Resilient Building Design Guidelines

October 19th 2015

Acknowledgments

Many thanks are due to the City of Hoboken's staff who have worked in cooperation with Princeton Hydro to produce these Resilient Building Design Guidelines. This project was funded in part by a New Jersey Department of Community Affairs grant obtained in 2014 by the City.

Special thanks to:

The Honorable Dawn Zimmer - Mayor
Stephen D. Marks, PP, AICP, CFM, LEED GA - Assistant Business Administrator
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"If we are to learn anything from Superstorm Sandy, it is that the fabric of our city must be built back stronger and more resilient, and we must make smarter development choices."
Mayor Dawn Zimmer

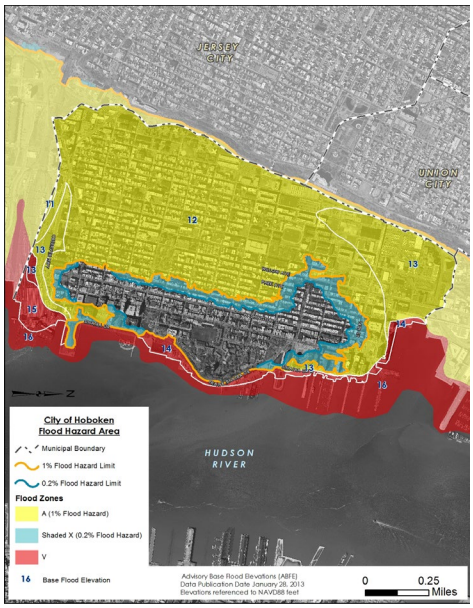
The City of Hoboken is a dense urban landscape of historic brownstones, mid-rise and high-rise residential and mixed-use buildings and ground-level retail establishments. The City's streets, sidewalks, trees, buildings and open spaces are intricately knit together into attractive neighborhoods and engaging streetscapes where shopping, dining and the daily necessities are just around the corner and generally located at grade level.

Severe coastal storms like Hurricane Sandy bring unprecedented flooding, massive evacuations, business interruptions and extensive property damage. Even infrequent repeat flooding can produce serious disruptions to the lives of residents, the operation of businesses and management of the City. All flooding can cause loss of life and property, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and reduction in property values.

However, Hurricane Sandy was not the only time the City has experienced flooding. Hoboken's 2.3 miles of coastal exposure and 94% impervious coverage makes the city particularly vulnerable to both frequent flooding and severe storm surges. Hoboken's relatively low ground elevation, limited infiltration potential and the City's aging combined sewer system all contribute to this situation. With the long-term impacts of climate change and sea level rise likely to cause more frequent flood events, the City must prepare a comprehensive land use policy, as well as specific site design guidance, that addresses these vulnerabilities.

Designing and building in dense, urban, flood-prone areas require special approaches and techniques to make sure residents and businesses experience minimal disruption and damage during and after a storm. Hoboken's Flood Damage Prevention Ordinance (Chapter 104), the City's Zoneing Code (Chapter 196), New Jersey's Uniform Construction Code (UCC), and International Building Codes (IBC) govern flood area construction. These laws, codes, and regulations determine the type of structures foundations and materials that are to be used to build resilient structures in flood prone areas.

Map of the City of Hoboken's Regulatory Flood Hazard Area



See page 44 for a full page map of the City's Flood Hazard Area.

Using these Guidelines

These guidelines provide an overview of the laws and regulations governing construction within Hoboken's flood-prone areas, as well as the approval process for repairs, improvements, and new construction. It also provides flood resilience strategies for residents, property and building owners, developers, and businesses. These design guidelines should be used by designers and builders as a guide for making post-mitigation buildings relate well to one another while preserving connectivity with a pedestrian-friendly streetscape and enhancing the character of Hoboken's neighborhoods.

If you are repairing, improving or building a structure in the City's Special Flood Hazard Area (SFHA), mapped on page 44, you will follow the approval process and project checklist for your project type on the following pages. Projects are either considered Rehabilitation (pg.8) (minor repairs), Substantial Improvement (pg.12) (non-minor repairs and renovation), or New Construction (pg.14). A description of each project type can be found in this guide. If you are still unsure about which applies to your project you should contact the City's Floodplain Administrator.

Also included in these guidelines are strategies for reducing your flood insurance premiums. This document includes information on using flood resilient building materials, permitted uses for areas below the Design Flood Elevation (DFE), floodproofing measures, protecting utilities and mechanical systems, and foundation design.

Are you in the Special Flood Hazard Area (SFHA)?

Use the map on page 44 to determine if your property is within a regulated flood zone and what the base flood elevation is for that zone.

What is your Design Flood Elevation (DFE)?

DFE = BFE + Freeboard

The DFE is the elevation to which construction is regulated in the City of Hoboken. It is calculated by taking the base flood elevation on the Adopted Regulatory Flood Maps and adding required freeboard. Freeboard is a specified height above the anticipated flood elevation,that accounts for future conditions and limitations in estimating flood elevations. See page 44&45 for the regulatory flood map to identify the DFE for your property.

THE APPROVAL PROCESS

A Construction Permit is required for most repairs and for all renovation or improvements made to a building or piece of property. If the property is located within the Special Flood Hazard Area and the renovations are substantial, or new construction is proposed, a Floodplain Permit must also be obtained.

The design review process is virtually the same for homeowners, building and property owners, businesses and developers, although requirements for compliance may vary based on the building type and amount of work being proposed.

The Project Review and Approval Process

1. Determine whether your property is located in a Special Flood Hazard Area (SFHA) and what the required design flood elevation (DFE) is. (See page 44)

2. Obtain an Elevation Certificate (EC) or site survey with spot elevations from a licensed Professional Land Surveyor. The EC must be provided on *FEMA Form OMB No. 1660-0008* or newer. A sample Elevation Certificate can be found on page 46.

3. Work with a licensed Professional Architect to design your construction or renovation to meet resilient Flood Damage Prevention and Uniform Construction Code requirements.

4. Use the following checklist to prepare your permit application. Remember, the Floodplain Administrator is available for consultation at any step along the way so don't hesitate to contact the office for guidance and assistance.

5. When application documents and architectural plans are ready they must be submitted to the Floodplain Administrator. The Administrator will review the plans for compliance with the Flood Damage Prevention Code and issue a permit, or a denial with specific changes that must be made to the plans before they can be approved. Some minor repairs or replacements may not require submission of architectural drawings. In such a case you would submit a detailed description of the work and material or equipment specifications along with the Elevation Certificate or survey.

6. Once the Floodplain Permit, Zoning Certificate, and any other required approvals have been obtained, an application is made to the Construction Code Office for plan review and Building Permits.

7. Depending on the work that is to be done interim inspections may be required by both the Construction Code Official and the Floodplain Administrator. You need to be aware of any required inspections and make sure the proper official is called to conduct a site inspection. If an interim inspection is missed, and the code official cannot verify the work that was done, they may require deconstruction of some or all of the work that was done after the missed inspection.

8. When construction or renovation work is completed on an area of a building below flood elevation a new as-built EC must be provided to the Floodplain Administrator prior to final inspection. For floodproofed buildings, an engineer-certified FEMA Floodproofing Certificate will be required instead of an as-built EC. The new EC or Floodproofing Certificate will also be required by your flood insurance company for rate adjustment.

9. After all final inspections are complete, a Certificate of Occupancy (CO), Certificate of Continued Occupancy (CCO) or Certificate of Approval (CA) will be issued by the Zoning Officer and Construction Official to close out the issued permits.

Emergency Work

When an emergency threatens a structure or property with imminent destruction or emergency work is required to protect the health and safety of the occupants, the Construction Official or Floodplain Administrator can make an exception to the standard permit approval procedure. However, beyond basic stabilization, any work to demolish, repair or rehabilitate the structure or property will require permits that can only be secured through the approval process. All projects should review these guidelines for ways to minimize future damage.

What qualifies for emergency work?

Any work to restore or deliver essential services or abate life-threatening conditions.

Credit: Liz Roll, FEMA

To Obtain a Floodplain Permit You Will Need:

- ☐ A completed application;
- ☐ Any applicable permit fees
- ☐ An Elevation Certificate or Property Survey with spot elevations showing the elevation of the lot, the adjacent sidewalk, and grade adjacent to the four corners of any existing structures; and
- ☐ Architectural drawings of the proposed work including, but not limited to:
  - Façade drawings and sections that show the height of each floor relative to sea level and DFE. The current standard of measurement is North America Vertical Datum of 1988 (NAVD88). The dataset may be revised from time-to-time and the new standards adopted by FEMA.
  - Location of flood vents and calculation of coverage area.
  - Specifications for flood resistant materials to be used and where.
  - Specifications for backflow prevention on any new or replacement waste water lines.
  - Location and elevation of all utility connections, meters, pumps and mechanical equipment.
  - Dry-floodproofing specifications where applicable.
  - Engineering details of any foundation or structural reinforcements, where applicable.

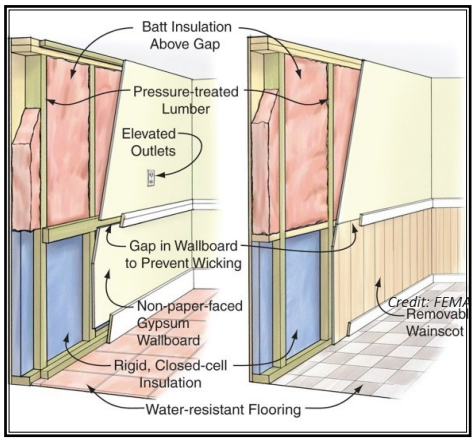
An existing structure located within the Special Flood Hazard Area (SFHA) may be rehabilitated and may continue to be used as it exists provided the cost of the proposed renovation or repairs made to the structure do not exceed 50% of the value of the structure. For more on Substantial Improvement guidelines see page 12.

When rehabilitating any part of a structure in the SFHA that falls below the Design Flood Elevation (DFE) flood resistant building materials must be used and prescribed construction methods are to be followed. Page 24 shows a sampling of building materials that are acceptable for use in the floodplain and materials that are not. A more complete and detailed list can be found in *FEMA Technical Bulletin 2: Flood Damage-Resistant Materials Requirements (2008)*. FEMA Technical Bulletins are referred to throughout these guidelines. These bulletins are updated periodically. Check the FEMA website or ask the Floodplain Administrator for the most recent version.

These materials are chosen because of their resistance to water damage and mold. Use of the specified materials may increase the cost of renovation by 3-5%, but will reduce the time and expense of recovery from future flooding. For example, standard paper-coated sheetrock and fiberglass insulation act like sponges drawing moisture up the wall much higher than the water level reached by the flooding. As a result, moisture can easily be trapped creating the perfect environment for mold growth; and more material needs to be cut away and replaced. Closed-cell foam insulation is mold resistant, can get wet and will dry completely without having to be replaced. Such materials can reduce or eliminate the need for replacement.

Loss of electricity, heat and hot water significantly increase the amount of recovery time after any natural disaster such as a flood, heavy snow, ice storm or earthquake. For that reason, all new or replacement utility connections, breaker panels and meters must be elevated above DFE. Mechanical equipment such as HVAC, boilers, and water heaters should also be relocated above DFE whenever possible. It is important not only to protect the equipment from flood damage, but also to prevent gas and oil from mixing with flood water contributing to other environmental risks. Where relocation is not possible, equipment should be elevated to the greatest extent possible.

When electrical wiring is replaced in an area below flood elevation, it should be installed "top-down" and outlets should be elevated. Trunk lines for standard electrical installation run through the lower half of the wall to outlets 12-18" above the floor. In flood prone areas the main lines should be run through the ceiling or upper wall then down to switches and outlets set at mid-wall height. Any wiring installed below the DFE must be water-resistant.

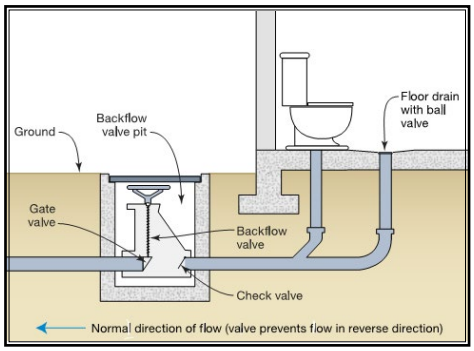


Please consult page 23 and 24 for recommendations on materials.

Credit: FEMA

Garden Apartment

Many areas of Hoboken may have garden apartments that are considered basement to the NFIP. Refer to the regulating floodplain map to see if your garden apartment is within the floodplain.



Backflow prevention measures are required on new and replacement sewer lines.

Credit: FEMA

When rehabilitating any living space below flood elevation there are other things to take into consideration that may have a significant impact on reducing flood risk and lowering the cost of flood insurance. Some recommendations are listed below. You may also wish to consult the city's Flood Plain Administrator for other ideas and local best practices.

A "garden apartment" may be insured under the National Flood Insurance Program (NFIP) but if the unit is below grade on all four sides it is considered by FEMA and the NFIP to be a "basement" and not a living space. Contents and structural elements found in a normal dwelling such as flooring, drywall, kitchen and bathroom fixtures and finishes may not be covered in the event of flooding.

A great example of a residential retrofit can be found on page 30. This condo association was able to reduce their flood insurance by $12,000 by raising the basement floor, installing flood vents, and elevating utilities & mechanical equipment.

Requirements

- If the space to be renovated is below Design Flood Elevation (DFE), design standards dictate that the materials to be used for reconstruction are flood damage resistant.
- All new or replacement utility connections must be located at or above the DFE.
- All new mechanical equipment must be located above DFE.
- Backflow prevention measures are required on new and replacement sewer lines.

Recommendations

- Any crawl space or cellar completely below grade should be filled in and eliminated
- The floor of the lowest encolsed area should be at or above the lowest adjacent grade on at least one side of the building; this area should be fitted with engineered flood vents.
- Dwelling units below grade should be elevated or eliminated whenever possible.
- Consider a change of use. Non-residential uses such as commercial offices and retail spaces are permitted below DFE and can be dry flood-proofed, where as a residential use cannot.
- Install a backflow prevention system to prevent sewage from backing up into the building.

The Scenario

There are many ways to retrofit an existing building and the following example is presented to give the reader some ideas. Moving utilities, elevating the lowest floor and installing engineered flood vents as a means to decrease flood exposure and reduce flood insurance premiums is exemplified in the following case study. Each situation is different and requires a unique solution. Consider the techniques in these Resilient Building Design Guidelines and discuss your options with the City of Hoboken Floodplain Administrator.

