Resilient Nantucket: Flooding Adaptation & Building Elevation Design Guidelines

Suggested Practices for Historic Nantucket Buildings at Risk of Flooding & Sea Level Rise

Nantucket, Massachusetts

2021

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&
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Nantucket, Massachusetts

Prepared for the

Town of Nantucket, Massachusetts

Thomason and Associates

Nashville, Tennessee

2021

ACKNOWLEDGEMENTS

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CHAPTER 1: INTRODUCTION

Purpose of the Manual—Nantucket and Sea Level Rise

The *Resilient Nantucket: Flooding Adaptation & Building Elevation Design Guidelines* is intended to serve as an addendum to *Building With Nantucket In Mind*, which is the basis for the island's design review. As the location of one of the oldest and largest National Historic Landmark districts in the United States, historic preservation plays a unique and vital role for the Town of Nantucket. Historic preservation in Nantucket promotes tourism, strengthens the local economy, protects the town and surrounding area's historic character, and fosters community investment in protecting Nantucket's historic identity. The Nantucket Historical Commission and the Town of Nantucket's Department of Planning and Land Use Services, in partnership with dedicated citizens and the wider community, have shepherded the town's historic preservation objectives through increasingly difficult preservation challenges in the 21st century. Nantucket faces significant challenges related to high-water natural disasters, challenges which have increased both in frequency and in scope as climate change and global sea level rise have fueled high-water natural disaster events in the last two decades.

A focus of historic preservation as a core element for Nantucket's coastal community resilience planning was recognized in the Massachusetts Municipal Vulnerability Preparedness (MVP) Community Resilience Building Workshop and Report, completed in spring 2019. In both the MVP Workshop Report and the 2019 update to the Hazard Mitigation Plan, the preservation of historic and cultural resources in response to climate change and sea-level rise was an identified priority for future investigation and action.

The following year, the Town and Preservation Institute Nantucket launched a project: *Resilient Nantucket: 3D Digital Documentation and Sea Level Rise Visualization,* with funding provided through a Coastal Resilience Grant from the Massachusetts Office of Coastal Zone Management. The project used LiDAR scanning to digitally document the core of Nantucket Town, its waterfront, and Brant Point. The resulting images provided high-resolution, 3D visualizations, of sea-level rise projections in the study area. The digital data and other products generated by this project provide the ability to generate vulnerability assessments of historic resources, inform adaptation strategies, and clearly communicate sea level rise projections and impacts to residents and stakeholders.

The *Resilient Nantucket: Flooding Adaptation & Building Elevation Design Guidelines* for the Town of Nantucket join a range of other planning and mitigation documents which together provide a unified approach for protecting Nantucket's resources from natural

disasters. The *Town of Nantucket Hazard Mitigation Plan* (*HMP*), updated in 2019, provides an overarching framework for disaster mitigation preparation, response, and recovery. The Nantucket HMP is in accordance with the *Massachusetts Comprehensive Emergency Plan (CEMP)*, last updated in 2018, and together these planning documents maintain Nantucket's compliance with Federal Emergency Management Agency (FEMA) mandated preparedness standards.

At the local level, the Town of Nantucket has actively built up its natural disaster preparation, response, and recovery capacities through several concentric planning initiatives. The *Nantucket Master Plan* (2009) identified key natural and cultural resources for protection and was supplemented by specific area plans. The *Nantucket and Madaket Harbors Action Plan* (2009), the *Nantucket Wetland Protection Regulations* (2013), and the *Nantucket Coastal Management Plan* (2014) developed preservation and resiliency capacities for specific elements of Nantucket's coastal, wetland, and harbor resources. The *Nantucket Comprehensive Emergency Preparedness Plan* (2013) and the Storm Surge and Critical Infrastructure on Nantucket project (2015) have developed strategies for protecting community resources and infrastructure in the Town of Nantucket.

High-water natural disasters in Nantucket's recent past, including Hurricane Sandy (2012) Hurricane Jose (2017), Winter Storm Grayson (2018), a January blizzard (2018), and Winter Storm Riley (2018), have brought renewed attention towards building up Nantucket's high-water natural disaster resiliency. Statewide and federal planning initiatives, such as the National Oceanic and Atmospheric Association's Global and Regional Sea Level Rise Scenarios for the United States (2017), the Massachusetts Climate Change Projections (2018), and the Massachusetts Integrated State Hazard

Mitigation and Climate Adaptation Plan (2018), along with previous planning efforts undertaken by the Town of Nantucket, informed the creation of the Town of Nantucket Coastal Risk Assessment and Resiliencyfeet (2.5 meters) by 2100, up from the 2001 estimates of 0.3 feet (0.09 meters) to 2.89 Strategies study (2020). The Town of Nantucket's Historic Preservation Design Guidelines will build upon previous planning efforts to add additional expertise, best practices, and informed guidance on hardening Nantucket's cultural resources against the increasing threat of high-water natural disasters.

Sea Level Rise, Risks, and Resilience

Nantucket faces significant high-water natural disaster threats, and the frequency and intensity of these threats are increasing and exacerbated by rising seas. The latest revisions to global sea level rise estimates by the Intergovernmental Panel on Climate Change (2017) predict that Earth's oceans will rise between 1.0 feet (0.3 meters) to 8.2 feet (2.5 meters) by 2100, up from the 2001 estimates of 0.3 feet (0.09 meters) to 2.89

feet (0.88 meters). Adjustments to these estimates for the Northeastern Atlantic seaboard by the U.S. Army Corps of Engineers predict sea level rise between nearly 1.0 feet (0.3 meters) and 1.6 feet (0.5 meters) higher than global averages.

Sea level rise estimates for the Massachusetts coastline could be even higher, according to the National Oceanic and Atmospheric Administration, which projects possible sea level rise in the Commonwealth of up to 3.3 feet (1.0 meters) higher than global averages. Sea level rise data collected in Nantucket Harbor indicate that Nantucket's average sea level has been increasing by about 0.14 inches per year since 1965, rising to around 7.7 inches higher by 2020. The Town of Nantucket Coastal Risk Assessment and Resiliency Strategies study sums up the sea level rise threats Nantucket faces over the coming decades: "based on the 2017 NOAA projections and the 2018 Massachusetts projections, it is reasonable to expect relative sea level on the Nantucket coast to rise by at least 4 to 6 feet above 2000 levels by 2100."

Sea level rise increases the force and frequency of high-water natural disaster events like hurricanes, tropical storms, and nor'easters. These natural disasters, when combined with rising seas, have led, and will continue to lead, to more damaging storm surges, coastal flooding, severe rain and wind events, and coastal erosion. These threaten the Town of Nantucket by damaging infrastructure and utilities, isolating the community from the mainland, and compromising Nantucket's natural and cultural resources, including the community's historic properties.

Given the scope of the challenges facing Nantucket, previous planning studies, community involvement, and mitigation preparation has identified specific risk areas in the Town of Nantucket and on the island. Regions and neighborhoods on Nantucket identified by previous planning studies, most recently the Town of Nantucket Coastal Risk Assessment and Resiliency Strategies study (2020), include:

Downtown	Miacomet	Pocomo
Brant Point	South Shore	Polpis
Cliff Road	Surfside	Shawkemo
Wauwinet	Airport Area	Quaise
Eel Point	Tom Nevers	Monomoy
Madaket	Southeast Quarter	Mid-Island
Sheep Pond Road	Siasconset	Coatue
Cisco	Quidnet	Great Point
Hummock Pond		

While each of these regions on Nantucket face individualized risks, overarching concerns can be identified that are shared across the entire island:

- Coastal sea level rise and erosion: Nantucket's entire coastline is vulnerable to coastal sea level rise. This threat leads to increased threats from erosion, coastal flooding, and inland flooding (as natural barriers and other protections erode).
- High wind events: Nantucket's geographic location places the entire community in the path of storms which create dangerous high wind conditions.
- Hurricanes, tropical storms, nor'easters, and winter storms: Nantucket faces storm threats on a seasonal basis. Storms bring high-water and high-wind conditions, precipitation, and flooding threats.

Beyond these community-wide threats, specific threats affect specific planning areas on Nantucket. Some specific areas of concern, as identified in the Town of Nantucket Hazard Mitigation Plan (2019) include:

⇒ Flooding in the Downtown, Brant Point, Madaket, and Mid-Island neighborhoods of Nantucket.

⇒ Flooding along Airport Road, Raceway Road, and Somerset Road.

⇒ Erosion at Millie's Bridge and along southern edge of the Nantucket Airport.

⇒ Erosion threats to Nantucket infrastructure, including both of Nantucket's wastewater treatment facilities.

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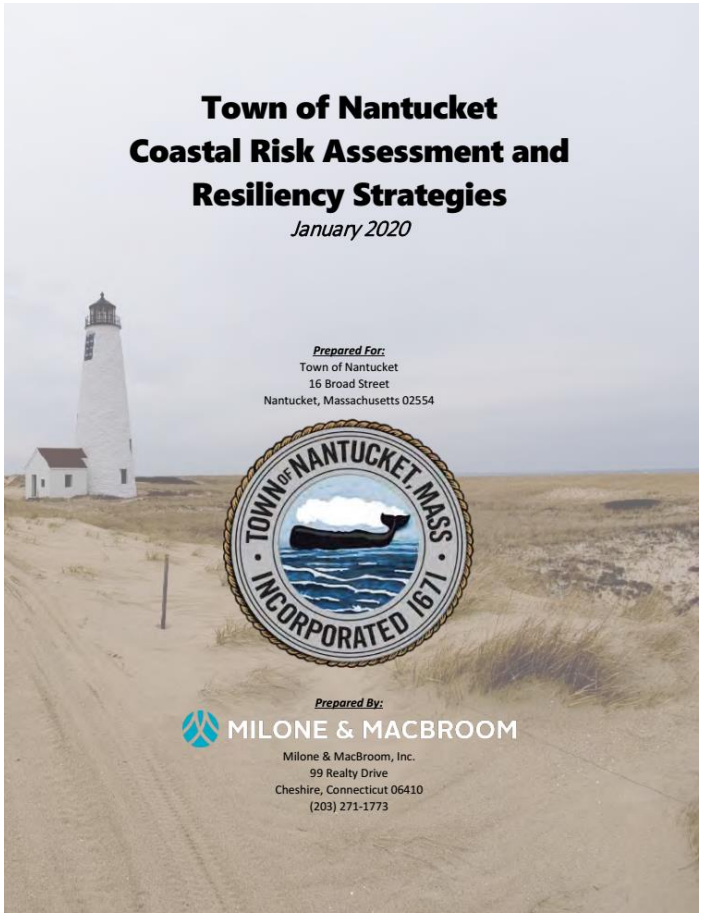
Community engagement and planning studies have also yielded strategies and discussion centered on building up Nantucket's resilience. Climate resilience, defined as Nantucket's ability to lessen the impact of high-water natural disaster risks, takes the form of three distinct strategies or approaches addressing vulnerabilities: retreat, accommodation, and protection. Managed retreat involves a planned, measured response that relocates resources away from areas threatened by sea level rise and erosion. Accommodation requires the adoption of mitigation strategies to protect resources in place. Examples of accommodation measures include elevation and design guideline policies, streetscape redesign, "hardening" community infrastructure, and the adoption of zoning, improvement, or other types of regulations designed to increase hazard mitigation for Nantucket properties. Protection strategy encourages the creation of infrastructure that protects resources from sea level rise, erosion, and high-water threats. Examples of protection include coastal hazard mitigation infrastructure, beach nourishment, and green/gray coastline defense development.

In community meetings, residents of Nantucket have identified preferred approaches for building resistance in different areas of the town and the island. Results from these meetings, outlined in the Town of Nantucket Coastal Risk Assessment and Resiliency Strategies study (2020), show that Nantucket prefers to use protection strategies for the Nantucket airport area. Residents prefer a blended protection and accommodation approach for Downtown and Brant Point. Protection and then a blended accommodation/retreat strategy is preferred for neighborhoods south of Nantucket Harbor. Accommodation and retreat are the preferred strategies for Cliff Road and Maddequet/Eel Point, Madaket and Sheep Pond Road, Tom Nevers/Southeast Quarter, Quidnet and Wauwinet, and Coatue/Great Point, and retreat dominated the resident response towards Siasconset.

Based on resident feedback and the conclusions of various Nantucket planning studies, accommodation strategies across Nantucket will strengthen the community's resilience. Accommodation strategies also offer the most comprehensive and feasible path to protecting Nantucket's historic resources and character. To this end, these resiliency guidelines will strengthen Nantucket's accommodation approaches to mitigating vulnerabilities, providing specific guidance, best practices, and examples of design concepts that will enhance Nantucket's ability to protect its historic resources.



The Town of Nantucket Coastal Risk Assessment and Resiliency Strategies report from 2020 is one of a number of studies completed in recent years to address the issue of flooding and rising sea levels.

Nantucket's Historic Resources—What is at Risk?

All of Nantucket is a designated National Historic Landmark with properties of architectural and historical significance located across the island. The greatest concentration of historic properties are in the local historic districts of Nantucket and Siasconset. The *Town of Nantucket Hazard Mitigation Plan* of 2019 identified the east section of the Nantucket Historic District including downtown and Brant Point to be the most vulnerable areas with regard to coastal flooding. The prevalence of low - lying coastal land and the high building densities creates a dangerous potential for repeated flood damage, even with the protections provided by the sheltered harbor. Approximately 950 buildings in the downtown and Brant Point areas are located within 1% annual - chance and 0.2% annual - chance flood zones. The areas of Easy Street, Easton Street at North Beach, and Washington Street frequently experience flooding from either storms or high-tide events.

In Siasconset most of the historic district is located on the bluff above the flood zone. While areas along Front Street and adjacent streets are at risk for erosion, there is no risk for flooding in the near future. The one exception in the community is the Codfish Park neighborhood along Codfish Park Road where 61 dwellings and outbuildings are located. These properties are currently outside the mapped 1% annual-chance coastal floodplain, but near the edge of the 1% annual-chance flood zone with the potential for wave velocity hazard. The Codfish Park neighborhood experienced flooding and erosion during the 1992 No Name storm, with several structures lost to the ocean. Damage to buildings also occurred in the April 1997 storm.

Flood zones have been mapped and identified for properties in the Nantucket and Siasconset Historic Districts. Flood zones are geographic areas that the Federal Emergency Management Agency (FEMA) has defined according to varying levels of flood risk. These zones are depicted on Nantucket's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the potential severity or type of flooding in the area. High-risk areas are defined as "AE" zones which designate a base flood elevation that must be met in order for a property to meet flood insurance requirements. High-risk areas may also include "VE" coastal areas which have 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.

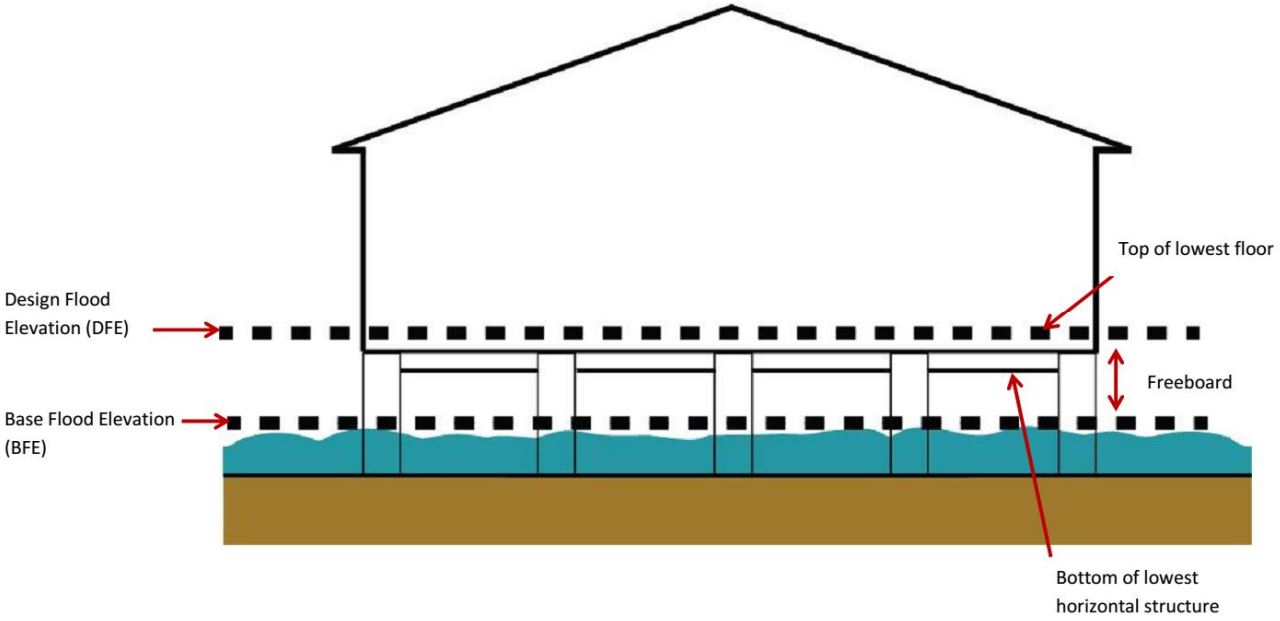
Base Flood Elevations (BFEs) are shown on Flood Insurance Rate Maps (FIRMs) and the flood profiles. The BFE is the elevation of flooding, including wave height, having a 1% chance of being equaled or exceeded in any given year (also known as "base flood" and "100-year flood"). The BFE is the computed elevation to which floodwater is anticipated to rise during the base flood. The BFE is the regulatory requirement for the elevation or flood proofing of buildings and structures. The difference between the BFE and a building or structure's elevation determines the flood insurance premium.

Using 3D technology, the Preservation Institute of Nantucket completed visualization studies of areas such as North Wharf (above) and Brant Point (below) to show these areas in 2100 based on current estimates of sea level rise.

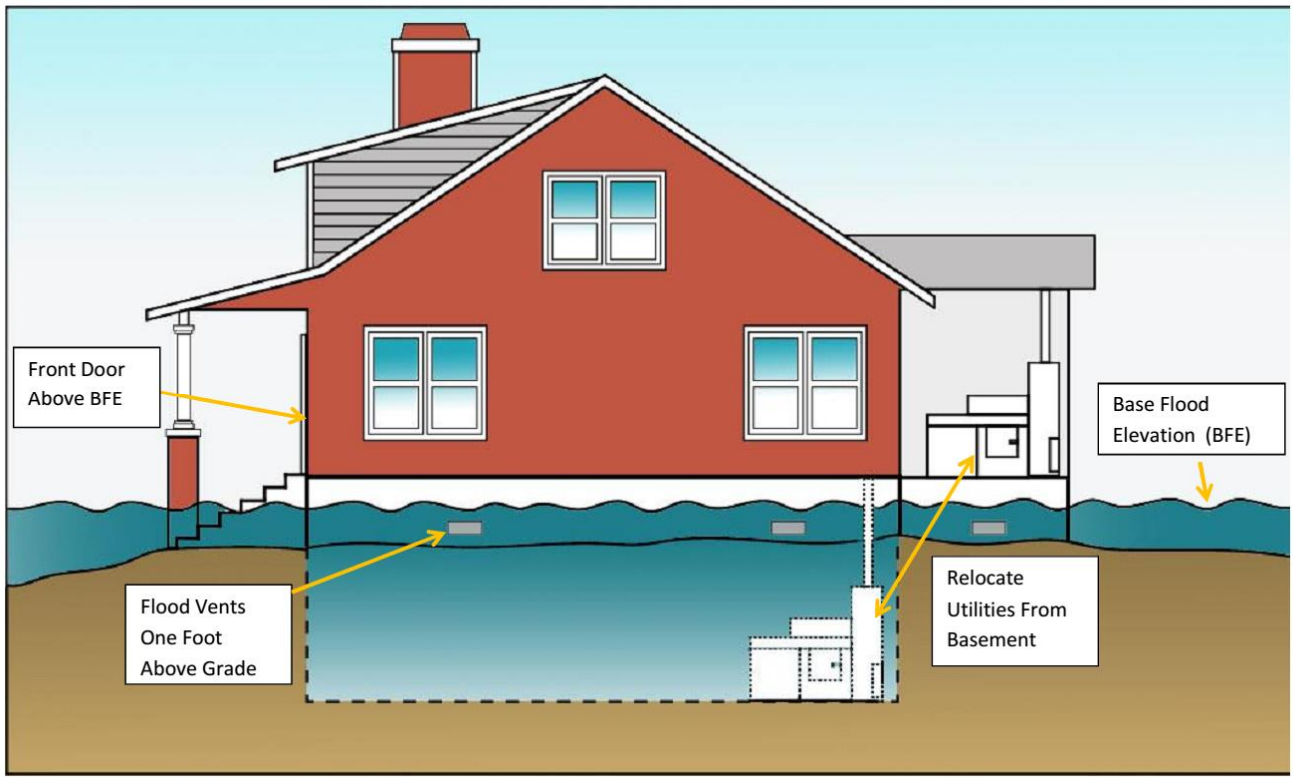
In order to obtain an accurate flood risk assessment, property owners in the historic districts need to acquire an Elevation Certificate from a licensed surveyor, architect, or engineer. An Elevation Certificate will identify the height of the lowest floor relative to the BFE. The height of the lowest occupied floor, which may be the basement, can be used to calculate flood insurance rates and determine the height to which the building must be protected to comply with Nantucket's floodplain management regulations. The BFE in the Nantucket and Siasconset Historic Districts vary from six (6) to eight (8) feet. Properties most at risk are properties along Washington Street which have a BFE of eight (8) feet.

In addition to the BFE, the Nantucket and Siasconset Historic Districts also have a Design Flood Elevation (DFE) and Regulatory Flood Protection Elevation (RFPE) which is one-foot (1') above the BFE. The DFE and RFPE are regulatory flood elevations adopted to add additional height as a factor of safety. This additional amount of height is also called the "freeboard" which is the level at which a structure's lowest floor must be elevated or flood proofed to be in accordance with the Town's floodplain management regulations.

