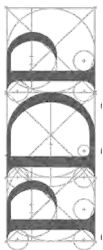


ELEVATION DESIGN GUIDELINES FOR HISTORIC PROPERTIES

NEW JERSEY HISTORIC PRESERVATION OFFICE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 2019





All components of the *Elevation Design Guidelines or Historic Properties* including all text, graphic design, photography and illustrations unless noted otherwise were prepared by Dominique M. Hawkins, FAIA, LEED AP with drafting assistance by Elsa De Leon.

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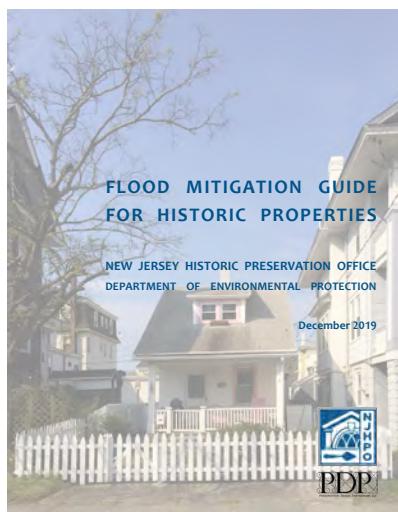


We would like to express our appreciation to the New Jersey Historic Preservation Office and Department of Environmental Protection for their support in the completion of this project.

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These *Elevation Design Guidelines for Historic Properties* were prepared for the New Jersey Historic Preservation Office, Department of Environmental Protection as a companion to the *Flood Mitigation Guide for Historic Properties*. Reference to both documents is recommended.



Superstorm Sandy proved devastating for many New Jersey communities. Sandy significantly damaged many historic buildings, some beyond repair. In the aftermath of the storm, municipalities were faced with the challenge of rebuilding in a manner that provided protection of its citizens and the character of their communities. (Photograph courtesy of NJ HPO/FEMA.)

1 Flooding & Historic Buildings

BUILDING ELEVATION

Elevated Building — A non-basement building

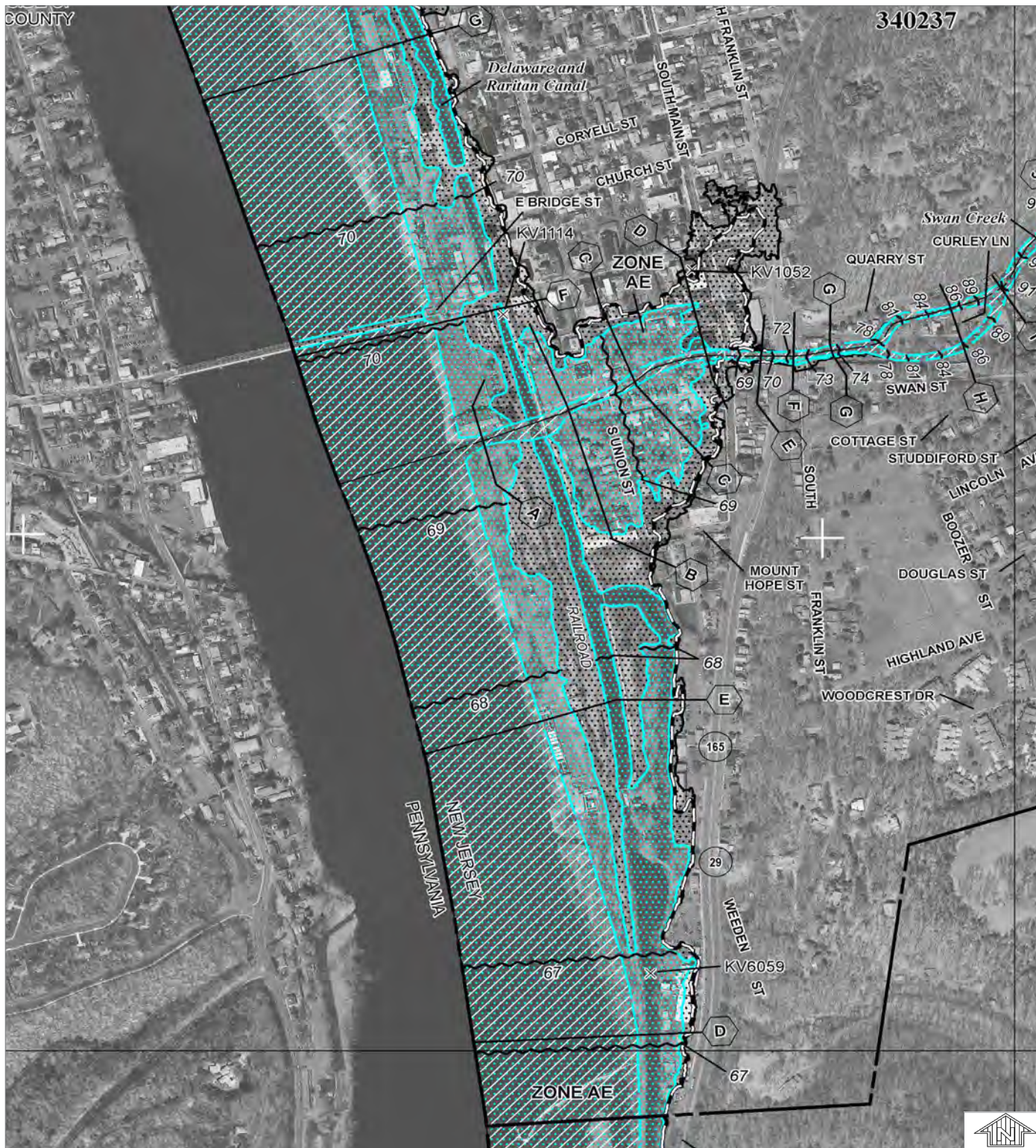
- (i) built, in the case of a building in an Area of Special Flood Hazard, to have the top of the elevated floor or, in the case of a building in a Coastal High-Hazard Area or Coastal A Zone, to have the bottom of the lowest horizontal structural member of the elevated floor, elevated above the base flood elevation plus freeboard by means of piling, columns (posts and piers), or shear walls parallel to the flow of the water, and
- (ii) adequately anchored so as not to impair the structural integrity of the building during a flood up to the magnitude of the base flood.

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

New Jersey’s history of settlement along waterways forms the basis for the state’s development patterns. Some of the New Jersey’s earliest communities are located along or near waterfronts, both coastal and inland. Historic buildings and structures are increasingly vulnerable to the effects of environmental change including flooding from high tides and severe storms. As individual property owners are struggling with how to best protect their homes, local Historic Preservation Commissions (HPCs) are challenged with balancing the level of desired protection with the maintenance of their community’s historic character.

Building elevation is a common option considered by residential property owners to improve flood resilience. Elevation is the process of raising the habitable portion of a building above the anticipated flood level to minimize future loss. Some of the benefits of properly completed building elevations are that they can significantly decrease future flood damage and flood insurance premiums. However, elevation can be both costly and significantly impact the historic character of individual properties and surrounding neighborhoods.

The purpose of these *Elevation Design Guidelines for Historic Properties* is to assist residential property owners and HPCs in the establishment of parameters for building elevation specific in their municipalities that is sensitive to the local historic character. These parameters consider localized flood risk; floodplain management requirements; parcel site limitations; as well as building typology, style, and materials.



The pale blue dots on this Flood Insurance Rate Map of Lambertville, New Jersey indicate the Special Flood Hazard Areas (SFHAs). The SFHA (also known as the 1% annual chance flood, 100-year flood and base flood zone), has historically been subject to a 1% chance of flooding during any given year. In this case, the SFHA is defined as Zone AE, in which the base flood elevations are determined. The portions with the black dots represents areas of historically 0.2% annual chance flood (also known as the 500-year flood zone). Areas without dots have been determined to be outside of the historically 0.2% annual chance floodplain. It is important to highlight that these categories do not include future conditions due to climate change or other factors. (Map obtained through FEMA's Map Service Center at <https://mcs.fema.gov/portal/home>.)

SPECIAL FLOOD HAZARD AREAS

The Special Flood Hazard Area (SFHA) is area of the floodplain that has a 1% chance or 1-in-100 chance of flooding in any given year based upon historical data and known as the 100-year-floodplain. The SFHA includes two different flood zones on the FIRMs: A Zones and V Zones. The difference between the two zones is that V Zones are subject to storm-induced velocity wave action (for example, a beach house that could be inundated in a storm), while A Zones are not. Therefore, buildings and their foundations in V Zones must meet more stringent standards because of the forces they must withstand. (Refer to *Building Foundations*, page 31.)

Area of Special Flood Hazard — Land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year. It is shown on the FIRM as Zone V, VE, V1-30, A, AO, A1 A30, AE, A99, or AH.

AH Zone — Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone.

AO Zone — Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet.

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

Coastal High Hazard Area (V Zone) — An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources.



The flood vulnerability for this small cottage is much higher than its elevated neighbors. (Photograph courtesy of NJ HPO/FEMA.)

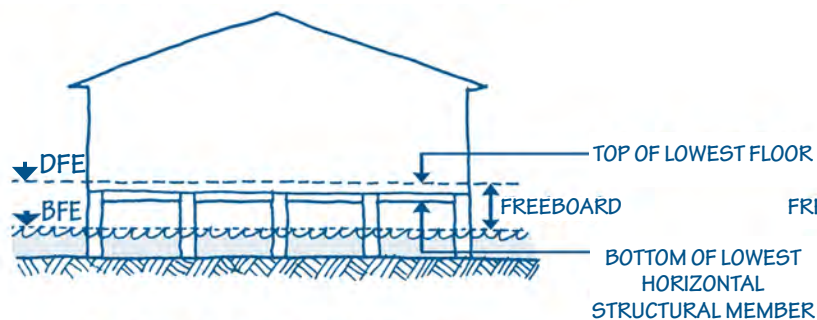
IDENTIFYING FLOOD RISK

Flooding can occur from a variety of natural sources including storms, precipitation, the ocean, bays, harbors, rivers, streams, and creeks. Flooding can also occur as a result of failures of man-made infrastructure such as water and storm water systems, and dams. Although flood threat from infrastructure failure is often sudden and unpredictable, low-lying, flood prone areas located adjacent to or near waterways, also known as floodplains, are mapped by the Federal Emergency Management Agency (FEMA). Information regarding a property's flood vulnerability can be found on FEMA's Flood Insurance Rate Maps (FIRMs) as well as Digital Flood Insurance Rate Maps (DFIRMs) available online through FEMA's Flood Map Service Center, which can be searched by street address. (<https://mcs.fema.gov/portal/home>.) FIRMs serve as the basis for floodplain regulation and management, as well as a tool for determining flood insurance premiums. **However, both FIRMs and DFIRMs are based upon historical or current flood data and do not address future threats such as subsidence or sea level rise.**

The FIRMs and DFIRMs identify the extent of the 1% floodplain of the ground, also known as the 100-year floodplain, or Special Flood Hazard Area (SFHA), representing the properties at the greatest risk of flooding. Buildings outside of the SFHA with levels below grade, such as basements, may be equally vulnerable to flooding. In addition, properties outside of designated floodplains often experience flooding during major storm events, such as hurricanes, tropical storms, and Nor'easters.

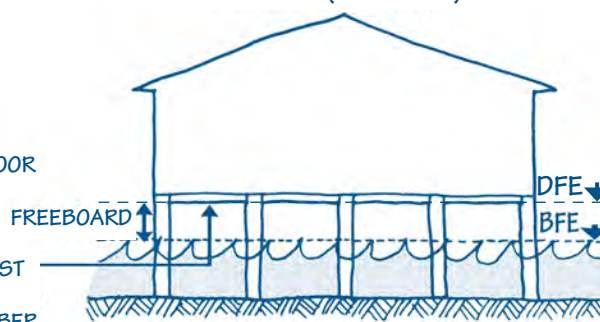
The best way to obtain an accurate flood risk assessment for a specific property is to acquire an Elevation Certificate from a licensed surveyor, architect, or engineer. The Elevation Certificate will identify the height of the lowest floor relative to the Base Flood Elevation (BFE) or SFHA. The height of the lowest occupied floor, which may be the basement, can be used to calculate flood insurance rates and determine the height to which the building must be protected to comply with the local municipality's floodplain management regulations. A potential benefit of an Elevation Certificate is that flood insurance may be reduced for properties located within a floodplain whose lowest occupied floor is above the BFE.

A ZONES IN COASTAL AREAS:
SUBJECT TO BREAKING WAVES AND EROSION DURING THE
BASE FLOOD LOWEST HORIZONTAL MEMBER ABOVE BFE



A ZONE BUILDING (OPEN FOUNDATION)

V ZONES:
BOTTOM OF LOWEST HORIZONTAL MEMBER
ABOVE BFE (FREEBOARD)



V ZONE BUILDING (OPEN FOUNDATION)

NFIP minimum elevation requirements: A Zones – elevate top of lowest floor to or above BFE; V Zones – elevate bottom of lowest horizontal structural member to or above BFE. In both V Zones and A Zones, many people have decided to elevate a full story to provide below-building parking, far exceeding the elevation requirement. See FEMA Technical Fact Sheet No. 1.2, Summary of Coastal Construction Requirements and Recommendations, for more information about NFIP minimum requirements in A Zones and V Zones. (Refer to https://www.fema.gov/media-library-data/20130726-1537-20490-0596/fema499_1_2.pdf. Base diagram obtained at FEMA.gov.)

FLOODPLAIN MANAGEMENT REQUIREMENTS

Municipalities that want to participate in the National Flood Insurance Program (NFIP) must comply with minimum floodplain management requirements established by the federal government. Participation allows the residents to apply for flood insurance and the community to receive assistance in the event of a disaster.

Many New Jersey municipalities choose to protect their residents and property owners from flooding with an even higher standard of requirements and participate in the Community Rating System (CRS) program. The CRS is a voluntary program that recognizes and encourages community floodplain management activities that exceed NFIP requirements. A goal of the CRS is to reduce a property's vulnerability to flooding. One of the ways that municipalities achieve the goal is to require that buildings be elevated above the BFE, lessening the potential impact.

Numerous New Jersey municipalities have established a Design Flood Elevation (DFE) that is generally one to three feet above the Base Flood Elevation (BFE). The additional height requirement is referred to as freeboard. Higher standards have allowed many New Jersey municipalities to achieve a CRS rating of 5, providing property owners with up to a 25% reduction in their flood insurance premiums. By implementing additional programs, policies, and requirements, Sea Isle City has achieved a rating of 3, allowing its residents to benefit from up to a 35% reduction in their flood insurance premiums.

To be compliant with floodplain regulations, the lowest floor of residences must be at or above the municipality's BFE/DFE (as applicable) or wet-floodproofed. Dry floodproofing is not a compliant option for residences seeking to participate in the NFIP nor typically under municipal floodplain regulations. (Refer to Appendix A: Glossary, page 59, for wet floodproofing and dry floodproofing definitions.)

LOCATION DEFINITIONS

Base Flood Elevation (BFE): Elevation of flooding, including wave height, having a 1 percent chance of being equaled or exceeded in any given year (also known as "base flood" and "100-year flood"). The BFE is the basis of insurance and floodplain management requirements and is shown on FIRMs.

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

Freeboard: An additional amount of height above the Base Flood Elevation (BFE) used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations.

Lowest Floor: This is defined as the vertical location of the top of the lowest floor of the structure (in "A" type Zone) or the bottom of the lowest horizontal structural member (in "V" type Zones and recommended for Coastal A Zones) in relation to the Base Flood Elevation (BFE) and of building servicing systems in relation to the BFE.

PRE-FIRM STRUCTURES

Buildings constructed or substantially improved prior to the community's initial FIRM are called "pre-FIRM structures" and were likely not built to avoid or reduce flood damage. Buildings constructed or substantially improved after the community's initial FIRM should have been constructed in compliance with the local floodplain ordinance. Most historic buildings are pre-FIRM structures. ***Municipalities may mandate compliance with local floodplain management requirements for all buildings, including pre-FIRM structures.***

FLOOD DAMAGE PREVENTION ORDINANCES

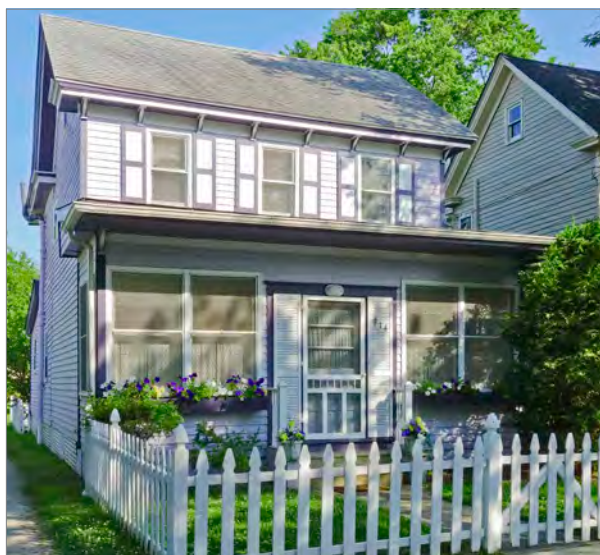
New Jersey's Bureau of Flood Engineering has prepared samples of Flood Damage Prevention Ordinances (FDPO) to provide communities with guidance in developing an ordinance that meets the FEMA Map Modernization Program minimum requirements. These sample ordinances are tailored by individual municipalities to meet their needs. (<https://www.nj.gov/dep/floodcontrol/modelord.htm>.)

FLOODSMART

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

NJFLOODMAPPER

Rutgers University's New Jersey Flood Mapper is an interactive, user-friendly, GIS-based mapping program that combines sea level rise with tides and storm surge data to create a "Total Water Level" provides information to local communities to inform planning and decision making. (<http://njfloodmapper.org/>.)



Buildings constructed prior to the issuance of Flood Insurance Rate Maps are referred to as pre-FIRM and are often vulnerable to flood damage if located within the Special Flood Hazard Area (SFHA).

FLOODPLAIN REQUIREMENTS FOR HISTORIC BUILDINGS

The NFIP allows municipalities to waive compliance with floodplain management regulations at historically designated structures. However, this does not lessen their flood vulnerability nor reduce flood insurance premiums. Some municipalities, particularly those participating in the CRS, mandate compliance with local floodplain regulations for all buildings, including those designated as historic. The level of required compliance varies by municipality, and consultation with the municipal floodplain administrator is recommended early when contemplating a flood mitigation project.

There are many types of work within a designated floodplain applicable to all properties that may be subject to floodplain management regulations including those designated as historic by the municipalities. Examples include:

- Modifying or adding to any building system or equipment, including electrical, plumbing, heating, air conditioning, and generators;
- Installing finishes, doors, and windows;
- Limiting the use of basements and first floors of buildings within the floodplain to parking, building access, and parking;
- Undertaking substantial repairs or improvements to existing structures;
- Constructing additions to existing structures; and
- Erecting new buildings.

Municipal floodplain requirements can be codified as an individual article in the municipal code or under another article in code, such as planning and zoning. Consultation with the municipal floodplain administrator can identify municipal-specific requirements including any variances for historic and/or existing buildings. This includes determining appropriate elevation heights to provide flood hazard protection and maintain historic character, thus allowing HPCs to be responsive to the level of vulnerability in their review process.



The Town of Beach Haven's HPC established protocols after Superstorm Sandy that addressed local floodplain management concerns while preserving the historic character of their community. This included establishing maximum building elevation heights relative to the local BFE.

MUNICIPAL BUILDING & ZONING REQUIREMENTS

With the increased recognition of flood vulnerability, some municipalities are modifying local building and zoning requirements to improve flood resilience and storm water management. These regulations are typically triggered in the municipal permitting process, but can be imposed on all properties, irrespective of whether work is proposed.

In considering modifications for flood resiliency, some alterations can run afoul of local building and zoning codes and historic preservation goals. Areas of potential concern include:

- Maximum building heights;
- Off-street parking requirements;
- Plumbing and electrical regulations;
- Installation of solar panels; and
- Installation of generators.

To the extent feasible, conflicts should be addressed in an inclusive manner that provides the best community outcome, balancing safety, preservation, and quality of life issues.

NJ REHABILITATION SUBCODE

The New Jersey Rehabilitation subcode can provide relief from building code requirements for historic structures. ***However, code relief will not lower flood vulnerability nor impact flood insurance premiums.***

NJ DIVISION OF CODES AND STANDARDS BULLETIN 13-1A

The New Jersey Department of Community Affairs, Division of Codes and Standards issued Bulletin 13-1A in May 2013 to address elevating existing homes. The Bulletin offers guidance on some of the technical issues associated with elevating existing houses in flood hazard areas with no increase in the habitable space.



These houses are regularly spaced with consistent setbacks, mature trees, and shrubs. With the lack of sidewalks, the homes are accessed from the driveways. Evergreen foundation plantings provide screening and a similar treatment would be beneficial if the homes were elevated.