A 4-Unit condo building had a subgrade, full-height enclosure (basement) below the living floor. The building is located in an AE floodzone with a 9' Base Flood Elevation (BFE).

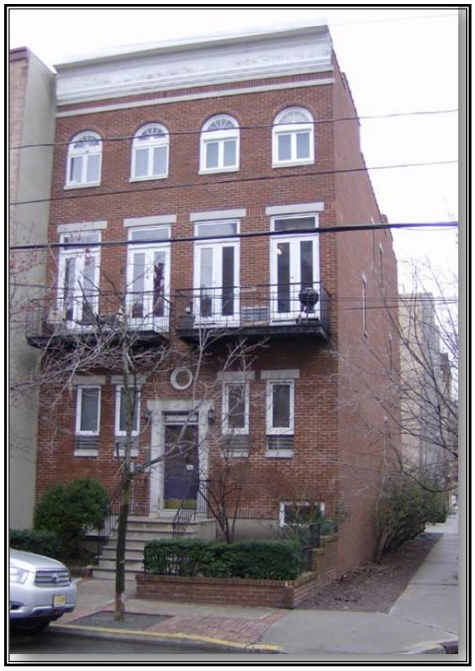
The bottom floor had an elevation of 2.8' and the Lowest Adjacent Grade (LAG) was at 4.2' making it 17" subgrade (subgrade is an NFIP designation that is given to a property when the lowest floor is lower on all four sides than the LAG).

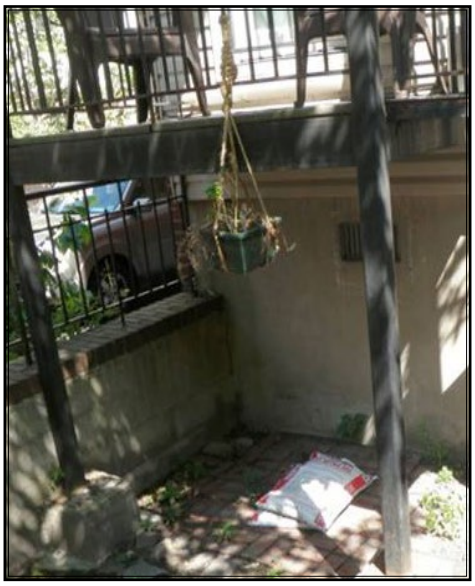
The enclosure also did not have the proper flood opening ratio which leaves the structural walls vulnerable to hydrostatic pressure that could result in devastating damage.

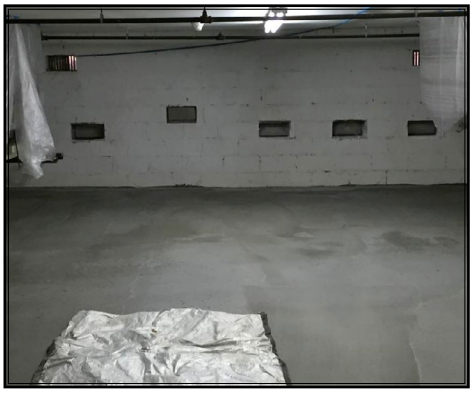
The combination of a subgrade enclosure and inadequate venting leads to a -6 lowest floor rating. The only machinery located in the enclosure were 4 water heaters on platforms.

In this condition the insurance premium was $14,000 for $300,000 worth of coverage.

One of the condo owners contacted a consultant that specializes in this area, on behalf of the Homeowners Association looking for ways to lower the premium. The first non-compliance issue that needed to be addressed was the subgrade classification. The second was the lack of proper flood vents. The consultant produced a risk report showed that if these changes were made the insurance premium would drop to $2,000 a year total and they would receive $500,000 more in building coverage.







Credit (all photos): Smartvent, Inc

The Solution

To fix the subgrade issue the enclosure floor was heightened and engineered flood vents were installed. Vent ratio to enclosed area is a critical component to risk and premium reduction.

To fix the subgrade issue the enclosure floor was heightened by 17". To do this stone was first laid and compacted, then a flowable concrete fill was added on top. After the fill was complete, 7 engingeerd flood vents were added to the back and side wall. The vents were installed on 2 different walls and within 12" above the adjacent grade to meet FEMA requirements. Vent ratio to enclosed area is a critical component to risk and premium reduction.

After the retrofit, the premium was reduced to $2,000, or only $500 per owner verses $14,000 or $3500 per owner. Additionally, their coverage was increased to $800,000. This 85% reduction in yearly premium with a return on investment of 2.5 years is very typical. Over 10 years the savings will be $120,000.

Filling an enclosed area in an urban community can be complicated and expensive yet every situation is different. Venting and eliminating a subgrade space often leads to dramatic premium reductions because the risk is lowered significantly. In some situations the subgrade may only be 6" lower than the outside grade.

Simple grading or additional measurements by the surveyor may offer the same savings with little investment. It's impossible to accurately estimate the reduction possibilities without an accurate Elevation Certificate (EC). With an EC, a specialized risk report can accurately predict the retrofit requirements and the premium reduction.

RETROFITTING COMMERCIAL SPACE

Similar to minor residential improvements, rehabilitation or minor renovations to an existing commercial unit can be done without required compliance with the Flood Damage Prevention Code and standard permit procedures will be followed. A "non-substantial" commercial renovation might include new interior finishes, or fit out of an existing commercial unit by a new tenant.

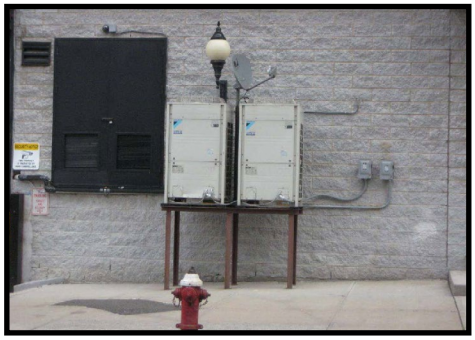
If the space to be renovated is below Design Flood Elevation (DFE), design standards dictate that the materials to be used for reconstruction are flood damage resistant. Use of flood resistant materials (page 24) can significantly reduce damage caused by future flooding and reduce the amount of time a business is displaced or unable to operate.

Unlike residential properties, non-residential commercial space may be dry flood-proofed. Dry flood-proofing prevents flood water from entering the unit altogether. Once floodwaters recede, the business can resume operations immediately.

A combination of methods may be necessary to completely dry-proof a commercial location. The most commonly used are watertight shields for windows and doors that are easily deployed when flooding or sever weather is forecast. Shields block flood water and other debris from coming in contact with the storefront keeping the commercial unit dry and protected. For additional information see *FEMA P-936, Floodproofing Non-Residential Buildings.*

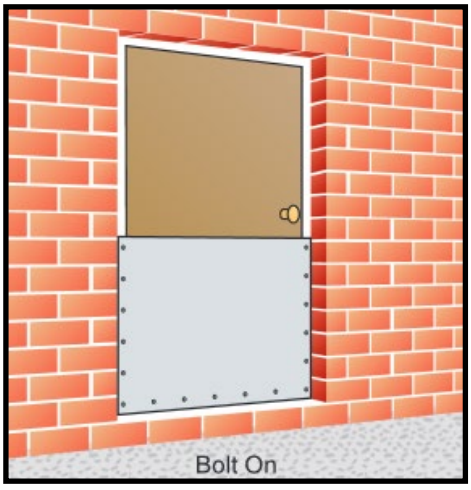
REQUIREMENTS

- The materials to be used for reconstruction must be flood damage resistant.
- All new or replacement utility connections must be located at or above the Design Flood Elevation.
- All new mechanical equipment must also be located above DFE.



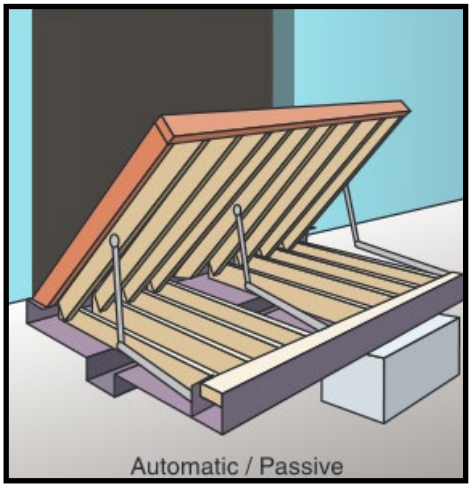
Elevating utilities and mechanical equipment above the DFE prevents damage from floodwaters and allows for quicker recovery.

Credit: F. Banisch



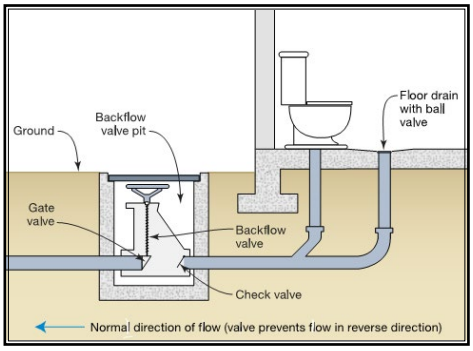
Commercial spaces can be protected using dry-floodproofing techniques.

Credit: FEMA



Using automatic flood shields is safer and more reliable for protecting buildings during an emergency.

Credit: FEMA



Backflow prevention measures can prevent sewage from backing up into building.

Credit: FEMA

RECOMMENDATIONS

- Unlike residential properties, non-residential commercial space may be dry flood-proofed. Dry flood-proofing prevents flood water from entering the unit altogether. A flood-proofed building or commercial unit must provide a FEMA Flood-proofing Certificate certified by a licensed engineer in lieu of an Elevation Certificate.
- Walls should be reinforced to withstand floodwater pressures and impact forces generated by floating debris.
- Membranes and other sealants may be used to reduce seepage of floodwaters through walls and wall penetrations.
- Drainage collection systems and sump pumps should be installed to control interior water levels, collect seepage, and manage hydrostatic pressures on the slab and walls.
- Backflow prevention measures should be installed to limit sewer line back-ups into the building and reduce recovery time after a storm.

SUBSTANTIAL DAMAGE AND IMPROVEMENT PROJECTS

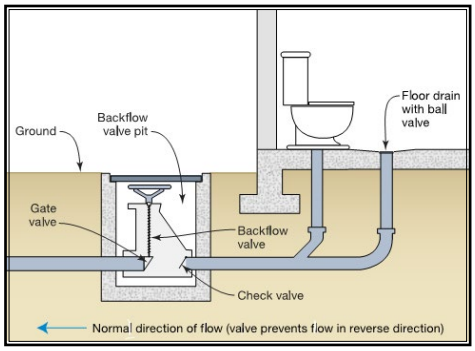
When an existing structure within the Special Flood Hazard Area (SFHA) is being renovated or improved, for any reason, and the value of those alterations exceed the market value of the structure prior to the alterations by 50% or more, those improvements are considered substantial. Market value, for this purpose, does not include land value or take into consideration the overall value of the property which may be influenced by other factors such as location, accessory uses or structures, neighborhood, and community amenities. The market value of the structure is based just on the building to be improved and the value of its parts, i.e building materials and labor.

A simple rule of thumb: When any building is renovated where interior finishes are being updated over more than one-half of the floor area or where electrical, plumbing or mechanical equipment is being replaced that improvement is typically substantial.

A building that is being substantially improved must be brought into compliance with current construction standards including the Flood Damage Prevention Code. This includes relocation of utility connections and mechanical equipment and may include abandonment of residentially occupied space below Design Flood Elevation (DFE).

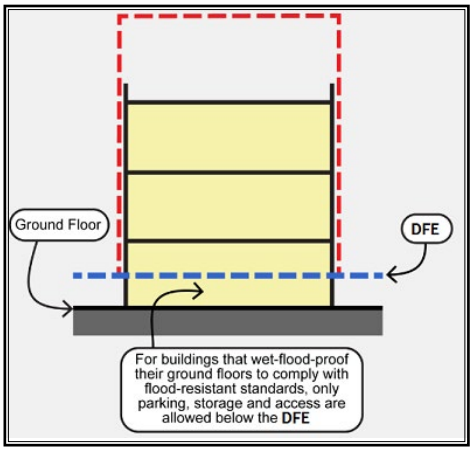
Enclosed areas below DFE can be used only for building access, storage and parking (where parking is permitted by zoning). Where an enclosed area below DFE is below grade on all sides, the floor of the basement or crawl space must be raised to the level of the lowest adjacent grade or higher. Engineered flood vents must also be installed on at least two sides; this will allow hydrostatic pressure to equalize on the foundation walls to prevent damage or collapse during a flood event.

Unlike free-standing suburban homes, row houses in Hoboken cannot be easily elevated above the DFE. Compliance can however be achieved by elevating the residential living space. Floors may be shifted within the existing building to achieve the necessary elevation. It may also be possible to add a floor or horizontal extension to replace the lost residential floor area. Such solutions must be reviewed on a case by case basis by the Floodplain Administrator and may be subject to other approvals by the Planning or Zoning Board.



Backflow prevention measures are required on new and replacement sewer lines.

Credit: FEMA



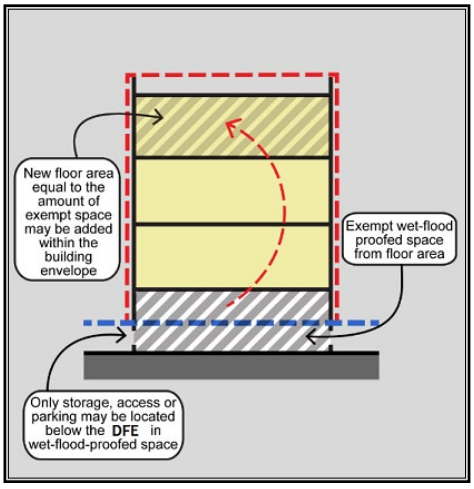
Occupancy below the DFE is limited to parking, storage, and building access.

REQUIREMENTS:

- Residential use of any floor below DFE must be vacated. Lowest enclosed area should be unfinished or minimally finished using flood resistant materials (see page 24). The area of a structure below DFE may be used only for building access, storage, and parking where permitted.
- A crawl space, cellar or basement below grade on all sides must be eliminated or filled in to match the level of the lowest adjacent grade next to the building.
- Lowest enclosed area below DFE must be fitted with the required number of flood vents installed on at least two sides of the building.
- All utility connections and mechanical equipment must be relocated above DFE or protected from contact with flood waters.
- Plumbing and waste lines must be fitted with backflow prevention.