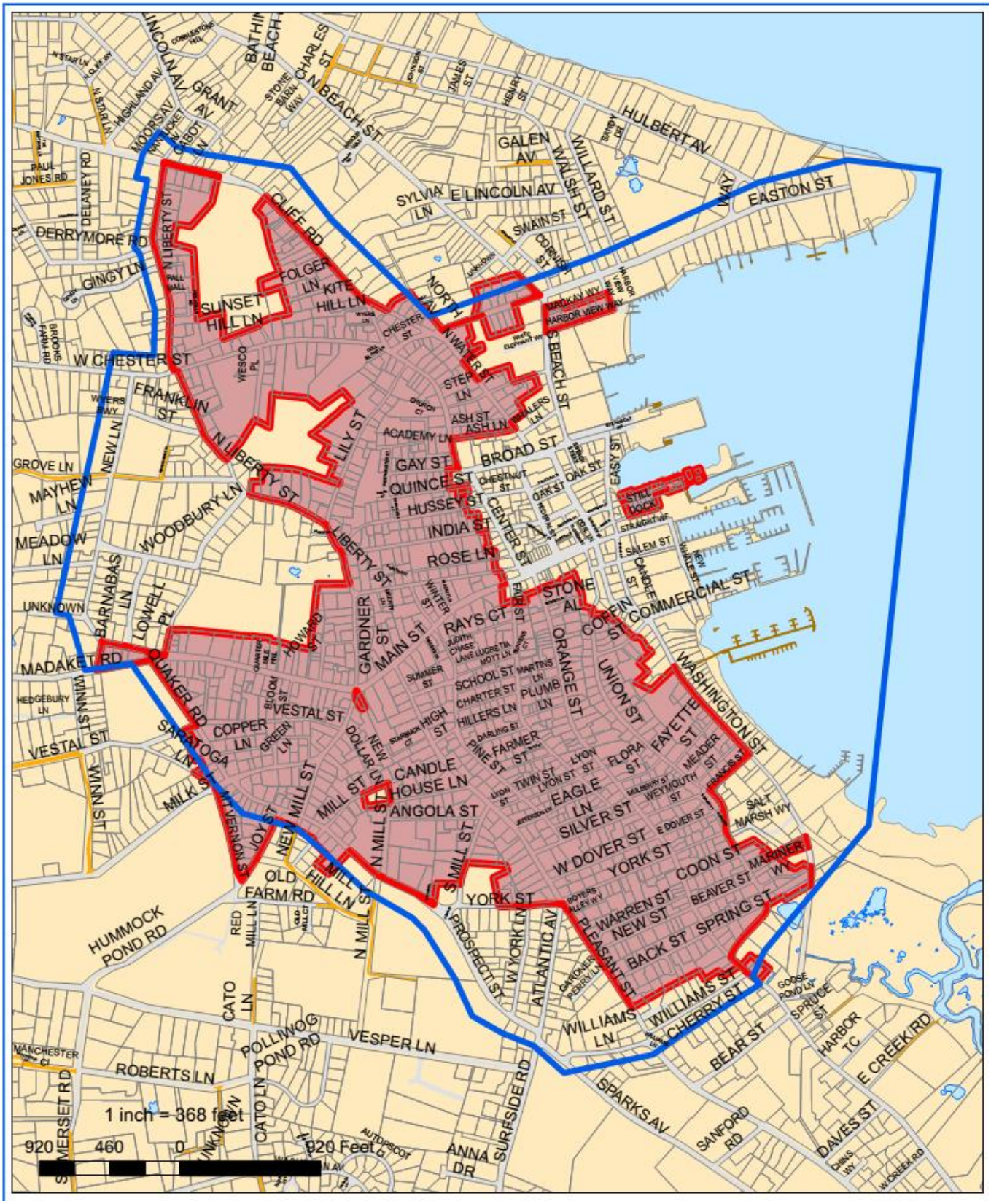
In order to meet the regulatory flood elevations, Nantucket's historic resources can be made more resilient through actions such as dry flood proofing, wet flood proofing, elevation and the retrofitting of flood-resistant natural features or materials. This design guideline manual outlines the various approaches to meeting flood requirements while also striving for consistency with the manual "Building with Nantucket in Mind, Guidelines for Protecting the Historic Architecture and Landscape of Nantucket Island" which was published and adopted in 1992. This manual and later amendments serve as the basis for design review on the island by the Nantucket Historic District Commission.



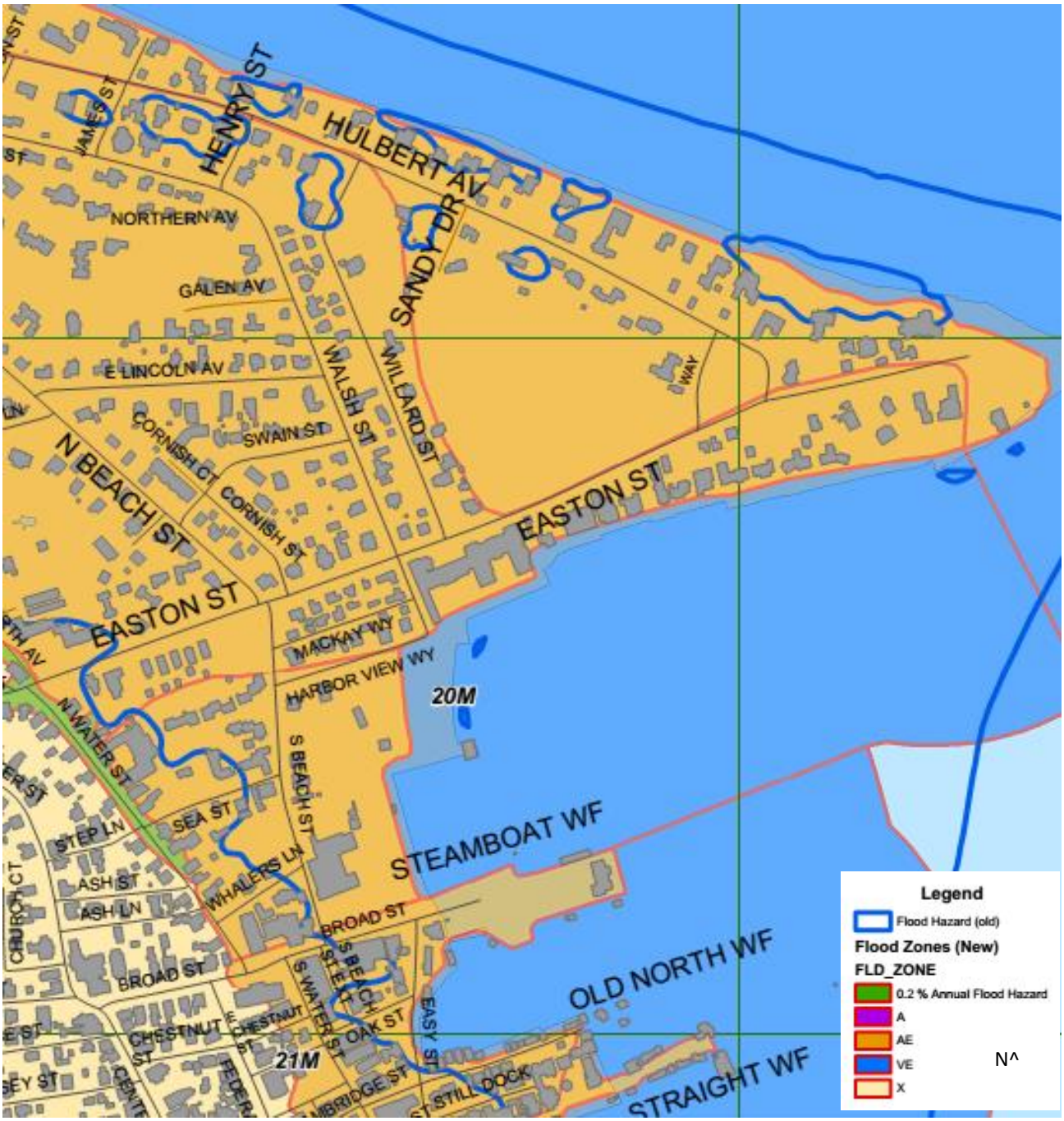
This illustration depicts differences between the Base Flood Elevation (BFE) and Design Flood Elevation (DFE) .for A Zone Buildings in coastal communities.



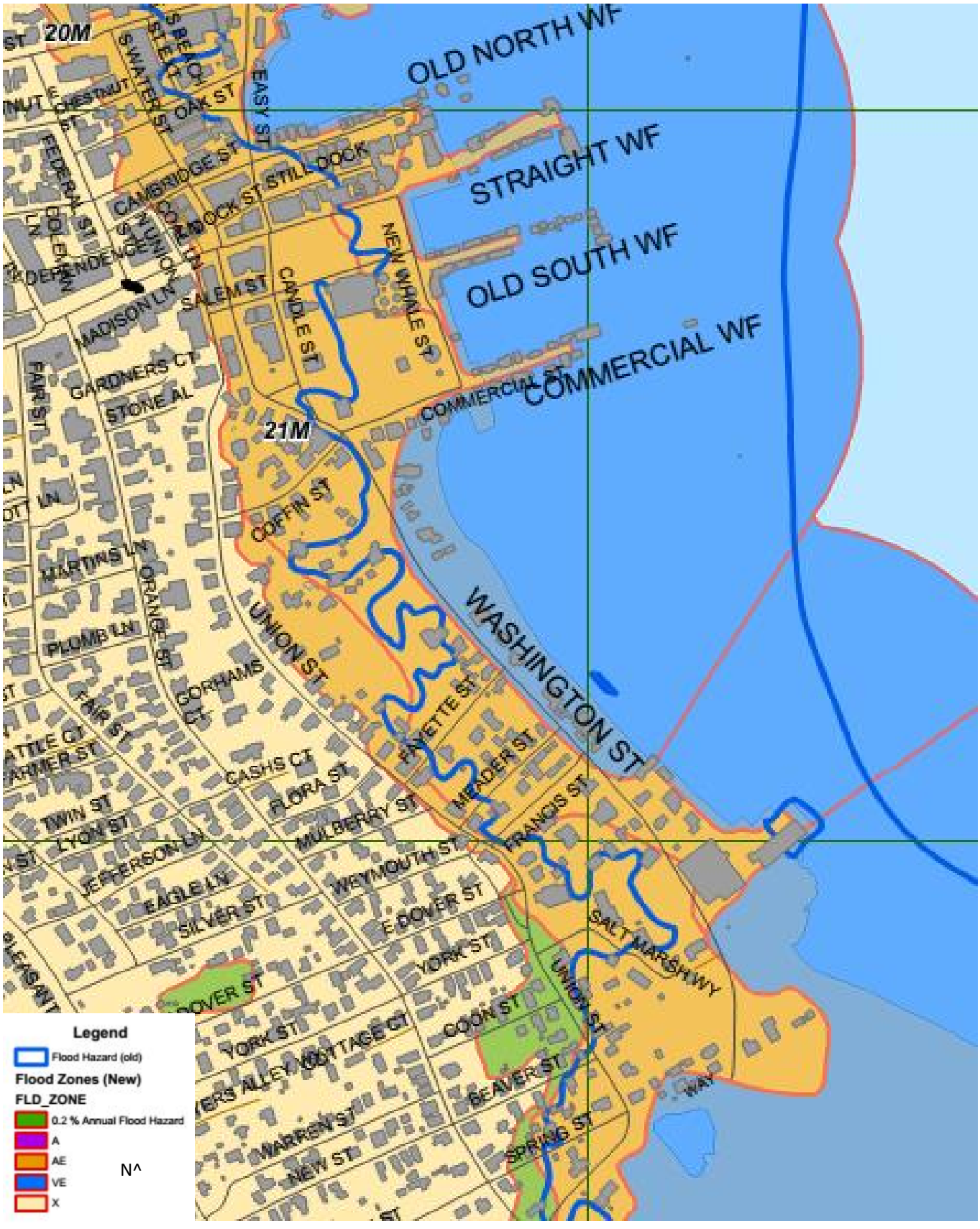
Resilience for Nantucket's historic properties may also include "wet flood-proofing" where the water is allowed to flow through the basement or crawl space and exit via flood vents.



Map of the Nantucket Historic District. The blue line is the boundary of the Core Historic District and the red line is the Residential Old Historic Zoning District.

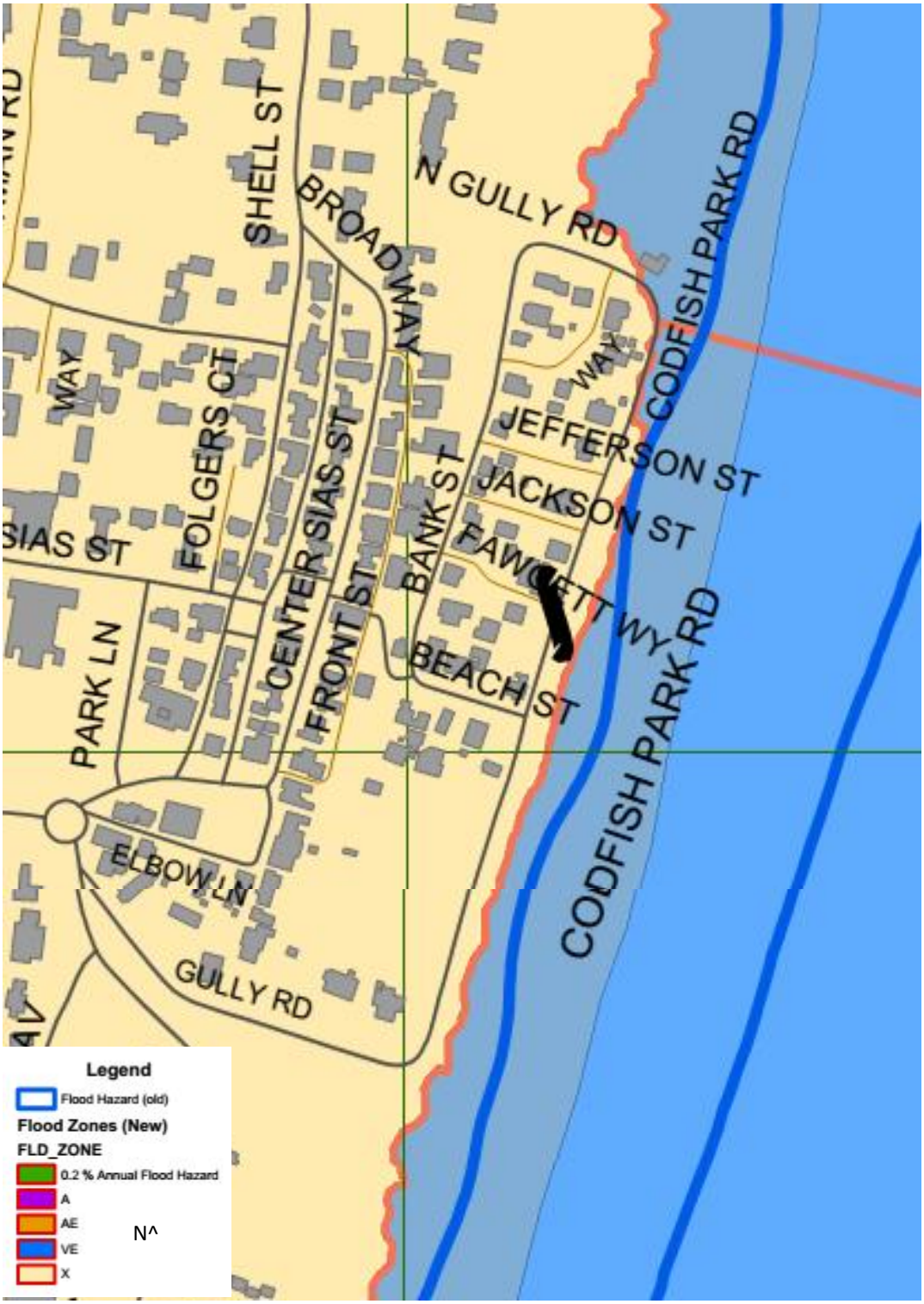


Within the Nantucket Historic District are the AE flood zones which include the properties on Brant Point, the north section of the commercial district and dwellings on the east side of Water Street. (Flood Insurance Rate Map, 2014)



The Nantucket Historic District includes properties along Washington Street which are vulnerable to wave action (VE Zone) and the flood zone extends west to Union Street (AE Zone). (Flood Insurance Rate Map, 2014)

Map of the Siasconset Historic District. The blue line is the boundary of the Core Historic District and the green line is the Sconset Old Historic Zoning District.



The Siasconset Historic District is largely above the flood zones but some properties along Codfish Park Road may be vulnerable in the future due to rising sea levels. (Flood Insurance Rate Map, 2014)

High tides are now a common occurrence in the Nantucket Historic District such as on September 22, 2020.

Nantucket and Flood Resiliency Programs

The National Flood Insurance Program

The National Flood Insurance Program (NFIP) was created in 1968 by Congress to provide federally backed flood insurance. The program is a voluntary agreement between municipalities and the Federal Emergency Management Agency (FEMA.) FEMA is a Department of Homeland Security Agency that is responsible for coordinating disaster planning and response throughout the United States. FEMA updates and operates the overarching federal disaster response plans, advises and approves state-level Comprehensive Emergency Management Plans (CEMP), provides disaster mitigation support to local governments, and coordinates federal, state, and local response to natural disasters.

To streamline the process of flood risk management, states and local governments designate agencies or individuals to coordinate with federal NFIP staff and resources. In Massachusetts, the Department of Conservation and Recreation's Flood Hazard Management Program (DCR/FHMP) coordinates with local authorities to implement the NFIP as outlined in the Massachusetts Floodplain Management Guide. This agency in turn communicates with the Town of Nantucket's designated flood risk mitigation leadership, including the local Floodplain Manager and the Department of Planning and Land Use Services. While the NFIP and the DCR/FHMP are advisory, the Town of Nantucket enforces the flood risk management regulations laid out in the Massachusetts Building Code and the Code of the Town of Nantucket. Chapter 139-12 of the Code of the Town of Nantucket deals specifically with flood risk mitigation regulations. Regulatory standards in these codes are based on NFIP mapping and analysis.

The Massachusetts Emergency Management Agency

FEMA's state-level counterpart in Massachusetts is the Massachusetts Emergency Management Agency (MEMA). MEMA develops and updates the Massachusetts Comprehensive Emergency Management Plan (CEMP) in consultation with various stakeholders, and this state-level plan interfaces with FEMA's national emergency planning. Planning at the local level in turn interfaces with the state-level CEMP, and for Nantucket, this plan is called *The Town of Nantucket Natural Hazard Mitigation Plan*. Federal regulations guide the creation and upkeep of these plans so that each level of this emergency management infrastructure remains consistent with the others.

Floodplain Regulations and Nantucket's Historic Buildings and Structures

The Nantucket Historic District was listed in the National Register of Historic Places on November 13, 1966. The island was also declared a National Historic Landmark in 1966 and this nomination was updated with additional information and inventory in 2012. Zoning ordinances did not exist on Nantucket for many years. The first historic districts were established in 1955, "Old and Historic Nantucket" and "Old and Historic Siasconset," to promote exterior design standards. The Nantucket Historic District encompasses the entire island including historic buildings and structures in Nantucket, Siasconset and other communities. Properties that are fifty years old or older and which retain their architectural and historical integrity are considered contributing to the character of the district. Included in the federal and state flood resiliency program regulations are specific considerations for buildings and structures that have obtained a "Historic Designation." Properties that are considered to be contributing to the character of the National Historic Landmark District are considered to be historic buildings or structures.

If a contributing building or structure in Nantucket's floodplains undergoes substantial improvement or damage (worth 50% or more of the building's market value), the building or structure must be brought up to code. However, the definition of substantial improvement/damage exempts "any alteration of a historic structure, provided that the alteration will not preclude the continued designation as a historic structure." This exemption can be interpreted as an exemption only from those flood mitigation activities that would preclude the structure's historic designation (recommended) or a complete exemption from all flood mitigation. The local Building Commissioner may make this determination but should do so consistently for all qualifying historic structures. Certain physical features such as roof forms, doors, windows, siding, porches, and many other architectural features qualify a building or structure as contributing to the historic district. When these features are removed or significantly altered, the contributing status can be rescinded so these features must be preserved or repaired in order to maintain the substantial improvement exemption.

In past years the island's historic structures have been allowed to maintain subsidized insurance rates and have been exempt from some required improvements triggered by damages or improvements that exceed fifty percent of its their market value. However, with the continued cycle of repeated flooding, the subsidized rates are increased by as much as 18% every year causing financial hardship for many residents. In order to minimize their insurance rates property owners may wish to mitigate future damage and losses due to flooding. The level of mitigation directly correlates with insurance premiums.

Nantucket's historic buildings and structures may be particularly at risk from coastal flooding, relative to other assets, for the following reasons:

- ❑ Location: Historic properties built before modern zoning regulations may be located in higher risk areas than what would be allowed under current laws. Nantucket's downtown is an example of a high density of historic properties located in a coastal flood zone.

- ❑ Construction: The majority of the island's buildings and structures were built of old-growth lumber, have stone or brick foundations and often display excellent craftsmanship. However, they were generally not built with flood proofing techniques or with methods required by today's Building Codes and may not be able to withstand flooding as those built within the past fifty years.

- ❑ Age: Unless regularly maintained, materials may deteriorate and a historic property may not be able to withstand flooding as well as when first constructed.

- ❑ Sea Level Rise: Buildings and structures that were historically at a relatively low risk from coastal flooding may be more exposed in the present-day due to sea level rise over the last century.

Additionally, hazard mitigation activities may be more difficult to implement to a historic property without altering its historic character. Of particular concern are those in the flood zones which have basements used for habitable space. Under current FEMA regulations basements may not be habited because flooding can damage utilities, create health risks and undermine the foundation.

Dwellings on Union Street are representative of the historic resources which may be at risk in the future due to floods and high water events.

CHAPTER 2: NANTUCKET AND DESIGN REVIEW FOR RESILIENCE

Design Guidelines and Existing Conditions

Nantucket's floodplains includes the waterfront and numerous blocks of residential and commercial buildings in the Town of Nantucket. Nantucket is known as one of the best-preserved communities in America with its collection of late 17th- to mid-19th-century buildings. The island's maritime heritage is represented by the nearly 800 buildings built before the Civil War. By the late 19th century the whaling and fishing industry was in decline but the local economy gradually improved as the island became a vacation and tourism destination. Visitor's were drawn to Nantucket by the summer climate and also by its wealth of historic buildings. In recognition of its notable heritage, the Nantucket Historic District was created by the townspeople and the Massachusetts legislature in 1955. The National Park Service, U.S. Department of the Interior, designated the town a National Historic Landmark in 1966 and subsequently listed it in the National Register of Historic Places.

In order to preserve and protect Nantucket's historic resources, the Nantucket Historic District Commission was created by public mandate to review and approve all construction on the island. Design guidelines were published in 1992 to provide information on "best practices" for the preservation and rehabilitation of existing historic buildings and structures. The guidelines also have standards for new construction to ensure compatibility with the island's historic architecture. These guidelines, detailed in the publication *Building With Nantucket in Mind,* are used by the Nantucket Historic District Commission when it reviews applications for rehabilitation, new construction and demolition. The design guidelines are based on the character and traditions of historic Nantucket architecture to ensure that new construction is in keeping with the island's architectural heritage. The design guidelines detailed in *Building With Nantucket in Mind* have five major goals for the Town of Nantucket:

1. To preserve as unchanged as possible the old structures built before the middle of the 19th century in their original settings and conditions; also to maintain the fundamental harmony of the historic community by approving new structures and changes in old ones only when they will blend harmoniously with the traditions of the era before 1846.

2. To preserve the historic character of the old town of Nantucket as a whole, including its pedestrian scale as well as its close and complementary pattern.

3. To preserve the integrity of the historic buildings that physically express the history of the island; to encourage faithful maintenance and accurate restorations of historic structures; to ensure that all additions to or alterations of historic buildings are compatible with the original building.

4. To make certain all new buildings are compatible with the buildings adjacent to them and contribute to the overall harmony of the street; to encourage new buildings that, while reflecting the traditions and character of historic buildings, are in themselves high quality designs for this area.