2 Balancing Preservation & Elevation

RESILIENCE TO NATURAL HAZARDS

The subject of Resilience to Natural Hazards was addressed as part of the 2017 edition of *The Secretary of the Interior's Guidelines for Rehabilitation*.

Resilience to natural hazards should be addressed as part of the treatment Rehabilitation. A historic building may have existing characteristics or features that help address or minimize the impacts of natural hazards. These should be used to best advantage and 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.

Most HPCs utilize *The Secretary of the Interior's Standards*, and more specifically, *The Standards for Rehabilitation* in their review processes. The National Park Service identifies the *Standards for Rehabilitation* as an appropriate treatment for flood adaptation. ([Refer to Planning and Assessment for Flood Risk Reduction matrix, page 9.](#))

The individual *Standards for Rehabilitation* emphasize the need to minimize changes to a property. However, the 2017 *Rehabilitation Guidelines* provide a framework in which to address Resilience to Natural Hazards, including flooding. ([Refer to Resilience to Natural Hazards sidebar, at left.](#)) The November 2019 *Guidelines for Flood Adaptation for Rehabilitating Historic Buildings* outline flood mitigation strategies for historic buildings. ([Refer to page 9.](#)) Similar to the *Standards for Rehabilitation*, it is up to HPCs to interpret the *Guidelines*. This includes balancing the appropriate level of alteration at regulated buildings to allow for the maintenance of the historic character and the safe, continued use of buildings relative to parcel-specific flood risk. To best achieve this goal, HPCs should establish parameters for individual property owners to make changes necessary for their continued habitation. ([Refer to Establish Neighborhood Parameters for Elevation, page 17.](#))

In instances where there is substantial change at a property, compliance with existing local floodplain management regulations, including those located within a historic district, may be required. Substantial improvements and additions to existing buildings, in addition to new construction, imposes an addition challenge for HPCs. These often include elevation of residences to or above the BFE/DFE.

HISTORIC PRESERVATION REVIEW

Historic preservation review for flood mitigations is typically only applicable to those properties that would otherwise be subject to review.

HISTORIC PRESERVATION COMMISSION

HPCs have the responsibility of reviewing exterior alterations to locally designated historic properties including alterations associated with flood mitigation. To conduct informed flood mitigation reviews, it benefits HPC members to have a good understanding of:

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

Property owners seeking to be more resilient to flooding will be influenced by any or all of these issues. (*Refer to Elevation Factors, page 34.*) Informed HPC members will be better able to balance a property owner's proposal with genuine requirements and the preservation of their community's historic character.

In reviewing flood mitigations projects, and more specifically in utilizing these *Elevation Design Guidelines for Historic Properties* to inform their decision-making process, HPCs should ensure that flood mitigation policies compliment rather than conflict with their current policies and review criteria. This may require updating of existing historic preservation design guidelines and public information.

NJ HISTORIC PRESERVATION OFFICE

The New Jersey Historic Preservation Office (NJ HPO) reviews proposed flood mitigation and repair measures for historic properties to ensure, to the degree possible, that the proposed alterations do not affect the property's historic character, integrity, and eligibility for funding. NJ HPO reviews properties that are:

- Receiving federal tax credits;
- Receiving state or federal funding;
- Receiving state or federal permits;
- Seeking financial incentives such as funding from the New Jersey Historic Trust; or
- Protected by easements held by the NJ HPO or New Jersey Historic Trust.

Immediately following a flood, NJ HPO encourages stabilization repairs, including the installation of temporary shoring and roof tarps. Quick action has the potential to reduce additional damage and secondary damage such as mold. Prior to undertaking any further work, NJ HPO should be contacted to review properties under their jurisdiction. NJ HPO review is not a substitute for local HPC review. If there are differences of opinion between HPC and NJ HPO review, the more stringent option will typically apply.

ELEVATION PATTERN BOOK & DESIGN GUIDELINES

Following Superstorm Sandy, the Beach Haven Historic Preservation Advisory Commission (HPAC) initially developed a pattern book depicting local modifications to utilize during their review of elevation applications to facilitate discussions with applicants. The pattern book included photographs of various options for stairs including materials, configurations, and railings, as well as foundation screening, providing a quick and easy means of guiding the preservation review process.

Design Guidelines



Beach Haven, New Jersey

Beach Haven Historic Preservation Advisory Commission
300 Engliside Avenue
Beach Haven, New Jersey 08008

NJ Historic Preservation Office Project #18-1872-2

With financial assistance from the NJ HPO, Beach Haven commissioned design guidelines. The April 2019 Design Guidelines incorporate the HPAC's rehabilitation approach to the design challenges associated with building elevations, providing clear guidance for its residents.

THE SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION (2017)

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 historical, cultural, or architectural values.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
3. Each property shall 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 architectural elements from other buildings, shall not be undertaken.
4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall 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 ON FLOOD ADAPTATION FOR REHABILITATING HISTORIC BUILDINGS

PLANNING AND ASSESSMENT FOR FLOOD RISK REDUCTION (NPS, 2019)

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. Reevaluating and reassessing potential impacts on a regular basis.	



GUIDELINES ON FLOOD ADAPTATION FOR REHABILITATING HISTORIC BUILDINGS

PLANNING AND ASSESSMENT FOR FLOOD RISK REDUCTION (NPS, 2019)

RECOMMENDED	NOT RECOMMENDED
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.
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. 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.
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.



Poorly maintained buildings are more susceptible to damage from flooding and may require stabilization prior to elevation.

3 Basic Improvements for Flood Resilience



A key component of maintenance to reduce potential flood damage is to ensure that stormwater collected by gutters and downspouts flows away from a building rather than pooling adjacent to the foundation or support systems.

Whether or not a building elevation is anticipated, there are several relatively low-cost basic improvements that can be undertaken by property owners to improve flood resilience and recovery.

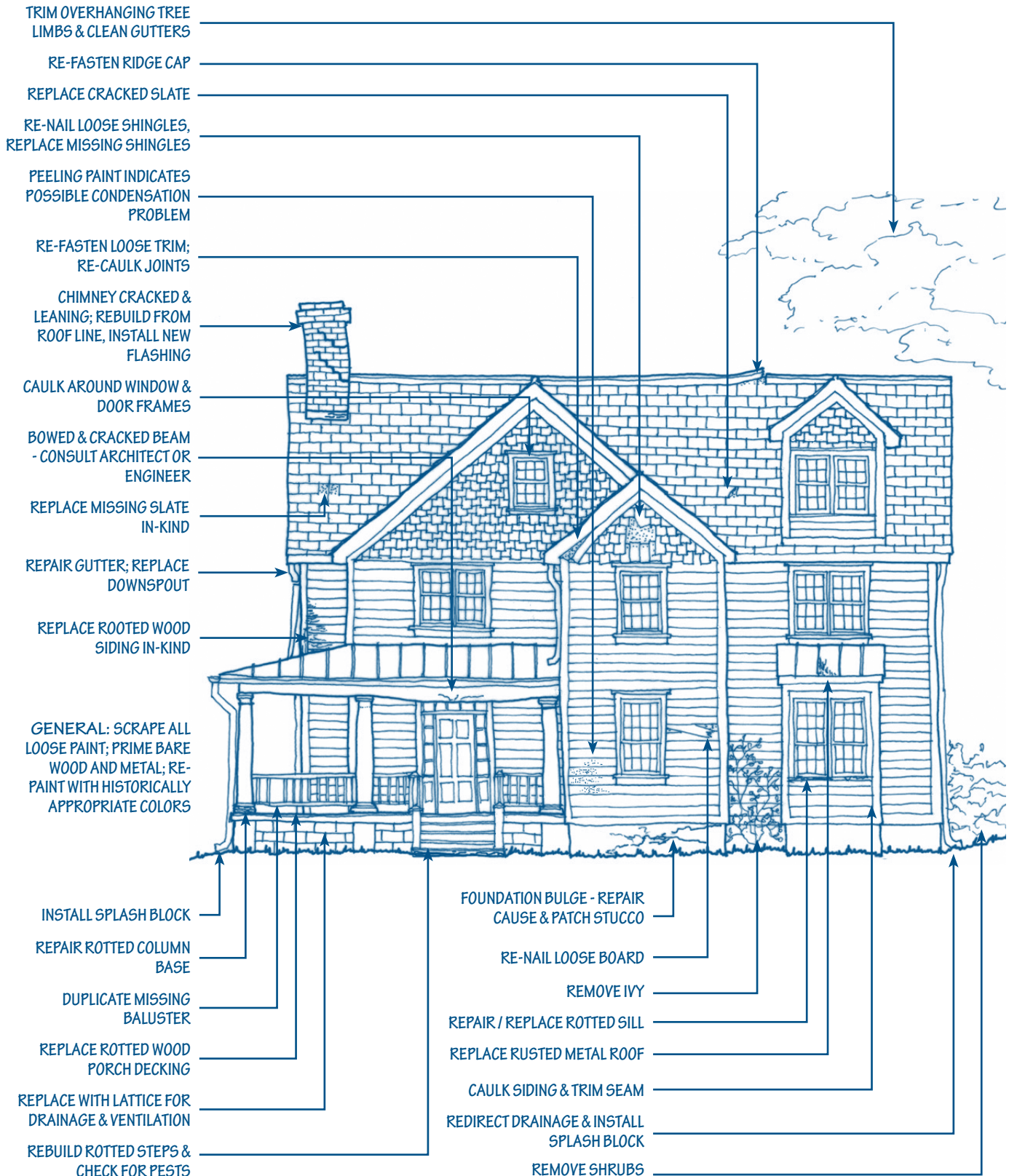
Basic improvements can include:

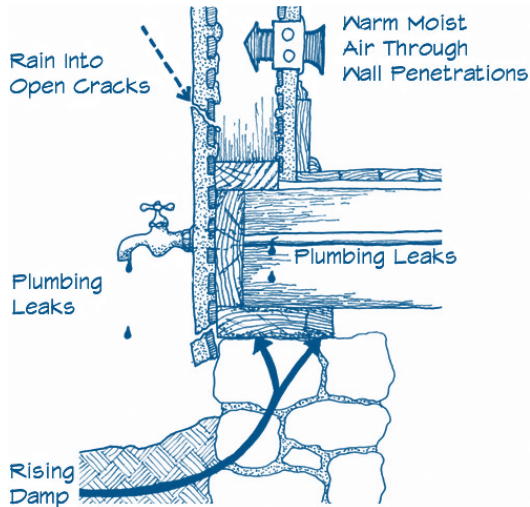
- A. Maintenance of historic resources and properties;
- B. Relocation of critical systems and equipment above the Design Flood Elevation (DFE);
- C. Installation of secondary power sources such as solar collectors and generators to allow electrical independence in the aftermath of a flood event; and
- D. Use of flood damage-resistant materials in flood-prone locations.

These basic improvements are relatively easy to complete and do not require significant modification of historic residences, thereby limiting the impact on historic integrity. The completion of basic improvements can also be integrated into building elevations, improving their resiliency and ultimate success.

Local review requirements of basic improvements, whether by a building inspector or an HPC, will vary. However, most HPCs do not review maintenance projects and alterations that are not visible from a public way.

TYPICAL BUILDING MAINTENANCE NEEDS





Building maintenance should include special attention in managing water sources to reduce wood rot and loss of mortar at brick and stone.



Sealing opening around penetrations such as hose bibs is recommended.



The soil at the base of the porch has eroded and storm water drains towards the building foundation. Regrading to provide storm water drainage away from the building is recommended.

A. MAINTENANCE

Flooding is often accompanied by secondary factors such as high winds and followed by fire. There are simple maintenance measures that can reduce the vulnerability of historic properties to primary and secondary hazards that should be completed at all vulnerable properties, including:

- Grading land to promote positive drainage away from historic buildings (municipal approval should be sought for potential impact on neighboring properties, sidewalks, or roadways as required);
- Trimming overhanging tree limbs that might crash through a roof or take down electric and telephone lines in a wind storm;
- Clearing site debris that might become waterborne or airborne (if high winds accompany the flood), clog storm drains, provide fuel for a fire, and harbor pests or cause damage to the historic building or surrounding buildings;
- Ensuring oil and propane tanks, including barbeque grills, and associated connections are well maintained and anchored to prevent flotation;
- Removing clutter and unnecessary storage in a building, particularly if items are hazardous, highly flammable, or located in a flood-prone area, such as basements;
- Maintaining roofing, flashing, gutters, and downspouts to direct stormwater away from buildings;
- Reinforcing roof framing to support wind and snow loads;
- Repointing masonry, including chimneys, walls, foundations, and piers, to prevent collapse and stormwater infiltration;
- Replacing or securing missing or dislodged siding to prevent stormwater infiltration and potential wind-borne debris;
- Replacing cracked window glass that can shatter in a wind storm and allow water infiltration;
- Sealing openings between building components or around penetrations such as hose bibs;
- Maintaining shutters in an operational condition to protect windows from airborne debris in a wind storm;
- Replacing cracked pipes to prevent plumbing leaks or sewer failure; and
- Replacing batteries in smoke and carbon monoxide detectors to provide notification of a fire or gas leak.

A poorly maintained building, particularly one that is structurally compromised, is a poor candidate for elevation because the act of elevation can further destabilize its structure.

B. RELOCATION OF CRITICAL SYSTEMS & EQUIPMENT

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

The types of systems and equipment that could be impacted include:

- Heating;
- Hot water;
- Air conditioning;
- Electrical / Security / Communications; and
- Appliances.

Relocation will often require raising the systems and equipment to higher levels, at a minimum to the BFE/DFE. This includes not only major equipment but raising secondary elements such as electrical outlets, junction boxes, switches, disconnects, panels, and meters. Depending on their location, it may also be appropriate to install backflow prevention valves at plumbing fixtures and floor drains to prevent sewage from backing up into buildings.

All relocated equipment should be installed in a manner that meets both manufacturers' and municipal code requirements including clearances, access, and ventilation. At the interior of a building, the relocation of equipment to upper floors can result in the loss of habitable space, although not typically subject to HPC review. This can include boilers, water heaters, electrical panels, washers, and dryers.

Relocation of exterior equipment may require mounting on roofs, freestanding platforms, or walls. HPC's jurisdiction typically includes evaluating the potential visual impact of all building systems and building interiors are equipment from the public way. Every effort should be made to minimize the visibility of all equipment by selecting a visually inconspicuous location and screening materials such as shrubs and fencing. (*Refer to Foundation Screening, page 33.*)



The air conditioner unit is inconspicuously located on a raised platform at the side yard to minimize its visibility from the street.



Interior drywall was removed and electrical outlets and plumbing connections were raised following a flood.



Building systems and equipment are often located in basements where they are highly susceptible to flood damage, necessitating costly replacement.

PROTECTING BUILDING SYSTEMS

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



Propane tanks can provide an alternative fuel source however, they should be secured to prevent floatation in a flood event.



The back-up generator is located up on the hill and concealed by foliage.



Secondary power sources, such as solar panels, can facilitate recovery from a flood, although their installation may be limited by HPCs, particularly on principal façades. However, locations for their efficacy may limit available options in some circumstances. The visual impact of solar panels can be mitigated with placement on secondary elevations; installation parallel to the roof surface; selecting a frame-less panel that matches the roof color; and maintaining a consistent minimum offset of 6-inches from eaves, rakes, and ridges.

C. INSTALLATION OF SECONDARY POWER SOURCES

Loss of power often occurs as the result of flooding, particularly when accompanied by high winds. This could be property specific – loss of power at a building – or impact multiple properties – downed electrical lines in a neighborhood. An independent power source, such as solar collectors or a generator, can provide a means of facilitating recovery after a flood, allowing equipment such as sump pumps and fans to remain operational, thus, speeding up a return by occupants. Like the relocation of critical systems, every effort should be made to minimize the visibility of secondary power sources. HPCs should consult local review requirements to ensure compliance with all applicable regulations.



Proper maintenance can impact the flood resilience of materials. Although the stone may be an acceptable flood resistant material, the lack of mortar provides a path for flood water ingress.



Wood, particularly unpainted wood near the ground, is highly susceptible to damage when exposed to flood water.

D. USE OF FLOOD DAMAGE-RESISTANT MATERIALS IN FLOOD-PRONE LOCATIONS

Certain materials are less affected by being submerged in water than others. FEMA categorizes building materials in one of five levels to rank their potential resistance to flood, ranging from those that require a constant dry environment to those that can withstand high flood exposure. Several interior materials popularized during the mid-20th century that appear to be water resistant are also rated “unacceptable” for flood resistance including ceramic and linoleum tile.

Brick, which is a common exterior material for historic buildings, is classified as having an “Acceptable” flood resistance without the application of any coatings. It should be noted that FEMA’s material ratings are for individual materials rather than wall and floor assemblies. Therefore, each component in an assembly should be evaluated for flood resistance. For example, although individual bricks may be acceptable, brick walls can only provide protection if all components of the wall assembly are acceptable, and well maintained. This includes ensuring that mortar joints are repointed and that joints and penetrations are sealed. Depending on the municipality, HPC review may be required for the modification of all exterior materials, including repointing.

FLOOD-RESISTANT MATERIALS

Materials identified by FEMA as flood resistant and available in the following documents:

- **FEMA Technical Bulletin 2:** “Flood Damage-Resistant Material Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program” (2008)
- **FEMA Technical Bulletin 7:** “Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program” (1993)

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



A consistent elevation height can help maintain a cohesive neighborhood character. (Photograph courtesy of NJ HPO/FEMA.)

4 Establish Neighborhood Parameters for Elevation

Building elevations occur over time, on a property-by-property basis. Establishing a historically sensitive strategy can set a precedent for future elevations at neighboring properties, thereby providing a context for building elevations to maintain a neighborhood's historic character.

Many residential property owners considering building elevation will request elevating above the required height established by the Base Flood Elevation/Design Flood Elevation (BFE/DFE). Justification for the additional height may include the desire for an increased safety margin or to allow owners to benefit from usable space below their habitable lowest floor for permitted uses such as parking and storage. However, extreme building heights are typically at odds with the preservation of a historic neighborhood's character.

One reason for additional height is the relative nominal cost associated with going higher once building elevation is undertaken. A significant portion of the costs of building elevation is associated with disconnecting the building's systems (inclusive of water supply, plumbing, sewage, electrical, and gas connections), raising the building off its current support system, increasing the height of the support system (piers and/or foundations), lowering and anchoring the building to the extended support system, and reconnecting building systems. Therefore, most of the cost associated with the additional height is attributed to erecting the increased height of the support system.

With an understanding of local flood risk, HPCs can identify consistent parameters for building elevation that provide for resident safety and meet municipal historic preservation review requirements.



Understanding a building's context and features is critical to developing an appropriate mitigation strategy.

In evaluating options for elevation, HPCs should consider the following characteristics:

A. Neighborhood/Streetscape Considerations

- Context and Character
- Level of Flood Vulnerability
- Locally Appropriate Elevation Options

B. Site Considerations

- Size and Configuration
- Access and Parking
- Landscape Features

C. Building Preservation Consideration

- Materials and Condition
- Type and Style
- Character Defining Features
- Stairs, Porches, and Stoops
- Prominent Alignments and Arrangements
- Building Foundations
- Foundation Screening

Understanding these characteristics can provide a framework of considerations for building elevation and can establish the basis for HPCs to review alterations in their municipalities.



Historic landscape features, such as fences and site walls, should be retained whenever possible.

Existing neighborhood character can guide the establishment of elevation parameters.



A. NEIGHBORHOOD CONSIDERATIONS

PRESERVATION RECOMMENDATIONS

- *Identify neighborhood character-defining elements*
- *Retain or integrate key elements into neighborhood elevation strategy*

CONTEXT & CHARACTER

Historic context can exist at a large scale, defining a city or neighborhood, along a streetscape, and at an individual property. Historically, neighborhoods were often developed with a consistent pattern along a street including parcel size, setbacks, form, massing, and materials. Historic districts and individual properties embody this historic context and character. This context may be defined as part of a historic district nomination, or it may be necessary to elevate historic development patterns and current conditions to reflect an understanding of the sense of place.

At the neighborhood scale, that context may be defined in terms of density, such as urban, town, village, suburban, or rural. No matter what the density, the combined arrangement of roadways, parcels, buildings, and landscape features make up the historic context.

In considering elevations every effort should be made to maintain the character of individual buildings and properties as well as the surrounding neighborhood context. This will likely include identifying those elements that should be maintained, those that should be integrated, and elements that will likely require modification for a successful elevation. The selection of the various options will be greatly impacted by the extent of elevation required to achieve an accepted reduction in the level of flood vulnerability.



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



House A is above the BFE/DFE and elevation is not required, although it may be prudent to abandon the basement. Houses C and D were elevated to the BFE/DFE with the increased elevation of D requiring reorientation of the stair. House B was elevated well above the BFE/DFE to allow for parking at the ground level and both the front porch and chimney were eliminated, significantly impacting the historic integrity.