RECOMMENDATIONS:

- Residential floor area below DFE which is vacated to make the structure compliant might be recouped by transferring the floor area elsewhere within the building envelope by adding a floor or rear extension. The allowable building envelope is established by zoning. See Chapter 196 of the Hoboken Municipal Code or check with the floodplain manager.
- Where a floor cannot be added, the floors within the structure may be realigned to raise the lowest occupied floor above DFE.
- Consider a change of use for the ground floor. Non-residential uses on the ground floor such as commercial offices and retail spaces are permitted below DFE and can be dry-floodproofed where a residential use cannot. A dwelling unit that is above grade but below the DFE may be converted and dry floodproofed for a permitted commercial use. Additional approvals for change of use may be required.



Add a floor to maintain the same floor area ratio.

NEW CONSTRUCTION

New construction projects must be fully compliant with Federal, State and Local Flood Damage Prevention Code requirements. Where multiple regulations overlap, the higher regulatory standard shall apply.

Applications for new construction that are subject to site plan or variance approval by the Planning or Zoning Board must also be reviewed by the Floodplain Administrator prior to being deemed complete by the reviewing Board. This pre-review is intended to save everyone time and money. If a project approved by the Board is not compliant with the Flood Damage Prevention Code, permits will not be approved for construction of the project. If measures taken to make the project compliant significantly change the approved structure, the applicant may be required to return to the approving Board for amended approval.

New construction projects not requiring Board approval will be reviewed by the Flood Plain Administrator. Once determined that the project is compliant with the Flood Damage Prevention Code a Floodplain Permit will be issued. No Construction Permits will be issued for construction in the Special Flood Hazard Area without a Floodplain Permit.

Commercial spaces on the first floor can be dry floodproofed, while keeping residential units above the DFE.

Credit: F. Banisch

REQUIREMENTS:

- In residential buildings areas of the building below DFE shall be used only for parking, storage and building access including residential lobbies, retail entrances, driveways and loading docks.
- Only commercial/non-residential portions of a mixed-use building are allowed to be dry floodproofed.
- Residential services located below DFE including but not limited to resident parking, resident storage units and building amenities for use only by the residents of the building may only be wet floodproofed.
- All residential dwelling units must be elevated above DFE.
- All emergency exit stairwells and corridors shall be wet floodproofed and designed with hydrostatic openings (flood vents) to maintain the operation of the exit door. Emergency exits must open at grade. Evacuation points from elevated floors are not acceptable as emergency exits.
- Automatic sewage backflow prevention devices shall be required on sewer lines below DFE to prevent sewage from backing up into the building.

Elevate external mechanical systems above the DFE.

Credit: F. Banisch

Use platforms to elevate external mechanical equipment above the DFE.

Credit:J. Miller

Landscaping can be used to soften the appearance of elevated buildings.

Credit: F. Banisch

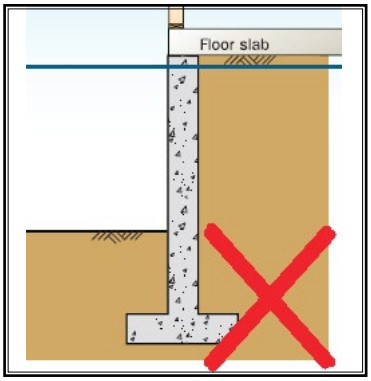
- Utility connections, meters, mechanical and life-safety equipment shall be either elevated above DFE or located within a certified dry floodproof enclosure.
- A variance may be granted to dry floodproof the residential lobby only in cases where there are at least two other means of emergency egress that are wet floodproofed.
- Parking (where permitted) shall be located at grade. A parking deck may only be elevated if constructed over piers or piles that are unenclosed or enclosed only by flood permeable walls such as breakaway walls or walls fitted with hydrostatic openings.
- Below grade parking in the SFHA is not permitted unless the below grade parking area is designed and approved as temporary stormwater storage (detention).
- Garage walls fronting on a street or pedestrian way should have regular fenestration consistent with the pattern of fenestration on floors above grade.
- The setback or right-of-way area in front walls should have at-grade planting beds, rain gardens, or green walls installed and maintained by the property owner(s) as a required buffer planting. Alternative visual effects will be considered on a case by case basis by the reviewing board at the time of site plan review.

CITY OF HOBOKEN
DESIGN
STANDARDS
& GUIDELINES

Selection of the appropriate foundation type is important for a building's structural strength. Poor drainage and floodwater ponding are common in Hoboken, making proper foundation design and materials selection essential to resilient design.

The foundation type most common for buildings in Hoboken's flood hazard areas is a solid perimeter wall with footings and reinforced slabs supported by and tied into underground pilings. Solid perimeter wall foundations create enclosures that are sometimes called crawlspaces or underfloor spaces. Such enclosures in floodprone areas must be designed to withstand hydrostatic pressure, and have adequate flood openings to allow floodwater to flow into and out of the space. These areas may not be designed for residential uses.

To prevent the displacement of stormwater, the City does not allow the placement of fill to raise the ground level or filled stem-walls

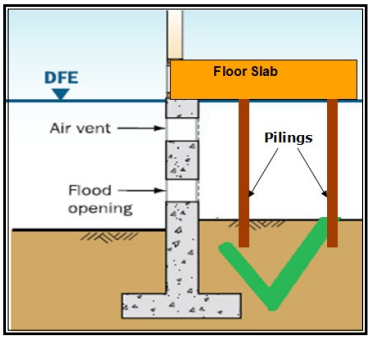


Filled stem-walls, thick monolithic slabs and placement of fill to raise the ground level are not permitted.

Credit: FEMA

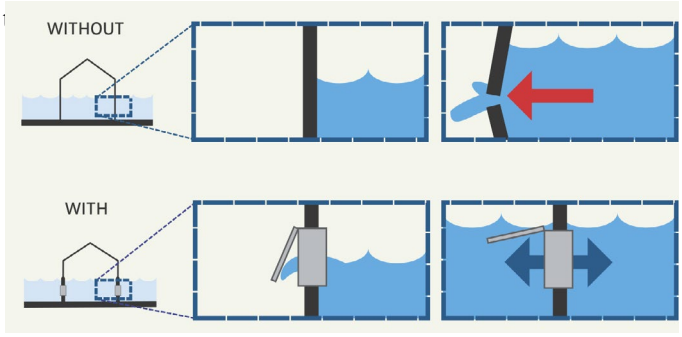
Foundation Guidelines

- Use pilings and footings in solid perimter foundation design.
- Do not use fill to raise the ground level.
- Any enclosure that is below the DFE, but above grade must be fitted with adequate flood openings.
- The floor of any cellar or crawl space that is below grade on all four (4) sides should be raised to match or exceed the height of the lowest adjacent grade next to the building.When a building is substantially improved, this is required. On new construction in t building below grade is not permitted.



Solid perimeter wall foundations with footings and slabs supported by underground pilings are appropriate for most areas of Hoboken.

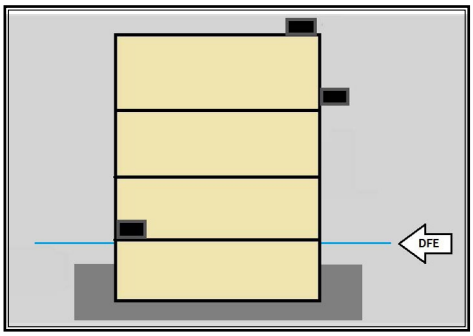
Credit: FEMA



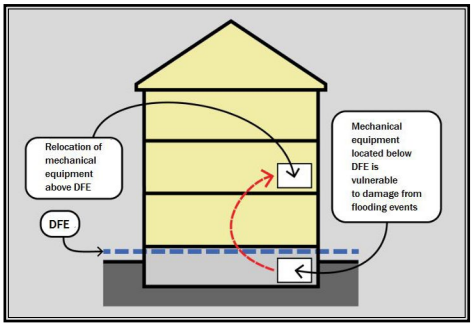
Enclosures below the DFE need to be fitted with flood openings to prevent foundation collapse from uneven hydrostatic pressure.

Credit: FEMA

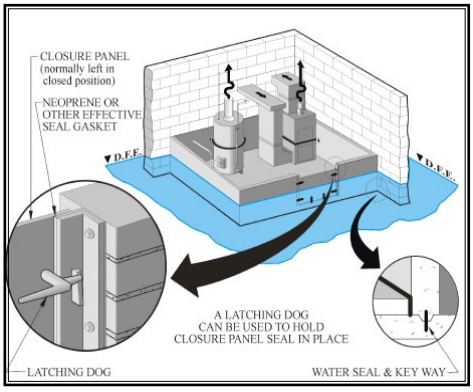
MECHANICAL SYSTEMS AND UTILITIES



Place utilities and mechanical equipment above the DFE. If utilities are placed outside the building, they should be anchored



Relocate mechanical equipment above the DFE. For best results place on a higher floor.



If the utilities cannot be relocated, put a barrier around them to prevent floodwaters from entering.

Credit: FEMA

The loss of electricity, heat or hot water significantly lengthen recovery time after any natural disaster. Protecting mechanical systems from flood waters will minimize damage and make it easier to return to normal after a storm. In addition, it is important to prevent damage and keep liquid fuels and other contaminants from mixing with flood waters.

Requirements

- All new or replacement utility connections must be located at or above the Design Flood Elevation.
- All new mechanical equipment must also be located above DFE.

Recommendations for Existing Systems

Relocate

- Move external equipment to the roof.
- Relocate internal equipment to higher floors.
- Build an additional equipment room above DFE.
- Replace multi-unit systems with smaller on-demand systems within individual units.
- Remove fuel tanks if heating systems are replaced with a natural gas system.
- Consider clearance and venting requirements before relocating

Elevate

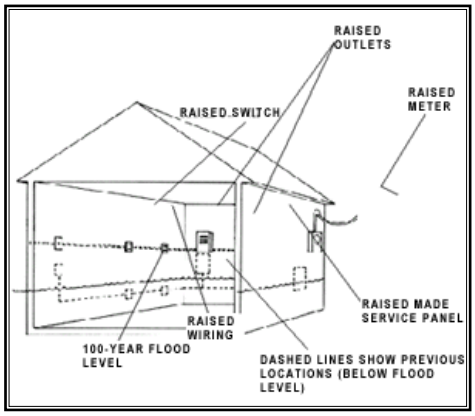
- In areas below the DFE, raise internal equipment as high as possible.
- Place external equipment on platforms above the DFE.
- Equipment must be anchored against wind.

Floodproof

- Mechanical equipment in non-residential buildings MAY be located inside barriers that are designed to resist flood loads and keep floodwaters away from the equipment. In new construction, however, elevation of mechanical equipment provides a higher level of protection and is preferable.

Electrical

- When replacing electrical wiring in areas below DFE, wires should run down from the ceiling, instead of along the floor, and outlets should be elevated above the DFE.
- Any wiring installed below the DFE must be water-resistant and comply with the National Electric Code.
- All new electric meters and panels must be relocated above the DFE.
- Use conduits mounted on walls, which will be easier to replace after flooding.
- Where permitted, place electric equipment such as disconnects, panels, switch gear, and transformers above the DFE. Make sure they are accessible by stairs and a work platform if higher than 65 inches above the ground or floor.
- Branch circuits and secondary electrical components vulnerable to flooding can be isolated from the building's electrical system to allow power to be safely restored. All work must comply with the National Electric Code.

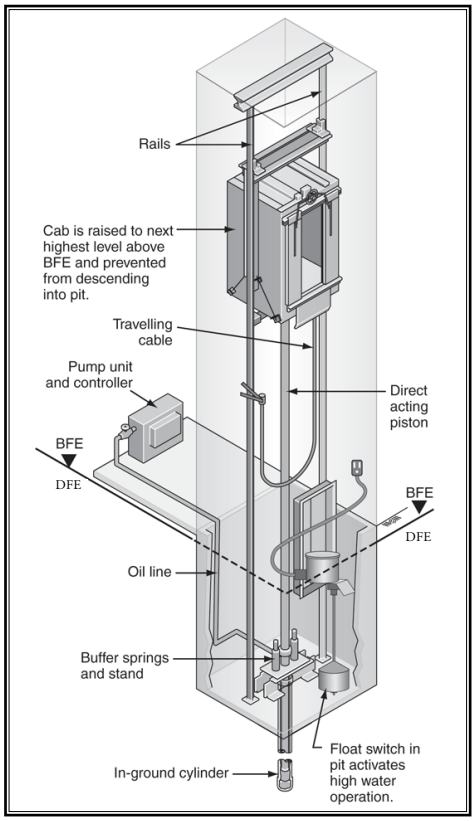


All electric wiring and outlets should be elevated above the DFE.

Credit: Paragon Certified Restoration

Elevators & Lifts

- Elevators and lifts may access areas below DFE, but motors, elevator controls, and hydraulic pumps must be located above the DFE.
- Cabs and shafts should be designed to resist flood loads and constructed of flood damage-resistant materials.
- Use float switches to avoid sending cabs to areas below the DFE during a flood.
- Refer to *FEMA's Technical Bulletin 4: Elevator Installation for Buildings Located in Special Flood Hazard Areas* in accordance with the National Flood Insurance Program for additional technical guidance.



Float switches prevent elevator cabs from entering flooded areas.

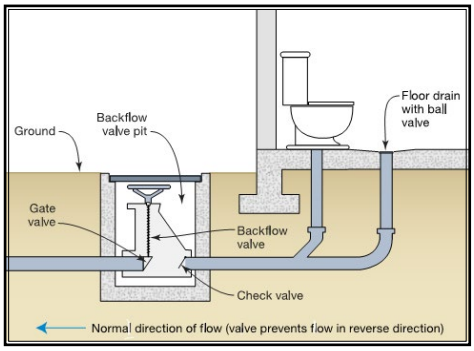
Credit: Otis Elevator Company

Heating and Cooling Equipment

- Electrical service is only permitted below the DFE to meet life safety and electrical code requirements.
- Furnaces, water heaters and other equipment can be protected by floodproof gates in non-residential buildings, but elevating equipment above the DFE offers the surest protection from flood damage.
- Vents and fill inlets on all mechanical equipment should be elevated above the DFE or protected against infiltration of floodwater.
- Underground Storage Tanks must be properly anchored or removed since submerged tanks can collapse or be dislodged.
- For existing buildings, consider converting to natural gas.