5. To encourage new development adjacent to the town to continue the traditions and fabric of the town, particularly with regard to its historic pattern, scale, streetside building alignment and pedestrian details.

The design guidelines detailed in *Building With Nantucket in Mind also* have four major goals for construction outside the Town of Nantucket:

1. To protect the character of existing small settlements on the island, especially Siasconset, but also Wauwinet, Quidnet, Surfside and Madaket; and to ensure that all new construction in or adjacent to them is harmonious with their intrinsic unity.

2. To foster a relatedness of character and 'sense of place' among all new buildings, based on traditional forms, so that they share a common identity and express their common heritage.

3. To preserve and protect the spacious character of the natural landscape outside of high-density settlements through the sensitive design of buildings, including their siting; to encourage clustering of houses; to minimize the visual impact on the landscape of scattered new houses; and to make sure new buildings are designed as partners with the land, not its conquerors.

4. To encourage new constructions that are of the highest design quality and that represent careful responses to the specific site features, year-round climate and the needs and desires of the occupants.

Since the publication of *Building With Nantucket in Mind*, the Nantucket Historic District Commission has adopted numerous amendments dealing with many aspects of historic buildings, materials and site and setting. These amendments provide additional information to property owners regarding paint colors, approvable roof shingles, installation and placement of solar panels and signs for commercial buildings. *Building With Nantucket in Mind* and the adopted amendments can be found on the Town's website at Historic District Commission.

The Nantucket Historic District Commission

The Nantucket Historic District Commission (HDC) is made up of eight citizens who meet on a regular basis to review applications for rehabilitation, new construction and demolition within the Nantucket National Historic Landmark District. The (HDC) is served by the Preservation Planning Staff which is within the Planning & Land Use Services Department of the Town and County of Nantucket. The Preservation Planning Staff is responsible to be a liaison between property owners and the HDC. HDC Applications along with an accompanying checklist and other required materials such as photographs and drawings are submitted to the Staff prior to review by the HDC. The HDC conducts review of applications based upon the adopted design guidelines.

The Nantucket Historic Structures Advisory Board

The goal of the Nantucket Historic Structures Advisory Board (HSAB) is to preserve the integrity and sense of scale and proportion of the historic structures and village streetscapes of the Nantucket Historic District. The Board We review all applications to the Historic District Commission (HDC) to construct or otherwise alter any structures. Using all resources available; Building with Nantucket in Mind, the archives of the Nantucket Preservation Trust, PIN (Preservation Institute- Nantucket), and the Nantucket Historical Association, Building Department documents and our own intimate knowledge of the Old Historic District. We support the HDC board review process by providing comments and recommendations for all applications.

The Nantucket Historical Commission

In addition to the design review provided by the HDC and HSAB, the Nantucket Historical Commission (NHC) serves the public by protecting the National Historic Landmark of Nantucket. Nantucket's important historic resources include buildings and structures as well as their setting and context, the American and Native American artifacts, and the island's special visual quality, as expressed in the natural and built environment. The NHC advises the Select Board on matters of preservation, and works with Nantucket's Preservation Planner, Planning Director, and other municipal agencies. It creates plans and guidelines for historic preservation, directs surveys of buildings and lands of archaeological and historic significance, and advocates for historic preservation. The NHC complements the HDC which is Nantucket's regulatory architectural review board and also serves as a liaison with the Massachusetts Historical Commission and local preservation and conservation non-profit groups.

The Nantucket Preservation Trust

The Nantucket Preservation Trust (NPT) is a nonprofit, membership-based organization with a focus on the preservation of the island's historic architecture. The NPT provides programs that explore the architecture and history of the island, and strives to increase awareness of the importance and fragility of the island's architectural heritage. Of special concern are Nantucket's historic interiors that are not protected by local government regulations and are often threatened by insensitive rehabilitation.

The Nantucket Land Bank

The Nantucket Land Bank was created in 1983 assists in flood resiliency through its work of acquiring property to protect natural environments on the island. The Land Bank purchases, holds and manages open space and has restored a number of wetland areas on the island. The Land Bank has removed non-contributing buildings and structures and restored natural habitats. Their work includes enhancing the quality of life for residents and visitors with increased outdoor recreational opportunities.

Land Bank properties include the park area and boardwalk along Easy Street.

The *Flooding Adaptation and Building Elevation Design Guidelines* are intended to be an additional source of design review guidance for property owners and the HDC, HSAB and NHC. As property owners move forward with resilient projects in the future, the guidelines provide "best practices" for hardening and elevating Nantucket's historic buildings and structures to withstand flooding, high-water events and rising sea levels.

CHAPTER 3: RESILIENCE GUIDELINES–OVERALL APPROACH

Introduction

The resiliency standards for the Town of Nantucket are intended to provide standards for the preservation and protection of existing historic buildings in flood zones. These standards are a response to increased flooding and the potential for rising sea levels affecting the National Historic Landmark District. The historic district has experienced repeated flooding issues since its founding in the 18th century.

The Town of Nantucket encourages property owners in the island's flood plains to make their historic buildings and structures more resilient through hardening and elevation. **Hardening** is the term to describe making buildings more flood proof and wind proof through exterior barriers, window shutters and other preventive techniques known as "dry-flood proofing." Another approach to hardening is "wet-flood proofing" where water is allowed to flow through the building with no or minimal damage. **Elevation** refers to the process of raising an existing building on its foundation to a height above projected future high water caused by storms and floods. The resilience standards seek to allow for increased height or hardening while resulting in the least adverse impact possible to a historic property's original design and its context within the streetscape.

The resiliency standards address both low elevation projects (four feet or less) and high elevation projects (above four feet). Low elevation projects may include simply raising the existing foundation by several feet which in most cases will retain much of the architectural context of the property and streetscape. However, high elevation projects may require the addition of extended foundation piers or posts resulting in a visual change to a property's appearance and its context within the streetscape.

The intensity of recent storms and rising sea levels makes elevation a significant factor for homeowners faced with repeated flooding and rising insurance rates. By applying the design guidelines, the Nantucket HDC and NHC encourage a consistent approach to elevation. These elevation design guidelines are intended to assist property owners with appropriate designs and not as a list of steps for codes compliance. Property owners and other stakeholders should consult Nantucket's National Flood Insurance Program (NFIP) rating, and therefore, the flood insurance rates and local floodplain regulations and requirements when determining the best approach for each historic property.

Congress passed the Homeowner Flood Insurance Affordability Act in 2014 to implement reforms to the NFIP. Many properties in high-risk flood zones such as those in the Nantucket and Siansconset Historic Districts were constructed prior to the adoption of the community's first Flood Insurance Rate Map (FIRM). Several provisions of the 2014 law apply to these "pre-FIRM" properties. In consultation with local building code officials and HDC Staff, a property owner can determine an appropriate elevation level and related methods to mitigate associated impacts on historic buildings.

The FIRMs 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 basements, may be equally vulnerable to flooding. Properties outside of designated floodplains may experience flooding from hurricanes, tropical storms, and other extreme weather events.

Additionally, if the owner of a historic property is seeking federal or state historic tax credits or grants, it is essential to engage in early discussions with the Massachusetts State Historic Preservation Office pertaining to those requirements.

The Pacific Club at 15 Main Street is representative of the historic buildings which were built prior to the adoption of Nantucket's FIRM maps.

What are the Resiliency Standards Based On? - The National Park Service Guidelines on Flood Adaptation for Rehabilitating Historic Buildings

Nantucket's *Flooding Adaptation & Building Elevation Design Guidelines* have been developed in accordance with the National Park Service's (NPS) *Standards on Flood Adaptation for Rehabilitating Historic Buildings* published in 2019. These standards are referenced throughout this chapter and provide the basis for resiliency recommendations and outline flood mitigation strategies for historic buildings. Similar to the *Secretary of the Interior's Standards for Rehabilitation,* it is up to the Nantucket Historic District Commission to interpret the standards.

The NPS standards are organized by various treatments and approaches to resiliency. The most common adaptation measures are described using definitions established by the Federal Emergency Management Agency (FEMA). These adaptation treatments are:

- Planning and Assessment for Flood Risk Reduction
- Temporary Protective Measures
- Site and Landscape Adaptations
- Protection of Utilities
- Dry Flood proofing
- Wet Flood proofing
- Filling the Basement
- Elevating the Building on a New Foundation
- Elevating the Interior Structure
- Abandon the First Story
- Move the Historic Building

All of these approaches and treatments are reviewed and assessed for their applicability to Nantucket's historic resources which are at risk in the island's flood zones. The flooding design guidance developed for Nantucket is modeled from the NPS flooding adaptation treatment standards and should be integrated into all relevant town planning documents as updated or completed, including the *Coastal Resilience Plan*. Planning and assessment for reducing flood risk is the first step that property owners should take prior to selecting an adaptation treatment. Temporary protective measures are treatments that usually do not have a major affect on a property's appearance. The impacts of the other adaptation treatments to the historic property will vary greatly depending on factors such as location and site conditions, historic significance, flood risk, materials, site and setting and architectural style.

Lessons Learned—Best Practices from State and Local Resilience Efforts and Design Guidelines

The National Park Service's *Standards on Flood Adaptation for Rehabilitating Historic Buildings* was published in 2019. This effort followed years of assessing the impact to historic properties and historic districts in recovery efforts from disasters such as Hurricane Katrina in 2005 and Hurricane Sandy in 2012. Hundreds of historic properties were destroyed from these and other flooding events. For historic properties which survived, resilient approaches such as dry flood proofing, wet flood proofing and elevation were undertaken—often with mixed results. Some approaches were consistent with retaining the property's essential architectural and historical character while others resulted in a loss of integrity and altered the streetscape. High elevation projects where a property is raised four feet or more above its original foundation have been particularly challenging.

Over the past two decades, a national conversation between historic preservationists and natural disaster planners has begun to shed light on the changing realities of historic preservation in light of global climate change. A national review of state hazard mitigation plans (SHMPs) in 2014 showed that only 26% of these plans contained mention of historic preservation mitigation strategies and 50% neither include mention of this objective nor included historic preservation staff in a core planning capacity. In this respect, Massachusetts and Nantucket are ahead of the national curve. The Town of Nantucket's previously noted planning studies have outlined mitigation strategies to protect various historic resources. Locally, Nantucket has explicitly stated the importance of historic preservation objectives in natural disaster planning since the last *Nantucket Master Plan* update (2009).

How have other localities adapted Historic Preservation Design Guidelines to adapt disaster mitigation for historic resources? Cities such as New Orleans, Charleston, and Miami have all amended their design guidelines to allow for more flexibility in hardening and elevation projects. In smaller communities like Mandeville, Louisiana and Belhaven, North Carolina property owners have elevated entire blocks of dwellings to meet FEMA standards. Of particular relevance to Nantucket are the design standards adopted by New Jersey, Newport, Rhode Island and Boston.

New Jersey: The New Jersey Elevation Design Guidelines for Historic Properties, adopted in 2019, establishes specific parameters for building elevation while accounting for "localized flood risk; floodplain management requirements; parcel site limitations; as well as building typology, style, and materials." In a section titled "Balancing Preservation and Elevation," the plan addresses the difficult realities of managing traditional preservation expectations (*The Secretary of the Interiors Standards for Rehabilitation*) while accounting for increasing climate change.

The impact to historic resources resulting from Hurricane Katrina in New Orleans (above) and Hurricane Sandy on the New Jersey shore (below) led to updated design guidelines to address resiliency efforts (Photographs courtesy of FEMA).

Newport, Rhode Island: In January of 2020, Newport's Historic District Commission concluded that "best policy for the long-term preservation of historic structures is to support elevating structures to FEMA requirement," citing the "intensification of flooding due to hurricanes, severe storms and high tides" in the city during recent years. The Newport Historic Commission also cited a US Department of Interior Memorandum from November 2019 that states that "changing weather patterns, stronger hurricanes, and other extreme weather events have increased the risk of flooding, both in terms of frequency and magnitude. Historic properties that have never flooded before are now exposed to this risk…" Newport's initiative focused on four areas of consideration: streetscapes and context, site design, foundation design, and architecture/preservation.

Boston, Massachusetts: The *Boston Resilient, Historic Buildings Design Guide*, adopted in August 2018, outlines the basics of preservation and resilience, beginning the process of increasing resiliency, and specific recommendations by building element. The plan also highlights several case study areas and districts throughout the city, including Bay Village, South End, St. Botolph, Fort Point Channel, and Back Bay, and highlights specific resilience and elevation examples from these case studies as useful high-water mitigation examples.

The recent proliferation of these planning efforts for areas threatened by rising sea levels and the effects of climate change along the Atlantic coast, joined with examples from coastal and lowland regions throughout the United States like Mississippi, Louisiana, Georgia, and Florida, demonstrate the potential utility of historic preservation design guidelines as a basis for enacting appropriate design guidelines. With the publication of the National Park Service's *Standards on Flood Adaptation for Rehabilitating Historic Buildings* in 2019, there is now a standardized nationwide approach for the development of local design guidelines for resiliency.

CHAPTER 4: NANTUCKET'S CHARACTER IN THE FLOOD ZONES

In the Town of Nantucket the most vulnerable areas to flooding and sea level rise are those along the harbor. These areas include the wharfs, the commercial buildings along lower Main and adjacent streets, the dwellings bounded by Union and Water Streets, and Brant Point. In Siasconset, the flood plain encompasses residential properties along Codfish Park Road. The majority of the properties in these areas are over fifty years of age and would be considered contributing to the character of the Nantucket Historic Landmark District. Each of these areas have specific design characteristics which impact the development of the resilience guidelines.

Wharfs

Streets along the waterfront such as Straight Wharf, Broad Street, and Commercial Street end in a series of docks and commercial buildings built directly over the water. Many of these buildings were constructed since the 1960s but were designed to be consistent with Nantucket's historic architecture and have exteriors of wood shake shingles, gable roofs and sash windows. The majority of the buildings were constructed at-grade on the docks over the water. Some buildings were built on earth fill at-grade or on concrete or wood pilings over the water. In the future these buildings and the wharfs themselves may require elevation or hardening.

Streetscape of the waterfront and buildings along Commercial Street.

Streetscape of commercial buildings on Old South Wharf.

View of commercial buildings along Straight Wharf.

Lower Commercial Area

West of the wharfs are the brick and frame commercial buildings which are along Easy Street, Salem Street, Candle Street, Straight Wharf and lower Broad and Main Streets. These buildings display typical commercial designs with storefronts of display windows with upper facades of brick and frame with sash windows. Most buildings have gable roofs but some have gambrel or hipped designs. Almost all of these buildings are constructed at-grade with entrances directly on the street. Most were designed with detailing such as exteriors with wood shake shingles. A number of buildings have wood canopies or canvas awnings at the storefronts.

With only a few exceptions these commercial buildings have wood doors and lower wood panels called bulkheads beneath the display windows. These features are not flood-resistant and during high water can allow water into the first floor unless temporary flood barriers are employed. Commercial buildings must also be designed to be compliant with the Americans with Disabilities Act (ADA) which can pose challenges for hardening and elevation projects.

Streetscape of commercial buildings on Straight Wharf Street.

20th century frame commercial building at 28 Easy Street.

One of the few brick commercial buildings in the lower commercial area is the Thomas Macy Warehouse built in 1846 at 12 Straight Wharf.

At 6 Broad Street is a traditional storefront design with display windows resting on frame bulkheads which are on a concrete foundation.

Storefronts with frame bulkheads below the display windows include those at 19 Washington Street (left) and 17 Main Street (right). The design of these bulkheads are appropriate but they are not of flood-resistant materials.

Residential Area from the Waterfront to Union and Water Streets

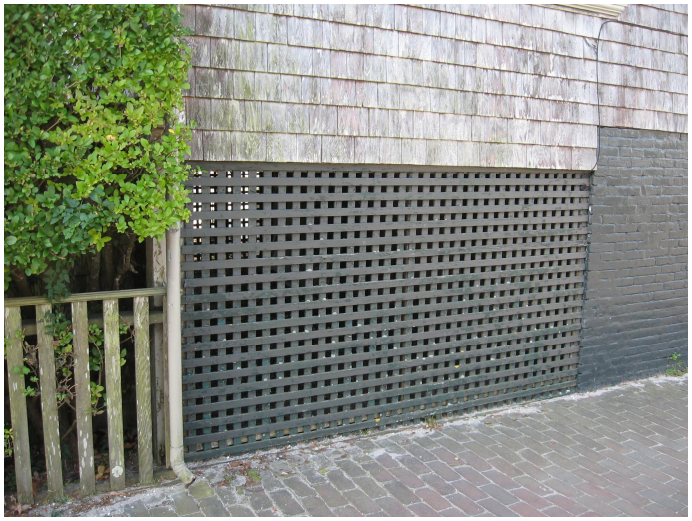
To the west of the harbor and waterfront area are the residential properties within the flood zone which extends to the east side of Union and Water Streets. The flood zone includes Washington Street and the adjacent blocks of Coffin, Fayette, and Meador Streets. These streets display many fine examples of 18th and 19th century Nantucket dwellings. Common characteristics include stone or brick perimeter wall foundations, exteriors of weatherboard siding or wood shingles, interior brick chimneys, gable roofs and entrances accessed by wood stairs.

Nantucket's design review guidelines have resulted in consistency in rehabilitation and new construction projects in the historic district. Of particular importance in the formulation of resiliency guidelines are the designs and materials of foundations, basement windows, staircases, porches, and entrances. Many of the dwellings have had the basements remodeled to accommodate living space for the owner or renters. These spaces often have wood sash or fixed casement windows inserted into the brick, stone or concrete foundations. Most foundations are solid perimeter design rather than piers. Staircases generally display wood treads, risers, landings and square newels and balusters. Beneath stair landings or below porches, panels of wood vertical board are more common than those of wood lattice. Many entrances retain their original wood paneled doors and other features such as transoms and sidelights. The preservation and replication of these features are of particular importance in any hardening or elevation project for dwellings in these blocks.

Streetscape of dwellings on the east side of N. Water Street within the flood zone.

The ca. 1850 dwelling at 6 Union Street has a brick foundation with lattice vent panels, a staircase with square newels and balusters and lattice panels beneath the stair landing.

Built in 1997, the dwelling at 44 Washington Street was designed to be compatible with adjacent historic buildings and has wood staircases with square newels and balusters and a pier foundation with lattice panels.

Some dwellings have a variety of foundation materials such as the stone and brick foundation at 7 Union Street (left). Beneath the porch at 33 Union Street are appropriate lattice panels (right).


In the early 20th century some foundations were rebuilt with concrete and basement living space added (29 Union Street , left). Rock-faced concrete block was also used as a foundation material in the early 1900s (39 Washington Street, right).


Dwellings built in recent decades generally have solid concrete foundations with flood vents (2 Harbor View Way, left). Beneath porches and stair landings vertical panels are widely common (6 Fayette Street, right).

Siasconset

The Siasconset Historic District is located in the community of Siasconset at the southeast area of the island. The historic district encompasses blocks of residential, commercial and religious buildings constructed from the 1700s to the present. The majority of the district's properties are located on a bluff overlooking the ocean and are not at risk of flooding. Below the bluff are the streets of Codfish Park Road and Bank Street with interspersed short connecting streets. The flood zone for the historic district currently only includes Codfish Park Road but rising sea levels may threaten the entire area below the bluff in the future. Properties on these streets are primarily one– to two-story frame dwellings or seasonal rental homes built near, or at-grade.

Frame dwelling at 30 Codfish Park Road built in 1928.

One– and one-half story frame dwelling built in 1920 at 24 Codfish Park Road.

One of the most common stair in Nantucket is the center/linear split design which takes advantage of the shallow street setbacks (7 Union Street, left and 25 Washington Street right).

Historic and rebuilt stairs are usually simple designs with square newels and square balusters (1 Fayette Street, left and 8 Harbor View Way, right).

The pattern of square newels and balusters is also found in new construction and rebuilt stairs, (13 Union Street, left and 44 Washington Street, right).

CHAPTER 5: GUIDELINES FOR FLOOD RESILIENCE AND NATURAL FEATURES

Introduction

The resilience guidelines for Nantucket are based on the guidelines already in use by the Nantucket Historic District Commission (HDC), the 2019 guidelines published by the National Park Service and "best practices" from various community and state standards. The intent of the resilience guidelines is to provide recommendations for hardening and elevation of properties within the flood zones in accordance with established standards and consistent with past projects approved by the HDC. The guidelines are numbered to provide easy reference for the HDC and property owners in the design review and approval process.

Flood Proofing Using Natural Features

In Nantucket's flood zones there are already a number of resilience programs utilizing natural features to reduce flooding to historic properties. One of these is the Nantucket Land Bank which was established in 1983 to acquire waterfront access, preserve open space, and protect environmentally sensitive areas. Through promoting the preservation of wetlands the Land Bank assists in reducing flooding on adjacent property. The *Nantucket Natural Hazard Mitigation Plan* of 2019 has a number of recommendations for reducing flooding using the island's natural features. Property owners can also reduce flooding through reducing the amount of hard surfaces on their property, adding permeable paving materials and using plants which absorb and retain water. Flood proofing using natural features will generally have little effect on altering the appearance of a historic property.

Building With Nantucket in Mind

The existing design guidelines discuss the historic evolution of the island's landscape and natural features. There were very few trees in town until the mid-1800s. Among the first trees planted in town were the elms placed along Main Street in 1851 by Henry Coffin and many other residents planted trees by the end of the century. Landscape features in the Nantucket Historic District are characterized by a limited number of plant materials due to the climate. The HDC does not generally review residential plantings but strongly recommends that any new lot development use traditional plant materials and designs. Hedges or other front plantings should be coordinated with adjacent lots as well as with the existing street edge. New landscaping should follow simple, restrained designs in keeping with the character of Nantucket.

National Park Service Flood Adaptation Recommendations

- Identify, retain, and preserve features of the historic site and setting that are important in defining its overall historic character before undertaking site mitigation work or changing the landscape or its features.
- Protect and maintain buildings, site, and landscape features by providing proper drainage to ensure that water does not erode foundation walls, drain toward the building, or damage or erode the landscape.
- Improve or restore on-site or adjacent natural systems such as living shorelines, wetlands, and beaches and dunes. Selecting new infrastructure that is able to retain floodwaters on site, such as a cistern, bio-swale, permeable pavers, green roofing and associated rail collection systems.
- Design new or improve existing stormwater management systems to reduce surface floods and reverse-flow flooding (water moving backward through the system to flood through drains). Storm-water management systems may include water retention features such as cisterns, bio-swales, permeable pavers, and green roofs.

Town flood control is assisted through the retention of wetlands such as on Brant Point.

The Nantucket Land Bank protects wetlands along the town's waterfront including these parcels on Washington Street (above and below).


Property owners are encouraged to use permeable materials for driveways such as gravel instead of hard surfaces like concrete or asphalt (28 Easton Street, left and 6 Beaver Street (right).

Gravel mixed with loose cobblestones is also an appropriate parking treatment (57 Washington Street).

Nantucket Resilient Guidelines for Natural Features

1. Natural features should be introduced for historic properties and replace hard surfaces as much as possible.

2. Property owners are encouraged to retain appropriate yard vegetation and avoid "overhardscaping" the lot.

3. Adding and protecting wetlands and natural areas should continue to be encouraged throughout the island, especially in the flood zones.

