard setbacks, extended stairs may require re-orientation to fit within the property boundaries.

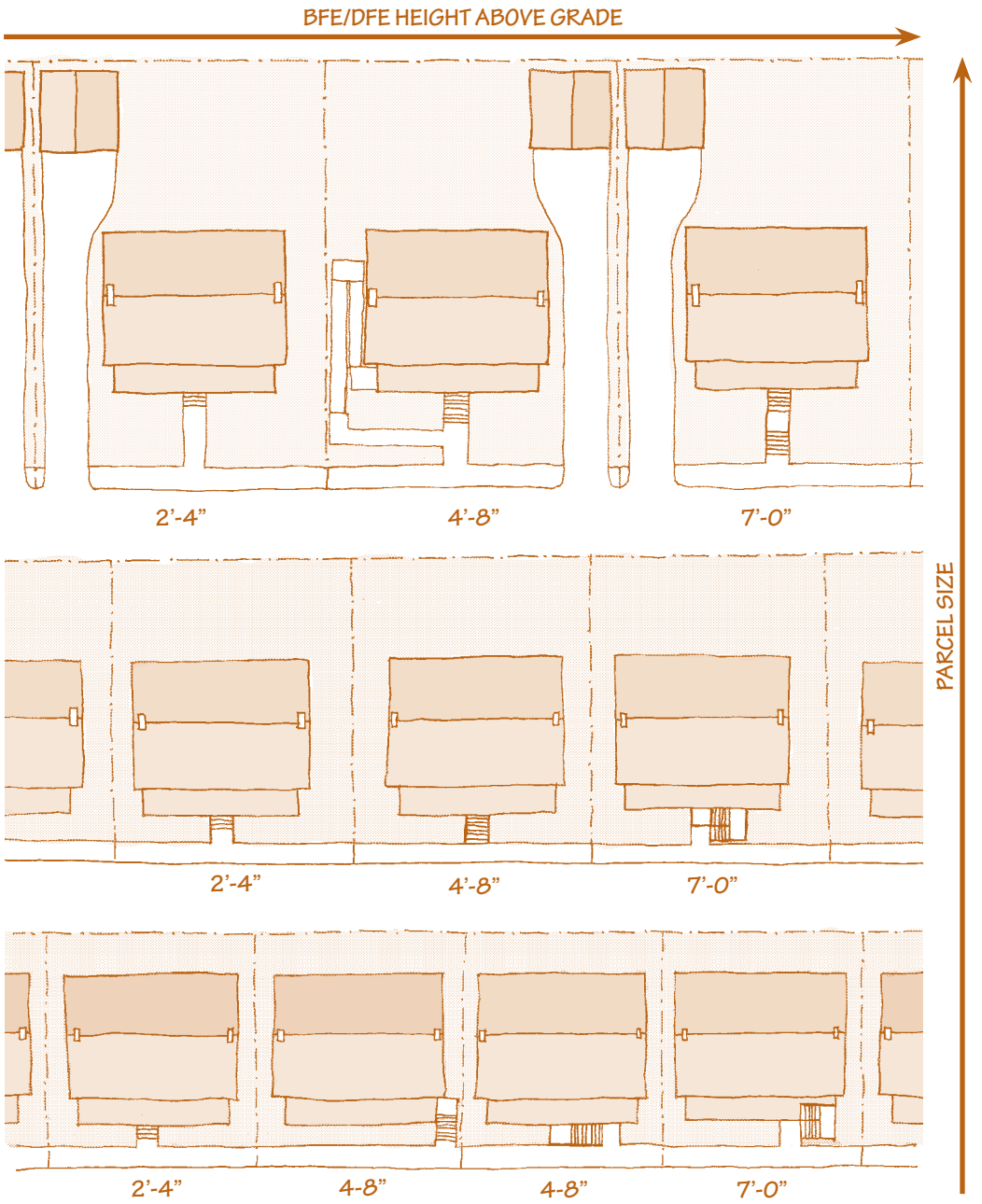
FIRST FLOOR BFE/DFE HEIGHT ABOVE GRADE

SMALL PARCEL WITH MINIMAL SETBACKS

ACCESS: WALKWAY

Narrow setbacks can limit options for extended stairs. If needed, it may be necessary to remove a portion of the porch to accommodate elongated stairs.

FIRST FLOOR BFE/DFE HEIGHT ABOVE GRADE



HISTORIC PROPERTY ELEVATION CONSIDERATIONS

RESIDENTIAL PARCEL SIZE AND CONFIGURATION

Like topography, the size of parcels can vary dramatically from closely spaced, compact residences on relatively small lots and minimal setbacks, to generous suburban-style lots with larger setbacks. When considering elevating a building, the size and configuration of parcels can have a substantial impact on elevation options and screening possibilities. At larger parcels, it may be possible to elevate the grade beneath the residence, relocate it onto a higher portion of the parcel (although building on fill is discouraged), or relocate it away from vulnerability. *(Refer to Building Relocation, page 8.38)* If the distance between the building and the ground is not dramatically altered, it easier to screen higher foundations or pier supports, expanded stairs, and raised mechanical equipment. If modifying the height of a site by regrading, care should be taken to prevent stormwater runoff onto adjacent properties.

Smaller parcels do not provide the same opportunity for on-site relocation. Even if a residential building on a small parcel could be relocated, its relationship with adjoining parcels may be compromised. Parcels with narrow front and/or side yard setbacks can present significant challenges, particularly for extended stairs and associated screening required for higher elevations.

Existing driveways and walkways may need to be reconfigured to allow for extended stairs when elevating a residence.

RESIDENTIAL ACCESS AND PARKING

Higher elevations require more steps to access the front door. At many parcels, it may be necessary to utilize existing walkways, driveways, parking areas, and landscape areas to accommodate extended stairs, requiring the alteration of historic alignments.

Property owners will often seek increased building elevations to accommodate parking beneath their residences. This will typically require relocated and potentially wider curb cuts, front yard paving for vehicular access, and the elimination of front porches and landscaping. Furthermore, the addition of garage doors under the living story facing the street can greatly alter the historic character of the streetscape, particularly when introduced at the front elevation.

PRESERVATION RECOMMENDATIONS

- ❑ Maintain relative visual setbacks and building heights between adjacent parcels
- ❑ Consider potential options for building relocation while maintaining the surrounding historic character and visual relationship between adjacent parcels
- ❑ Work with local planning or building authorities to identify appropriate options for extended stairs and ramps located within front or side yard setbacks that maintain historic character
- ❑ Identify screening elements to conceal expanded foundation walls, piers, stairs, and mechanical equipment that are consistent with the space limitations and historic character

PRESERVATION RECOMMENDATIONS

- ❑ Minimize alteration of existing walkways, driveways, and parking areas to the extent possible to maintain historic setting
- ❑ Provide landscape screening to visually minimize the impact of required alteration
- ❑ Maintain existing curb cuts and limit front yard paving
- ❑ Maintain front yard landscaping
- ❑ Maintain front porches and carports
- ❑ Limit additional garage doors under living story, particularly front-facing garage doors

This row of commercial storefronts in Apalachicola shares a common raised walkway, providing access to all businesses. An accessible parking lot is located on the raised site at the rear of the buildings. Plantings along the sidewalk conceal the retaining wall.

NON-RESIDENTIAL PARCEL SIZE AND CONFIGURATION

Due to the wide range of non-residential building types, there are no "typical" parcel sizes or configurations. In dense historic commercial districts, buildings may share party walls, while a historic church may be located in a more suburban or rural neighborhood surrounded by landscaping and parking. Elevating shared party-wall buildings is particularly challenging since buy-in is required from multiple property owners.

Similar to residential properties, the size and configuration of parcels can have a substantial impact on elevation options and height. Public entrance requirements for elevated, non-residential properties often mandate an accessible ramp. Greater elevation heights will typically require longer ramps in addition to extended stairs. If the elevation height is too long to accommodate a ramp, a lift or elevator may be required. This can be problematic, particularly if flood water contact is possible. Due to mandated public access requirements, elevation of non-residential buildings may be limited if located on a very small parcel or if there are limited setbacks.

At larger parcels, it may be possible to elevate the grade beneath the building or relocate the building away from vulnerability. If the grade is elevated, consideration should be given to including accessible parking at the elevated grade level. Similar to residential properties, if the distance between the building and the ground is not dramatically altered, it easier to screen including higher foundations or pier supports, retaining walls, expanded stairs, ramps, and raised mechanical equipment. If modifying the height of a site by regrading, care should be taken to prevent stormwater runoff onto adjacent properties.

PRESERVATION RECOMMENDATIONS

- ❑ Minimize alteration of existing walkways, driveways, and parking areas to the extent possible to maintain historic setting
- ❑ Provide compatible, dignified access to the building entrance for all visitors
- ❑ Provide an accessible route to parking
- ❑ Maintain existing curb cuts and limit paving in front of building
- ❑ Provide landscape screening to visually minimize the impact of required alterations

It is often easier to install accessible parking and ramps at former residential buildings.

Small Main Street areas with buildings that share party walls may not have sufficient sidewalk space for individual ADA ramps.

This corner commercial building in Pensacola's downtown had a sidewalk wide enough to install a ramp on the side elevation. The ADA establishes the requirements for the ramp slope, width, handrail height, and handrail configuration.

NON-RESIDENTIAL ACCESS AND PARKING

Unlike most residential properties, non-residential properties are required to comply with the Americans with Disabilities Act (ADA). *(Refer to Accessibility, sidebar at right)* It is typical for non-residential properties to require access to a primary entrance that can accommodate an individual in a wheelchair as well as an accessible route to nearby parking. This can be challenging for historic properties with an entry directly from a sidewalk, particularly when considering building elevation.

On larger parcels that can accommodate access and parking, it may be necessary to utilize existing walkways, driveways, and parking areas to accommodate accessible ramps, extended stairs, and accessible parking. To the extent feasible, historic alignments such as the axis of entry along a walkway should be maintained, with every effort made to provide a dignified entry for all, no matter what their physical limitations.

ACCESSIBILITY

Providing access to an elevated building for individuals with physical disabilities is especially challenging whether at a private home or at a non-residential building. Requirements for ramps are governed by the Americans with Disabilities Act (ADA). The length of ramps meeting accessibility requirements to accommodate extreme elevations can be prohibitive, particularly at smaller parcels.

If the installation of a ramp is not feasible, an accessible lift or elevator can be installed. When installing a lift or elevator, consideration should be given to limiting the visibility of the lift or roof penetrations and installing associated mechanical equipment above the Design Flood Elevation (DFE). In addition, care should be used when selecting the lift or elevator in coastal environments where salt can corrode the metal components.

On-site accessible parking may also be required depending on parcel configuration and proximity to public parking.

PRESERVATION RECOMMENDATIONS

- ❑ Maintain relative visual setbacks and building heights between adjacent parcels
- ❑ Identify appropriate options for extended stairs and ramps located within front or side yard setbacks that maintain historic character
- ❑ Identify screening elements to conceal expanded foundation walls, piers, stairs, and mechanical equipment that are consistent with the space limitations and historic character

After elevating this residence for flood mitigation, the stair and front porch were re-orientated to provide access to the raised first floor height. At the front porch, a railing was installed to match the second floor railing and lattice screening was added below.. The historic landscape wall remains.

The Grady Building in Apalachicola has a shared, extended front stoop to provide space for steps and a ramp.

STAIRS, RAMPS, PORCHES, AND STOOPS

Stairs are often a character-defining feature, leading to a porch or stoop, or direct access to a primary entrance door. The combination of stairs, porches, and/or stoops can be key elements in defining a building's type and style. Increased building elevation heights require longer stair runs to access the raised ground floor level. To the extent possible, extended stairs should retain the original orientation and configuration, as well as relationships to the primary entrance door, walkways, and sidewalks. This can pose significant challenges when the parcel size and setbacks are restricted or the elevation height is extreme. *(Refer to Residential and Non-Residential Parcel Size and Configuration, pages 8.9 and 8.10)*

Building codes establish the minimum number of steps required and their associated length relative to the height of the living surface above exterior grade. For example, a floor surface that is four-feet above grade requires a minimum of seven steps, at a minimum length of 6'-5". If an accessible entrance is desired or required, four-feet elevation above grade requires a ramp at least 53-feet in length. *(Refer to Stair and Ramp Configurations, page 8.36)*

Handrails and guardrails are an important component of stairs, ramps, porches, and stoops. With the extended height, it may be necessary to extend or introduce handrails and guardrails where they did not previously exist. Their height must meet Florida Building Code (FBC) requirements. Handrails and guardrails should be compatible to the building type, style, and location, with attention the typical historic materials and features, such as newel posts.

PRESERVATION RECOMMENDATIONS

- ❑ Extend stairs in a manner that maintains historic alignments and relationship with the entrance door to the extent possible
- ❑ Align extended piers with vertical elements such as porch columns or posts and corners of stair landings
- ❑ Install screening to visually minimize porch piers, stair supports, and ramps
- ❑ Install railings that are compatible with the historic building type and style
- ❑ Minimize visual impact of accessible ramps, elevators, or lifts

PROMINENT ALIGNMENTS AND ARRANGEMENTS

A street façade often includes a building's most ornate and significant elements, helping to define its style. Significant building features, their alignments, and decorative elements on the street façades can guide the parameters of an elevation project. Some of these elevation features may include:

- The primary entrance door or storefront;
- The porch (or stoop), and associated steps, railings, columns, and piers;
- Chimneys;
- Projecting bays;
- Church towers; and
- Windows.

Historic arrangements can be symmetrical with central doors and aligned windows, or asymmetrical. Alterations associated with an elevated building should complement the alignments, arrangements, and materials of the historic structure.

PRESERVATION RECOMMENDATIONS

- ❑ Extend stairs in a manner that maintains historic alignments and relationship with the entrance door to the extent possible
- ❑ Locate extended foundation of building walls, bays, and chimneys to align with existing wall plane
- ❑ Locate extended piers to align with vertical elements such as porch columns or posts
- ❑ Maintain the existing fenestration pattern and reflect it in the extended foundation as appropriate

Due to the limited space between the building and the sidewalk, access stairs were re-oriented. However, the top stair landing re-orients visitors to the central entry. Little else changed when the building was elevated.

When the building was elevated, the chimney was reconstructed to match the historic appearance.

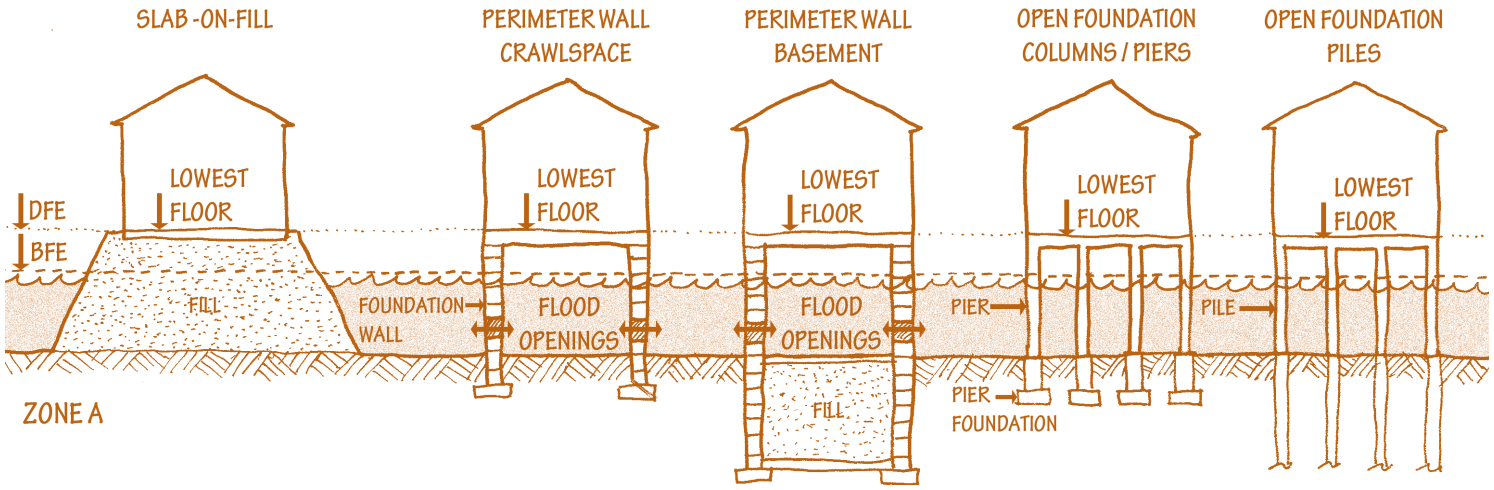
Historic fences should be retained.

LANDSCAPE FEATURES

Landscape features at a historic property can be significant in defining a sense of place. Landscape features can include a tree canopy over a roadway, fences, and walls marking a property's boundaries, and mature shrubs at the foundation. Significant landscape features may need to be removed and/or relocated to implement certain elevation strategies. Raising the grade beneath the building may have the most significant impact on landscape features, including trees, landscape walls, and fences. It may be possible to relocate plantings to accommodate associated features like extended stairs or ramps when elevating a building. *(Refer to Foundation Screening, page 8.16, for landscaping utilized for screening and Chapter 5: Landscape Improvements, for additional resilient design recommendations for landscapes)*

PRESERVATION RECOMMENDATIONS

- ❑ Minimize alteration of character-defining landscape features to the extent possible to maintain historic setting
- ❑ Prevent stormwater drainage onto neighboring parcels and minimize drainage onto the roadway



Examples of NFIP-compliant homes in Zone A where the top of the lowest floor is located above the BFE. (Base diagram obtained from FEMA)

BUILDING FOUNDATIONS

Foundations support buildings above the ground but in some instances, also must be designed to restrain buildings from the force of flood water, wave action, and high winds. In addition to holding a building up, a flood resilient foundation resists buoyancy to prevent a building from floating off its foundation. Given the significant role they play in the structural performance of a building, foundations must be engineered to ensure a building's long-term stability. Any building required to be in full compliance with NFIP requirements must meet or exceed NFIP foundation design criteria. This includes all new construction as well as any existing building determined to be Substantially Damaged or Substantially Improved unless a variance is granted for a historically-designated property. *(Refer to Chapter 3: Wind Retrofitting, Substantial Improvement, page 9.3, and Substantial Damage, page 9.4)*

In evaluating compliance, FEMA classifies foundations as either open or closed:

- **Open foundations**, found at buildings supported by piers or piles, allow flood water to freely pass under the building. Open foundations are often found at wood-framed buildings, porches, and in coastal environments. Although not appropriate for all building types, styles, and materials, open foundations typically allow for increased elevation heights and are less susceptible to flood damage, particularly in coastal zones, where foundation are vulnerable to wave storm surge damage. *(Refer to Foundation Screening, page 8.16, for NFIP requirements for architectural treatments, such as lattice)*

- **Closed foundations** have perimeter masonry or concrete construction that enclose all or part of a building's perimeter that prohibit the flow of flood water. Closed foundations can be found at buildings with basements and crawlspaces, and depending on their design, slab-on-grade construction.

  Closed foundations are vulnerable to lateral pressure of raised flood water against building walls. This could lead to structural failure or collapse. A manner of reducing the pressure is to allow the unimpeded flow of water in and out of the foundation so that the interior and exterior water heights rise and fall at the same rate and to the same levels. The unimpeded transfer of flood water through flood openings equalizes the lateral forces, significantly reducing the strain on the building's structure. *(Refer to Flood Water Pressure and Forces, sidebar page 2.12, and Flood Openings, page 6.2)*

  Flood openings allow the passage of flood water in and out of a building without mechanical intervention such as sump pumps. They must be of sufficient size, number, and location to be able to quickly equalize interior and exterior water levels. They will typically be located around the perimeter of a building or foundation, no more than 12-inches above the adjacent exterior grade height, and may also be needed between adjacent, enclosed spaces, such as in interior foundation walls. In the case of a filled or abandoned basement, the installation of flood openings and drainage through the basement slab may be required.

Before renovation, the foundation was enclosed with rusticated block between the piers. After rehabilitation, the space between the brick piers was opened and the blocks reused to build a property wall.

Installing brick veneer at the face of concrete piers can improve its visual compatibility with a historic building. Adding lattice set back from the face of the brick will visually screen the concrete pier from view.

To improve resilience, piers, piles, and most closed foundations are constructed with either concrete or filled concrete block. Concrete and filled concrete block are typically not compatible with historic stone and brick foundation materials. To improve visual compatibility, it is possible to install a stone or brick veneer; stucco; or colored concrete to match the historic material.

When evaluating options for elevating historic buildings, safety must be balanced with historic character. To the extent possible, the visual qualities of historic building foundation materials should be continued at the foundation. However, NFIP design parameters that minimize damage in the event of a flood are often not historically sensitive. *(Refer to FEMA Flood Opening Requirements, sidebar page 6.2, and FEMA's Hurricane Sandy Recovery Fact Sheet No. 2, Foundation Requirements and Recommendations for Elevated Homes. [May 2013])*

Closed foundation walls will require flood vents within 12-inches of the ground. However, installing brick, pest barriers, or other materials that prevent the free-flow of flood water can impede water flow and should be avoided.

PRESERVATION RECOMMENDATIONS

- ❑ Extend foundations and piers in a manner that is consistent with the existing building foundation
- ❑ Cover concrete or concrete block foundation elements with stone, brick, or stucco to be more compatible with the historic building materials, or utilize tinted concrete to mimic the historic material
- ❑ Locate flood openings in a manner that minimizes visibility without impeding functionality, typically at both side elevations
- ❑ Provide foundation screening to minimize visual impact of elevation and flood vents without impeding their function

Landscaping will help to reduce the visual impact of lattice screening on significantly elevated buildings.

Horizontal boards are recessed from the front plane of the foundation piers.

Operable panels can be used to provide access to crawlspaces.

FOUNDATION SCREENING

Screening of extended foundations can mitigate the adverse impact of a building elevation and elevated mechanical equipment. Screening can be with landscaping or architectural elements, however, they must be designed to not impede the flow of flood water, particularly in Coastal High Hazard Areas. *(Refer to NFIP: Flood Insurance Rate Map Terminology, sidebar page 2.6)* At parcels with narrow setbacks, raised planter walls can mitigate the visual impact of elevations, incorporating stairs "buried" into the landscape. However, care should be taken to prevent stormwater run-off onto adjacent parcels. *(Refer to Chapter 5: Landscape Improvements)*

Landscape screening at the base of a building can be scaled to minimize the visual impact of the elevation. For example, the use of taller plantings and small trees will likely be more successful than only low ground cover at higher building elevation projects. Native vegetation will generally be more appropriate, encourage stormwater absorption, and require less maintenance. If it is not possible to locate mechanical equipment away from public view, it can be screened with vegetation or architectural elements such as fencing. *(Refer to Relocation of Critical Systems and Equipment, page 4.5)*

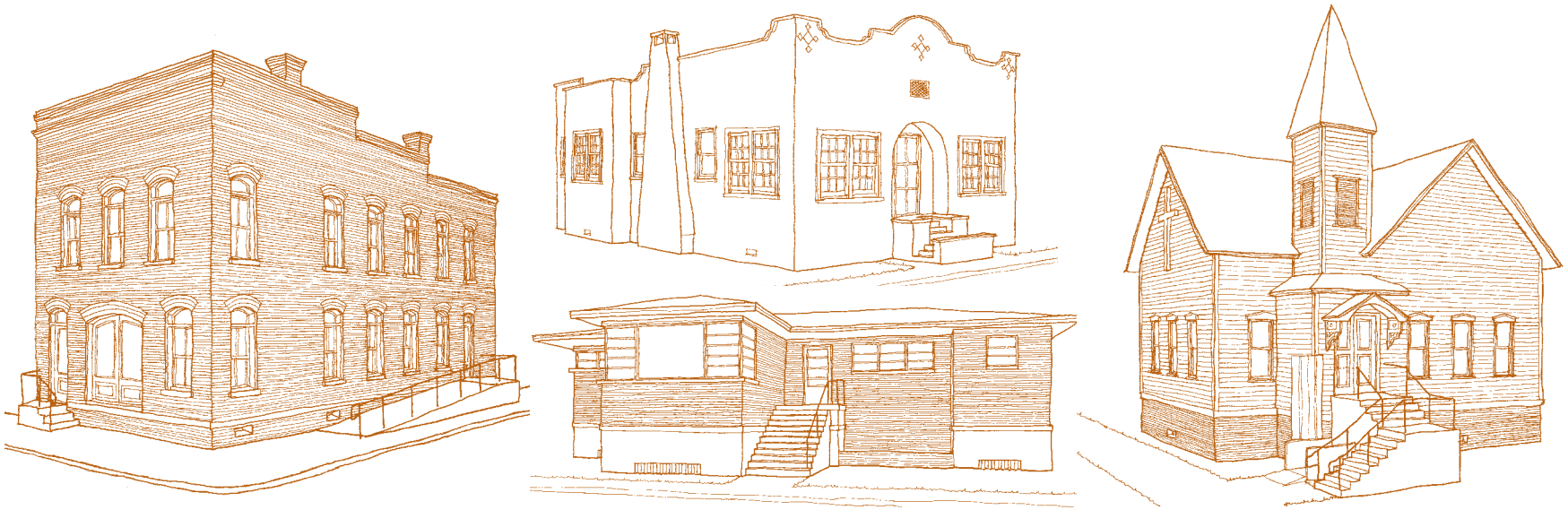
Architectural screening, such as lattice or panels, is generally used on pier or piling support systems. Similar to building foundation walls, extended piers should be screened in a manner that is sensitive to the character of the building. Lattice or panels should be of a compatible material and installed at the rear of, or between and recessed from, the outer face of piers. Additionally, the walls, lattice, or screening should be designed and installed in a manner that allows them to break-away or collapse for unimpeded water flow. *(Refer to Building Foundation Screening Requirements, sidebar at right)*

BUILDING FOUNDATION SCREENING REQUIREMENTS

FEMA's **Technical Bulletin 9**, Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings (2021) summarizes design and building code requirements for architectural screenings, differentiating requirements for various hazard zones.

PRESERVATION RECOMMENDATIONS

- ❑ Utilize landscape screening that is scaled to the proposed elevation
- ❑ Native plantings, including evergreens, as appropriate to the location
- ❑ Install architectural foundation screening between or behind piers that is consistent with the building type and style



BUILDING ELEVATION CASE STUDIES

The following pages include illustrations of both residential and non-residential building elevation case studies. The residential case studies represent a variety of house types found in Florida's historic communities, with elevations to the following three DFE heights:

- 2'-4" above adjacent grade
- 4'-8" above adjacent grade
- 7'-0" above adjacent grade

Each example assumes buildings began at or near grade and have limited front yard setbacks, making stair configurations more challenging.

The elevation case studies for non-residential buildings are more limited due to the challenges of ADA access.

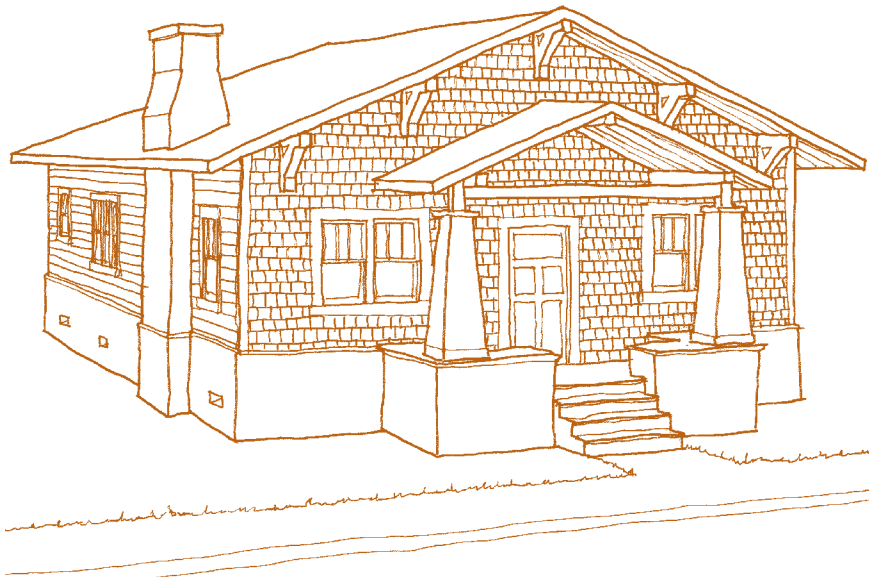
For elevation each type, it is assumed that:

- Existing basements, where they exist, will be abandoned and infilled *(refer to Building Foundations, page 8.14)*;
- Building systems and equipment will be elevated in an inconspicuous manner *(refer to Relocation of Critical Building Systems and Equipment, page 4.5)*;
- Stylistically appropriate railings, simplified for drawing clarity, will be included at stairs, landings, and porches *(refer to Stairs, Ramps, Porches and Stoops, page 8.12)*;
- Flood openings will be installed at side elevations where possible *(refer to Flood Openings, page 6.2, and Building Foundations, page 8.14)*;
- Parking and garage doors will not be introduced at street-facing façades *(refer to Residential Access and Parking, page 8.9, and Non-residential Access and Parking, page 8.11)*;
- Ramps will provide dignified access for all *(refer to Stair and Ramp Configurations, page 8.36)*; and
- Landscape screening will be introduced to obscure extended foundations and lattice will be installed at the rear of or between and recessed from outer face of piers *(refer to Foundation Screening, page 8.16, and Chapter 5: Landscape Improvements)*.