Water and Sewer Pipes

- Utility pipes and lines that come from the ground must be installed to prevent the entry of floodwaters.
- Backflow prevention valves should be added to sewer lines and floor drains to minimize stormwater and sewage flowing into buildings.
- The City requires installation of backflow valves when new sewer lines are installed or existing lines are replaced.
- In areas expected to have waves and debris, pipes and lines should be attached to the inland side of a foundation element or placed in conduit that will resist impacts.



Backflow prevention measures are required on new and replacement sewer lines.

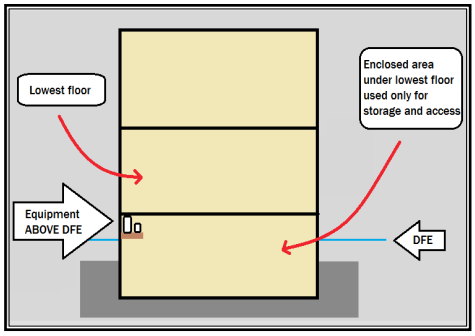
Credit: FEMA

Duplicate Power Sources

- Back-up power such as natural gas generators or battery back-ups should be used to provide power to life safety equipment, alarms, or emergency lighting.
- Install generator-ready hookups for quick-connections after floodwater recedes.

Areas below the DFE should be prepared to flood. For this reason, only certain uses are allowed below the DFE. Spaces elevated above the DFE usually sustain little damage and often can be reoccupied quickly after floodwaters recede. Where possible, consider elevating the building above the DFE, converting existing residential units to a commercial use or storage, and designing to maximize the space above the DFE.

Theses guidelines outline the requirements and recommendations to minimize property damage from flood events. It is important to consider the use of the space, building materials, floodproofing options, and accessiblity when designing below the DFE. Areas below DFE should not be extensively finished. Where finishes are used they must be flood resistant to withstand direct contact (up to 72 hours) with flood waters, including brackish water.



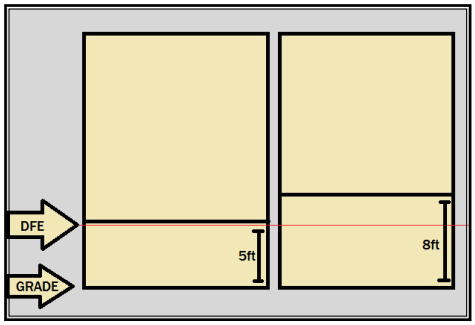
To minimize damage, uses below the DFE are limited to storage, building access, parking, and commercial spaces that are dry floodproofed.

Residential Units Below the DFE

- New residential units are not permitted below the DFE.
- An existing residential unit below DFE may remain in place if the total work done in the unit and/or the building is not a substantial improvement.
- If substantial improvements are to be made, the unit must be relocated or eliminated.

Commercial Uses Below the DFE

- Commercial buildings or mixed-use buildings may have dry floodproofed non-residential uses such as offices or retail units below the DFE.
- Commercial uses below the DFE must be dry floodproofed.
- A floodproofed building or unit must provide a FEMA Floodproofing Certificate certified by a licensed engineer.



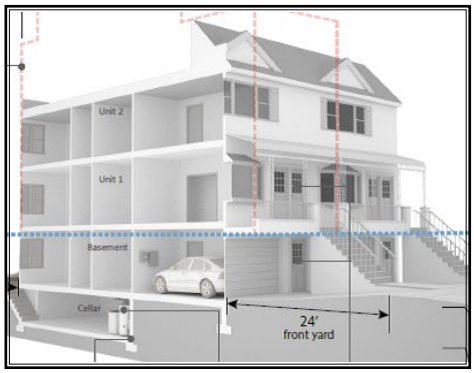
Adding extra height to enclosures below the DFE allows more flexibility to create commercial space, lobbies, parking or storage facilities beneath the DFE.

Other Acceptable Uses

- Building access, lobbies and emergency hallways.
- Storage.
- Parking (where permitted), driveways, and loading docks.
- Non-residential uses that are floodproofed.

ENCLOSURES BELOW THE DFE

- A cellar or crawl space that is below grade on all four (4) sides must be filled in and the floor raised to match or exceed the height of the lowest adjacent grade next to the building.
- Areas below DFE should not be extensively finished. Where finishes are used they must be flood resistant to withstand direct and prolonged contact (up to 72 hours) with flood waters.
- Enclosed areas below DFE must be fitted with hydrostatic openings (flood vents).
- No bathrooms or plumbing outlets are permitted below DFE.
- Appliances are not allowed in an enclosed wet floodproofed area.
- Electrical outlets should be elevated and wiring done "top-down" to the greatest extent possible.
- Mechanical equipment and utility connections must be elevated above DFE, relocated or otherwise protected from inundation during flooding.

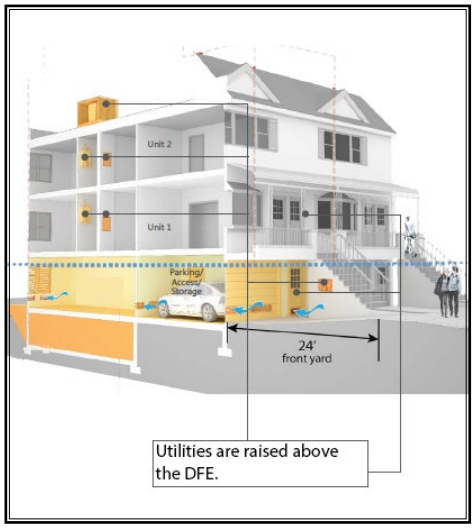


Multi-unit buildings with utilities in the basement may not be compliant with the NFIP or City's current regulations.

Credit:: New York City Planning Department

EMERGENCY EXITS

- Emergency exits MUST open at grade.
- Evacuation points from elevated floors are NOT emergency exits.
- Emergency exit stairways and corridors MUST be wet floodproofed and designed with flood vents to maintain operation of the exit door.



To comply with the current regulations, utilities can be placed in the units. The basement should be filled, and the area below the DFE should be wet floodproofed and used as parking and/or temporary storage.

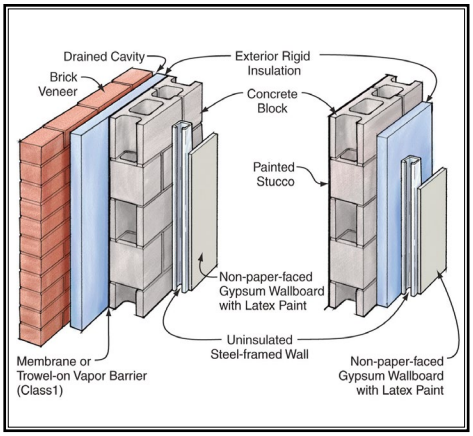
Credit:: New York City Planning Department

For all repairs, rehabilitation projects, and new construction projects below the DFE, regardless of use, flood resistant building materials must be used, and prescribed construction methods are to be followed. Selecting appropriate building materials is the simplest way to increase flood resilience and reduce future flood damage to your property.

These materials are chosen specifically because of their resistance to water damage and mold. Use of the specified materials may increase the cost of renovation by 3-5%, but will reduce the time and expense of recovery from future flooding.

Building materials used below the DFE must be capable of withstanding direct and prolonged contact (up to 72 hours) with floodwaters without sustaining any damage that requires more than cosmetic repair. Acceptable materials resist water and mold growth, and can be easily cleaned or pollutants carried by floodwater.

Unacceptable materials include wood, paper products and other materials that absorb or retain water, dissolve or deteriorate, lose strength or integrity, or are adversely affected by water.

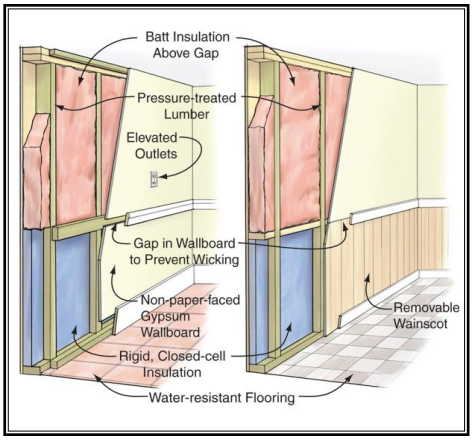


Construction with proper flood resistant materials minimizes damage from flood loads and long-term exposure to floodwaters.

Credit: LSU Ag Center and Coastal Contractor Magazine

Material Guidelines Below the DFE

- Structural elements should be steel or concrete; concrete must be reinforced where necessary subject to anticipated flood depths.
- Specially treated and decay-resistant lumber and marine grade plywood can be used for certain applications but should be limited.
- Flooring materials should be nonporous, such as polished concrete, ceramic or porcelain tile, terrazzo or vinyl.
- Wood flooring and carpeting should not be used below DFE.
- Walls and ceilings should be finished with materials such as, but not limited to, aluminum studs, cement board, treated lumber, paperless gypsum board, glass, metal, PVC, and Latex or epoxy paint.
- Only closed cell insulation is permitted below DFE. Fiberglass insulation should not be used in any area that may come in contact with floodwaters.



Flood resistant design aids speedy recovery after storm events.

Credit: LSU Ag Center and Coastal Contractor Magazine

MATERIAL TYPE	MATERIALS TO USE	MATERIALS TO AVOID
Structural Flooring Materials	• Concrete • Steel • Marine grade or preservative treated plywood • Treated or naturally decay-resistant lumber	• Engineered wood or laminate flooring • Oriented-strand board • Exterior grade or edge-swell resistant headers and beams • I-joists
Finish Flooring Materials	• Ceramic, porcelain or clay tiles • Terrazzo or terrazzo tiles • Vinyl tile or sheets	• Engineered wood or laminate flooring • Carpeting • Wood flooring • Cork
Structural Wall and Ceiling Materials	• Concrete • Brick face • Cement board, fiber-cement board • Pressure-treated lumber • Solid, standard, structural lumber • Aluminum studs • Closed cell insulation • Paperless gypsum board	• Fiberglass insulation • Paper-faced gypsum board • Oriented-strand board • Greenboard
Finish Wall and Ceiling Materials	• Glass • Metal cabinets or doors • PVC board and trim • Latex or epoxy paint • Stainless steel or galvanized steel hardware	• Wood cabinets and doors • Particle board cabinets and doors • Standard wood finish trim • Non-latex pain • Wallpaper • Plaster • Cork

For a complete list of acceptable materials see FEMA Technical bulletin 2: Flood Damage-resistant Materials Requirements.

Wet floodproofing allows floodwaters to enter and exit a building unimpeded and relies on the use of flood damage-resistant materials and construction techniques to minimize flood damage.

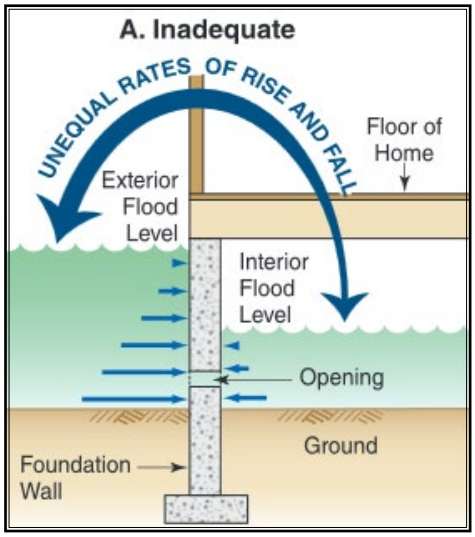
Wet floodproofing is required for all spaces below the DFE that are used for parking, storage, or building access. Wet floodproofing is not permitted in the livable areas of residential buildings.

Designing Flood Openings

- Flood openings must allow automatic inflow and outflow of water to minimize pressure on walls and must also allow water levels within the enclosure to rise and fall at the same rate as those outside.
- Number of openings must be engineered for the amount of enclosed space. The number may vary based on the type of vent, but a general rule of thumb would be 1 square inch of vent area to 1 square foot of enclosed floor area.
- Vents must be located on at least two sides of the enclosed area.
- The bottom of each vent opening may not be located more than 12 inches above the interior floor or the exterior grade immediately below the opening, whichever is higher.
- Screens, grates, grills or other covers or devices must be free-moving and must not resist or impede automatic flow of floodwater.

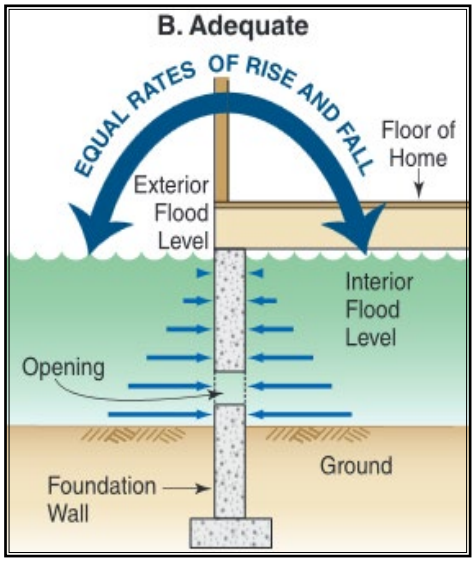
Flood Resistant Materials

- All wet floodproofed areas must use materials designed to withstand contact with floodwaters (see page 24-25).



Inadequate openings may result in foundation collpase from pressure from floodwaters.

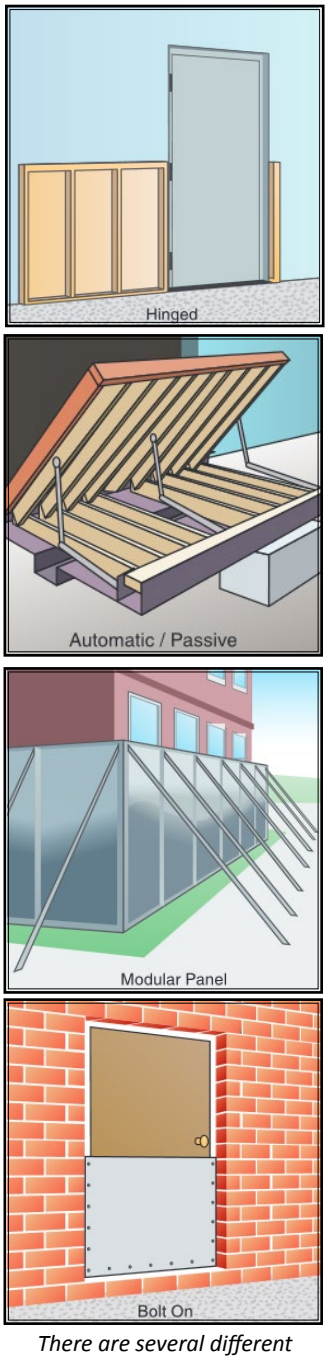
Credit: FEMA



Openings should have a ratio of 1 square inch of vent area to 1 square foot of enclosed floor area.