4. The restoration and stabilization of shorelines throughout the island is recommended especially areas within or adjacent to the Nantucket and Siasconset Historic Districts.

5. The installation of permeable paving surfaces is recommended for existing properties and should be required for new construction projects in the island's flood zones.

6. The replacement of the hard asphalt parking lots in the historic district flood zones with permeable surfaces is recommended.

7. Incorporating landscaping in front yards where possible is encouraged. Plantings greater than 6" in height should be kept a minimum of two feet away from foundation walls to prevent moisture buildup and from any flood vents to ensure their proper function.

8. Ensure that any natural features added to a historic property does not introduce water into the foundation and has proper drainage.

An example of water absorption landscaping is in front of the commercial building at 14 Easy Street.

The introduction of permeable surfaces for large parking lots in the historic district's flood zone should be considered in the future. The large expanses of asphalt in the lots on Salem Street (above) and Fayette and Washington Streets (below) contribute to the flooding in these areas.

CHAPTER 6: GUIDELINES FOR BUILDING RESILIENCE

Introduction

A basic approach to historic preservation guidelines is an emphasis on maintaining the property in good condition and adding appropriate features for long-term preservation. Coastal areas such as Nantucket have particular challenges due to the affects of wind, rain and frequent storms. With rising sea levels and climate change historic buildings will need additional resilience in the years ahead. This will require continual maintenance and the consideration of retro-fitting protective measures to ensure the life expectancy of Nantucket's historic resources. For historic properties at risk of flooding, treatments should be undertaken to avoid or minimize the impacts and to ensure the continued preservation of the property and its historic character. Historic properties should be maintained in good condition, monitored regularly, and assessed for actions which may improve their resilience.

Resilience strategies include strengthening the foundation and "harden" the windows and doors. Some strategies for building resilience include:

Evaluation: check your historic building's masonry, walls, and footings and assess their strength. Your local floodplain manager or the preservation planner can connect you with resources or expertise to assist in this evaluation.

Anchoring: ensure that the structure is secured to its foundations. Evaluating these connections and investing in their repair or strengthening will help prevent building movement in a high-water event. Anchoring measures can include straps, clips, or other forms of connection.

Drainage: Install a (or repair an existing) drainage system to draw water away from the building's foundations.

Storm shutters: The installation of storm-resistant shutters can strengthen the building envelope and protect windows.

Storm panels: If shutters were not historically installed on a building, demountable storm panels can be installed in advance of storm events to protect exterior windows. Several commercial storm panel products are available, and plywood or metal panels can also aid as mitigation measures on a temporary basis.

Storm screens: These protective systems can be permanently secured to upper-floor windows, where panel installation can be difficult.

Storm doors: Storm doors are a natural first step to protect and strengthen exterior doors. In addition to (or in lieu of) storm doors, storm panels can be added on a temporary basis to protect vulnerable exterior doors.

Flexible wind abatement systems: Hurricane nets or other flexible wind abatement systems can provide an effective "hardening" layer to exterior doors. These systems are particularly useful for large or unusual exterior doors, which may be difficult to adequately protect with traditional panels or storm doors.

Side latches or bolt drops: These types of mitigation additions strengthen exterior door's stress points, which can be put under particular duress during high-water natural disaster events.

Weather stripping: a key point of weakness for exterior doors is the door's seal. Replacing or repairing weather stripping regularly can help mitigate this particular exterior weakness.

Building With Nantucket in Mind

Specific maintenance recommendations are not within the current guidelines but they are clearly stated in the preservation goals including "to encourage faithful maintenance and accurate restorations of historic structures." Maintenance includes actions such as keeping water out of the building through repairs as needed to the roof, gutters, downspouts and chimneys. Maintenance also means channeling water away from the building through proper drainage. Resilience is also assisted through making the historic buildings more wind and water resistant through the addition of shutters, storm windows and doors and strengthening the foundation.

The design guidelines currently do not encourage the installation of shutters but climate change may result in an increase in storm activity and the need for additional window protection. Shutters, also called louvered blinds, are not common features on Nantucket's historic buildings. Shutters are generally added for privacy and to protect window glass. The guidelines recommend that they not be used on the exterior unless "clearly beneficial to the building or appropriate to its style and period." If shutters are installed they should be of sturdy wood construction with louvers. They should be large enough to cover the entire window area. Shutters must be functional and operable, and not look as if they were simply flat-mounted on the wall.

Storm windows are common in the historic districts and the guidelines allow these to be installed if they are of full-view design or if the meeting rail of the storm window matches the location of the window behind it. Storm windows are recommended to protect historic windows from wind and rain damage.

National Park Service Flood Adaptation Recommendations

- Develop and implement a plan to reduce the risk of damage or destruction to the historic building.
- Maintain the building, its site, and setting in good repair, and regularly monitor character-defining features.
- Undertake work to prevent or minimize the loss, damage, or destruction of the historic property while retaining and preserving significant features and the overall historic character of the building, its site, and setting.
- Use and maintain existing historic and non-historic characteristics, features, and materials of the historic building, its site, setting, and larger environment that may help to avoid or minimize the impacts of flooding.
- Ensure that, when planning work to adapt for flooding, all feasible alternatives are considered, and that the options requiring the least alteration are considered first.

Appropriate building resilience includes protecting the doors and windows at 6 York Street with a storm door (above) and storm windows (below).

Nantucket Resilient Guidelines–Building Resilience

1. Assess the structural integrity of the foundation and its ability to withstand floor waters. Add additional anchoring measures if needed.
2. Keep gutters and downspouts in good repair. Make sure they are properly connected, are clean of leaves and other debris, and channel water effectively away from the building.
3. Deteriorated gutters and downspouts should be replaced with new gutters and downspouts in keeping with HDC guidelines.
4. All water should drain away from a building and should not enter the foundation.
5. New shutters should be of louvered or paneled wood construction or another documented historical style appropriate for that style of the building in Nantucket. All shutters shall be appropriately sized to fit the window opening so that when working and closed, they will cover the window opening.
6. The addition of storm windows and doors is encouraged to protect historic materials. These should be consistent with HDC guidelines.

Storm panels are applied to protect windows over the winter and during storms (9 Codfish Park Road).

The solid wood storm shutters at 23 Front Street in Siasconset protect the original windows when they are closed during storms.

CHAPTER 7: WET FLOOD PROOFING STRATEGIES FOR NANTUCKET'S HISTORIC BUILDINGS

Introduction

"Wet flood proofing" is a method to reduce damage that typically involves three elements—allowing floodwaters to enter and exit to minimize structural damage, using flood damage-resistant materials, and elevating utility service and equipment. When a building is retrofitted to be wet flood proofed, non-flood damage-resistant materials that are below the Base Flood Elevation (BFE) should be removed and replaced with flood damage-resistant materials. When evaluating a building for wet flood proofing it is important to assess how water flows and drains around the building. It may be appropriate to fill in all or part of the basement or crawl space and improve the grading around the building. Appropriately sized and placed flood vents will need to be added in the foundation to allow floodwaters to enter and exit the building.

Most properties in Nantucket have solid foundation walls of brick, stone, or concrete. Flood water must be able to freely flow in and out without requiring electrical, mechanical, or manual operation. This includes exterior walls as well as interior walls separating enclosed spaces. To allow the free flow of water, a minimum of two flood openings are required and they must be located on different walls. Any modification to or covering of flood openings such as louvers or screens should be installed in a manner that does not impede the free flow of flood water.

If the first floor area is below the BFE, wet flood proofing should include the installation of water-resistant materials. This may include the addition of a concrete or marine-grade wood floor, water-resistant wallboard, and concrete or terrazzo floors. Relocate electrical outlets to upper walls. In any wet flood proofing project it is important to relocate utilities from basements or at-grade exteriors and place them on roofs, upper floors or on exterior platforms elevated above the Design Flood Elevation (DFE). This action is essential to maintain business utilities during a flood event and reduce replacement costs.

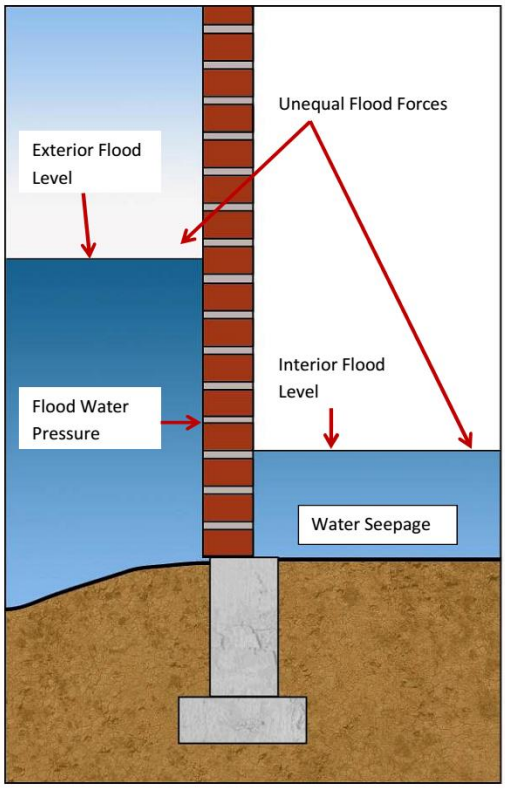
Building With Nantucket in Mind

Wet flood proofing strategies primarily affect properties in the basement and first floor areas. The most relevant sections of the existing design guidelines address foundations and exterior siding materials. Foundations in the historic districts are generally of brick laid with narrow inch mortar joints, stone, or concrete or parged concrete block. Buildings on brick, stone or concrete piers are not as common and new construction using this type of foundation has traditionally been discouraged by the HDC. Exterior wall surfaces are both small overlapping cedar shingles and clapboard. The HDC recommends that new construction be covered in a small-scale textured material traditional to Nantucket-white cedar shingles with a 5-inch exposure, wooden clapboard with a 3 ½-inch exposure, or select common brick of a uniform red tone as seen in the Nantucket Historic District.

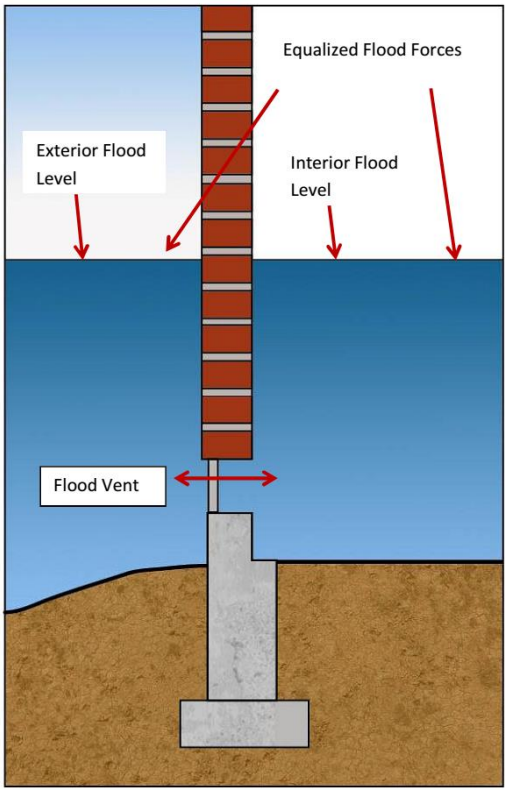
Nantucket's heritage of wood shingle and wood clapboard exteriors is an important aspect of the HDC's design guidelines. These materials are not flood resistant and alternative materials may need to be considered for sections of walls which are below the flood risk level (2 York Street).

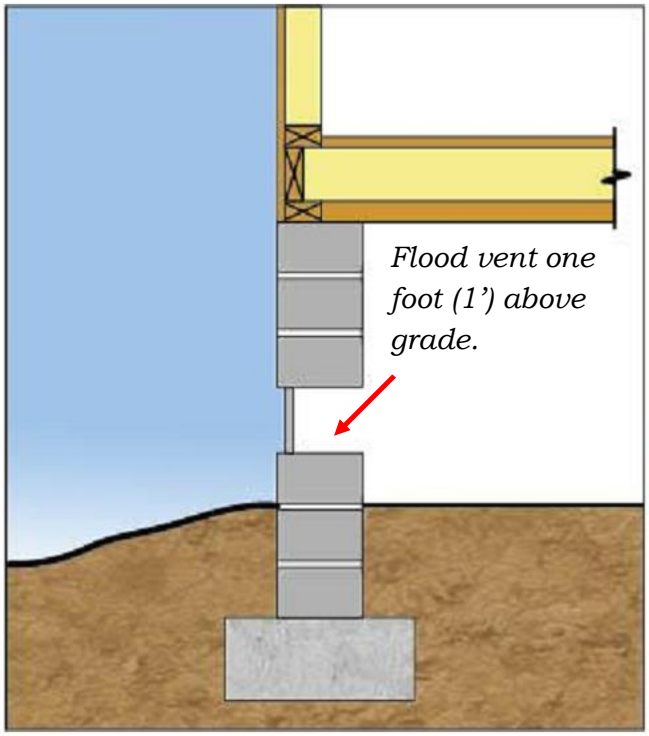
National Park Service Flood Adaptation Recommendations

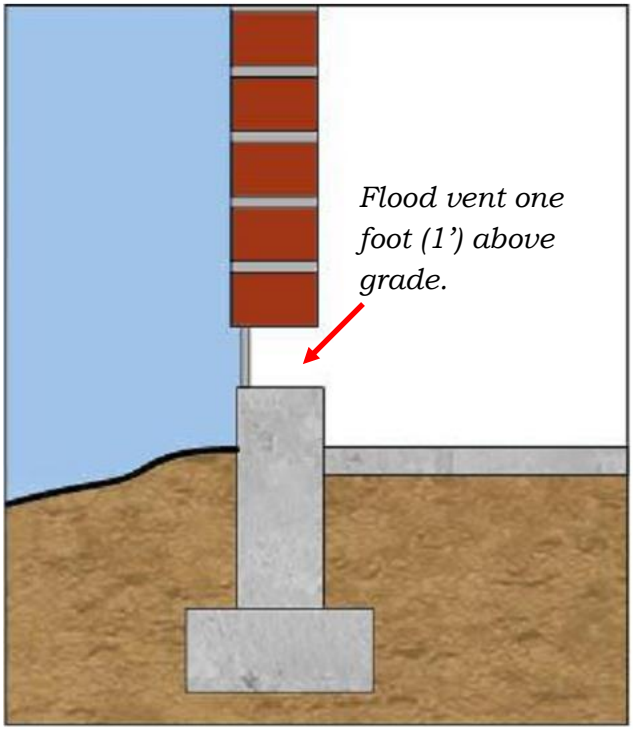
- Evaluate the strength of walls and footings of historic buildings to ensure that they are strong enough to withstand floodwater pressure and flood-borne debris.
- Anchor the building or structure, where necessary, to prevent movement or collapse of the historic property.
- Relocate all utilities above the established flood risk level or protecting them in place with a watertight enclosure.
- Follow the recommended structural engineering guidance for the number, size, and placement of hydrostatic flood vents.
- Install a pumping system for draining the building in concert with the receding waters outside the property.
- Retain interior historic materials, features, and finishes that are flood-damage resistant.
- Remove non-historic interior finishes and furnishings that absorb and trap moisture, such as carpets. Using substitute materials that are more flood-damage resistant when replacing deteriorated or destroyed historic materials and features that are compatible with the historic character of the building.
- Relocate electrical outlets and panels above the flood risk level.



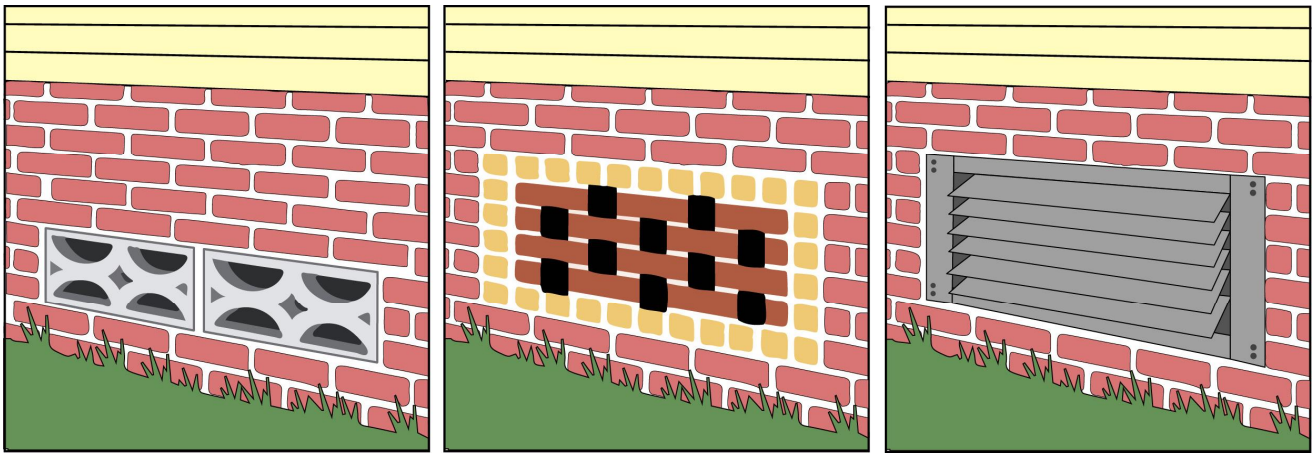
In a flood, water pressure can result in interior flooding and damage (above) while wet flood proofing allows the water to enter and exit via flood vents (below).







YES: *The bottom of flood vents must be placed no more than one-foot (1') above grade. The illustration at left shows a frame dwelling with a concrete block foundation and at right is a brick commercial building on a poured concrete foundation.*



YES: *Appropriate flood vents may include decorative masonry panels (left), honeycomb brick (middle) or metal vents (right) depending on the age and style of the dwelling.*

YES: *Example of appropriate metal vents in a brick foundation.*

Nantucket Resilient Guidelines for Wet Flood Proofing

Flood Vents and Foundations

1. Install flood vents in solid foundation walls. which meet FEMA standards. Reuse historic foundation vents where possible. New vent materials should be as compatible as possible.

2. The bottom of flood vents may not be higher than one foot (1') above either the exterior grade or interior floor.

3. Ensure the vent is of proper size. The size of the vent is determined by the size of the area being protected. The formula for this is one square inch of vent opening = one square foot of floor space. For example one hundred (100) square feet of floor space would require one hundred (100) inches of open vent space. Louvers in vents subtract from the area of open vent space. Only the open area - free from obstructions - can be counted toward the inches required.

4. At least two (2) flood vents are required for each enclosed area. A minimum of two (2) vents must be placed on at least two different walls.

5. Manual closures are not permitted. If a vent comes with manual closures, this feature must be left in the open position.

6. Decorative metal grilles are not common in Nantucket's Historic Districts and simple metal vents are recommended for retrofitting brick, stone and concrete foundations. Outside of the districts decorative grilles may be appropriate.

The installation of flood vents is one strategy for wet flood proofing. This example shows the addition of a flood vent opening in a brick foundation (above) and the addition of a flood vent meeting FEMA standards (below).

7. Select a compatible design and placement for new vents, or paint vents to blend in with the property's foundation material.
8. Adapt existing openings such as ventilation vents and basement windows to accommodate flood vents.

Relocate Utilities

9. Remove utilities from the basement and relocate them to an upper floor room, attic space or on an exterior elevated platform. If utilities are kept within the basement they must be in watertight compartments or protected by impermeable walls.
10. Utilities mounted on the exterior should be screened with appropriate landscaping, fencing and lattice panels in keeping with Nantucket's traditional designs.
11. Utilities should be sited at rear or side locations not readily visible from the street or public right-of-ways.
12. Interiors are not reviewed by the HDC but property owners are encouraged to follow best practices and elevate electrical outlets and wiring above the flood risk level.

Flood Resistant Materials

13. For properties subject to repeated flooding, property owners should retrofit basement or ground floors with flood-resistant materials.

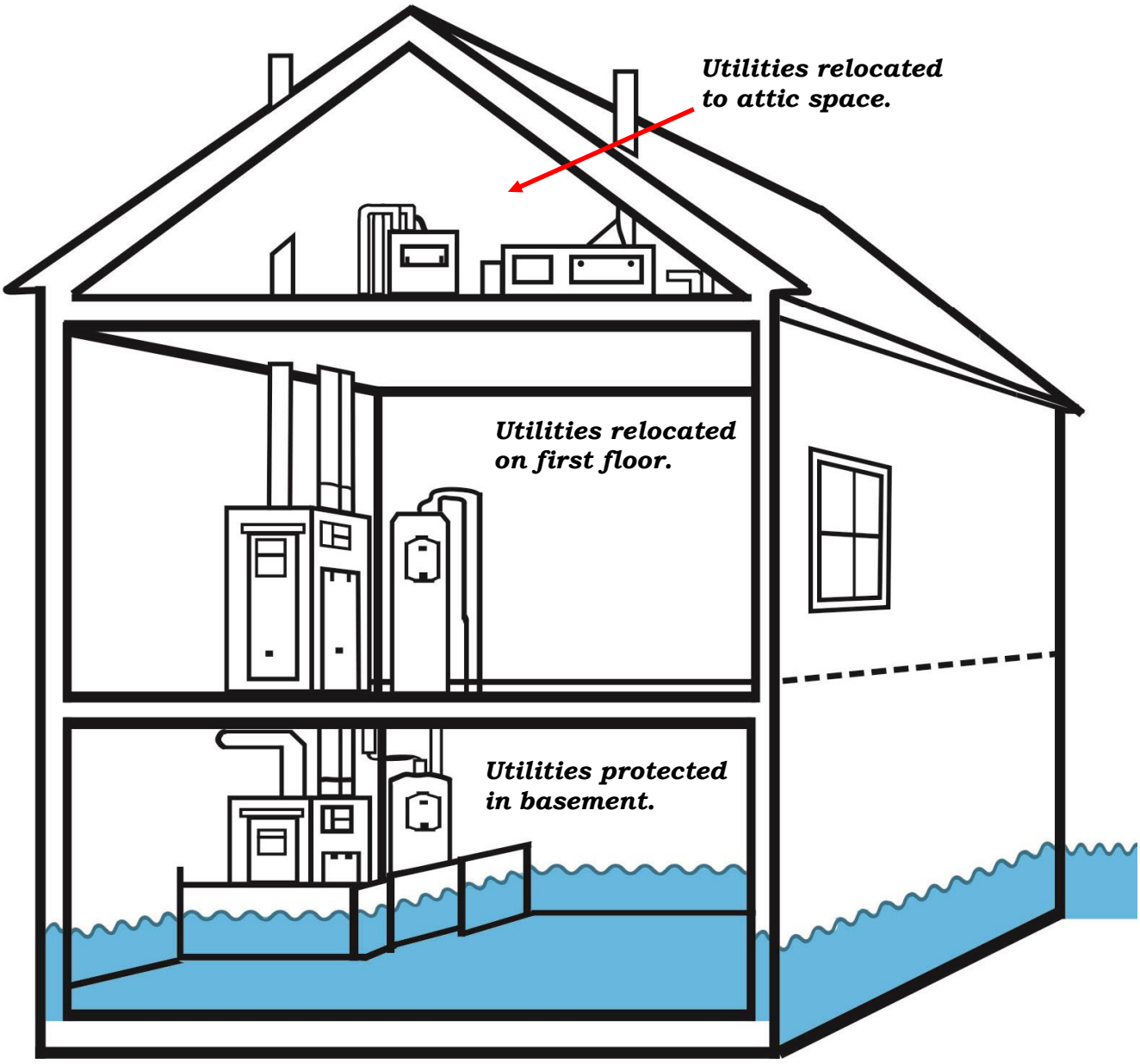
Appropriate flood vents in the brick foundation at 42 Fayette Street (above and below).