LEVEL OF FLOOD VULNERABILITY

Historic districts and properties vary dramatically across the state of New Jersey. The topography can be relatively flat, dramatically sloped, or somewhere in between. The level of flood vulnerability is identified as the location of the lowest habitable area of the house relative to anticipated flood levels, typically defined as the Base Flood Elevation (BFE) or the Design Flood Elevation (DFE).

In the case of a historic district located on the slope of a hill, houses at the bottom of the hill are more vulnerable to flooding than similar houses located at the top of the hill. To reduce the flood vulnerability of the downhill houses, they may need to be elevated to prevent flooding while the properties further uphill can remain at their current elevation. Given the potential variety of conditions within municipalities or a single historic district, it is challenging to establish a single “rule” that defines a uniform height to which buildings can or should be elevated. Instead, it may more helpful for HPCs to consider establishing elevation heights based upon parcel flood vulnerability relative to the BFE / DFE.

Some of the more extreme elevations may also run afoul of building height limits found in municipal zoning codes. For example, if a 33-foot tall historic building with a steeply pitched roof that needs to be elevated 4-feet to meet the DFE in a zone with a 35-foot height limit, it will exceed the allowable zoning height. Similarly, the roof pitch of a new house in a historic district may be “flattened” to meet zoning height requirements, making it incompatible with the adjoining historic buildings. Local HPCs should work with zoning code officials to facilitate a review process that reduces flood vulnerability and maintains the historic building character.

PRESERVATION RECOMMENDATIONS

- Limit elevation of the first floor of existing buildings to the DFE
- Work with municipal zoning code officials to reconcile building height limits with heights of elevated historic buildings
- Consider height of potential new construction or additions that must meet floodplain requirements and limit the first floor height of new construction in historic districts to the DFE



The parcel size allows the ground plane to be elevated above the street level and the house is supported on a raised brick foundation, elevating the first floor level well above the street level. The continuous evergreen shrubs obscure the raised foundation.



Extreme elevations to accommodate parking can greatly impact a building's relationship to the ground and should be avoided. Horizontal board foundation screening is rarely appropriate for historic buildings.

ELEVATION OPTIONS

There are four general categories for building elevation:

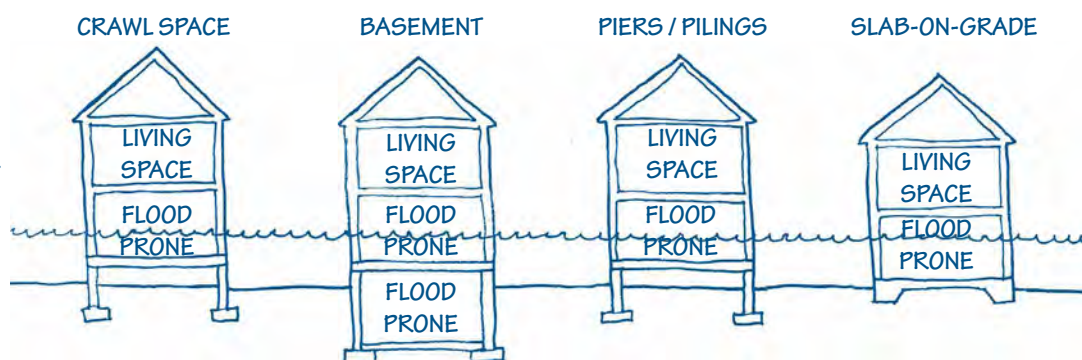
- Non-structural elevation by abandoning flood-vulnerable areas of a building and relocating uses to higher, non-vulnerable areas – This could be as simple as abandoning portions of the basement;
- Elevating the building and supporting it on piers or piles;
- Elevating the building and supporting it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

Each of these elevation types may be utilized on their own, or in combination, to suit local conditions. For a residence with a basement that is vulnerable to flooding, raising all equipment and systems above the BFE/DFE, whether in the basement or to a higher floor level, is a simple option with little or no impact on the exterior of the building. ([Refer to Relocation of Critical Systems & Equipment, page 14.](#)) In instances where the flood vulnerability is greater, such as a traditional masonry home with a wood porch and a basement, it may be appropriate to elevate a masonry building onto a higher foundation wall; support the wood porch on higher piers; relocate all of the systems to upper floor levels and abandon the basement. Similarly, a wood framed residence may be elevated on higher piers while the masonry chimney would require an extended foundation, ideally matching the chimney material. ([Refer to Illustrated Case Studies, page 35.](#))

ZONE A ELEVATION OPTIONS

PRE-ELEVATION FOUNDATION TYPES FLOOD-PRONE LOWER PORTION OF BUILDING

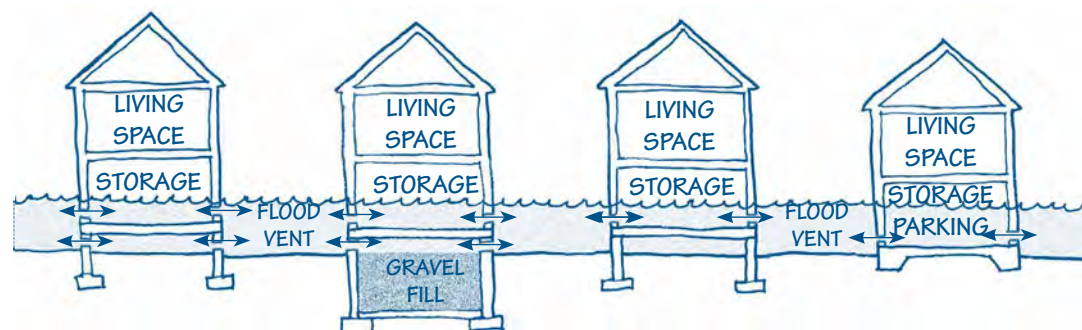
BFE/DFE
GRADE



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

NON-STRUCTURAL ELEVATION LIMIT USE BELOW BFE/DFE; FREE PASSAGE OF FLOOD WATER THROUGH BUILDING

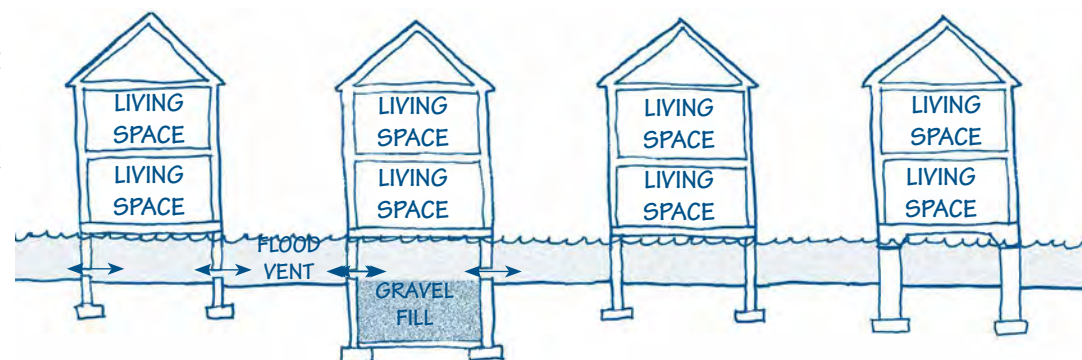
BFE/DFE
GRADE



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

INCREASE PIER & FOUNDATION HEIGHT ELEVATE LIVING SPACE ABOVE BFE/DFE & ABANDON BASEMENT

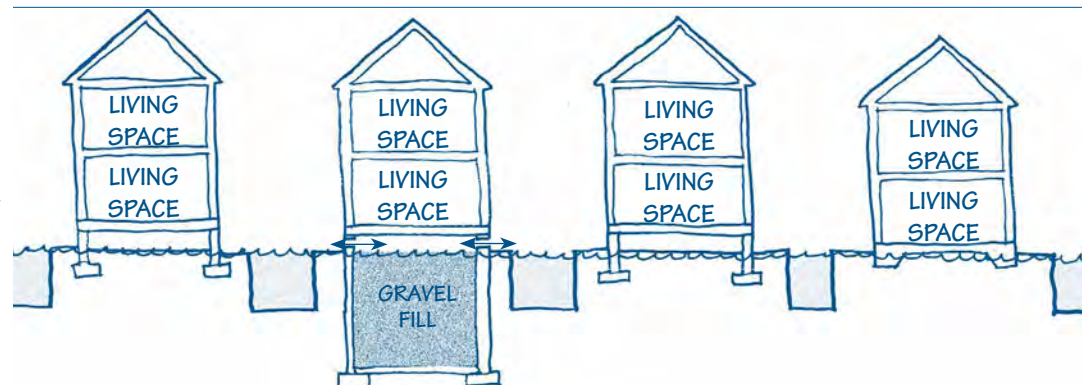
BFE/DFE
GRADE



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

ELEVATE BUILDING & SITE RE-GRADE BUILDING PERIMETER & RELOCATE HOUSE AT HIGHER HEIGHT

BFE/DFE
GRADE



The elevation of the grade at the perimeter of the raised building can help retain its context to the site. This is typically only feasible at larger parcels.



The shared party walls in row houses make them difficult to elevate. However, non-structural elevation in which lower level(s) are abandoned could be a viable mitigation measure. (Refer to page 36.)

PRESERVATION RECOMMENDATIONS

- Limit elevation of the first floor of existing buildings to the DFE
- Work with municipal zoning code officials to reconcile building height limits with heights of elevated historic buildings
- Consider height of potential new construction or additions that must meet floodplain requirements and limit the first floor height of new construction in historic districts to the DFE

Some of the considerations when evaluating the various options include:

- **Extent of flood vulnerability:** There may be engineering challenges that would lend themselves to either foundation walls or piers;
- **Size and setbacks of parcel:** Larger parcels with generous setbacks may lend themselves to elevation of the site and associated building(s) while smaller parcels are more limiting;
- **Historic configuration:** Attached or semi-attached homes are often limited to non-structural elevation since they share a party wall(s) with their neighbor(s);
- **Building type and style:** The historic relationship of a building to the ground will vary based on the type, style, and massing, with some forms of elevation lending themselves to some options; and
- **Historic building material:** Masonry buildings were typically supported on masonry foundation walls while wood frame buildings were historically supported by either masonry piers or foundation walls.

Communities that are most vulnerable to flooding may have a history of elevating their buildings. Prior building elevations, potentially documented in historic photographs or local newspaper articles, can provide a basis for future building elevations. If prior examples are not available, developing an understanding of building types, styles, materials, and building characteristics, often within the larger context of a historic neighborhood, is essential to developing a strategy for municipal elevation design guidelines.

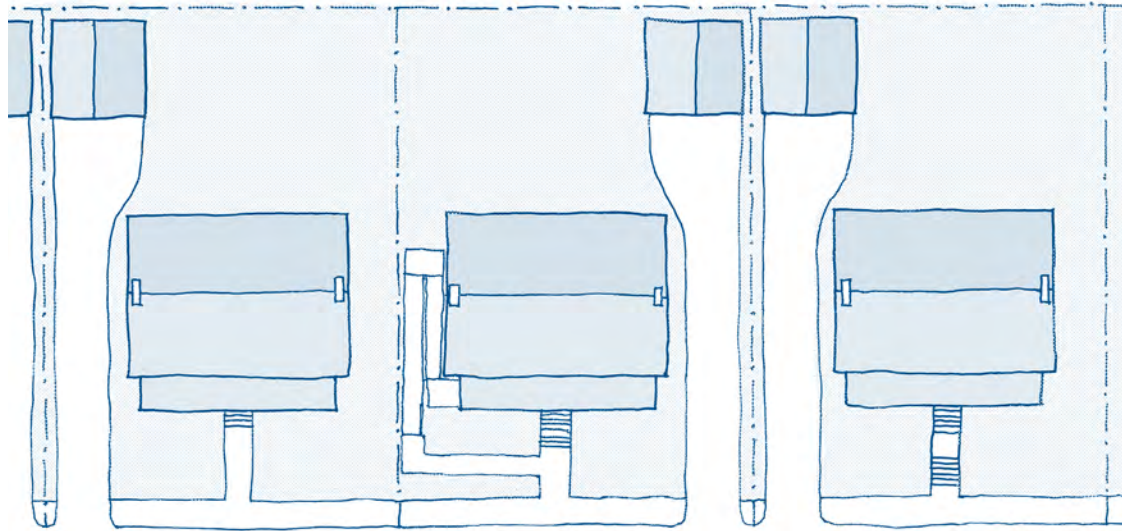
In considering the impact of individual building elevations, particularly within the context of a larger historic neighborhood, one of the challenges for HPCs will be to maintain the cohesive character of the neighborhood as elevation projects are implemented. Individual property owners will make personal determinations regarding whether to elevate their buildings and there will be a period in which some properties are elevated, and others are not.

Establishing clear guidance regarding the goals of elevation and design parameters that work for the individual characteristics of a neighborhood can improve the outcome. This is particularly true in neighborhoods that have small parcels located close together in which changes at one parcel can have a significant visual impact on adjoining parcels.

It is also important to keep in mind that any new construction will be required to comply with all floodplain management regulations. Therefore, applying a height standard consistent with the BFE/DFE for new construction will limit the “lollipop” houses that often loom over smaller-scale historic residences.

PARCEL CONFIGURATIONS

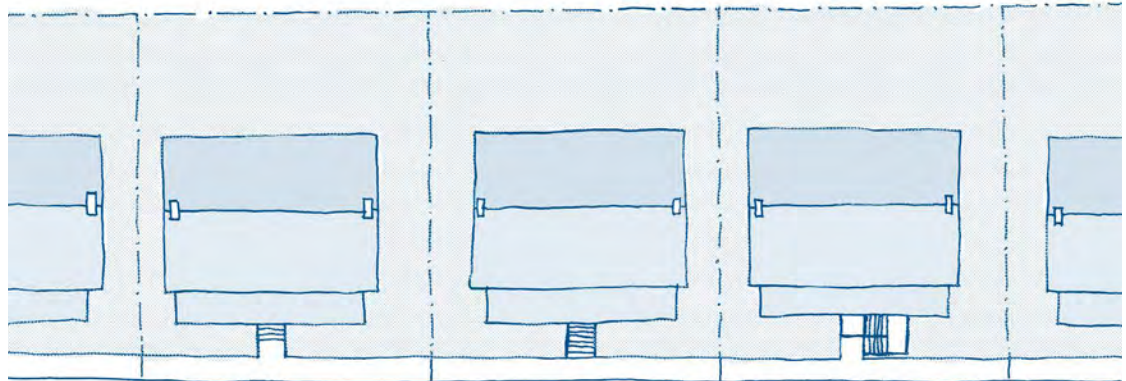
LARGE PARCEL WITH
LARGE SETBACKS
ACCESS WALKWAY AND
DRIVEWAY



1ST FLOOR HEIGHT
ABOVE GRADE

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

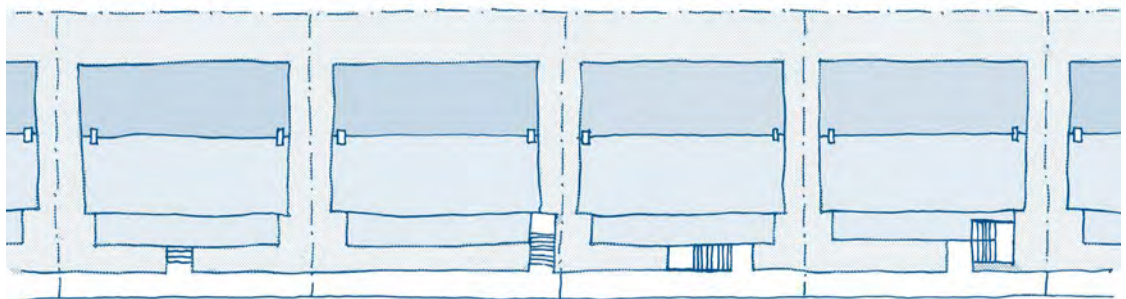
MEDIUM PARCEL
WITH SMALL
SETBACKS
ACCESS WALKWAY



1ST FLOOR HEIGHT
ABOVE GRADE

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

SMALL PARCEL
WITH MINIMAL
SETBACKS
ACCESS WALKWAY



1ST FLOOR HEIGHT
ABOVE GRADE

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



Larger building lots provide greater flexibility for the addition of extended stairs and foundation screening. The use of tall evergreen shrubs and varying smaller shrubs at the house to the left provides year-round screening and visual interest.

B. SITE CONSIDERATIONS

PRESERVATION RECOMMENDATIONS

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

SIZE & CONFIGURATION

Like topography, the size of parcels in historic districts and at historic parcels can vary dramatically from closely spaced, compact residences on relatively small lots and minimal setbacks, to generous suburban style lots with larger setbacks. When considering options for elevation, the size and configuration of parcels can have a substantial impact on elevation options and screening possibilities.

The possibilities for larger parcels may include elevating the grade beneath the residence, relocation onto a higher portion of the parcel, or relocation away from vulnerability or the water's edge. If the distance between the building and the ground is not dramatically altered, it is easier to screen including higher foundations or pier supports, expanded stairs, and raised mechanical equipment. If modifying the height of a site by regrading, care should be taken to prevent stormwater runoff onto adjacent properties.

Smaller sites do not provide the same opportunity for relocation, and if a residence could be relocated, their relationship with adjoining parcels may be compromised. Those with narrow front and/or side yard setbacks, can present a significant challenge, particularly to accommodate extended stairs and associated screening required for higher elevations.

ACCESS & PARKING

While many historic homes in cities are entered directly from a sidewalk, in smaller towns, suburban and rural locations, houses on larger parcels may include a walkway to the front entrance and potentially a driveway with a parking area near the house. Based upon the size and configuration of the site and relative height of a proposed elevation, it may be necessary to utilize existing walkways, driveways, and parking areas to accommodate extended stairs, requiring the alteration of historic alignments.

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



The wide, central stair is a significant compositional feature of this building, creating a prominent alignment for the composition. The side-yard driveway is visually a secondary access route. Evergreen shrubs provide year-round screening for elevated foundations. (Photograph courtesy of NJ HPO/FEMA.)

LANDSCAPE FEATURES

Landscape features within at a historic property can be significant in defining a sense of place. Landscape features can include a tree canopy over a roadway, fences and walls marking a property's boundaries, and mature shrubs. Significant landscape features may need to be removed and/or relocated to implement certain elevation strategies. Raising the grade beneath the building may have the most significant impact on landscape features, including trees, landscape walls, and fences. It may be possible to relocate plantings to accommodate building elevation activities and extended stairs. [\(Refer to Foundation Screening, page 33, for landscaping utilized for screening.\)](#)

ZONING BONUSES PROMOTING PRESERVATION

Following Superstorm Sandy, the Beach Haven HPC worked with municipal zoning officials to mitigate parking under residences. A zoning bonus for the construction of a one-car garage is available to property owners who limit their building elevations and exclude parking under their residences.

PRESERVATION RECOMMENDATIONS

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



Masonry retaining walls can provide an effective grade transition for elevated sites and minimize storm water runoff onto adjacent parcels.

PRESERVATION RECOMMENDATIONS

- Minimize alteration of character-defining landscape features to the extent possible to maintain historic setting

TYPE VS. STYLE

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



Some buildings include elements typical of different styles and periods. The front gambrel roof of this residence suggests the Dutch Colonial style, however, the porch detailing including the bracketed turned wood posts and balustrade is typical of Victorian period residences.

PRESERVATION RECOMMENDATIONS

- Identify local building types and styles
- Understand local building characteristics and context
- Identify examples that are appropriate for the historic context



This bungalow features Arts and Crafts detailing. The perimeter retaining wall raises the height of the site adjacent to the building, reinforcing the visual relationship to the ground.

C. BUILDING PRESERVATION CONSIDERATIONS

HISTORIC BUILDING TYPES & STYLES

New Jersey's historically designated residences date to 17th century European settlements well into the 20th century. Historic building types include everything from farm houses to row houses, mill worker's housing to beach houses. Residences were constructed of stone and brick as well as wood framing. Historic building styles include Dutch Colonial, Queen Anne, Art Deco, Colonial Revival, and Mid-Century Modern. The characteristics of New Jersey's historic residential building types vary in size, height, form, and appendages including porches, bays, and chimneys.

In most cases, elevating buildings alters the relationship of the building to the ground, introducing visual verticality. As such, buildings that have a vertical emphasis, such as a 3-story Queen Anne with a corner tower, can be easier to sensitively elevate than a 1-story cottage.

Although it is not possible to identify every elevation option, a framework for selecting appropriate alterations can help HPCs make appropriate choices for their communities. Examples provided in the Illustrated Case Studies address a variety of New Jersey residential building types to identify strategies for addressing elevation in a variety of contexts. (*Refer to Illustrated Case Studies, page 35.*)



The house retains its highly decorative character-defining features including the tower, balcony, porch, windows, doors, chimney, and wood shingle cladding. The wide, prominent stair, maintains its frontal access and includes railings and newel posts that are similar to the balustrade. The porch piers are aligned with the columns above and partially obscured by shrubs. (Photograph courtesy of NJ HPO/FEMA.)