Credit: FEMA

DRY FLOODPROOFING



There are several different mechanisms for dry floodproofing. The City recommends using automated systems.

Credit:FEMA

Dry Floodproofing is a combination of design modifications that results in a building or structure, including the attendant utility and sanitary facilities, being water tight with walls substantially impermeable to the passage of water and with structural components having the capacity to resist flood loads.

Dry floodproofing can be a particularly useful flood protection technique for creation of an active street-level use and an engaging pedestrian experience. Though sometimes more expensive than elevation, dry floodproofing allows both existing and new non-residential uses to operate at the street level.

A combination of methods may be necessary to completely dry floodproof a non-residential location. The most commonly used are watertight shields for windows and doors that are easily deployed when flooding or sever weather is forecast. Shields block flood water and other debris from coming in contact with the storefront keeping the commercial unit dry and protected.

Dry Floodproofing Guidelines

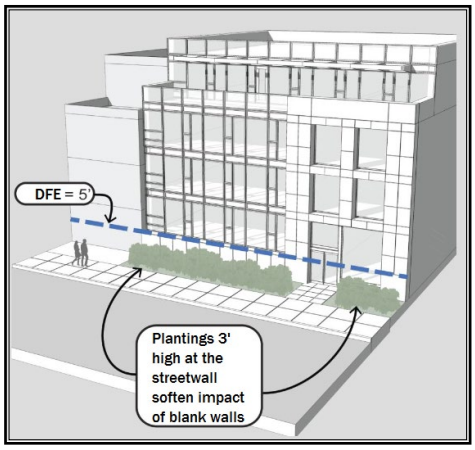
- Can only be used for non-residential buildings or for commerical uses in mixed-use buildings in "A" or "AE" zones.
- Dry floodproofing measures are not permitted in the "V" zone.
- All buildings that use dry floodproofing must provide the required FEMA Floodproofing Certificate.
- Where possible, use automatic or "passive" floodproofing measures. Measures that require human intervention before an event may result in higher insurance premiums.
- The City of Hoboken may require development of an emergency and maintenance plan along with periodic testing to deploy floodproofing measures.

The first occupied floor of a building may be as much as 10 feet above sidewalk grade. Special attention has to be paid and skillful site design used to make sure these buildings maintain connectivity to the flow of street life and remain pedestrian friendly. Elevated spaces also present accessibility challenges that need to be addressed through thoughtful planning and design.

Building access is a permitted use below DFE which provides an important opportunity for buildings to relate directly to the outside world. The otherwise vacant space below DFE can become an inviting lobby while less public areas of the grade level are used for building amenities such as mail and package rooms, trash and recycling collection, storage units and bicycle parking.

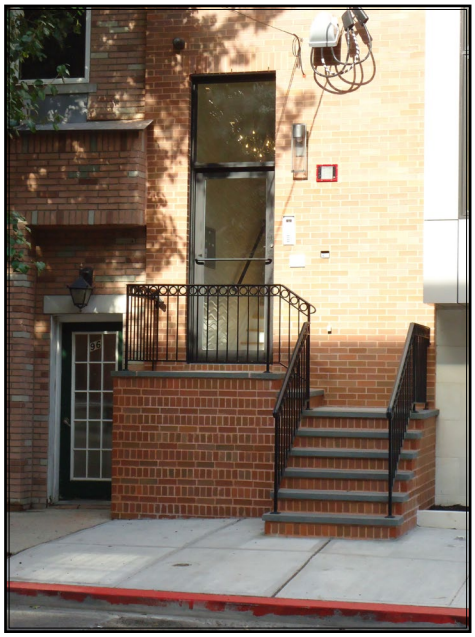
At-grade entrances also better serves residents with disabilities and can make compliance with ADA requirements easier. Stairs, ramps and lifts that might otherwise dominate the façade of a building can be located within the building providing greater accessibility, comfort and safety for everyone.

In historic areas where stoops are an integral part of the streetscape, a "split-stoop" may be employed to maintain the look of the block. A split-stoop is one that is divided between the outside and the inside of a building. The outside stoop and building entrance are designed to match other on the block frontages. Inside the building, a second set of stairs rise the level of the first dwelling floor.



Use plantings to create visual appeal along long blank walls.

Credit:NYC Department of Planning



A split stoop allows matches frontage, while allowing acess to dwelling above DFE.

Credit:Ann Holtzman

Streetscape Guidelines

- Limit the negative effects of blank walls at street level by adding a green buffer such as an at-grade planting bed or Green Wall.
- Use curb-side trees to create an inviting environment around the building.
- Use low voltage LED lighting to give landscaping a dramatic effect or highlight architectural details.
- Extend the upper façade pattern of fenestration and articulation all the way down to grade level.
- Recessed entryways and porticoes provide interest and draw the eye into the building.
- Use windows around a lobby or commercial entrance to draw the attention of passers-by to the building.
- Stairways and ramps should be located within the building, with street-level entryways and high levels of transparency.

Credit:F. Banisch

Credit:A. Holtzman

Parking is an acceptable use for the space below the DFE. However, parking is only allowed in areas as directed by zoning regulations. Existing buildings that do not have approval for on-site parking cannot convert the ground floor unit to parking without obtaining a zoning variance.

Where on-site parking is approved, it is important to design parking garages to blend in with the City's streetscape. Too often, parking garages can limit pedestrian interaction and create long blank walls at street-level.

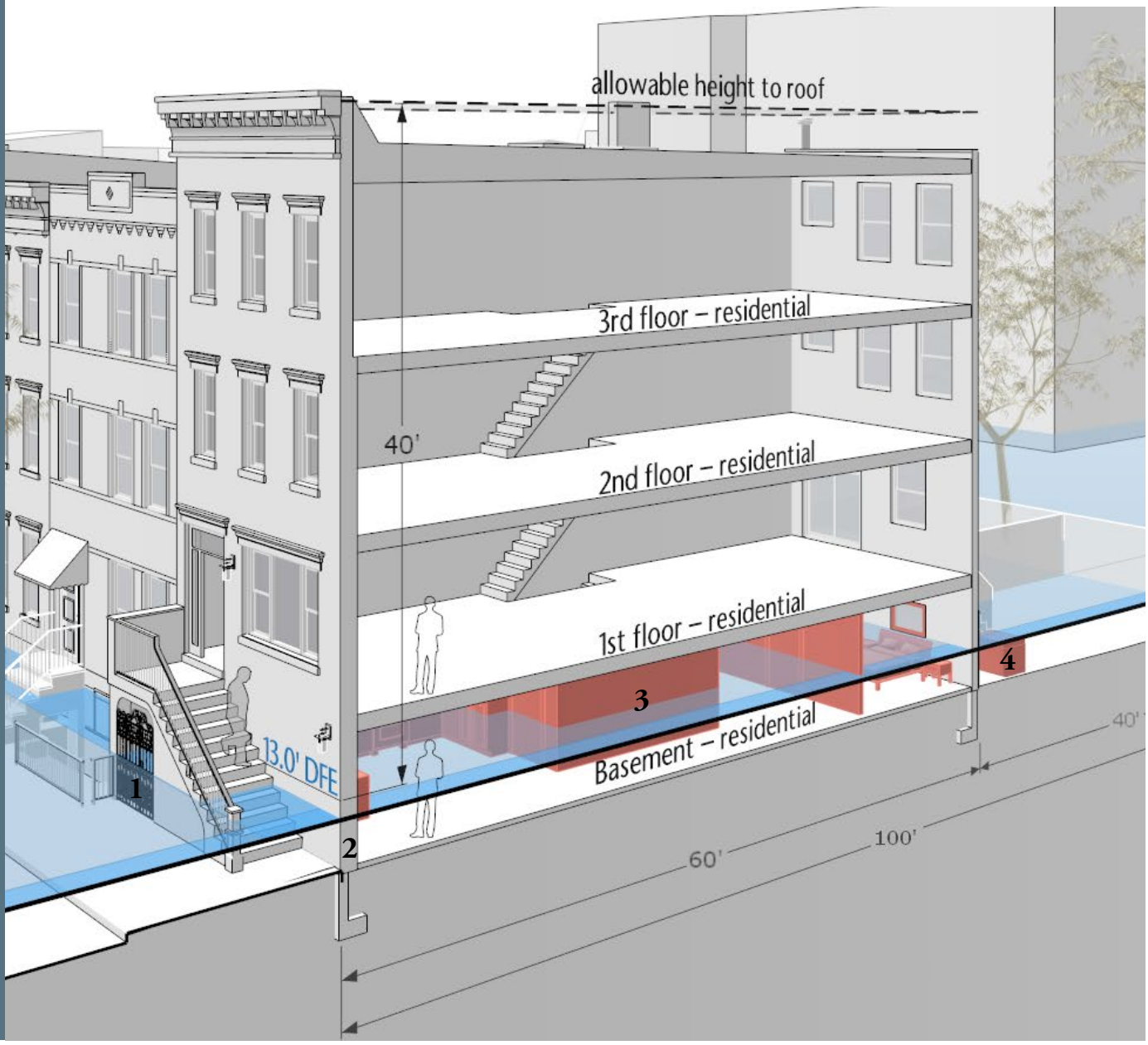
For this reason the City of Hoboken has included design standards for all parking. Use the guidelines listed below standards whereever possible. Alternative visual treatments are encouraged and will be considered on a case by case basis by the reviewing board at the time of site plan review.

Parking Guidelines

- All garages below the DFE must be wet floodproofed.
- Use dry floodproofed commercial spaces to envelope parking in new buildings to protect the streetscape.
- For all non-private parking below the DFE, floodprone spaces must be marked as such.
- Recess garage walls to reduce impact on streetscape.
- Regular fenestration (windows) consistent with the pattern of fenestration on floors above grade is required for garage walls fronting on a street or pedestrian way.
- Use planting beds, rain gardens or green wall systems installed and maintained by the property owner(s) to soften design along the streetscape.

EXAMPLES OF RETROFITTING, ADAPTIVE DESIGN, & NEW CONSTRUCTION

EXISTING CONDITIONS
(NOT COMPLIANT WITH FEMA OR NFIP)

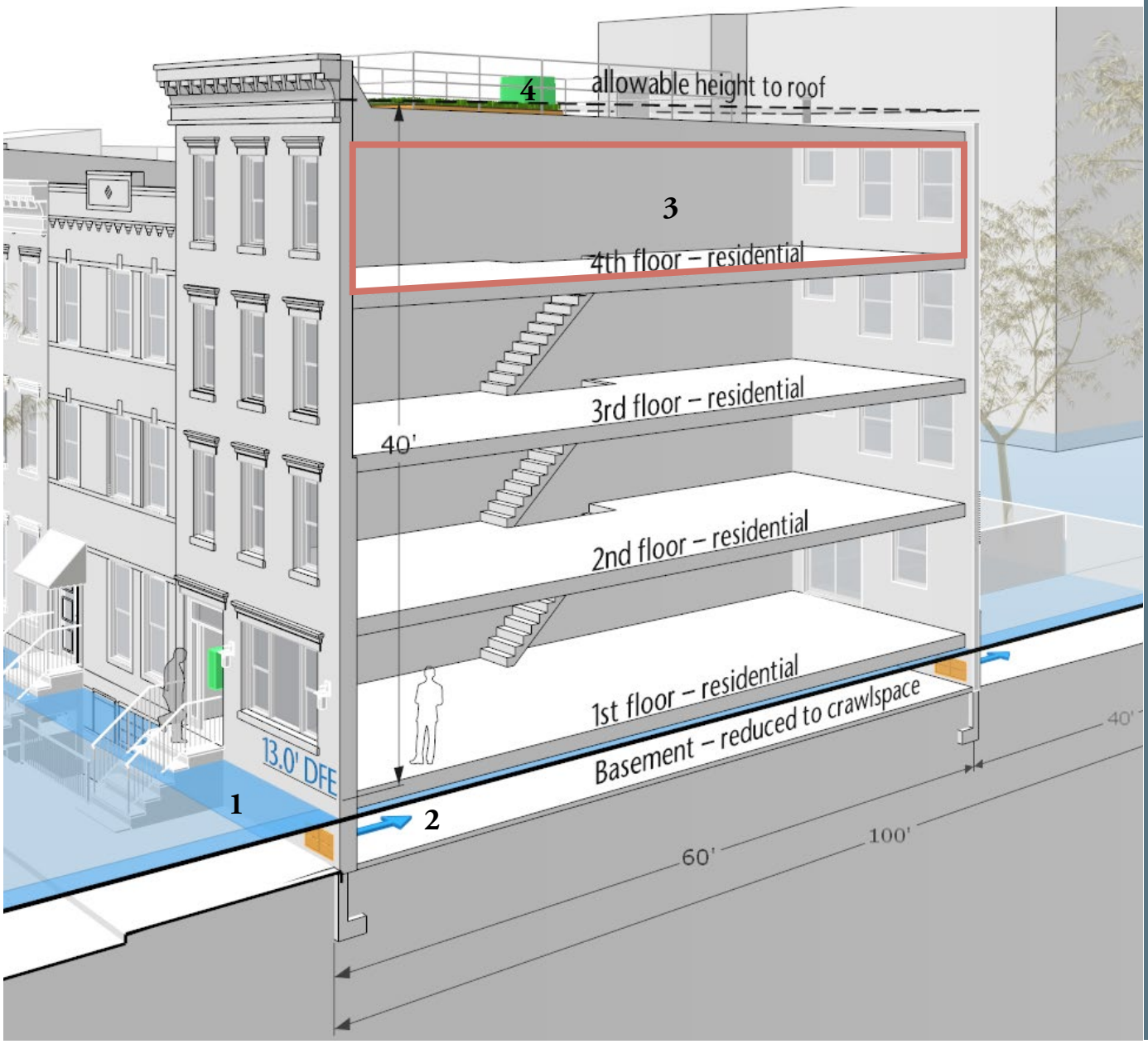


1 Building access is provided at two front entrances. One above DFE and one at grade, but below DFE.

2 Un-reinforced masonry bearing party-walls and wood floor joists built on a rubble foundation.

3 Garden level apartment is located below the DFE. This floor is not recognized by FEMA or the NFIP as livable space.

4 Critical systems (utilities, mechanical equipment) are located in the basement and in the rear yard at grade.



1 Building entrance is modified.

Door entering the basement is removed and replaced with a maintenance hatch.