Appropriate flood vent in the concrete foundation at 2 Harbor View Way.

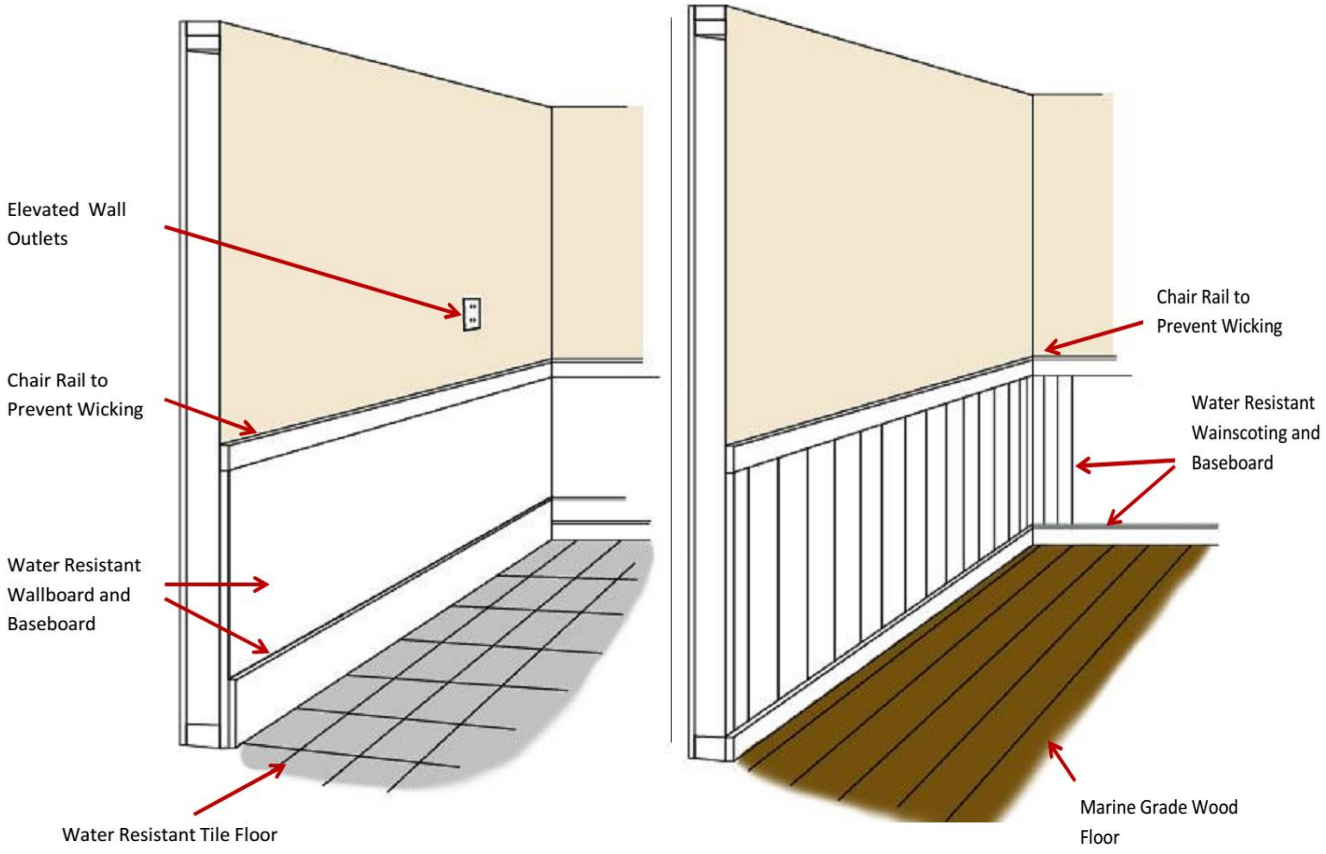
YES—*For properties without basements utility units should be elevated at the rear on non-readily visible elevations (6 Harbor View Way).*

YES—*Commercial buildings should also have utilities elevated and sited at rear elevations (34 Straight Wharf).*

YES—*Large utility units should be sited at rear or side elevations and screened through lattice or with wood panels as at 4 Whaler's Lane.*



Utilities should be protected in basements with flood proof barriers or relocated to first floor enclosures or attic spaces.



Wet floodproofing includes the retrofit or installation of water-resistant surfaces and materials. Following a flood these materials should have the ability be retained or replaced at minimal cost.

After repeated flooding this historic commercial building was retrofitted with a marine grade wood floor and water resistant wainscoting and wall board.

Filling the Basement

Another possible treatment for properties in the Nantucket Historic District flood plain is to fill the basement. This method is for properties with basements that are below ground level on all sides and of masonry construction. Many properties have such basements, especially on Union and Water Streets. However, many of these basements have been converted into living space or rental units and this approach may not be practical or financially feasible in some cases. Filling a basement may have a limited impact upon the historic character of a property but it will result in the loss of space and/or access to any historically important features in the basement.

14. Property owners may fill the basement as a wet flood proofing strategy. The fill material should be compacted gravel, soil, or sand and the height of the fill must reach the same level as the grade surrounding the building.

15. Ensure that the basement walls are of sufficient strength to support and withstand the added pressure of the fill material.

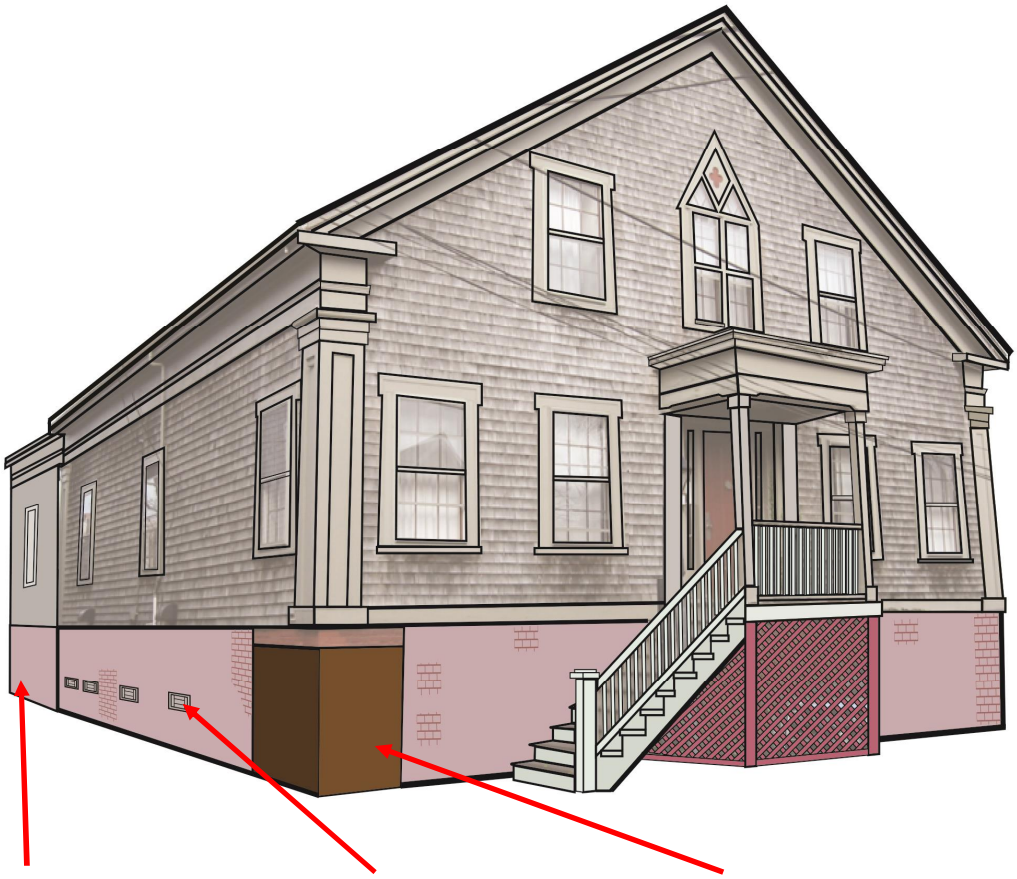
16. Add sufficient openings in the basement floor to allow the water to seep into the ground below following flood events.

17. Adapt or retrofit basement windows into flood vents in keeping with the architectural character of the property as much as possible.

Basement apartments or living space have been added to many properties in the Nantucket Historic District (19 Union Street).

Filling the basement and adapting basement windows into flood vents may be a future strategy for properties in the flood zone (6 Union Street).

Wet Flood Proofing—Best Practices



Yes—*Build a rear addition to compensate for the lost basement square footage.*

Yes—*Option 1, Vacate the basement and add flood vents at window locations.*

Yes—*Option 2, Vacate and fill the basement.*

Wet flood proofing options for 3 Whaler's Lane.

CHAPTER 8: DRY FLOOD PROOFING STRATEGIES FOR NANTUCKET'S HISTORIC BUILDINGS

Introduction

Dry flood proofing is an adaptation strategy intended to keep water out of a building. Strategies include creating a temporary or permanent barrier around the building, creating a watertight seal around the foundation and up to the established flood risk level, and deploying temporary flood barriers at building openings. For commercial buildings this may also include raising the first floor level to be above the established flood risk. Dry flood proofing is generally not recommended where the anticipated flood or high water level is more than three feet.

The creation of permanent barriers and use of temporary barriers is likely to have little or minimal impact on the architectural and historic character of properties in Nantucket's Historic Districts. There are already examples of the successful use of these barriers to restrict flooding and high water events. Dry flood proofing of dwellings may require the addition of waterproof sealants at foundations and the covering or enclosure of basement windows and vents. For commercial buildings the deployment of flood barriers across the storefront is an option as is the retrofitting of storefronts with more water-resistant materials. Commercial property owners may also wish to consider redesigning first floor areas to prevent flooding of these areas and their contents.

Building With Nantucket in Mind

As in the case of wet flood proofing, dry flood proofing strategies primarily affects a property's foundation, basement and/or first floor areas. Nantucket's existing design guidelines recommends preserving and maintaining original foundation materials and designs. Similarly, exterior siding materials are also to be preserved and maintained.

Using water proof sealants and coatings on foundations may be an acceptable approach, however these types of sealants have the potential to stain or discolor exterior surfaces and they should be used with care. These types of sealants also result in an impermeable vapor barrier which may cause condensation within a basement or crawl space. In many cases dwellings in the flood zones have wood shingles or siding which extend below the flood risk level. These materials are not flood resistant and appropriate alternative materials may need to be considered for these properties. The appearance of the historic storefronts of commercial buildings in the flood zones should also be preserved. Temporary flood barriers may provide protection for these properties but retrofitting with appropriate flood-resistant materials may also be a preferred strategy.

National Park Service Flood Adaptation Recommendations

- Evaluate the strength of masonry walls and footings of historic buildings to ensure that they are strong enough to withstand floodwater pressure and debris.
- Install a drainage system around the foundation and footings of the historic building to avoid undermining the building and to allow for proper site drainage.
- Design temporary or permanent closures for all openings (i.e. windows and doors) that are below or extend into the established flood risk level while maintaining the historic character of the building.
- Block character-defining window or door openings that extend into the flood protection zone with temporary flood shields.
- Install fasteners or tracks for flood shields in concealed locations, and in a manner that does not damage, alter, or otherwise impact the historic character of the property.
- Coat or cover the exterior of foundation wall surfaces with a proven waterproof coating or membrane at or below the established flood risk level.
- Apply a waterproof coating to the building that is compatible with the historic masonry materials. Regularly inspect to ensure compatibility and durability.

Permanent barriers include levees, berms, and concrete or wood flood walls as this example on Washington Street.

Temporary barriers such as sandbags can be placed at doorways and along foundations (53 Washington Street).

Nantucket Resilient Guidelines for Dry Flood Proofing

Site Considerations

1. Investigate the structural ability of the building to withstand hydrostatic pressures from flooding and strengthen as needed with methods that have the least impact on historic and architectural integrity.
2. Examine the drainage around the building and add new drains as necessary to assist in removing water from the site.

Temporary and Permanent Barriers

3. Install temporary or permanent flood barriers in a manner that does not result in any alteration or damage to properties in the flood zones.

4. The addition of protective barriers over basement windows, vents and other openings below the flood risk level should be with materials and designs that are compatible with the building or structure.

Waterproof Membranes and Sealants

5. The introduction of water proof membranes or sealants on foundations or in basements should not result in any removal or alteration of original materials. The effectiveness of these products should be regularly evaluated to identify any harmful affects.

Temporary barriers include movable concrete panels. At Harbor View Way, these panels are combined with wooden gates and sandbags during periods of high water.

Temporary barriers also include water-filled interlocking plastic units known as "Jersey" barriers (Candle Street Substation).

An example of dry flood proofing is the Sea Street Pump Station. The building was hardened through the addition of a concrete and skirt wall which closely matched the original brick material. Pumping equipment was added in the basement which could be submerged during flooding and other equipment was relocated to an elevated platform.

Doorway openings in the added brick skirt wall were fitted with flood shields which could be closed during flooding.

An example of dry flood proofing is the Sea Street Pump Station. The building was hardened through the addition of a concrete and skirt wall which closely matched the original brick material. Pumping equipment was added in the basement which could be submerged during flooding and other equipment was relocated to an elevated platform.

Doorway openings in the added brick skirt wall were fitted with flood shields which could be closed during flooding.

Flood Shields

6. The installation of flood shields to protect doors and windows is appropriate as long the installation is temporary and reversible.

7. The addition of flood barrier fasteners or tracks at door openings should be with the least amount of hardware required and result with minimal impact to historic materials.

Rebuild Storefronts with Flood Resistant Materials

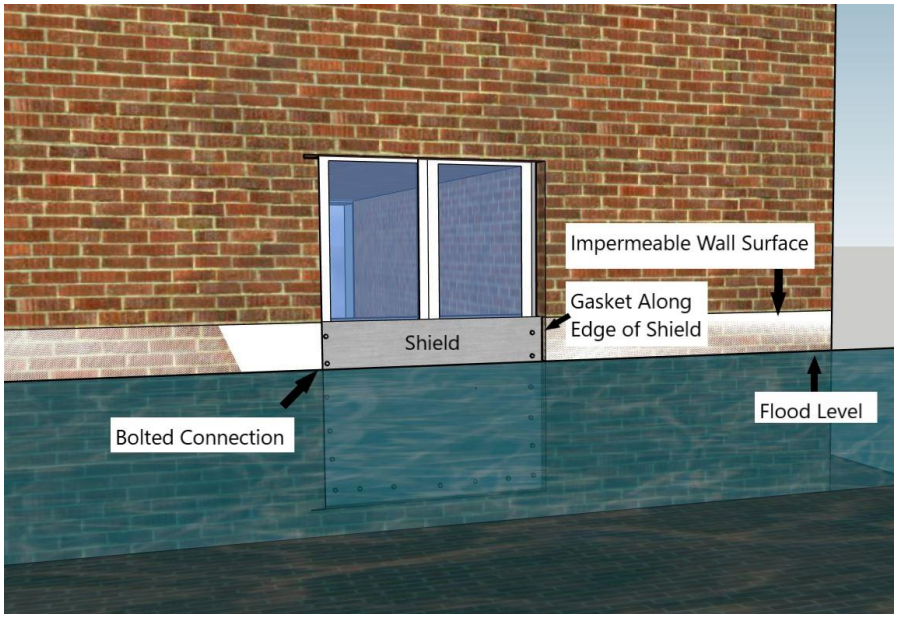
8. To withstand flooding in the lower commercial area of the Nantucket Historic District, deploying flood shields across the width of the storefront is recommended.

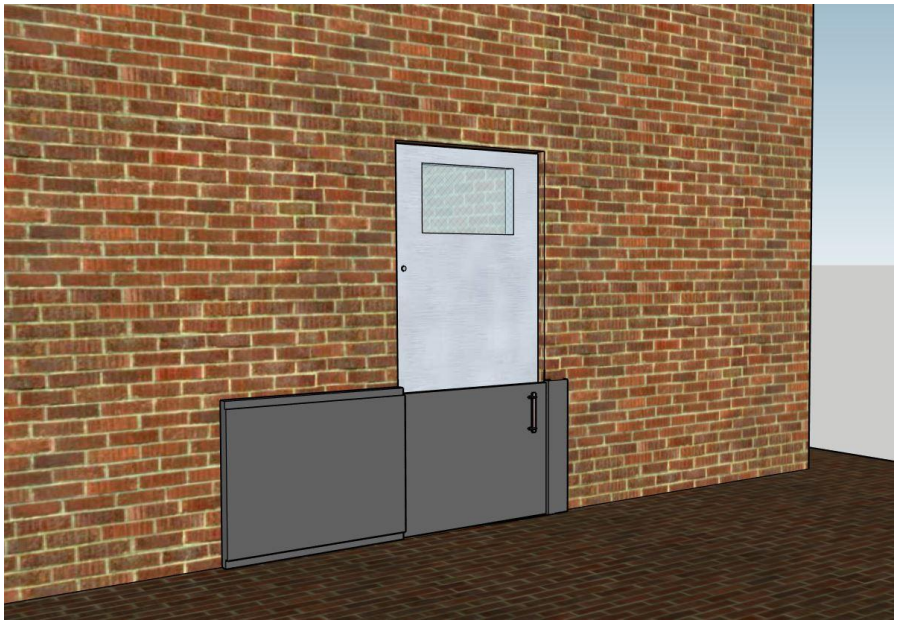
9. If desired by the property owner, rebuilding the panels below the display windows (bulkheads) may be appropriate. Acceptable materials include brick or concrete with a parged surface and flood-resistant wood panels.

Raise the First Floor Level

10. It is appropriate to raise the height of interior first floors on buildings which have sufficient floor-to-ceiling heights to avoid repeated flooding. This should not result in significant alterations to the storefront and interior historic features. This approach is most appropriate for commercial, public, and religious buildings rather than dwellings.

Dry flood proofing may include the installation of temporary flood panels at storefronts (above) or residential doors





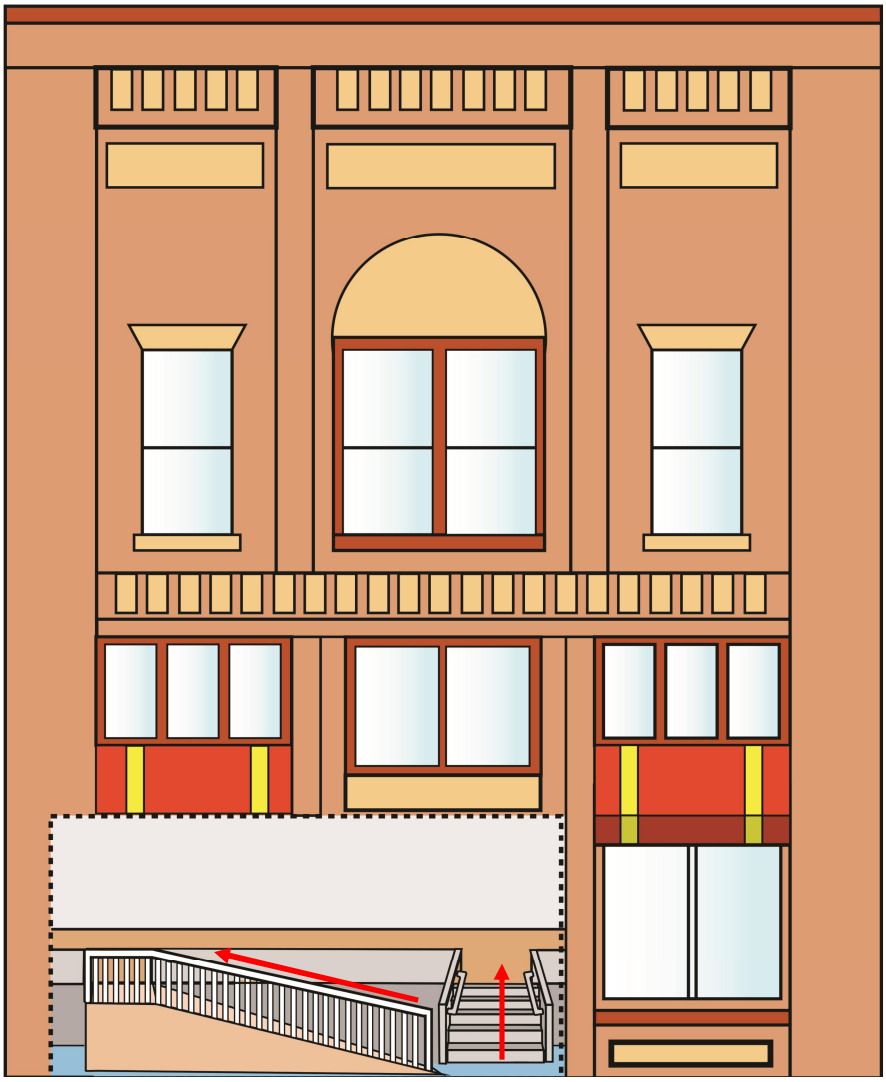
Dry flood proofing for commercial buildings can include the temporary addition of flood shields on primary entrances (above left) or more permanent shields on rear doors not readily visible from the street (below left).

Temporary flood panels are now widely available to protect entire storefronts of downtown commercial buildings. When high water events are anticipated these can be erected to minimize flood damage.

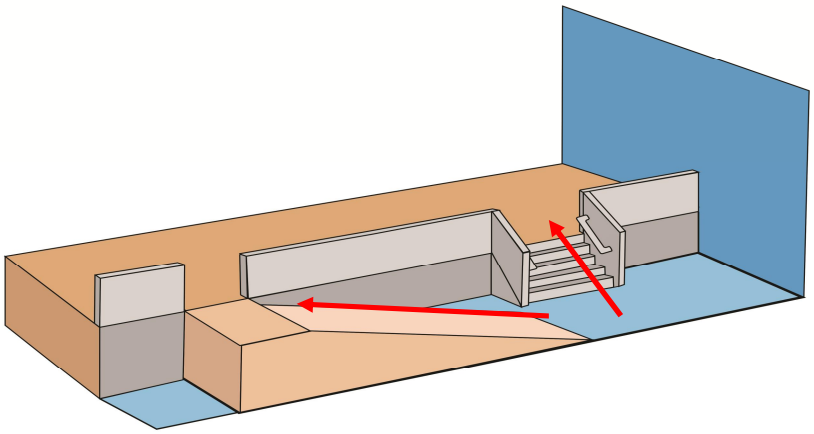
The rehabilitation of this historic coastal commercial building included the hardening of the bulkheads (the panels beneath the display windows) through the replacement of the wood panels with brick and a parged surface to withstand flooding. This approach would be appropriate for Nantucket's storefronts to assist with dry flood proofing.