CHARACTER DEFINING FEATURES

Like other HPC reviews, proposed alterations need to be reviewed holistically for their impact on the individual building as well as within the larger neighborhood context. To the extent possible, proposed alterations to historic buildings should retain:

- The overall building proportions, appropriate to typology and style;
- Historic access and orientation;
- The composition of character-defining building elements;
- Historic building features, including appendages such as porches, bays, and chimneys; and
- Character-defining materials and features.

When retention in place is not possible, it may be feasible to salvage character-defining elements for sensitive reuse as required to accommodate the building elevation. Where salvage is not feasible, historic elements can be reconstructed in an integrated manner with the elevation.

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



Stone stoops are character-defining features of many row houses and their alteration should be avoided.

PRESERVATION RECOMMENDATIONS

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



A straight-run stair would fit in the front yard, however, its placement in the side yard takes advantage of the porch depth and allows for a direct approach from the sidewalk. Side yard construction may be limited in some municipalities. (Photograph courtesy of NJ HPO/FEMA.)

STAIRS, PORCHES & STOOPS

PRESERVATION RECOMMENDATIONS

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



The landscape screening for the accessible ramp is a continuation of the porch foundation screening.

Stairs play a significant role in the arrival sequence at a residence. They can be a significant feature, leading to a porch or stoop to access a primary entrance door. Increased building elevation heights require longer stair runs to access the raised living floor level. To the extent possible, extended stairs should retain the original orientation and configuration, as well as relationships to the primary entrance door, walkways, and sidewalks. This can pose significant challenges when the parcel size and setbacks are restricted.

Building codes establish the minimum number of steps required and their associated length relative to the height of the living surface above exterior grade. For example, a floor surface that is 4-feet above grade requires a minimum of 7 steps, at a minimum length of 6'-5". ([Refer to Stair Configurations, page 56.](#))

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

Accessibility

Providing access to an elevated building to individuals with physical disabilities is especially challenging. The length of ramps meeting accessibility requirements to accommodate extended heights can be prohibitive, particularly at smaller parcels. A ramp for an elevation of 4-feet above grade must be at least 53-feet long. If the installation of a ramp is not feasible, an accessible lift or elevator can be installed. When installing a lift or elevator, consideration should be given to limiting the visibility of roof penetrations and installing associated mechanical equipment above the BFE/DFE.



Stair orientation should be maintained for center hall residences whenever possible. The wood porch posts align with the brick piers below. The square lattice foundation screening is appropriate for the building style.

PROMINENT ALIGNMENTS & ARRANGEMENTS

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

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

Historic arrangements can be symmetrical, as in a Colonial Revival home with central doors and aligned windows, or asymmetrical, typical of Queen Anne and many Arts and Crafts bungalows. Alterations associated with a building elevation should complement the alignments, arrangements, and materials of the historic structure.



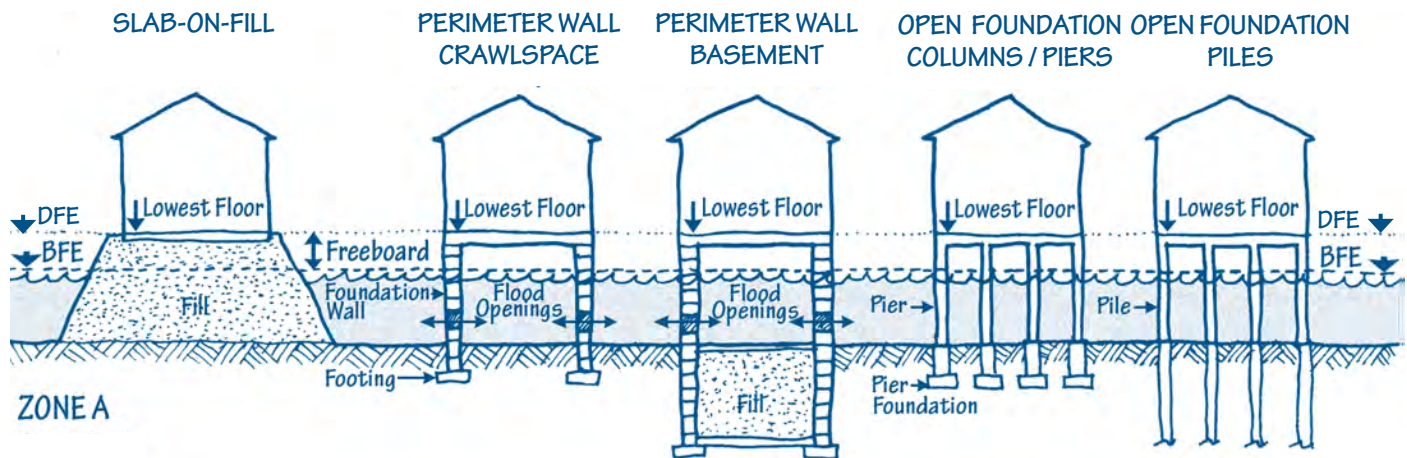
The rounded corner of the raised porch complements the building lines. The openings between the brick piers is similar to the windows beyond, making the raised porch a well-designed extension of the house. (Photograph courtesy of NJ HPO/FEMA.)

PRESERVATION RECOMMENDATIONS

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



The stair is aligned with the entrance door and tower above. Every effort should be made to maintain the orientation of the stair and approach sequence.



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



Open piles without screening are generally incompatible with historic buildings. (Photograph courtesy of NJ HPO/FEMA.)



The design of the raised, closed foundation is compatible with the historic house. The colors, fenestration pattern, quoins, and window surrounds relate to the architectural detail on the upper floors. (Photograph courtesy of NJ HPO/FEMA.)

FOUNDATION REQUIREMENTS

FEMA's **Hurricane Sandy Recovery Fact Sheet No. 2, Foundation Requirements and Recommendations for Elevated Homes** (May 2013), provides guidance on foundation design to improve flood resistance.

BUILDING FOUNDATIONS

Foundations support buildings above the ground but in some instances, also must be designed to restrain buildings from the force of floodwater and wave action. In addition to holding a building up, a flood resilient foundation resists buoyancy to prevent a building from floating off its foundation. Given the significant role they play in the structural performance of a building, foundations must be engineered to ensure a building's long-term stability. Any building required to be in full compliance with NFIP requirements must meet or exceed NFIP foundation design criteria. This includes all new construction as well as any existing building determined to be Substantially Damaged or Substantially Improved.

FEMA classifies foundations as either open or closed.

- **Open foundations**, found at buildings supported by piers or piles, allow flood water to freely pass under the building. Open foundations are often found at wood-framed buildings, porches, and in coastal environments.

Although not appropriate for all building types, styles, and materials, open foundations typically allow for increased elevation heights and are less susceptible to flood damage, particularly in coastal zones, where foundation are vulnerable to wave storm surge damage. (Refer to *Foundation Screening*, page 33, for NFIP requirements for architectural treatments, such as lattice.)

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

Closed foundations are vulnerable to lateral pressure of raised floodwater against building walls. This could lead to structural failure or collapse. A manner of reducing the pressure is to allow the unimpeded flow of water in and out of the foundation so that the interior and exterior water heights rise and fall at the same rate and to the same levels. The unimpeded transfer of floodwater through



Flood vents, such as those located along the foundation, allow the free passage of water in and out of a closed foundation or building.

flood openings equalizes the lateral forces, significantly reducing the strain on the building's structure.

Flood openings allow the passage of floodwater in and out of a building without mechanical intervention such as sump pumps. They must be of sufficient size, number, and location to be able to quickly equalize interior and exterior water levels. They will typically be located around the perimeter of a building or foundation, close to the adjacent exterior grade height, and may also be needed between adjacent, enclosed spaces, such as in interior foundation walls. In the case of a filled or abandoned basement, the installation of flood vents and drainage through the basement slab may be required.

Many manufactured flood openings are metal louvers or vents. Some flood openings are designed to be more in keeping with the architectural character of historic buildings. They should be selected and installed to allow the free flow of water and to prevent animal and insect infestation.

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

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

When evaluating elevation options for historic buildings, the consideration must balance safety with historic character. To the extent possible, the visual qualities of historic building foundation materials should be continued at the foundation. However, NFIP design parameters that minimize damage in the event of a flood are often not historically sensitive.

NFIP FLOOD OPENING REQUIREMENTS

The minimum requirements for flood openings as established by the National Flood Insurance program (NFIP) are as follows:

- “A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding,
- The bottom of all openings shall be no higher than one foot above grade. Garage doors do not meet the National Flood Insurance Program (NFIP) minimum requirements for openings.”

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

FEMA's **Technical Bulletin No 1, Openings in Foundation Walls and Walls of Enclosures Below Elevated Buildings in Special Flood Hazard Areas** provides guidance that conforms within accordance with the National Flood Insurance Program, addressing the requirements for flood openings for enclosed foundations.

PRESERVATION RECOMMENDATIONS

- *Extend foundations and piers in a manner that is consistent with the existing building foundation*
- *Locate flood openings in a manner that minimizes visibility without impeding functionality*
- *Provide foundation screening to minimize visual impact of elevation and flood vents without impeding their function*

BUILDING FOUNDATION SCREENING REQUIREMENTS

FEMA's **Technical Fact Sheet No. 27, Enclosures and Breakaway Panels** (December 2010) summarizes design and building code requirements for architectural screenings, differentiating requirements for various hazard zones.



The landscaping at this building is very lush and conceals the foundation.

PRESERVATION RECOMMENDATIONS

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



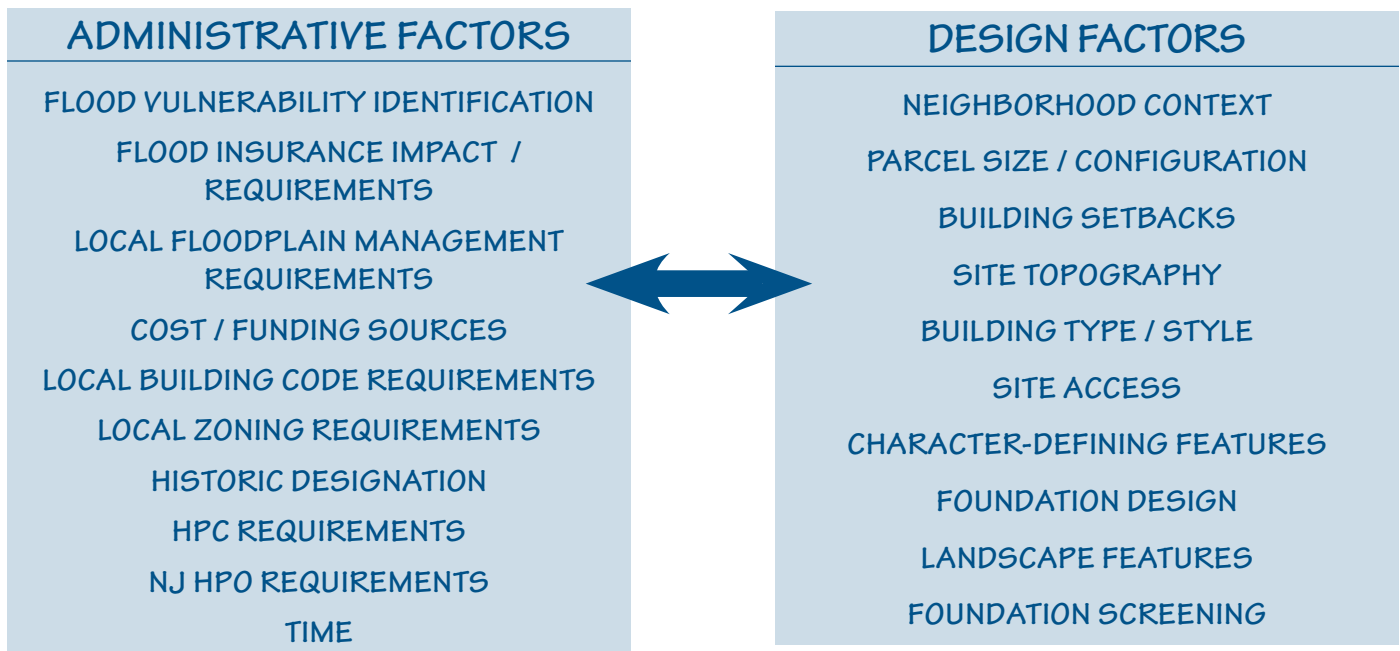
Square lattice provides foundation screening between the piers. The use of diagonal or square lattice should be appropriate for the building's style. The central stair maintains the orientation to the front door and the brick foundation of the house includes flood vents at the side elevation facing the driveway.

FOUNDATION SCREENING

Screening of extended foundations can serve to mitigate the adverse impact of a building elevation and elevated mechanical equipment. Screening can be achieved utilizing landscaping or architectural elements. However, the use of screening elements must be designed in a manner that does not impede the flow of flood water, particularly in Coastal High Hazard Areas ([Refer to Special Flood Hazard Areas, page 3.](#)) At parcels with narrow setbacks, raised planter walls can be utilized to mitigate the visual impact of elevations, incorporating stairs “buried” into the landscape.

Landscape screening can be utilized at the base of a building and can be scaled to minimize the visual impact of the elevation. For example, the use of taller plantings and small trees will likely be more successful than low ground cover at higher building elevation projects. Similarly, utilizing indigenous vegetation, native to a specific area, such as evergreen shrubs inland and decorative grasses at coastal location, will generally be more appropriate, encourage stormwater absorption, and require less maintenance. If it is not possible to locate mechanical equipment away from public view, it can be screened with vegetation or architectural elements such as fencing.

Architectural screening, in the form of lattice or panels, is generally utilized on pier or piling support systems. Similar to building foundation walls, extended piers, either those supporting a residence or an appendage such as a porch, should be screened in a manner that is sensitive to the character of the building. However, in Coastal High Hazard Areas, the screening can increase the surface area subject to wave action impact and velocity. Therefore, the walls, lattice or screening should be designed and installed in a manner that allows them to break-away or collapse to allow unimpeded water flow.



ELEVATION FACTORS

Property owners must consider an enormous number of administrative and design factors in their decision-making process when considering elevating a historic building, some of which may be conflicting. An understanding of the varying requirements can help assess the long-term benefits of varying elevation options.

Owners of historic properties need to balance the practical implications of building elevations with maintaining the

historic character of their residence and within their neighborhood context. One of the greatest challenges local HPCs will have is limiting building elevation height to a height that provides the community-identified level of safety to minimize the impact on historic character. This can be best achieved by establishing a clear community-specific parameters related to appropriate flood mitigation measures.



5 Illustrated Case Studies

DESIGN PROFESSIONALS

The National Flood Insurance Program (NFIP) and individual communities have established specific compliance requirements for elevation. *In addition to complying with building code and HPC requirements, alterations at buildings located within locally designated floodplains must also comply with the community's floodplain management regulations.*

The review process for elevation, both structural and non-structural elevation, typically requires the preparation of drawings by a licensed architect or structural engineer. Improperly installed or constructed elevation or wet floodproofing alterations can result in significant damage to an existing building and prevent owners from benefiting from reduced flood insurance rates. *Consultation with an architect or structural engineer who has specific experience with flood mitigation alterations and HPC requirements is highly recommended.*

A licensed architect, engineer, or surveyor is also required to prepare an Elevation Certificate, potentially allowing property owners to take advantage of reduced flood insurance rates. (Refer to *Identifying Flood Risk*, page 3.)

The following pages include illustrations of a variety of house types found in New Jersey, with elevations to the following three DFE heights:

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

Each example assumed buildings began at or near grade as represented in adjacent examples. In addition, front yard setbacks are limited, making stair configurations more challenging.

For elevation each type, it is assumed that:

- Existing basements will be abandoned and infilled;
- Building systems and equipment will be elevated in an inconspicuous manner;
- Stylistically appropriate railings, simplified for drawing clarity, will be included at stairs, landings, and porches;
- Parking and garage doors will not be introduced at street-facing façades; and
- Landscape screening will be introduced to obscure extended foundations.

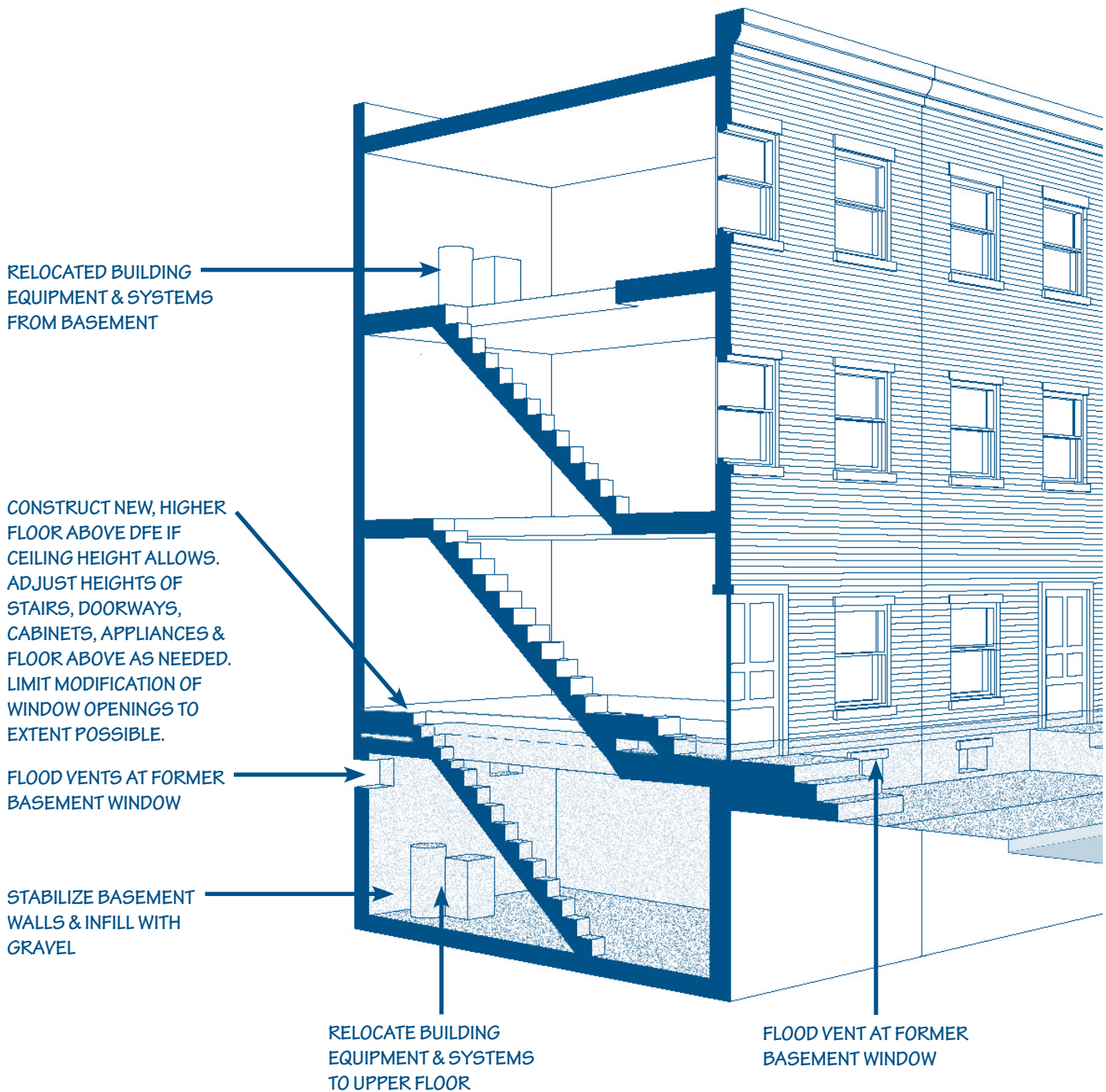
The recommendations in the case studies are intended to meet the requirements of the NFIP, however, local floodplain management regulations should be consulted to ensure municipal compliance.