The recommendations in the following case studies are reflect the requirements of the NFIP but may or may not meet local floodplain management regulations. Property owners should work with a professional architect or engineer to ensure municipal compliance. *(Refer to Design Professionals, sidebar page 2.15, and Chapter 9: Review Requirements for Historic Buildings)*

CRAFTSMAN BUNGALOW
4'-8" ABOVE ADJACENT GRADE

- ❑ Extended stucco walls and chimney with matching stucco
- ❑ Flood vents at side elevation
- ❑ Stuccoed masonry stair configuration maintains central approach
- ❑ Introduction of stair railings



2'-4" ABOVE ADJACENT GRADE

- ❑ Extended stucco walls and chimney with matching stucco
- ❑ Flood vents at side elevation
- ❑ Stuccoed masonry stair configuration maintains central approach

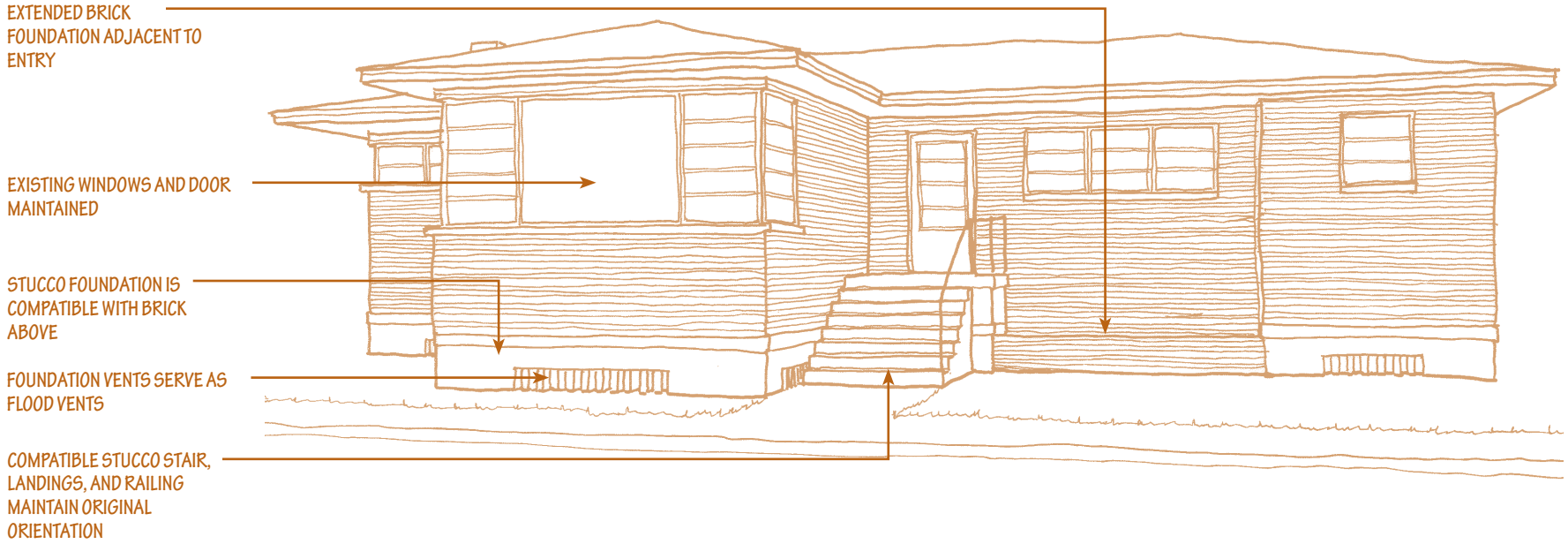
7'-0" ABOVE ADJACENT GRADE

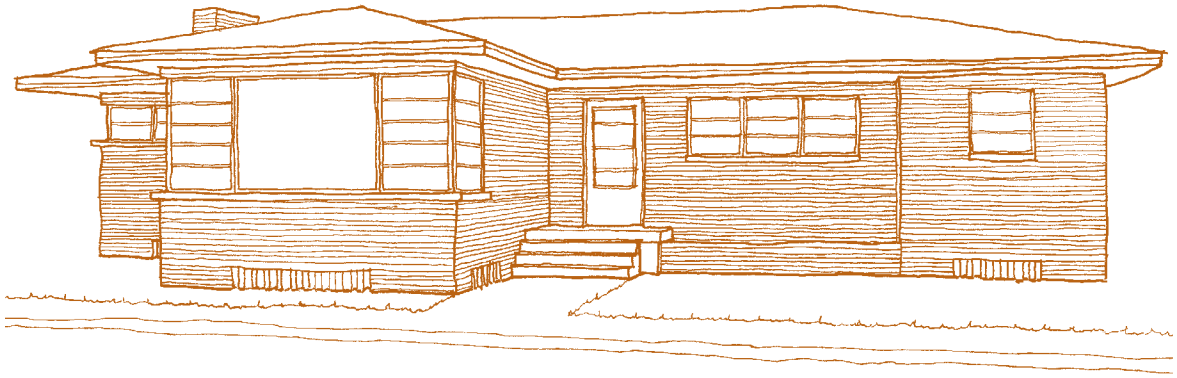
- ❑ Extended stucco walls and chimney with matching stucco
- ❑ Flood vents at side elevation
- ❑ Stuccoed masonry stair configuration limited by setback – Intermediate landing re-establishes central approach to entrance door
- ❑ Introduction of stair railings
- ❑ Site elevated 3'-0" with matching stuccoed wall

RANCH

4'-8" ABOVE ADJACENT GRADE

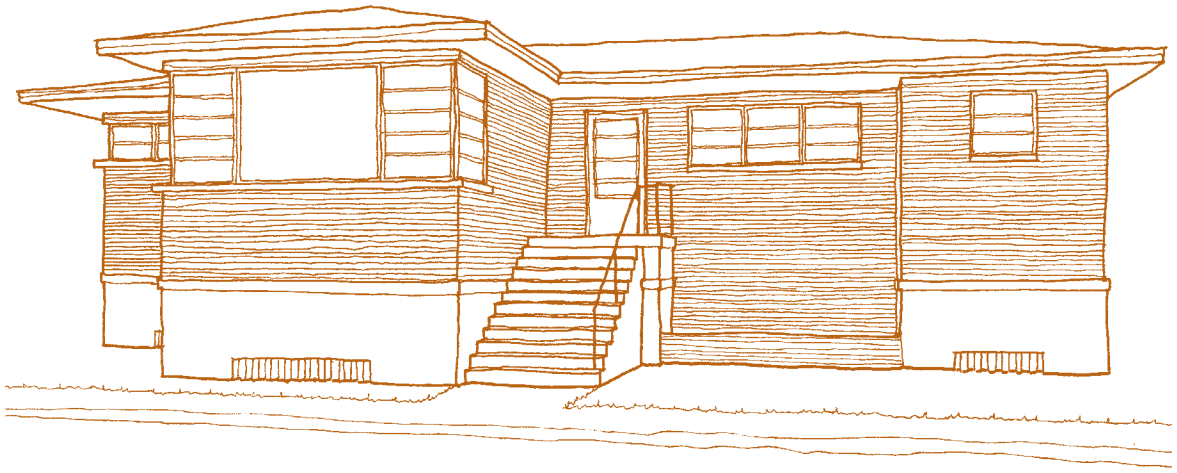
- ❑ Extended brick walls with compatible stucco
- ❑ Foundation vents retained to serve as flood vents
- ❑ Stuccoed masonry stair configuration maintains entry door approach
- ❑ Introduction of stair railings





2'-4" ABOVE ADJACENT GRADE

- Extended brick walls
- Foundation vents retained to serve as flood vents
- Stuccoed masonry stair configuration maintains entry door approach



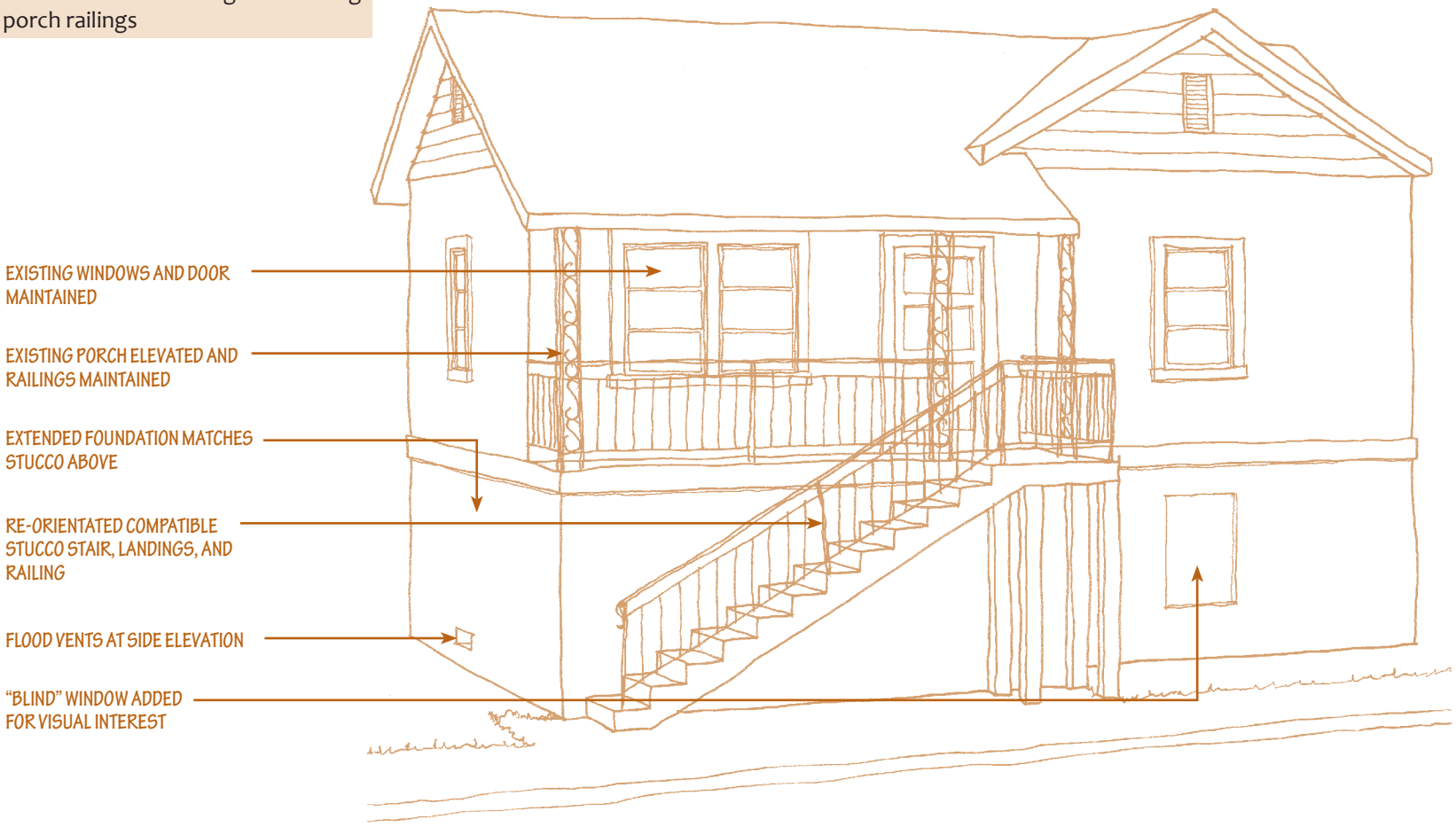
7'-0" ABOVE ADJACENT GRADE

- Extended brick walls with compatible stucco
- Foundation vents retained to serve as flood vents
- Stuccoed masonry stair configuration maintains entry door approach
- Introduction of stair railings

MINIMAL TRADITIONAL

7'-0" ABOVE ADJACENT GRADE

- Extended stucco walls with matching stucco
- Flood vents at side elevation
- Top landing at side-stair configuration re-establishes central approach to entrance door at narrow setback
- Introduction of stair railings matching existing porch railings



2'-4" ABOVE ADJACENT GRADE

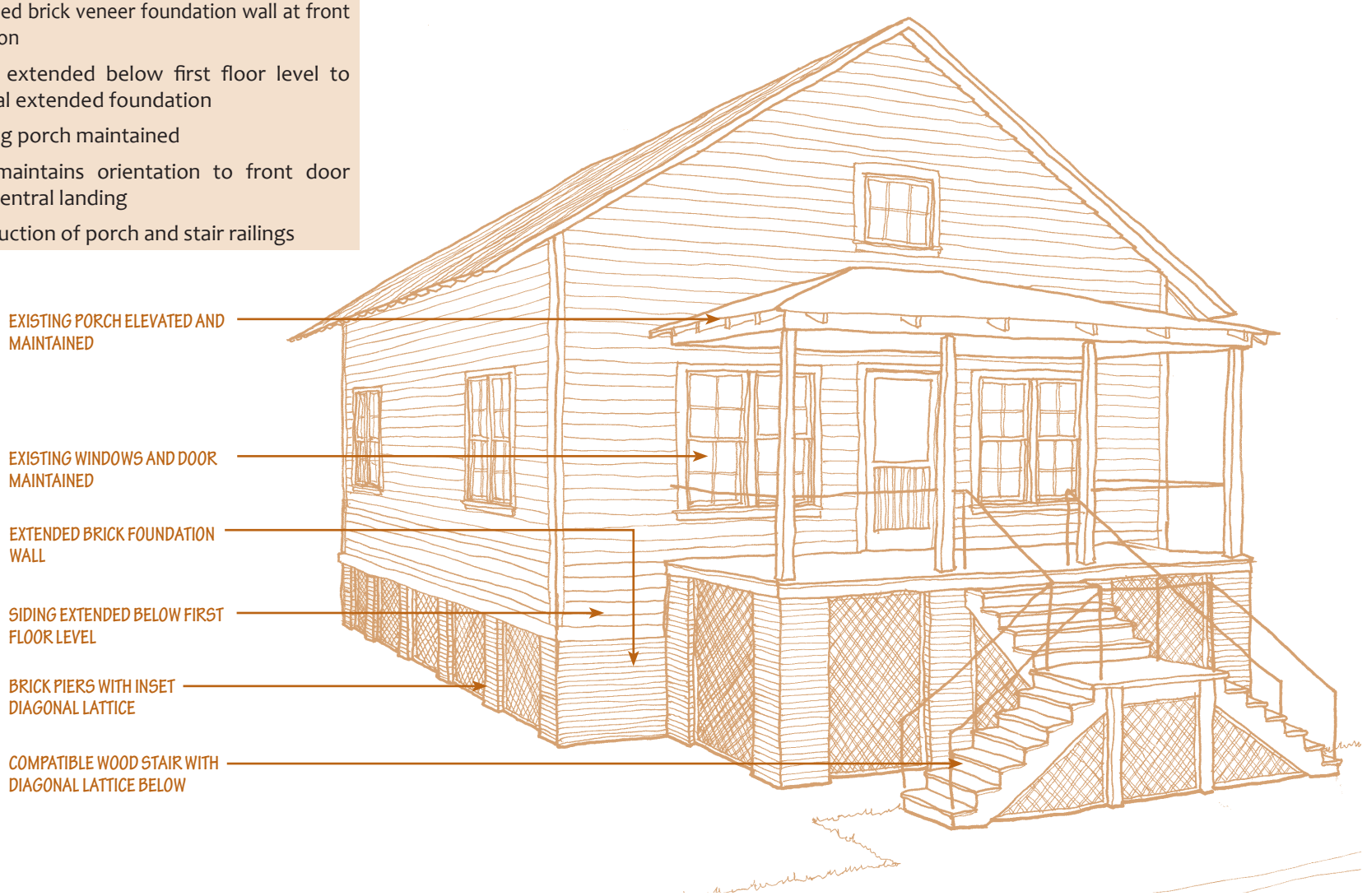
- ❑ Extended stucco walls with matching stucco
- ❑ Flood vents at side elevation
- ❑ Stair configuration maintains central approach to entrance door

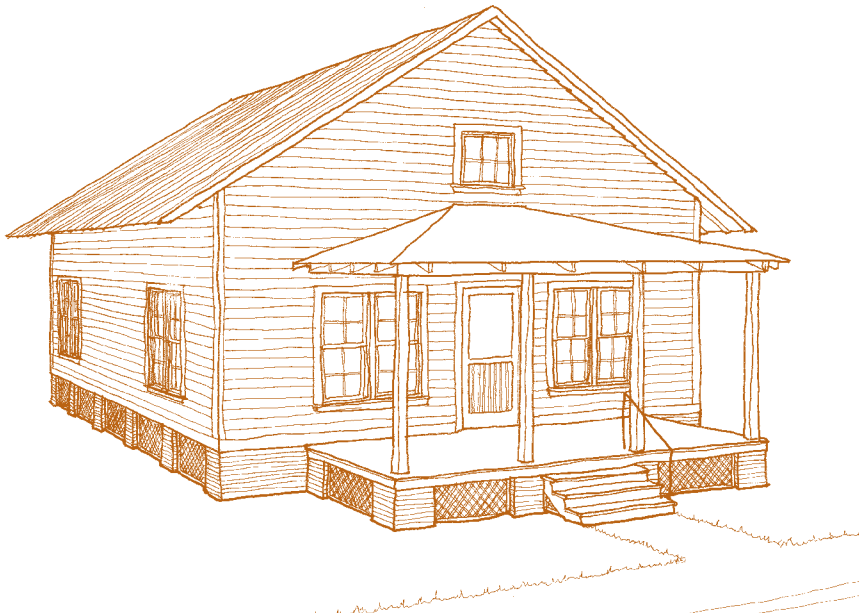
4'-8" ABOVE ADJACENT GRADE

- ❑ Extended stucco walls with matching stucco
- ❑ Flood vents at side elevation
- ❑ Top landing at side-stair configuration re-establishes central approach to entrance door at narrow setback
- ❑ Introduction of stair railings matching existing porch railings

FRAME VERNACULAR
7'-0" ABOVE ADJACENT GRADE

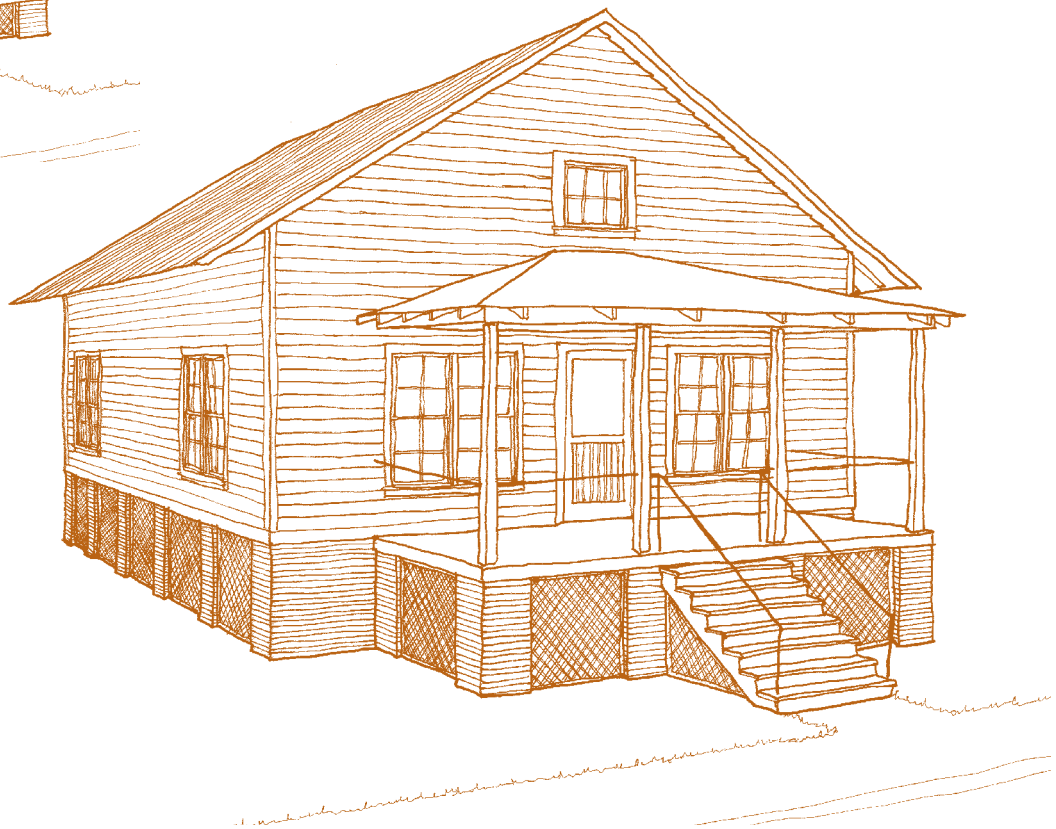
- ❑ Extended brick veneer piers with inset diagonal lattice
- ❑ Extended brick veneer foundation wall at front elevation
- ❑ Siding extended below first floor level to conceal extended foundation
- ❑ Existing porch maintained
- ❑ Stair maintains orientation to front door from central landing
- ❑ Introduction of porch and stair railings





2'-4" ABOVE ADJACENT GRADE

- ❑ Extended brick veneer piers with inset diagonal lattice
- ❑ Extended brick veneer foundation wall at front elevation
- ❑ Existing porch maintained
- ❑ Stair maintains orientation to entrance door



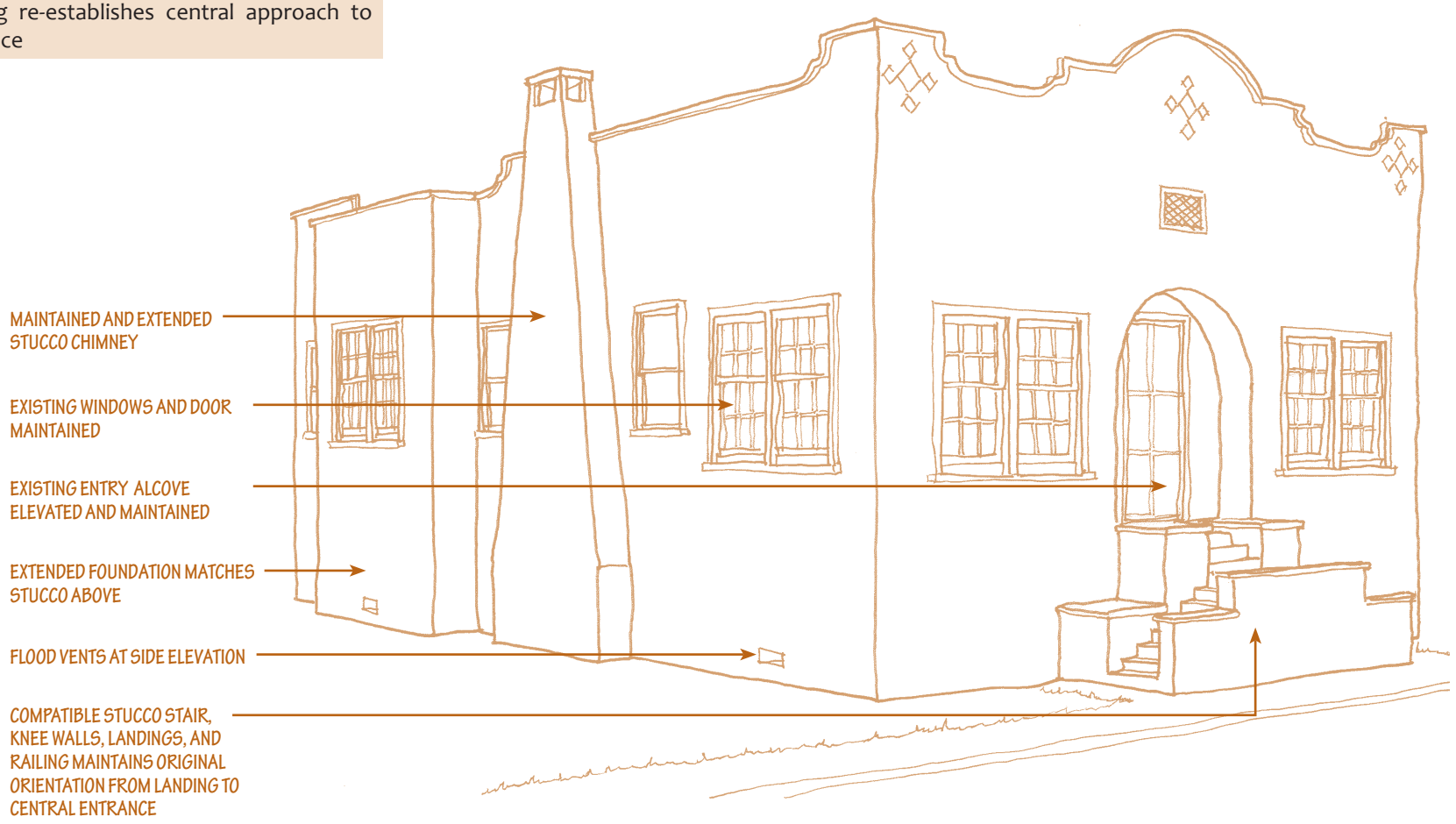
4'-8" ABOVE ADJACENT GRADE

- ❑ Extended brick veneer piers with inset diagonal lattice
- ❑ Extended brick veneer foundation wall at front elevation
- ❑ Existing porch maintained
- ❑ Stair maintains orientation to entrance door
- ❑ Introduction of porch and stair railings

MEDITERRANEAN REVIVAL

7'-0" ABOVE ADJACENT GRADE

- Extended stucco walls and chimney with matching stucco
- Flood vents at side elevation
- Stuccoed masonry stair configuration with knee walls limited by setback – Intermediate landing re-establishes central approach to entrance



2'-4" ABOVE ADJACENT GRADE

- ❑ Extended stucco walls and chimney with matching stucco
- ❑ Flood vents at side elevation
- ❑ Stuccoed masonry stair configuration with central knee walls maintains central entrance approach

4'-8" ABOVE ADJACENT GRADE

- ❑ Extended stucco walls and chimney with matching stucco
- ❑ Flood vents at side elevation
- ❑ Stuccoed masonry stair configuration with knee walls limited by setback – Intermediate landing re-establishes central approach to entrance

VICTORIAN
4'-8" ABOVE ADJACENT GRADE

- ❑ Extended brick veneer piers and chimney with matching brick
- ❑ Diagonal lattice inset between piers
- ❑ Wood stair with lattice below re-oriented toward sidewalk
- ❑ Introduction of porch and stair railings

2'-4" ABOVE ADJACENT GRADE

- ❑ Extended brick veneer piers and chimney with matching brick
- ❑ Diagonal lattice inset between piers
- ❑ Wood stair orientation towards driveway maintained
- ❑ Introduction of porch and stair railings

7'-0" ABOVE ADJACENT GRADE

- ❑ Extended brick veneer piers and chimney with matching brick
- ❑ Diagonal lattice inset between piers
- ❑ Wood stair with lattice below re-oriented toward sidewalk
- ❑ Introduction of porch and stair railings

CLASSICAL REVIVAL
7'-0" ABOVE ADJACENT GRADE

- ❑ Extended masonry walls and chimneys with compatible masonry veneer or stucco
- ❑ Flood vents at perimeter to mimic window openings
- ❑ Masonry stair configuration maintains central approach to entrance door
- ❑ Introduction of railings at stair and landing

2'-4" ABOVE ADJACENT GRADE

- ❑ Extended masonry walls and chimneys with compatible stucco
- ❑ Flood vents at perimeter to mimic window openings
- ❑ Masonry stair configuration maintains central approach to entrance door

