

This example is a three-story masonry building with party-walls and a mix of commercial and residential space on the ground-floor and two stories of residential units above.

Retrofit strategies that will result in partial NFIP reduction in flood insurance premiums require filling the basement to the lowest adjacent grade and limiting the ground-floor space to commercial use to allow for dry floodproofing. The ground-floor residential unit is relocated to an addition at the roof within the building bulk envelope. The commercial storage is relocated to a new addition in the rear.

Due to the high flood elevation, resulting in undue hardship for egress from the building, the property owner can file for a variance

to install deployable flood shields around the building façade as long as these are structurally integral to the building foundation. Temporary emergency egress stairs must be deployed over the gates.

This retrofit strategy minimizes the loss of commercial and residential floor area but requires significant structural reinforcement of the entire structure, as well as attention to structural reinforcement at party-walls so as not to affect neighbors' property.

Alternative adaptation strategies, currently not recognized by FEMA and NFIP, include simply relocating critical systems to a new rear addition, or leaving existing commercial and residential uses on the ground floor and wet or dry floodproofing below the DFE.

KEY CHARACTERISTICS

FLOOD RISK

Flood Zone/BFE	AE +11'
Grade Elevation	+4' at sidewalk, +0' at rear property
Design Flood Elevation (DFE)	+12' (8' above sidewalk grade)
Lowest Occupiable Floor	+5.5' (1.5' above grade)
Cellar Elevation	-2' (6' below sidewalk grade)
Critical Systems Location	Cellar

TYOLOGY

Lot Size	33' x 66'
Building Size	33' x 48'
Yards	2' front; 15' rear
Construction Type	Masonry with wood joists
Foundation Type	Rubble
Year Built	1925
Stories	3 + cellar
Residential Floor Area	4,000 s.f. total
Residential Units	2 single storey, 1 triplex
Commercial Floor Area	800 s.f.
Commercial Units	1

SITE CONDITIONS

Sidewalk Width	12'
Roadbed Width	37'
Zoning District	R5 + C1-3 Overlay, Mixed Use

 1% annual flood chance
 0.2% annual flood chance



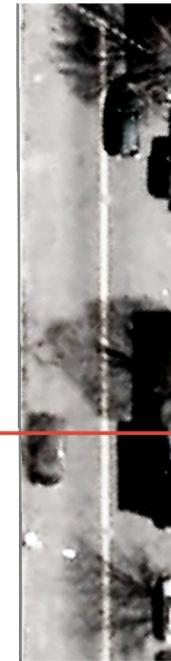
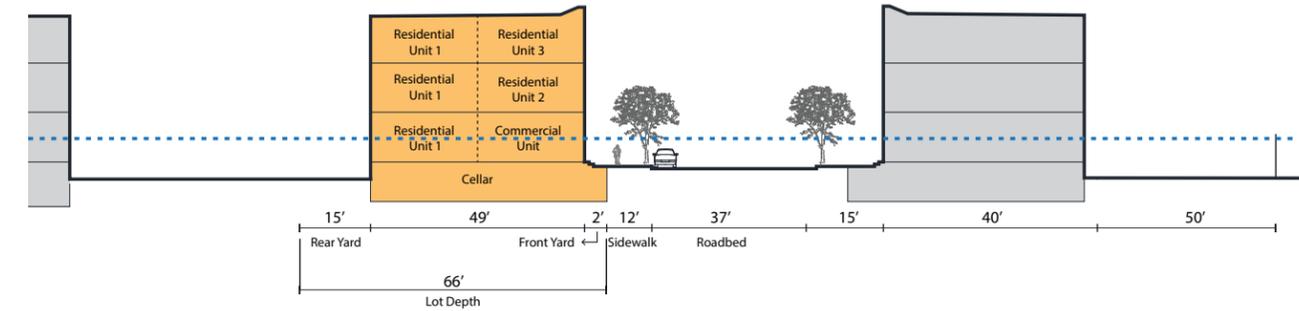
SITE & BUILDING CONDITIONS

SITE CONDITIONS

Sites with standard lot size and no side yards. Rear yards typically range from 0 to 6 feet below the sidewalk grade. Standard width public streets and sidewalks are typical of this commercial corridor typology.