Oversized stoop is replaced to access to new 1st floor.

2 Foundation reinforced and basement reduced to crawl space.

Footings and foundation walls are reinforced.

1st floor is lowered to the DFE, reducing basement to a crawlspace.

Flood vents are put in front and rear facade walls making the area below DFE compliant.

3 Floor area is retained and realigned within the building envelope.

Roof is raised to limit of building envelope and floors realigned within building.

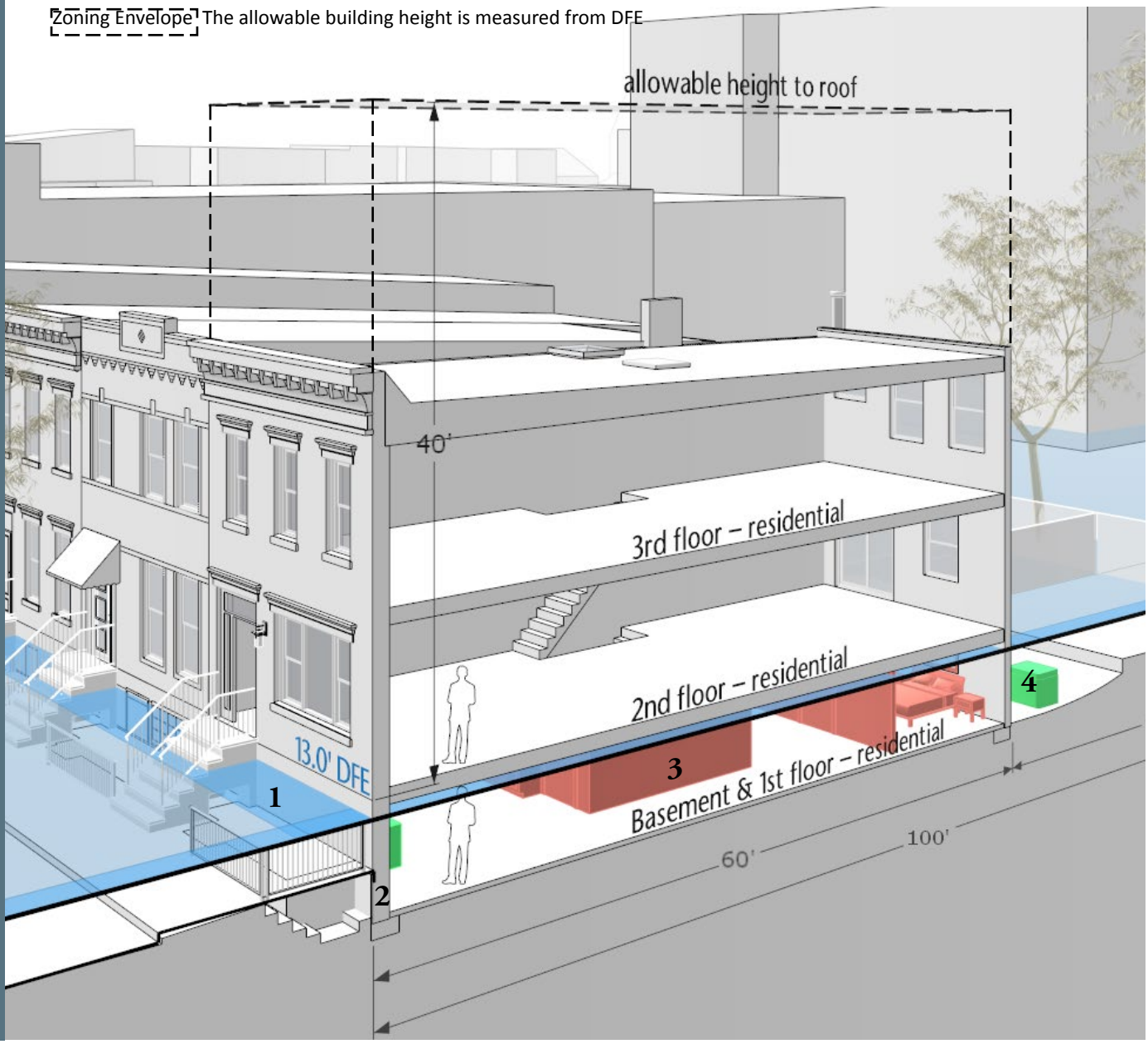
Non-compliant living space below DFE is relocated to an upper floor retaining the original floor area.

4 Critical systems relocated above DFE.

Utility connections, meters, water heaters, heating and cooling equipment and fire suppression equipment relocated from the basement and yard to above DFE.

A sump pump with emergency battery backp is installed in the new crawlspace.

EXISTING CONDITIONS
(NON COMPLIANT WITH FEMA OR NFIP)

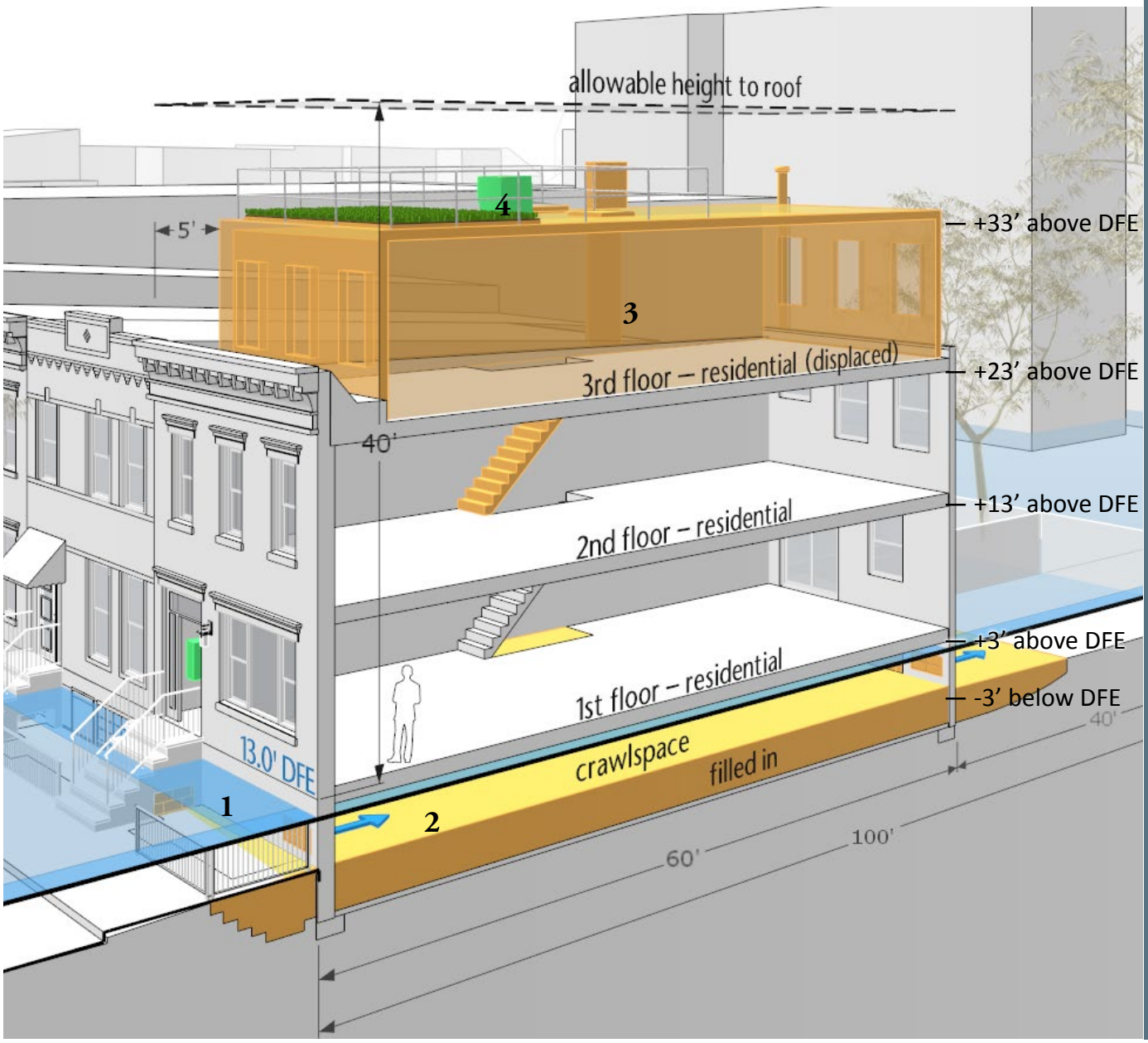


1 Building access is provided at two front entrances. One above DFE and one several feet below sidewalk grade and DFE.

2 Un-reinforced masonry bearing party-walls and wood floor joists built on a rubble foundation.

3 Basement level apartment is located below grade on all four sides. A below grade basement is not covered by flood insurance as "living space."

4 Critical systems (utilities, mechanical equipment) are located in the basement and in the rear yard at grade.



1 Building entrance is modified.

Basement door and sidewalk areaway are filled in to sidewalk grade.

Area below flood elevation converted for storage use only.

2 Foundation reinforced and basement reduced to crawl space.

Footings and foundation are reinforced.

Floor of basement is raised to match or exceed lowest adjacent grade.

Flood vents are introduced at front and rear facade walls making the area below DFE compliant.

3 Floor area is relocated within the building envelope.

A new 3rd floor is constructed on top of the existing structure within the permitted building envelope.

Non-compliant living space below DFE is relocated to an upper floor retaining the original floor area.

4 Critical systems relocated above DFE.

Utility connections, meters, water heaters, heating and cooling equipment relocated from the basement and rear yard to above DFE.

A sump pump with emergency battery backup is installed in the new crawlspace.

ADAPTIVE REUSE: RESIDENTIAL BUILDING: EXISTING CONDITIONS

(NON COMPLIANT WITH FEMA OR NFIP)

1 Building access is provided at a single side entrance located below the DFE. A fire escape at the rear of the building provides secondary egress.

2 Structure has unreinforced masonry bearing walls and wood joists built on a rubble foundation.

3 "Street" level apartment is located below DFE. Enclosed area below DFE may only be used for building access, storage, parking where permitted, or a non-residential use.

4 Critical Systems are located in a mechanical room on the ground floor.

1 Building facade and egress are modified.

1st floor facade is replaced by a new storefront with separate entrance for the commercial use.

Residential entrance is retained and a new wet floodproof lobby created.

Flood vents are installed to allow water to enter/exit residential areas of the ground floor.

2 Foundation reinforced and new non-residential area designed.

Footings and foundation walls are reinforced.

Underfloor crawl space is filled and a new reinforced slab floor installed at grade.

A waterproof wall is constructed to separate commercial and residential areas.

3 Floor area is retained and conversion to dry floodproof non-residential use.

Non-compliant living space below DFE is converted to a permitted non-residential use.

Commercial unit is dry flood-proofed and storefront if fitted with deployable flood barriers.

4 Critical systems relocated above DFE.

Utility connections, meters, water heaters, heating and cooling equipment, and fire suppression equipment are relocated to a dry floodproofed room within the commercial space and above DFE.

Flood barriers are stored on site and an emergency deployment plan is created and executed.

600 Harrison Street - New Construction

Flood Damage Resistant Design & Active Urban Streetscape

(Compliant with NFIP & FEMA guidelines)

1 The grade level garage, trash and bicycle storage areas are wet floodproofed. Walls are reinforced and only flood resistant building materials are used below DFE. Flood vents are installed throughout to allow the free entry and exit of flood waters.

2 A landscaped buffer and shade trees enhance streetscape and capture rainwater.

3 Fire suppression, alarm, communications equipment and elevator mechanicals are located on the 2nd floor. Heating and cooling equipment is mounted on the roof.

4 1st occupied residential floor, critical systems and mechanical equipment are located above DFE.

5 The residential lobby is finished with wet floodproof materials to quickly recover from flooding. Emergency egress stairs from residential floors enter this space, and vents enable door operation even if the area is flooded. The elevator shaft is reinforced construction and protected by a passive flood door.

6 A slightly elevated retail and residential entry plaza is introduced to help protect these areas from light flooding and to add visual interest to the streetscape. ADA ramps are integrated into the setback and streetscape design to provide ease of access.

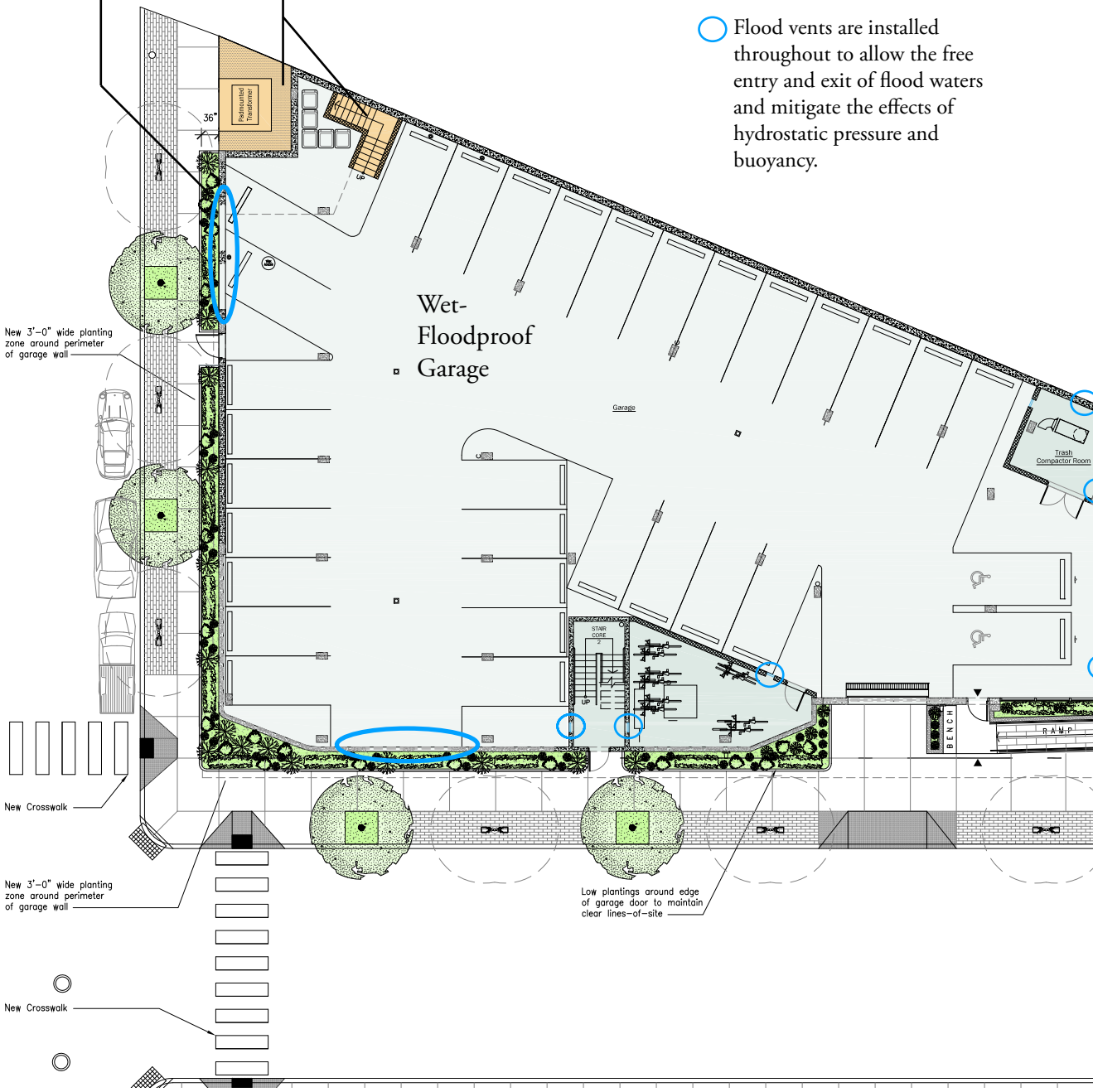
7 The glass facade wall on the retail space are fitted with flood gates to the DFE to protect against flooding and damage from floating debris. the lobby is not designed for emergency egress and will be vacated during storm.