4'-8" ABOVE ADJACENT GRADE

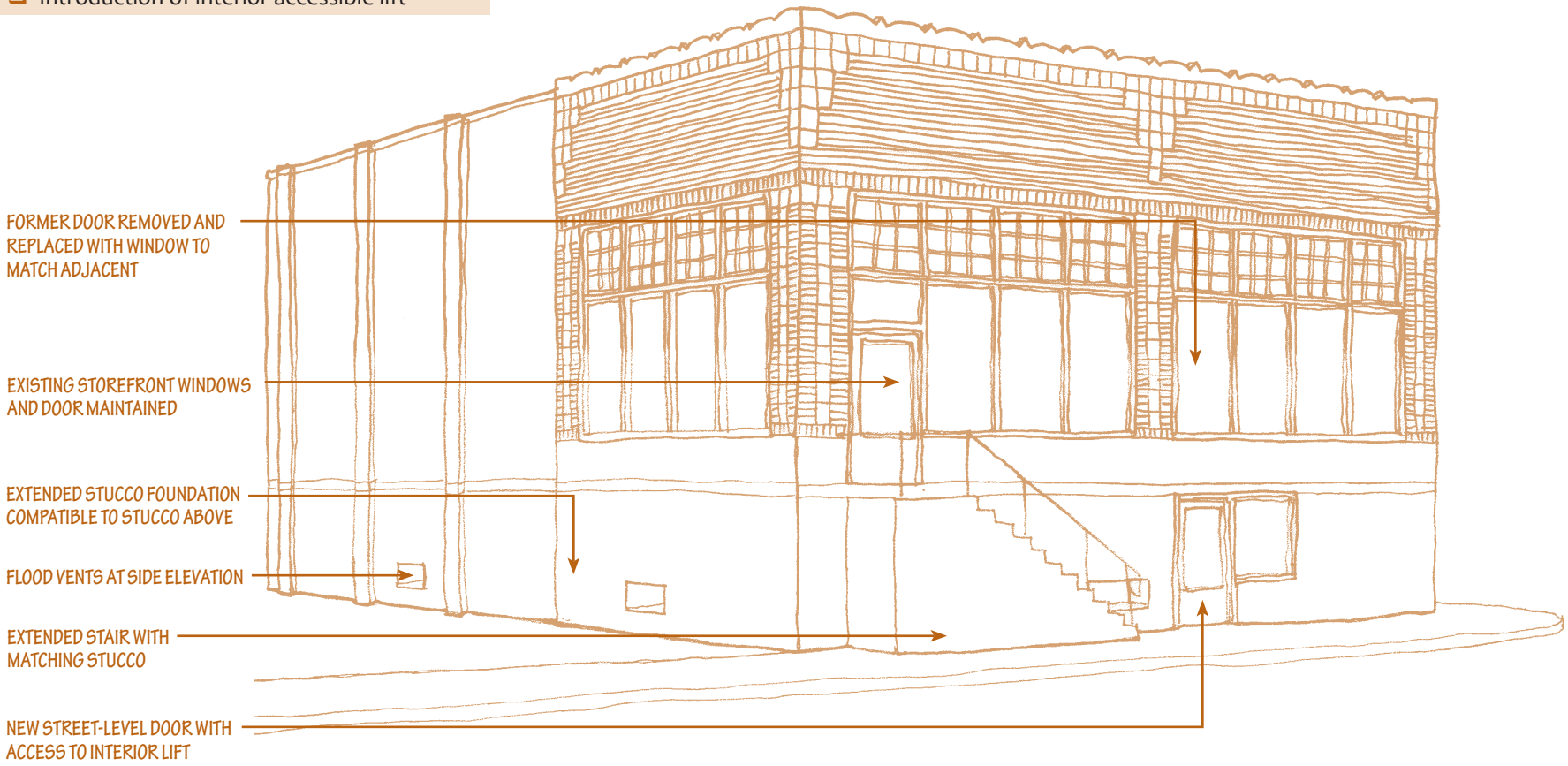
- ❑ Extended masonry walls and chimneys with compatible stucco
- ❑ Flood vents at perimeter to mimic window openings
- ❑ Masonry stair configuration maintains central approach to entrance door
- ❑ Introduction of railings at stair and landing

1-STORY STOREFRONT - RAMP
2'-4" ABOVE ADJACENT GRADE

- Two storefronts combined
- Extended masonry walls with compatible stucco
- Flood vents at side and front elevations
- Introduction of accessible ramp across width of combined storefront

1-STORY STOREFRONT - LIFT
7'-0" ABOVE ADJACENT GRADE

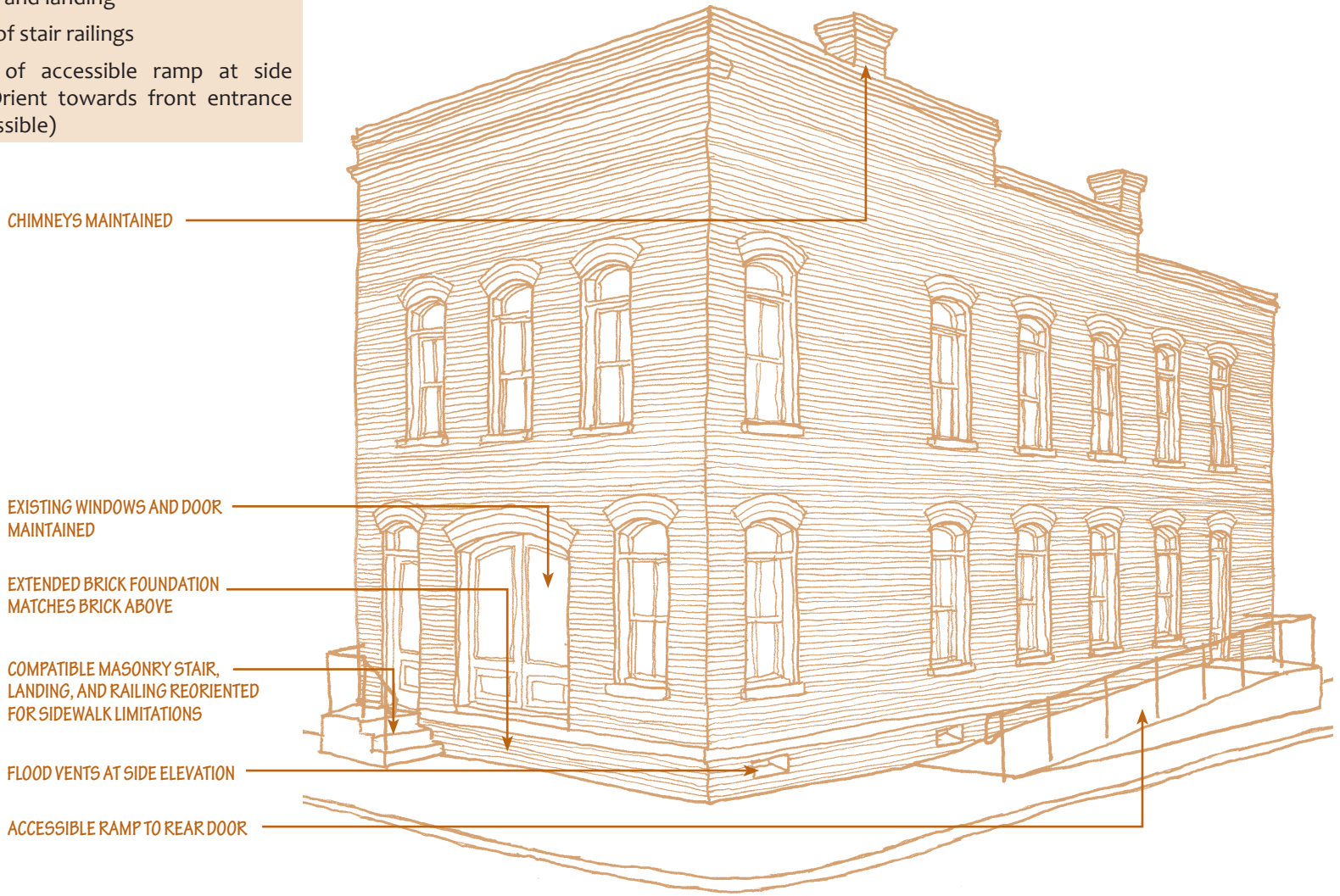
- ❑ Two storefronts combined
- ❑ Extended masonry walls with compatible stucco
- ❑ Flood vents at side and front elevations
- ❑ Introduction of stucco stair with railings
- ❑ Introduction of interior accessible lift



2-STORY COMMERCIAL - RAMP

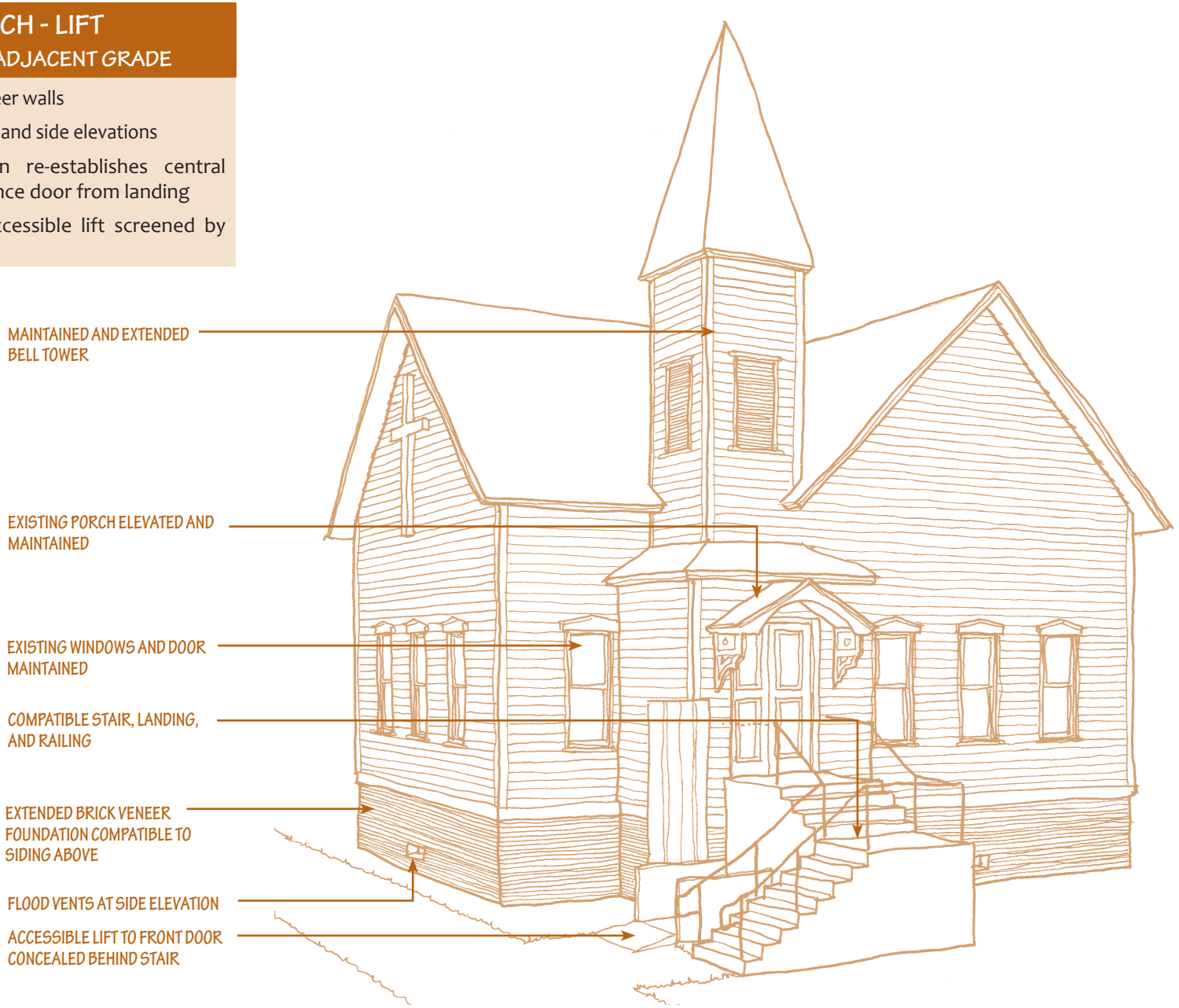
2'-4" ABOVE ADJACENT GRADE

- ❑ Extended brick walls
- ❑ Flood vents at side elevation
- ❑ Masonry stair and landing
- ❑ Introduction of stair railings
- ❑ Introduction of accessible ramp at side elevation (Orient towards front entrance whenever possible)



CHURCH - LIFT
7'-0" ABOVE ADJACENT GRADE

- ❑ Extended brick veneer walls
- ❑ Flood vents at front and side elevations
- ❑ Stair configuration re-establishes central approach to entrance door from landing
- ❑ Introduction of accessible lift screened by stair



STAIR AND RAMP CONFIGURATIONS

THE CONFIGURATIONS AND DIMENSIONS OF STAIRS CAN AID IN DETERMINING APPROPRIATE OPTIONS FOR EXISTING SITE CONSTRAINTS WHEN ELEVATING A BUILDING.

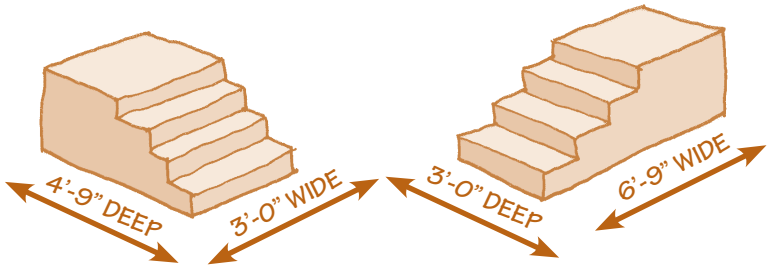
THE FOLLOWING DIMENSION ASSUMPTIONS ARE UTILIZED STAIR DIAGRAMS AND MATRIX BELOW:

- LANDINGS ARE 3'-0" DEEP
- STAIRS ARE 3'-0" WIDE
- STAIR TREADS ARE 11" DEEP AND RISERS 7" HIGH
- RAMPS MAINTAIN 1:12 SLOPE & 5'-0" LANDINGS

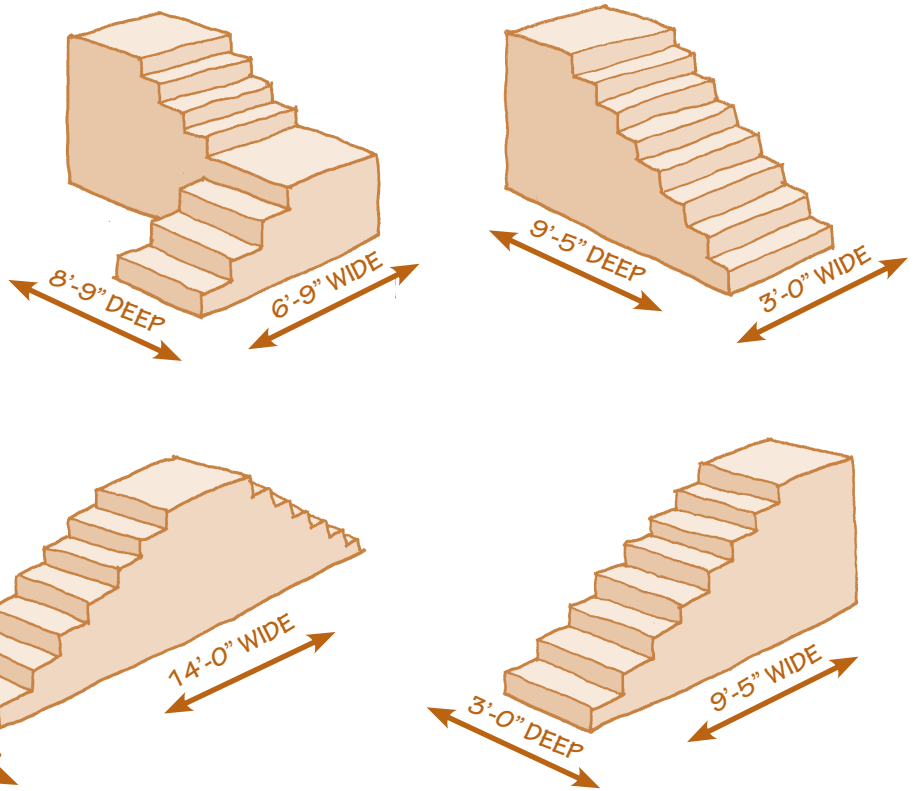
STAIR AND RAMP MATRIX

Height to Living Floor from Grade	Number of Steps	Stair Length Excluding Landings	Ramp Length Including Minimum Required Landings
7"	1	11"	7'-0"
1'-2"	2	1'-10"	14'-0"
1'-9"	3	2'-9"	21'-0"
2'-4"	4	3'-8"	28'-0"
2'-11"	5	4'-7"	35'-0"+5'
3'--6"	6	5'-6"	42'-0"+5'
4'-1"	7	6'-5"	49'-0"+5'
4'-8"	8	7'-4"	56'-0"+5'
5'-3"	9	8'-3"	63'-0"+10'
5'-10	10	9'-2"	70'-0"+10'
6'-5	11	10'-1"	77'-0"+ 0'
7'-0"	12	11'-0"	84'-0"+10'
7'-7"	13	11'-11"	91'-0"+15'
8'-2"	14	12'-10"	98'-0"+15'
8'-9"	15	13'-9"	105'-0"+15'

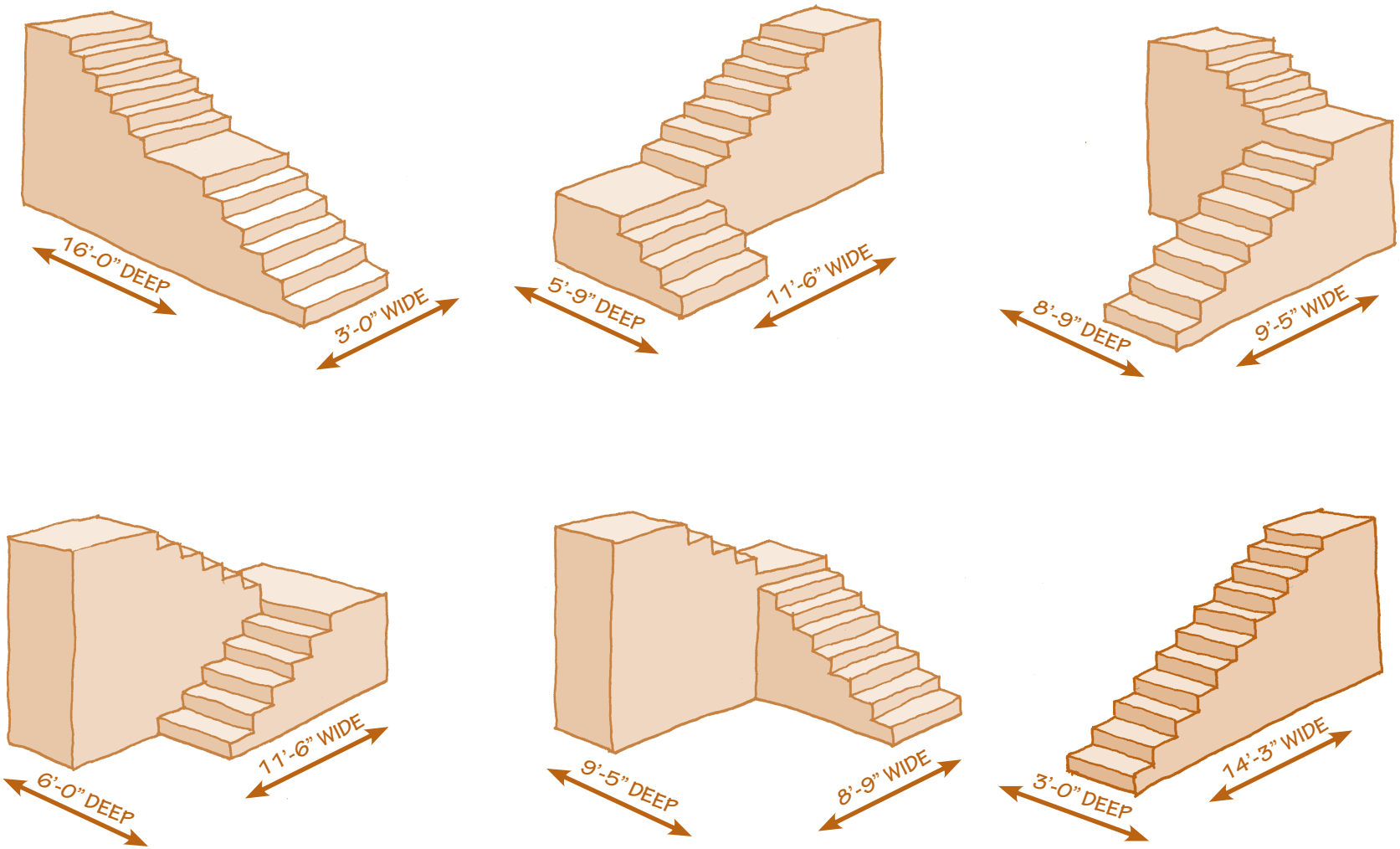
FIRST FLOOR 2'-4" ABOVE ADJACENT GRADE



FIRST FLOOR 4'-8" ABOVE ADJACENT GRADE



FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE



The Cap San Blas Lighthouse and Keeper's Quarters were relocated to Port St. Joe to reduce threat of erosion, flood, and wind damage.

BUILDING RELOCATION

Relocation moves a building out of a flood area onto a portion of the existing parcel that is at a higher elevation, if available, or onto a different parcel that is not vulnerable to flooding. It provides an alternative to demolition for situations where it is not feasible for the building to remain in place.

Property owners and planners should consider the factors below when evaluating how difficult it will be to move a building and associated outbuildings, if applicable:

- **Foundations:** Buildings resting on piers or with basements facilitate the installation of lifting beams. Slab-on-grade buildings can be more challenging.
- **Size:** Smaller buildings are easier to move than larger, multi-story buildings.
- **Footprint geometry:** Simple rectangular buildings are easier to move than buildings with multiple wings or complex footprints.
- **Material:** Wood framed buildings are lighter than masonry buildings and therefore easier to move.
- **Condition:** Buildings in good condition are better candidates for relocation than buildings in poor or fair condition. *(Refer to Maintenance, page 4.3)*

The actual process of moving the building is similar to building elevation in that it generally involves the building being lifted off its foundation. From there it is placed onto a flatbed truck, driven to its new location, and set upon a new foundation. Because the building is being moved horizontally, not simply lifted vertically and set down again, relocation is a complex process that involves:

- ❑ Finding an available, appropriate new parcel;
- ❑ Ensuring that there is an accessible route to the new location with minimal obstructions such as underpasses, utility lines, traffic signals, and narrow or low load capacity roadways and bridges;
- ❑ Securing the required permits not only for the relocation activity but for ground disturbance, roadway, and utilities where applicable;
- ❑ Constructing a compatible foundation and providing utility hook-ups at the new site;
- ❑ Disconnecting utilities at the existing site;
- ❑ Reinforcing the existing building to ensure it can take the stress of moving;
- ❑ Bracing chimneys, porches, carports, and other projecting elements, or carefully dismantling them to allow reassembly at the new site;
- ❑ Inserting a structural support system under the building, and then, detaching it from and lifting it off its existing foundation;
- ❑ Placing the building and its structural support system onto a trailer;
- ❑ Transporting the building to the new location;
- ❑ Lowering the building onto the new foundation;
- ❑ Connecting the utilities;
- ❑ Finishing the new site, including regrading and installing paving, site walls, fences, trees, and plantings *(refer to Chapter 5: Landscape Improvements)*;
- ❑ Removing and/or addressing contaminated materials at the former site, including septic systems and fuel storage tanks; and
- ❑ Restoring the former site to address local requirements, potentially including removal of utilities, backfilling the basement, removing paving, regrading, and replanting the site to a more "natural" landscape.

HISTORIC PRESERVATION CONSIDERATIONS FOR ELEVATING AND RELOCATING

EXISTING FEATURES

- ❑ Maintain existing building walls, porches, towers, chimneys, and bays
- ❑ Maintain outbuildings such as garages and agricultural buildings
- ❑ Maintain the historic configuration of window and door openings
- ❑ Maintain historic landscape elements such as walkways, fences, and walls
- ❑ Maintain mature trees and shrubs
- ❑ Limit on-site driveways and parking to existing locations

BUILDING WALL EXTENSIONS

- ❑ Extend masonry wall material or piers to be compatible with existing material
- ❑ Install true or veneer brick or stone to match historic material if concrete support is installed to meet National Flood Insurance Program (NFIP) requirements
- ❑ Install colored concrete or stucco to match historic material if brick or stone finish is financially infeasible
- ❑ Install flood openings on secondary elevations
- ❑ Install metal louvers and flood vents that are compatible in color with the wall to minimize the visual impact
- ❑ Install wood lattice or similar screening material inset between or behind extended piers or piles that is compatible to style of the buildings (For example, square lattice at Colonial Revival buildings and diagonal lattice at Victorian period buildings)
- ❑ Avoid installing horizontal board lattice, which is typically inappropriate for historic buildings

SYSTEMS AND EQUIPMENT

- ❑ Relocate all building systems and equipment out of flood prone areas to an inconspicuous location
- ❑ Screen systems and equipment with landscaping or fencing to minimize visibility

PORCH EXTENSIONS

- ❑ Locate porch piers under the center line of columns and at corners of stair landings
- ❑ Install new piers to match historic masonry whenever possible
- ❑ Install true or veneer brick or stone to match historic material if concrete support is installed to meet National Flood Insurance Program (NFIP) requirements
- ❑ Install colored concrete or stucco to match historic material if brick or stone veneer is financially infeasible
- ❑ Install wood railings that are compatible to the style of the house in style and detailing, as required by the Florida Building Code (FBC)

STAIR EXTENSIONS

- ❑ Maintain the principal exterior building access orientation and features for stairs, including railings, and landings
- ❑ Construct new stairs and landings of materials compatible with the building (typically wood at wood framed buildings and porches, and stone or brick at stone or brick buildings or those without a porch)
- ❑ Install railings that are compatible with existing historic railings or the historic character of the building that are of traditional materials and detailing including terminations such as newel posts at wood railings and lambs tongues at metal railings

RAMPS

- ❑ Provide a dignified entrance for all visitors through the main door whenever possible
- ❑ Construct new ramps and landings of materials compatible with the building (typically wood at wood-framed buildings and porches, and stone or brick at stone or brick buildings or those without a porch)
- ❑ Install railings that are compatible with existing historic railings or the historic character of the building, using traditional materials and detailing, including terminations such as newel posts at wood railings and lambs tongues at metal railings

HISTORIC PRESERVATION CONSIDERATIONS FOR ELEVATING AND RELOCATING

LIFTS / ELEVATORS

- ❑ Provide a dignified entrance for all visitors through the main door whenever possible
- ❑ Select a compatible color lift/elevator and minimize its visibility
- ❑ Locate lift/elevator mechanisms and power supply to minimize potential damage from flood water
- ❑ Select lifts that are compatible with the location (salts in coastal environments increase the likelihood of rusting)

LANDSCAPING

- ❑ Avoid elevating a building on fill
- ❑ Avoid adding parking in front yards or under houses and buildings
- ❑ Avoid new curb cuts in front of houses and buildings
- ❑ Replace asphalt or concrete driveways with permeable material to improve storm water absorption
- ❑ Install landscaping of varying heights and forms, and consider adding water absorbing plants like Yaupon holly, palms, and magnolias that also add visual interest along the sidewalk and complements the arrangement of the building façade and entrance path
- ❑ Locate plants so they do not interfere with flood vent operation as they grow
- ❑ Install vegetation that is native to the area to minimize the need for watering and fertilizers
- ❑ Install fences or walls to conceal raised foundations or relocated systems and equipment

GARAGES

- ❑ Install flood openings below the BFE to be compatible with NFIP requirements (garage doors do not meet the requirements of flood openings)
- ❑ Construct freestanding garages that are compatible to the historic nature of the residence and neighborhood character
- ❑ Orient garage doors away from the primary building façade

RELOCATING

- ❑ Relocate on the same parcel or to a new site outside of the established flood risk area but similar in character to the original setting
- ❑ Construct a new foundation that is visually compatible with the original foundation using visually similar materials
- ❑ Orient the primary façade so that it has the same relationship to the public way
- ❑ Duplicate site configuration including setbacks, access walkways, and parking areas to the extent possible
- ❑ Install asphalt or concrete driveways with permeable material to improve storm water absorption
- ❑ Relocate historic garages, other outbuildings, and landscape features to new parcel and reinstall in a similar configuration as the original site
- ❑ Relocate historic fences and rebuild historic walls on new parcel
- ❑ Install trees, shrubs, and landscaping compatible with the original location
- ❑ Install vegetation that is native to the area to minimize the need for watering and fertilizers

Pensacola, 1906 (Library of Congress)

9 REVIEW REQUIREMENTS FOR HISTORIC BUILDINGS

REVIEW REQUIREMENTS

It is generally recommended that property owners consult with local municipal officials early in their design process to understand the specific requirements for their projects.

Property owners are required to comply with the local requirements for construction found within their community. Local requirements incorporate federal and state requirements, and may impose additional conditions for the issuance of permits.