BUILDING TYPOLOGY

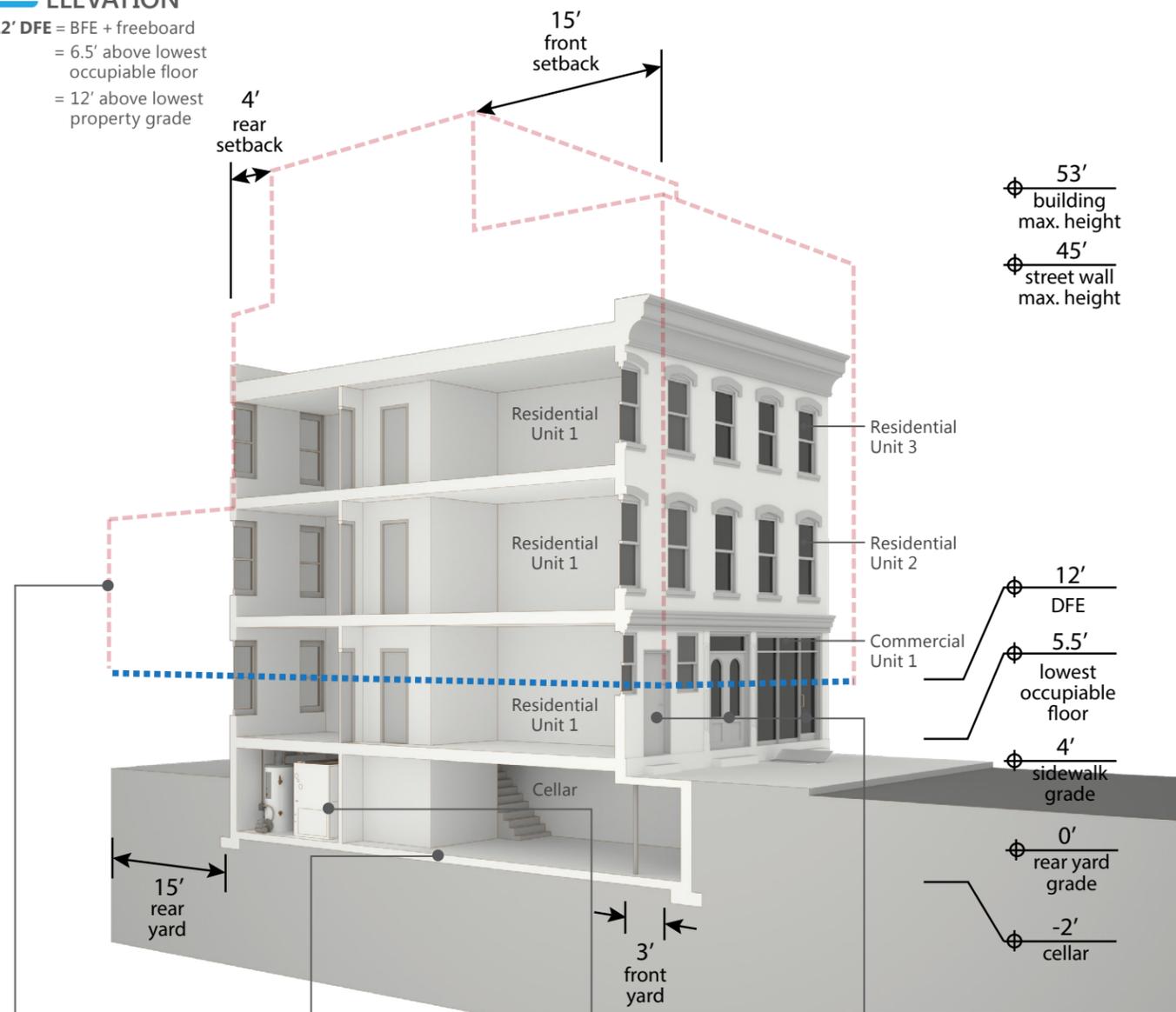
Commercial and residential use is located at the ground floor with residential use above. Buildings are two to four-story masonry party-wall with wood joists and a rubble foundation. Critical systems are located in cellar with commercial space storage. Entrances are provided at or above sidewalk grade.