Another strategy for dry proofing commercial buildings is to harden the storefront and raise the interior first floor level. In this approach the frame storefront bulkheads are replaced with concrete and a parged surface (above)

After entering the business, shoppers can either go up the ADA compliant ramp (left) or go up the stairs to the new first floor level (right). The entrance area has been retrofitted with flood resistant materials including a tile floor and tile surfaces on the stairs.



This illustrates the strategy for raising the first floor of a commercial building. After entering the storefront, shoppers can either go up stairs to the new first floor level or use a ADA compliant ramp.



CHAPTER 9: ELEVATION STRATEGIES FOR NANTUCKET'S HISTORIC BUILDINGS

Introduction

Elevation is a resilience strategy that involves increasing the height of a building by detaching it from its foundation, raising it to the needed height above the flood risk level and then setting it on a new foundation. Elevation is now a common method of flood proofing for many coastal communities. This approach has the potential to change the architectural character of a property as well as its surroundings and streetscape. Any elevation project will require careful planning so that the property retains as much of its integrity and original relationship to neighboring properties as possible.

Elevation makes it possible to protect a historic building from most flood risks. Depending on the flood zone, historic buildings can be raised from 1' to 4' which is considered a low-elevation project or if the flood risk is much greater, elevation can be from 5' to as much as 9' which is considered a high-elevation project. Maintaining the original character and integrity of a historic property has fewer challenges in a low-elevation project. Low-elevation projects can be mitigated through consistency with foundation materials, matching stair and porch details, and adding landscaping or screening. High-elevation projects have the potential to alter historic properties to such an extent that they may no longer have integrity and can be considered non-contributing to the character of a historic district.

Following several decades of elevation projects, the National Park Service along with numerous states and communities have developed "best practices" for elevation projects. These best practices are intended to maintain a property on its original site and maintain as much of its architectural character as possible while at the same time reducing its flood risk. Property owners in the Nantucket Historic District flood zones should consult with the Town's floodplain administrator and other professionals to identify the height needed to be above the Design Flood Elevation (DFE). If an elevation project is identified as the best approach, the owner should consult with the HDC and Staff on the best practices to maintain the property's architectural integrity.

Historic properties in the rural areas of Nantucket may be able to undertake elevation projects which include adding earth fill beneath the foundation as part of raising the height of the building. This approach helps to keep the building directly connected with the ground and reduces the need for increasing the foundation height. However, in the Nantucket and Siasconset Historic Districts this approach is not possible due to FEMA regulations. In urban areas raising the grade of one property increases flood risks to its neighbors and this is not allowed.

Building With Nantucket in Mind

The Historic District Commission's existing guidelines were written before changes to the National Flood Insurance Program (NFIP) and FEMA affecting historic properties. While elevation is not directly addressed in the guidelines there are sections which are applicable to an elevation project. In addition, the HDC has reviewed and approved several elevation projects in recent years which also provide direction for the resiliency guidelines.

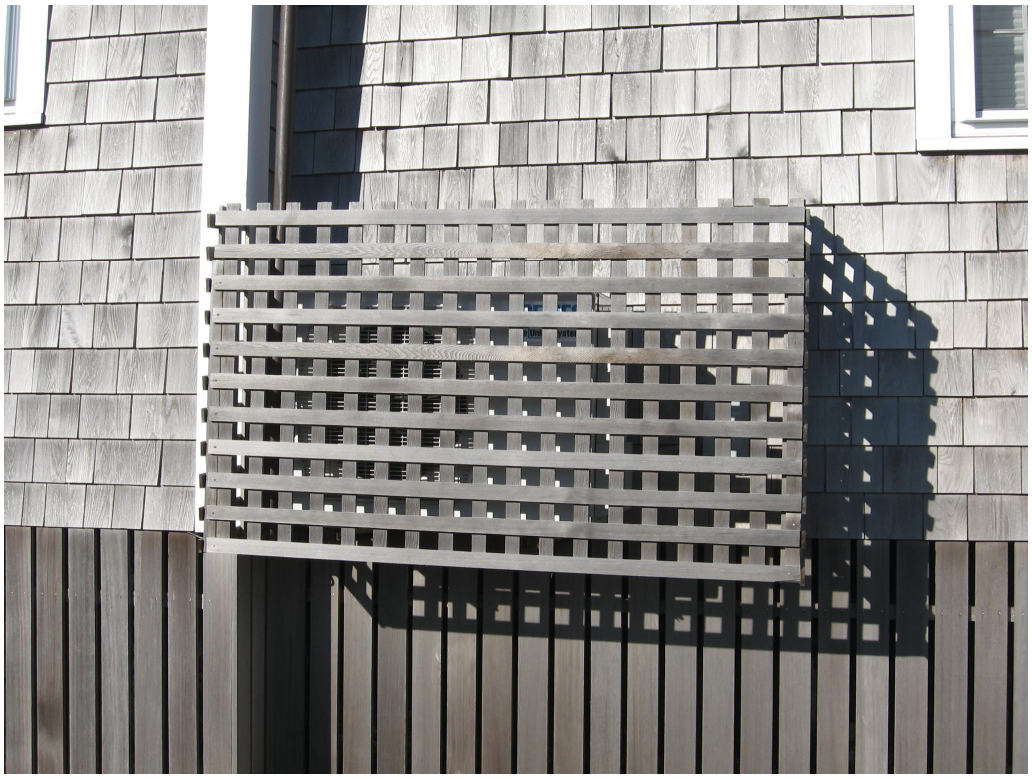
Elevation projects primarily require changes to foundations, stairs, porches, and chimneys. These projects generally do not require changes to exterior siding materials such as wood siding, wood shingles or brick although there may be a need to add a compatible skirt wall, fascia boards etc. to assist with the visual transition from the foundation to the lower part of the house. Distinctive architectural features, windows, roofs, and doors are usually retained and not altered in an elevation project.

Elevation typically requires extending the existing stairs or building entirely new stairs to access the property. This may also result in adding new stair landings or re-building porch sections. Interior chimneys will need to be detached from the ground or removed although the sections above the roof line should be retained. Exterior wall chimneys will need to be extended to the ground using compatible masonry materials.

Most of the buildings in the Nantucket and Siasconset Historic District floodplains have solid perimeter masonry foundations with some examples of pier foundations also present. In addition to supporting the dwelling, a foundation in an elevation project must also be designed to anchor the dwelling from floodwater and wave action. The anchoring system must also be sufficient to keep the dwelling from floating off its foundation. Dwellings required to be in full compliance with NFIP regulations must meet or exceed NFIP foundation construction and design criteria. Foundations can either be closed or open in accordance with FEMA standards. Closed foundations are those with perimeter masonry walls and low elevation projects must have flood vents to equalize water pressure during floods. Open foundations are used for high elevation projects located on raised piers or posts.

New or rebuilt foundations should be compatible with their historic character. Original foundation materials such as stone, brick, rock-faced concrete block etc. should be salvaged and reused in the new foundation as much as possible, especially on the main façade. If a dwelling is on a pier foundation the visual appearance of piers should be maintained. Maintain the appearance of solidity in a foundation through the introduction of lattice panels or vertical panels between the piers or posts.

Successful elevation projects in the Nantucket Historic District include the dwelling at 3 Meador Street (above). For this project the stair was extended and rebuilt with appropriate detailing, vertical panels were added at the foundation, the chimney was retained and the HVAC unit was elevated and screened with appropriate lattice panels (below).



For high elevation projects, screening elements such as landscaping, lattice panels or wood slat panels must be designed to allow the free flow of water. Wood lattice or panels must be hinged to move or "break-away" in the case of flooding. For frame dwellings, porch elements such as wood columns, railings, and floors should be kept intact in any elevation. Once elevated, it is likely that brick, concrete or stone porch foundations will need to heightened by several feet. For solid perimeter foundations match the brick, concrete or stone with materials to match as closely as possible and with the required flood vents. If matching is not possible, foundations may be painted a uniform color or have an added parged surface. Dwellings with Bungalow style brick piers should have the brick piers extended and match the original materials as much as possible.

For high elevation projects new concrete or brick piers may be required. Piers supporting the porch should be placed under the center line of the porch columns and at the corners of stair landings. Porch piers should match the historic masonry columns or piers as much as possible. An alternative is to also utilize concrete or a parged color compatible with the historic masonry.

Stairs are often significant features leading to a front porch and the primary entrance. Elevating a dwelling will require a longer stair run to access the new living floor level. The new extended stairs should maintain the original orientation and design as much as possible. Nantucket's building code requires a minimum number of steps depending on the height of the first floor. It may be preferred to reconfigure the stairs in order to have the required number of steps rather than moving the dwelling back on the lot to maintain the front setback. Along with increased height, it may also be necessary to extend or add handrails where they did not previously exist.

The majority of historic chimneys in Nantucket are of brick construction. In most elevation projects it will be required to detach interior and exterior wall chimneys from their foundations. Interior brick chimneys should be retained, elevated along with the house and be at the original height above the roofline. Exterior wall brick chimneys should be elevated along with the house and kept at their original height above the wall or roofline. New masonry should then be added in similar design and materials to attach it to the ground. Match any new brick as closely as possible. If matching brick is not possible, the application of a consistent parged surface is appropriate.

Dwellings may need to be adapted to provide access through ramps or lifts to meet Americans with Disabilities Act (ADA) requirements. Such adaptations may be needed for occupants with disabilities or for dwellings converted into office or commercial use. For low elevation projects wood ramps are recommended at side or rear elevations and screened with landscaping or wood screen panels.

The elevation of 57 Washington Street is another successful elevation project in the Nantucket Historic District (above). This project included adding a new concrete foundation and retaining the chimney at the roofline. The staircase was extended with appropriate detailing and vertical panels were added at the porch foundations (below).

Elevation of dwellings above four feet make it difficult to utilize an ADA compliant ramp which does not significantly impact the appearance of a historic property. Appropriate alternatives for high elevation projects include chair lifts and elevators. These should be sited on rear elevations or on side elevations not readily visible from the street and screened.

Technological advances since the mid-20th century have introduced modern heating and cooling units and other utilities into most buildings in Nantucket. Traditionally these types of utilities are located in a basement, on the first floor level, or on the exterior at-grade. Utilities can be ruined even if they are exposed to floodwater for just a short period of time. This can delay recovery after a flood as well as require additional expense for replacement. In any elevation project the utilities will be required to be relocated to at least the Design Flood Elevation (DFE). Utilities should be placed on rear or non-readily visible side elevations and screened with landscaping, wood panels or other screening elements.

When a dwelling undergoes a high elevation one option for utilizing the space beneath the house is vehicular parking. Parking beneath the house may be appropriate as long as there is extensive screening and the context of the historic property within its streetscape is maintained. Historic dwellings have pedestrian access at the front elevation and parking beneath a high elevation house is not appropriate with a driveway connecting directly to the street. Driveways should be sited at the side and rear of the house. Parking beneath a house should not be side or rear loaded and not directly from the front of the house.

There may be properties within the flood plains that were built in the mid-20th century and constructed so the house cannot be detached from their concrete slab foundations. In these cases the entire house and foundation must be elevated as one unit. These concrete foundations were not meant to be exposed and they will require the application of a parged skim coat to even out rough surfaces.

For historic properties outside of the historic districts and on large lots, elevation can also be achieved by adding earth fill beneath the building. Adding this type of grading or terracing may meet FEMA standards depending on how close the property is to its neighbors. The advantage to this approach is that the DFE may be achievable through elevating the house, filling in beneath and lowering the property with minimal changes to its architectural design.

The primary goal of any elevation project is to preserve and maintain the essential architectural character of a property as much as possible. While elevation projects present unique challenges, the resilient design guidelines provide a wide variety of mitigation approaches to keeping Nantucket's historic character while meeting flood risk requirements.

National Park Service Flood Adaptation Recommendations

- Identify, retain, and preserve materials and features of the building that are important in defining its overall historic character before elevating the building.
- Assess the impact of elevating a building on its historic character, including the aspects of the site, setting, and design of the property.
- Elevate later additions and porches that also contribute to the historic significance of the building along with the main structure.
- Repair any structural deficiencies, such as rotten sill plates and termite damage, before beginning work to separate the building from the existing foundation.
- Identify and retain the historic massing, scale, size, form, and proportional relationships of the major elements of the historic building and/or the historic district.
- Design a new foundation that preserves the historic character of the building.
- Use existing attributes and features such as large lot size, tall building height, visible foundation, porches or terraces, and stairs/steps to minimize the impact of alterations to the historic character of the property.

The large number of elevation projects completed in recent decades led to the development of the National Park Service's Flood Adaptation standards for historic buildings. The elevation example above is incompatible with the dwelling's and district's historic character while the example below is much more successful (Photos courtesy

Resiliency Standards—Louisiana Example of a Low-Elevation Project

Bungalow Before and After Low Elevation

YES: *Porch columns and foundation piers align.*

YES: *Wide fascia board divides porch and piers.*

YES: *Stair landing is at the level of the original porch.*

Resiliency Standards—Iowa Example of a Low Elevation Project

YES: *Rebuilt wood staircase leads to front porch.*

YES: *Stone piers extended to ground and porch columns align.*

YES: *Slatted wood panels between the foundation piers.*

YES: *Wide fascia board between porch floor and pier foundation.*

Resiliency Standards—Louisiana Example of a High Elevation Project

Bungalow, Before and After High Elevation

***YES**: Craftsman style - porch columns extend as unified element to piers.*

***YES:** Open risers on stairs with a Craftsman porch*

***YES:** Lattice panels are appropriately placed behind and between the brick piers and painted a dark color.*

***YES:** Appropriately sized fascia board between the porch*

Nantucket Resilient Guidelines for Elevation—Site Considerations

1. Identify all materials and features of the building that should be preserved, maintained and reused in the elevation project.
2. Assess the impact of the elevation project on not only the site but to neighboring properties as well to ensure proper drainage.
3. If necessary, a building may be moved further back on the lot to accommodate the construction of stairs. It is preferred to maintain a direct stair connection perpendicular to the sidewalk or street.
4. Driveways should be sited at the side and rear of the house. Parking beneath a house is not appropriate for high-elevation projects in the historic districts.
5. When installing landscaping for elevation projects use indigenous vegetation native to coastal Massachusetts such as deciduous shrubs and decorative grasses. Consider plants that allow for moisture absorption. For high elevation projects small native trees and tall grasses may be used for effective screening.

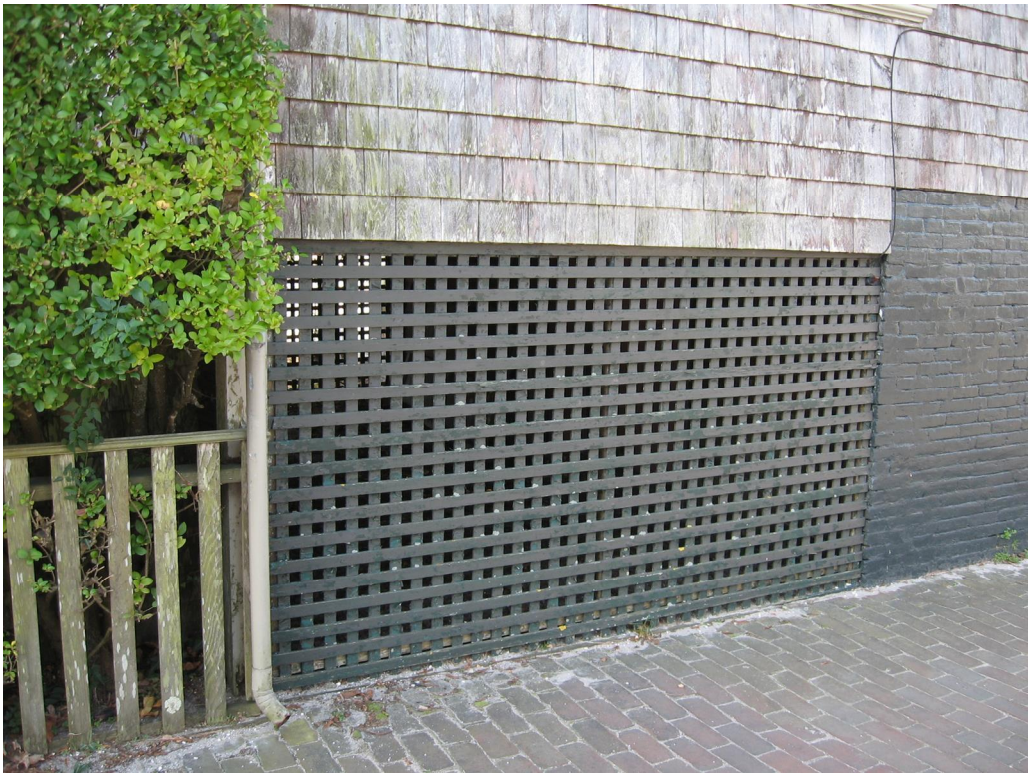
Landscaping is recommended to screen the foundation of an elevated dwelling (59 Washington Street).

Nantucket Resilient Guidelines for Elevation—Foundations/Flood Vents

1. Buildings with solid brick, stone or concrete perimeter foundations should be rebuilt with similar materials. The appearance of the original and added materials should be compatible through the addition of a parged surface or uniform paint color.
2. Re-use historic foundation materials. Some dwellings in Nantucket have foundations of original brick, ballast stone or rock-faced concrete block. When a dwelling undergoes a low elevation project it is recommended that historic materials be salvaged from the rear and side elevations and used for the new foundation on the front and readily visible sides of the dwelling.
3. Install flood vents in solid foundation walls. which meet NFIP standards. Reuse historic foundation vents or retrofit existing basement windows where possible. New vent materials should be as compatible as possible and painted to match the foundation color.
4. Raised brick foundations may be solid, pierced, or piers. Lattice or slatted wood panels may be placed between brick piers.
5. Lattice and other wood screening panels should be hinged in order to retract or open during high water.

The elevated dwelling at 57 Washington Street has a rebuilt concrete foundation with a parged surface providing a uniform appearance.

Historic materials such as early 20th century rock-faced concrete block should be salvaged and added to increase the height of the foundation on the primary façade and readily visible side elevations (52 Union Street).



An example of appropriate design wood lattice panels include 33 Union Street (above) and 14 Harbor View Way, (below). The addition of landscape features is recommended to assist in screening the foundation.

An example of appropriate design vertical wood panels include 57 Washington Street (above) and 4 Whaler's Lane (below). The addition of landscape features is recommended to assist in screening the foundation.

Nantucket Resilient Guidelines for Elevation—Stairs and Porches

1. Retain the historic entrances and the traditional approach to the dwelling.

2. Match new stairs and railings with the style and features of the historic design. Salvage and reuse the original stair materials as much as possible.

3 If the stair did not originally have a handrail, new handrails should be designed to be appropriate to the building's age and style.

4. Construct railings with traditional proportions, or, if a taller rail is necessary to meet building codes, retain a horizontal rail at the traditional railing height.

5. Break up the run of stairs with a landing when a long run of stairs is required. For every twelve feet (12') of vertical rise a stairway must have a landing. For high elevation projects new stair landings should be at the original porch location height.

6. Adding new stair access to the side, rather than the front, of the house is not traditional in Nantucket's Historic Districts and is not appropriate.

7. Porch columns should align with the foundation piers below and not be offset.

The rebuilt stair and porch at 3 Meador Street is an appropriate design with square newels and balusters and vertical panels below the landing.

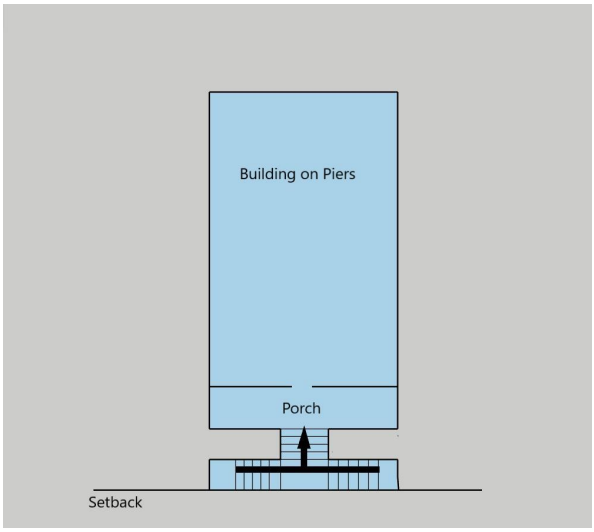
The elevated dwelling at 59 Washington Street has an extended stair on the interior of the porch and with an appropriate added handrail.

8. Original masonry pier materials should be salvaged and reused as much as possible in an elevation project.
9. Bungalow style porch columns should be extended to the ground in keeping with the dwelling's original design.
10. Fascia boards at least 4" and a maximum of 12" should be added at the base of the porch's wall and above the foundation piers.

The porch columns and piers are in appropriate alignment on this high-elevation project.

Above is an example of an appropriate porch column and foundation pier alignment on a high-elevation project.

The tapered painted brick foundation piers are designed to match the tapered Bungalow style porch columns on this elevation project.



Example of a center/linear split staircase for a high elevation project.

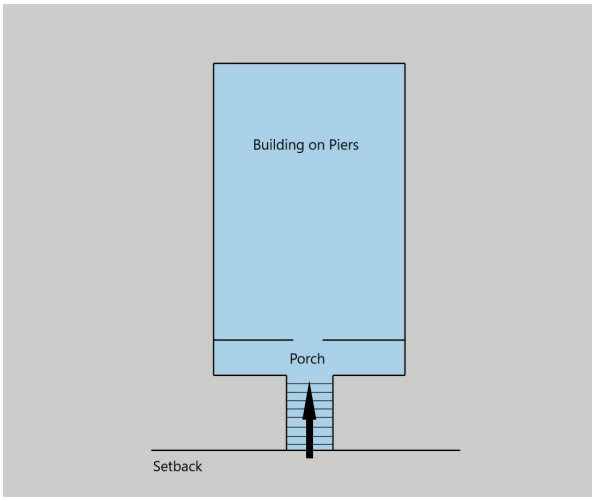
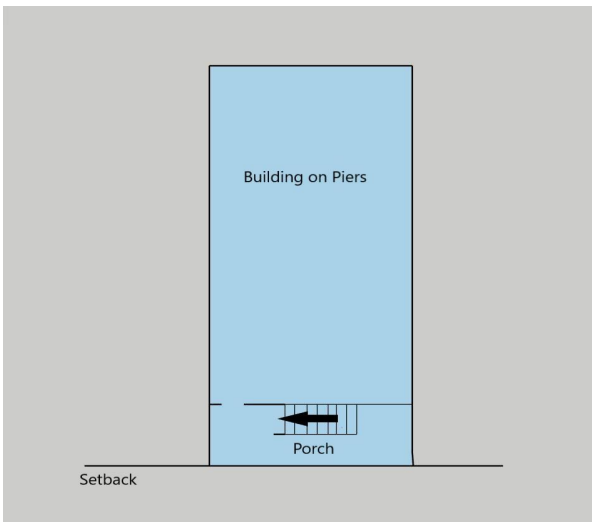


Illustration of a straight-run staircase for a high elevation project.