Many flood mitigation and wind retrofit projects require local regulatory review. While wind retrofit review will typically be limited to the local building department, flood mitigation review is more complex and can involve reviews by multiple entities. Based upon the local requirements and the proposed project, local required reviews may include the entities listed below:

- Building department
- Planning department
- Zoning department
- Floodplain management
- Historic preservation staff or board

In addition, if the project is receiving either state or federal funding, it is also subject to review by the Florida Division of Historical Resources (DHR). *(Refer to Florida Division of Historical Resources, sidebar, page 9.13)*

HISTORIC BUILDING DEFINITION - FLORIDA BUILDING CODE

For the purposes of the Florida Building Code (FBC), a historic building is defined as a building or structure that is:

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

[Florida Building Code, 7th edition 2020]

FLOODPLAIN ORDINANCE EXEMPTION

Historic properties in Florida are NOT automatically exempt from floodplain regulation. However, Florida Statutes do provide consideration for historic properties with regard to definitions of substantial improvement.

If the building is designated as a contributing resource to a national or local designation and compliance with floodplain management requirements would cause the building to lose its designation, local governments may offer an exemption or a variance from the flood protection ordinance.

Stuart's House of Refuge on the barrier island is receiving rehabilitation grant funds to make the building more resilient.

The Old Calhoun County Courthouse is listed in the National Register of Historic Places. It suffered damage from Hurricane Michael.

HISTORIC BUILDING FLOOD MITIGATION REVIEW

Historic buildings in Florida include those designated as a contributing resource to a National Register Historic District or a local historic district, or an individually designated building either locally or on the National Register. The local planning department or the Florida Division of Historical Resources (DHR) can verify the historic designation status or provide information on the designation process. ***Although the NFIP and FBC provide provisions for historic properties, all properties in Florida are subject to the local floodplain regulations, including historic properties, unless specifically exempted or granted a variance based upon their historic designation.*** Keep in mind that any variance for floodplain compliance has consequences:

- Buildings are still vulnerable to flooding and associated damage;
- Flood insurance may still be required and insurance companies may have mitigation requirements; and
- The variance may provide a false belief that the flood risk is somehow reduced or eliminated.

In many municipalities, if a property has been substantially damaged and the necessary repairs would cause the building to lose its historic designation, a flood protection variance can be sought to forego full floodplain management compliance. ***If alterations occur at a property as a result of substantial damage or as part of a substantial improvement causing it to lose its historic designation, the property must comply with all requirements of the municipality's floodplain management ordinance and the FBC. The local government that designated the property as significant is responsible for determining whether the property could lose its designation because of mitigation projects. National Register designation evaluations are made by DHR.*** *(Refer to Substantial Improvement, page 9.3, Substantial Damage, page 9.4, Historic Preservation Boards, sidebar page 9.7, and Florida Division of Historical Resources, sidebar page 9.13)*

FLOOD MITIGATION REGULATORY COMPLIANCE

When a building is damaged due to any cause, local officials and insurance agencies will review the damage and may assign a level of damage to the building according to their respective regulations. In floodplain regulations, buildings can be considered Substantially Damaged or a Severe Repetitive Loss. When this occurs, a Substantial Improvement evaluation will be required. Local, state, and federal building damage designations apply to all properties and buildings, regardless of historic or architectural designations. It is important to be aware of the requirements for each of these categories for construction activity on a property. As always, it is prudent to have a project review with the local building officials early in the design process.

SUBSTANTIAL IMPROVEMENT

Any repair, alteration, addition, or improvement of a building or structure in a flood hazard area, the cost of which equals or exceeds 50% of the market value of the structure before the improvement or repair is started, is evaluated as a substantial improvement for the purpose of determining compliance with the flood provisions of the Florida Building Code (FBC). This includes:

- Regular repairs
- Work required for a change in occupancy or use
- Alterations and renovations
- Wind retrofits
- Exterior building improvements

The Substantial Improvement provision is often triggered by additions to existing buildings. Building additions are required to comply with the provisions of the FBC, but the cost of the addition may trigger the need for full compliance of the entire building as a Substantial Improvement. The Substantial Improvement provision is automatically triggered for repairs associated with a Substantial Damage determination. *(Refer to Substantial Damage, page 9.4)*

The Substantial Improvement provision of the FBC does not, however, include any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure. Local requirements may vary. *(Refer to Substantial Improvement Exemption for Historic Properties, sidebar page 9.4)*

Each community regulates Substantial Improvement, storm water, floodplain management, and historic preservation review in different ways. When considering a construction project, early consultation with local officials is recommended.

Application of the FBC still requires the local government to either expressly exempt historic properties or to provide a variance process. This gray area may cause local governments to employ the strictest interpretation of the FBC to avoid any impact to their Community Rating System (CRS) score. A property owner should assume that any proposed improvements to a property that are determined to be a Substantial Improvement are subject to full compliance with the local floodplain management ordinance unless officially notified otherwise by the local building official. *(Refer to Community Rating System, sidebar page 2.5)*

Proposed work that does not meet the threshold of a Substantial Improvement should not lessen the ability of the property to resist flood damage. This includes the installation of mechanical equipment at grade within the floodplain and sealing and modification of basement or crawlspace openings. *(Refer to Relocation of Critical Systems and Equipment, page 4.5, and Fenestration Modification, page 7.7)*

The Port Theatre, background, and adjacent commercial buildings on the Main Street in Port St. Joe were severely damaged, some will be demolished.

Small communities along waterways like Matlacha were significantly damaged by Hurricane Ian and properties will be evaluated for substantial damage.

SUBSTANTIAL DAMAGE

For the purpose of determining compliance with the flood provisions of the Florida Building Code, a Substantial Damage determination can be triggered by damage of any origin sustained by a structure if the cost of restoring the structure to its before-damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred. A designation of Substantial Damage triggers compliance with Substantial Improvement requirements.

The local building permit agency or official is usually responsible for making Substantially Damage determinations and is required to report these properties to FEMA.

SUBSTANTIAL IMPROVEMENT EXEMPTION FOR HISTORIC PROPERTIES

If the program that designated the building as historic determines that it will continue to be a historic building after the proposed work is completed, then the proposed work is not considered to be a Substantial Improvement under the Florida Building Code. However, local floodplain management ordinances may not have a historic property exemption.

SUBSTANTIAL IMPROVEMENT VALUATION

The calculation of Substantial Improvement requires a valuation of the existing structure, excluding the land value, as well as the estimated cost of construction. The simplest manner local governments use to document a property's value is through the county property tax assessor's office or website where assessment values can be searched by address. Property owners may be able to appeal the tax assessor's valuation.

As an alternative, property owners can retain a private appraiser to prepare an independent assessment. However, the assessment requirements for a Substantial Improvement determination vary and are more detailed than typical property assessments. A local government may not accept a standard property assessment for a Substantial Improvement determination. Property owners should utilize assessors qualified in Substantial Improvement valuations if seeking independent assessments.

In addition to property valuation, the determination of Substantial Improvement requires property owners to provide construction cost estimates. If the anticipated cost of construction is over a certain percentage of the assessment value (such as 50%), detailed documentation is required including:

- A description of the proposed work;
- Detailed cost estimates of the proposed improvements; and a statement indicating whether the applicant believes the property is not subject to the floodplain requirements; and
- An Elevation Certificate or survey. *(Refer to Elevation Certificate, page 2.8)*

In assessing the value of construction, the local agency may have a provision in their ordinance that allows them to review the aggregate total of all recent permit applications for a property. Some cities will use five years of building permit data in their calculation. If the aggregate total of recent and proposed work exceeds the Substantial Improvement threshold of the property value, the owner may be required to fully comply with floodplain regulations for both the existing building and proposed project.

REPETITIVE LOSS/SEVERE REPETITIVE LOSS AND HISTORIC PROPERTIES

Although historic structures may not be required to comply with floodplain regulations, if a historic structure is also a Repetitive Loss or Severe Repetitive Loss property, the local floodplain administrator may still decide to pursue mitigation. Repetitive loss properties are usually targeted for floodproofing or elevation, which reduce the flood risk but can negatively affect a historic property's integrity and continued federal or local designation. Acquisition by a government agency and demolition are other typical mitigation actions for severe repetitive loss properties with similarly negative impacts on historic properties.

DEMOLITION

In flood-prone areas, demolition may be proposed as a mitigation measure if a building has been extensively damaged by a flood event, or has a Repetitive Loss or Severe Repetitive Loss designation. Considerations for the future redevelopment includes the following possibilities:

- Potential replacement of a non-flood-compliant building with a flood-compliant building, with all that entails, including floor elevations and flood resistant materials, which may be incompatible with the historic context; or
- Allowing an area regularly affected by flood to return to a more natural state such as wetlands or floodplains as part of a buy-out or similar program; and
- Disconnecting utilities at the existing site; removing or addressing contaminated materials at the property including septic systems and fuel storage tanks; and
- Restoring the site to address local requirements, potentially including removal of utilities, backfilling of basements, removal of paving, regrading, and replanting the site to a more natural landscape.

Demolition of a historic building is the permanent loss of a historic resource. In order to offset this negative affect, the building should be documented with photographs and as-built drawings. Documentation may be a requirement of a preservation ordinance. Demolition activities may be subject to local archaeological ordinances for ground disturbance activity. The extent of required documentation can be as basic as exterior photographs or detailed enough to meet the standards of the Historic American Buildings Survey (HABS). Whenever possible and appropriate, documentation should be shared with the Florida Division of Historical Resources for inclusion in the Florida Master Site File (FMSF) to provide a lasting contribution to the greater understanding of the state's architecture, engineering, archaeology, or culture.

REPETITIVE LOSS

Buildings and structures that have a history of multiple flood events fall under one of two designations under the Florida Building Code and the NFIP: Repetitive Loss or Severe Repetitive Loss.

A Repetitive Loss structure as defined by the NFIP as "an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any ten-year period since 1978."

Repetitive Loss properties are tracked in a database of owners who have been paid for a flood insurance claim for either their building or contents. Repetitive Loss properties are often prioritized by local and state hazard mitigation plans for mitigation such as floodproofing or elevation. Loss information for uninsured properties is often not included in the database.

SEVERE REPETITIVE LOSS

If a building has flooded once from a natural event, it is likely that it will flood again in the future unless mitigation improvements are completed.

A Severe Repetitive Loss property is defined as:

Any building that:

1. Is covered under a Standard Flood Insurance Policy;
2. Has incurred flood damage for which:
   a. Four or more separate claim payments have been made under a Standard Flood Insurance Policy with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
   b. At least two separate claim payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceeding the fair market value of the insured building on the day before each loss. [FBC]

In cases where the building is severely damaged or the mitigation measures to improve resilience are too costly or difficult to implement, it may be difficult to obtain flood insurance. In these instances, government acquisition and demolition may be determined to be best mitigation measure.

Flood insurance data about individual properties cannot be publicly released by local municipalities in accordance with privacy protections. A review of the Flood Insurance Rate Maps (FIRMs) can provide information a property's flood risk. *(Refer to Flood Insurance Rate Maps, page 2.6)*

If a building is designated historic, there may be flexibility in the local ordinances for floodplain and building code compliance as long as the building retains its historic character.

FLORIDA BUILDING CODE FOR EXISTING BUILDINGS

Following a series of natural disasters, Florida adopted a single statewide building code in 2002 based on national models and standards. Florida-specific deviations from the International Building Code (IBC) include more stringent requirements related to wind and water impacts to protect properties from hurricanes.

HISTORIC BUILDINGS

The 2020 Existing Building Code of Florida Building Code's 7th edition includes a chapter that specifically addresses historic buildings. This provision allows historic building compliance flexibility through an alternative compliance or performance-based provision to preserve the historic character. To be considered for compliance flexibility, a qualified design professional must submit documentation of an equivalent level of safety and how the adherence to the Code would negatively affect the character of the historic building. *(Refer to Design Professionals, sidebar page 2.15)*

> Historic structures or portions of such structures that do not strictly comply with the Florida Building Code may be considered to be in compliance if it can be shown to the satisfaction of the building code official that equivalent protection has been provided or that no hazard will be created or continued through noncompliance.
>
> [FBC]

EXISTING BUILDINGS

Across Florida there are significant buildings that may not be officially designated as historic. *(Refer to Historic Building Definition - Florida Building Code, sidebar page 9.2)* The FBC does offer some flexibility for existing buildings to utilize alternative approaches in determining compliance that do not require strict conformance with the Code. This could have the benefit of protecting the integrity of an un-designated, significant community building. A qualified design professional is needed to pursue alternative approaches. *(Refer to Design Professionals, sidebar page 2.15)*

FLORIDA BUILDING COMMISSION PRODUCT APPROVAL

The Florida Building Commission is responsible for the development and subsequent updates of the FBC. The Commission also maintains an online database of building products that are compliant with the FBC. Products are organized into seven categories: panel walls, exterior doors, roofing, skylights, windows, shutters, and structural components. Some areas of the state have adopted more stringent requirements than the FBC, with specific products identified to reduce potential wind damage. For example, Miami-Dade and Broward counties are Wind-Borne Debris regions and require that building products are rated for use in a High Velocity Hurricane Zone, which is a more wind-resistant requirement than the FBC. *(Refer to Hurricane Wind Scale, sidebar page 3.3)*

Products that have been previously approved by the Florida Building Commission for a specific application may be used during a repair or rehabilitation requiring a building permit. New products can also be submitted to the Commission for its review and approval. Products outside of the seven categories are subject to review by the local building official. Alternative products will require the submission of detailed supporting documentation for review and approval.

HISTORIC PRESERVATION BOARDS

Communities with adopted preservation regulations have the responsibility of reviewing exterior alterations to locally designated historic properties, including alterations associated with flood and wind mitigation. In areas with local historic districts, the staff may determine that the project requires design review by the local historic preservation board. The board's staff may be able to review and approve certain types of work.

To conduct informed wind and flood mitigation reviews, it benefits review boards to have a good understanding of how the proposed project is impacted by the following:

- Local wind vulnerability;
- Local flood vulnerability;
- Variations in the topography that might increase or reduce vulnerability;
- Local floodplain requirements;
- Local building code and zoning requirements; and
- Flood insurance requirements.

Property owners seeking approval for alterations related to flood mitigation should address these issues in their application as clearly as possible. Review board members need to balance all requirements with the preservation of their community's historic character.

Historic preservation boards also have the responsibility to review the listing and de-listing of individual properties and districts on the local historic register. De-listed properties may be required to be fully compliant with local floodplain management requirements. *(Refer to Floodplain Ordinance Exemption, sidebar page 9.2)*

LOCAL REQUIREMENTS

Depending on the size of a community, there may be a single individual or different departments addressing floodplain management, including planning, zoning, and building code compliance. ***It is generally recommended that property owners consult with local municipal officials early in their design process to understand the specific requirements for their projects. Depending on the nature of the proposed work, it may be necessary to retain a registered architect or engineer to prepare required drawings and information.*** *(Refer to Design Professionals, sidebar page 2.15)*

FLOODPLAIN MANAGEMENT

The floodplain manager - often the building official in smaller communities - administers the locally adopted floodplain management ordinance. They can assist individual property owners in identifying their flood risk and clarifying mitigation option requirements. They are also responsible for identifying Substantial Improvement, Substantial Damage, Repetitive Loss, and Severe Repetitive Loss properties. *(Refer to Local Floodplain Management Regulations, page 2.9, Flood Mitigation Regulatory Compliance, page 9.3)*

PLANNING AND ZONING CODES

Additions to existing buildings, new construction, site plan reviews for larger development projects, and the addition of new site paving will often require planning and zoning approval. Planning and zoning departments serve many functions and will typically review applications for compliance with local ordinances for setbacks, developable area, building height, and impervious surface coverage. Projects that do not comply with the local land development code may require a board review at a public hearing.

BUILDING CODE COMPLIANCE

Building code compliance is required for many wind retrofit projects and all flood mitigation projects. The building official or code administrator is responsible for reviewing construction plans, enforcing the building code, conducting inspections of construction, repairs, additions, alterations, remodeling, or demolition in accordance with the Florida Building Code and applicable local ordinances. The local official is ultimately responsible for ensuring the public health, welfare, and safety of the community. Any non-prescriptive compliance alternatives or product approvals fall within this official's authority. *(Refer to Florida Building Commission Product Approval, page 9.6)* Projects seeking variances or exemptions from building code requirements may require a public hearing.

The Martin Theatre in Panama City awaits rehabilitation to recover from Hurricane Michael damage.

PROJECT REVIEW PROCESS

The review requirements for proposed projects will vary based upon:

- The type of work being proposed;
- Local building department submission requirements;
- Local historic preservation review requirements;
- Funding sources; and
- Flood insurance company requirements.

BASIC IMPROVEMENT AND WIND RETROFIT REVIEWS

Many of the types of projects identified in *Chapter 3, Wind Retrofitting* and *Chapter 4: Basic Improvements*, can be completed without the assistance of an architect or engineer. *(Refer to Design Professionals, sidebar page 2.15)* However, the property owner or their contractor should verify the submission and review requirements prior to beginning work. It is highly recommended that care is taken in selecting a contractor or design professional who has prior experience in the proposed the type of work at other historic properties.

In cases when a construction permit is not required, if the property is locally designated as historic or within a designated historic district, a Certificate of Appropriateness (COA) may be required from the local historic preservation board or commission. Each municipality will have a unique application process that may include all or parts of the review steps identified below.

Local requirements can vary dramatically between communities for the same type of work. Early consultation with the local building official can identify review requirements as a project is being planned. This can ultimately save both time and money as mitigation options are developed.

STEP 1. REVIEW STORM GUIDANCE FOR FLORIDA'S HISTORIC PROPERTIES

An early review of this Storm Guidance document can identify options to improve flood resilience and minimize the potential for wind damage. Whether the property is designated as historic or not, this Storm Guidance document can assist in the planning process by providing suggestions to reduce the impact of severe storms and flooding. It recommends "best practices" that minimize the visual impacts of proposed improvements.

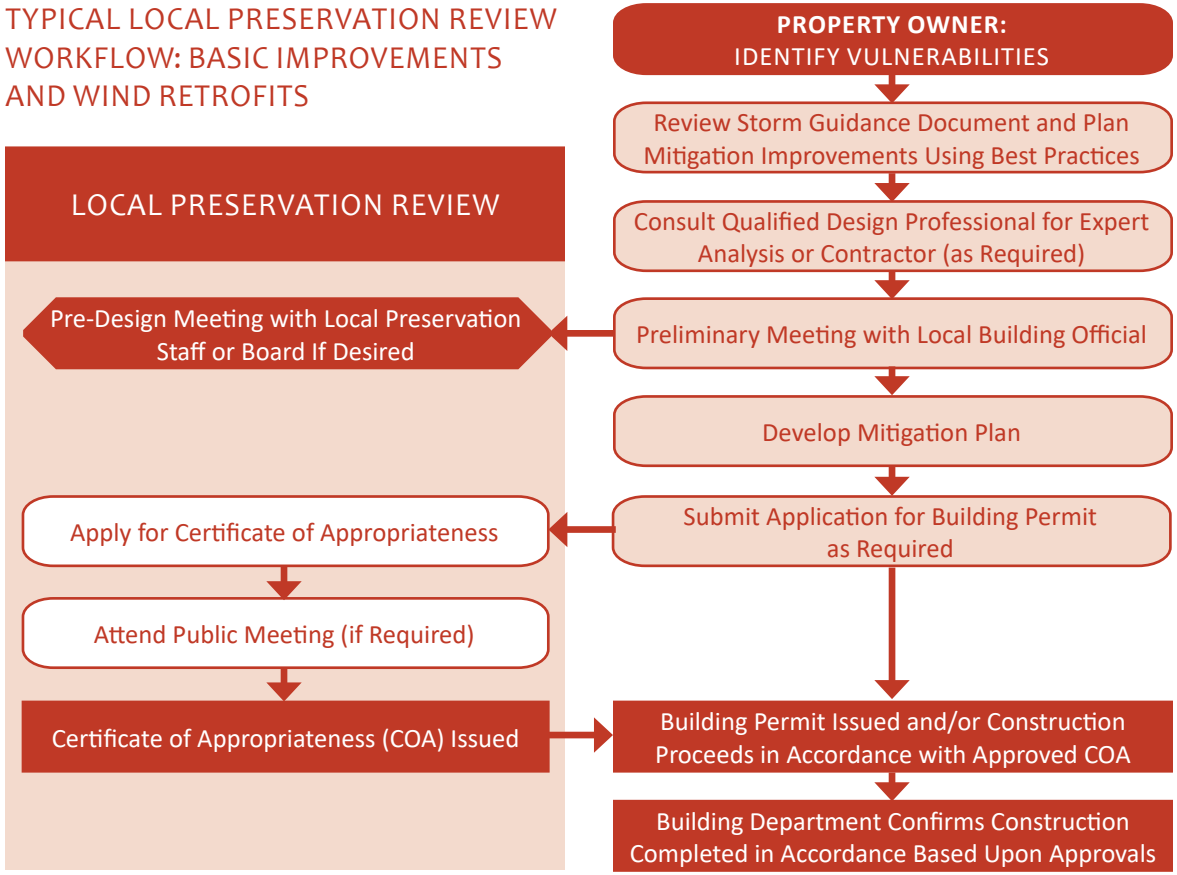
STEP 2. CONSULT WITH A DESIGN PROFESSIONAL OR CONTRACTOR

Property owners can complete some wind retrofit projects and basic improvements. Others will require guidance or assistance from a qualified architect or engineer, or directly from a contractor. *(Refer to Design Professionals, sidebar page 2.15)* Structural improvements to reduce wind vulnerability, particularly if it will result in a reduction of property insurance, will often require a design professional. *(Refer to Advanced Mitigation Package, page 3.15)* However, projects such as the relocation of an air conditioning unit can typically be completed by a contractor without the involvement of a design professional.

STEP 3. MEET WITH LOCAL BUILDING OFFICIAL

Although design professionals and contractors often provide guidance regarding requirements prior to construction, property owners are ultimately responsible for obtaining necessary permits and completing required reviews prior to completing work. Therefore, it is prudent for property owners to meet with the local building official to discuss potential improvements and associated requirements. The building official may also be able to identify other properties in the community that have addressed similar issues.

TYPICAL LOCAL PRESERVATION REVIEW WORKFLOW: BASIC IMPROVEMENTS AND WIND RETROFITS



This flow chart represents the steps that are typically involved when a property is subject to review under a local preservation ordinance. Many steps are the same whether there is a historic district or landmark ordinance that affects the property.

STEP 4. MEET WITH LOCAL PRESERVATION REPRESENTATIVES

A preliminary meeting with the local preservation official is sometimes required and always recommended. Although it is not binding, a preliminary review can identify issues and help in the development of a mitigation plan that is likely to meet local requirements and be approved.

STEP 5. DEVELOP A MITIGATION PLAN

Mitigation plans should be guided by:

- A property's vulnerabilities;
- Local regulatory requirements, and
- Available funding.

The goal of the mitigation plan should be to reduce vulnerability from severe storms while protecting the historic integrity of the property and its surroundings. Care should be used to minimize negative impacts on adjoining properties, particularly avoiding landscape improvements that may inadvertently direct storm water to an adjacent parcel. *(Refer to Chapter 5: Landscape Improvements)*

STEP 6. SUBMIT REQUIRED REGULATORY APPLICATIONS

Based upon the requirements of the community and nature of the proposed mitigation plan, a building permit must be submitted to the local building official. If locally required, a separate application for a Certificate of Appropriateness (COA) must also be submitted.

STEP 7. CERTIFICATE OF APPROPRIATENESS

Information regarding the local review process can usually be obtained through the local building or planning departments. Preservation pages on municipal websites often include information about the COA review process and may include design guidelines that can inform a mitigation plan. Some communities have a preservation staff member with the authority to grant COAs for some types of work. In other places, a COA can be granted after a public hearing.

STEP 8. COMPLETE CONSTRUCTION

Construction work should be completed based upon approved mitigation plans. If changes are needed during construction, notify the local building official to determine if additional reviews are required. Non-compliant work may be subject to fines, penalties, or removal of non-compliant work. Wind retrofit projects may provide opportunities for reduced insurance premiums. *(Refer to Wind Insurance Review, sidebar, page 9.14)*

BUILDING MITIGATION REVIEWS

Building mitigation projects, which include ***Wet Floodproofing, Dry Floodproofing, Building Elevation, and Relocation,*** are more complex than basic improvements. *(Refer to Chapter 6: Wet Floodproofing, Chapter 7: Dry Flooproofing, and Chapter 8: Elevating or Relocating)* An appropriately completed flood mitigation project can dramatically improve a property's resilience to flooding.

In addition to reducing flood vulnerability, most building mitigation projects are completed in an effort to reduce to the cost of flood insurance. *(Refer to National Flood Insurance Program, page 2.1, and Flood Insurance Company Review, page 9.14)* These complex projects always require the assistance of a qualified architect and/or engineer and may include either state or federal funding to supplement owner-provided funding. *(Refer to Design Professionals, sidebar page 2.15, and Funding Sources, sidebar page 2.20)* They also may require review and/or approval by a property owner's flood insurance provider to benefit from a reduction in future policy costs.

Given the level of investment typically required for a flood mitigation project, it is often worthwhile to consider wind retrofitting as part of the work. Wind retrofit projects may also be eligible for wind insurance premium reductions. *(Refer to Florida Wind Insurance Savings Calculator, sidebar page 3.4)*

STEP 1. REVIEW STORM GUIDANCE FOR FLORIDA'S HISTORIC PROPERTIES

At the beginning of the process, it is important to review this Storm Guidance document to better understand the mitigation options that will meet the project's goals given its physical restraints. For example, a residential building can be wet floodproofed, elevated or relocated to be compliant with National Flood Insurance Program (NFIP) requirements. However, a wood-framed residence cannot technically be wet floodproofed, leaving building elevation or relocation as the only viable options for a reduction in flood insurance premiums. Similarly, a masonry building with shared property walls cannot be easily elevated unless all buildings in the row participate in the elevation. In the case of a non-residential building that must comply with the Americans with Disabilities Act (ADA), the most viable options may be either wet floodproofing or dry floodproofing if the height of elevation would be significant. This Storm Guidance document can provide the property owner useful information during discussions with the project architect or engineer.

STEP 2. CONSULT WITH A DESIGN PROFESSIONAL

A qualified architect or engineer can guide a property owner through a mitigation project and:

- Explain the pros and cons of the various mitigation options;
- Develop plans for mitigation options;
- Assist in submitting applications for necessary regulatory approvals;
- Prepare a preliminary Elevation Certificate *(refer to Elevation Certificate, page 2.8)*;
- Complete construction documents to protect the building while minimizing the impact on the historic integrity;
- Identify potential funding opportunities;
- Review construction progress; and
- Prepare a Certified Elevation Certificate or Floodproofing Certificate *(Refer to Step 9. Submit Required Certificate, page 9.14)*

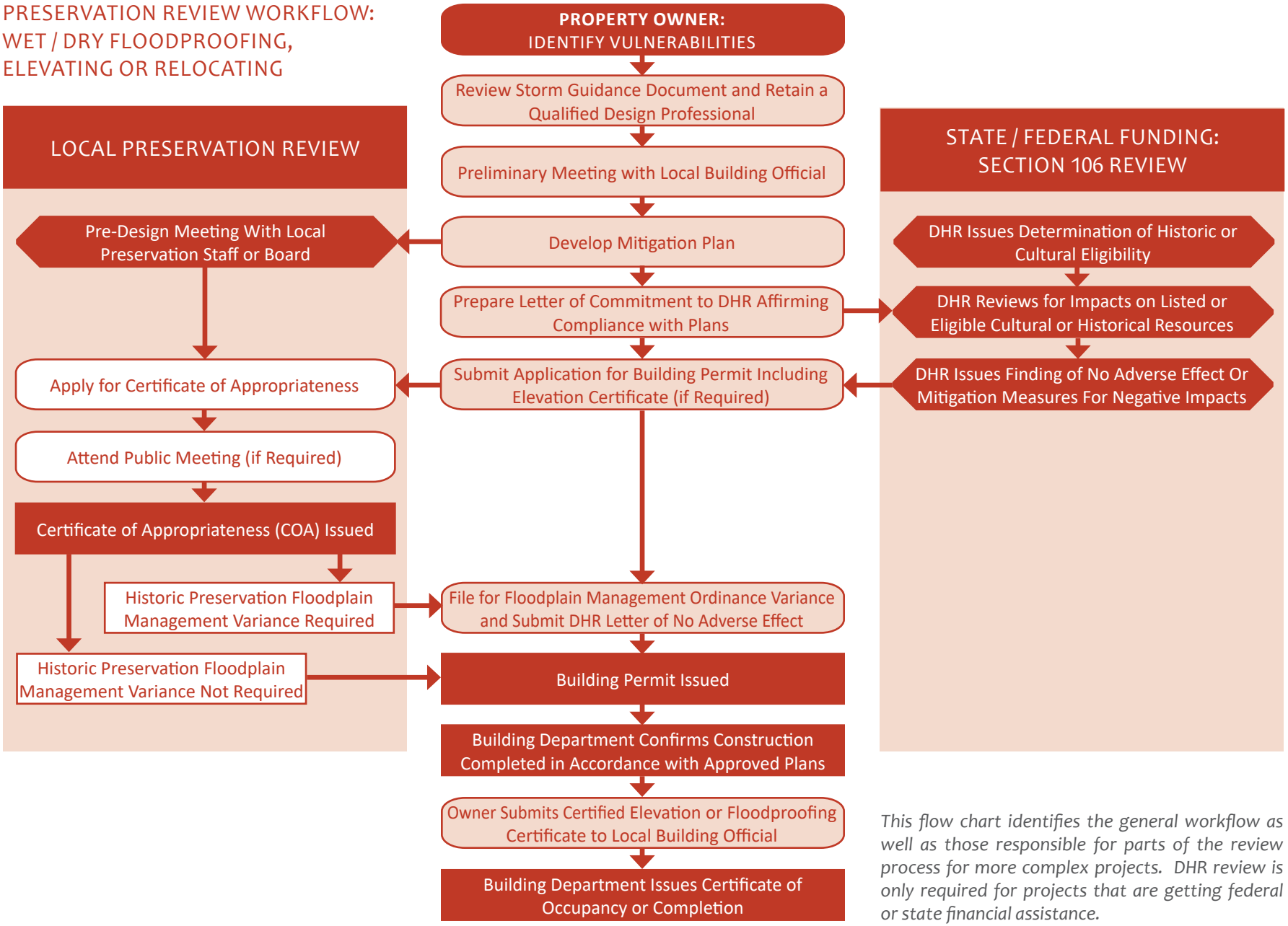
Due to the key role of the architect or engineer in developing the mitigation plan, it is critical that they be qualified in flood mitigation and wind retrofits as well as in the specific needs of historic properties. *(Refer to Design Professionals, sidebar page 2.15)*

STEP 3. PRELIMINARY MEETING WITH LOCAL BUILDING OFFICIAL

Prior to investing a lot of time or money in the development of a mitigation plan, a preliminary meeting with the local building official is highly recommended. In many communities, these meetings are held with a technical review committee, and are strongly encouraged or required. These are informal meetings with all related municipal agencies that may have comments on the project. The building official can confirm the requirements, permits, and reviews that are required for a proposed mitigation project as well as the local process and/or sequence of reviews. In addition to a building permit review, planning, zoning, and floodplain management reviews may be required.