EXISTING CONDITIONS

FLOOD ELEVATION

12' DFE = BFE + freeboard
 = 6.5' above lowest occupiable floor
 = 12' above lowest property grade

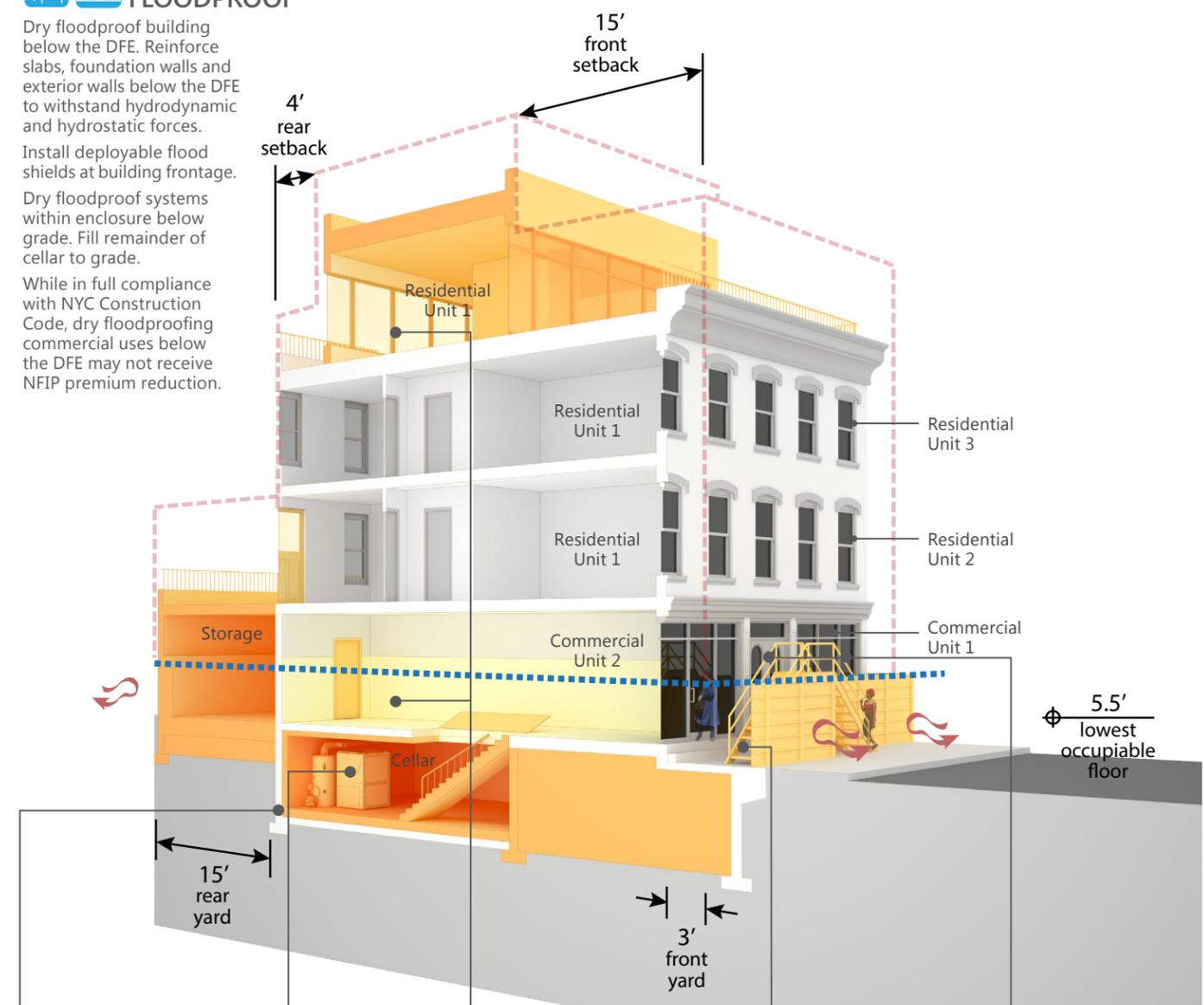


ILLUSTRATIVE RETROFIT STRATEGY

MIXED-USE ATTACHED

ELEVATE & DRY FLOODPROOF

Dry floodproof building below the DFE. Reinforce slabs, foundation walls and exterior walls below the DFE to withstand hydrodynamic and hydrostatic forces. Install deployable flood shields at building frontage. Dry floodproof systems within enclosure below grade. Fill remainder of cellar to grade. While in full compliance with NYC Construction Code, dry floodproofing commercial uses below the DFE may not receive NFIP premium reduction.



ZONING ENVELOPE

The allowable building height is measured from the DFE. The building is built to the maximum allowable floor area. In compliance with zoning, the floor area below the DFE can be relocated within the adjusted bulk envelope.

STRUCTURAL SYSTEMS

Three-story combustible construction with unreinforced masonry bearing party-walls and wood joists on a rubble foundation.

CRITICAL SYSTEMS

All systems are located in a mechanical room in the cellar.

ACCESS

Building access is provided at three front locations - one commercial entrance, one residential lobby and one residential entrance, all at 1.5' above the sidewalk grade. The building access at the rear yard is provided at two locations - one 4' above and the second 5' below the rear yard grade.

STRUCTURAL SYSTEMS

Fill partial cellar to lowest adjacent grade. Infilling and dry floodproofing all areas below the DFE requires reinforcing the foundation walls and slab. If adjacent properties are not infilling their sub-grade spaces, reinforce foundation walls to account for new load. Add new foundation system for addition at rear. Add reinforcement at foundation wall below the sidewalk and at the building facade for flood shields.

CRITICAL SYSTEMS

Systems to remain in place within dry floodproofed enclosure. Provide new stair access from commercial space. Locate remote emergency shut-off above the DFE. Install waterproof damper at the combustible air intake in mechanical room.

USE

Convert residential use below the DFE to commercial use and maximize the allowable floor area with a new addition at the rear. New addition involves loss of rear yard. Loss of use of the cellar with the exception of the mechanical room. Relocate the residential area below the DFE to the new 4th story addition. Gain 600 s.f. of commercial space.

