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# Guidelines on Flood Adaptation
## for
# Rehabilitating Historic Buildings

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*An illustrated version of these Guidelines is expected to be issued in Fall 2020.*

## Contents

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## Foreword

Flooding risk has long been a major challenge for many historic properties. Changing weather patterns, stronger hurricanes and other extreme weather events, sea level rise, increased nuisance flooding, king tides, and continuing development in flood plains are some of the factors increasing the risk of flooding events, both in terms of their frequency and magnitude. Some historic properties that have never flooded before may now be exposed to this risk, and those that flooded infrequently in the past may experience more instances of flooding or of water reaching higher levels than ever before.

The goal of the *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* is to provide information about how to adapt historic buildings to be more resilient to flooding risk in a manner that will preserve their historic character and that will meet *The Secretary of the Interior's Standards for Rehabilitation*. These guidelines should be used in conjunction with the *Guidelines for Rehabilitating Historic Buildings* that are part of *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*, issued in 2017. Like the *Guidelines for Rehabilitating Historic Buildings*, these guidelines are intended to focus primarily on historic buildings and their site and setting.

The treatments described here may be considered as means of preserving historic properties located in floodplains and making them more resilient to flooding hazards. Flood events can be particularly destructive to historic buildings and therefore may require greater adaptive treatments. While many of these treatments can be undertaken with minimal effects on the historic character of a property, some may require more change than would normally be acceptable in other contexts. Consequently, such treatments would generally not be appropriate to use in the majority of rehabilitation projects when the historic building does not have a flood risk. The treatment selected should always be one that minimizes changes to the building's historic character. Adaptation treatments should reduce the risk of flood damage as much as possible, but should do so without destroying significant historic materials, features, or spaces.

The National Park Service has developed these guidelines for adapting historic buildings to flooding risks in accordance with its directive to provide information concerning professional methods and techniques to ensure the preservation and rehabilitation of the historic properties that are an important part of the nation's heritage.

## The Secretary of the Interior's Standards for Rehabilitation

### Introduction to the Standards

The Secretary of the Interior is responsible for establishing standards for all cultural resources programs under Departmental authority and for advising Federal agencies on the preservation of historic properties listed in or eligible for listing in the National Register of Historic Places, including National Historic Landmarks. In partial fulfillment of this responsibility, *The Secretary of the Interior's Standards for the Treatment of Historic Properties* have been developed to guide work undertaken on historic properties; there are separate standards for preservation, rehabilitation, restoration, and reconstruction.

The *Standards for Rehabilitation* are one of the four sets of standards that comprise the overall treatment standards and address the most prevalent treatment. "Rehabilitation" is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historic, cultural, or architectural values.

The treatment standards were developed by the Secretary of the Interior to determine the appropriateness of proposed work on historic properties. The *Standards for Rehabilitation* guide Federal agencies in carrying out their responsibilities for properties in Federal ownership or control; and state and local officials in reviewing both Federal and non-Federal rehabilitation proposals. In addition, the Standards are used to determine if a rehabilitation project qualifies as a "certified rehabilitation" for Federal Historic Preservation Tax Incentive purposes. They have also been widely adopted and used by local historic district and planning commissions, local governments, non-profit organizations, design and building professionals, and the general public in communities across the country.

The intent of the Standards is to assist in the long-term preservation of the historic character of a historic property through the retention of its historic materials, features, and spaces. The Standards pertain to historic buildings of all materials, construction types, sizes, and occupancies, and address both the exterior and the interior of the building. They also encompass a building's site and setting, including landscape features as well as attached, adjacent, or related new construction.

**The Secretary of the Interior's Standards for Rehabilitation (36 CFR Part 68)**

The *Standards for Rehabilitation* are codified in National Park Service regulations 36 CFR Part 68 and are regulatory only for projects receiving Historic Preservation Fund grant assistance and other Federally-assisted projects. The Standards can be used to guide work on any historic building. A separate version of the *Standards for Rehabilitation* codified in 36 CFR Part 67 is used for "certified historic structures" pursuant to the Federal Historic Preservation Tax Incentives Program.

The following Standards (36 CFR Part 68) are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility, as well as the property's significance, physical condition, and all available documentation.

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces and spatial relationships.
2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.
4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.
9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.
10. New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

## Guidelines for Rehabilitating Historic Buildings

### Using the Guidelines

The *Standards for Rehabilitation* are a series of ten principals about maintaining and preserving the historic character and features of a historic property. Guidelines give more detailed, best-practice advice to apply the Standards during project planning by providing general design and technical recommendations. Unlike the Standards, guidelines are not codified as program requirements.

The *Guidelines for Rehabilitating Historic Buildings* issued in 2017 are part of *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*.

The Guidelines are presented in a "Recommended" vs. "Not Recommended" format. Those approaches, treatments, and techniques that are consistent with *The Secretary of the Interior's Standards for Rehabilitation* are listed in the "Recommended" column on the left; those approaches, treatments, and techniques which could adversely affect a building's historic character are listed in the "Not Recommended" column on the right. The Guidelines are intended to be used in the context of rehabilitating historic buildings and include sections on a building's site and setting. They are not meant to fully address the treatment of cultural landscapes, archeological resources, historic districts, and other types of historic resources.

### The Guidelines on Flood Adaptation for Rehabilitating Historic Buildings

Unlike other versions of the Guidelines, which are organized principally by material or building feature, the *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* are organized by adaptive treatment. The most common adaptation measures undertaken to create more resilient properties have been included in these Guidelines. These adaptive treatments are described using definitions established by the Federal Emergency Management Agency (FEMA) and are discussed in more detail in the sections that follow. The adaptation treatments are:

- Planning and Assessment for Flood Risk Reduction
- Temporary Protective Measures
- Site and Landscape Adaptations
- Protect Utilities
- Dry Floodproofing
- Wet Floodproofing
- Fill the Basement
- Elevate the Building on a New Foundation
- Elevate the Interior Structure
- Abandon the First Story
- Move the Historic Building

The treatment approaches are not organized in a particular order. “Planning and Assessment for Flood Risk Reduction” is a step that should be completed for all projects prior to selecting an adaptation treatment. “Temporary Protective Measures” and “Protect Utilities” are treatments that generally result in minimal changes to a building. The impacts of the other adaptation treatments to the historic building will vary greatly depending on multiple factors such as location and site conditions of a property, historic significance, flood risk, physical and structural attributes, and its features, materials, and architectural style. For example, elevating a building on a new foundation may have a minimal impact on one building’s historic character, yet for another property the same treatment may change the building’s historic character significantly and not meet the *Standards for Rehabilitation*. In many instances selecting more than one treatment or combining treatment approaches may be necessary to make the building more resilient to flooding and/or to minimize the impacts to the historic character and appearance of the property.

The *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* are general and intended to provide guidance in interpreting and applying the Standards to rehabilitation projects involving buildings that are at a risk for flooding. They are not meant to give case-specific advice. For instance, they cannot tell property owners or developers which features of a historic building are important in defining its historic character and, therefore, must be retained. (See *Preservation Brief 17: Architectural Character – Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character.)* This case-by-case determination is best accomplished with the assistance of qualified historic preservation professionals in the very early stages of project planning. For any treatment undertaken, assemble the appropriate project team, including architects, engineers, and other professionals. Obtain any necessary approvals or certifications prior to beginning work on the project.

These Guidelines do not address disaster response or short-term recovery. The Guidelines may be used after an event as properties undergo rehabilitation and adaptation to address the damage and future flooding risk. Limited information about drying and cleaning after a flood is included with descriptions of treatments that allow flood waters into a building.

The goal of achieving greater resilience and reducing flood risk must be balanced with minimizing the impacts to the historic character of the building. These guidelines are designed to help identify and evaluate the different adaptation options in order to select a treatment that meets the *Standards for Rehabilitation*. Wherever possible, the guidelines provide “Recommended” methods of implementing each type of adaptation in order to preserve as much of the historic character of a historic building and its site and setting as possible. All of the “Recommended” treatments may not apply to every project, even those within a single adaptation method. Technical limitations are identified for each treatment. The Guidelines, like the Standards, should be applied after taking into consideration economic and technical feasibility.

**The *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* should only be applied to historic properties with an established risk of flooding. This risk can be determined by the mapped areas of the 1% and 0.2% annual chance of flooding (such as a Flood Insurance Rate Map), a community model or projection for flood risk areas, or similar science-based projections. Such maps and models take into account river flow, storm tides, hydraulic analysis, rainfall, and topographic surveys among other factors.**

**A project meets the Standards when the overall effect of all work is consistent with the property's historic character. Treatments that might not be considered in other rehabilitation contexts because of their impacts on the historic character of a property may be acceptable in the context of adapting the property to flooding hazards. Even in this context, the selected treatment should always be one that minimizes the changes to the building's historic character and appearance. Adaptation treatments should increase the building's resilience to flooding risks as much as possible, but should do so without destroying significant historic materials, features, or spaces.**

The entire scope of the project, including alterations related to flood adaptation as well as any other work to the building or site, must be evaluated. The amount of change to features and spaces that can be accepted within the Standards will vary according to the roles they play in establishing the character of the property. Aspects less critical to the historic character may be altered more substantially with less effect on the character of the building as a whole. However, the cumulative effect of changes that are numerous or substantial can in some instances alter the overall character of the building, in which case the rehabilitation project will not meet the Standards.