MASONRY, 3-STORY, ROWHOUSE

FLOOD LEVEL 2'-4" ABOVE ADJACENT GRADE

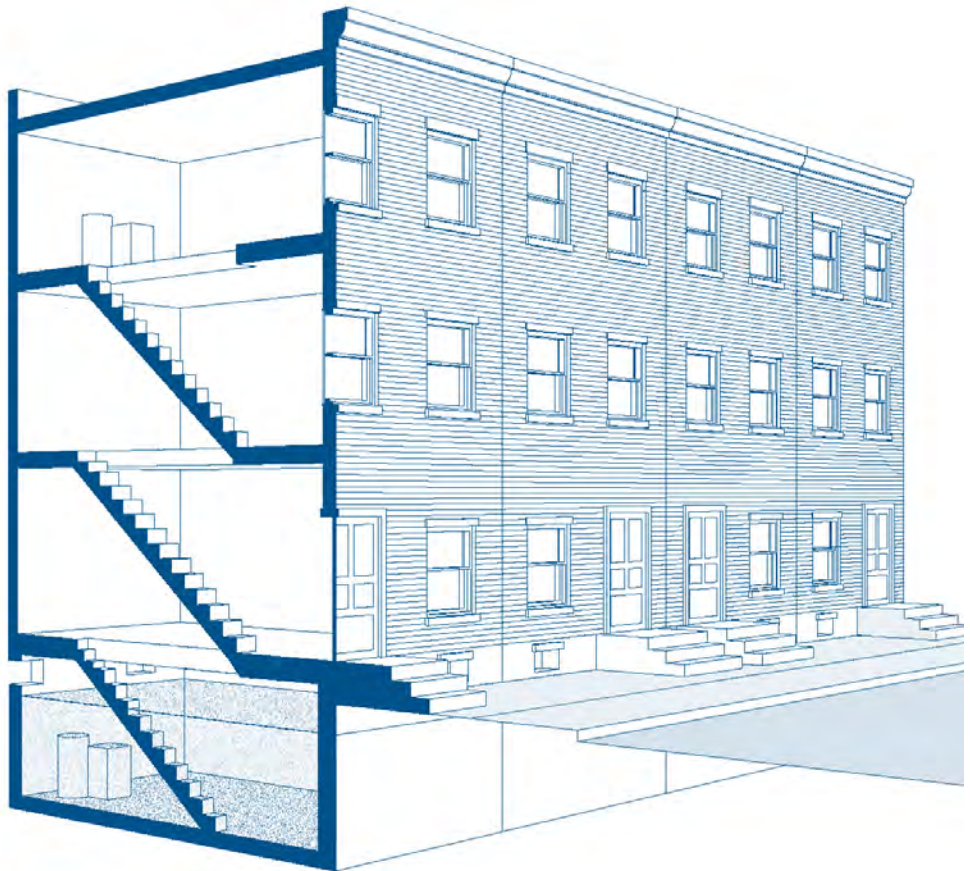
NON-STRUCTURAL ELEVATION

ABANDON USE OF BASEMENT & OVERBUILD FIRST FLOOR



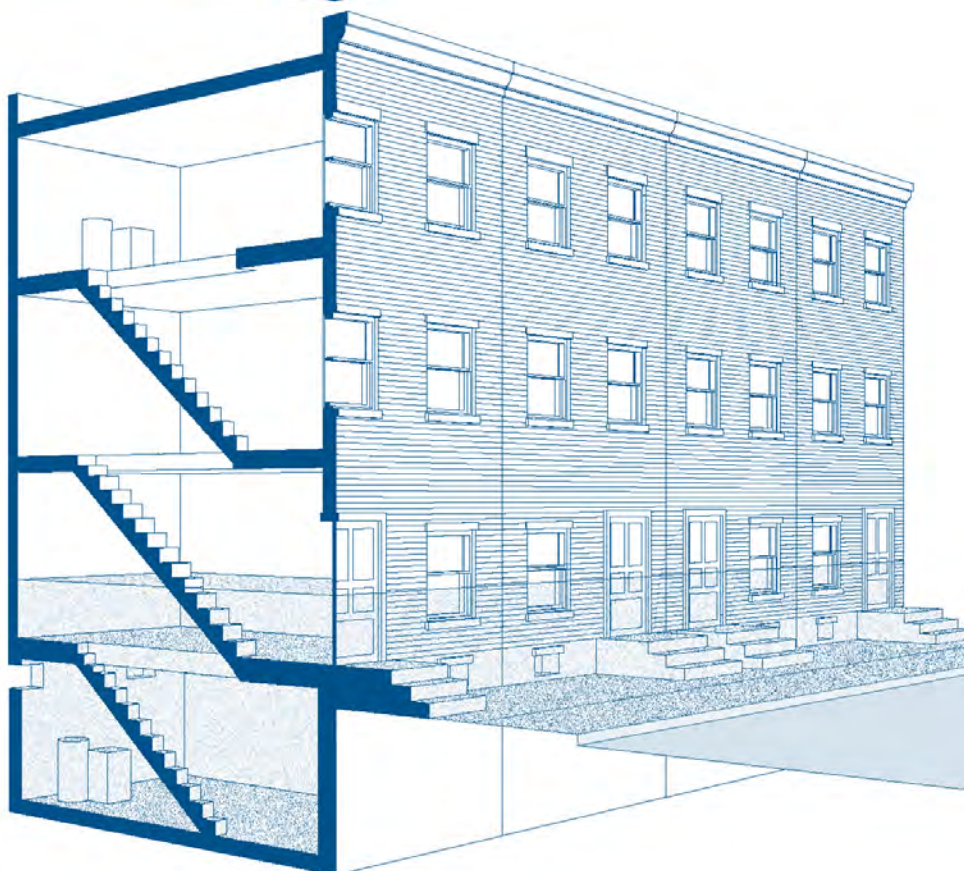
**BASEMENT BELOW DFE -
NON-STRUCTURAL ELEVATION
ABANDON OR LIMIT USE OF
BASEMENT**

- Relocate building systems and equipment above DFE
- Install flood vents at front and rear walls
- Stabilize basement walls
- Limit basement use to storage or infill with gravel if structurally required



**7'-0" ABOVE ADJACENT GRADE
NON-STRUCTURAL ELEVATION
ABANDON BASEMENT & LIMIT
FIRST FLOOR USE**

- Relocate building systems and equipment above DFE
- Install flood vents at front and rear walls
- Stabilize basement walls
- Infill basement with gravel if structurally required
- Limit use of first floor to entry, storage, and parking



MASONRY, 2-STORY, SIDE GABLE, TWIN WITH FULL-WIDTH PORCH

FIRST FLOOR 8" ABOVE ADJACENT GRADE / ABANDON FIRST FLOOR LIVING SPACE

EXISTING HEIGHT OF HOUSE & PORCH REMAINS UNCHANGED WITHOUT AGREEMENT OF BOTH PROPERTY OWNERS

FLOOD LEVEL 2'-4" ABOVE ADJACENT GRADE

3'-6" FRONT YARD SETBACK



2'-4" ABOVE ADJACENT GRADE

- Non-structural elevation
- Flood vents at front and rear elevations main block of left house
- Living space at first floor of left house is abandoned
- Right house remains non-compliant with NFIP



4'-8" ABOVE ADJACENT GRADE

- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations of main block
- Shared wood stair maintains center access orientation in narrow setback
- Square lattice between porch piers and under wood stair
- Introduction of railings



7'-0" ABOVE ADJACENT GRADE

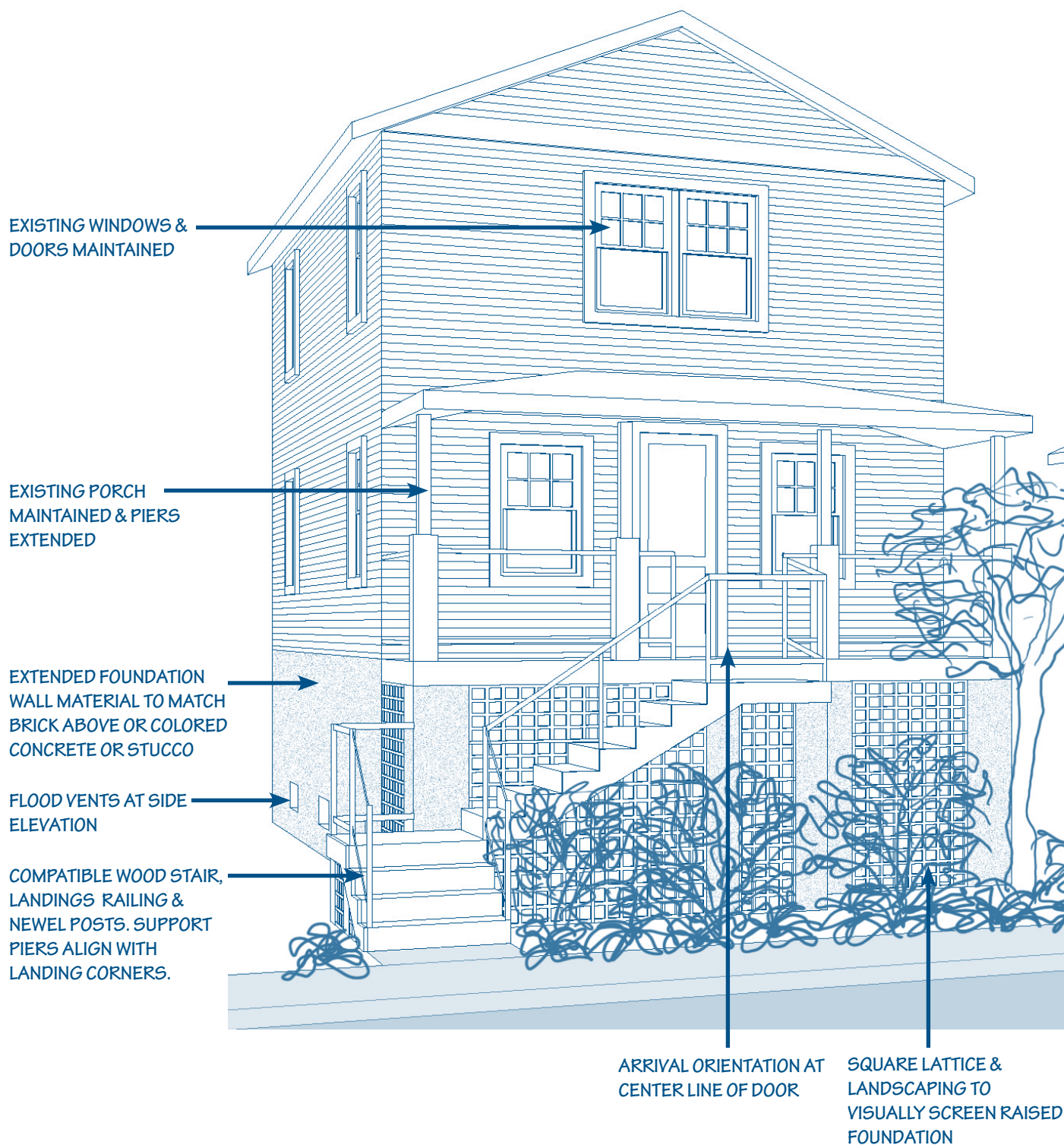
- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations of main block
- Wood stair configuration limited by sidewalk distance - reorientation to door center line at top landing
- Square lattice between porch piers and under wood stair



MASONRY, 2-STORY, FRONT GABLE WITH FULL-WIDTH PORCH

FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE

9'-0" FRONT YARD SETBACK



2'-4" ABOVE ADJACENT GRADE

- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations of main block
- Square lattice between porch piers and under wood stair
- Introduction of railings



4'-8" ABOVE ADJACENT GRADE

- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations of main block
- Wood stair maintains center access orientation
- Square lattice between porch piers and under wood stair
- Introduction of railings



7'-0" ABOVE ADJACENT GRADE

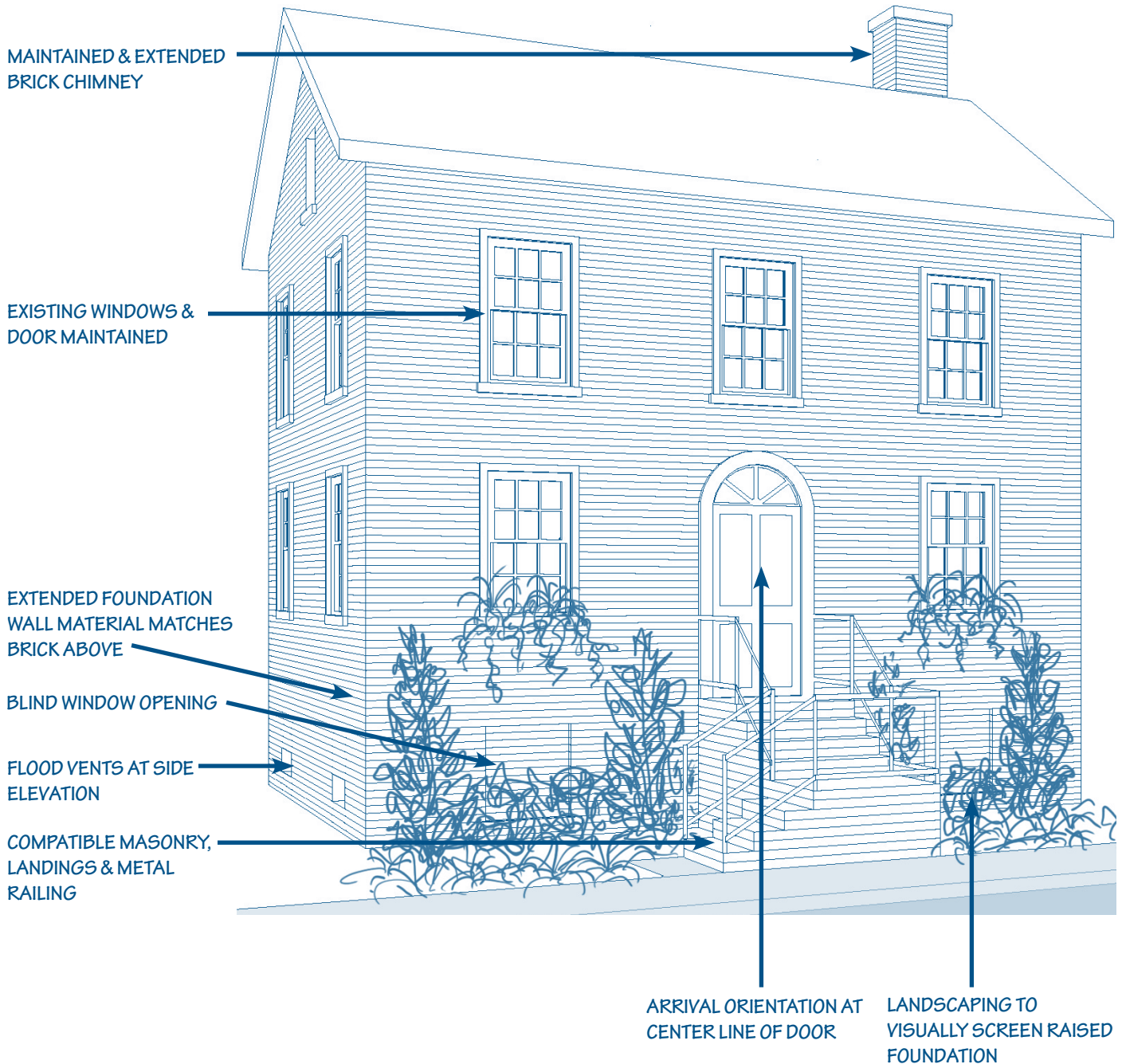
- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations of main block
- Wood stair configuration limited by setback - reorientation to door center line at top landing
- Square lattice between porch piers and under wood stair
- Introduction of railings



MASONRY, 2-1/2-STORY, SIDE GABLE

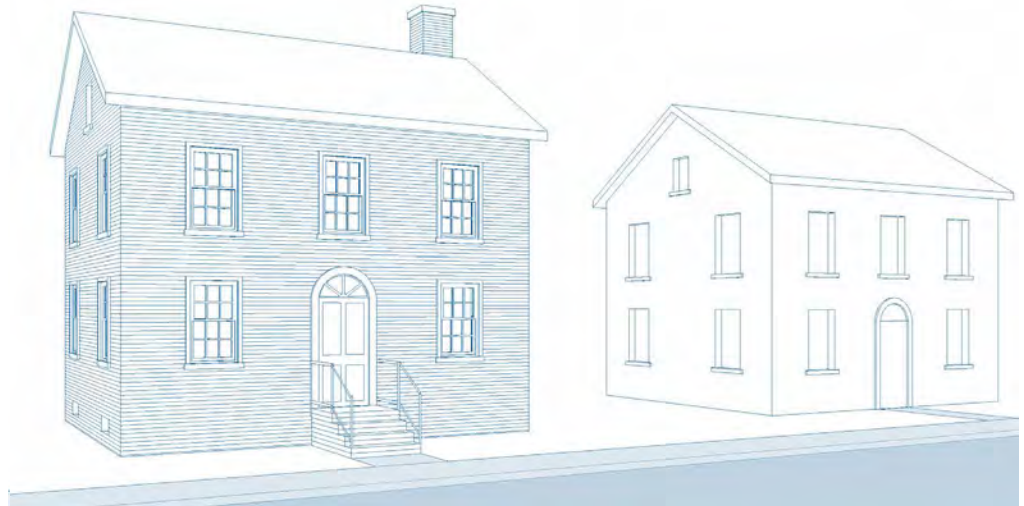
FIRST FLOOR 4'-8" ABOVE ADJACENT GRADE

10'-0" FRONT YARD SETBACK



2'-4" ABOVE ADJACENT GRADE

- Extended masonry walls with matching brick or colored stucco if cost prohibitive
- Flood vents at side elevations
- Masonry stair and landing
- Introduction of railings



4'-8" ABOVE ADJACENT GRADE

- Extended masonry walls with matching brick or colored stucco if cost prohibitive
- Flood vents at side elevations
- Masonry stair configuration limited by setback - L-shaped configuration maintains central door approach
- "Blind" window openings at front foundation suggest former basement windows



7'-0" ABOVE ADJACENT GRADE

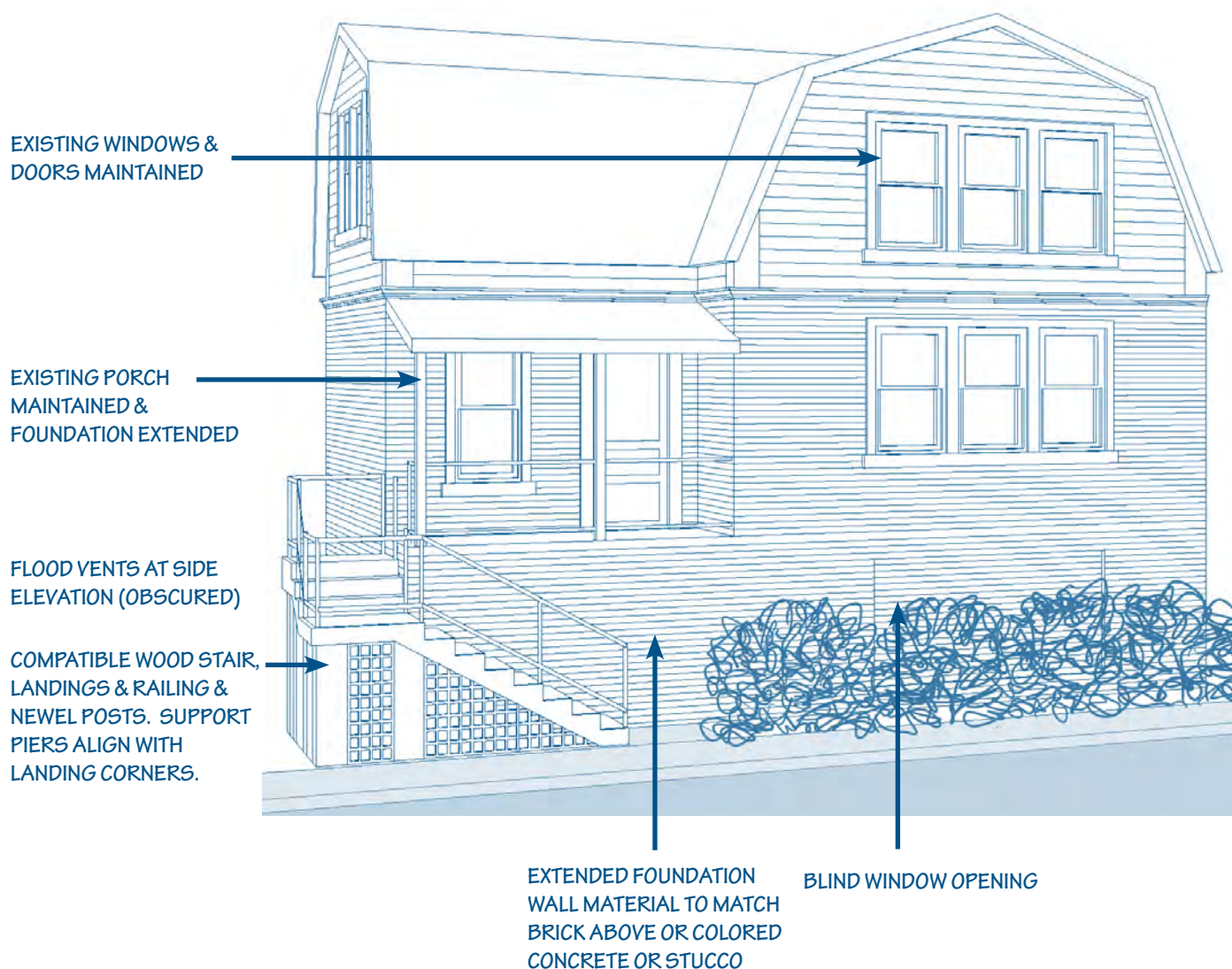
- Extended masonry walls with matching brick or colored stucco if cost prohibitive
- Flood vents at side elevations
- L-shaped masonry stair and landing
- "Blind" window openings at front and side foundations suggest former basement windows
- Watertable visually defining first floor height