The building official may be able to clarify whether a variance process is available as well as identify available funding options if a municipality is administering a mitigation grant program for individual properties. *(Refer to Funding Sources, sidebar page 2.20)*

PRESERVATION REVIEW WORKFLOW: WET / DRY FLOODPROOFING, ELEVATING OR RELOCATING



This flow chart identifies the general workflow as well as those responsible for parts of the review process for more complex projects. DHR review is only required for projects that are getting federal or state financial assistance.

Buildings subject to a preservation or design review board must have their project reviewed and approved prior to construction.

STEP 4. DEVELOP A MITIGATION PLAN

Working with a qualified design professional, a mitigation plan should be developed after gathering information on requirements and reviews. For complex projects, mitigation plans are generally guided by:

- Use of the property (residential or non-residential);
- Construction materials;
- The level of flood vulnerability, both current and projected; and
- Available funding.

Flood mitigation design guidelines can help property owners develop mitigation plans that are compatible with their historic property. Flood protection and mitigation can include significant building modifications and need not destroy its historic character. With any project, care should be used to provide an adequate level of protection from severe storms balanced with maintaining the historic appearance of the historic property within its larger setting to the greatest extent possible. During the development of a flood mitigation plan, it is highly recommended that wind retrofit improvements be considered as part of the project.

Prior to finalizing the mitigation plan, a preliminary meeting should be scheduled with the local preservation staff person or board. The preliminary review can identify potential issues that may trigger concern during the formal preservation review process.

STEP 5. SUBMIT REQUIRED REGULATORY APPLICATIONS

All complex projects that include wet floodproofing, dry floodproofing, building elevation, or relocation will require a building permit. Based on the local preservation requirements, review with a local preservation official or board may also be required. The preservation review application is typically separate from the building application. It is important to include all required information for each type of review. Incomplete or unclear applications generally result in delays.

STEP 6. CERTIFICATE OF APPROPRIATENESS

The process of obtaining a Certificate of Appropriateness (COA) can vary from municipality to municipality. Information regarding the local review process can usually be obtained through the local building or planning departments. Websites often include information about the COA review process and may include design guidelines that can inform a mitigation plan.

Some communities have a preservation staff member with the authority to grant COAs for some types of work. In other places, a COA is granted after a public hearing. An understanding of the requirements can minimize construction delays.

Building elevations, foundation repair, or other major construction will require involvement from design and construction professionals.

A major commercial building renovation in Key West may require a variance.

If a variance is not requested or approved, historic residential buildings require full compliance.

Elevating a historic building may require review for historic or archaeological impacts.

STEP 7. FLOODPLAIN MANAGEMENT ORDINANCE EXEMPTION OR VARIANCE

Under floodplain management ordinances there may be an exemption for historic properties or a variance process. If a property owner determines that compliance with the local floodplain management ordinance would compromise a property's continued designation as a historic property, a variance can be requested if staff is not authorized to issue an exemption. The variance application will be reviewed by city or county staff and provided to the local review board for consideration. *(Refer to Historic Building Flood Mitigation Review, page 9.2)*

If state or federal funding is sought, a letter of No Adverse Effect from the Division of Historical Resource must be included in the application. As part of the variance process, the application is considered at a public meeting. A project representative should be present to answer any questions. If a variance is not being sought, construction work can begin after all required approvals have been obtained and a building permit is issued. *(Refer to Florida Division of Historical Resources, sidebar at right)*

FLORIDA DIVISION OF HISTORICAL RESOURCES

Among its many duties, the Florida Division of Historical Resources (DHR) administers the listing of historic and cultural resources in the National Register of Historic Places. DHR also issues determinations of historic or cultural eligibility for the National Register.

For mitigation projects, DHR reviews flood mitigation and repair measures for historic and eligible properties that receive state or federal funding. DHR's review is intended to ensure, to the degree possible, that the proposed alterations do not affect the property's historic character, integrity, and eligibility for funding.

The types of funding that trigger DHR review includes those that are:

- Receiving federal tax credits;
- Receiving state or federal funding; or
- Receiving state or federal permits.

In its review, DHR can issue one of two findings, either the proposed mitigation will have No Adverse Effect or that it will have an Adverse Effect. In the case of an Adverse Effect, DHR can recommend changes to the proposed mitigation project to minimize the impact on the historic property.

Immediately following a flood, DHR encourages stabilization efforts, including the installation of temporary shoring and roof tarps. Quick action has the potential to reduce additional damage and secondary damage such as mold. Confirm with the funding or permitting agency how consultation with DHR will be conducted prior to beginning any work. DHR review is not a substitute for local preservation board review. If there are differences of opinion between the local board and DHR review, the more stringent option will typically apply. *(Refer to Funding Sources, sidebar page 2.20)*

An Elevation Certificate is required to close out residential building permits.

STEP 8. COMPLETE CONSTRUCTION

Construction work should be completed based upon approved mitigation plans. If changes are needed during construction, the local building official must be notified to determine whether additional reviews are required. Non-compliant work may be subject to fines, penalties, or removal.

STEP 9. SUBMIT REQUIRED CERTIFICATE

Following the completion of construction, the appropriate certificate must be submitted. For residential properties, the project architect or engineer must prepare an Elevation Certificate that affirms that the project was constructed to the height required by the municipality to minimize flood risk. For non-residential properties, a Floodproofing Certificate affirms that the non-residential project meets floodproofing requirements. *(Refer to Elevation Certificate and Floodproofing Certificate, page 2.8)*

STEP 10. CERTIFICATE OF COMPLETION OR OCCUPANCY

After the building official has confirmed that construction was completed in accordance with the approved mitigation plans and all required certifications have been submitted, the building official will issue a Certificate of Completion or Certificate of Occupancy for the project. The issuance of these certificates allows owner occupancy and use of the property for the approved use.

FLOOD INSURANCE COMPANY REVIEW

One of the benefits of complex building mitigation projects such as wet floodproofing, dry floodproofing, elevating, or relocating is that upon completion property owners can benefit from reduced flood insurance rates by reducing a property's level of risk. *(Refer to National Flood Insurance Rating Methods, page 2.3)*

While developing mitigation plans, it may be beneficial to consult with the flood insurance company to verify whether there are any specific requirements that should be incorporated into the design. When a mitigation project is complete, the property's flood insurance company should be notified to reassess level of risk and re-evaluate the insurance premium.

WIND INSURANCE REVIEW

Some improvements are eligible for reductions in wind insurance rates. The insurance provider should be contacted for additional information. *(Refer to the Florida Wind Insurance Savings Calculator, sidebar page 3.4)*

Commercial buildings will need a Certificate of Completion to document that the building official has approved the construction and final design.

Navarre, 2004. (Florida Memory)

10 EMERGENCY RESPONSE

EMERGENCY RESPONSE

Emergency response focuses primarily on life safety and, secondarily, on limiting property damage. These risks are not necessarily mutually exclusive. Historic preservation ranks lower among first responders' priorities.

Throughout the emergency response planning process it is important to evaluate the safety of individuals, a property's vulnerability, and the ways to reduce damage while considering their efficacy and potential impacts on historic integrity of a property.

Immediately prior to an emergency, proper preparation may be challenged by a lack of time or resources. Planning activities that occur well in advance of an emergency or storm event can provide a better outcome for historic properties and their occupants.

Following planning activities, focus can turn towards preparation for a storm threat. Pre-storm activities assume that there is little time to complete tasks prior to potential evacuation in advance of impact. During storm recovery, it is important to exercise safety, carefully document any losses, and begin the process of cleaning up and drying out. Understanding in advance the unique challenges and opportunities posed by historic properties can help protect the integrity.

PLANNING

Planning is the starting point of emergency response and the first step to protecting a historic property from a storm event. To the extent possible, all information, documents, inventories, and photographs should be updated regularly and stored in a protected location. Property owners and tenants are also encouraged to keep an additional copy off-site, either a physical copy or a digital copy that can be accessed if the storm event is significant and building access is not possible.

ASSESS RISKS

The risks of flood or storm damage may be well-known due to the proximity to a water source, personal experience with prior emergency events, community knowledge of previous events, or municipal or media coverage of prior local damage. Another way to assess risk is to utilize floodplain management tools and local wind speeds. *(Refer to Hurricane Wind Speeds, sidebar page 3.3)*

Flood risk at a specific property can be identified using the FEMA flood mapping tool. Additionally, an Elevation Certificate, if available for a property, can identify risk specific to a property, such as the height of the first floor above the ground and the type of foundation. *(Refer to Flood Insurance Rate Maps, page 2.6, and Elevation Certificate, page 2.8)*

MAINTAIN A PROPERTY AND RECORDS INVENTORY

- Maintain an inventory of any collections, records, artifacts, or building features that are vulnerable which would need to be relocated or protected in advance of a storm event
- Develop a plan to make necessary repairs or alternate protective measures to be undertaken prior to a storm event for any building features that are in a state of disrepair
- Keep an up-to-date property survey showing any improvements to the property
- Document the building with photographs and measured drawings, if possible, including an inventory of doors, windows, or other unique features
- Keep all inventory and documentation records in a safe place and store an additional copy off-site in a separate facility if possible

Each louvered shutter has a metal plate on the back face to protect the windows when closed. Verify that protective shutters are fully operational and well-fastened to jambs.

DEVELOP AN EMERGENCY PLAN

- Refer to local or state resources on recommended disaster supply kits and keep an up-to-date copy in paper format in the event access to technology is limited
- Collect important contacts, account numbers, and identify licensed contractors, electricians, plumbers, clean-up crews, service providers, and telecommunications companies
- Obtain wind protective measures for windows and doors, such as hurricane shields, and install wall-mounted hardware or pre-cut and pre-drill plywood
- Develop a support network to help prepare the site for an upcoming storm and to assist in disaster assessment and clean-up
- Maintain a list and gather any equipment and protective materials that will be needed and difficult to obtain such as sump pumps, plastic shovels, wet-vacuums; bleach, cleaning supplies, garbage bags, gloves, fans, protective gear; plywood, plastic sheathing, lumber; louvered window vents to promote drying; and on-site tools

PROPERTY MAINTENANCE

Flooding is often accompanied by secondary factors, such as high winds, and can be followed by fire. Simple maintenance measures can reduce the vulnerability to primary and secondary hazards that should be completed at all properties. ***A well maintained building, particularly one that is structurally sound, is more likely to withstand flooding and severe wind events than a poorly maintained building.*** Keeping an up to date maintenance manual can also prove helpful in the event of storm impact. *(Refer to Maintenance, page 4.3, and Appendix A: Storm Vulnerability Checklists)*

Partially drain swimming pools to allow collection of stormwater and debris and reduce post-storm recovery.

Install protection at doors and low window openings.

PRE-STORM ACTIVITIES

PROPERTY

- ❑ **Trees** - Remove rotted trees and trim overhanging tree limbs that might crash through a roof, take down electric and telephone lines, or block a roadway in high winds
- ❑ **Site debris** - Clear debris that might become water-borne or air-borne, clog storm drains, provide fuel for a fire, or cause damage to buildings
- ❑ **Site drains/gutters/downspouts/floor drains** – Clear for water flow
- ❑ **Oil and propane tanks** - Secure outdoor grills and other outdoor smokers, ovens, or kilns and close fuel line at main valve
- ❑ **Relocate potted plants** - Elevate above flood height and protect from wind
- ❑ **Outdoor furnishings** - Relocate to interior or secure
- ❑ **Swimming pools** - Partially drain

EXTERIOR BUILDING

- ❑ **Roof hatches/operable skylights/ventilators** - Secure and brace
- ❑ **Shutters** - Secure traditional or hurricane shutters or install plywood panels secured to building wall, not window or door frames
- ❑ **Windows/doors** - Secure and brace inward swinging windows and doors and install wind protection
- ❑ **Temporary barriers/shields** - Install at flood vulnerable openings, sandbags or metal panels

INTERIOR

- ❑ **Furnishings** - Remove breakable items from walls and cabinets; elevate vulnerable items; roll up rugs; close window treatments including interior blinds, drapes, and interior shutters
- ❑ **Utilities** – Turn off electricity at panel/gas to equipment, water heater, stoves, oven, and dryer
- ❑ **Important documents** – Collect insurance policies, deeds, leases, photo albums, business documents; place in a waterproof, fireproof, and portable container; maintain duplicates off site

STORM RECOVERY

SAFETY

- **Electricity** – Avoid standing in flood water unless electricity is turned off at the circuit breaker
- **Utilities** – Contact Florida Power and Light (or applicable electrical utility) and local gas service provider for emergencies, service resumption, or meter inspection if in contact with flood water
- **Unsafe buildings/conditions** – Report to the local planning and/or building department
- **Stabilize buildings** – Tarp damaged roof and stabilize structures
- **Secure** – Prevent building intruders

ASSESS AND RECORD DAMAGE

- **Document losses** – Inventory and photograph property, equipment, furnishings damage prior to beginning clean up
- **Insurance company** – File claims

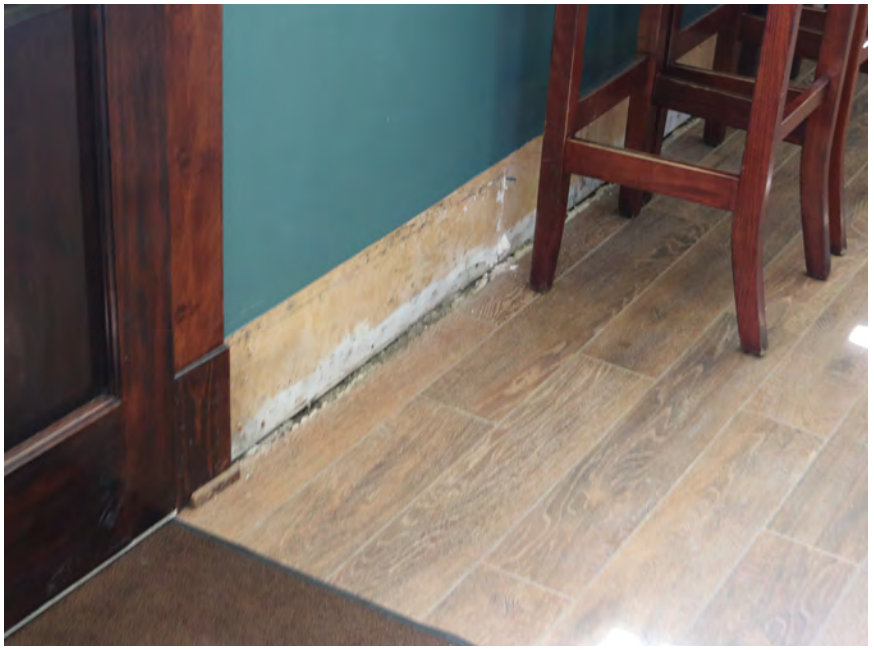
CLEANING UP AND DRYING OUT

- **Remove water** – Use sump pump and wet vacuum
- **Building materials** – Remove and discard damaged carpets, baseboards, wall surfaces, and insulation
- **Furnishings** – Discard if they cannot be cleaned
- **Remove mud/silt**– Remove prior to drying with a plastic-edged shovel to minimize damage to floor finishes
- **Ventilation** – Open windows and operate fans to dry out materials and minimize mold growth, remove baseboard and cornice to ventilate wall cavities and minimize mold growth
- **Clean/disinfect** – Use bleach and water solution, particularly at kitchen surfaces and equipment

Historic site features may be damaged and will need to be cleared from the public right-of-way for safekeeping and restoration activities.

Blue roof tarps are a common following a hurricane or other strong wind event and should only be temporary solutions.

Damage assessment teams can partner volunteers with local officials to collect the overall community damage impacts and provide information to property owners.



The removal of historic materials should be as limited as possible to avoid unintentional damage to the building's historic integrity.

Clean up may require removal of damaged drywall and insulation.

CARING FOR FLOOD-DAMAGED HISTORIC BUILDING MATERIALS

Historic building materials can often be salvaged with proper planning and if properly cared for after flood waters recede. Factors impacting the potential success of drying out a building include:

- Building materials;
- Height of flood water;
- Duration of flooding;
- Contaminants in flood water; and
- Duration prior to commencement of controlled drying.

There are two principal causes of flood water damage to historic building materials: the initial contact, and, secondary damage resulting from increased moisture and relatively humidity, like mold growth.

CLEANING UP

After the electricity has been disconnected and a building is deemed safe to enter, standing water can be removed and flood-damaged materials, equipment, and furnishings can be discarded. Mud and silt can enter wall cavities under baseboards and through electrical outlets and air ducts. As soon as feasible, mud and silt should be removed, preferably when wet, using plastic shovels to avoid scarring floor surfaces. All surfaces and openings should be thoroughly cleaned and dried prior to closing wall openings.

DRYING OUT

Although newer building materials such as drywall and wood laminates must be discarded if wet, historic building materials like plaster and solid wood trim and flooring can be salvaged if dried out slowly. The rate of drying will largely depend on the ambient relative humidity. When humidity rates are high, like during Florida's summers, the rate of drying needs to be slowed to prevent plaster cracking and wood warping. Historic preservation professionals, historic material specialists, or experienced contractors can be consulted for direct assistance.

Open all doors and cabinets and provide cross ventilation aided by fans to improve the effectiveness of the drying process if power is available. Dehumidifiers should be used with caution since they can dry out materials too quickly, but modest heating can be used in cooler temperatures. *(Refer to Installation of Secondary Power Source, page 4.6, and Historic England - Flooding and Historic Buildings, sidebar page 4.8)*

Rental equipment may be available to assist in the drying and dehumidifying process with precautions to ensure the process is low and slow to avoid permanent damage.

Lake County, ca. 1910 (Florida Memory)

A STORM VULNERABILITY CHECKLISTS

APPENDIX

Basic improvements are generally simple, low-impact strategies that are relatively simple and inexpensive to complete, and in some instances do not require a building permit or the services of a design professional. Although they typically will not result in a reduction in flood insurance premiums, they can potentially reduce the damage caused by flooding and high winds. *(Refer to Chapter 9: Review Requirements for Historic Properties)*

Whether or not a more complex mitigation project is anticipated, there are several relatively low-cost basic improvements that can be undertaken by property owners to improve flood and wind resilience and recovery. These basic improvements are relatively easy to complete, and, if carefully executed, do not require significant modification of historic buildings. If properly executed, they will have limited impact on historic integrity. ***Multiple basic improvements can often be implemented at a single property, improving its resiliency and recovery from flood and wind damage.***

BASIC IMPROVEMENT REQUIREMENTS

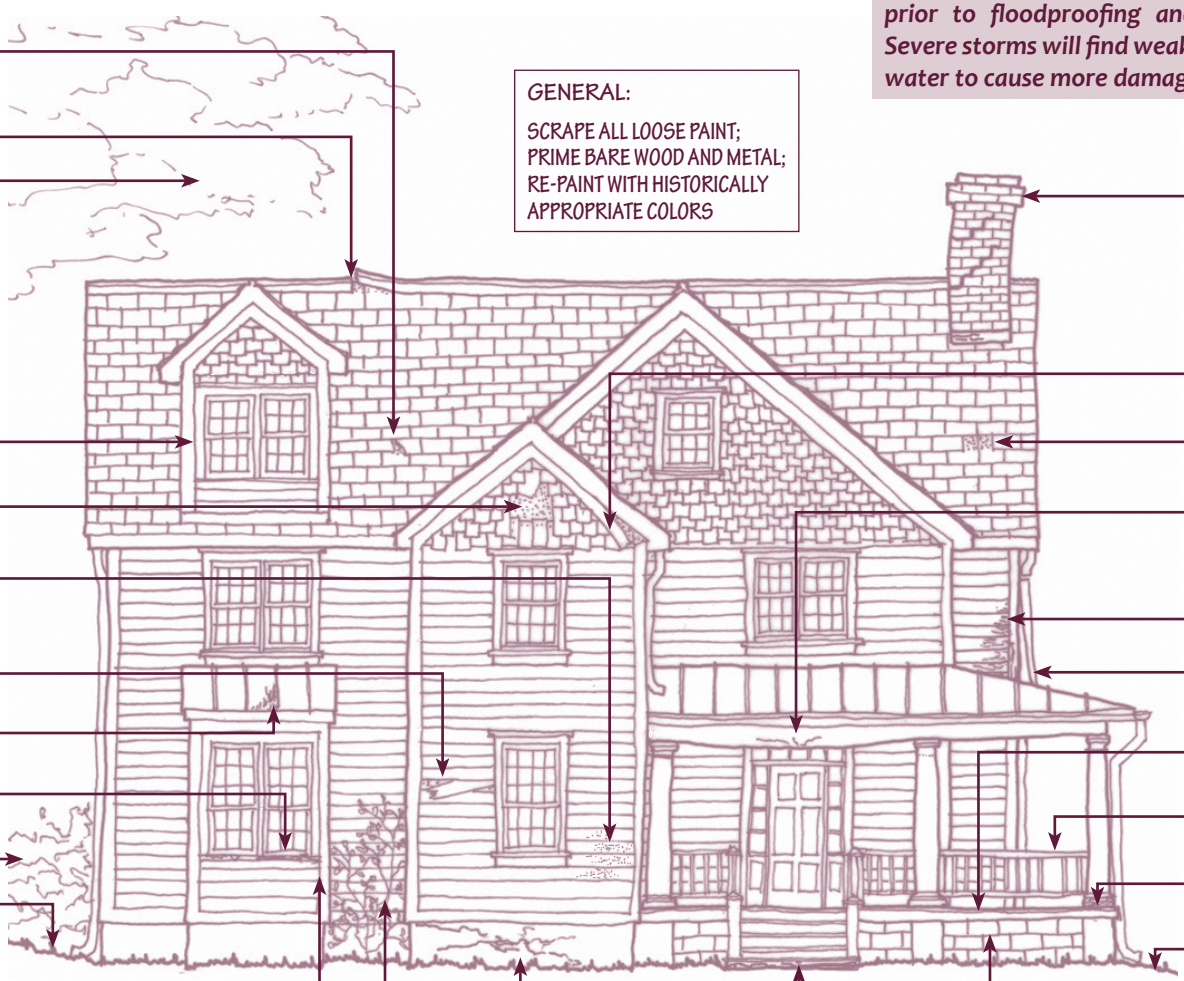
Some basic improvements are required as part of a wet floodproofing, dry floodproofing, building elevation, or building relocation project. Required improvements typically include the location of systems and equipment above the DFE, and use of flood damage-resistent materials in vulnerable areas.

Building permits may be required for:

- Installation of building systems and equipment
- Installation of back-flow preventer
- Installation of solar panels and generators
- Roof replacement and/or wind reinforcement

TYPICAL WOOD-FRAMED / RESIDENTIAL BUILDING MAINTENANCE NEEDS

Regular maintenance is an important factor in the long-term protection of all buildings and structures. Poorly maintained buildings and those that are structurally compromised will need additional work prior to floodproofing and wind retrofit projects. Severe storms will find weak points allowing wind and water to cause more damage and potential collapse.



MAINTENANCE IS GOOD PRESERVATION

Regular maintenance helps preserve buildings, structures, and properties; protect real estate value; and keeps Florida an attractive place to live, work, and visit. Lack of regular upkeep can accelerate deterioration of a property's elements and features. Small openings or unpainted surfaces can allow moisture penetration and eventually rot. In the case of historic buildings, character defining elements can be difficult and costly to replace. In addition, long-term lack of maintenance can impact a building's structure, resulting in expensive repairs.

Property owners and tenants are encouraged to inspect buildings and properties regularly to identify potential problems. Early detection usually means a smaller financial investment to not only improve a property's overall appearance and value, but also to prevent or postpone extensive and costly future repairs. Regular maintenance items include painting, and cleaning gutters and downspouts. Roof inspection for open joints, missing components, and cracks or bulges can reduce the potential for water infiltration.

MAINTENANCE

Flooding is often accompanied by secondary factors, such as high winds, and can be followed by fire. There are simple maintenance measures that can reduce the vulnerability of historic buildings and should be completed at all types of properties, including:

- ❑ Grading land to promote positive drainage away from historic buildings (contact local officials for any required review and approval of potential impacts on neighboring properties, sidewalks, archaeology, or roadways)
- ❑ Trimming overhanging tree limbs and removing rotted trees that might crash through a roof or take down electric and telephone lines in a wind storm
- ❑ Clearing site debris that might become water-borne or air-borne (if high winds accompany the flood), clog storm drains, provide fuel for a fire, and harbor pests or cause damage to the historic building or surrounding buildings
- ❑ Ensuring oil and propane tanks, including for outdoor grills, ovens, or kilns, and associated connections, are well maintained and anchored to prevent flotation

A well-maintained historic home will show consistent care across all building materials, exterior structural systems, decorative trim, and landscaping.

- ❑ Removing clutter and unnecessary storage in a building, particularly if items are hazardous, highly flammable, or located in a flood-prone area
- ❑ Maintaining roofing, flashing, gutters, and downspouts to direct stormwater away from buildings and allow absorption on the property
- ❑ Reinforcing roof framing to support wind loads
- ❑ Repointing masonry and repairing stucco, including chimneys, walls, foundations, and piers, to prevent collapse and stormwater infiltration
- ❑ Replacing or securing missing or dislodged siding to prevent stormwater infiltration and potential wind-borne debris
- ❑ Replacing cracked window glass that can shatter in a wind storm and allow water infiltration
- ❑ Sealing openings between building components or around penetrations such as hose bibs or conduits through walls
- ❑ Maintaining shutters in an operational condition to protect windows from air-borne debris in a wind storm
- ❑ Replacing cracked pipes to prevent plumbing leaks or sewer failure
- ❑ Replacing batteries in smoke and carbon monoxide detectors to provide notification of a fire or gas leak
- ❑ Locating a fire extinguisher in an accessible location

TYPICAL MASONRY / COMMERCIAL BUILDING MAINTENANCE NEEDS

GENERAL:

SCRAPE ALL LOOSE PAINT; PRIME BARE WOOD AND METAL; RE-PAINT WITH HISTORICALLY APPROPRIATE COLORS

REATTACH OR REPLACE DOWNSPOUT. VERIFY WHETHER SUFFICIENTLY SIZED FOR FLOW

REGULARLY REPAINT WOOD WINDOWS WITH HISTORICALLY APPROPRIATE COLORS AND REPLACE SEALANT AT MASONRY JOINTS

REPLACE INAPPROPRIATE WINDOW WITH 2/2 WINDOW TO MATCH HISTORIC CONFIGURATION

RESTORE ROTTED CORNICE AND REPLACE MISSING BRACKET

REGULARLY REPAINT EXTERIOR WOODWORK WITH HISTORICALLY APPROPRIATE COLORS

RECONNECT DOWNSPOUT TO BOOT - REPLACE DAMAGED BRICKS AND REPOINT OPEN JOINTS USING HISTORICALLY APPROPRIATE MORTAR

REMOVE PLANT GROWTH, CLEAR GUTTER AND VERIFY SLOPE TO DRAIN

RESTORE ROTTED CORNICE AND REPLACE MISSING BRACKET

CRACKING FROM CORNERS OF WINDOWS CAN INDICATE SIGNIFICANT PROBLEM - CONSULT ARCHITECT OR ENGINEER

REPOINT OPEN JOINTS USING HISTORICALLY APPROPRIATE MORTAR

RESTORE DAMAGED WOODWORK AND REPAINT

REPLACE DAMAGED BRICK AND REPOINT OPEN JOINTS USING HISTORICALLY APPROPRIATE MORTAR

MAINTENANCE MANUAL

Property owners will find it helpful to develop a maintenance manual to keep track of conditions, problems, maintenance tasks, and contractors who performed the work. This outline of conditions will assist property owners in diagnosing problems, prescribing remedies, and tracking the effectiveness of those remedies over time. The information in the manual generally falls into three categories:

- **General information** should include the names and telephone numbers for emergency services and repairs, as well as basic information on specific building equipment such as maintenance manuals;
- **Documentation information** should include historical, construction, alteration, and legal information that is specific to the property's past and current conditions; and
- **Inspection and maintenance requirements** should include the preventive maintenance checklists and with items to be inspected; how often inspections occur; and information on repair and upkeep techniques of particular components, materials, and equipment.