Finally, the Guidelines address unconventional treatments and situations when a historic building may not be able to be retained and preserved. Demolition is not a treatment that meets the *Standards for Rehabilitation*. These two sections are included solely for informational purposes.

### Assessing the Risk and Selecting an Adaptation Treatment

Before undertaking any work to adapt a historic building to be more resilient to potential flooding, research about the actual flood risk as well as the historic property must be undertaken. Proposed alterations to the property will need to be adequate to address the identified risk. Property owners should take into account the characteristics of the potential flooding, such as the direction the water will likely flow, the expected speed and depth of the water, the duration of the flood, whether there will be wave action, the potential for water-borne debris, and the salinity, toxicity, or cleanliness of the flood waters. The applicable Federal, state and local code requirements and regulations must also be considered.

These guidelines will use the term "**established flood risk level**" to describe the property-specific height of anticipated floodwater. This measurement should be based upon recognized flood data, past flood events, site-specific reports, and other applicable information. Often this

height is dictated by local floodplain management and codes and can be higher than the predicted flood level. In order to remain more general, this document purposefully does not use terms for flood risk defined by other agencies. The use of "established flood risk level" is an attempt to avoid confusion and the appearance of providing interpretation of Federal, state, and local regulatory terms for flood risk.

Prior to planning or undertaking any work, the spaces, features, materials, and finishes of the historic property affected by the flooding or the proposed adaptive treatment should be documented. The property's existing capacity to sustain and recover from flooding, as well as its physical condition and use, should be evaluated. Those spaces, features, and materials that are important to the historic character and significance of the property should be identified for retention and preservation. Prior alterations that provide additional resiliency to flooding may also be considered for retention, improvement, or enhancement. In regions where buildings were historically adapted to frequent flooding, the traditional treatment approaches should be considered.

It may also be helpful to consider adapting a historic property in scalable phases, particularly for coastal properties at risk to rising sea levels and increasing flood risk. Where the magnitude and time horizon of the risk are uncertain, it is important to build in future capacity where economically and technically feasible – for example, a flood wall with an over-engineered foundation that can be extended higher in the future.

These Guidelines are intended to assist property owners undertaking a flooding adaptation project, recognizing that, as with any rehabilitation project, there are always other design, programmatic, financial, and regulatory requirements that must also be considered in planning such projects. Among these, the National Flood Insurance Program (NFIP) may have significant financial impacts and influence design decisions. The NFIP is administered by the FEMA and implemented by state and local governments and is responsible for providing flood insurance, improving floodplain management, and developing Flood Insurance Rate Maps (FIRM). These Guidelines are not an attempt to interpret or provide guidance on the NFIP or which treatments may or may not reduce flood insurance costs.

The NFIP includes a provision that provides relief for historic buildings from certain floodplain requirements. This relief is not designed to reduce flood risk or insurance rates. The NFIP uses the term "historic structures" (44 CFR Part 59) and defines them as follows:

- Listed individually in the National Register of Historic Places or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register.
- Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district.

- Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior.
- Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either by an approved state program as determined by the Secretary of the Interior or directly by the Secretary of the Interior in States without approved programs.

This consideration is an option for historic properties when flood code-compliant work would result in a project that does not meet the *Standards for Rehabilitation*. The following treatments are intended to preserve historic properties located in a floodplain and make them more resilient to flooding hazards.

## Planning and Assessment for Flood Risk Reduction

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. Planning and risk assessment for potential flooding should therefore be undertaken proactively, and properties should be maintained in good condition, monitored regularly, and appropriately documented as part of any treatment plan for the property.

A historic building may have existing characteristics, features, or materials that themselves have inherent resilience to flood hazards and can help address or minimize the impacts of flooding. When applicable and appropriate these characteristics, features, or materials should be taken into consideration early in the planning stages of a rehabilitation project before proposing any new treatments. When new adaptive treatments are needed, they should be carried out in a manner that will have the least impact on the historic character of the building, its site, and setting. In adapting the building to be more resilient to flooding risks, the goal should always be to minimize the impacts to the building's historic character to the greatest extent possible. For future reference, it is helpful to record the decision making process.

All planning and assessment for reducing flood risks should include the following:

- Identify the historic property's flood risks and vulnerabilities and any existing capacity for resilience.
- Monitor the condition of the property and regularly reevaluate its flooding risks and vulnerabilities.
- Document the historic property as a record and future guide. *The Secretary of the Interior's Standards for Architectural and Engineering Documentation* or *Preservation Brief 43: Preparation and Use of Historic Structure Reports* can serve as a guide.
- Review and understand the compliance requirements of the local flood plain ordinance and related local regulations.
- Identify and assess all feasible adaptation treatment options as to how they will address the flooding risk.
- For each treatment option, evaluate the impacts of any potential alterations to the historic property's character-defining spaces, features, and materials, and its site and environment.
- Consideration should be given to how local communities have decided to adapt to the risk of flooding hazards and treat historic properties impacted by these risks. Also consider the future viability of community infrastructure, such as roads, sewers, and other utilities and services.

- Select the time frame for which the adaptation treatment is expected to adequately reduce the risk. This could be tied to the length of a mortgage or some other point in the future.
- Always select an adaptive treatment that minimizes the impacts to the historic character and appearance of an individual property and/or a larger historic district.

| **Recommended** | **Not Recommended** |
|---|---|
| Identifying historic materials, features, and spaces that are important in defining the historic character of the property when planning and undertaking flooding adaptation treatments. | |
| Developing and implementing a plan to reduce the risk of damage or destruction to the historic building. | Failing to proactively analyze and address a flooding risk. |
| Identifying and evaluating the vulnerabilities of the historic property to the impacts of flooding using the most current climate information and data available. | Failing to identify and periodically reevaluate the potential vulnerability of the building, its site, and setting to the impacts of flooding. |
| Assessing the potential impacts of known vulnerabilities on character-defining features of the building, its site, and setting.<br><br>Reevaluating and reassessing potential impacts on a regular basis. | |
| Documenting the property and character-defining features as a record and guide for future repair work, should it be necessary, and storing the documentation in a weatherproof location with at least one duplicate at a secure site. | Failing to document the historic property and its character-defining features with the result that such information is not available in the future to guide repair or reconstruction work. |
| Maintaining the building, its site, and setting in good repair, and regularly monitoring character-defining features. | Failing to regularly monitor and maintain the property and the building systems in good repair. |

| **Recommended** | **Not Recommended** |
|---|---|
| Using and maintaining existing historic and non-historic characteristics, features, and materials of the historic building, its site, setting, and larger environment (such as a site wall that keeps out flood waters) that may help to avoid or minimize the impacts of flooding. | |
| Undertaking 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. | Carrying out adaptive measures intended to address the impacts of flooding that are unnecessarily invasive or will otherwise adversely impact the historic character of the building, its site, or setting. |
| Ensuring that, when planning work to adapt for flooding, all feasible alternatives are considered, and that the options requiring the least alteration are considered first. | |
| Replacing damaged or deteriorated historic materials in kind where the traditional material is flood-damage resistant.<br><br>Replacing damaged or deteriorated historic materials that are not resilient to flooding with proven flood-damage resistant substitute materials that match the appearance and design. | |
| Utilizing local and regional traditions (such as elevating residential buildings) for adapting buildings in response to flooding when compatible with the historic character of the building, its site, and setting. | Utilizing an adaptation treatment traditionally used in another region or one typically used for a different building type or architectural style which is not compatible with the historic character of the property. |

| **Recommended** | **Not Recommended** |
|---|---|
| Using special exemptions and variances when prescribed adaptive treatments to protect buildings from flooding would otherwise negatively impact the historic character of the building, its site, and setting, while still taking steps to address or help minimize flood risk as much as possible. | Using a special exemption or variance to avoid taking any steps to address or help minimize the impacts of flood risk on a historic property. |
| Considering adaptive options, whenever possible, that would protect multiple historic resources, if the treatment can be implemented without negatively impacting the historic character of the overall historic property, district, or archeological resources, other cultural or religious features, or burial grounds. | Failing to consider other properties nearby in planning flood adaptations, therefore increasing the risk or exposure to neighboring properties. |

## Temporary Protective Measures

Temporary or non-permanent protective installations use materials or systems that can be deployed or activated when flooding is predicted, and removed or stored when the flood waters have receded. Temporary measures are generally the most affordable options and can have a low impact on the historic character of the property because they rarely involve permanent changes to the property. However, temporary measures may not be well suited for areas subject to frequent flooding. Temporary measures require time and people to quickly deploy them, so they are not a good option in locations where flooding may occur without sufficient warning time. Although someone may need to be on site to deploy the system, property owners or tenants themselves should secure the property as best they can and move to a safe location outside the flood zone for the duration of the event.

Temporary measures include sandbags, temporary dams, temporary floodgates, and flood-wrapping systems. Sandbags are the most widely-recognized tool used to protect a property from flood water, but there are also synthetic products that function in a similar fashion. Temporary dams are intended to encircle a building or close gaps in floodwalls. Temporary floodgates are removable barriers installed in windows, doorways, and other openings. Flood wrapping systems cover the most vulnerable portion of an existing structure to create a temporary impervious barrier. Wrapping systems do not lend additional strength or stability to a structure, therefore any building using such a system must be able to withstand the forces of the flood.