MASONRY & WOOD-FRAMED, 1-1/2-STORY, INTERSECTING GAMBREL WITH PARTIAL PORCH

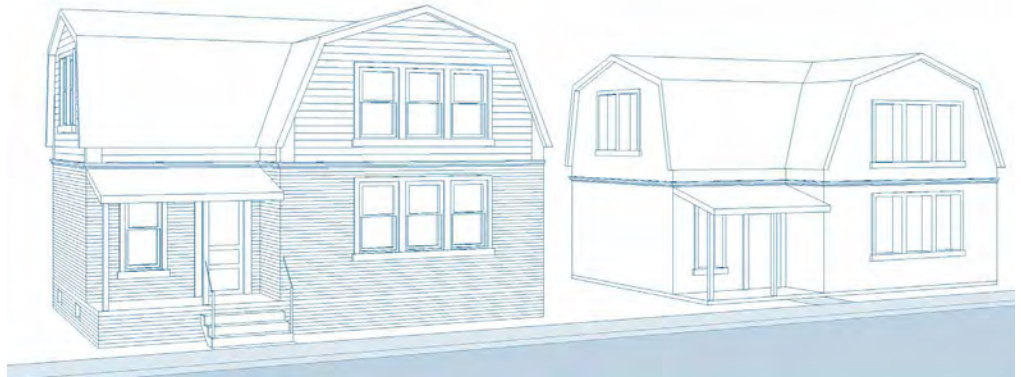
FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE

4'-0" FRONT YARD SETBACK



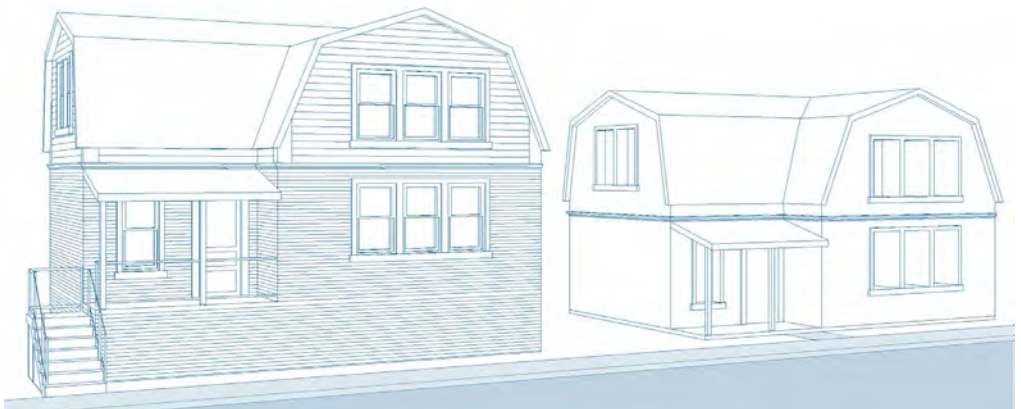
2'-4" ABOVE ADJACENT GRADE

- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations
- Wood stair maintains center access orientation
- Introduction of railings



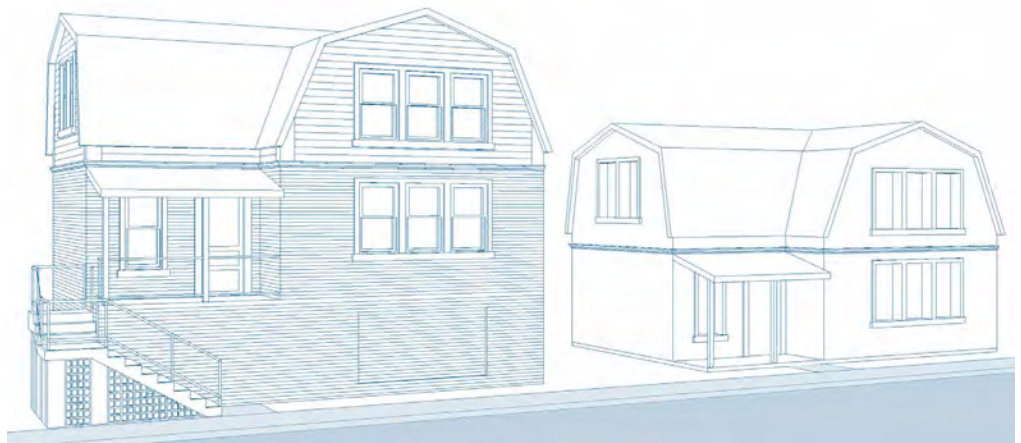
4'-8" ABOVE ADJACENT GRADE

- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations
- Wood stair configuration limited by setback, relocation to side of porch
- Square lattice under wood stair
- Introduction of railings



7'-0" ABOVE ADJACENT GRADE

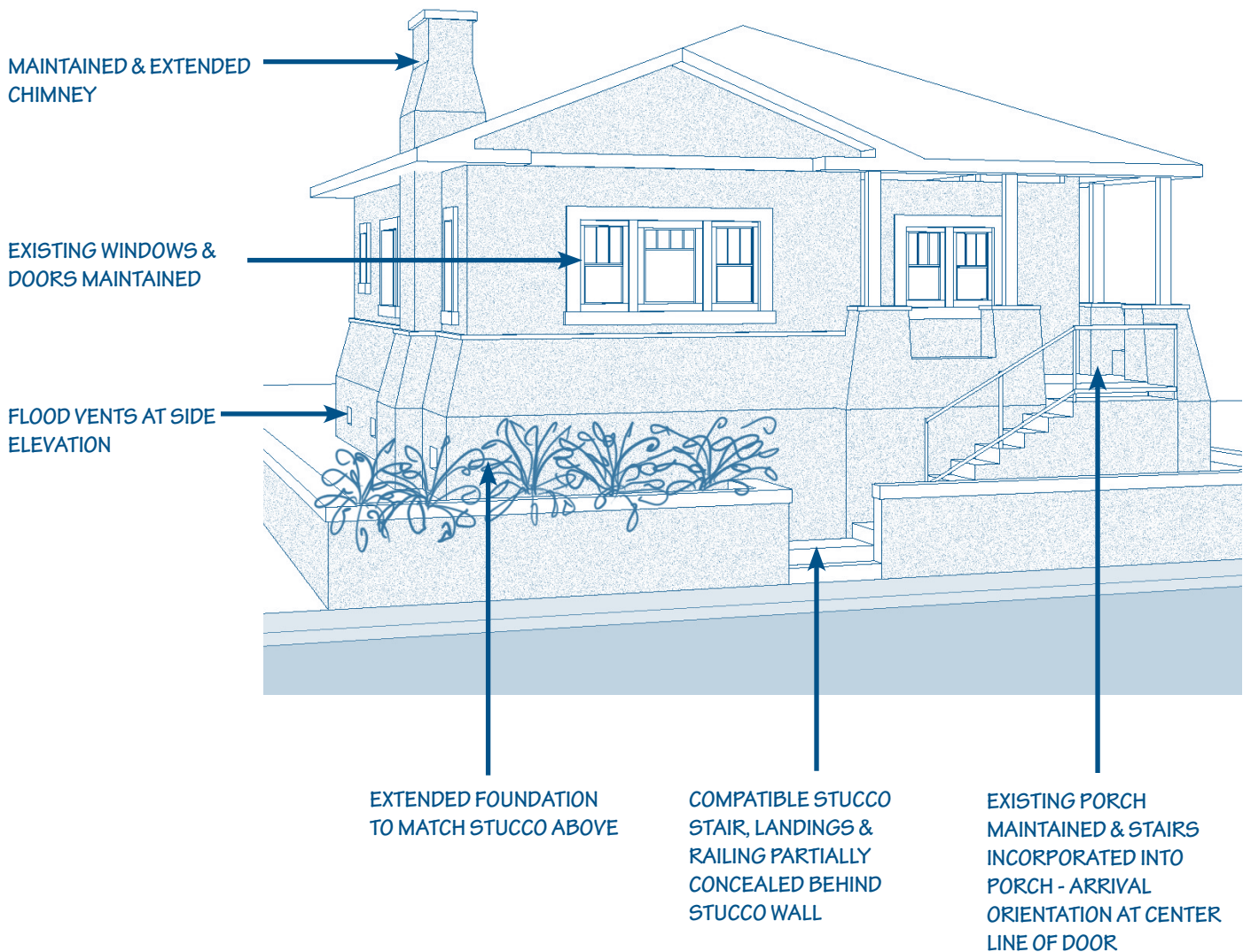
- Extended masonry walls and porch piers with matching brick or colored stucco if cost prohibitive at main block
- Flood vents at side elevations
- Wood stair configuration limited by setback - reconfiguration to wrap corner
- Square lattice under wood stair
- Introduction of railings



STUCCOED, 1-STORY, BUNGALOW WITH PARTIAL PORCH

FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE

4'-0" FRONT YARD SETBACK



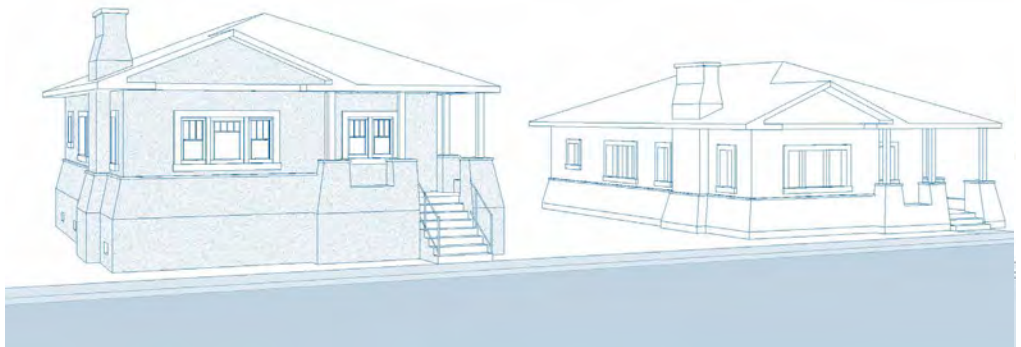
2'-4" ABOVE ADJACENT GRADE

- Extended stucco walls with matching stucco
- Flood vents at side elevations
- Stuccoed masonry stair maintains access orientation to porch



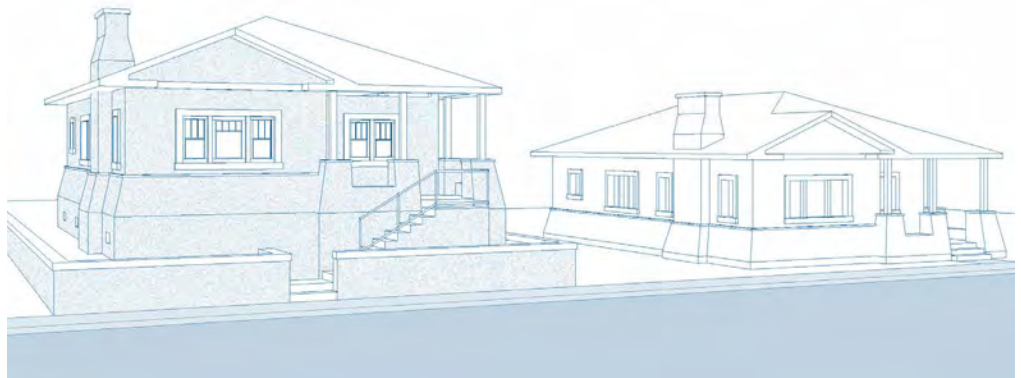
4'-8" ABOVE ADJACENT GRADE

- Extended stucco walls with matching stucco
- Flood vents at side elevations
- Stuccoed masonry stair maintains access orientation to porch
- Introduction of railings



7'-0" ABOVE ADJACENT GRADE

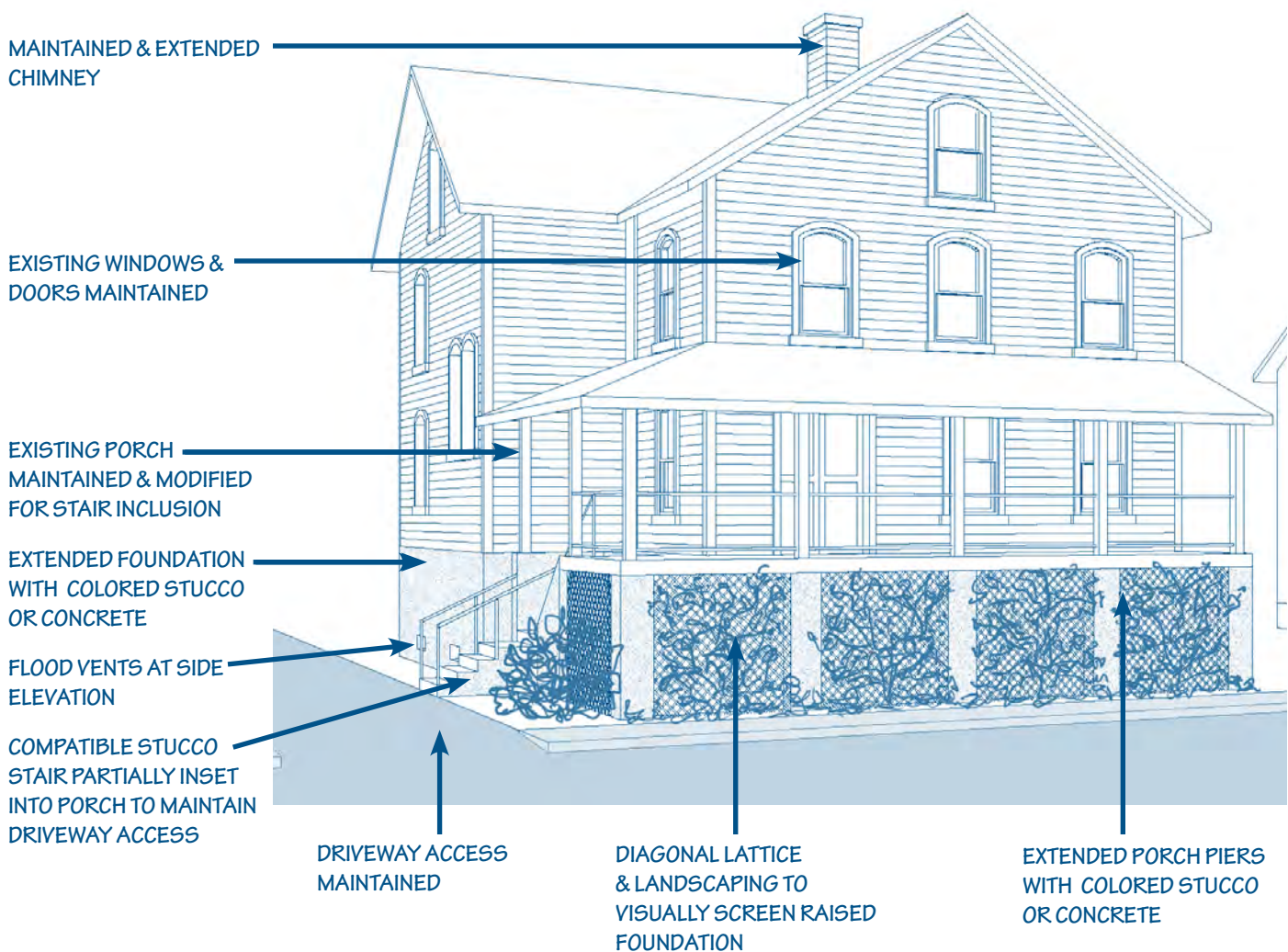
- Extended stucco walls with matching stucco
- Flood vents at side elevations
- Stuccoed masonry stair configuration limited by setback - L-shaped configuration maintains central approach
- Introduction of stuccoed wall to partially obscure stair and extended foundation
- Introduction of railings



WOOD-FRAMED, 2-1/2-STORY, INTERSECTING GABLE WITH WRAP-AROUND PORCH

FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE

2'-0" FRONT YARD SETBACK - 5'-0" SETBACK FROM DRIVEWAY



2'-4" ABOVE ADJACENT GRADE

- Extended foundation walls with colored stucco or concrete
- Flood vents at side elevations
- Diagonal lattice between porch piers
- Stuccoed stair and landing oriented towards driveway



4'-8" ABOVE ADJACENT GRADE

- Extended foundation walls with colored stucco or concrete
- Flood vents at side elevations
- Diagonal lattice between porch piers
- Stuccoed stair and landing oriented towards driveway and partially incorporated into porch



7'-0" ABOVE ADJACENT GRADE

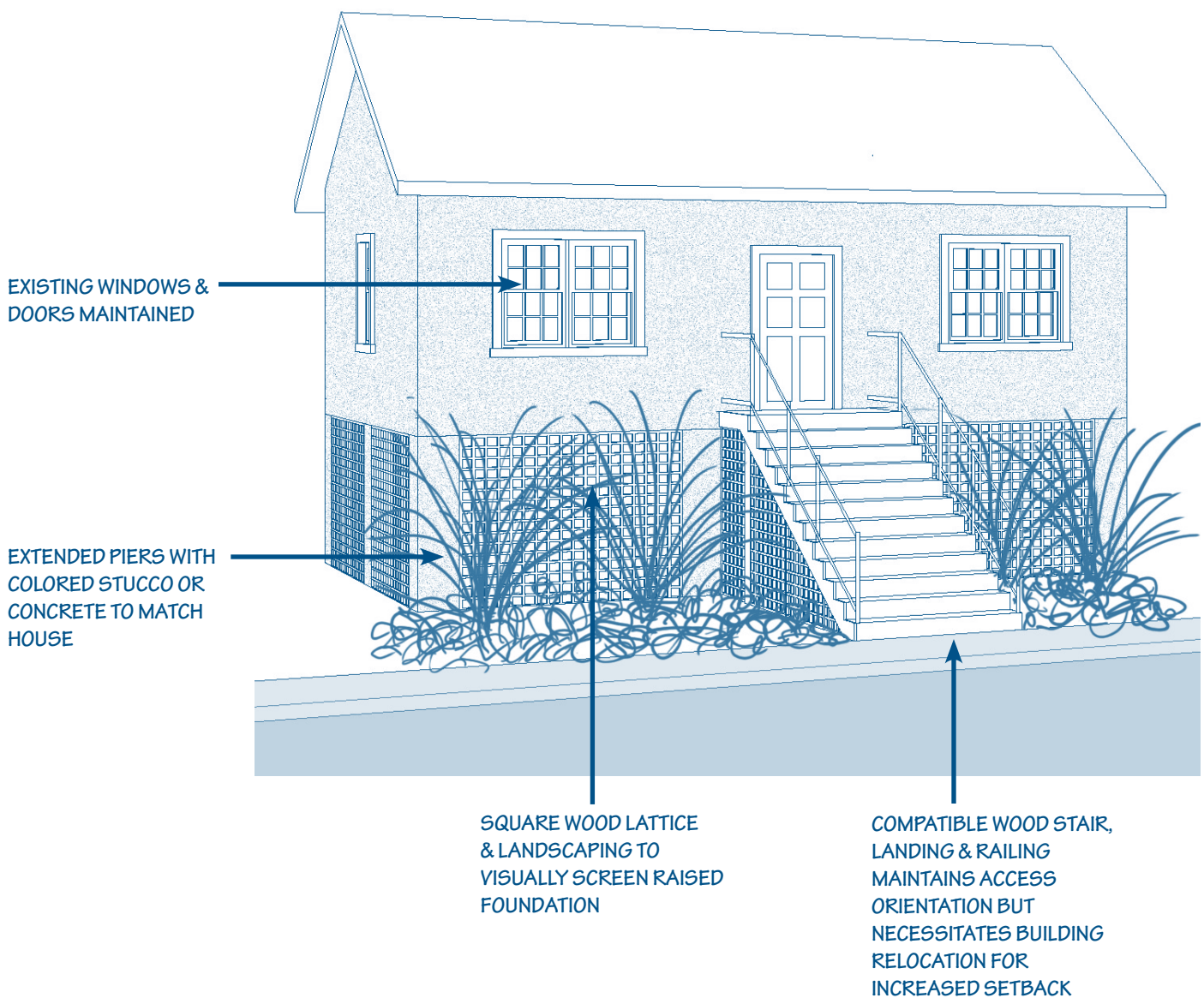
- Extended foundation walls with colored stucco or concrete
- Flood vents at side elevations
- Diagonal lattice between porch piers
- Stuccoed stair and landing oriented towards driveway and largely incorporated into porch