If a historic building is rehabilitated with grant funds, historic materials and features need to be repaired, if possible, to meet preservation requirements.

REPAIR VERSUS REPLACEMENT

One of the essential missions of Florida's Division of Historical Resources (DHR) is to protect and preserve historic properties for the benefit of future generations. ***To preserve the authenticity of Florida, the DHR strongly encourages the retention of historic materials or replacement in-kind whenever work on a property is considered.***

Recommended repairs are focused on specific areas of deterioration in order to maintain a building's stability and weather resistance, rather than wholesale replacement of a historic building material. Careful attention to detail might be required as part of the effort. Regular maintenance with timely repairs can minimize large repair costs associated with ongoing deterioration.

STORM VULNERABILITY CHECKLISTS

The following Storm Vulnerability Checklists can assist property owners in recording the current condition of their buildings, as well as keeping track of maintenance tasks as they are performed. The Checklists refer to typical problems associated with various materials and possible recommended actions. The Checklists should be modified to address the specific materials found at a property. If a building has serious problems, a more detailed inspection can be performed by a qualified architect or structural engineer who can recommend an appropriate treatment approach.

Florida's array of latitudes create distinct seasons for different regions of the state but winter seasons are not as severe as northern states. Specifically, winter in north Florida means colder and occasional freezing temperatures for short periods of time while winter in southern Florida is more like fall in northern states. There are two distinct seasonal shifts that property owners should coordinate with their cyclical maintenance check-ups; before fall/winter and in the early spring. The fall/winter review will assist in identification of projects needed before the season change, as well as identification of projects to be scheduled in advance of hurricane season for the following year. The spring review will help identify work that should be completed during the warm weather months prior to hurricane season. Areas of deterioration or problems should be photographed during each inspection. Dating of photographs can help document the condition's progression and assist in planning future repairs.

ROOFING AND RELATED ELEMENTS CHECKLIST

As a general rule, roofing and its associated components should be reviewed every fall and spring, accompanied by the regular cleaning of leaves and debris from gutters and downspouts. Additional reviews should be conducted prior to storm seasons. In addition, it is best to review the gutters, downspouts and attic areas during a rainstorm to determine whether they are functioning properly. Flat roofs or low-sloped roofs are best reviewed immediately following a rainfall to see if standing water or pooling is present. Care should be taken when reviewing or maintaining roofs since they are potentially dangerous, particularly when wet.

If there are questions regarding whether the severity of deterioration warrants replacement of an element, consultation with a professional is recommended. It is usually less costly to fix a small problem than to delay action, possibly resulting in more extensive deterioration and costly, future repair needs.

When planning a re-roofing project, the decking should be closely inspected and repaired as needed.

MATERIAL / LIFE SPAN	CONDITION OBSERVED	RECOMMENDED ACTION
Roofing – general	• Sagging or bowing of roof ridge, surface or rafters	❑ May indicate significant structural problems (Consultation with an architect or structural engineer is recommended, particularly if condition worsens)
	• Roof structure vulnerable to wind damage	❑ Reinforce roof framing (Consultation with an architect or structural engineer may be required)
Wood shingles or shakes 30+ years	• Shingles or shakes are not laid on open sheathing or batten strips (Verify from attic)	❑ Provide proper ventilation in attic
	• Moss, mold, or algae is present on roof surface	❑ Clean and treat surface to inhibit future growth ❑ Trim back overhanging tree limbs to allow direct sunlight onto roof surface
	• Wood is cupped or warped • Individual shingles or shakes are split • Individual shingles or shakes are uniformly thin from erosion • Shingles or shakes are missing	❑ Replace deteriorated shingles or shakes in-kind ❑ Consider roof replacement if deterioration is substantial or prevalent
Slate, clay, or concrete tiles 50+ years	• Shingles are not laid on spaced wood boards or batten strips (Verify from attic)	❑ Provide proper ventilation in attic
	• Broken or missing	❑ Re-attach, re-secure, or replace loose or missing slates or tiles in kind
	• Units are delaminating or flaking apart	❑ Replace deteriorated individual slates or tiles in-kind
	• Slate or tile particles are present in valleys, gutters, and downspouts	❑ Consider roof replacement when over 20% of slates or tiles are split, cracked, missing, or deteriorated

MATERIAL / LIFE SPAN	CONDITION OBSERVED	RECOMMENDED ACTION
Faux slate: rubber or plastic/polymer shingles (Varies based on manufacturer)	• Individual shingles are cracked • Individual shingles are curled, warped, or bent	❑ Replace deteriorated shingles with visually similar shingles ❑ Consider roof replacement if deterioration is substantial
	• Shingles are faded or discolored	❑ Consider roof replacement if deterioration is substantial
Asphalt shingles 20+ years	• Mineral granules are present in gutters and at the base of downspouts • Mineral granules are almost totally worn off shingle surface • Edges of shingles look worn • Shingles are missing • Shingles have lifting or curling edges	❑ Replace deteriorated or missing individual shingles in-kind ❑ Consider roof replacement when over 20% of units are split, cracked, missing, or deteriorated
	• Nails popping up	❑ Re-fasten or replace affected nails
	• Moss, mold, or algae has formed on roof surface	❑ Clean and treat surface to inhibit future growth ❑ Trim back overhanging tree limbs to allow sunlight to strike roof surface
Flat roofs (Varies based on product)	• Asphalt of roofing felt has bubbled, separated, or cracked • Roof feels loose or spongy underfoot • Water is pooling on roof • Mineral granules or gravel have worn away • Roofing felt looks dry or cracked	❑ Consider patching seams with compatible materials if area is isolated ❑ Consider roof replacement if deterioration is substantial or leaking is observed (Verify condition of roof substrate including rafters and plywood sheathing) ❑ Consider replacement roofing without gravel to reduce potential air-borne debris

MATERIAL / LIFE SPAN	CONDITION OBSERVED	RECOMMENDED ACTION
Metal roofs (60+ years)	• Surface has a substantial number of rust or corrosion spots • Surface has signs of previous tar patch jobs	❑ Tin, terne-coated steel, and terne-coated stainless all need repainting every 5-10 years and regular repair, but can last for decades if properly maintained ❑ Consider patching with compatible materials if area of deterioration is isolated ❑ Consider roof replacement if deterioration is substantial or prevalent
	• Metal is punctured • Joints or seams are broken	❑ Consider patching or re-soldering with compatible materials if area is isolated ❑ Consider roof replacement if deterioration is substantial or prevalent (Verify condition of roof substrate)
	• Surface of flat metal roof bulges • Water pools or stands on surface	❑ Consider roof replacement if deterioration is substantial or prevalent (Verify condition of roof substrate)
Flashing (formed sheet metal at joint intersections to prevent moisture penetration)	• Flashing is loose, corroded, broken, or missing • Flashing has roofing cement or tar • Flashing has openings or gaps • Vertical joints do not have both base and counter flashing	❑ Consider patching or replacement with compatible materials if area of deterioration is isolated, such as around a chimney ❑ Consider roof replacement if deterioration is substantial
Roof projections (dormer, TV dish, antenna, vent, pipe, skylight, mechanical equipment, lightning rod, cupola, etc.)	• Connections around roof projections are not properly flashed and watertight	❑ Consider patching with compatible materials if area of deterioration is isolated ❑ Removed abandoned rooftop projections that are not historic features to reduce number of roof penetration and attachment locations ❑ Consider flashing replacement if deterioration is substantial ❑ Verify that equipment is securely fastened to prevent it from becoming air-borne in a wind storm
Roof vents, soffits, overhangs	• Vulnerable to damage from high winds • Vulnerable to storm water infiltration	❑ Reinforce structure with hurricane-rated connectors ❑ Prepare vent protection such as plywood panels for installation in advance of a storm

MATERIAL / LIFE SPAN	CONDITION OBSERVED	RECOMMENDED ACTION
Chimneys	• Flashing around chimney is not watertight • Mortar joints in chimney are open or badly weathered • Masonry or stucco coating is cracked or crumbling • Chimney is leaning • Chimney is very tall or skinny	❑ Consider patching with compatible materials if area of deterioration is isolated ❑ Re-point deteriorated or open mortar joints ❑ Consider replacement if deterioration is substantial or prevalent (Replacement may necessitate chimney rebuilding from the roof surface up and replicate all chimney detailing in reconstruction) ❑ Install a reinforcing rod to prevent toppling in a wind storm
	• Chimney is not properly capped • Chimney is not properly lined	❑ Install an appropriate chimney cap for the building style and use dark colors instead of silver colored ❑ Install a chimney liner if wood-burning fireplace is used or if masonry or stucco inside flue is crumbling
Gutters and downspouts	• Gutters or downspouts are clogged	❑ Review roof drainage during a rainstorm (Water should collect in gutters and flow through downspouts without spilling over roof edge) ❑ Clean out debris at least twice each year, in the spring and fall, or more frequently based on tree proximity and debris accumulation ❑ Install screens over length of gutters and/or strainers over downspout locations
	• Gutters or downspouts are rusty, loose, askew, or tilting • Hanging gutter have open or missing seams • Sections are missing	❑ Consider repairing or patching with compatible materials if area of deterioration is isolated ❑ Consider gutter or downspout replacement if deterioration is substantial or sections are missing ❑ Verify gutters and downspouts are securely fastened to the building to prevent them from becoming air-borne in a wind storm
	• Metal lining of built-in box gutter has broken seams	❑ Re-solder open joints ❑ Consider replacement if deterioration is substantial or prevalent
	• Cast iron downspout boots are rusted	❑ Remove rust to bare metal (Apply rust-inhibitive primer and paint)
	• Water is pooling adjacent to foundation	❑ Re-grade area at foundation to direct water away from building ❑ Verify water exiting from downspout is directed away from building foundation (Install splash block or downspout extension at base of downspout to direct water to drain)

EXTERIOR WOODWORK CHECKLIST

Many of Florida's most historic residential buildings are wood frame construction. Generally, exterior woodwork should be reviewed every fall/winter and spring. The fall/winter review allows a property to be prepared for the change in temperatures and allows the owner to plan for spring repair and painting. The spring review will alert a property owner to damage that occurred over any severe temperature shifts and allow for repair during fair weather.

If there are questions regarding whether the severity of deterioration warrants replacement, consultation with a professional is recommended. If problems with the paint surface, wood siding, or shingles is a recurring issue, it could be related to the extreme difference in temperature and relative humidity between the inside and outside from air conditioning and or the type and installation of insulation in older buildings. Painting of exterior wood elements should be completed when the temperature and relative humidity are within the paint manufacturer's recommended ranges.

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Exterior walls (general)	• Exterior walls not plumb or vertically straight • Bulges visible at exterior walls • Door and window frames out-of-square • Siding surface is wavy • Wall or gable-end is vulnerable to wind damage	❑ May indicate differential or uneven foundation settlement or significant structural problems (Consultation with an architect or structural engineer is recommended, particularly if condition worsens) ❑ Install bracing or hurricane-rated connectors in consultation with an architect or engineer
Wood siding, shingles, and decorative woodwork	• Loose, cracked, missing, or open joints at wood siding, shingles or decorative woodwork	❑ Could lead to water infiltration and rot (Repair or replace in-kind as appropriate) ❑ Apply caulk to open joints (Verify compatibility with adjacent materials)
	• Thin or worn shingles	❑ Attempt patching with compatible materials if area of deterioration is isolated ❑ Consider replacement in-kind if deterioration is substantial or prevalent
	• Open joints around window and door frames • Open joints between dissimilar materials (such as wood siding and porch roof)	❑ Re-caulk, apply sealant, repair or replace deteriorated flashing as appropriate (Verify compatibility of caulk or sealant with adjacent materials and select paintable caulk or sealant if possible)
	• Mold, algae or mildew on siding or trim, especially on north side or shady areas • Vines growing on walls	❑ May indicate moisture problem (Verify if a vapor barrier is present in wall and consider removal if possible) ❑ Clean and treat surface to inhibit future growth (Do not use high pressure water since it could result in more significant problems) ❑ Remove vines and scrub surface with a stiff brush to remove roots on wall surface after they have dried ❑ Trim back shrubs and overhanging tree limbs to allow air circulation and sunlight to reach surface
	• Original siding or trim covered with vinyl or aluminum siding	❑ Vinyl or aluminum siding and capping can trap moisture and hide rot and damage (Vinyl or aluminum siding and capping should be removed and woodwork inspected for damage and repaired or replaced if necessary)

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Water and termite damage	• Dirt veins on exterior walls, particularly near foundation, steps, under galleries, porches, etc.	❑ Possible indication of termite damage (Contact extermination company to determine if there is active infestation and extent of damage)
	• Wood is soft when stuck with a small blade or ice pick, particularly window sills, galleries, porches, steps, sills, and siding	❑ Possible indication of wood rot or insect infestation (Eliminate source of moisture to control rot and replace defective elements in-kind; contact an extermination company to addressed possible infestation)
	• Wood is located on masonry foundation or pier or within six-inches of ground	❑ Wood on masonry foundations or piers or close to the ground can be vulnerable to rot and termite infestation (Review appropriate alternatives and conduct regular inspections) ❑ Retain a pest management company for regular inspections
	• Vegetation, such as shrubs, are located immediately adjacent to foundation • Vines are climbing on building	❑ Vegetation can trap moisture in woodwork by blocking sunlight and air circulation (Remove or thin vegetation close to a building or conduct regular inspections for rot behind vegetation) ❑ Climbing vines can trap moisture and grow behind siding (Remove vines to allow air and light at surface)
Windows, doors, skylights, garage doors	• Windows and doors do not fit or operate properly	❑ Verify whether frame is wracked or out-of-square (Possible indication of differential or uneven foundation settlement or deteriorated wall framing) ❑ Verify whether windows are painted shut and hardware, including sash cord or chains, is operational
	• Wood rot, particularly at sills and lower rails	❑ Repair or selectively replace deteriorated components in-kind ❑ Following repairs, verify deteriorated areas are well painted and joints caulked
	• Window is not operational	❑ Verify whether window has been painted shut ❑ Verify whether sash cords are attached to sash weights
	• Glass is cracked	❑ Replace glazing to match existing or impact-resistant glass
	• Glazing putty is missing, cracked, or deteriorated	❑ Replace glazing putty (Verify compatibility with adjacent materials)
	• Windows and doors are vulnerable to wind damage	❑ Repair traditional operable shutters ❑ Replace single-pane glass or apply impact-resistant film ❑ Install connectors for fabric storm panels or hurricane shutters, prepare plywood panels for installation ❑ Reinforce door hardware and garage doors from interior ❑ Replace with compatible labeled wind-resistant products
	• Storm/screen windows or doors are missing, deteriorated or non-operational	❑ Repair or replace deteriorated units as appropriate ❑ Consider installing interior storm windows and doors

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Porch, balcony, carport	• Vulnerable to wind damage	❑ Install bracing or hurricane-rated connectors in consultation with an architect or engineer ❑ Install connectors for fabric storm curtains
Painting	• Chalky or dull finish	❑ Surface cleaning might be all that is needed ❑ If repainting, additional preparation might be required
	• Paint surface worn	❑ Wood generally needs repainting every 5-8 years
	• Peeling, curling, crazing, and blistering	❑ Possible indication of non-compatible paint for surface (Review type of finish on existing material and confirm type of preparation required for new paint; may include surface scraping, sanding, and/or application of primer) ❑ Possible indication of a moisture problem (Review drainage, potential leaks and whether there is a vapor barrier within the wall and remove vapor barrier if appropriate) ❑ Check for drainage problems if area of failure is near gutter, downspout, or intersecting roof, such as a porch
	• Open joints between building components or around wall penetrations such as hose bibs, piping, or wiring • Caulk or sealant missing	❑ Seal openings to prevent infiltration of flood water, pests, and rodents
	• Caulk or sealant not adhering	❑ Verify compatibility with caulk or sealant and surface material (Select paintable caulk or sealant if possible and paint to match adjacent surface)

Failing paint and moisture can contribute to the deterioration of wood siding and should be repaired as soon as possible to avoid a larger repair project.

Brick walls and piers in Florida can deteriorate from saltwater intrusion and wind-blown sand in addition to usual maintenance issues.

EXTERIOR MASONRY, CONCRETE, AND STUCCO CHECKLIST

Masonry is present in most buildings, frequently as a foundation, pier, or chimney, and sometimes as the wall material. Since masonry is often part of the structural system of older buildings, it is critical that it be maintained to prevent serious problems. Masonry and stucco repair and cleaning should be conducted when the temperature is consistently between 40 - 90 degrees Fahrenheit to minimize potential spalling, problems associated with colder temperatures, and shrinkage with warmer temperatures. Painting or coating of masonry and stucco, where appropriate, should be completed when the temperature and relative humidity are within the paint or coating manufacturer's recommended ranges.

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Exterior walls and piers – (general)	• Cracks in masonry wall	❑ May indicate differential or uneven foundation settlement or significant structural problems (Consultation with an architect or structural engineer is recommended, particularly if condition worsens) ❑ Vertical and/or diagonal cracks or cracks that split individual bricks or stones indicate a potentially more significant problem, such as uneven settlement; horizontal cracks or hairline cracks limited to mortar joints or individual stones or bricks tend to be less serious (Consultation with an architect or structural engineer is recommended, particularly if condition worsens) ❑ Monitor and photograph condition every two years after repair to see if cracks return
	• Bows or bulges in wall plane • Leaning walls	❑ May indicate differential or uneven foundation settlement or significant structural problems (Consultation with an architect or structural engineer is recommended, particularly if condition worsens)
	• Water ponding adjacent to foundation • Vegetation, such as shrubs, located immediately adjacent to foundation • Vines growing on walls • Damp walls • Moss or algae on masonry surface	❑ Verify water exiting downspout is directed away from building foundation – Install splash blocks or downspout extensions to direct water away from wall ❑ Vegetation can trap moisture in masonry by blocking sunlight and air circulation (Remove or thin vegetation close to a building or conduct regular inspections for algae and mold behind vegetation and remove vines) ❑ Re-grade area adjacent to foundation to direct ground water away from building ❑ Remove vines and scrub surface with a stiff brush to remove roots on wall surface after they have dried ❑ Clean moss or algae from wall surface with low pressure water, with the possible use of gentle detergent and brushing
	• Efflorescence, usually a white, powdery surface due to water-soluble salts, leaching out of masonry and depositing on a surface by evaporation	❑ Clean efflorescence from wall surface with low pressure water, with the possible use of gentle detergent and a natural bristle brush ❑ Review area for possible sources of moisture

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Mortar	• Soft and crumbling • Open joints or broken joint bonds	❑ Consider patching with compatible mortar if area of deterioration is isolated (It is critical that mortar match original in appearance, profile, hardness, and composition to minimize potential reoccurrence) ❑ Consider replacement if deterioration is substantial
Stones and bricks	• Spalling, chipping, flaking, cracking, or crumbling of surface • Loose or missing stones or bricks	❑ Replace incompatible mortar and match original ❑ Consider patching with compatible materials if area of deterioration is isolated ❑ Consider replacement if deterioration is substantial
	• Pitted surface from sandblasting or pressure wash • Pitted surface from stucco removal	❑ Masonry with a damaged surface is more likely to absorb moisture, leading to accelerated deterioration (Consult a professional) ❑ Photograph condition and monitory biannually to see if surface continues to deteriorate ❑ Review adjacent materials and interior finishes for signs of moisture infiltration and rot
Concrete	• Open cracks in concrete surface	❑ Surface cracks can increase exposure of reinforcing bars to moisture and corrosion (Consultation with an architect or structural engineer is recommended, particularly if condition worsens) ❑ Substantial cracks might indicate differential or uneven foundation settlement or severe structural problems (Consultation with an architect or structural engineer is recommended, particularly if condition worsens)
	• Pitted surface from sandblasting or pressure wash	❑ Concrete with a damaged surface is more likely to absorb moisture leading to accelerated deterioration (Consult a professional) ❑ Monitor and photograph condition to see if it continues to deteriorate
Stucco	• Cracks in surface	❑ Consider patching with compatible stucco if area of deterioration is isolated ❑ Consider replacement if deterioration is substantial ❑ Substantial cracks might indicate differential or uneven foundation settlement or severe structural problems (Consultation with an architect or structural engineer is recommended, particularly if condition worsens)
	• Bulges in wall	❑ Verify keying of stucco to lath or underlying substrate (If wall area moves when pushed, stucco is not bonded and should be replaced with compatible material to avoid potential surface collapse) ❑ Check for moisture trapped behind stucco surface

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Brick or stone veneers	• Cracks in surface • Bulges in wall	❑ Verify brick and stone veneer is well attached to wall to prevent it from becoming air-borne
Flood vents	• Inadequate flood vents for free flow of flood water	❑ Install number and size of flood vents required to meet FEMA requirements
	• Flood vents located more than 12" above ground	❑ Consult architect or engineer to verify flood vents function as required ❑ Relocate flood vents so bottom is within 12" of ground to meet FEMA requirements
	• Flood vents blocked by debris or vegetation	❑ Clear both sides of flood vents to ensure free flow of water in and out
Painted masonry, concrete, and stucco	• Chalky or dull finish	❑ Additional preparation might be required prior to repainting (Preparation dependant on surface and condition)
	• Peeling, flaking, curling, and blistering	❑ Possible indication of a moisture problem (Review drainage, identify potential leaks and whether a vapor barrier is present in the wall and consider vapor barrier removal) ❑ Check for drainage problem if paint failure near a roof edge, downspout, porch ceiling, or foundations and repair
	• Paint surface worn	❑ Similar to woodwork, painted masonry tends to need repainting every 5-8 years with compatible paint

There are various types of stone and veneers used in Florida's historic buildings that need to be inspected to ensure they are not separating from the wall.

Paint is decorative and also a surface finish that needs to be maintained to protect the historic materials underneath from environmental damage.

PROPERTY CHECKLIST

Exterior maintenance extends beyond a building's perimeter to include the surrounding property. Seasonal property maintenance includes cutting grass, raking leaves, and clearing gutters and drains. Larger maintenance issues include: water management on the site, trimming trees, and regular repairs to fences, walls, walkways, and paved surfaces. Specific maintenance might be required for specialized site elements such as water features. Prior to anticipated storms, secure furnishings and features that could become air-borne or water-borne projectiles.

Monitor the foundation during rain storms for storm water that may be ponding or flowing into crawlspaces.

Tree rot can be difficult to identify

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Water management	• Rain water flows toward building foundation	❑ Re-grade around foundation to direct water away from building being mindful not to direct stormwater onto neighboring properties or to impact potential archaeological resources
	• Water ponding adjacent to foundation	❑ Verify water exiting downspouts is directed away from building foundation (Install splash blocks or downspout extensions to direct water away from walls)
	• Vegetation, such as shrubs, located immediately adjacent to foundation or vines are climbing on buildings	❑ Vegetation can trap moisture in wall surfaces by blocking sunlight and reducing air circulation (Remove or thin vegetation close to building or conduct regular inspections for rot, algae, fungus, and mold behind vegetation and remove climbing vines)
	• Debris around buildings including fallen tree limbs, leaves, construction debris, trash	❑ Remove debris that can become water-borne or air-borne projectiles in a storm, clog drains, provide fuel for a fire, harbor pests and rodents, or damage historic building materials
	• Tree limbs extend over roof • Trees are rotted	❑ Shade from the sun can lead to the formation of moss, fungus, mold, or algae; remove leaves and debris collected in gutters and downspouts to prevent clogging; and trim tree limbs that can cause severe damage if they fall during a storm (Trim limbs five feet away from building) ❑ Remove trees that are rotted an vulnerable to toppling in high winds
Metal and wood fences	• Metal fences	❑ Check for rust spots or bare metal (Remove rust, prime, and repaint every 5-8 years)
	• Wood fences	❑ Check for deterioration, repair, and/or replace components as needed ❑ Anticipate repainting or staining every 5-8 years
	• Fence vulnerable to wind damage	❑ Secure connections to prevent fence elements from becoming air-borne

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Sidewalk, walkway, and patio pavers	• Brick, flagstone, or concrete pavers cracked or missing	❑ Verify the condition of the sub-base and replace deteriorated or missing units in-kind
	• Water ponding on paved surface • Subsidence of paved surface	❑ Verify the condition of the sub-base and reset individual units to allow appropriate drainage
	• Vegetation growing between individual units	❑ Some vegetation has a substantial root structure that can dislodge individual paving units (Remove vegetation if appropriate)
Asphalt and concrete paving and driveways	• Cracked surface	❑ Seal cracks to minimize potential water infiltration ❑ Consider sealing or repaving entire surface if cracks are substantial or prevalent
	• Water ponding on paved surface • Subsidence of paved surface	❑ Verify the condition of the sub-base and patch to allow appropriate drainage
Pests and rodents	• Rodent droppings • Holes from burrowing animals	❑ Possible indication of pest or rodent infestation (Contact pest management company to determine if there is active infestation or nesting birds) ❑ Review appropriate alternatives and conduct regular inspections
Exterior furnishings	• Furnishings and planters in flood or wind-prone areas	❑ Identify protected storage area or securing methods to prevent furnishings and planters from becoming air-borne or water-borne projectiles
Equipment (TV dish, air conditioners, generator, pool equipment, etc.)	• Located in flood-vulnerable locations	❑ Elevate equipment and associated electrical connections above flood-vulnerable height
	• Located in wind-vulnerable locations	❑ Secure to prevent equipment from becoming air-borne projectiles
Propane and fuel tanks	• Located in flood-vulnerable locations • Located in wind-vulnerable locations	❑ Secure and/or anchor propane tanks and fuel tanks from barbecue grills, ovens, and kilns to prevent flotation and becoming air-borne projectiles
	• Rusted connections	❑ Replace deteriorated connections to minimize potential for fire if dislodged
Garages and storage buildings	• Accumulated clutter • Storage of hazardous or flammable materials	❑ Remove unwanted clutter that may become water-borne or air-borne in the event of flooding ❑ Relocate vulnerable objects to shelving above the vulnerable flood height and/or store in plastic bins ❑ Safely dispose of hazardous or flammable materials
	• Roof vulnerable to wind damage	❑ Reinforce framing with bracing or hurricane-related connectors
	• Door vulnerable to wind damage	❑ Reinforce door opening from interior

INTERIOR CHECKLIST

Exterior maintenance problems can be most evident at the interior of a building. The areas most likely to demonstrate exterior problems tend to be the least-visited parts of a house, such as the attic, basement, or crawlspace. It is important to remember that attics, basements, and crawlspaces are spaces with distinct conditions. Attics sit directly under roofs and thus can be highly susceptible to temperature changes, moisture infiltration, and wind damage. Similarly, a basement or a crawlspace is vulnerable to moisture and pest infestation and damage. Because these spaces typically do not have heat, air conditioning, or moisture control at the same levels as the rest of the building, problems can fester and become severe before being noticed. It is important that these areas, though often awkward to access, receive regular attention.

Attic spaces are often unfinished and can reveal moisture and structural damage, particularly at buildings with complex roofs and towers.

Crawlspaces can be inspected through access panels to observe any issues with debris, standing water, or nesting rodents.