No temporary system is failproof. There can be water seepage with these materials and systems, and they should be used in conjunction with pumps and emergency generators. Generators should be elevated above the established flood risk level. If a temporary measure is breached or overtopped, the deployed system should be immediately removed once flood waters have receded to promote drying. With any of these systems, if custom-sized or special components are needed for certain locations (like a floodgate for a specific-width opening), it is important that they be easy to locate and identify to facilitate timely installation when flooding is predicted.

## Technical Limitations:

- Temporary protective measures are generally designed for relatively shallow floods of limited duration.
- Deployment takes time and varies depending on the equipment or system and the labor available to put it in place.
- Equipment requires storage space, and, if stored off site, the logistics of getting the temporary barrier or system to the site must be factored into deployment time.

- During a flood event, temporary measures must not rely on continual on-site monitoring, as evacuation from the flooded area may be required until emergency personnel allow property owners to return.

| **Recommended** | **Not Recommended** |
|---|---|
| Selecting a temporary barrier, system, or equipment that will protect the historic building from the predicted type of flooding and that can be deployed using the labor, equipment, and warning time available. | Selecting a system or equipment inadequate to protect the historic building from predicted flooding and/or cannot be deployed quickly. |
| Evaluating and ensuring the ability of masonry walls and temporary flood barriers or other systems covering masonry openings to withstand the forces of flooding. Reinforcing walls as necessary to withstand such forces. | Reinforcing masonry walls to withstand the forces of flooding in a manner that destroys historic materials and features or diminishes the historic character of the property. |
| Installing fastening devices or stanchions to attach the temporary barrier or system in concealed or secondary locations of the building, and in a manner that does not damage, alter, or otherwise impact the historic character of the property. | Installing fastening devices or stanchions where they would damage, alter, or otherwise impact the distinctive materials, features, and spaces of the property. |
| Establishing procedures, responsibilities, and regular training for deploying temporary barriers and other systems. | |
| Installing pumps to remove water that breaches the temporary barrier or other system. If pumping out water post-flood event, ensuring that the water is pumped far enough from the protected property to avoid seeping back in. | |
| Investing in a generator as a backup to operate the pumps if there is a power failure during or after a flood. Installing a generator in a floodproof enclosure or above the established flood risk level. | |

| **Recommended** | **Not Recommended** |
|---|---|
| Providing sufficient clearance between the temporary barrier and the walls of a historic structure to ensure that the force of the water against the barrier is not transferred to the historic building. | Erecting temporary barriers that are in direct contact with any significant historic building, structure, or object on the site. |
| Obtaining removable flood barriers for openings in any existing solid masonry perimeter site walls that are strong enough or reinforced to withstand the forces of a flood. | |
| Relocating furnishings and valuable collections to higher floors, upper shelves, or off-site to protect them from seepage or possible failure of the temporary barrier or system. Using water-tight containers for storage whenever possible. | Assuming that temporary barriers or other systems will keep out all water and, therefore, not planning ahead for possible seepage or failure of a temporary barrier or system. |

## Site and Landscape Adaptations

A range of site and landscape interventions can be implemented to protect a historic building from flooding, both on the property itself as well as off-site when that is possible. The advantage of these options is that the historic building itself generally remains unaltered. The relationship of a building to its site and setting is important to the preservation of its historic character. Changes to the site and landscape should be carefully planned to avoid negatively impacting the property's historic integrity and any historic landscape features, archeological resources, other cultural or religious features. Such changes can also impact the integrity of a historic district.

The different types of site interventions can include basic regrading, large engineered structures, and infrastructure projects that may protect many properties in a neighborhood or district. Storm-water management systems, berms, and floodwalls can all be used to control water on a single site, and each of these site interventions can also be 'scaled up' to protect multiple properties and larger areas. Levees and the restoration of natural flood control systems like living shorelines, dunes, marshes, and wetlands are additional tools for larger-scale interventions.

Site mitigation will change how water moves through and around a property. Altering the existing site conditions must be done with thoughtful examination of potential impacts to neighboring properties adjacent to and downstream from a property.

## Technical Limitations:

- Site or landscape adaptation measures can make flooding worse for other properties, and codes or regulations may not allow their use in certain locations.
- Adding a new site or landscape feature is not possible on-site for properties that are already on fully developed sites (i.e., the building occupies the majority of the lot), although it may be possible to modify an existing feature like a site wall.

| **Recommended** | **Not Recommended** |
|---|---|
| Identifying, retaining, and preserving 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. | Removing or substantially changing site features that are important in defining the overall historic character of the property so that, as a result, the historic character of the property is diminished. |

| **Recommended** | **Not Recommended** |
|---|---|
| Altering the site or setting in locations that are not important to the historic character of the property. | Damaging or destroying significant historic landscape features, designs, or plantings in order to establish a new site or landscape feature to protect the property from flood risks. |
| Retaining the topography and historic relationship between buildings and the site and setting. | Changing the grade level of the site if it substantially diminishes its historic character. For example, adding fill to a site such that the formerly visible historic foundation is concealed. |
| Protecting and maintaining 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. | Failing to ensure that site drainage is adequate so that buildings and site features are damaged or destroyed.<br><br>Changing the site grading so that water does not drain properly or is redirected toward other buildings or structures. |
| Surveying and documenting areas where the terrain will be altered or new features constructed to determine the potential impact to important landscape features, archeological resources, other cultural or religious features, or burial grounds. | Failing to survey the building site prior to beginning work, which may result in damage or loss of important landscape features, archeological resources, other cultural or religious features, or burial grounds. |
| Protecting (e.g., preserving in place) important site features, archeological resources, other cultural or religious features, or burial grounds. | Leaving known site features or archeological material unprotected so that it is damaged as a result of adaptation work. |
| Planning and carrying out any necessary site investigation before adaptation work begins, using professional archeologists and methods, when preservation in place is not feasible. | Allowing unqualified personnel to conduct archeological investigations, which can result in damage or loss of important archeological material. |
| Improving or restoring on-site or adjacent natural systems such as living shorelines, wetlands, and beaches and dunes.<br><br>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. | |

| **Recommended** | **Not Recommended** |
|---|---|
| Designing new or improving existing storm-water 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. | Damaging or destroying historic materials, features, or spaces of the historic building, site, and setting in order to add or improve storm-water management. |
| Constructing a levee, berm, or embankment on adjacent or nearby land outside the historic site or district to minimize impacts to the character of the historic property and increase area of protection for the historic site or district.<br><br>Designing a new floodwall or berm or improving an existing barrier to provide flooding protection to a historic site. | Damaging or destroying important landscape features, archeological resources, other cultural or religious features, or burial grounds in order to construct the flood protection. |
| Ensuring that the new or modified floodwall or berm is compatible with the historic character of the property. | Constructing a tall floodwall or berm that is incompatible with the historic character of the site or setting that blocks the property from significant viewsheds, or alters the appearance of the property from the public right-of-way. |

## Protect Utilities

Utilities and mechanical systems for historic buildings are often placed in basements to conceal them from sight. Any part of these systems that is in such flood-vulnerable locations should be elevated or relocated above the established flood risk level. Utilities and mechanical systems should be relocated to utilitarian or other secondary spaces in historic buildings that are unlikely to flood. Exterior utilities and mechanical systems should similarly be elevated to protect them from flooding, and placed in locations that minimize as much as possible their visibility and impact on the historic character and appearance of the building.

When planning a project involving mechanical, electrical, plumbing, or fire suppression systems, it is helpful to be aware of the service life of the various features of the systems involved. Sometimes it may be necessary to keep the systems, in whole or in part, in the existing location even though it is a known flood risk area of the property. This part of the system will need to be placed within a watertight enclosure or be sacrificial and replaced after a flood. Depending on the frequency of expected flooding, the cost of that part of the system, and its expected service life, this approach may be economically reasonable.

The protection of utilities should be addressed as part of any adaptation treatment. While utilities are not specifically addressed in all other treatments described in these Guidelines, the following recommendations are applicable.