A landscaped buffer around the garage and the addition of shade trees enhance the streetscape and help capture rainwater delaying its entry into the sewer system.

A mechanical mezzanine is provided in the garage to elevate utility connections above DFE.

An elevated platform is also provided outside of the building to raise Public Service's Transformer above DFE.

Flood vents are installed throughout to allow the free entry and exit of flood waters and mitigate the effects of hydrostatic pressure and buoyancy.



All other building systems are elevated. Fire suppression, alarm and communications equipment and elevator mechanicals are located on the 2nd floor. Heating and cooling equipment are mounted on the roof.

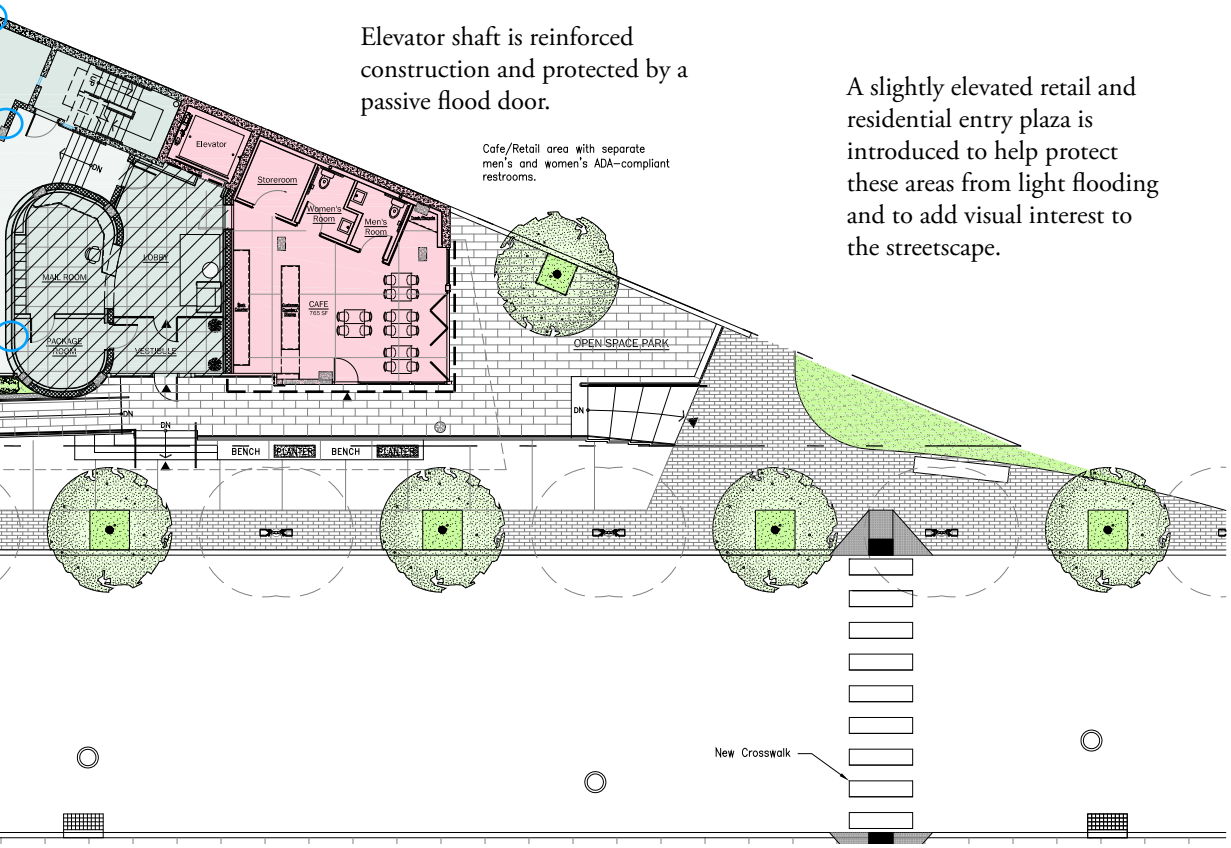
The grade level garage, trash and bicycle storage areas are wet floodproofed. Walls are reinforced and only flood resistant building materials are used below DFE.

Damp-Floodproof Lobby

Dry-Floodproof Retail & Elevator

Elevator shaft is reinforced construction and protected by a passive flood door.

A slightly elevated retail and residential entry plaza is introduced to help protect these areas from light flooding and to add visual interest to the streetscape.



An ADA compliant ramp is integrated into the setback and streetscape design to provide ease of access for all residents and business patrons.

The glass façade wall on the retail space and lobby are fitted with flood gates to the DFE to protect against flooding and damage from floating debris. The lobby is not designed for emergency egress and will be vacated during a storm event. The residential lobby is finished with wet floodproof building materials and finishes for quick and easy recovery if flooded.

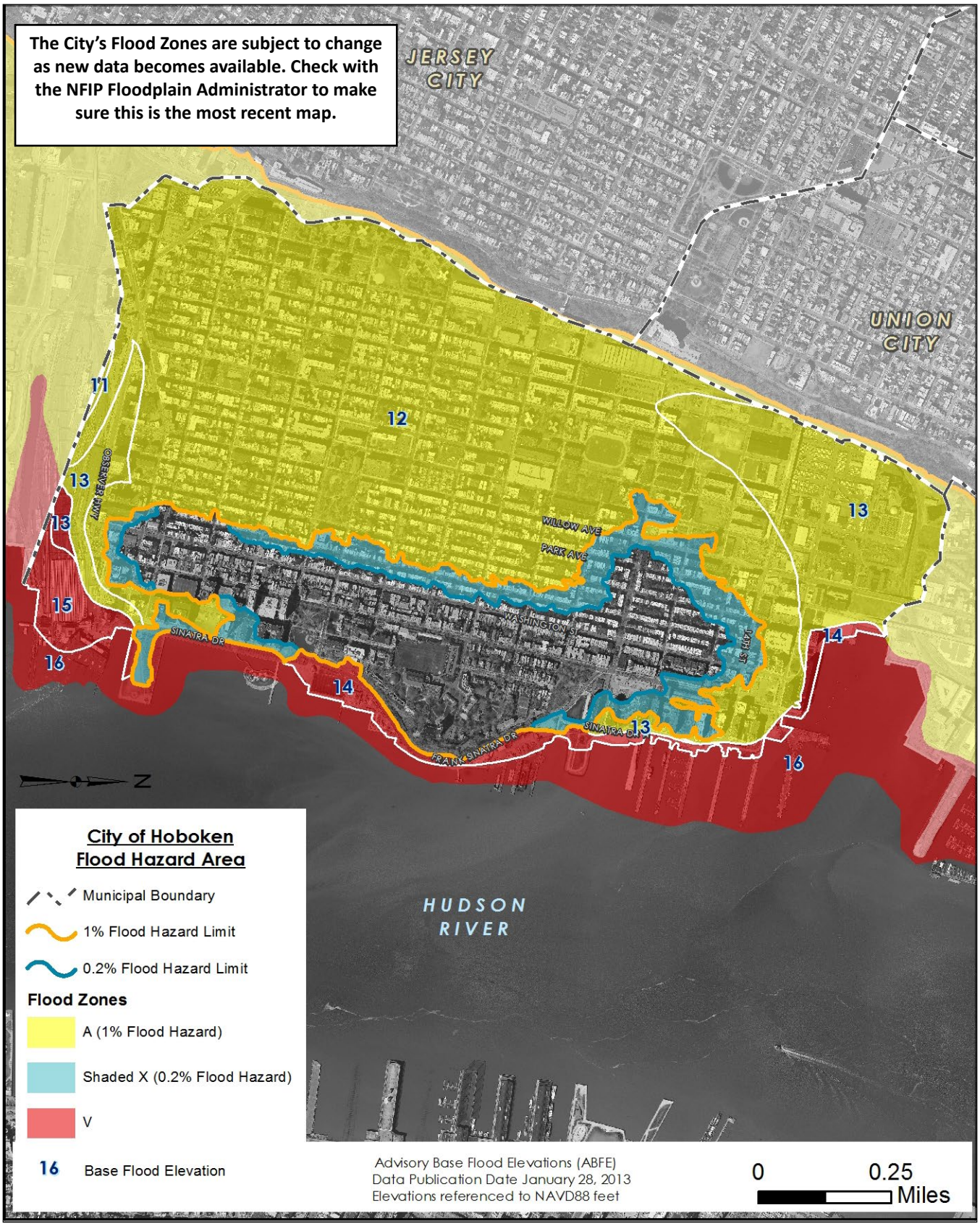
• Retail use spaces are dry flood proofed with flood gates outside of commercial storefront system.

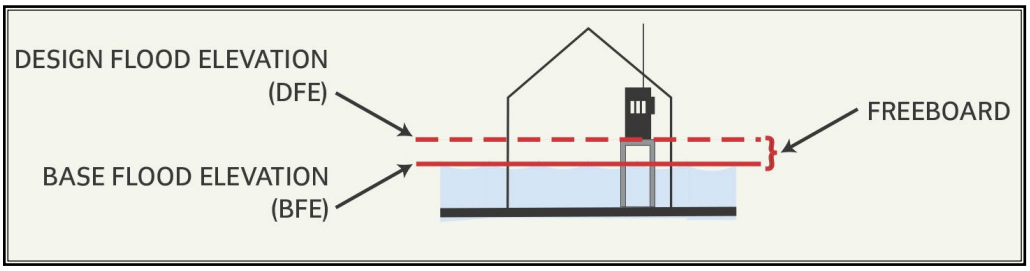
• Any door in a demising wall between a residential use and a retail use is to be flood proof.

• Demising walls separating retail from residential are to be reinforced and dryproofed.

• Residential use spaces are wet flood proofed with flood vents; these include the garage area and any emergency egress stairwells.

REFERENCES & RESOURCES


The City's Flood Zones are subject to change as new data becomes available. Check with the NFIP Floodplain Administrator to make sure this is the most recent map.
JERSEY CITY
UNION CITY
HUDSON RIVER
11
12
13
13
13
13
14
14
15
16
16
OBSERVER HWY
WILLOW AVE
PARK AVE
WASHINGTON
SINATRA DR
FRANK SINATRA DR
1ST ST
N
City of Hoboken
Flood Hazard Area
Municipal Boundary
1% Flood Hazard Limit
0.2% Flood Hazard Limit
Flood Zones
A (1% Flood Hazard)
Shaded X (0.2% Flood Hazard)
V
16 Base Flood Elevation
Advisory Base Flood Elevations (ABFE)
Data Publication Date January 28, 2013
Elevations referenced to NAVD88 feet
0
0.25
Miles



Freeboard Requirements for the City of Hoboken

Building Type	Zone X	Zone A	Zone V
Residential structures	+1 ft	+1 ft	+2 ft
Building and other structures with school or day-care facilities; and other nonessential facilities	+1 ft	+1 ft	+2 ft
Essential facilities	+1 ft	+2 ft	+3 ft
Buildings and other facilities that manufacture, process, handle, store, use or dispose of hazardous materials	+1 ft	+2 ft	+3 ft
Temporary Structures	N/A	+1 ft	N/A

Design Flood Elevation (DFE)

The elevation to which construction is regulated in the City of Hoboken is the base flood elevation on the adopted FEMA Flood Maps, as illustrated on page 44, plus freeboard outlined to the left.

Essential facilities include, but are not limited to; fire, rescue, ambulance, and police stations and emergency vehicle garages; buildings designated as emergency shelters; other facilities required for emergency response; hospitals and other health care facilities having surgery or emergency treatment facilities; power-generating stations and other public utility facilities.

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
National Flood Insurance Program

ELEVATION CERTIFICATE

IMPORTANT: Follow the instructions on pages 1–9.

OMB No. 1660-0008
Expiration Date: July 31, 2015

SECTION A – PROPERTY INFORMATION

	FOR INSURANCE COMPANY USE
A1. Building Owner's Name	Policy Number:
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.	Company NAIC Number:
City State ZIP Code	

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

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

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

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

A7. Building Diagram Number _____

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

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

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number			B2. County Name		B3. State
B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/ Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use base flood depth)

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

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

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

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

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

C2. Elevations – Zones A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Complete Items C2.a–h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters.

Benchmark Utilized: _____ Vertical Datum: _____

Indicate elevation datum used for the elevations in items a) through h) below. ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____
Datum used for building elevations must be the same as that used for the BFE.

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

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

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

☐ Check here if comments are provided on back of form.
☐ Check here if attachments.

Were latitude and longitude in Section A provided by a licensed land surveyor? ☐ Yes ☐ No

Certifier's Name		License Number	
Title	Company Name		
Address	City	State	ZIP Code
Signature	Date	Telephone	

PLACE SEAL HERE

FEMA Form 086-0-33 (7/12) See reverse side for continuation. Replaces all previous editions.