STUCCOED, 1-STORY, SIDE GABLE COTTAGE

FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE

14'-6" SETBACK TO MAINTAIN STAIR ORIENTATION



2'-4" ABOVE ADJACENT GRADE

- Extended piers with colored stucco or concrete to match house
- Square wood lattice between building piers and under wood stair
- Wood stair and landing necessitates increased setback to 6'-0"



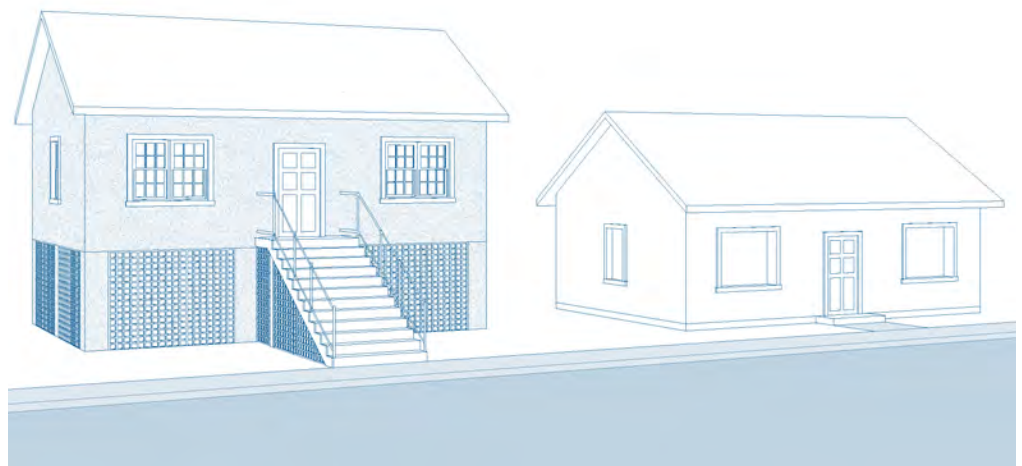
4'-8" ABOVE ADJACENT GRADE

- Extended piers with colored stucco or concrete to match house
- Square wood lattice between building piers and under wood stair
- Wood stair and landing necessitates increased setback to 10'-6"



7'-0" ABOVE ADJACENT GRADE

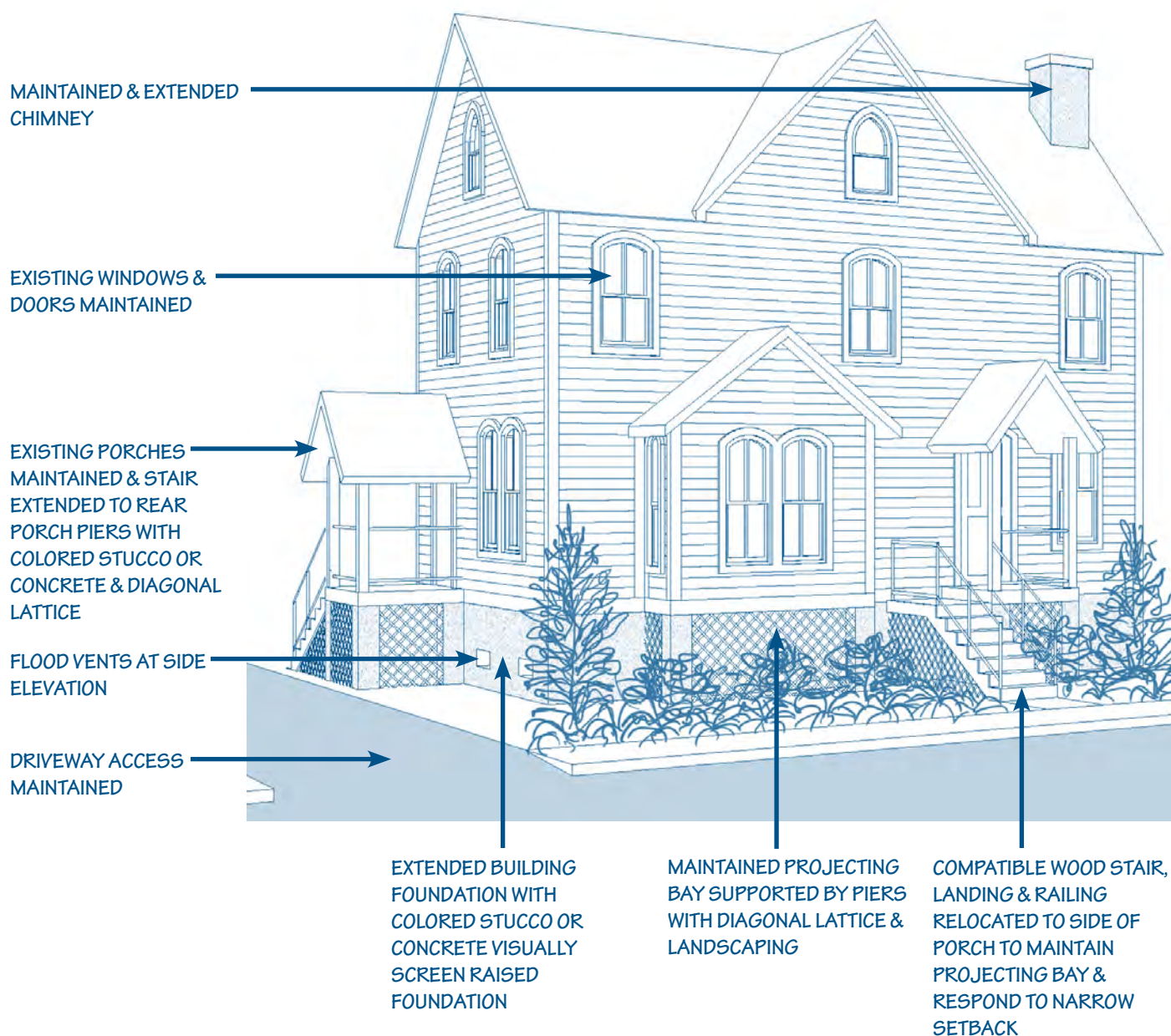
- Extended piers with colored stucco or concrete to match house
- Square wood lattice between building piers and under wood stair
- Wood stair and landing necessitates increased setback to 14'-6"



WOOD-FRAMED, 2-1/2-STORY, INTERSECTING GABLE WITH ENTRANCE PORCH & BAY

FIRST FLOOR 4'-8" ABOVE ADJACENT GRADE

10'-0" FRONT YARD SETBACK



2'-4" ABOVE ADJACENT GRADE

- Extended foundation walls with colored stucco or concrete
- Flood vents at side elevations
- Diagonal lattice between piers at porches and projecting bay
- Wood primary stair maintains access orientation
- Secondary stair and landing adjacent to driveway



4'-8" ABOVE ADJACENT GRADE

- Extended foundation walls with colored stucco or concrete
- Flood vents at side elevations
- Diagonal lattice between piers at porches and projecting bay
- Wood primary stair at side of porch to maintain projecting bay and respond to narrow setback
- Secondary stair and landing adjacent to driveway



7'-0" ABOVE ADJACENT GRADE

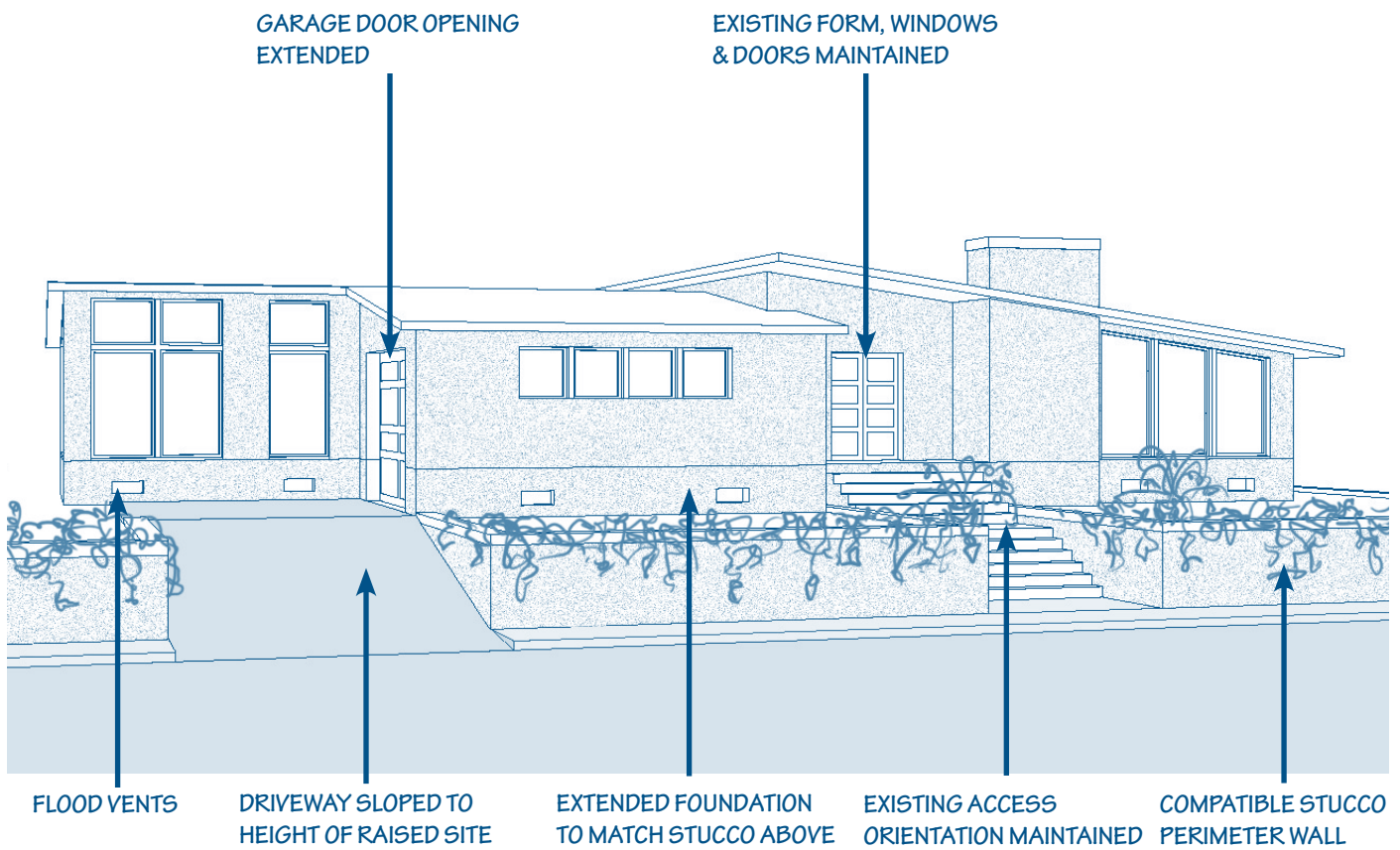
- Extended foundation walls with colored stucco or concrete
- Flood vents at side elevations
- Stair to sidewalk reorientated due to narrow front setback
- Diagonal lattice between porch piers
- Secondary stair and landing adjacent to driveway



STUCCOED, 1-STORY, WITH INTEGRATED GARAGE

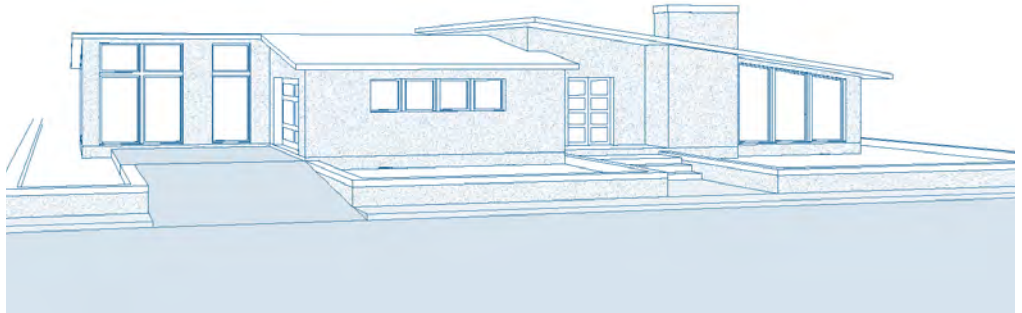
FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE

20'-0" FRONT YARD SETBACK



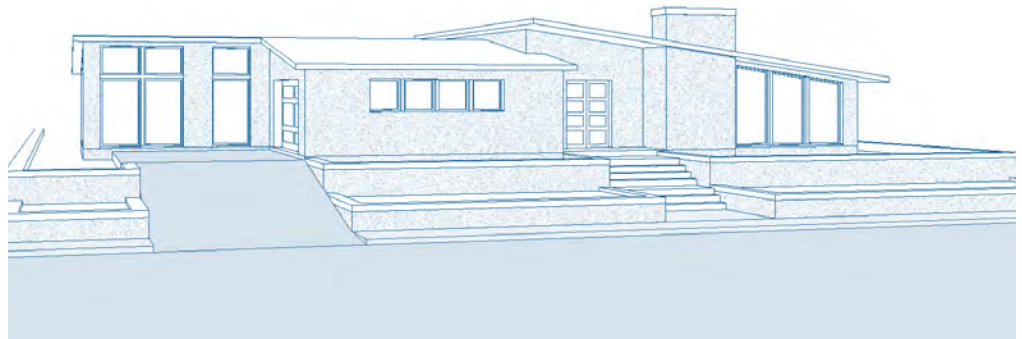
2'-4" ABOVE ADJACENT GRADE

- Building and site elevated
- Perimeter site wall with matching stucco
- Access orientation maintained with stair integrated into landscape walls
- Driveway sloped to elevated garage



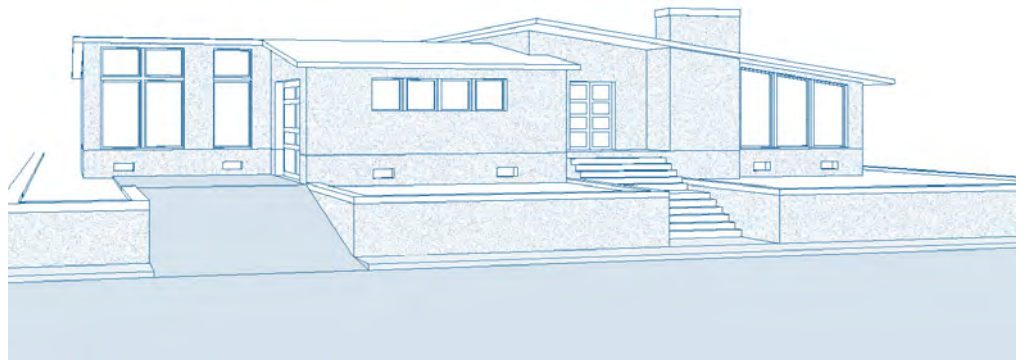
4'-8" ABOVE ADJACENT GRADE

- Building and site elevated
- Terraced perimeter site walls with matching stucco
- Access orientation maintained with stair integrated into landscape walls
- Driveway sloped to elevated garage



7'-0" ABOVE ADJACENT GRADE

- Site elevated to 4'-6"
- Extended foundation wall 2'-6" with matching stucco
- Flood vents installed at perimeter
- Terraced perimeter site walls with matching stucco
- Access orientation maintained with stair integrated into landscape walls
- Garage opening extended 2'-6" - Driveway sloped to elevated garage



STAIR CONFIGURATIONS

THE CONFIGURATIONS & DIMENSIONS OF STAIRS INCLUDED IN THE ILLUSTRATED CASE STUDIES CAN PROVIDE ASSIST IN DETERMINING APPROPRIATE OPTIONS FOR EXISTING SITE CONSTRAINTS AT AN ELEVATED HOUSE.

THE FOLLOWING ASSUMPTIONS WERE MADE REGARDING DIMENSIONS:

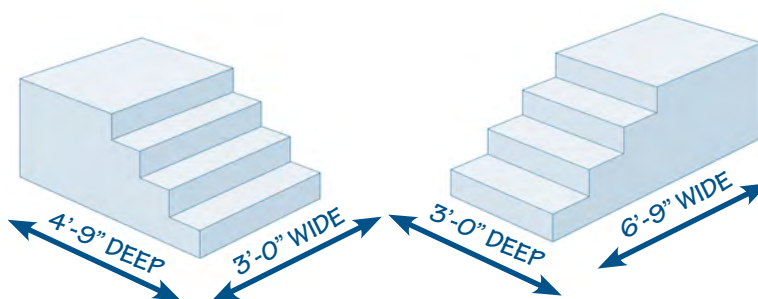
- LANDINGS ARE 3'-0" DEEP
- STAIRS ARE 3'-0" WIDE
- STAIR TREADS ARE 11" DEEP AND RISERS 7" HIGH
- THERE IS A STEP UP ONTO A PORCH FOR STAIRS WITHOUT A TOP LANDING

STAIR DIMENSION MATRIX

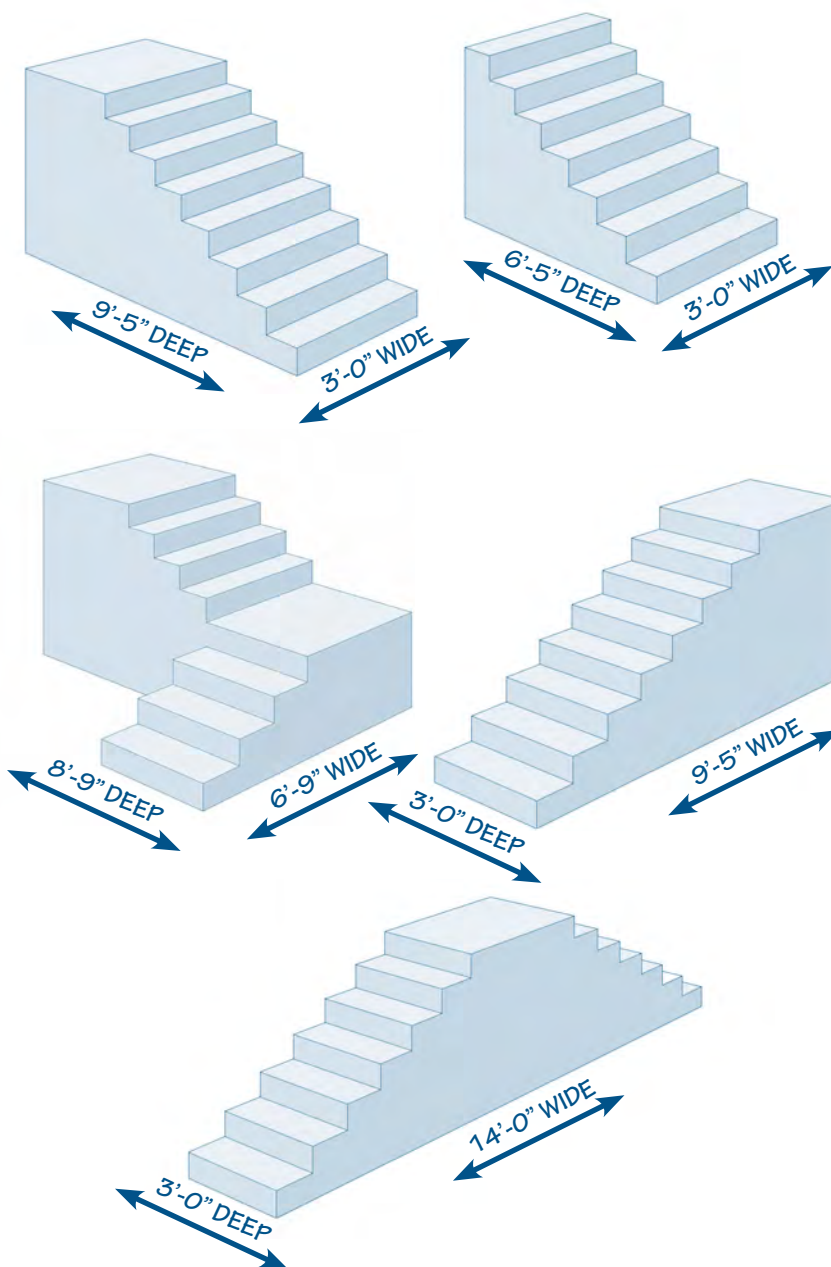
THE MATRIX BELOW CAN BE UTILIZED TO PLAN FOR EXTENDED STAIRS.