## Technical Limitations:

- The new location for the equipment must provide adequate space and ventilation requirements.
- The relocated equipment must be accessible for monitoring, servicing and inspection.

| **Recommended** | **Not Recommended** |
|---|---|
| Relocating all utilities above the established flood risk level or protecting them in place with a watertight or impermeable enclosure. | Relocating systems and utilities to a historically significant interior space or a highly visible location. |
| Relocating and anchoring exterior mechanical equipment and fuel tanks to an elevated platform that is compatible with the building's historic character and is, preferably, on a secondary or otherwise less visible elevation. | Constructing a new platform for exterior equipment with incompatible materials and/or in a highly visible location if it can otherwise be avoided. |

| **Recommended** | **Not Recommended** |
|---|---|
| Using fencing or landscaping to screen exterior mechanical equipment and reduce its visibility. | |
| Relocating interior mechanical equipment to utilitarian or insignificant spaces within the building that are unlikely to flood. | |
| Relocating ducts, pipes, and conduit to spaces that are unlikely to flood to the extent practical; and concealing such systems within walls, attics, chases, and soffits in historically-finished spaces. | Relocating ducts, pipes, and conduit to primary spaces and leaving them exposed, or concealing the systems in a manner that will change the overall character of the space. |
| Insulating the outside of ducts in the established flood risk area so that insulation can be removed after a flood to promote drying. | Selecting ducts with integral insulation that is not flood-damage resistant and will be located in the established flood risk area. |
| Installing an electrical disconnect well above the established flood risk level in an easy to access location. This should be separate from the utility panel. | |
| Eliminating electrical service to (or separating it from) flood-prone areas of the building or site with minimal disturbance to historic features and finishes. | Damaging or destroying historic interior or exterior features, finishes, or materials to an excessive degree in order to access wall cavities for re-wiring. |
| Installing backflow prevention devices. | |
| Installing sump pumps at the lowest level of the structure that are powered by a back-up power source. | |

# Dry Floodproofing

Dry floodproofing is an adaptation method designed to keep water out of a building. This treatment requires establishing a watertight seal on the exterior of the foundation and sealing all interior spaces below the established flood risk level. This adaptation measure may involve significant alterations that impact historic spaces, features, and materials affecting the building's historic character and appearance. In order to dry floodproof a property, all openings (windows, doors, and any utility penetration) that extend or are completely below the established flood risk level must be designed to be temporarily or permanently sealed. Exterior foundation surfaces must be impervious to water. This can be accomplished with a waterproof coating or membrane. Walls must be reinforced and anchored to withstand flooding forces, including buoyancy and debris impact, and a specially engineered drainage system must be installed. Impacts to historic character are likely to be less for buildings where dry floodproofing is only necessary below grade, thus reducing the visible impacts of the alterations.

The aspect of dry floodproofing that can pose the greatest concern from a technical preservation perspective is waterproofing. There are numerous products and technologies that are available, from tar to synthetic materials, and each product has different performance standards and the potential to negatively impact the historic materials to which it is applied. It is important that a product be thoroughly researched before applying it to a historic building, and closely monitored during and after installation in order to avoid unintended consequences that may hasten deterioration or cause damage or discoloration. Additionally, waterproof coatings, being vapor impermeable, can trap moisture in the wall or on the interior wall surface and cause deterioration or damage to historic materials.

Because of the strength of flood forces, dry floodproofing is generally not recommended for projected inundation levels that are more than three feet of water, particularly for unreinforced masonry. This adaptation method will require a high frequency of maintenance when exposed to repeated flooding. It is a more appropriate treatment to use where the flood risk is infrequent or below three feet.

## Technical Limitations:

- This adaptation method is only appropriate for load-bearing masonry buildings or frame buildings with masonry foundations, where the established flood risk level is below the top of the foundation, since masonry walls can be made to withstand flooding forces.
- The treatment requires regular maintenance, monitoring, and repair to perform effectively in repetitive flood events, as system components such as sealants and membranes can degrade or become damaged.

- This method is not recommended if flooding is anticipated at levels higher than three feet due to structural and other considerations.
- Any building component, which could include foundations, walls, slab, or sanitary systems, must be able to withstand hydrostatic forces.

## Structural Considerations

| **Recommended** | **Not Recommended** |
|---|---|
| Evaluating the strength of masonry walls and footings of historic buildings to ensure that they are strong enough to withstand floodwater pressure and flood-borne debris. | Proceeding with dry floodproofing without assessing the structural stability of the historic building. |
| Anchoring the structure to the foundation with appropriate placement and engineering, to prevent movement or collapse of the historic building. | Altering visible foundation walls to an extent that the historic character of a building is affected. |

## Site Drainage

| **Recommended** | **Not Recommended** |
|---|---|
| Preparing to effectively manage the incoming floodwaters and addressing moving and removing the water from the site and historic building after the flooding. | |
| Installing a drainage system around the foundation and footings of the historic building to avoid undermining the building and to allow for proper site drainage. | Ignoring potential impacts to the historic landscape, archeological features, or other historic resources that could be caused by the installation of a drainage system. |
| Installing a backflow valve to prevent sewer and drain backups. | |
| Installing one or more sump pumps, if needed, to effectively control water on the site and reduce hydrostatic pressure post-flooding. | |

## Coverings and Coatings

| **Recommended** | **Not Recommended** |
|---|---|
| Designing 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.<br><br>Blocking character-defining window or door openings on a primary or highly visible façade that extend into the flood protection zone with temporary flood shields.<br><br>Blocking openings on secondary elevations or in less visually prominent locations with temporary flood shields or compatible masonry infill recessed within the opening to retain the profile of the opening. | Blocking character-defining openings such as the historic building's windows and doors permanently in a nonreversible manner. |
| Installing stanchions, fasteners, or tracks for flood shields in concealed or secondary locations, and in a manner that does not damage, alter, or otherwise impact the historic character of the property. | Installing flood shield fasteners where they would damage, alter, or otherwise impact the historic character of the property. |
| Building a low wall that is compatible with the historic building, around basement windows to keep out flood waters. | |
| Installing required vents in foundation walls that can be sealed in the event of flooding. | |
| Coating or covering the exterior of foundation wall surfaces with a proven waterproof coating or membrane at or below the established flood risk level.<br><br>Wrapping the foundation with a temporary, removable waterproof membrane instead of applying a permanent waterproof coating, when possible. | Coating or covering portions of the walls above the established flood risk level. |

| **Recommended** | **Not Recommended** |
|---|---|
| | Applying coatings or coverings in a manner that alter or damage the historic character of the building. |
| Applying a waterproof coating of the building that is compatible with the historic masonry. | Applying a waterproof coating that is incompatible with the historic masonry or that is not watertight and could cause damage or deterioration. |
| Inspecting applied coatings or membranes on a regular basis to ensure performance and periodically reapplying the coating or replacing the covering. | Failing to maintain a waterproof coating or membrane after it has been applied. |

## Wet Floodproofing

Wet floodproofing allows water to enter a historic building during a flood event and drain out as the flood waters recede. It is not recommended where flooding is expected to exceed 24 hours in duration. Because this approach allows flood waters to enter the building, which will likely cause damage to historic materials, features, and finishes, it is best to limit this treatment to buildings where the area of inundation is an unfinished space, such as a basement, if the building is not constructed of flood damage-resistant materials.

Wet floodproofing requires water to move in, through, and out of the building at a consistent rate, largely controlled by vents. The total number, size, and locations of the vents is based on the square footage of the building and the anticipated performance of the vents. Water must also be able to move through the interior spaces of the flooded portions of the building, such as through door and other openings. The building may require structural reinforcement and anchoring to the foundation to allow it to withstand the force of the flood waters. All mechanical, electrical, and plumbing systems must be elevated above the established flood risk level or otherwise designed to withstand floodwaters (see Elevate Utilities). Where the floodwater may not drain naturally from the lowest levels of the property, a new drainage system must also be designed and installed to help remove the water from the building.

Interior spaces must be altered to allow for inundation, potential contamination, draining, cleaning, and drying which can require removal and replacement of historic materials. If the basement is finished, materials that will be in contact with the water may need to be replaced with more water-resistant and impervious materials. For example, gypsum wall board will need to be completely removed and replaced with a more flood-damage resistant substitute material such as marine-grade wood or non-paper-backed gypsum board to avoid moisture and mold issues. Because water will wick up through many materials, a horizontal waterstop joint is recommended to limit the amount of materials that will require drying and cleaning. Any wall cavities will need to be opened and accessed after each flood to clean and dry. Additionally, all interior furnishings and personal effects must be moved from the area prior to the flooding event to protect them from damage of the flood waters. After the flood, the cleaning process can involve harsh chemicals, power washing, and additional material removal and replacement. Be aware that drying and cleaning can take extended periods of time, and the building may not be habitable during this process. The drying process can be moderately accelerated by using dehumidifiers and fans, but heated air systems are not recommended.

The primary preservation concern about this adaptation method is the potential loss of historic materials. It is crucial to identify and document the condition of the historic materials, features, and finishes before selecting this treatment. Some traditional materials perform as well as recommended modern flood-damage resistant materials. Many historic buildings have been altered over time and may no longer retain a high degree of historic interior materials or features

(e.g., plaster has been replaced with drywall). In these instances it may be possible to replace those features with flood-damage resistant material without impacting the historic character of the building. Flood-damage resistant substitute materials may be used to replace deteriorated or damaged historic materials and features below the established flood risk level.

This adaptation method is generally not appropriate for a historic building that still retains a high level of historic materials, features, finishes, and spaces at or below the established flood risk level because it could result in their loss.

## Technical Limitations:

- This adaptation is not viable for buildings where flooding will likely exceed 24 hours due in part to the potential for damage, contamination, and biological growth possible over longer exposures to floodwater.
- Any building component, which could include foundations, walls, slab, or sanitary systems, must be able to withstand hydrostatic forces.
- The building has to dry out after a flood, so this method is not suitable if there is inadequate foundation ventilation.
- This adaptation requires a lengthy cleaning process and drying time, and, therefore, is best applied when flood waters will be limited to non-living spaces (i.e., basements, crawlspaces, garages, etc.) or for nonresidential properties.