EVATION CERTIFICATE, page 2

PORTANT: In these spaces, copy the corresponding information from Section A.	FOR INSURANCE COMPANY USE
ilding Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.	Policy Number:
y State ZIP Code	Company NAIC Number:

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION (CONTINUED)

py both sides of this Elevation Certificate for (1) community official, (2) insurance agent/company, and (3) building owner.

mments

gnature Date

SECTION E – BUILDING ELEVATION INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE)

Zones AO and A (without BFE), complete Items E1–E5. If the Certificate is intended to support a LOMA or LOMR-F request, complete Sections A, B,and C.
Items E1–E4, use natural grade, if available. Check the measurement used. In Puerto Rico only, enter meters.

. Provide elevation information for the following and check the appropriate boxes to show whether the elevation is above or below the highest adjacent grade (HAG) and the lowest adjacent grade (LAG).

a) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

b) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the LAG.

. For Building Diagrams 6–9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 8–9 of Instructions),
the next higher floor (elevation C2.b in the diagrams) of the building is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

. Attached garage (top of slab) is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

. Top of platform of machinery and/or equipment servicing the building is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? ☐ Yes ☐ No ☐ Unknown. The local official must certify this information in Section G.

SECTION F – PROPERTY OWNER (OR OWNER'S REPRESENTATIVE) CERTIFICATION

e property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without a FEMA-issued or community-issued BFE) or he AO must sign here. The statements in Sections A, B, and E are correct to the best of my knowledge.

perty Owner or Owner's Authorized Representative's Name

dress City State ZIP Code

gnature Date Telephone

mments

☐ Check here if attachments.

SECTION G – COMMUNITY INFORMATION (OPTIONAL)

e local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C (or E), and f this Elevation Certificate. Complete the applicable item(s) and sign below. Check the measurement used in Items G8–G10. In Puerto Rico only, enter meters.

. ☐ The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)

. ☐ A community official completed Section E for a building located in Zone A (without a FEMA-issued or community-issued BFE) or Zone AO.

. ☐ The following information (Items G4–G9) is provided for community floodplain management purposes.

. Permit Number	G5. Date Permit Issued	G6. Date Certificate Of Compliance/Occupancy Issued

. This permit has been issued for: ☐ New Construction ☐ Substantial Improvement

. Elevation of as-built lowest floor (including basement) of the building: _____ . _____ ☐ feet ☐ meters Datum _____

. BFE or (in Zone AO) depth of flooding at the building site: _____ . _____ ☐ feet ☐ meters Datum _____

0. Community's design flood elevation: _____ . _____ ☐ feet ☐ meters Datum _____

cal Official's Name Title

mmunity Name Telephone

gnature Date

mments

☐ Check here if attachments.

IA Form 086-0-33 (7/12) Replaces all previous editions.

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
National Flood Insurance Program

FLOODPROOFING CERTIFICATE
FOR NON-RESIDENTIAL STRUCTURES

OMB No. 1660-0008
Expiration Date: July 31, 2015

The floodproofing of non-residential buildings may be permitted as an alternative to elevating to or above the Base Flood Elevation; however, a floodproofing design certification is required. This form is to be used for that certification. Floodproofing of a residential building does not alter a community's floodplain management elevation requirements or affect the insurance rating unless the community has been issued an exception by FEMA to allow floodproofed residential basements. The permitting of a floodproofed residential basement requires a separate certification specifying that the design complies with the local floodplain management ordinance.

BUILDING OWNER'S NAME

STREET ADDRESS (Including Apt., Unit, Suite, and/or Bldg. Number) OR P.O. ROUTE AND BOX NUMBER

OTHER DESCRIPTION (Lot and Block Numbers, etc.)

CITY STATE ZIP CODE

SECTION I – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

Provide the following from the proper FIRM:

COMMUNITY NUMBER	PANEL NUMBER	SUFFIX	DATE OF FIRM INDEX	FIRM ZONE	BASE FLOOD ELEVATION (In AO Zones, Use Depth)

Indicate elevation datum used for Base Flood Elevation shown above: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

SECTION II – FLOODPROOFING INFORMATION (By a Registered Professional Engineer or Architect)

Elevations are based on: ☐ Construction Drawings ☐ Building Under Construction ☐ Finished Construction

Floodproofing Design Elevation Information:

Building is floodproofed to an elevation of ____ . ____ feet (In Puerto Rico only: ____ . ____ meters). ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____
(Elevation datum used must be the same as that used for the Base Flood Elevation.)

Height of floodproofing on the building above the lowest adjacent grade is _____ feet (In Puerto Rico only: _____ meters).

For Unnumbered A Zones Only:

Highest adjacent (finished) grade next to the building (HAG) _____ . _____ feet (In Puerto Rico only: _____ . _____ meters)

☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

(NOTE: For insurance rating purposes, the building's floodproofed design elevation must be at least 1 foot above the Base Flood Elevation to receive rating credit. If the building is floodproofed only to the Base Flood Elevation, then the building's insurance rating will result in a higher premium.)

SECTION III – CERTIFICATION (By a Registered Professional Engineer or Architect)

Non-Residential Floodproofed Construction Certification:

I certify that, based upon development and/or review of structural design, specifications, and plans for construction, the design and methods of construction are in accordance with accepted standards of practice for meeting the following provisions:

The structure, together with attendant utilities and sanitary facilities, is watertight to the floodproofed design elevation indicated above, with walls that are substantially impermeable to the passage of water.

All structural components are capable of resisting hydrostatic and hydrodynamic flood forces, including the effects of buoyancy, and anticipated debris impact forces.

I certify that the information on this certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.

CERTIFIER'S NAME LICENSE NUMBER (or Affix Seal)

TITLE COMPANY NAME

ADDRESS CITY STATE ZIP CODE

SIGNATURE DATE PHONE

Copies should be made of this Certificate for: 1) community official, 2) Insurance agent/company, and 3) building owner.

National Flood Insurance Program

FLOODPROOFING CERTIFICATE

FOR NON-RESIDENTIAL STRUCTURES

Paperwork Reduction Act Notice

General: This information is provided pursuant to Public Law 96-511 (the Paperwork Reduction Act of 1980, as amended), dated December 11, 1980, to allow the public to participate more fully and meaningfully in the Federal paperwork review process.

Authority: Public Law 96-511, amended; 44 U.S.C. 3507; and 5 CFR 1320.

Paperwork Burden Disclosure Notice: Public reporting burden for this data collection is estimated to average 3.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and submitting this form. You are not required to respond to this collection of information unless a valid OMB control number is displayed on this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0008). **NOTE: Do not send your completed form to this address.**

Privacy Act Statement

Authority: Title 44 CFR § 61.7 and 61.8.

Principal Purpose(s): This information is being collected for the primary purpose of estimate the risk premium rates necessary to provide flood insurance for new or substantially improved structures in designated Special Flood Hazard Areas.

Routine Use(s): The information on this form may be disclosed as generally permitted under 5 U.S.C. § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA-003 – National Flood Insurance Program Files System or Records Notice 73 Fed. Reg. 77747 (December 19, 2008); DHS/FEMA/NFIP/LOMA-1 – National Flood Insurance Program (NFIP) Letter of Map Amendment (LOMA) System of Records Notice 71 Fed. Reg. 7990 (February 15, 2006); and upon written request, written consent, by agreement, or as required by law.

Disclosure: The disclosure of information on this form is voluntary; however, failure to provide the information requested may result in the inability to obtain flood insurance through the National Flood Insurance Program or may be subject to higher premium rates for flood insurance. Information will only be released as permitted by law.

	Description	Hoboken Chapter 140 (adopted 12-18-2013)	NJ UCC (building subcode and residential subcode)
Elevation of Lowest Floor	Minimum elevation is BFE + 1 ft As-built surveyed elevation certification required.	§ 140-16E and Table 1 § 140-12A	Building: 1612.4; 1612.5(1.1) ASCE 24: 2.3 and Table 2-1 Residential: R322.2.1; R322.1.10
Dry Floodproofing Design and Elevation (only nonresidential and nonresidential portions of mixed-use buildings)	Minimum elevation is BFE + 1 ft. Design certification required.	§ 140-17B § 140-16E and Table 1 § 140-12B	Building: 1612.4, 1612.5(1.3) ASCE 24: Ch. 6 Residential: not permitted
Structural Fill (slab-on-grade)	Compacted for stability during flooding. Avoid using fill that limits storage of stormwater.	§ 140-16B(2) "methods and practices and minimize flood damage"	Building: 1612.4, 1804.4 ASCE 24: 1.5.4; 2.4 Residential: R322.1.2, R506
Use of Enclosed Areas Below Elevated Lowest Floor (not dry floodproofed)	Only parking of vehicles, storage and building access. Avoid storing damageable items and hazardous materials in flood-prone enclosures.	§ 140-17A(3) and -17B(6)	Building: 1612.4 ASCE 24: 2.6 Residential: R322.2.2
Walls of Enclosures (including walls forming crawlspaces or garages)	Must have flood openings; engineered openings must be certified.	§ 140-17A(3) and -17B(6)	Building: 1612.4; 1612.5(1.1) ASCE 24: 2.6 Residential: R322.2.2; R309.3 (garages)
Flood Damage-Resistant Materials	Readily cleanable and stable after inundation.	§ 140-15B	Building: 1612.4 ASCE 24: Ch. 5 Residential: R322.1.8
Electrical, Heating, Ventilation, Plumbing, and Air Conditioning Equipment	Must be elevated unless specifically designed. Should not be located in enclosures unless required based on limited use. For nonresidential, may be located inside floodproofed barrier.	§ 140-16C(4)	Building: 1403.5, 1612.4 ASCE 24: Ch. 7 Residential: R322.1.6 (and references to this section in mechanical, fuel gas, and plumbing chapters)

"I'VE HAD A FIRM BELIEF THAT THE BEST FLOOD MITIGATION IS TO DO IT RIGHT THE FIRST TIME. AND HAVING WELL WRITTEN CODES AND REGULATIONS ARE OF PARAMOUNT IMPORTANCE WHEN IT COMES TO DOING IT RIGHT!"

- Rececca C. Quinn, CFM of RC Quinn Consulting, Inc

Common abbreviations used in this document:

ADA - American's with Disabilities Act

ASCE - American Society of Civil Engineers

DFE - Design Flood Elevation

EC - Elevation Certificate

FEMA - Federal Emergency Management Agency

FIRM - Flood Insurance Rate Map

IBC - International Building Code

NFIP - National Flood Insurance Program

SFHA - Special Flood Hazard Area

SI/SD - Substantial Improvement/Substantial Damage

UCC - Universal Construction Code

Common terms used in this document:

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year. The base flood is commonly referred to as the 100 year flood.

Basement: Any area of the building having its floor subgrade (below ground level) on all sides. (Note: this definition is limited to application of flood damage reduction requirements; it differs from the UCC definition that applies outside of special flood hazard areas.)

Design Flood Elevation: The elevation to which construction is regulated in the City of Hoboken; it is the base flood elevation on the FIRM plus freeboard outlined in section 104-16 of the City's Code.

Dry Floodproofing: A combination of design modifications that results in a building or structure, including the attendant utility and sanitary facilities, being water tight with walls substantially impermeable to the passage of water and with structural components having the capacity to resist loads as identified in ASCE 7.

Flood Insurance Rate Map (FIRM): The official map on which the Federal Emergency Management Agency has delineated both areas of special flood hazard and the risk premium zones applicable to the community.

Flood Hazard Map: The official map adopted by the City of Hoboken to delineate flood hazard areas and used to regulate development.

Flood Zone: Designations shown on FEMA's FIRM:

> **Zone A:** Special flood hazard areas inundated by the 1% annual chance flood; base flood elevations are not determined.
>
> **Zone AE:** Special flood hazard areas subject to inundation by the 1% annual chance flood; base flood elevations are determined; floodways may or may not be determined.

Zone AO: Areas of shallow flooding, with or without a designated average flood depth.

Zone X (shaded): Areas subject to inundation by the 500-year flood (0.2% annual chance); areas subject to the 1% annual chance flood with average depths of less than 1 foot or with contributing drainage area less than 1 square mile; and areas protected by levees from the base flood.

Zone X (unshaded): Areas determined to be outside the 1% annual chance flood and outside the 500-year floodplain.

Zone VE: Special flood hazard areas subject to inundation by the 1% annual chance flood and subject to high velocity wave action (also referred to as coastal high hazard areas).

Highest Adjacent Grade: The highest natural elevation of the ground surface, prior to construction, next to the proposed walls of a structure.

Limit of Moderate Wave Action (LiMWA): The inland limit of the area affected by waves greater than 1.5 feet during the base flood. Base flood conditions between the Zone VE and the LiMWA will be similar to, but less severe than, those in the Zone VE.

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 nonelevation design requirements.

Special Flood Hazard Area: Term used by FEMA to identify the land area subject to flood hazards and shown on a Flood Insurance Rate Map or other flood hazard map as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE, or V1-30.

Substantial damage: Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred.

Substantial improvement: Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% 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 official 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."

Wet floodproofing: floodproofing method that relies on the use of flood damage-resistant materials and construction techniques to minimize flood damage to areas below the design flood elevation of a structure intentionally allowed to flood.

ASCE 7. Minimum Design Loads for Buildings and Other Structures (2010), American Society of Civil Engineers. http://dx.doi.org/10.1061/9780784412916

ASCE 24. Flood Resistant Design and Construction (2005), American Society of Civil Engineers. FEMA's "Highlights of ASCE 24-05." http://www.fema.gov/library/viewRecord.do?id=3515.

FEMA Hurricane Sandy Recovery Advisories (2013). http://www.fema.gov/building-science/hurricane-sandy-building-science-activities-resources.

FEMA P-312. Homeowner's Guide to Retrofitting (2014). https://www.fema.gov/media-library/assets/documents/480.

FEMA P-467-2. Floodplain Management Bulletin: Historic Structures (2008). https://www.fema.gov/media-library/assets/documents/13411.

FEMA P-758. Substantial Improvement / Substantial Damage Desk Reference (2010). http://www.fema.gov/library/viewRecord.do?id=4160.

FEMA P-936. Floodproofing Non-Residential Buildings (2013). http://www.fema.gov/media-library/assets/documents/34270.

FEMA P-938. Hurricane Isaac in Louisiana (2013; Hurricane Isaac Recovery Advisories in Appendix D). https://www.fema.gov/media-library/assets/documents/31386.

FEMA Technical Bulletins. http://www.fema.gov/plan/prevent/floodplain/techbul.shtm.