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

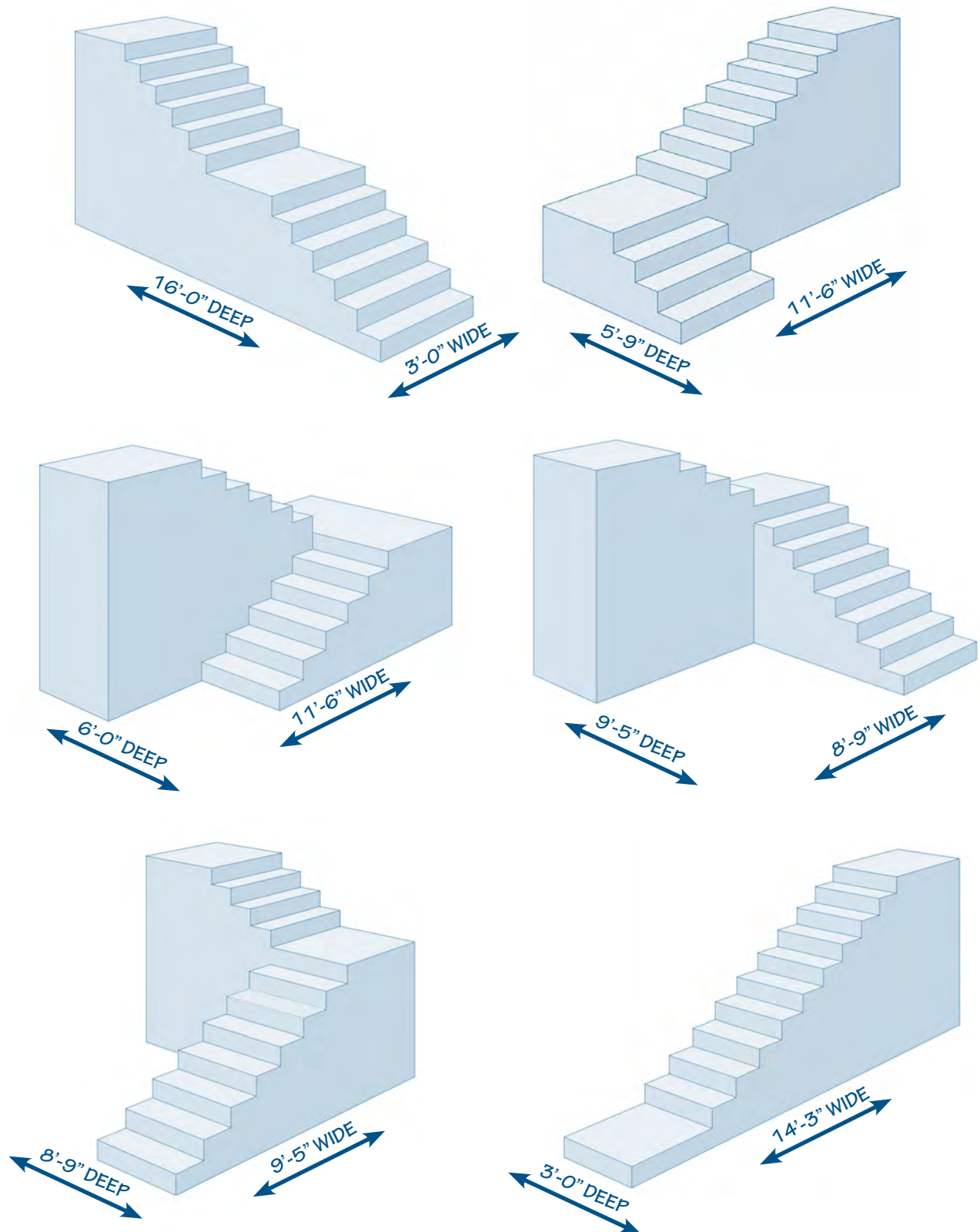
FIRST FLOOR 2'-4" ABOVE ADJACENT GRADE



FIRST FLOOR 4'-8" ABOVE ADJACENT GRADE



FIRST FLOOR 7'-0" ABOVE ADJACENT GRADE



HPC REVIEW CONSIDERATIONS

MAINTAINING EXISTING FEATURES

- Maintaining and extending house walls, porches, chimneys, and bays.
- Maintaining the historic configuration of window and door openings whenever possible.
- Maintaining historic landscape elements such as walkways, fences, and walls.
- Maintaining mature trees and shrubs.
- Limiting on-site driveways and parking to existing locations.

RELOCATING SYSTEMS AND EQUIPMENT

- Relocating all building systems and equipment out of flood prone areas to an inconspicuous location. Screening with landscaping or fencing as required.

EXTENDING BUILDING WALLS

- Extending masonry wall material or piers to match existing whenever possible. It may be necessary to utilize brick or stone veneers to meet National Flood Insurance Program (NFIP) requirements. If financially infeasible, utilize concrete or stucco color compatible to masonry.
- Installing flood vents on secondary elevations whenever possible. Using metal louvers and flood vents that are compatible in color to minimize the visual impact.
- Installing lattice or similar screening material between extended piers or piles. Lattice should be wood, when possible, and in a style compatible to the house. Typically, square lattice at Colonial Revival houses and diagonal lattice at Victorian period houses. Horizontal lattice is typically not appropriate at historic residences.

EXTENDING PORCHES

- Locating porch piers under center line of columns and at corners of stair landings. Porch piers should match historic masonry whenever possible. It may be necessary to utilize veneers to meet National Flood Insurance Program (NFIP) requirements. If financially infeasible, utilize concrete or stucco color compatible to masonry.
- Increasing height may require introduction of a new porch railing. If so, the railing should be compatible to the style of the house in materials and detailing.

EXTENDING STAIRS

- Maintaining principal exterior building access orientation and features for stairs, including railings and landings whenever possible.
- Constructing new stairs and landings of materials compatible for house. At wood framed houses and porches, wood stairs are generally more appropriate. At stone or brick houses without a porch, stone or brick, or a combination of both tend to be more appropriate and add visual interest.
- Selecting railings compatible with the historic character of the house that are of traditional materials and detailing including terminations such as newel posts at wood railings and lambs tongues at metal railings.

LANDSCAPING

- Avoiding the introduction of parking in front yards or under houses. Limiting the introduction of curb cuts in front of houses and garage doors below elevated foundations.
- Replacing asphalt or concrete driveways with permeable material to improve storm water absorption.
- Installing landscaping of varying heights and forms, including evergreens, to add visual interest along the sidewalk complementing symmetrical arrangement of façade.
- Selecting and locating plantings in a manner that does not interfere will flood vent operation.
- Selecting native vegetation that is compatible to location to minimize the need for watering and fertilization.
- Installing fences or walls to conceal raised foundations or relocated systems and equipment.

GARAGES

- Garages and storage are permissible uses below the DFE. However, to meet NFIP requirements, flood vents must be installed below the BFE. Garage doors do not meet the requirements of flood vents.
- Constructing garages that are compatible to the historic nature of the residence and neighborhood character.
- Providing access to garage space or installing garage doors on a building façade should be avoided.

Appendix Glossary

ACRONYMS

CRS: Community Rating System

DFE: Design Flood Elevation

DFIRM: Digital Flood Insurance Rate Map

FEMA: Federal Emergency Management Agency

FIRM: Flood Insurance Rate Map

GIS: Geographic Information System

HPC: Historic Preservation Commission

LiMWA: Limit of Moderate Wave Action

NFIP: National Flood Insurance Program

NJ HPO: New Jersey Historic Preservation Office

NJHT: New Jersey Historic Trust

NJOEM: New Jersey Office of Emergency Management

NOAA: National Oceanic and Atmospheric Administration

NPS: National Park Service

SFHA: Special Flood Hazard Area

The definition sources referenced in the glossary:

- **FEMA:** Federal Emergency Management Agency
- **NFPI:** National Flood Insurance Program, 44.CFR.59.1 Definitions
- **NJ FDPO:** New Jersey Flood Damage Prevention Ordinance - (60.3) Best Available Data Model Type D&E (2019)
- **NOAA:** National Oceanic and Atmospheric Administration

Local floodplain management definitions may vary. Consultation with the municipal floodplain ordinance is recommended.

1% Annual Chance Floodplain (100-year Floodplain) — An area that has a 1% chance of flooding in any given year. Properties can experience a “100-year flood” in two consecutive years, just as it is possible for properties to flood even if they are located outside of the floodplain, particularly in a severe weather event such as a hurricane.

0.2% Annual Chance Floodplain (500-year Floodplain) — An area that has a 0.2% chance of flooding in any given year.

AH Zone — Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. (NJ FDPO)

AO Zone — Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. (NJ FDPO)

Area of Special Flood Hazard — Land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year. It is shown on the FIRM as Zone V, VE, V1-30, A, AO, A1 A30, AE, A99, or AH. (NJ FDPO)

Base Flood — A flood having a one percent chance of being equaled or exceeded in any given year. (NFIP / NJ FDPO)

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

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

Breakaway Wall — A wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces without causing damage to the elevated portion of the building or supporting foundation system. (NFIP / NJ FDPO)

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

Coastal High Hazard Area — An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. (NFIP / NJ FDPO)

Climate Change — Climate is determined by the long-term pattern of oceanic and atmospheric conditions at a location. Climate is described by statistics, such as means and extremes of temperature, precipitation, and other variables, and by the intensity, frequency, and duration of weather events. Over Earth's history, indications of climate change have been recorded in fossils and ice core samples. At one extreme, climate change can result in extended periods of heat and drought; at the other, extensive glaciation. Currently, our planet's global surface temperature is rising. This change is linked to human activities that increase the amount of greenhouse gases (e.g., carbon dioxide and methane) in the atmosphere. It is important to understand climatic processes because they have the potential to affect environmental conditions. (NOAA)

Community Rating System (CRS) – A voluntary program for National Flood Insurance Program (NFIP) participating communities. The goals of the CRS are to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management. (FEMA)

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

Digital Flood Insurance Rate Maps (DFIRMs) – Digitally converted flood insurance maps developed in conjunction with FEMA.

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

Event Flooding – Occasional flooding that has a specific cause, typically a storm or a devastating failure of infrastructure.

Elevated Building — A non-basement building

- (i) built, in the case of a building in an Area of Special Flood Hazard, to have the top of the elevated floor or, in the case of a building in a Coastal High-Hazard Area or Coastal A Zone, to have the bottom of the lowest horizontal structural member of the elevated floor, elevated above the base flood elevation plus freeboard by means of piling, columns (posts and piers), or shear walls parallel to the flow of the water, and
- (ii) adequately anchored so as not to impair the structural integrity of the building during a flood up to the magnitude of the base flood.

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

Erosion — The process of gradual wearing away of land masses. (NJ FDPO)

Existing Construction — For the purposes of determining rates, structures for which the “start of construction” commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. “Existing construction” may also be referred to as “existing structures.” (NFIP – Note: Also known as “Pre-FIRM”)

Flood or Flooding — A general and temporary condition of partial or complete inundation of normally dry land areas from:

- a) The overflow of inland or tidal waters and/or
- b) The unusual and rapid accumulation or runoff of surface waters from any source. (NJ FDPO)

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

Flood Elevation Determination – A determination by the Administrator of the water surface elevations of the base flood, that is, the flood level that has a one percent or greater chance of occurrence in any given year. (NFIP)

Flood Insurance Rate Map (FIRM) — The official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community. (NJ FDPO – Note: These maps are based upon historical flood information and are updated periodically. They do not include anticipated sea level rise or climate change.)

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

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

Floodplain Management — The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works, and flood plain management regulations. (NFIP)

Floodplain Management Regulations — Zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance and erosion control ordinance), and other applications of police power. The term describes such State or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction. (NFPI / NJ FDPO)

Floodproofing — Any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures, and their contents. (NFPI / NJ FDPO)

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

Floodproofing, Dry — The floodproofing method that, as specified in ASCE 24, is used to render a structure’s envelope substantially impermeable to the entrance of floodwaters.

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

Floodway — The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than 0.2 foot. (NJ FDPO)

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

Highest Adjacent Grade — The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure. (NFPI / NJ FDPO)

Historic Structure — Any structure that is:

- a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- b) 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;
- c) 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; or
- d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
 - (1) By an approved State program as determined by the Secretary of the Interior; or
 - (2) Directly by the Secretary of the Interior in States without approved programs. (NFPI / NJ FDPO)

Integrity — The ability of a property to convey its historic significance.

Limit of Moderate Wave Action (LiMWA) — Inland limit of the area affected by waves greater than 1.5 feet during the Base Flood. Base Flood conditions between the V Zone and the LiMWA will be similar to, but less severe than those in the V Zone. (NJ FDPO)

Lowest Floor — The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for the parking of vehicles, building access or storage in an area other than a basement is not considered a building’s lowest floor provided that such enclosure is not built so to render the structure in violation of other applicable non-elevation design requirements of 44 CFR Section 60.3. (NFPI / NJ FDPO)

Mean Sea Level — For purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community’s Flood Insurance Rate Map are referenced. (NFIP)

New Construction — Structures for which the start of construction commenced on or after the effective date of a floodplain regulation adopted by a community and includes any subsequent improvements to such structures. (NJ FDPO)

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

100-year Flood — See base flood. (NFIP)

Participating Community, also known as an Eligible Community — A community in which the Administrator has authorized the sale of flood insurance. (NFIP)

Persistent (“Nuisance”) Flooding — Minor flooding which typically results in traffic problems, road closures, overwhelmed storm drains, and occasionally infrastructure damage, in addition to public inconvenience and business interruptions.

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

Preliminary Flood Insurance Rate Map (pre FIRM) — The draft version of the FIRM released for public comment before finalization and adoption. (NJ FDPO)

Repetitive Loss Property — An NFIP-insured structure that has had at least 2 paid flood losses of more than \$1,000 each in any 10-year period since 1978. (FEMA)

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

Sea Level Rise — A result of climate change, refers to the increased average elevation of coastal waters. The increased height of the seas can cause low lying coastal areas, such as those along the Delaware Bay and Atlantic Ocean, to experience more frequent flooding.

Severe Repetitive Loss Property — Any building that:

1. Is covered under a Standard Flood Insurance Policy;
2. Has incurred flood damage for which:
 - a. 4 or more separate claim payments have been made under a Standard Flood Insurance Policy with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claims payments exceeding \$20,000; or
 - b. At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss. (FEMA)

Special Flood Hazard Area — See “area of special flood hazard.” (NFPI)

Special Hazard Area — An area having special flood, mudslide (i.e., mudflow), or flood-related erosion hazards, and shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, A99, AH, VO, V1-30, VE, V, M, or E. (NFIP)

Start of Construction — (For other than new construction or substantial improvements under the Coastal Barrier Resources Act (P.L. No. 97-348)) includes substantial improvements and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site such as the pouring of a slab or footings, the installation of pilings, the construction of columns, or any work beyond the stage of excavation, or the placement of a manufactured home on a foundation.

Permanent construction does not include land preparation, such as clearing, grading and filling nor does it include the installation of streets and/or walkways, nor does it include excavation for a basement, footings or piers, or foundations or the erection of temporary forms, nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building. (NFPI / NJ FDPO)

Storm Surge — The abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. The surge is caused primarily by a storm's winds pushing water onshore. The amplitude of the storm surge at any given location depends on the orientation of the coast line with the storm track; the intensity, size, and speed of the storm; and the local bathymetry. (NOAA)

Structure — A walled and roofed building, a manufactured home, or a gas or liquid storage tank that is principally above ground. (NJ FDPO)

Subsidence — The lowering of ground plane elevation that results from geological factors and the compression of land mass following the extraction of groundwater from underground aquifers. Subsidence can exacerbate other types of flooding and increase the frequency of tidal flooding in low-lying areas, particularly when coupled with sea level rise.

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

Substantial Improvement — Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds fifty (50) percent of the market value of the structure before the “start of construction” of the improvement. This term includes structures which have incurred “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either:

- a) Any project for improvement of a structure to correct existing violations of State or local health, sanitary or safety code specifications which have been identified by the local code enforcement officer and which are the minimum necessary to assure safe living conditions; or
- b) Any alteration of a “historic structure,” provided that the alteration will not preclude the structure’s continued designation as a “historic structure.” (NFIP (50%) / NJ FDPO)

Variance — A grant of relief from the requirements of this ordinance that permits construction in a manner that would otherwise be prohibited by this ordinance. (NJ FDPO)

Violation — The failure of a structure or other development to be fully compliant with this ordinance. A new or substantially improved structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in 44 CFR §60.3(b)(5), (c)(4), (c)(10), (e)(2), (e)(4), or (e)(5) is presumed to be in violation until such time as that documentation is provided. (NJ FDPO)

V Zone — See “coastal high hazard area.” (NFIP)

Water Surface Elevation — The height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929, (or other datum, where specified) of floods of various magnitudes and frequencies in the flood plains of coastal or riverine areas. (NFIP)

Appendix B Flood Resources

The Federal Emergency Management Agency (FEMA) has numerous publications available to address construction in flood-prone areas available on their website at www.fema.gov. *(Refer to Appendix B: Bibliography, Flood Mitigation Guide for Historic Properties for additional resources.)*

Hurricane Sandy in New Jersey and New York: Mitigation Assessment Team Report - Recovery Advisories and Fact Sheets for Hurricane Sandy

- RA1. Improving Connections in Elevated Coastal Residential Buildings (February 2013)
- RA2. Reducing Flood Effects in Critical Facilities (April 2013)
- RA3. Restoring Mechanical, Electrical, and Plumbing Systems in Non-Substantially Damaged Residential Buildings (April 2013)
- RA4. Reducing Interruptions to Mid- and High-Rise Buildings During Floods (March 2013)
- RA5. Designing for Flood Levels Above the BFE After Hurricane Sandy (April 2013)
- RA6. Protecting Building Fuel Systems from Flood Damage (April 2013)
- RA7. Reducing Flood Risk and Flood Insurance Premiums for Existing Residential Buildings in Zone A (November 2013)
- Fact Sheet 1. Cleaning Flooded Buildings (May 2013)
- Fact Sheet 2. Foundation Requirements and Recommendations for Elevated Homes (May 2013)

FEMA Fact Sheets

- Community Rating System (June 30, 2017)
- Historic Structures and The Biggert-Waters Flood Insurance Reform Act of 2012
- Historic Preservation and Cultural Resources: Protecting Our Heritage (July 2016)
- Technical Fact Sheet 1.2: Summary of Coastal Construction Requirements and Recommendations

FEMA Technical Bulletins

- Technical Bulletin 0: User's Guide to Technical Bulletins (July 2019)
- Technical Bulletin 1: Openings in Foundation Walls and Walls Of Enclosures (2008)
- Technical Bulletin 2: Flood Damage-Resistant Materials Requirements (August 2008)
- Technical Bulletin 3: Non-Residential Floodproofing - Requirements and Certification (1993)
- Technical Bulletin 4: Elevator Installation (November 2010)
- Technical Bulletin 5: Free-Of-Obstruction Requirements (August 2008)
- Technical Bulletin 6: Below-Grade Parking Requirements (1993)
- Technical Bulletin 7: Wet Floodproofing Requirements (1993)
- Technical Bulletin 8: Corrosion Protection for Metal Connectors in Coastal Areas (1996)
- Technical Bulletin 9: Design and Construction Guidance for Breakaway Walls (June 2019)
- Technical Bulletin 10: Ensuring That Structures Built on Fill in or Near Special Flood Hazard Areas Are Reasonably Safe from Flooding (May 2001)
- Technical Bulletin 11: Crawlspace Construction (November 2001)

FEMA P-234: Repairing Your Flooded Home (October 2010)

FEMA P-259, 3rd Edition: Engineering Principles and Practices of Retrofitting Floodprone Residential Structures (2012)

FEMA P-312, 3rd Edition: Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home from Flooding (2014)

FEMA P-348, Edition 1, Protecting Building Utilities from Flood Damage (2019)

FEMA 386-6, Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning (2006)

FEMA P-467-2, Floodplain Management Bulletin: Historic Structures (2008)

FEMA P-499 Home Builder's Guide to Coastal Construction (2010)

FEMA P-758 Substantial Improvement/Substantial Damage Desk Reference (2010)

FEMA P-1037 Reducing Flood Risk to Residential Buildings That Cannot Be Elevated (September 2015)

ADDITIONAL RESOURCES

Historic England. *Flooding and Historic Buildings.*

<https://historicengland.org.uk/advice/technical-advice/flooding-and-historic-buildings/>

Historic Scotland. *Flood Damage to Traditional Buildings.*

www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=13349883-20bf-48ec-afd9-a59500e9a44e

Livingston, Dennis. *Rebuilding Water-Damaged Homes*

<https://ag.purdue.edu/extension/eden/Mold/AFHH-manual.pdf>

National Trust for Historic Preservation. *Treatment of Flood Damaged Older and Historic Buildings.* (Information Booklet No. 82, 1993.)

www.ncptt.nps.gov/wp-content/uploads/NTHP-Information-Booklet-82-Flood-Damage-and-Older-Homes.pdf?b5c287