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Attic space	• Water stains on rafters or roof boards (Probably indicated by either a dark patch on the wood or plaster or a white bloom indicating salt crystallization)	❑ Review during or immediately following a rainstorm to understand whether staining is an active or past problem (Pay particular attention to flashing locations around roof penetrations such as vent pipes, chimneys and dormer windows, as well as at valleys and eaves, especially prior to storm seasons)
	• Mildew on underside of roof structure • Dampness in attic space • Overheated attic	❑ Verify whether the attic is sufficiently ventilated
	• Broken or missing collar beams • Cracked or sagging rafter	❑ Potential structural problem (Consultation with an architect or structural engineer is recommended, particularly if condition worsens)
	• Roof structure vulnerable to wind damage	❑ Reinforce roof and gable-end framing and install hurricane-rated connectors (Consultation with an architect or structural engineer may be required)
	• Inadequate insulation at attic floor or between rafters	❑ Install appropriate insulation without a vapor barrier (Select insulation that is reversible and will not cause damage if wet)

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Basement and crawlspace	• Mortar of walls or piers is soft and crumbling • Damp or moldy smell • Evidence of dampness under first floor framing or around pipes • Evidence of wood rot or insect infestation at wood sills on top of foundation walls or first floor joists • Periodic flooding	❑ Review for potential moisture infiltration ❑ Verify water exiting from downspouts is directed away from building foundation (Install splash blocks or downspout extensions at base of downspouts) ❑ Re-grade area at foundation to direct rain water away from building ❑ Verify that foundation vents are clear of debris ❑ Check underground water supply and drainage systems for cracked or clogged pipes ❑ Re-point areas of deteriorated mortar ❑ Apply stucco to brick piers if appropriate ❑ Retain a pest management company to provide regular inspections and contact immediately for potential infestation
	• Accumulated clutter • Storage of hazardous or flammable materials	❑ Remove unwanted clutter that may become water-borne or air-borne projectiles in the event of flooding ❑ Relocate vulnerable objects to shelving above the vulnerable flood height and/or store in plastic bins ❑ Safely dispose of hazardous or flammable materials
	• Building systems and equipment in flood-prone area	❑ Relocate building systems and equipment including electric panels, conduits, and junction boxes above expected flood water height ❑ Install a drainage system and sump pump to remove accumulated flood water
	• Cracked pipes • Sewage backups	❑ Replace cracked pipes to prevent plumbing leaks and sewer failure ❑ Install a back flow preventer or backwater valve
	• Open joints between building components or around wall penetrations such as hose bibs, piping, or wiring • Caulk or sealant missing	❑ Seal openings to prevent infiltration of flood water, pests, and rodents in a color compatible with adjacent wall surface
	• Inadequate insulation	❑ Install insulation under first floor framing ❑ Install appropriate insulation around pipes, heating, and air conditioning ducts (Condensation can form on un-insulated equipment and pipes)

MATERIAL	CONDITION OBSERVED	RECOMMENDED ACTION
Furnishings and storage (furniture, kitchen cabinets, appliances, computer equipment, televisions)	• Fabrics and soft materials located in flood-prone areas • Furnishings resting on floor in flood-vulnerable area	❑ Minimize fabrics and soft materials near floors such as rugs, cloth chairs, sofas, bed linens, and drapes ❑ Select furnishings, kitchen cabinets, and appliances for flood-prone areas supported by metal legs such as bookcases, dressers, beds, sofas, chairs, and tables ❑ Locate computers and television equipment above flood-vulnerable heights ❑ Maintain copies of computer files, important papers, and photographs offsite or in a waterproof container
	• Accumulated clutter • Storage of hazardous or flammable materials	❑ Remove unwanted clutter that may become water-borne or air-borne projectiles in the event of flooding or a severe storm ❑ Relocate vulnerable objects to shelving above the vulnerable flood height and/or store in plastic bins ❑ Safely dispose of hazardous or flammable materials
Smoke and carbon monoxide detectors, fire extinguishers	• Smoke and/or carbon monoxide detector missing or out of warrantee • Batteries are dead	❑ Install new smoke and/or carbon monoxide detector ❑ Replace batteries every six months ❑ Install fire extinguishers in accessible locations

Calhoun County, 1916 (Florida Memory)

B APPENDIX ORGANIZATIONS AND RESOURCES

ORGANIZATIONS

The organizations and agencies on the following pages include the principal entities that most individuals will interact with during a flood mitigation project at a historic property. Although each entity may serve many functions, their primary functions in addressing flood and wind mitigation at historic properties are identified for easy reference. Many of their websites include detailed information about their roles and resources.

BEGINNING A MITIGATION PROJECT

The best first stop for a property owner considering a flood mitigation project is their local government offices. Many municipalities at the local level or county levels have staff members who are able to assist individuals attempting to navigate mitigation projects.

Depending on the complexity of the proposed mitigation project, consultation with a qualified architect or engineer can provide valuable information related to the specific issues and potential mitigation measures at a property. *(Refer to Design Professionals, sidebar page 2.15)*

LOCAL GOVERNMENT

The following is a list of officials within typical municipal or county government departments who can provide specific information regarding flood and wind mitigation requirements and program within their communities:

BUILDING OFFICIAL

- Administers the local building code for flood and wind mitigation projects
- May assist with variances regarding required building flood heights in flood zones

FLOODPLAIN MANAGEMENT OFFICIAL

- May double as the building official or stormwater engineer
- Administers variances from floodplain management codes
- Provides reports to FEMA and the Community Rating System (CRS) program where applicable
- May have access to Elevation Certificates and Floodproofing Certificates previously commissioned for a property

CODE ENFORCEMENT OFFICER

- Responds to complaints regarding non-compliance with municipal code requirements

MUNICIPAL PLANNER

- May advise on setback, use, height, and preservation requirements of the zoning code

STORMWATER ENGINEER

- May advise on municipal infrastructure improvements and coordinate with municipal floodplain management staff and local mitigation task force

PRESERVATION PLANNER / STAFF

- May administer local preservation ordinance requirements and serve as a liaison to a historic preservation board

REVIEW BOARDS

- May include historic resource commission, zoning, adjustments, and/or enforcement, depending on local ordinances

STATE GOVERNMENT

FLORIDA DIVISION OF EMERGENCY MANAGEMENT

- Statewide agency that is the intermediary between the federal government and local agencies
- Issues guidance materials related to Florida's hazards and response programs
- Can assist property owners in connecting with their local mitigation officials and any available grant programs

www.floridadisaster.org/dem

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

- Statewide agency responsible for stewardship of air, water, and land resources; property owners with coastal property or septic tanks may require review and approval for redevelopment
- Administers the Office of Resilience and Coastal Protection that offers resiliency guidance and research to property owners contemplating mitigation activities

www.floridadep.gov/about-dep

FLORIDA DIVISION OF HISTORICAL RESOURCES

- Statewide agency that is the intermediary between federal and local governments concerning historic structures and archaeological sites for federal historic tax credit projects and some local property tax exemptions
- Provides comments on state-funded and federally-funded or permitted projects involving historic structures or archaeological sites including FEMA Flood Mitigation Assistance and Hazard Mitigation Grant Program activities
- Administers grant programs for historic structures and archaeological sites owned by non-profit entities
- Provides educational programming and guidance for disaster mitigation

www.dos.myflorida.com/historical

FEDERAL GOVERNMENT

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

- Administers the National Flood Insurance Program (NFIP) and publishes the Flood Insurance Rate Maps (FIRMs)
- Issues guidance materials on flood mitigation techniques and compliance methods
- May provide financial recovery assistance during immediate aftermath, long-term recovery, and/or mitigation assistance to reduce threats of future flood events under a variety of programs

  Disaster Assistance: *www.fema.gov/assistance*

  Flood Maps: *www.fema.gov/flood-maps*

HOUSING AND URBAN DEVELOPMENT, U.S. DEPARTMENT OF (HUD)

- Following a Presidential Disaster Declaration, HUD may provide recovery assistance directly to individuals and more commonly through funds issued to a local government through the Community Development Block Grant (CDBG) program
- The Florida Department of Economic Opportunity can be contacted for HUD funding opportunities

  www.floridajobs.org

SMALL BUSINESS ADMINISTRATION (SBA)

- Can provide loans for disaster recovery not only to businesses but also to renters and property owners to assist recovery efforts where insurance or FEMA funding is not available
- Items that may be covered include property damage for primary residences and qualified rental properties, and personal property for damage to contents

  www.sba.gov

STATE-WIDE NON-PROFITS

FLORIDA TRUST FOR HISTORIC PRESERVATION

- Statewide non-profit that can offer guidance and contacts for considering impacts of mitigation activities on historic properties
- May provide documentation and evaluation assistance following a storm event

  www.floridatrust.org

PRIVATE ENTITIES

INSURANCE AGENCY

- Private sector resource for providing homeowner, flood, wind, and liability insurance
- May provide appropriate repair and replacement costs for historic properties through consultation with a qualified insurance agent prior to a storm

RESOURCES

Many of the organizations identified in this section have information available on their websites and can assist in planning and funding a mitigation project. The following are titles of recommended publications and other resources:

FLOOD AND WIND IMPACTS: HISTORIC PROPERTIES

The Secretary of the Interior's Standards (SOIS) for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings (2017)

U.S. Department of the Interior, National Park Service Technical Preservation Services, 2017

Provides general guidance for all historic resources and is regulatory document for projects receiving federal funds or permits that may affect their preservation, rehabilitation, restoration, or reconstruction

www.nps.gov/tps

The Secretary of the Interior's Standards for Rehabilitation and Guidelines on Flood Adaptation for Rehabilitating Historic Buildings

U.S. Department of the Interior, National Park Service Technical Preservation Services, 2021

Provides technical preservation guidance specific to historic properties at risk to flooding

www.nps.gov

Treatment of Flood Damaged Older and Historic Buildings

National Trust for Historic Preservation, Richard Wagner and Claudette Hanks Reichel, 1993

Advises historic property owners how to begin immediate and long-term repairs for a flood-damaged historic property

www.savingplaces.org

Make Mitigation Happen: Mitigating Your Home Could Translate to Savings and Peace of Mind.

Florida's Foundation, Florida Department of State, Florida Division of Emergency Management, (2013)

Provides mitigation guidance to protect homes from hurricanes

www.floridadisaster.org/dem/library/publications-and-guides

Protecting Your Historic Home from Natural Disasters

National Park Service Center for Training and Technology and the Louisiana Division of Historic Preservation, 2015

Helps residential property owners identify the means to minimize risk and prepare for future disasters, as well as provide critical environmental and historic preservation information

www.ncptt.nps.gov

Disaster Planning for Florida Historic Resources and Disaster Mitigation for Historic Structures: Protection Strategies

1000 Friends of Florida, Florida Department of State, Division of Historical Resources, Florida Division of Emergency Management, 2006 and 2008

Illustrates the basic principles of disaster mitigation for Florida's historic resources as well as mitigation and planning objectives

www.floridadisaster.org

Resilient Heritage in the Nation's Oldest City: St. Augustine

City of St. Augustine and Taylor Engineering et. al., 2020

Explains the comprehensive basis for disaster mitigation at the local level with respect to archaeological and historic preservation, economic impacts and incentives, regulatory initiatives, and creative adaptation measures

www.citystaug.com

Flood Mitigation Design Guidance for Historic Residential Property Owners

City of St. Augustine and Preservation Design Partnership, 2021

Outlines specific physical site and building mitigation and preservation techniques for historic residential property owners within the context of floodplain management for traditional 19th century architecture

www.citystaug.com

Drying Out Water Damaged Buildings – Video

North Carolina State Historic Preservation Office, 2018

Offers a tutorial on the specific means and methods for drying out a historic wood frame building

www.ncdcr.gov/state-historic-preservation-office

Resilient Rehab: A Guide to Historic Buildings in Miami-Dade County

Miami-Dade County Office of Historic Preservation and Shulman + Associates, 2021

Updates traditional historic preservation design guidelines to include a focus on resilient building strategies

www.miamidade.gov

Buoyant City: Historic District Resiliency and Adaptation Design Guidelines

City of Miami Beach and Shulman + Associates et. al., 2020

Identifies the challenges of flooding in historic districts along with opportunities for creative adaptation and resiliency initiatives

www.miamibeachfl.gov

Flooding and Historic Buildings

Historic England, 2015

Provides a wholistic approach to flood mitigation with special focus on unique building materials and acceptable conservation techniques for historic buildings

www.historicengland.org.uk

Flood Damage to Traditional Buildings

Historic Environment Scotland, 2014

Recognizes the increased severity and occurrence of flooding and erosion and the need for more guidance to protect traditional buildings from damage

www.historicenvironment.scot

Rebuilding Water Damaged Homes: A Manual for the Safe, Healthy, Green, and Low-cost Restoration of Housing

U.S. Department of Housing and Urban Development, The Alliance for Healthy Homes, and Dennis Livingston, 2009

Focuses on recovery processes by homeowners/tenants and contractors as a workbook for educational seminars on repair of pre-WWII homes using low-cost strategies, maximizing energy efficiency where possible

www.hud.gov

FLOODPLAIN AND COMPLIANCE POLICIES

Florida Building Code, Existing Building, 7th Edition (FBC)

International Code Council, Inc., 2020

Regulates the repair, alteration, change of occupancy, addition to, and relocation of, existing buildings in Florida; enforced by local governments and maintained by the Florida Building Commission in accordance with Florida Statutes

www.codes.iccsafe.org

FEMA Floodplain Management Bulletin – Variances and the National Flood Insurance Program

Federal Emergency Management Agency P-993, 2014

Assists local governments review requests for variances to floodplain requirements with respect to the National Flood Insurance Program (NFIP)

www.fema.gov

FEMA Floodplain Management Bulletin - Historic Structures

Federal Emergency Management Agency P-467-2, 2008

Addresses how the National Flood Insurance Program (NFIP) treats historic structures and identifies mitigation measures to protect historic resources from floods

www.fema.gov

Florida Department of Emergency Management: The Florida Greenbook of Environmental and Historic Preservation Compliance

Guides applicants of FEMA Public Assistance funding programs through environmental and historic preservation compliance requirements

www.floridadisaster.org/globalassets/dem/recovery/flgreenbook.pdf

National Flood Insurance Program (Florida Hazards)

Identifies pertinent resources to view Flood Insurance Rate Maps (FIRMs), advice on flood insurance, and planning for a flood event

www.floridadisaster.org

FINANCIAL ASSISTANCE PROGRAMS

Disaster Recovery Assistance Programs for Historic Properties

Florida Division of Historical Resources, 2017

Summarizes the recovery programs available at the state and national level for historic properties impacted by natural disasters

www.dos.myflorida.com/historical

Federal Emergency Management Agency (FEMA)

Offers preparedness, mitigation, resilience, and emergency grants through a variety of different programs within the agency

www.fema.gov

U.S. Department of Housing and Urban Development (HUD) Disaster Resources

Shares information on current and past disaster assistance programs which may be available to communities and individuals

www.hud.gov

U.S. Army Corps of Engineers (USACE) Flood Risk Management Program

Focuses on the policies, programs, and expertise of the USACE to reduce overall flood risk from building community infrastructure to planning initiatives at a large scale

www.iwr.usace.army.mil

Florida Department of Economic Opportunity Office of Long Term Resiliency

Supports communities following disasters with housing, infrastructure, and economic development through the HUD Community Development Block Grant Program

www.floridajobs.org

Florida Department of Emergency Management Hurricane Loss Mitigation Program

A state-funded mitigation program aimed at minimizing damages caused by hurricanes by promoting property resiliency through retrofits made to residential, commercial, and mobile home properties

www.floridadisaster.org

INTERACTIVE RESEARCH

National Oceanic and Atmospheric Administration (NOAA)

www.noaa.gov

In Harm's Way: Hurricane Ida's Impacts on Socially Vulnerable Communities

www.storymaps.arcgis.com/stories

Office for Management Digital Coast Data Resources

www.coast.noaa.gov/digitalcoast

Sea Level Rise Viewer

www.coast.noaa.gov/slr

Florida Public Archaeology Network (FPAN) Tidally United Summits and HMS Florida Program

www.fpan.us

Hurricane Retrofit Guide

Division of Emergency Management, Bureau of Mitigation (2010)

apps.floridadisaster.org/hrg

Florida Wind Insurance Savings Calculator

Division of Emergency Management

apps.floridadisaster.org/wisc

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) TECHNICAL PUBLICATIONS

The Federal Emergency Management Agency (FEMA) has numerous publications available to address construction in flood-prone areas available on their website at *www.fema.gov*.

HURRICANE SANDY IN NEW JERSEY AND NEW YORK: MITIGATION ASSESSMENT TEAM REPORT - RECOVERY ADVISORIES AND FACT SHEETS FOR HURRICANE SANDY

- RA1. Improving Connections in Elevated Coastal Residential Buildings (February 2013)
- RA2. Reducing Flood Effects in Critical Facilities (April 2013)
- RA3. Restoring Mechanical, Electrical, and Plumbing Systems in Non-Substantially Damaged Residential Buildings (April 2013)
- RA4. Reducing Interruptions to Mid- and High-Rise Buildings During Floods (March 2013)
- RA5. Designing for Flood Levels Above the BFE After Hurricane Sandy (April 2013)
- RA6. Protecting Building Fuel Systems from Flood Damage (April 2013)
- RA7. Reducing Flood Risk and Flood Insurance Premiums for Existing Residential Buildings in Zone A (November 2013)
- Fact Sheet 1. Cleaning Flooded Buildings (May 2013)
- Fact Sheet 2. Foundation Requirements and Recommendations for Elevated Homes (May 2013)

FEMA FACT SHEETS

- Community Rating System (June 2017)
- Historic Structures and The Biggert-Waters Flood Insurance Reform Act of 2012
- Historic Preservation and Cultural Resources: Protecting Our Heritage (July 2016)
- Technical Fact Sheet 1.2: Summary of Coastal Construction Requirements and Recommendations

FEMA TECHNICAL BULLETINS

The following Technical Publications are for buildings in Special Flood Hazard Areas in accordance with the National Flood Insurance Program:

- **Technical Bulletin 0:** User's Guide to NFIP Technical Bulletins (June 2021)
- **Technical Bulletin 1:** Requirements for Flood Openings in Foundation Walls and Walls of Enclosure: Below Elevated Buildings (March 2020)
- **Technical Bulletin 2:** Flood Damage-Resistant Materials Requirements (August 2008)
- **Technical Bulletin 3:** Non-Residential Floodproofing Requirements and Certifications (January 2021)
- **Technical Bulletin 4:** Elevator Installation (June 2019)
- **Technical Bulletin 5:** Free-of-Obstruction Requirements (March 2020)
- **Technical Bulletin 6:** Below-Grade Parking Requirements (January 2021)
- **Technical Bulletin 7:** Wet Floodproofing Requirements and Limitations (May 2022)
- **Technical Bulletin 8:** Corrosion Protection for Metal Connectors in Coastal Areas (August 2019)
- **Technical Bulletin 9:** Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings (September 2021)
- **Technical Bulletin 10:** Ensuring That Structures Built on Fill in or Near Special Flood Hazard Areas Are Reasonably Safe from Flooding (May 2001)
- **Technical Bulletin 11**: Crawlspace Construction for Buildings Located in Special Flood Hazard Areas (November 2001)

FEMA - MISCELLANEOUS

FEMA FL-RA1, Successfully Retrofitting Buildings for Wind Resistance - Hurricane Michael in Florida (June 2019)

FEMA FL-RA2, Best Practices for Minimizing Wind and Water Infiltration Damage (June 2019)

FEMA P-234: Repairing Your Flooded Home (October 2010)

FEMA P-259, 3rd Edition: Engineering Principles and Practices of Retrofitting Floodprone Residential Structures (2012)

FEMA P-312, 3rd Edition: Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home from Flooding (2014)

FEMA P-348, Edition 1, Protecting Building Utilities from Flood Damage (2019)

FEMA 386-6, Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning (2006)

FEMA P-467-2, Floodplain Management Bulletin: Historic Structures (2008)

FEMA P-499 Home Builder's Guide to Coastal Construction (2010)

FEMA P-758 Substantial Improvement/Substantial Damage Desk Reference (2010)

FEMA P-804, Wind Retrofit Guide for Residential Buildings (December 2010)

FEMA P-936, Floodplain Management Bulletin – Floodproofing Non-Residential Buildings (2013)

FEMA P-1037 Reducing Flood Risk to Residential Buildings That Cannot Be Elevated (September 2015)

Protect Your Property from Severe Winds (September 2021)

This brochure provides homeowners and renters with steps to prepare for and reduce disaster damage from severe winds.

Lake County, ca. 1910 (Florida Memory)

COMMON ACRONYMS

BFE: Base Flood Elevation

CRS: Community Rating System

DEM: Division of Emergency Management

DFE: Design Flood Elevation

DHR: Division of Historical Resources

FBC: Florida Building Code

FEMA: Federal Emergency Management Agency

FIRM: Flood Insurance Rate Map

GIS: Geographic Information System

LiMWA: Limit of Moderate Wave Action

MHHW: Mean Higher High Water

NFIP: National Flood Insurance Program

NOAA: National Oceanic and Atmospheric Administration

NPS: National Park Service

SFHA: Special Flood Hazard Area

APPENDIX C

GLOSSARY

This glossary includes terminology commonly referenced in flood mitigation. ***Definitions provided are for reference only. It is important to confirm the most recent definitions for legal use within each municipality.***

The definition sources referenced in this glossary are from the following resources:

- **FBC:** Florida Building Code
- **FEMA:** Federal Emergency Management Agency
- Florida Department of Financial Services
- **NFIP:** National Flood Insurance Program
- **NOAA:** National Oceanic and Atmospheric Administration
- **NPS:** National Park Service

1% Annual Chance Floodplain (100-year Floodplain). An area that has a 1% chance of flooding in any given year. Properties can experience a "100-year flood" in two consecutive years, just as it is possible for properties to flood even if they are located outside of the floodplain, particularly in a severe weather event such as a hurricane.

0.2% Annual Chance Floodplain (500-year Floodplain). An area that has a 0.2% chance of flooding in any given year.

100-year Flood. See base flood. [NFIP]

Accessible. A site, building, facility, or portion thereof that complies with the Florida Building Code. [FBC]

Accessory Structure. An accessory structure is a structure which is on the same parcel of property as a principal structure and the use of which is incidental to the use of the principal structure. For example, a residential structure may have a detached garage or storage shed for garden tools as accessory structures. Other examples of accessory structures include gazebos, picnic pavilions, boathouses, small pole barns, storage sheds, and similar buildings. National Flood Insurance Program (NFIP) regulations for new construction generally apply to new and substantially improved accessory structures. [NFIP]

Adaptive Reuse. The conversion of functional change of a building from the purpose or use for which it was originally constructed or designed. [FBC]

Adaptive Use. A use for a building other than that for which it was originally designed or intended. [FBC]

Addition. An extension or increase in floor area, number of stories, or height of a building or structure. [FBC]

Alteration. Any construction or renovation to an existing structure other than a repair or addition. [FBC]

Anchored. Adequately secured to prevent flotation, collapse or lateral movement. [NFIP]

Anchoring. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall 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. There are specific requirements for manufactured homes and structures in V Zones. [NFIP]

Architectural Style. Refers to the decorative elements applied to a specific form, such as brackets or a type of window or door, and is often associated with specific construction periods.

Architectural Type. Addresses the overall size, shape, and proportions of a building.

ASCE 24. A standard titled flood resistant design and construction that is referenced by the Florida Building Code. ASCE 24 is developed and published by the American Society of Civil Engineers, Reston, VA.

Base Flood. A flood having a one percent chance of being equaled or exceeded in any given year. This is the regulatory standard also referred to as the "100-year flood." [NFIP]

Base Flood Depth (BFD). The depth shown on the Flood Insurance Rate Map (FIRM) for Zone AO that indicates the depth of water above highest adjacent grade resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. [NFIP]

Base Flood Elevation (BFE). The elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM) for zones AE, AH, A1–A30, AR, AR/A, AR/AE, AR/A1– A30, AR/AH, AR/AO, V1–V30 and VE. [NFIP]

Basement. (for flood loads). The portion of a building having its floor subgrade (below ground level) on all sides. This definition of "Basement" is limited in application to the provisions of Section 1612. [FBC]

Breakaway Wall. A wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system. [NFIP]

Certifications. Certain activities (e.g., floodproofing design, V-Zone construction design, survey of building elevations, hydrologic and hydraulic analyses, survey and topographic data) require certification by a licensed professional architect, engineer, surveyor, or the community floodplain administrator. [NFIP]

Climate Change. Climate is determined by the long-term pattern of oceanic and atmospheric conditions at a location. Climate is described by statistics, such as means and extremes of temperature, precipitation, and other variables, and by the intensity, frequency, and duration of weather events. Over Earth's history, indications of climate change have been recorded in fossils and ice core samples. At one extreme, climate change can result in extended periods of heat and drought; at the other, extensive glaciation. Currently, our planet's global surface temperature is rising. This change is linked to human activities that increase the amount of greenhouse gases (e.g., carbon dioxide and methane) in the atmosphere. It is important to understand climatic processes because they have the potential to affect environmental conditions. [NOAA]

Coastal A Zone. Area within a special flood hazard area, landward of a V zone or landward of an open coast without mapped coastal high hazard areas. In a coastal A zone, the principal source of flooding must be astronomical tides, storm surges, seiches or tsunamis, not riverine flooding. During the base flood conditions, the potential for breaking wave height shall be greater than or equal to 1 ½ feet (457 mm). The inland limit of the coastal A zone is (a) the Limit of Moderate Wave Action if delineated on a FIRM, or (b) designated by the authority having jurisdiction. [FBC]

Coastal High Hazard Area. Area within the special flood hazard area extending from offshore to the inland limit of a primary dune along an open coast and any other area that is subject to high-velocity wave action from storms or seismic sources, and shown on a Flood Insurance Rate Map (FIRM) or other flood hazard map as velocity Zone V, VO, VE or V1-30. [FBC]

Community Rating System (CRS). A program developed by FEMA to provide incentives for those communities in the Regular Program that have gone beyond the minimum floodplain management requirements to develop extra measures to provide protection from flooding. [NFIP]

Crawlspace. Crawlspace foundations are commonly used in some parts of the nation to elevate the lowest floors of residential buildings located in Special Flood Hazard Areas (SFHAs) above the Base Flood Elevation (BFE). Crawlspaces should be constructed so that the floor of the crawlspace is at or above the lowest grade adjacent to the building. Crawlspaces that have their floors below BFE must have openings to allow the equalization of flood forces. [NFIP]

Cumulative Damage Building. Any building that has incurred flood-related damage as a result of two or more flooding events in which the cumulative amounts of payments equals or exceeds the fair market value of such building, as determined through use of the following procedure. To determine whether a building has been cumulatively damaged, a loss percentage will be calculated, for each loss, equal to the claim payment amount for that loss divided by the fair market value of such building on the day before each loss. [NFIP]

Cumulative Damage Property. Either a cumulative damage building or the contents within a cumulative damage building, or both. [NFIP]

Dangerous. Any building, structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:

1. The building or structure has collapsed, has partially collapsed, has moved off its foundation, or lacks the necessary support of the ground.
2. There exists a significant risk of collapse, detachment or dislodgement of any portion, member, appurtenance or ornamentation of the building or structure under service loads. [FBC]

Design Flood. The flood associated with the greater of the following two (2) areas:

(1) Area with a floodplain subject to a 1-percent or greater chance of flooding in any year; or

(2) Area designated as a flood hazard area on the city's flood hazard map, or otherwise legally designated. [FBC]

Design Flood Elevation (DFE). The elevation of the "design flood," including wave height, relative to the datum specified on the city's legally designated flood hazard map. In areas designated as zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as zone AO where the depth number is not specified on the map, the depth number shall be taken as being equal to two (2) feet. [FBC]

Digital Flood Insurance Rate Maps (DFIRMs). Digitally converted flood insurance maps developed in conjunction with FEMA.