## Structural Needs

| **Recommended** | **Not Recommended** |
|---|---|
| Evaluating the strength of walls and footings of historic buildings to ensure that they are strong enough to withstand floodwater pressure and flood-borne debris. | Proceeding with wet floodproofing without assessing the structural stability of the historic building. |
| Anchoring the structure, where necessary, to prevent movement or collapse of the historic building. | Altering visible foundation walls to an extent that the historic character of a building is affected. |

## Utilities

| Recommended | Not Recommended |
|---|---|
| Relocating all utilities above the established flood risk level or protecting them in place with a watertight or impermeable enclosure. | Relocating systems and utilities to a historically significant interior space or a highly visible location. |
| Installing a Ground Fault Circuit Interrupter (GFCI) to protect the electrical system of the historic building and prevent possible fires. | |

## Site Drainage and Venting

| Recommended | Not Recommended |
|---|---|
| Following the recommended structural engineering guidance for the number, size, and placement of hydrostatic flood vents, as well as any other ventilation requirements. | Ignoring industry standards for flood venting requirements resulting in the loss of structural stability of the building in a flood event. |
| Retaining historic foundation vents in highly visible locations where feasible. | Selecting a non-engineered vent system in order to retain historic vents where engineered vents would result in significantly fewer openings in the foundation. |
| Selecting a compatible design and placement for new vents, or painting vents to blend in with the foundation material. | Installing highly visible vents and placing them without consideration of the rhythm of fenestration. |
| Installing a pumping system for draining the building in concert with the receding waters outside the property. | Failing to regulate the rate of water draining from the property, potentially causing structural damage to the building or neighboring properties. |

## Interior Alterations

| **Recommended** | **Not Recommended** |
|---|---|
| Retaining historic materials, features, and finishes that are flood-damage resistant.<br><br>Removing non-historic finishes and furnishings that absorb and trap moisture, such as carpets. | Removing intact, undamaged, or repairable historic materials, features, and finishes in anticipation of a possible flood. |
| 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. Replacing character-defining features with a substitute material that matches the design and appearance of the historic component. | Selecting flood-damage resistant replacement materials and features that are potentially destructive or incompatible with the historic building. |
| Relocating, if necessary, electrical outlets and panels above the established flood risk level in a manner compatible with the historic character of the building by placing them in less visible locations and possibly concealing them with existing features such as a door frame or chair rail. | Relocating electrical outlets or panels above the established flood risk level in a highly visible location that impacts the historic character of the interior spaces. |
| | Making new openings in walls which damage or destroy historic materials and features or otherwise impact the historic character of the building in order to allow the free movement of water. |
| | Applying impermeable coatings that cannot be easily removed, or otherwise sealing the building envelope in a way that may cause damage to the building. |

| *The following wet floodproofing treatments are intended for interior spaces that have been significantly altered in the past or irrevocably destroyed or damaged such that the spaces possess a low level of historic integrity. These treatments do not meet the Standards for Rehabilitation if the interior spaces still retain a high level of historic materials, features, or finishes, because it could result in their loss and significantly diminish the building's historic character.* | |
|---|---|
| **Recommended** | **Not Recommended** |
| Installing interior flood-damage resistant materials in a manner that limits destruction of the historic materials and features. | Selecting flood-damage resistant materials that are incompatible and potentially destructive to the historic envelope. |
| Using flood-damage resistant substitute materials that are compatible with the existing historic interior finishes and character. | Installing flood-damage resistant materials without considering their impact on the historic character of the building. |
| Selecting and installing impervious materials that allow air circulation within the building envelope. | Installing and applying materials and treatments that prevent the proper movement of air and water vapor through the building envelope or interior walls. |
| Installing a horizontal waterstop joint in the wall that prevents the wicking of moisture during a flooding event in a manner that does not compromise the structural integrity of the wall or causes the loss of intact historic features. | Removing or damaging structural materials and intact historic features to install a water-stopping joint in a wall. |

## Property Clean-Up Post-Flooding

| **Recommended** | **Not Recommended** |
|---|---|
| Using the gentlest means possible for effectively removing surface grime and killing flood-borne bacteria. This can include a low-pressure water wash and appropriate cleaners. | Using abrasive materials or methods to clean the flood-impacted building. |

| **Recommended** | **Not Recommended** |
|---|---|
| Identifying and assessing the flood-damaged building to determine the impacts to the historic materials and features. Determining which materials and features can be cleaned, dried, and repaired and which materials must be replaced. | Removing flood-impacted materials and features without proper assessment or consideration of their historic value or ability to be cleaned and repaired. |
| Allowing all the materials that were submerged or in contact with the flood waters to properly dry using dehumidifiers and fans before repairing the building. | Accelerating or force drying the building with heat in order to expedite repair of the damaged building. |

# Fill the Basement

One treatment measure to provide flood protection for a historic building that will have minimal impact on its character is to fill in the basement. However, this method can only be used for a basement that is below ground level on all sides and of masonry construction. A walkout basement would not be a candidate for this adaptation treatment. A drawback to this treatment is that, because a basement may serve as an unintended water catchment during a flood event, water displacement issues may be a problem, since the basement would no longer serve that function. Although filling a basement may have a more limited impact upon the historic character of a resource, it will result in the loss of space and/or access to any historically important features in the basement. If the basement contributes to the significance of the property or includes significant historic features, such as a fireplace, dumbwaiter, or an innovative historic heating system, this treatment is not recommended.

Local ordinances may define basements in different ways. In some cases, a basement is considered occupied space that therefore needs to be protected from flooding. In other instances a basement is viewed as only unfinished space that can flood. A property owner will need to learn the specific rules in their community.

Fill material can be compacted gravel, soil, or sand and must reach the same level as the ground surrounding the building. In some cases the fill material will settle further and more material must be added to maintain the necessary fill height equal to the surrounding ground level.

## Technical Limitations:

- The treatment can only be used on buildings with basements of masonry construction due to structural considerations.
- Access and clearance to the basement must be sufficient to allow compacting equipment to enter and to be removed after the basement has been filled.

## Structural Considerations

| **Recommended** | **Not Recommended** |
|---|---|
| Assessing the strength of basement walls and footings to ensure they are strong enough to support the fill after it is compacted. | Filling in a basement without assessing or evaluating the strength of the basement walls and footings to ensure they are strong enough to support the fill when compacted. |

| Recommended | Not Recommended |
|---|---|
| Modifying and anchoring basement walls and footings, when necessary, to provide enough strength to support the fill as long as the modifications do not significantly alter the visible exterior portions of the foundation. | Altering visible exterior foundation walls to an extent that the historic character of a building is negatively impacted. |

## Drainage

| Recommended | Not Recommended |
|---|---|
| Removing or breaking up non-porous or concrete basement floor slabs prior to adding fill or creating drainage holes and trenches in the existing floor, while still protecting foundations and footings. | Filling in a basement without addressing potential drainage issues that may arise as a result of the fill. |
| Installing a pumping system in an accessible location to drain the space if necessary. | Neglecting to install a pumping system if needed to facilitate drainage. |

## Systems Relocation (See Protect Utilities)

| Recommended | Not Recommended |
|---|---|
| Relocating all systems and utilities, including HVAC, plumbing, and electrical, above the established flood risk level to a secondary interior space with minimal significance and visibility, such as an attic or closet. | Relocating systems and utilities to a historically-significant interior space or a highly-visible location. |

## Filling the Basement

| Recommended | Not Recommended |
|---|---|
| Using a fill material, such as gravel, soil, or sand that could be removed in the future. | Using fill material such as concrete that will be difficult to remove in the future. |

| **Recommended** | **Not Recommended** |
|---|---|
| Compacting the fill so that it protects the basement adequately from water entering the space. | Leaving the fill material loose without compacting it. |
| Filling a basement to the required fill height which is equal to the surrounding ground level. | Adding insufficient fill material that is not enough to reach the required fill height. |
| Monitoring and supplementing the fill already in place with additional fill if needed to reach the required fill height. | |

## Elevate the Building on a New Foundation

This adaptation method involves raising the height of a building by lifting the building from the existing foundation, constructing a new, higher foundation, and resetting the building on the new foundation. While this is one of the most common solutions for residential buildings at risk from flooding, when the change in height of the new foundation is significantly different from the original height, the historic character and appearance of the building can be considerably impacted. As a result, elevating a building on a new foundation can greatly affect the historic character and integrity of the building, and any associated historic district if not carefully planned and considered.

This adaptation treatment can generally protect a historic building from any type of flooding if the water does not reach the new first-floor level after elevation. The likely characteristics of the flood will dictate the type of foundation treatment. For example, a building that is properly tied to the piers of an open foundation will generally have less damage from fast-moving floodwaters than a building on a closed foundation. In other circumstances, break-away walls may be the only type of solid infill allowable below the established flood risk level. Local zoning and building code requirements may limit how, and to what height, a building may be elevated. Consultation with a local floodplain administrator or other knowledgeable professional will also help identify requirements specific to a location or site. The local floodplain administrator may also be able to provide information about the future viability of community infrastructure impacted by flood events such as roads, sewers, and other utilities and services. Continued access to infrastructure should be considered; there could be a point in the future when an elevated building no longer has services or road access.

In general, this method of adaptation is easiest for frame buildings above crawlspaces, piers, or post foundations. Large masonry buildings, row houses, slab-on-grade construction, and downtown commercial buildings sharing party walls can be more challenging and expensive to elevate and, in some cases, impractical or infeasible. For example, in cases of multiple connected properties, like a block of row houses, then close coordination and agreement among property owners, as well as shared financing and liability, would be necessary.