Interior staircases may be appropriate for some dwelling designs.

Nantucket Resilient Guidelines for Elevation—Chimneys

1. Interior brick, stone or concrete chimneys should be retained, elevated along with the house and be at the original height above the roofline.
2. Exterior wall brick chimneys should be retained in place and kept at their original height above the exterior walls and roofline.
3. Once elevated, brick and stone chimneys should have new or salvaged brick and stone added to extend it to the ground.
4. Match any new brick as closely as possible. If matching brick is not possible, the application of a consistent parged surface is appropriate.

When elevating a dwelling a preferred option for an exterior wall chimney is to keep the chimney intact and to extend the chimney to match the existing height above the roof.

When elevating a dwelling a preferred option for an interior chimney is to retain the chimney and elevate it with the dwelling.

Nantucket Resilient Guidelines for Elevation—Accessibility

1. Provide accessibility solutions of the highest level of access and the least impact on the building's historic character. Avoid damage to significant features and materials.
2. Install ADA ramps, chair lifts, or elevators on side or rear elevations to minimize their visual impact.
3. If an access ramp is needed, it should be simple in design, constructed of wood or metal, and painted in colors that are compatible with those of the building.
4. Chair lifts may be appropriate if they are sited at side or rear elevations not readily visible. Chair lifts should be screened and installed in such a way to be reversible and with the least impact to the historic building as possible.
5. Elevators may also be appropriate if sited at rear or side elevations which are not readily visible and are screened with fencing lattice panels or landscaping.

Some low-elevation projects may be able to utilize ADA ramps on the primary façade. Such ramps should be in traditional designs and screened as at 95 Washington Street.

This chair lift design provides access from a dedicated parking space and required only a small section of the porch to be removed (4 Whaler's Lane).

ADA compliance can be achieved for low-elevation projects through adding chair lifts. This example shows an ADA compliant parking space and a lift screened with landscaping. Only a small section of this porch railing was removed and can be replaced when the lift is no longer in

For high-elevation buildings, chair lifts should be added on rear or side elevations and have limited visibility. This design has minimal structural framework and the porch can be viewed behind it.

Nantucket Resilient Guidelines for Elevation—Utilities

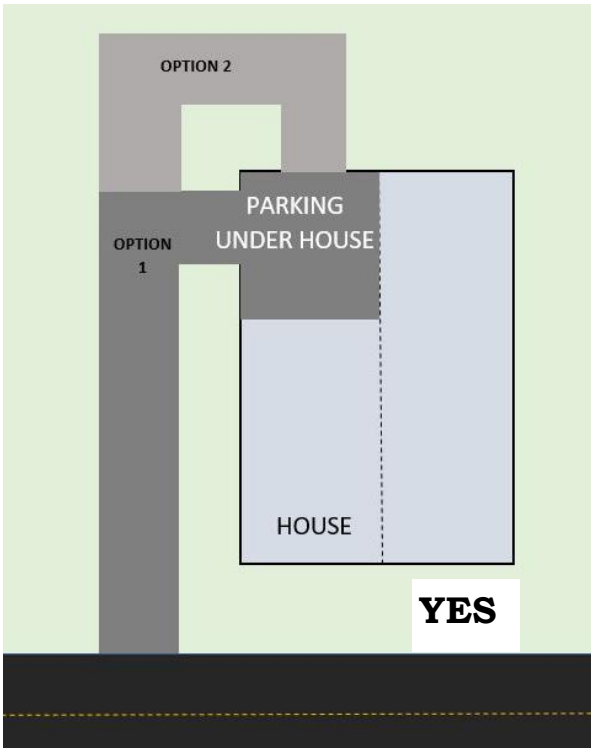
1. Elevate HVAC units or any other exterior equipment as inconspicuously as possible. Consider relocating HVAC equipment to rear roof lines not readily visible from the street.
2. In addition to HVAC units, secondary elements such as electrical outlets, switches, junction boxes, meters, and wiring must also be raised above the BFE.
3. HVAC units should be screened with landscaping, wood lattice or slats or other screening elements.
4. If raised on platforms consider ladders and moveable screen panels for access and servicing.
5. All utilities which are placed on elevated platforms must be securely anchored to meet wind-resistant requirements.
6. Similarly, propane and other fuel tanks should be screened and anchored so they do not float and become a hazard during a flood.

For low-elevation projects, site HVAC units on platforms at the rear on non-readily visible side locations (8 Harbor View Way).

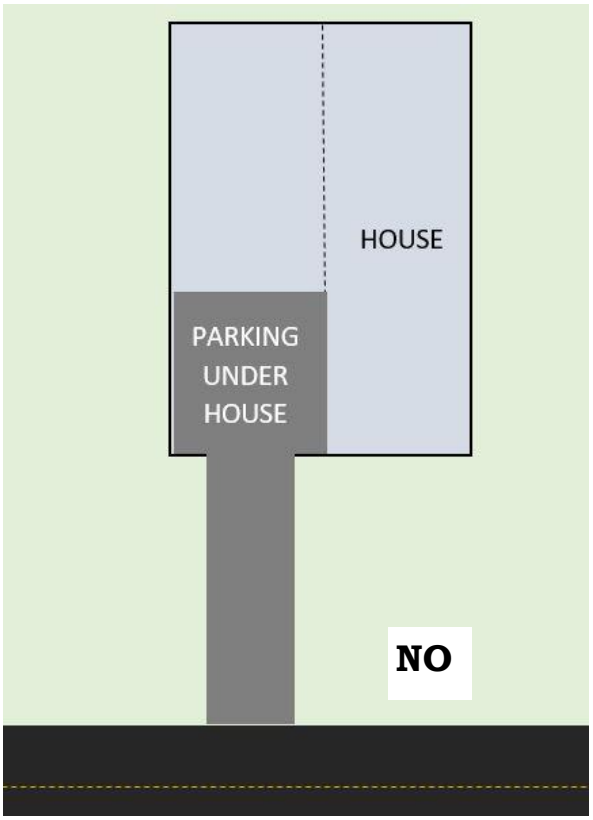
For high elevation projects HVAC units must be on platforms above the required flood elevation level.

Nantucket Resilient Guidelines for Elevation—Parking

1. Parking underneath contributing buildings in Nantucket's Historic Districts is not permitted. Parking beneath elevated non-contributing and new construction buildings may be considered depending on proposed design and context of the dwelling's block.
2. Parking beneath a house in high-elevation projects should not be accessed directly from the street on the main façade. Driveways should be placed at the side of the house when rear access or alleys do not exist. Garage doors should not be placed on the main façade or readily visible side elevations.
3. Driveways should lead to parking beneath the house via the rear elevation or non-readily visible side elevations. Exceptions to this standard include the elevation of Ranch or Mid-Century Modern dwellings which were designed with vehicular access from the street on the primary façade.
4. New driveways should be of traditional paving materials such as concrete, crushed stone, brick, or gravel. Alternative materials which resemble these materials may also be appropriate. Black asphalt driveways are discouraged unless they have a covering of pea gravel or crushed shells.



Parking for high-elevation projects should not be at the front of the house directly from the street (above). It is more appropriate to provide parking at the rear of the house or beneath the house via a side driveway (below).



Nantucket Resilient Guidelines for Elevation—At-Grade Dwellings

1. At-grade or slab foundations should be finished with a smooth concrete or stucco finish as part of low- and high-elevation projects.
2. If the dwelling originally had a garage on the primary façade it is appropriate to maintain the driveway on the front with access to parking beneath the house.
3. Garage doors should be designed to complement the dwelling's architectural design and have sufficient vents or break-away properties to meet FEMA standards.
4. For low-elevation projects concrete stairs may be appropriate. High-elevation projects should have wood stairs which are simple in design.

Above and below are examples of appropriate design and stair placement for mid-20th century dwellings.

Garage doors must be designed with appropriate flood vents to meet FEMA standards.

YES: *This at-grade dwelling at was elevated by four feet and has a parged foundation.*

YES: *The concrete block piers were also finished with a parged surface.*

YES: *A simple porch and staircase were added on the primary elevation.*

YES: *This dwelling at was elevated nine feet and the slab was finished with a parged concrete surface.*

YES: *The concrete block piers were also finished with a smooth surface.*

YES: *A simple porch and staircase were added on the primary elevation.*

Nantucket Resilient Guidelines for Elevation—Grading and Terracing

1. Elevating historic buildings in Nantucket's Historic Districts by adding fill or terracing does not meet FEMA standards and is not allowed.
2. Historic buildings in the rural areas of the island may be elevated by adding fill or terracing depending on the site and location of neighboring buildings.
3. In any elevation using fill or terracing, retain and preserve building and landscape features that contribute to the overall historic character of the individual building including trees, gardens, yards, arbors, ground cover, fences, foundations, and significant vistas and views.
4. As much as possible, retain and preserve the historic relationship between the building and the landscape features including site topography, retaining walls, foundation plantings, hedges, streets, walkways, and driveways.

Grading and terracing a historic building may be appropriate in rural sections of the island and where there will be no major impact to adjacent properties from water displacement. These illustrations show a dwelling at-grade (above) and elevated through fill and terracing (below).

High-elevation projects may include a combination of terracing and increasing the foundation height.

This historic house in Louisiana was elevated eight feet primarily by raising the earth grade which preserved its overall design and character (Photo courtesy of Louisiana Division of Historic Preservation).

Nantucket Elevation Guidelines—Best Practices

Yes—*Elevate the foundation and add flood vents.*

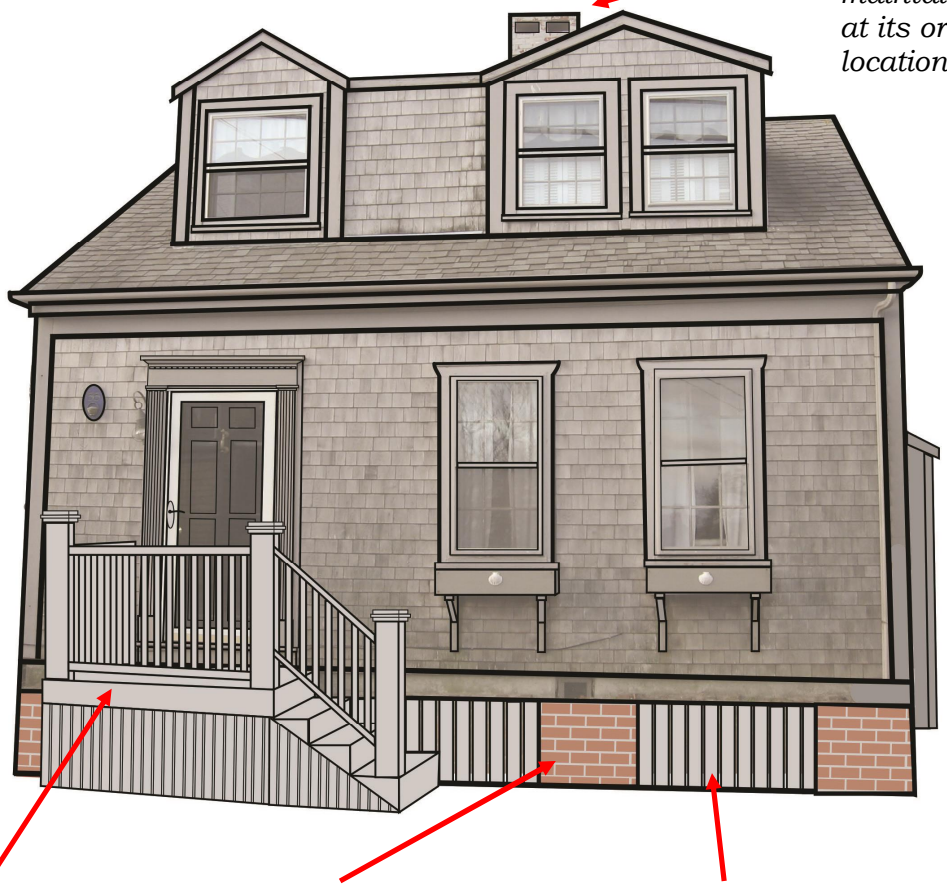
Yes—*Extend the vertical foundation slats.*

Yes—*Extend the stair height.*

Yes—*Extend the brick porch piers*

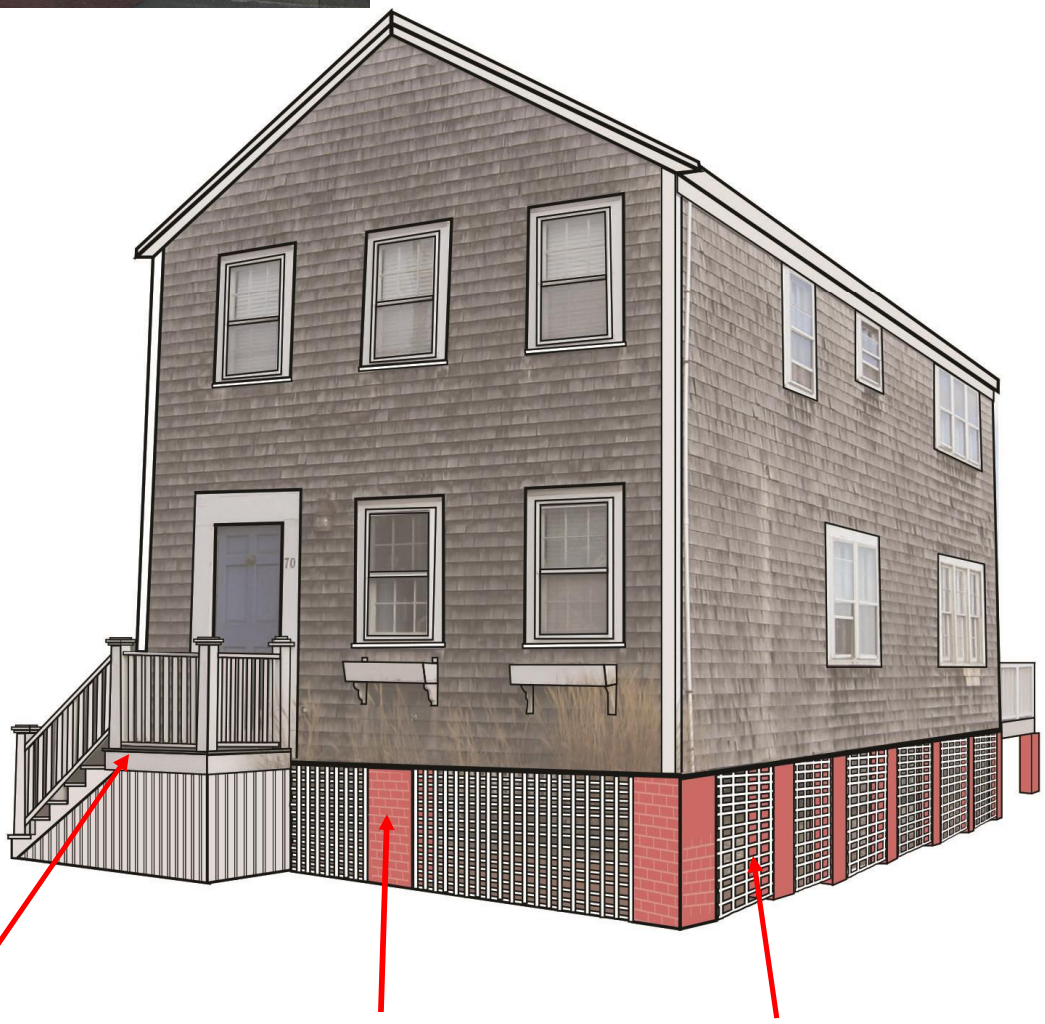
Elevation guidelines for 55 Easton Street.

Nantucket Elevation Guidelines—Best Practices



Elevation guidelines for 55 Washington Street.

Nantucket Elevation Guidelines—Best Practices



Yes—*Increase the height of the staircase and match the existing design with a step down to the porch.*

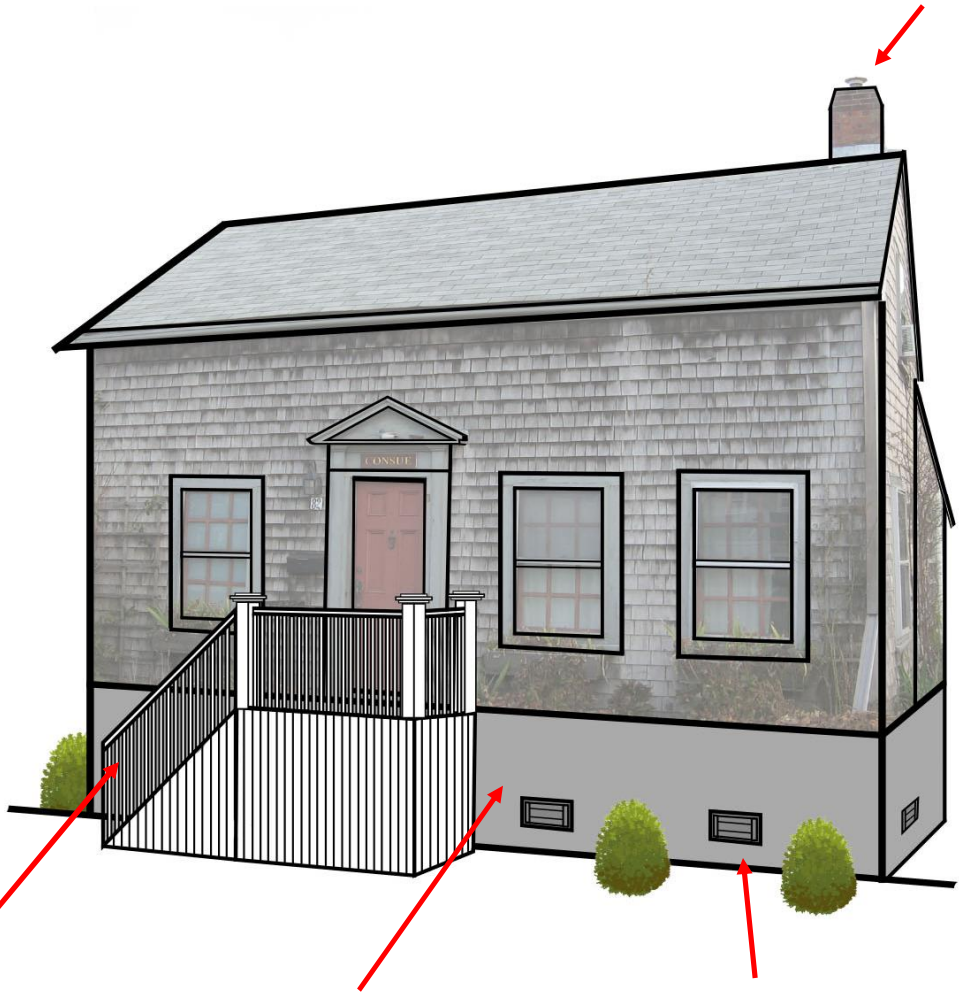
Yes—*Rebuild the foundation with brick piers.*

Yes—*Add lattice or vertical panels between the brick piers.*

Elevation guidelines for 70 Washington Street.

Nantucket Elevation Guidelines—Best Practices

Yes—*Elevate and maintain the chimney at its original roof location.*



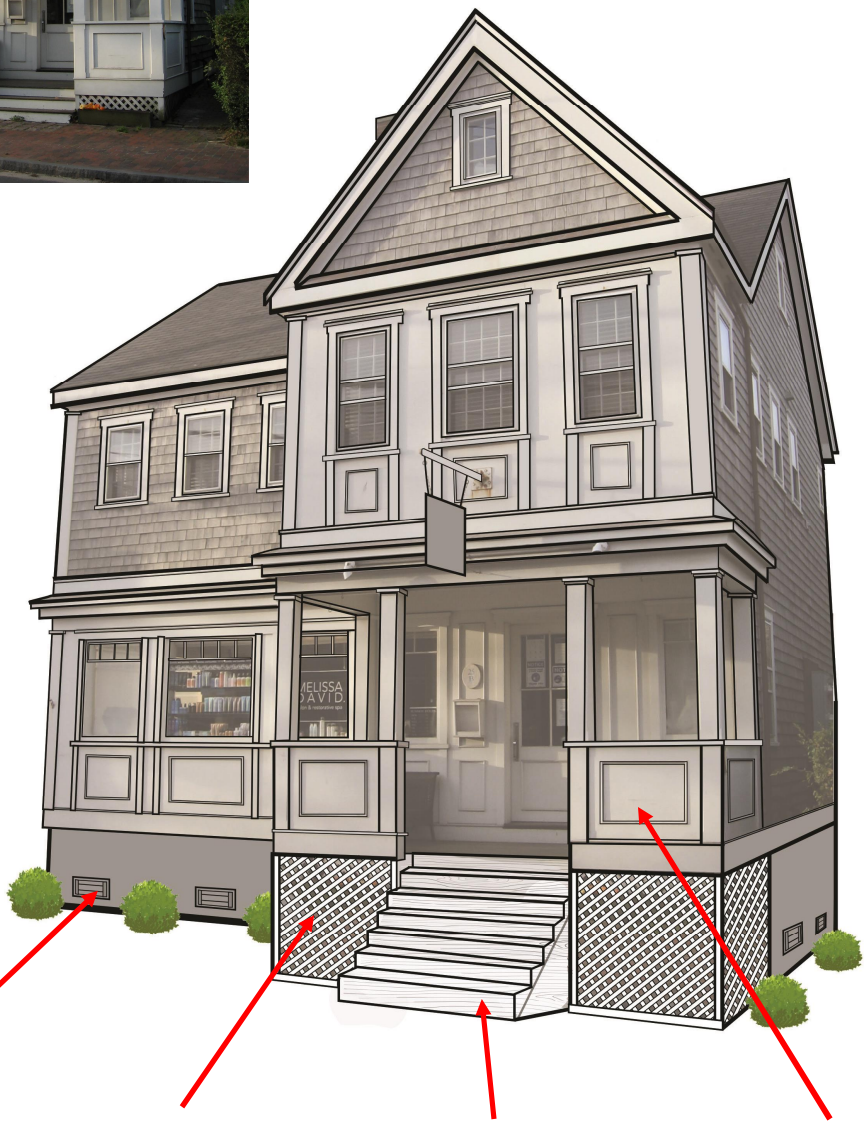
Yes—*Add a new staircase in compliance with HDC guidelines with a step down to the porch.*

Yes—*Elevate the foundation with concrete and a parged surface.*

Yes—*Add appropriate flood vents for wet proofing.*

Elevation guidelines for 82 Union Street.