Doublewide Manufactured (Mobile) Home. A manufactured (mobile) home that, when assembled as a nonmovable, permanent building, is at least 16 feet wide and has an area within its perimeter walls of at least 600 square feet. [NFIP]

Dwelling. A building designed for use as a residence for no more than 4 families or a single-family unit in building under a condominium form of ownership. [NFIP]

Dry Floodproofing. A combination of design modifications that results in a building or structure, including the attendant utilities and equipment and sanitary facilities, being water tight with walls substantially impermeable to the passage of water and with structural components having the capacity to resist loads as identified in ASCE 7. [FBC]

Elevated Building. A building that has no basement and that has its lowest elevated floor raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns. Solid (perimeter) foundations walls are not an acceptable means of elevating buildings in V and VE zones. [NFIP]

Elevation Certificate. A community's permit file must have an official record that shows new buildings and substantial improvements in all identified Special Flood Hazard Areas (SFHAs) are properly elevated. This elevation information is needed to show compliance with the floodplain management ordinance. ***FEMA encourages communities to use the Elevation Certificate developed by FEMA to fulfill this requirement since it also can be used by the property owner to obtain flood insurance.*** [NFIP] ***MAY NO LONGER BE 'REQUIRED' BUT CAN POTENTIALLY IMPACT FLOOD INSURANCE RATE UNDER FEMA 2.0.***

Elevators. The National Flood Insurance Program (NFIP) regulations require that elevators and their associated equipment be protected from flood damage. The best way to do this is to locate mechanical equipment associated with the elevator above the Base Flood Elevation (BFE). NFIP flood insurance coverage is limited for elevator equipment. New or replacement equipment relevant to an elevator, installed on or after October 1, 1987, and located below the lowest floor of an elevated building or in a basement is not covered by flood insurance. [NFIP]

Enclosure. That portion of an elevated building below the lowest elevated floor that is either partially or fully shut in by rigid walls. [NFIP]

Encroachments. Encroachments are activities or construction within the floodway including fill, new construction, substantial improvements, and other development. These activities are prohibited within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses that the proposed encroachment would not result in any increase in flood levels. [NFIP]

Equipment or Fixture. Any plumbing, heating, electrical, ventilating, air conditioning, refrigerating, and fire protection equipment, and elevators, dumb waiters, escalators, boilers, pressure vessels and other mechanical facilities or installations that are related to building services. Equipment or fixture shall not include manufacturing, production, or process equipment, but shall include connections from building service to process equipment. [FBC]

Erosion. The collapse, undermining, or subsidence of land along the shore of a lake or other body of water. [FEMA]

Event Flooding. Occasional flooding that has a specific cause, typically a storm or a devastating failure of infrastructure.

Existing Construction. For the purposes of determining flood insurance rates, structures for which the "start of construction" commenced before the effective date of the Flood Insurance Rate Map (FIRM) or before January 1, 1975, for FIRMs effective before that date. "Existing construction" may also be referred to as "existing structures."

Existing Structure. For application of provisions in flood hazard areas, an existing structure is any building or structure for which the start of construction commenced before the effective date of the community's first flood plain management code, ordinance or standard. [FBC]

Federal Emergency Management Agency (FEMA).

1) An agency within the U.S. Department of Homeland Security charged with responding to Presidentially-declared disasters.
2) The Federal agency under which the NFIP is administered. In March 2003, FEMA became part of the newly created U.S. Department of Homeland Security. [NFIP]

Fill. Earthen fill is sometimes placed in a Special Flood Hazard Area (SFHA) to reduce flood risk to the filled area. The placement of fill is considered development and will require a permit under applicable Federal, state and local laws, ordinances, and regulations. Fill is prohibited within the floodway unless it has been demonstrated that it will not result in any increase in flood levels. Some communities limit the use of fill in the flood fringe to protect storage capacity or require compensatory storage. The use of fill is prohibited for structural support of buildings in V Zones. [NFIP]

Flood or Flooding. A general and temporary condition of partial or complete inundation of normally dry land from:

(1) The overflow of inland or tidal waters.

(2) The unusual and rapid accumulation or runoff of surface waters from any source. [FBC]

Flood Damage-Resistant Materials. Any construction material capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic repair. [FBC]

Flood Elevation Determination. A determination by the Administrator of the water surface elevations of the base flood, that is, the flood level that has a one percent or greater chance of occurrence in any given year. (NFIP)

Flood Hazard Area. The greater of the following two areas:

(1) The area within a floodplain subject to a 1-percent or greater chance of flooding in any year.

(2) The area designated as a flood hazard area on the city's flood hazard map, or otherwise legally designated. [FBC]

Flood Insurance Rate Map (FIRM). Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community. [NFIP]

Flood Insurance Study (FIS). The official report provided by the Federal Emergency Management Agency that contains the Flood Insurance Rate Map (FIRM), the Flood Boundary and Floodway Map, the water surface elevation of the base flood and supporting technical data. [FBC]

Flood Map. A Flood Insurance Rate Map (FIRM), Flood Boundary and Floodway Map (FBFM), and Flood Hazard Boundary Map (FHBM) are all flood maps produced by FEMA. The FIRM is the most common type of map and most communities have this type of map. At a minimum, flood maps show flood risk zones and their boundaries, and may also show floodways and Base Flood Elevations (BFEs). The FBFM is a version of a flood map that shows only the floodway and flood boundaries. [NFIP]

Flood Opening. An opening in an enclosed structure intended to automatically allow the free passage of water between the exterior and the interior to reduce hydrostatic loads. [FBC]

Floodplain. Any land area susceptible to being inundated by floodwaters from any source. [NFIP]

Floodplain Management.

a. The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to, emergency preparedness plans, flood-control works and floodplain management regulations.

b. Floodplain management is a decision-making process that aims to achieve the wise use of the nation's floodplains. "Wise use" means both reduced flood losses and protection of the natural resources and function of floodplains. [NFIP]

Floodplain Management Ordinances. Once FEMA provides a community with the flood hazard information upon which floodplain management regulations are based, the community is required to adopt a floodplain management ordinance that meets or exceeds the minimum NFIP requirements. The overriding purpose of the floodplain management regulations is to ensure that participating communities take into account flood hazards, to the extent that they are known, in all official actions relating to land management and use. [NFIP]

Floodplain Management Regulations. Zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance and erosion control ordinance), and other applications of police power. The term describes such State or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction. [NFIP]

Floodproofing. 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. [NFIP]

Floodproofing Certificate. Documentation of certification by a registered professional engineer or architect that the design and methods of construction of a nonresidential building are in accordance with accepted practices for meeting the floodproofing requirements in the community's floodplain management ordinance. This documentation is required for both floodplain management requirements and insurance rating purposes. [NFIP]

Flood-Related Erosion. The collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding. [NFIP]

Flood-Resistant Material. Flood-resistant material includes any building product capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage. Prolonged contact is defined as at least 72 hours. Significant damage is any damage requiring more than low-cost cosmetic repair (such as painting). All structural and non-structural building materials at or below the Base Flood Elevation (BFE) must be flood resistant. [NFIP]

Floodway. The channel of a river, creek, 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. [FBC]

Flood Zones. Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30. [NFIP]

Foundation. Without a proper foundation, an elevated building can suffer damage from a flood due to erosion, scour, or settling. The National Flood Insurance Program (NFIP) regulations provide performance standards for anchoring new buildings and foundation and fill placement standards for buildings, for manufactured homes, and in V Zones. However, the NFIP performance standards do not specify how a building's foundations are to be constructed in A Zones. The national model building codes address building foundations and the proper placement, compaction, and protection of fill. [NFIP]

Foundation Walls. Masonry walls, poured concrete walls or precast concrete walls, regardless of height, that extend above grade and support the weight of a building. [NFIP]

Freeboard. An additional amount of height above the Base Flood Elevation used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations. [NFIP]

Functionally Dependent Use. A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. This term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and shipbuilding and ship repair facilities, but does not include long-term storage or related manufacturing facilities. [NFIP]

Garages. **Attached Garages**. A garage attached to a residential structure or in an enclosed area below an elevated building may have the garage floor slab below the Base Flood Elevation (BFE). Because such a garage is an enclosed area below the BFE, openings are required either in the exterior walls of the garage or in the garage doors themselves. [NFIP]

Grade Elevation. The lowest or highest finished ground level that is immediately adjacent to the walls of the building. Use natural (pre-construction), ground level, if available, for Zone AO and Zone A (without BFE). [NFIP]

Grandfathering. An exemption based on circumstances previously existing. [NFIP]

Hazard. Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome. [FEMA]

Hazard Mitigation. Any action taken to reduce or eliminate the long-term risk to human life and property from hazards. The term is sometimes used in a stricter sense to mean cost-effective measures to reduce the potential for damage to a facility or facilities from a disaster or incident. [FEMA]

Hazard-Specific Annex. Individual chapters in an emergency operations plan that describe strategies for managing missions for a specific hazard. They explain the procedures that are unique to that annex for a hazard type and may be short or long depending on the details needed to explain the actions, roles, and responsibilities. The information in these annexes is not repeated elsewhere in the plan. [FEMA]

High Hazard Area. An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The coastal high hazard area is identified as Zone V on Flood Insurance Rate Maps (FIRMs). Special floodplain management requirements apply in V Zones including the requirement that all buildings be elevated on piles or columns. [NFIP]

Highest Adjacent Grade. The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure. In AO Zones, 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 Flood Insurance Rate Map (FIRM); or at least two feet if no depth number is specified. [NFIP]

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

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

Historic Character. The essential quality of an historic building or space that provides its significance. The character might be determined by the historic background, including association with a significant event or person, the architecture of design, or the contents or elements and finishes of the building or space. [FBC]

Historic Context. A unit created for planning purposes that groups information about historic properties based on a shared theme, specific time period and geographical area. [NPS]

Historic Fabric. Original or added building or construction materials, features and finishes that existed during the period that is deemed to be most architecturally or historically significant or both. [FBC]

Historic Integrity. The ability of a property to convey its historical associations or attributes measured by location, design, setting, materials, workmanship, feeling, and association. [NPS]

Historic Preservation. A generic term that encompasses all aspects of the professional and public concern related to the maintenance of an historic structure, site or element in its current condition, as originally constructed, or with the additions and alterations determined to have acquired significance over time. [FBC]

Historic Site. A place, often with associated structures, having historic significance. [FBC]

Historic Structure. A building, bridge, lighthouse, monument, pier, vessel or other construction that is designated or that is deemed eligible for such designation by a local, regional or national jurisdiction as having historical, architectural or cultural significance. [FBC]

Impervious Surface. Surfaces and other forms of development impenetrable to water and reduce the infiltration of water into the ground. [NOAA]

Increased Cost of Compliance. Coverage for expenses that a property owner must incur, above and beyond the cost to repair the physical damage the structure actually sustained from a flooding event, to comply with mitigation requirements of state or local floodplain management ordinances or laws. Acceptable mitigation measures are elevation, floodproofing, relocation, demolition or any combination thereof. [NFIP]

Insurance, Commercial. Coverage for commercial buildings and their contents against loss caused by fire, windstorm, and many other causes of loss, or perils. [Florida Department of Financial Services]

Insurance, Flood. A separate policy that can cover buildings, the contents in a building, or both, damaged from flooding.

Insurance, Homeowners. Protects financial interests for damages from a covered peril. A peril is something that causes or may cause injury, loss, or destruction, such as a fire, tornado, or hurricane. [Florida Department of Financial Services]

Insurance, Windstorm. Generally required to be included as part of a typical homeowner's insurance policy (Florida Statute 627.712) and by installing wind mitigation features a property owner may be eligible for a reduction in the windstorm premium. [Florida Department of Financial Services]

Integrity. The authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric period. [NPS]

Letter of Map Change (LOMC). A general term used to refer to the several types of revisions and amendments to FEMA maps that can be accomplished by letter. Letters of map change include:

Letter of Map Amendment (LOMA): An amendment to the currently effective FEMA map which establishes that a property is not located in a Special Flood Hazard Area (SFHA). A LOMA is issued only by FEMA.

Letter of Map Revision (LOMR): FEMA's modification to an effective Flood Insurance Rate Map (FIRM), or Flood Boundary and Floodway Map (FBFM), or both. Letter of Map Revisions are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA).

Letter of Map Revision Based On Fill (LOMR-F): FEMA's modification of the Special Flood Hazard Area (SFHA) shown on the Flood Insurance Rate Map (FIRM) based on the placement of fill outside the existing regulatory floodway.

Conditional Letter Of Map Revision (CLOMR): FEMA's comment on a proposed project that would, upon construction, affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). The letter does not revise an effective NFIP map, it indicates whether the project, if built as proposed, would be recognized by FEMA. FEMA charges a fee for processing a CLOMR to recover the costs associated with the review. [NFIP]

Limit of Moderate Wave Action (LiMWA). Line shown on FIRMs to indicate the inland limit of the 1 ½- foot (457 mm) breaking wave height during the base flood. [FBC]

Load-Bearing Element. Any column, girder, beam, joist, truss, rafter, wall, floor or roof sheathing that supports any vertical load in addition to its own weight or any lateral load. [FBC]

Local Floodplain Management Ordinance. An ordinance or regulation adopted pursuant to the requirements in Title 44 Code of Federal Regulations, Parts 59 and 60 for participation in the National Flood Insurance Program. [FBC]

Lowest Adjacent Grade. The lowest point of the ground level immediately next to a building. [NFIP]

Lowest Floor. The lowest floor of the lowest enclosed area (including a 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 requirements. [NFIP]

Lowest Floor Elevation (LFE). The measured distance of a building's lowest floor above the National Geodetic Vertical Datum (NGVD) or other datum specified on the FIRM for that location. [NFIP]

Lowest Horizontal Structural Member. In V Zones, new construction must have the elevation of the lowest horizontal structural member at or above the Base Flood Elevation (BFE). Horizontal structural members are obstructions and can transmit the force of wave impacts to rest of the structure. This elevation is used as the reference level to determine insurance rates. This contrasts with construction and insurance rating in A Zones, which uses the elevation of the lowest floor including basement as the reference level. [NFIP]

Manufactured (Mobile) Home. A structure built on a permanent chassis, transported to its site in one or more sections and affixed to a permanent foundation. "Manufactured (mobile) home" does not include recreational vehicles. [NFIP]

Map Revision. A change in the Flood Hazard Boundary Map (FHBM) or Flood Insurance Rate Map (FIRM) for a community which reflects revised zone, base flood or other information. [NFIP]

Masonry Walls. Walls constructed of individual components laid in and bound together with mortar. These components can be brick, stone, concrete block, etc. [NFIP]

Mean Higher High Water (MHHW). A tidal datum. The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, simultaneous observational comparisons are made with a control tide station in order to derive the equivalent datum of the National Tidal Datum Epoch. [NOAA]

Mean Sea Level. For purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced. [NFIP]

Mechanical Equipment. The National Flood Insurance Program (NFIP) requires that all mechanical equipment in new or substantially improved structures be elevated to above the BFE or designed so that floodwaters cannot infiltrate or accumulate within any component of the system. This would include electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities. [NFIP]

National Flood Insurance Program (NFIP). 1) The NFIP is a program that makes federally-backed flood insurance available in those states and communities that agree to adopt and enforce flood-plain management ordinances to reduce future flood damage. [NFIP]

National Flood Insurance Program (NFIP). The program of flood insurance coverage and floodplain management administered under the Act and applicable federal regulations promulgated in Title 44 of the Code of Federal Regulations, Subchapter B. [NFIP]

National Geodetic Vertical Datum (NGVD) of 1929. National standard reference datum for elevations, formerly referred to as Mean Sea Level (MSL) of 1929. NGVD 1929 may be used as the reference datum on some Flood Insurance Rate Maps (FIRMs). [NFIP]

Natural grade. The grade unaffected by construction techniques such as fill, landscaping or berming. [NFIP]

New Construction. Buildings for which the "start of construction" commenced on or after the effective date of an initial Flood Insurance Rate Map (FIRM) or after December 31, 1974, whichever is later, including any subsequent improvements.

a. For Floodplain Management Purposes: Structures for which the start of construction commenced on or after the effective date of a floodplain management regulation adopted by a community and includes any subsequent improvements to such structures. [NFIP]

North American Vertical Datum (NAVD) of 1988. The vertical control datum established for vertical control surveying in the Unites States of America based upon the General Adjustment of the North American Datum of 1988. It replaces the National Geodetic Vertical Datum (NGVD) of 1929. [NFIP]

Nuisance Flooding. Minor, recurrent flooding that takes place at high tide. It occurs when the ocean has reached the "brim" locally. Because of sea level rise, nuisance flooding in the United States has become a "sunny day" event—not necessarily linked to storms or heavy rain. [NOAA]

Obstructions. All new construction and substantial improvements in V Zones must have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls. Foundations that offer minimal resistance to floodwaters passing beneath an elevated building are required in V Zones. Fill is prohibited for the structural support of buildings in V Zones. [NFIP]

Openings. In A Zones, all new construction and substantial improvements may have fully enclosed areas below the lowest floor that are usable solely for vehicle parking, building access, or storage, in an area other than a basement, which are subject to flooding. These enclosed areas must be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing the entry and exit of floodwaters. [NFIP]

Participating Community. A community for which FEMA has authorized the sale of flood insurance under the NFIP. [NFIP]

Participation in the NFIP. Participation in the National Flood Insurance Program (NFIP) is voluntary. To join, the community must:

1. Complete an application;
2. Adopt a resolution of intent to participate and cooperate with FEMA;
3. Adopt and submit a floodplain management ordinance that meets or exceeds the minimum NFIP criteria. The floodplain management ordinance must also adopt any FIRM or FHBM for the community.

Within participating communities, the Federal government makes flood insurance available throughout the community. [NFIP]

Perimeter Barrier. A continuous barrier to keep the flood water away from the perimeter of a building or group of buildings, either permanently or immediately preceding a food event. These barriers can be permanent or deployable immediately preceding a food event.

Permit for Floodplain Development. A permit is required before construction or development begins within any SFHA.

Persistent Flooding. See Nuisance Flooding.

Positive Roof Drainage. The drainage condition in which consideration has been made for all loading deflections of the roof deck, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation. [FBC]

Post-FIRM Building. A building for which construction or substantial improvement occurred after December 31, 1974 or on or after the effective date of an initial Flood Insurance Rate Map (FIRM), whichever is later.

Post-Flood Insurance Rate Map (FIRM) Buildings. New construction and those built after the effective date of the first FIRM for a community. Insurance rates for Post-FIRM buildings are dependent on the elevation of the lowest floor in relation to the Base Flood Elevation (BFE). [NFIP]

Pre-FIRM Building. A building for which construction or substantial improvement occurred on or before December 31, 1974 or before the effective date of an initial Flood Insurance Rate Map (FIRM). [NFIP]

Preservation. The act or process of applying measures necessary to sustain the existing form, integrity and materials of an historic building or structure. [FBC]

Primary Residence. A single family building, condominium unit, apartment unit, or unit within a cooperative building that will be lived in by the policyholder or the policyholder's spouse for:

- More than 50% of the 365 calendar days following the current policy effective date; or
- 50% or less of the 365 calendar days following the current policy effective date if the policyholder has only one residence and does not lease that residence to another party or use it as rental or income property at any time during the policy term. [NFIP]

Primary Residential Property. Either a primary residence or the contents within a primary residence, or both. [NFIP]

Principal Residence. A single-family dwelling in which, at the time of loss, the named insured or the named insured's spouse has lived for either 80% of the 365 days immediately preceding the loss or 80% of the period of ownership, if less than 365 days. [NFIP]

Proper Openings. Enclosures (Applicable to Zones A, A1-A30, AE, AO, AH, AR and AR Dual). All enclosures below the lowest elevated floor must be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. A minimum of 2 openings, with positioning on at least 2 walls, having a total net area of not less than 1 square inch for every square foot of enclosed area subject to flooding must be provided. The bottom of all openings must be no higher than 1 foot above the higher of the exterior or interior (adjacent) or floor immediately below the openings. [NFIP]

Provisional Rating. A method for placing flood coverage prior to the receipt of a FEMA Elevation Certificate. [NFIP]

Recreational Vehicle. 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 a Special Flood Hazard Area (SFHA) must meet the elevation and anchoring requirements for manufactured homes, unless it:

a. Is on the site for fewer than 180 consecutive days, or
b. Is 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. [NFIP]

Rehabilitation. Any work, as described by the categories of work defined herein, undertaken in an existing building. [FBC]

Rehabilitation, Historic Building. The act or process of making possible a compatible use of a property through repair, alterations and additions while preserving those portions or features which convey its historical, cultural or architectural values. [FBC]

Repair. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage. [FBC]

Repetitive Loss Structure. An NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978. [NFIP]

Replacement Cost Value (RCV). The cost to replace property with the same kind of material and construction without deduction for depreciation. [NFIP]

Reroofing. The process of recovering or replacing an existing roof covering. See "Roof recover" and "Roof replacement." [FBC]

Resilience, Flood. The ability to withstand, respond to, and recover from a flooding or storm event.

Restoration. The act or process of accurately depicting the form, features and character of a property as it appeared at a particular period of time by means of the removal of features, and repair or replacement of damaged or altered features from the restoration period. [FBC]

Retrofit. The voluntary process of strengthening or improving buildings or structures, or individual components of buildings or structures, for the purpose of making existing conditions better serve the purpose for which they were originally intended or the purpose that current building codes intend. [FBC]

Riverine Flooding. Occurs when streams and rivers exceed the capacity of their natural or constructed channels to accommodate water flow and water overflows the banks, spilling out into adjacent low-lying, dry land. [FEMA]

Roof Recover. The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering. [FBC]

Roof Repair. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance. [FBC]

Roof Replacement. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering. [FBC]

Roof Section. A separating or division of a roof area by existing expansion joints, parapet walls, flashing (excluding valley), difference of elevation (excluding hips and ridges), roof type or legal description; not including the roof area required for a proper tie-off with an existing system. [FBC]

Setback. Setbacks may be used to keep development out of harm's way. Setback standards establish minimum distances that structures must be positioned (or set back) from river channels and coastal shorelines. Setbacks can be defined by vertical heights or horizontal distances. Setbacks are not required by the National Flood Insurance Program (NFIP). The Community Rating System (CRS) credits setbacks under Higher Regulatory Standards, Special Hazards Regulations. [NFIP]

Severe Repetitive Loss Building. Any building that:

1. Is covered under a Standard Flood Insurance Policy made available under this title;
2. Has incurred flood damage for which:
   a. 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or
   b. At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claims payments exceed the fair market value of the insured building on the day before each loss. [NFIP]

Severe Repetitive Loss Property. Either a severe repetitive loss building or the contents within a severe repetitive loss building, or both. [NFIP]

Solid (Perimeter) Foundation Walls. Walls that are used as a means of elevating a building in A Zones and that must contain sufficient openings to allow for the unimpeded flow of floodwaters more than 1 foot deep. [NFIP]

Special Flood Hazard Area (SFHA). An area having special flood, mudflow or flood-related erosion hazards and shown on a Flood Hazard Boundary Map (FHBM) or a Flood Insurance Rate Map (FIRM) Zone A, AO, A1-A30, AE, A99, AH, AR, AR/A, AR/AE, AR/AH, AR/AO, AR/A1-A30, V1-V30, VE or V. The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. For the purpose of determining Community Rating System (CRS) premium discounts, all AR and A99 zones are treated as non-SFHAs. [NFIP]

Start of Construction. The date of issuance of permits for new construction and substantial improvements, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement is within one hundred eighty (180) days of the date of the issuance. The actual start of construction means either the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns.

Permanent construction does not include land preparation (such as clearing, grading, or filling), the installation of streets or walkways, excavation for a basement, footings, piers, or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main buildings. For a substantial improvement, the actual "start of construction" means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building. [FBC]

Sea Level Rise. The increasing of the average global sea level. [NOAA]

Storage. All new construction and substantial improvements must have any fully enclosed area below the lowest floor useable solely for storage, parking or access. 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 example, if the structure is a residence, storage should be limited to items such as lawn and garden equipment, snow tires, and other low damage items which will not suffer flood damage or can be conveniently moved to the elevated part of the building. [NFIP]

Storm Surge. The abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. The surge is caused primarily by a storm's winds pushing water onshore. The amplitude of the storm surge at any given location depends on the orientation of the coast line with the storm track; the intensity, size, and speed of the storm; and the local bathymetry. [NOAA]

Structure. A walled and roofed building, other than a gas or liquid storage tank, principally above ground and affixed to a permanent site as well as a manufactured home on a permanent foundation. [NFIP]

Subgrade Crawlspace. A crawlspace foundation where the subgrade under-floor area is no more than 5 feet below the top of the next-higher floor and no more than 2 feet below the lowest adjacent grade on all sides. [NFIP]

Subsidence. Sinking of the ground because of underground material movement—is most often caused by the removal of water, oil, natural gas, or mineral resources out of the ground by pumping, fracking, or mining activities. [NOAA]

Subsidence can also be caused by natural events such as earthquakes, soil compaction, glacial isostatic adjustment, erosion, sinkhole formation, and adding water to fine soils deposited by wind (a natural process known as loess deposits). Subsidence can happen over very large areas like whole states or provinces, or very small areas like the corner of your yard. [NOAA]

Coastal land around the Western Gulf is sinking because people are pumping groundwater out of aquifers faster than natural processes can put it back. [NOAA]

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

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

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official and that is the minimum necessary to assure safe living conditions.
2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure. [FBC]

Substantial Structural Damage. A condition where one or both of the following apply:

1. The vertical elements of the lateral force-resisting system have suffered damage such that the lateral load-carrying capacity of any story in any horizontal direction has been reduced by more than 33 percent from its pre-damage condition.
2. The capacity of any vertical component carrying gravity load, or any group of such components, that supports more than 30 percent of the total area of the structure's floor(s) and roof(s) has been reduced more than 20 percent from its pre-damage condition and the remaining capacity of such affected elements, with respect to all dead and live loads, is less than 75 percent of that required by the Florida Building Code, building for new buildings of similar structure, purpose and location. [FBC]

Substantially Damaged Property. Either a substantially damaged building or the contents within a substantially damaged building, or both. [NFIP]

Swimming Pools. A pool adjacent to an elevated V Zone building may be constructed at grade or elevated so that the lowest horizontal structural member supporting the pool is at or above the Base Flood Elevation (BFE). A design professional must assure community officials that a pool beneath or adjacent to an elevated V Zone building will not divert waves and increase the potential damage to any nearby buildings. [NFIP]

Travel Trailer. Under the NFIP, a travel trailer can be considered a building only if it is without wheels, built on a chassis and affixed to a permanent foundation and regulated under the community's floodplain management and building ordinances or laws. [NFIP]

Unsafe. Buildings, structures or equipment that are unsanitary, or that are deficient due to inadequate means of egress facilities, inadequate light and ventilation, or that constitute a fire hazard, or in which the structure or individual structural members meet the definition of "Dangerous," or that are otherwise dangerous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance shall be deemed unsafe. A vacant structure that is not secured against entry shall be deemed unsafe. [FBC]

Variance. A grant of relief by a participating community from the terms of its floodplain management regulations. [NFIP]

Vulnerability. The susceptibility of human settlements to the harmful impacts of natural hazards. [FEMA]

V-Zone Certificate. National Flood Insurance Program (NFIP) regulations require coastal communities to ensure that buildings built in V Zones are anchored to resist wind and water loads acting simultaneously. Buildings in V Zones are subject to a greater hazard than buildings built in other types of floodplains. Not only do they have to be elevated above the Base Flood Elevation (BFE), they must be protected from the impact of waves, hurricane-force winds and erosion. [NFIP]

Water Surface Elevation. The height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929, (or other datum, where specified) of floods of various magnitudes and frequencies in the flood plains of coastal or riverine areas. [NFIP]

Wet Floodproofing. Wet Floodproofing includes permanent or contingent measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing floodwaters to enter the structure or area. Generally, this includes properly anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls. [NFIP]

Wind Retrofit, Existing Building. Voluntary mitigation actions taken on existing buildings. For a building retrofit to be effective, the building needs to achieve the performance level selected by the building owner or operator (the target performance level) and be commensurate with the level of the wind event for which the retrofit was designed. [FEMA]

Zone. A geographical area shown on a Flood Hazard Boundary Map (FHBM) or a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area. [NFIP]

Zone A. Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones. [NFIP]

Zone A99. Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones. [NFIP]

Zone A1-30. These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format). [NFIP]

Zone AE. The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones. [NFIP]

Zone AH. Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones. [NFIP]

Zone AO. River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones. [NFIP]

Zone AR. Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations. [NFIP]

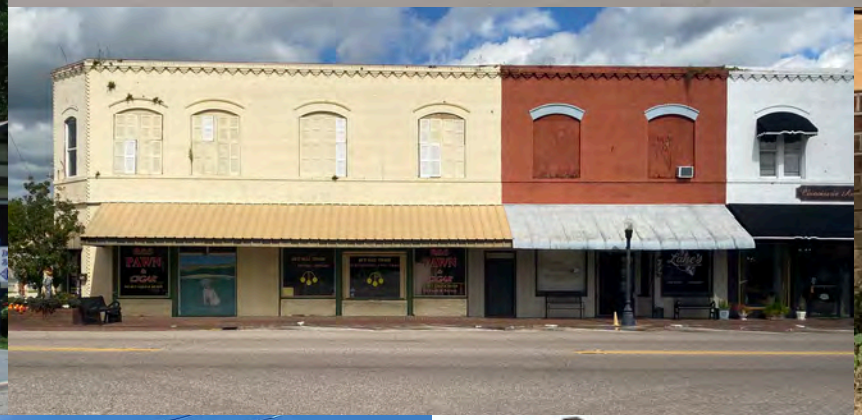
Zone B and X. Area of moderate flood hazard, usually the area between the limits of the 100- year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile. [NFIP]

Zone C or X. Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100- year flood. [NFIP]

Zone D. Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk. [NFIP]

Zone V. Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones. [NFIP]

Zone VE and V1-30. Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones. [NFIP]



PDP

Preservation Design Partnership, LLC

Philadelphia, Pennsylvania

www.pdparchitects.com