Buildings can generally be elevated at least a nominal amount without a major impact on the property's historic character. How high will depend on the historic character and appearance of the specific property. Thoughtful design will take into account both the flood risk and the existing historic design. **Setting a universal standard or measurement for how high any given building can be elevated is not possible.**

The size, scale, height, and massing of a building will affect how much change in height may be acceptable without impacting the historic character of the property. Generally, there is less perceived impact on the character of a historic building when the proportional and massing

relationships of the foundation to the body of the building and the overall vertical or horizontal emphasis of the building are maintained. In order to maintain the overall historic character and appearance of the building, it is important to consider the following aspects of the site, setting, and design of the property:

- topography and landscaping
- the shape and size of the lot
- placement of the building on the site, such as set back
- building footprint in relation to the shape and size of the lot
- massing/form noting the existing overall width to height ratio
- building height and number of floors
- horizontal or vertical orientation
- property type
- construction type
- relative visibility of the foundation or basement
- mass of foundation in comparison to the main mass of the building

A smaller-scale building may be difficult to elevate more than a few feet without having an impact on its historic character. With some exceptions, elevating a small building to a height approaching a full story will not meet the *Standards for Rehabilitation*.

The historic setting, features, spaces, and materials of a building should be preserved if they are important in conveying the historic associations, character, and significance of the property. As the height of a building increases, meeting the Standards will be more challenging because the character and appearance of foundations, basements, porches or terraces, and staircase height and length, as well as other exterior features and materials, will substantially change. For buildings within historic districts, elevations should be coordinated to maintain the historic spatial and architectural relationships among buildings and the character of the district. Local preservation guidelines can help provide standardized design and treatment approaches for elevating buildings specific to the district.

Where there is a tradition of elevating buildings as a means of adapting them to flooding events, there may be more flexibility to increase the height of a foundation. In this historic context, a more significant degree of change may be acceptable while still maintaining the historic character of the property. These traditional adaptive approaches may be specific to certain regions and to specific building or construction types in those areas. It is also important to follow the material and foundation treatments of the regional tradition.

## Technical Limitations:

- The historic building must be structurally stable and/or repaired or temporarily reinforced in order to be raised onto a new foundation.
- There must be a structural system that can support the building on temporary cribbing while a new foundation is constructed. For example, buildings in which a structural slab also functions as the floor or subfloor do not have a platform that would support the walls when lifted.
- The building must be physically separated from neighboring buildings, although attached buildings that are essentially one structure can be elevated together.
- Constrained sites may limit how high a building can be elevated due to limited space available to construct or extend stairs to provide access.
- Foundation type (open vs. closed) may be prescribed by the local ordinance.

## Planning and Preparation

| **Recommended** | **Not Recommended** |
|---|---|
| Identifying, retaining, and preserving materials and features of the building that are important in defining its overall historic character before elevating the building. | |
| Assessing the impact of elevating a building on its historic character, including the aspects of the site, setting, and design of the property (see the bulleted list above). | |
| | Elevating a building that was specifically designed to connect to or interact with the landscape without also planning how to retain this spatial relationship, such as buildings with interior spaces that open onto a terrace or outdoor courtyard. |

| Recommended | Not Recommended |
|---|---|
| Documenting the building in photographs and/or drawings, particularly any features that may be lost or altered, prior to beginning work. | |
| Elevating later additions and porches that also contribute to the historic significance of the building along with the main structure. | Demolishing later additions and porches without regard to their historic significance. |
| Repairing any structural deficiencies, such as rotten sill plates and termite damage, before beginning work to separate the building from the existing foundation. | Lifting a building from its foundation without first conducting a thorough inspection and repairing any identified structural issues. |
| Protecting fragile features and materials subject to damage from minor movements or vibrations of the structure, like decorative plaster. | |

## Height of the Elevation

| Recommended | Not Recommended |
|---|---|
| Identifying and retaining the historic massing, scale, size, form, and proportional relationships of the major elements of the historic building and/or the historic district. | Elevating a building without considering the impact to the massing, size, scale, form, and proportional relationships of the historic building and/or the historic district. |
| Designing a new foundation that preserves the historic character of the building. | Designing a new foundation that is too tall, so that its size and scale are out of proportion to the historic building and, thus, diminish its character. |

| Recommended | Not Recommended |
|---|---|
| Using 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. For example, an existing porch can be altered to create a wider skirting board to mask part of the change in height. | Altering the building's important character-defining features to mask the change in height, such as elongating first-floor windows. |
| | Adding conjectural features from other buildings to mask a change in height, such as adding a new porch where none existed historically. |
| Applying regional or local traditions that have developed to adapt certain building types to flooding risks. | Applying regional or local traditions to property or construction types that are not connected to that location. |
| Elevating a building already on a visible historic foundation, such as a raised basement or crawlspace. | Elevating a building on grade or with no visible foundation more than a few feet without concealing or masking the change in height of the foundation using site alterations or other design techniques. |
| | Elevating a small-scale or one-story building to a height approaching a full additional story. |

## New Foundation

| Recommended | Not Recommended |
|---|---|
| Constructing a new foundation that is compatible with the historic character of the building. | Constructing a new foundation that alters the overall proportions, massing, or scale of the building without making site alterations, such as regrading or adding elevated planting beds at the foundation, to minimize the appearance of the increased height. |

| **Recommended** | **Not Recommended** |
|---|---|
| Salvaging and reusing historic materials and features, like stone, brick, decorative vents, etc., from the historic foundation to construct the new foundation, particularly where visible. | Demolishing a historic foundation without saving salvageable materials for reuse. |
| Matching the new foundation to the visual characteristics of the historic foundation. | Designing a new foundation with a different architectural expression or appearance than the historic foundation. |
| Maintaining the visual appearance of piers or posts if a historically-open foundation must be closed, such as using infill material that is recessed between piers and darker in color. | |
| | Selecting an open foundation for a building that historically had a closed crawlspace or basement without using design techniques to mask the change. |
| Using creative design techniques to minimize the perception of the change in height and appearance of the foundation of the historic building where compatible.<br><br>Creating an illusion of solidity in tall open foundations by installing louvers or traditional lattice between piers or posts.<br><br>Creating an illusion of a shorter foundation in wood-clad buildings by lowering the transition point from visible foundation materials to siding or weatherboard. | Designing new foundation treatments that mask the change in elevation to a point that alters the historic proportions of the building and changes its historic character. |
| Installing flood vents in solid foundation walls. Reusing historic foundation vents in highly visible locations where feasible. Selecting a compatible design and placement for new vents, or painting vents to blend with the foundation material. | Installing flood vents in a haphazard pattern or in locations that compete with the architectural rhythm or historic character of the building. |

| **Recommended** | **Not Recommended** |
|---|---|
| Retaining a substantial visual connection of the building to the ground when using an open foundation type.<br><br>Using piers, posts, or columns large enough in width or circumference to visually support the structure, with the number and placement of piers, posts, or columns similar to that of traditional building practices, even if the new technology structurally requires fewer supports. | Failing to retain a substantial visual connection of the building to the ground when constructing a new, higher foundation.<br><br>Selecting piers, posts, or columns that are visually undersized.<br><br>Recessing all foundation materials; failing to extend historic columns, piers, or pilasters to the ground; or selecting a color scheme that creates an effect of a floating or unsupported building. |
| Relocating all utilities above the established flood risk level or protecting them in place with a watertight or impermeable enclosure. (See Protect Utilities) | Relocating systems and utilities to a historically significant interior space or a highly visible location. |
| Concealing, insulating, and protecting utility connections and any ducts or pipes located underneath the building in an open foundation. | |

## Access

| **Recommended** | **Not Recommended** |
|---|---|
| Retaining the historic access locations and approach/orientation to the building and its front or main entrance, where feasible.<br><br>Keeping the physical features that identify the historic access points. | Abandoning historic primary entry points or significantly altering the path to a front or main entrance, when it can be avoided. |
| Matching new stairs, railings, or ramps with the style and features of the historic design; and salvaging and reusing historic features to the extent possible. | |

| **Recommended** | **Not Recommended** |
|---|---|
| Constructing railings with traditional proportions, or, if a taller rail is necessary to meet code, retaining a horizontal rail at the traditional railing height. | Noticeably altering the design and proportions of a historic railing, so that it changes the historic character of the feature. |
| Breaking up the run of stairs with a landing or changing the design or materials, where appropriate, when a long run of stairs is required because of the change in elevation.<br><br>Altering the material of the stairs to fit or blend in more with the immediate surroundings to minimize the perceived change in height. Where terraces, raised planters, or regrading is used, consider using stone, brick, or another material that fits in with the landscape for the lower section of stairs. | Installing a long run of stairs that changes the historic character of the building and its site and setting if it can be avoided. |
| Providing access via an exterior elevator, lift, or ramp located and designed to be compatible with the historic character of the property. Floodproofing or locating the operating system of the elevator or lift above the established flood risk level. | |
| Minimizing the impact of ramps by installing them on secondary elevations when it does not compromise accessibility or by screening them with plantings on more visible locations. | Installing elevators, lifts, or incompatible ramps at a primary entrance, or relocating primary entrances to secondary locations to provide access without investigating other options or locations. |