Nantucket Elevation Guidelines—Best Practices



Yes—*Elevate the foundation and add flood vents.*

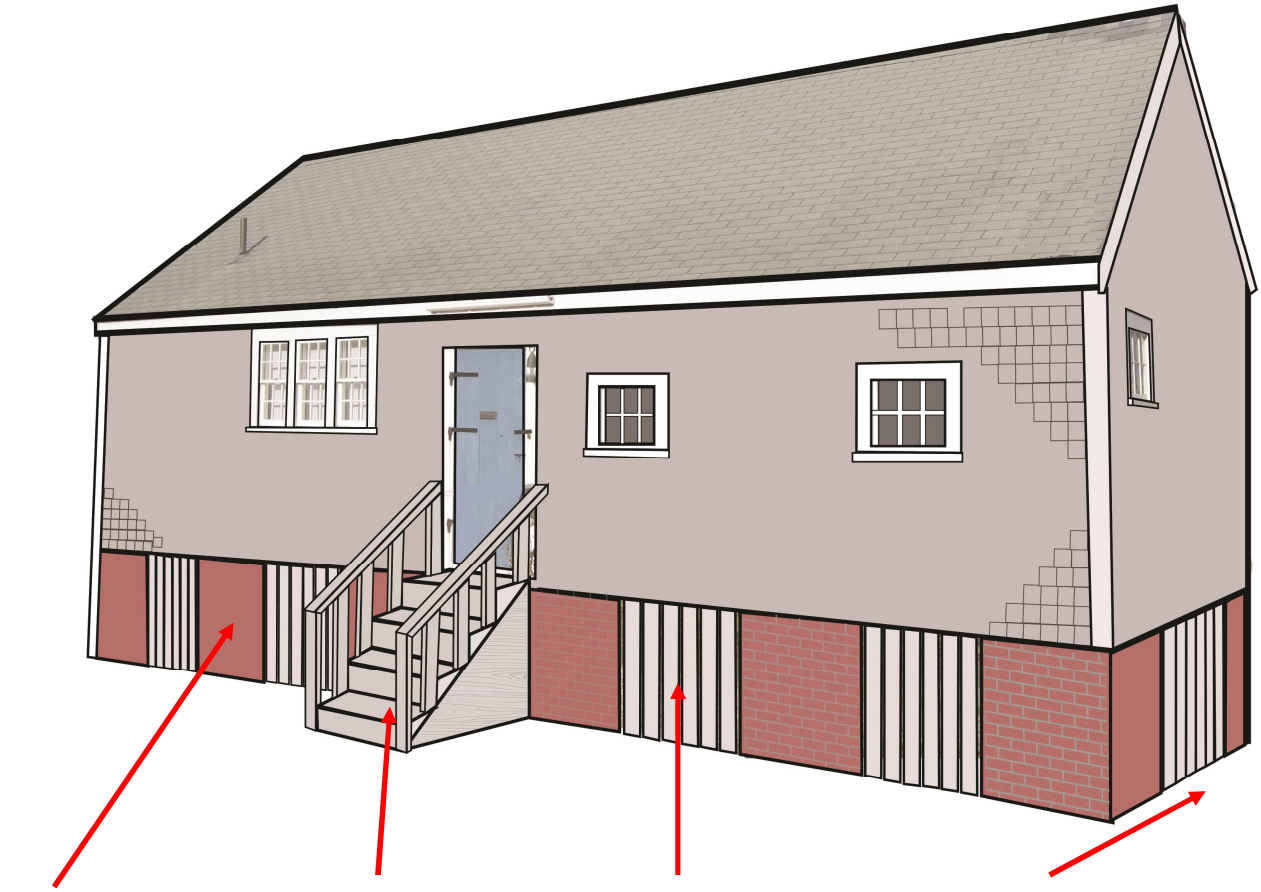
Yes—*Elevate the porch and add lattice panels.*

Yes—*Extend the stair height.*

Yes—*Consider replacing the wood panels with flood-resistant materials.*

Elevation guidelines for 25B Washington Street.

Nantucket Elevation Guidelines—Best Practices



Yes—*Elevate the foundation on brick piers.*

Yes—*Add a straight run stair at the entrance with a step down to the landing.*

Yes—*Add vertical wood panels between the piers.*

Yes—*Consider moving the building back to accommodate the stair.*

Elevation guidelines for 20 Old North Wharf.

CHAPTER 10: MOVING & RELOCATION STRATEGIES FOR HISTORIC BUILDINGS

Relocating a building to a location either inside or outside Nantucket's Historic Districts should be considered only as a last resort to avoid demolition. From a preservation perspective, relocation has several negative aspects. First, the context of the building is lost, as well as its relationship with the surrounding natural and built environment. Moving a historic building removes it's original setting and its relationship to the island's heritage. Second, such character-defining features as chimneys, foundations and porches may be damaged or destroyed as a part of the move. Finally, the placement of moved/relocated historic buildings may negatively impact its new surroundings, especially if the new building is not compatible in scale, style, and setback with its new surroundings.

Before permitting a building to be moved, the Historic District Commission (HDC) will consider the historic and architectural significance of the building, the contribution the building makes to the historic district, and the impact of its removal on the character of the district. A property's contributing status to the National Landmark Historic District can be de-listed if it is moved.

The owner of the building to be moved should be prepared to justify the necessity for the move, outline what steps have been taken to avoid moving the building, explain the proposed moving process, and provide detailed plans showing the relationship of the moved building to the new site. If relocation is warranted, every effort should be made to move the building intact as a single unit.

Building With Nantucket in Mind

The HDC's existing guidelines place an emphasis on preserving "…as unchanged as possible the old structures built before the middle of the 19th century in their original settings and conditions" and "to preserve the integrity of the historic buildings that physically express the history of the island." While the guidelines lack detailed recommendations on moving and relocation, it is clear that such a major change to a property would only be approved under extreme circumstances.

Rising sea levels and shoreline erosion may require consideration of this flood adaptation strategy in coming years. The HDC and its partner agencies should identify vacant parcels which may be appropriate sites for the relocation of historic buildings. The HDC is also encouraged to develop specific criteria and steps that property owners must follow if relocation becomes necessary.

National Park Service Flood Adaptation Recommendations

- Find an available site with as similar a setting as possible to the original site of the building that also eliminates or reduces the flood risk.
- Document the historic building with photographs, a site plan with the four directional cardinal points noted, and the relationships to outbuildings and other site and landscape features noted.
- Hire a professional building mover to undertake the move and ensuring that the move is adequately covered by cargo insurance for all phases of the relocation project.
- Move a historic building in one piece, without disassembling portions or sections of it, whenever possible.
- Ensure that disassembled sections or units of a historic building are clearly marked with each unit's orientation, i.e., front and back, individually numbered, and its location on the building marked on a plan and elevation drawings. Provide a secure location for storage of all disassembled components.
- Conduct archeological investigations at the new site to ensure there are no negative impacts in relocating the building. Protect and /or preserve any known sites at the original location before the move.

Relocation is usually undertaken as a last resort to preserve a threatened building. In this case the house was moved to make way for a new development and relocated and rehabilitated a few blocks away.

Nantucket Resilient Guidelines for Elevation—Moving & Relocation

1. Document the original site and its context thoroughly with drawings and photographs prior to relocation.
2. Move the building as a single unit in lieu of partial or complete disassembly, if possible.
3. All features should be adequately protected and windows and doors boarded or braced in the least damaging manner.
4. Relocated buildings should be carefully rebuilt and placed on a foundation which replicates the original using masonry material compatible with traditional foundations. Salvaging and reuse of original foundation materials is strongly encouraged. The chimney should be reconstructed using the removed materials with new mortar that matches the original in color, content and consistency.
5. Choose a compatible site as possible for the relocated building. If this is a contributing building, move it to a site in its relevant historic district if possible.
6. If moved within a historic district position the building on the new site so it relates to adjacent buildings and the overall streetscape. Place the building so that orientation of its principal façade and front and side setbacks are compatible with the surrounding buildings.

This historic building experienced frequent flooding and was moved to a compatible site. It was relocated on a terraced and elevated foundation.

CHAPTER 11: NEW CONSTRUCTION ADAPTATION STRATEGIES

A primary focus of the guidelines in "Building With Nantucket in Mind" is requiring new construction to be compatible with the traditional architecture of the island. New construction projects in Nantucket go through a detailed review process by the Nantucket Historic District Commission (HDC) and the Historic Structures Advisory Board (HSAB). This review process seeks to ensure that new residential, commercial, religious, agricultural and public buildings are compatible with the historic and architectural character of the island. New construction projects in the Nantucket and Siasconset Historic Districts are particularly important so that the final designs reinforce the existing architecture and streetscapes.

In Nantucket's flood zones, new construction must not only meet the guidelines of the HDC but also those of FEMA and the National Flood Insurance Program. Buildings must be designed to be above the Design Flood Elevation (DFE). This requires new construction to be designed with wet or dry flood proofing properties or elevated above the DFE. New commercial buildings in the flood zones must be built to provide pedestrian access to customers while also meeting ADA requirements. New construction may call for the use of non-traditional flood-resistant materials for storefronts and the lower exterior walls of buildings.

A key principle for new construction in the flood zones is to **plan defensively.** New buildings should be designed to last for decades and withstand rising sea levels above what is presently required under the DFE. New construction will need to not only follow the existing guidelines administered by the HDC but also those adopted for flood adaptation and resilience including:

- Foundations may be designed to withstand flooding through dry proofing such as solid concrete or masonry materials.
- Foundations may be designed to withstand flooding through wet proofing such as having basements designed to flood and with sufficient flood vents.
- Building so that the first floor is elevated above the DFE.
- Elevating the utilities on upper floors or exterior platforms above the DFE.
- Utilizing permeable paving surfaces for driveways and parking areas.
- Installing water absorption plantings in landscaping.
- Constructing commercial buildings with flood-resistant materials on the storefront.

Nantucket Resilient Guidelines—New Construction

1. New construction shall be consistent with design guidelines currently applied by the HDC.
2. Foundations must be of masonry and meet FEMA requirements including the design and location of flood vents.
3. Foundations may be of solid perimeter masonry or concrete or brick piers.
4. If concrete block is used for foundations a parged surface must be applied on the primary façade and readily visible side elevations.
5. Screening between foundation piers or below porches should be of wood in traditional vertical panel or lattice designs. For wet proofing projects these panels must be "breakaway" designs and be able to open during flooding or high water events.
6. Stairs, landings and porches should be designed in traditional Nantucket forms and be of wood construction. Brick and concrete stairs are not appropriate for new construction in the flood zones.
7. Utilities may be flood proofed through protective walls in the basement, installation on upper floors or on raised exterior platforms. If located on the exterior, utilities should be screened through wood panels or lattice.

The 2016 dwelling at 11 Fayette Street was designed with an appropriate brick pier foundation and lattice panel screening (above). The front porch and stair have traditional designs with lattice panels beneath (below).

8. Flood-resistant materials for new construction may be appropriate if they resemble traditional historic materials such as exterior shingles, wood siding, trim or fascia boards.
9. Commercial buildings should be designed with traditional storefronts but with flood-resistant materials such as brick or concrete.
10. High-elevation buildings should not have parking underneath the first floor. This approach is incompatible with traditional Nantucket building forms.
11. New ancillary buildings in the flood zones such as garages should be built with appropriate flood vents or other flood-proofing designs.
12. New construction site planning should include the use of permeable paving surfaces for parking and driveways and water-absorption landscaping.

These new construction projects above and below are based on historic designs but are elevated above the DFE through pier foundations, have traditional wood stairs and the piers and porch columns are in alignment.

Flood-Resistant Materials for New Construction

When reviewing the appropriateness of flood-resistant materials the HDC will consider the following:

Durability. The flood-resistant material must be demonstrated to the HDC to have proven durability, longevity, and repairability.

Appearance. A flood-resistant material shall have a similar profile, texture, detail, and finish as the historic material, so that the only aspect of the alternative material that varies from the original being replaced is the material itself. Products which have simulated wood graining or a bright sheen are generally incompatible with historic materials.

Location. The location of flood-resistant materials is an important factor in their approval. Flood-resistant materials should only be used for skirt walls or first floors rather than the entire building. For example, a two-story dwelling may have flood-resistant materials on the first floor and traditional wood siding or shingles on the second floor.

Sustainability. The sustainability of flood-resistant materials may also be considered including assessing the amount of recycled product content, and use of non-renewable resources. A materials manufacturing process, transport, and ability to be recycled may also be considered.

Cost. The cost of a flood-resistant material versus the costs of replacing in-kind historic materials will also be considered. When evaluating flood-resistant materials, include cost factors such as life cycle cost and payback over time versus repair and replacement of traditional materials.

In considering flood-resistant materials, the HDC may review:

1. Samples of the material;
2. Product literature, including information on the expected lifespan, durability of the material, and long term life cycle costs;
3. Ability to accurately replicate the visual and aesthetic characteristics of the historic material in the specific application requested, and;
4. The ability to repel water and ability to expand and contract with conjoined historic materials.

It is anticipated there will be advances in the development of flood-resistant materials in the future and new criteria may be applied in evaluating the visual standards required by the HDC.

New construction must be built to be above the DFE such as this dwelling at 2 Hulbert Avenue completed in 2019. This dwelling is elevated with a stone foundation and vertical board panels beneath the porch.

New commercial buildings should have flood-resistant storefronts. This building was designed with a concrete first floor, stairs to the main entrance and an ADA compliant entrance on the side elevation.

APPENDIX A–TERMINOLOGY FOR FLOOD ADAPTATION STRATEGIES

Base Flood — A flood having a one percent chance of being equaled or exceeded in any given year.

Base Flood Elevation (BFE) — The flood elevation shown on a published Flood Insurance Study (FIS) including the Flood Insurance Rate Map (FIRM). For zones AE, AH, AO, and A1-30 the elevation represents the water surface elevation resulting from a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year. For zones VE and V1-30 the elevation represents the stillwater elevation (SWEL) plus wave effect (BFE = SWEL + wave effect) resulting from a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year.

Basement — Any area of the building having its floor subgrade (below ground level) on all sides.

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.

Design Flood Elevation (DFE)– Regulatory flood elevation adopted by a local community. If a community regulates to minimum NFIP requriements, the DFE is identical to the BFE. Typically, the DFE is the BFE plus any freeboad adopted by the community. (FEMA).

Elevation Certificate – NFIP form used to provide elevation information to ensure compliance with floodplain regulations and to aid in determining the insurance rate for a specific property.

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.

Flood Damage Resistant Materials — Materials identified by FEMA as flood resistant.

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.

Flood Insurance Rate Map (FIRM)— The official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) — The official report in which the Federal Insurance Administration has provided flood profiles, as well as the Flood Insurance Rate Map (s) and the water surface elevation of the base flood.

Floodplain or Flood-prone Area – Any land area susceptible to being inundated by water from any source (see definition of ``flooding").

Floodplain Management — 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 flood plain management regulations.

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.

Floodproofing — Any combination of structural and nonstructural 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.

Floodproofing Certificate — A certification, in the form and containing the information required by FEMA, that a structure has been designed and constructed to be dry floodproofed to the flood protection elevation. A floodproofing certificate may only be prepared and certified by a licensed professional engineer or professional architect.

Floodproofing, Dry — The floodproofing method that is used to render a structure's envelope substantially impermeable to the entrance of floodwaters.

Floodproofing, Wet — The floodproofing method that relies on flood damage-resistant materials and construction techniques to minimize flood damage to areas below the design-flood elevation of a structure.

Freeboard — A factor of safety usually expressed in feet above a flood level for purposes of flood plain management. "Freeboard" tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed.

Lowest Floor — The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for the parking of vehicles, building access or storage in an area other than a basement is not considered a building's lowest floor provided that such enclosure is not built so to render the structure in violation of other applicable non-elevation design requirements.

National Flood Insurance Program (NFIP) — A program administered by the federal government that enables property owners in participating communities to purchase flood insurance protection against losses from flooding.

Pre-FIRM Structures — Buildings constructed or substantially improved prior to the community's initial FIRM are called "pre-FIRM structures" and were likely not built to avoid or reduce flood damage. Buildings constructed or substantially improved after the community's initial FIRM should have been constructed in compliance with the local floodplain ordinance. Most historic buildings are pre-FIRM structures.

Repetitive Loss Property — 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.

Resilience, Flood — The ability to withstand, respond to, and recover from a flooding or storm event.

Severe Repetitive Loss Property– Any building that:

1. Is covered under a Standard Flood Insurance Policy;

2. Has incurred flood damage for which: a. 4 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 At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss.

Substantial Damage — Damage of any origin sustained by a structure whereby the cost of restoring the structure to its condition before damage would equal or exceed fifty (50) percent of the market value of the structure before the damage occurred.

Substantial Improvement— Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds fifty (50) percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage," regardless of the actual repair work performed. The term does not, however, include either: a) Any project for improvement of a structure to correct existing violations of State or local health, sanitary or safety code specifications which have been identified by the local code enforcement officer and which are the minimum necessary to assure safe living conditions; or b) Any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."

APPENDIX B- TAX CREDITS FOR FLOOD RESILENCE AND ADAPTATION

Flood adaptation and resilience projects in Nantucket may qualify for federal or state tax credits. This will depend on the type of project, the costs, and the adjusted basis of the property. Elevating buildings have substantial expenses and this type of project may qualify for tax credits. Property owners considering substantial projects related to elevation, wet floor proofing, dry flood proofing or other resilience strategies are encouraged to discuss the potential for tax credits with Nantucket's preservation planning staff.

Federal Historic Tax Credit

The Federal Tax Credit for Rehabilitation reduces the cost of restoration and rehabilitation to the owner of an income producing historic property as an income tax credit. The credit is 20% of what an owner spends rehabilitating the building, not including acquisition costs or costs of site work or new construction.

To qualify for the 20% Credit:

1. The building must be listed in the National Register of Historic Places, or listed as a contributing structure within a National Register Historic District. Not every building in a district is contributing. The applicant building must be designated by the National Park Service as a structure that retains historic integrity and contributes to the historic character of the district, thus qualifying as a "certified historic structure." Your Certification by the National Park Service may be initiated by completing and submitting Part 1 of the Historic Preservation Certification Application.
2. The rehabilitation project must meet the "substantial rehabilitation test," which means that the cost of rehabilitation must exceed the pre-rehabilitation cost of the building. Generally, this test must be met within two years or within five years for a project completed in multiple phases. The cost of a project must exceed the greater of $5,000 or the building's adjusted basis. The following formula will help you determine if your project will be substantial:

   A — B — C + D = adjusted basis

   A = purchase price of the property (building and land)

   B = the cost of the land at the time of purchase

   C = depreciation taken for an income-producing property

   D = cost of any capital improvements made since purchase

3. After rehabilitation, the structure must be income producing for five years. Owner-occupied residential properties do not qualify for the federal rehabilitation tax credit. The 20% credit is available only to properties rehabilitated for income-producing purposes, including commercial, industrial, agricultural, rental residential or apartment use. The credit cannot be used to rehabilitate your private residence. However, if a portion of a personal residence is used for business, such as an office or a rental apartment, the amount of rehabilitation costs spent on that portion of the residence may be eligible for the credit.

4. The rehabilitation must meet *The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitation of Historic Buildings.*

Massachusetts Historic Tax Credit

The Massachusetts Historic Rehabilitation Tax Credit demonstrates the economic benefits of preservation while revitalizing neighborhoods, as historic structures are adapted for use as quality affordable housing, community centers, commercial and office space, performing arts venues, restaurants, health centers, veteran and senior housing and more. This pilot program in Massachusetts has been extended to expire on December 31, 2022.

The Massachusetts Historic Commission (MHC) certifies proposed rehabilitation projects via a three-part application process and allocates available credits. Under the program, a certified rehabilitation project on an income-producing property is eligible to receive up to 20% of the cost of certified rehabilitation expenditures in state tax credits. An annual cap helps prioritize selection of projects based on criteria that ensure the funds are distributed to projects that provide the most public benefit.

The MHC accepts Part 1 applications on a rolling basis. To avoid delays in approvals, the MHC encourages submission of Part 1 applications well in advance of a Part 2 application, in particular if the property is not National Register-listed and/or the National Register eligibility of the property has not recently been determined. Part 1 certification must be assigned before the MHC will review a Part 2 application. There are three application cycles (rounds) per year. The deadlines for applications are January 15, April 30, and August 31. In order to be considered for allocation of funds, Part I and Part II must be submitted to the MHC by the application deadline.

The Massachusetts Historic Rehabilitation Tax Credit may be coupled with the Federal Rehabilitation Tax Credit. Both the federal and Massachusetts State Rehabilitation Tax Credits are administered by the MHC. Information explaining the application process and requirements can be obtained through MHC offices at 617-727-8470 and found at the MHC webpage https://www.sec.state.ma.us/mhc/mhctax/taxidx.htm. This site includes application forms, as well as a full list of previous historic rehabilitation tax credit awards with real examples of certified projects.

Applications must also obtain a support letter from Preservation Massachusetts. This organization may be contacted by phone at 617-723-3383 or through their website, https://www.preservationmass.org/historic-tax-credits, another source of helpful information about the program.

APPENDIX C—REFERENCES FOR FLOOD ADAPTATION STRATEGIES

FEMA Technical Bulletins

- Technical Bulletin 0: User's Guide to Technical Bulletins (July 2019)
- Technical Bulletin 1: Openings in Foundation Walls and Walls Of Enclosures (2008)
- Technical Bulletin 2: Flood Damage-Resistant Materials Requirements (August 2008)
- Technical Bulletin 3: Non-Residential Floodproofing - Requirements and Certification (1993)
- Technical Bulletin 4: Elevator Installation (November 2010)
- Technical Bulletin 5: Free-Of-Obstruction Requirements (August 2008)
- Technical Bulletin 6: Below-Grade Parking Requirements (1993)
- Technical Bulletin 7: Wet Floodproofing Requirements (1993)
- Technical Bulletin 8: Corrosion Protection for Metal Connectors in Coastal Areas (1996)
- Technical Bulletin 9: Design and Construction Guidance for Breakaway Walls (June 2019)
- 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 (November 2001)
- Floodproofing Non-Residential Buildings, FEMA P-936 (July 2013)
- Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning, State and Local Mitigation How-To Guide, FEMA 386-6 (May, 2005)
- Protecting Building Utility Systems from Flood Damage, FEMA P-348, Edition 2 (February 2017)

FEMA Fact Sheets

- Community Rating System (June 30, 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

Federal, State and Community Resources

Boston Resilient, Historic Buildings Design Guide. City of Boston.

Buoyant City, Historic District Resiliency & Adaptation Guidelines. City of Miami Beach.

Design Guidelines for Elevating Historic Buildings. Charleston, South Carolina

Disaster Mitigation for Historic Structures: Protection Strategies. Florida Department of State, Division of Historical Resources.

Disaster Planning for Florida's Historic Resources. Division of Historical Resources, Florida Department of State.

Elevation Design Guidelines for Historic Buildings in the Louisiana GO Zone. Louisiana Department of Cultural Development, Division of Historic Preservation.

Elevation Design Guidelines for Historic Homes in the Mississippi Gulf Coast Region, Mississippi Development Authority.

Elevation Guidelines for Historic Properties. New Jersey Historic Preservation Office, Department of Environmental Protection.

Guidelines on Flood Adaptation for Rehabilitating Historic Buildings. National Park Service.

Policy Statement and Design Guidelines for Elevating Historic Buildings. Newport, Rhode Island.

Stockade Historic District, Flood Mitigation Design Guidelines, City of Schenectady, New York.