## Associated Site Alterations (see also Site and Landscape Adaptations)

| Recommended | Not Recommended |
|---|---|
| Altering the landscape by adding fill or constructing raised planters to reduce the amount of new foundation that is visible. | Altering a landscape, garden, or archeological site that has historic significance in its own right or that is integral to the significance of the site in conjunction with the building. |
| Designing new driveways, parking areas, or patios so that they are as unobtrusive as possible and are compatible with the historic character of the property and the district. Using permeable surfaces where possible. | Adding new site features in prominent locations where they negatively impact the historic character of the building site or result in the loss of historic landscape features or plant materials.<br><br>Adding new driveways and curb cuts to facilitate parking underneath an elevated house. |

## In Historic Districts

| Recommended | Not Recommended |
|---|---|
| Elevating buildings in historic districts that are similar in style and size to consistent heights if that is the character of the district while maintaining the historic spatial and architectural relationships between the buildings. | Elevating buildings in historic districts that are similar in style and size to different heights unless that is the historic character of the district. |
| Elevating buildings in districts with a tradition or history of elevating buildings. | |

## Elevate the Interior Structure

This treatment involves removing the existing first- or ground-floor level and replacing it with a new floor plate at a level above the established flood risk level while the exterior structure remains virtually unchanged. This treatment is most suitable for buildings with large-volume first-floor spaces, such as Main Street commercial buildings. For historic buildings that are more challenging to elevate, such as attached row houses, raising the lowest interior floor out of the established flood risk level may be a good alternative to elevating the entire structure. The existing first floor must have a ceiling height tall enough to accommodate the change, preferably without needing to alter ceilings or upper floors. All systems that lie below the new first-floor elevation, such as electrical and plumbing, will also need to be relocated to reduce the potential for loss and damage due to flooding. In order to limit flood damage, existing basements, crawlspaces, and newly-created spaces beneath the new floor level will need to be filled to a level even with grade (see Fill the Basement), or have automatic flood vents installed to allow water to flow through the non-inhabited area (see Wet Floodproofing).

The new floor height should generally be limited to a level below the sills of first-floor windows or storefronts. Alternatively, the new floor should be held back from exterior walls to reduce visibility of the alteration from the exterior. This treatment may require changes to ground-level access points of the building. If the change in floor height is fairly minimal, subtle exterior alterations may solve access issues, but, more commonly, the new floor height is accessed within the building by constructing an interior stair or ramp.

This treatment can have a significant impact on historic buildings with intact, character-defining first-floor spaces. Generally, the first floor contains many of the building's character-defining spaces, features, and materials. Depending on the historic integrity of the building before the adaptation begins, such changes can result in the loss of historic character.

Properties with a historically significant first-floor interior stair will require careful alterations to be able to retain the functionality and appearance of the stair. Every effort should always be made to retain it, if possible, or relocate existing decorative features and materials that would otherwise be impacted (i.e., wainscot, baseboards, etc.). Buildings with significantly altered interiors may generally be more adaptable to this type of treatment.

### Technical Limitations:

- Existing floor-to-ceiling height of the first floor must be tall enough to accommodate the change in floor level without impacting the ceiling or structure above.
- This treatment should be combined with either wet or dry flood-proofing.

## Planning and Preparation

| Recommended | Not Recommended |
|---|---|
| Identifying, retaining, and preserving materials and features of the building that are important in defining its overall historic character before elevating the interior structure of the building. | Elevating the interior structure that results in the destruction of the historic character of the building. |
| Documenting the building in photographs and/or drawings, particularly any features that may be lost or altered, prior to beginning work. | |

## Structural Considerations

| |
|---|
| **Several structural issues associated with this treatment must be evaluated. These include assessing the walls, columns, and footings and potentially anchoring the building differently, depending on the existing connections. The building structure must be able to support a filled basement, moving water beneath it, or keeping water out of the building. Refer to Fill the Basement, Wet Floodproofing or Dry Floodproofing, as applicable.** |

## Exterior Impacts

| Recommended | Not Recommended |
|---|---|
| Maintaining original entrances and fenestration patterns on the exterior of the building. Access to the new floor level from the original entrance level should generally be made on the interior of the building. | Altering the appearance of historic access points by lengthening or shortening original entries. |
| Preserving the historic character of the building when creating access to useable space underneath the new floor level. For example, adding a new exterior service entrance on the back of a building or other less visible location. | Putting in new storage or garage doors that alter the rhythm of the fenestration pattern, features, and appearance of the historic building. |
| Maintaining storefront glass and bulkhead heights at their original locations. | Altering the appearance of the storefront by obscuring the original storefront windows, or adding or extending the height of the bulkhead areas, when elevating the interior floors. |

| **Recommended** | **Not Recommended** |
|---|---|
| Retaining original windows on primary or highly visible facades. Protecting windows that extend below the established flood risk level with temporary waterproof coverings. | Removing or blocking historic windows on primary or highly visible facades with a new floor structure that abuts the windows. |
| Installing a new floor at a level below the sills of first-floor windows or storefronts, or holding back the new floor from exterior openings sufficient to minimize the visibility of the alteration. | Locating a new floor structure at a level above existing window sills or door thresholds, allowing it to be visible from the exterior or otherwise altering the building's historic character. |

## Interior Considerations

| **Recommended** | **Not Recommended** |
|---|---|
| Preserving character-defining spaces, features, and finishes when elevating the interior structure. | Elevating the interior structure, resulting in the destruction of the character-defining spaces, features, and finishes. |
| Maintaining the historic character of entrances, while floodproofing the non-elevated access spaces. | Installing incompatible features and finishes to floodproof the non-elevated access spaces. |
| Adding interior ramps or stairs that are compatible with the historic character of the entrance while maintaining historic features such as lobby spaces or commercial storefront spaces. | Placing ramps or stairs in a location that disrupts the character and appearance of historic interior spaces, and damages or removes historic interior materials and finishes. |
| Retaining historic materials and features such as original trim and reinstalling it at the new floor level. | Destroying historic features above the new elevated floor level. |
| | Destroying character-defining ceiling features and finishes if the new floor requires the ceiling to be elevated to maintain a useable floor height. |
| | Elevating the first-floor structure to a height that causes a 'domino effect' requiring changes to ceilings and floors above. |

## Abandon the First Story

This adaptation method requires modifying a multi-story building to relocate all living spaces to upper floors above the established flood risk level. The abandoned first story must be altered and adapted into a utilitarian wet or dry floodproofed space. A local floodplain ordinance may determine which floodproofing method is allowable. This option is best suited for multi-story masonry buildings. Historic buildings with unfinished interior spaces that are constructed of durable materials, for example mills or industrial buildings with load-bearing masonry walls, are also likely candidates. This treatment is not recommended for light-frame construction. Due to concerns about life-safety and potential repetitive damage, this adaptation requires the sacrifice of occupiable space within the building. After the project is complete, the abandoned first story may only be used for parking, storage, and building access.

The abandoned story can be dry or wet floodproofed (see Dry Floodproofing and Wet Floodproofing). Dry floodproofing may impact the exterior due to the treatments necessary to resist water infiltration. For dry floodproofing, the first story must have a sump pump installed to remove water that may penetrate the space. Masonry walls may still require air venting that seals in the event of a flood.

Wet floodproofing is not recommended as a treatment for buildings with a significant amount of historic integrity at the first story, as it can result in the loss of historic features and materials. In wet floodproofing, the abandoned first-story interior should have flood-damage resistant materials. Where the existing historic materials are not flood-damage resistant, they should be replaced only after they have been damaged. Flood-damage resistant substitute materials should be compatible with the historic character of the building. For wet floodproofed areas, flood vents must be added to exterior and interior walls to allow flood waters to freely flow throughout the abandoned space. In addition, all mechanical systems and utilities must be elevated or dry floodproofed in place.

Abandoning the first story will also shift the location of the conditioned space within the building envelope. Such a shift may have unintended consequences for historic materials by changing the number of freeze-thaw cycles or the location of the dew point within a wall. It is important to consult a professional who can help model or predict such changes and how they might be addressed.

This treatment will result in the loss of usable floor area in the building, and owners may therefore decide to make up for the lost floor area by adding to the building or making other alterations. New rooftop and other additions to historic buildings should follow the guidance in the *Guidelines for Rehabilitating Historic Buildings*.

## Technical Limitations:

- The building must have at least two stories.
- This method cannot be used for light-frame buildings, as all walls in the flood zone must be made resistant to water damage.
- Additional technical limitations will depend on which treatment (dry or wet floodproofing) is selected for the abandoned first story. Please refer to those treatments.

## Planning and Preparation

| **Recommended** | **Not recommended** |
|---|---|
| Evaluating the strength of walls, columns, and footings to ensure they are strong enough to withstand flooding and support the retrofit of abandoning the first story of the building. | Abandoning the first story without proper reinforcement of the lower levels to withstand flood forces. |
| Documenting the interior materials, features, finishes, and spaces on the first story prior to abandoning it. | |

## Structural Considerations

**Several structural issues associated with this treatment must be evaluated. These include assessing the walls, columns, and footings and potentially anchoring the building differently, depending on the existing connections. The building structure must be able to support a filled basement, moving water beneath it, or keeping water out of the building. Refer to Fill the Basement, Wet Floodproofing or Dry Floodproofing, as applicable.**

## Exterior and Interior Considerations

| **Recommended** | **Not Recommended** |
|---|---|
| | Selecting wet floodproofing for the abandoned story if the interior spaces still retain a high level of historic materials, features, or finishes. |

| **Recommended** | **Not Recommended** |
|---|---|
| Retaining historic materials, features, and finishes that are flood-damage resistant.<br><br>Removing non-historic finishes and furnishings that absorb and trap moisture, such as carpets. | Removing intact, undamaged, or repairable historic materials, features, and finishes in anticipation of a possible flood. |
| Maintaining and using existing access points (entrances, stairs, and elevator shafts) to gain access to upper floors. | Relocating interior access points (stairs and elevator shafts) so that the original circulation patterns and historic relationships between interior features and spaces are altered. |
| Adding interior stairs, elevators, or lifts within the first-story space away from windows or storefronts at the original first floor. | Inserting new interior stairs, elevators, or lifts that cut across the glazed areas of windows so that they are highly visible from the exterior. |
| Designing secondary egress from the new first story so that it is compatible with the historic character of the building and does not destroy historic materials. | Installing a means of secondary egress from the new first story without considering its impact on the historic character and appearance of the building. |
| Creating compatible new openings or altering existing openings, if necessary for new parking or storage areas in the abandoned story, on secondary elevations. | Creating new openings or altering existing openings for parking or storage uses on the primary facade(s). |

## Move the Historic Building

Moving a historic building requires separating the building from its foundation and relocating it to a new site and foundation. Relocating a historic building is generally not a recommended preservation practice. In certain communities however, there is a tradition of moving buildings. In some instances, whole neighborhoods were relocated together. Moving a historic building is usually considered only when the property is expected to flood repeatedly, succumb to river or shoreline erosion, or is subject to permanent inundation due to sea level rise or subsidence. Moving a structure is more challenging, both technically and financially, when it is masonry construction, and it is not feasible for buildings with shared walls, like row houses, unless they are moved together.

The building must be strong enough to withstand the travel required in the relocation. Historic buildings that are in poor condition, or have structural deficiency or damage, may require additional reinforcement prior to a move. It is always preferable that a historic building be moved in one piece. In some cases, porches or small additions may need to be removed, relocated separately, and reassembled and reattached to the building after relocation. The various construction periods, additions, and ancillary structures of a property, if important to its historic character, should be considered in determining what needs to be moved to the new location. Prior to the move, photographs of the building from all elevations should be taken, and interior finishes should be temporarily protected during the move (see *Tech Note 2: Temporary Protection*). Drawings may be required if any sections of the building will need to be reassembled. (See HCRS Publication No. 9 *Moving Historic Buildings*).

The primary goal in selecting a new site should be a location that eliminates or reduces the flood risk. The new site should provide as similar a setting as possible to the original. In siting the historic building, consideration should be given to such factors as the original directional orientation of the building and if it had a strong visual relationship to a landscape or other feature, such as a road. The new foundation should match the original in height, design, and materials.

Moving a building to a new site requires a significant amount of preparation. Depending on the distance and the route to the new location, coordination with local highway departments, police departments, local permitting agencies, and utility companies may be required. If the building passes through more than one locality, each government entity may charge for permits, police assistance, etc.

State and Tribal Historic Preservation Offices (SHPO/THPO) play a vital role in determining whether the building's historic designation can be retained in a new location, as per Federal regulations (36 CFR Part 60). Some properties may be delisted from the National Register of Historic Places if moved without prior review. Building owners should work with the SHPO or

THPO prior to moving. Relocations that include federal buildings, assistance, or permitting will involve the SHPO or THPO as part of the Section 106 review process prior to the move (see 36 CFR Part 60 and 36 CFR Part 800).

## Technical Considerations:

- The building must be structurally stable to move safely, or it can be successfully disassembled and reassembled on the new site.
- Masonry buildings can be more difficult to move.
- The new site must be located outside of the established flood risk area but similar in character to the original setting.
- Routes between the historic location and the new proposed site must be suitable for transporting a building.

## Planning and Preparation

| **Recommended** | **Not Recommended** |
|---|---|
| Finding 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. | Relocating a building to a site that is noticeably different from the original setting of the building if it can be avoided.<br><br>Selecting a site that does not reduce the flood risk. |
| Documenting 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. | Moving a historic building without documenting the existing conditions at the original site. |
| Hiring 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. Special permits may be required from state or local governments and utility companies. | Moving a historic building without first obtaining cargo insurance. |

| Recommended | Not Recommended |
|---|---|
| Moving a historic building in one piece, without disassembling portions or sections of it, whenever possible.<br><br>Ensuring 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. Providing a secure location for storage of all disassembled components. | Moving a historic building in multiple pieces or sections if it can be avoided.<br><br>Disassembling a building without marking individual units or sections, or separating a section from the building without consideration of how it is constructed, such as cutting a gable in half but not along a stud. |
| Conducting archeological investigations at the new site to ensure there are no negative impacts in relocating the building. Protecting and /or preserving any known sites at the original location before the move. | Losing or unintentionally damaging archeological data that may exist on the site during the move. |

## Moving Considerations

| Recommended | Not Recommended |
|---|---|
| Providing protection by bracing or covering fragile features and materials such as chimneys, stucco, interior plasterwork, windows, and decorative trim prior to the move. | |
| Retaining later features and additions to a building that contribute to the historic character when moving a structure.<br><br>Moving outbuildings important to the historic character of the property to the new site. | Removing later additions for the move that may have acquired significance.<br><br>Moving only the main building when there are outbuildings and other features that are important in defining the historic significance of the property and should also be relocated. |
| Ensuring the moved building will have no negative effects on neighboring properties in the new location and will not diminish their integrity of setting. | |

## Relocation

| **Recommended** | **Not Recommended** |
|---|---|
| Constructing a foundation that is structurally adequate to support the historic building, and obtaining the necessary permits prior to relocating the building. | Constructing a new foundation that is structurally inadequate to provide the necessary resilience recommended by building codes and flood guidance for future natural risks.<br><br>Altering the building to provide additional living or storage space under the building without masking the additional foundation height. |
| Reestablishing the original placement of the historic building in the new location as closely as possible.<br><br>Observing and reestablishing the orientation, setting, and general environment of the original historic site. | Placing the historic building in the new location without consideration of the orientation, setting, or environment of the original historic site, thus diminishing its historic character. |
| Making appropriate repairs to sill plates and floor joists while the building is on temporary cribbing and these features are accessible. | |
| Allowing adequate time for the historic building to settle on the new foundation before repairing finishes or chimney features. | |
| Placing historic outbuildings at the new site in the proper location and distance from the main building based on documentation. | Placing outbuildings and other important features on the new site without regard to their original use, locational relationship, or distance from the main historic building. |

## Unconventional Treatments

There are a number of potential treatments in the developmental or experimental phase for adapting historic properties for flood risk. Many are in the prototype phase and are being tested for their performance. Some of these adaptations include:

- Hydraulic lift and anchoring systems to allow a building to remain in place and be lifted before and during a flooding event.
- Buoyant foundations with guideposts, also known as "amphibious architecture," to allow a building to float. Buildings are retrofitted with buoyancy blocks, vertical guideposts, and a structural sub-frame.
- Mechanized sea walls that can be constructed as large-scale protection.
- Bringing water back into a community rather than keeping it out, sometime referred to as "living with water." This may include widening previously controlled river channels, reestablishing canals, and designing other large-scale water retention areas.

As these technologies become more widely used, the impacts to historic properties will need to be evaluated.

## Demolition

In this section demolition refers to the complete removal of a historic building and any related structures in order to clear a historic site within an established flood risk level of any occupied structures. It is important to understand that demolition is not a treatment that meets the *Standards for Rehabilitation.*

This action may be incentivized where buyout zones have been identified as part of the community hazard mitigation plan. In these and possibly other situations, a government agency may purchase a property and demolish the structure after the sale to eliminate continued property risk and loss from the floodplain area and allow for open space. In other cases, private property owners may choose to demolish an existing historic building in order to eliminate their flood risk, allowing them to rebuild in a more flood-resilient method or relocate.

The Standards were created to support the preservation of historic buildings. Demolition is never a recommended treatment. However, in making land-use and planning decisions for a community or neighborhood, there may be situations when it is necessary to identify sacrificial historic sites or structures. Demolition could be chosen to remove buildings most at risk, in order to provide space needed to undertake adaptive measures to protect other, more important historic buildings, or to allow for new structures designed to withstand water damage in future flood events. Such a decision should be made only after extensive research of the historic property or district has been completed, in order to fully understand the significance of the building(s) that would be lost.

### Preservations Considerations

- Evaluating and considering all feasible alternatives before deciding to demolish any historic structure, such as adapting the property to flood risks, donating or selling the building, or moving it out of the established flood risk area.
- Documenting the building in photographs and/or drawings or 3-D scans prior to demolition.
- Ensuring that archeological resources are identified and protected prior to allowing heavy equipment into the area.
- Protecting neighboring properties from damage during demolition.
- Salvaging historic materials prior to demolition for reuse.

*An illustrated version of these Guidelines is expected to be issued in Fall 2020.*