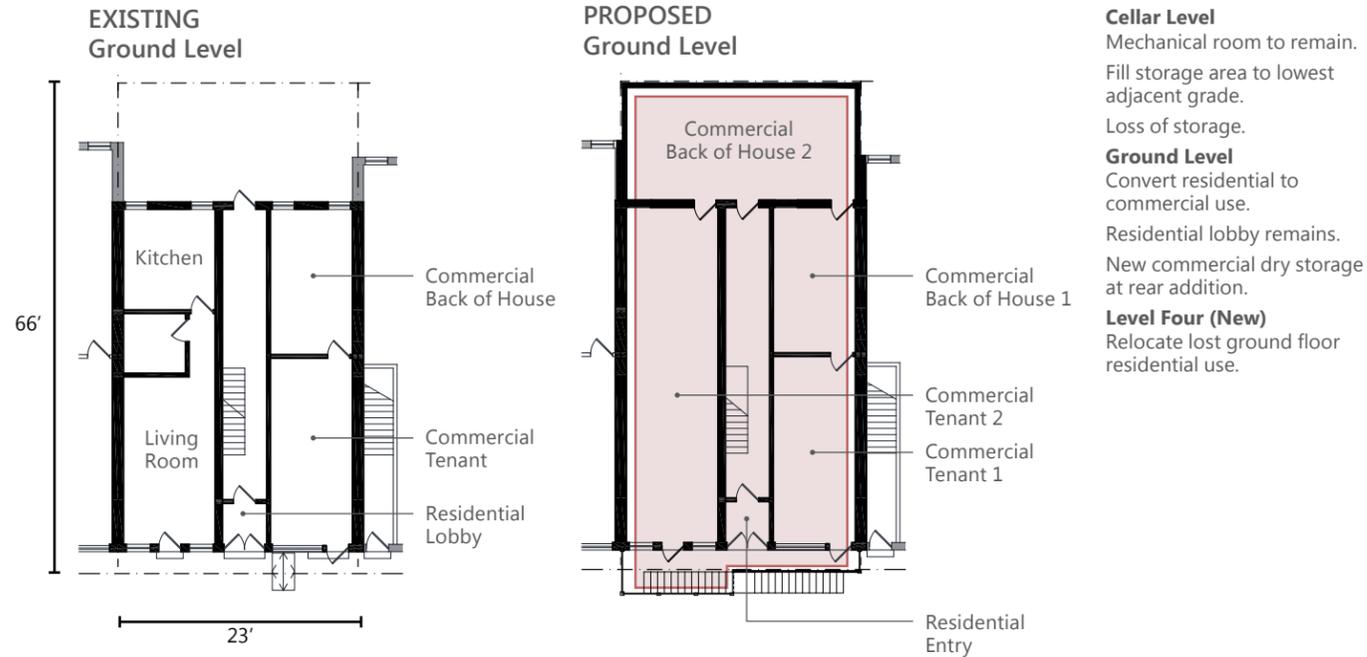
STREETScape

Existing residential lobby access to remain. Provide accessible entry at new commercial entries. Convert facade design of old residential use to comply with commercial streetscape mitigation requirements. Deployable flood shields and temporary stairs installed in public right of way per DOT revocable consent regulations.

ACCESS

Residential lobby to remain. Provide accessible entry at new commercial storefront. When deployable flood shields are in use, all egress paths must be provided via temporary stairs up and over the gates. Obtain DOT permit as required.

CHANGE OF USE

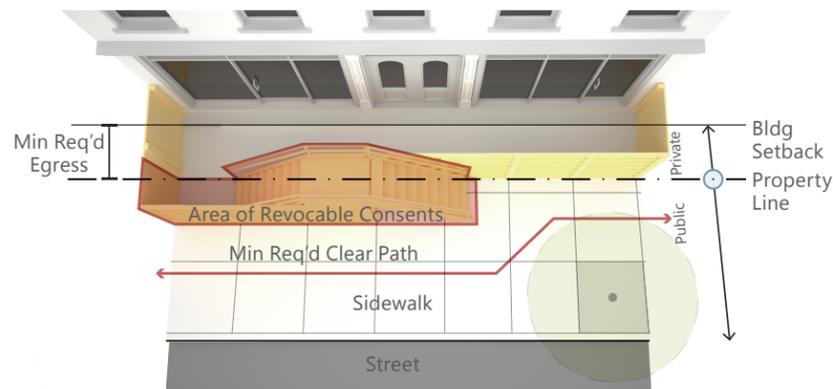


ADAPTATION CONSIDERATIONS

DRY FLOODPROOFING

Temporary flood shields and egress stairs deployed in front of a building are subject to building code requirements as well as the Department of Transportation (DOT) requirements where shields and/or stairs are partially or fully in the public right of way.

NYC DOB requirements for building access, width of egress, structural stability, headroom, and clearance height are tied to the building's occupancy and use, while NYC DOT has requirements and clearances for the public right of way – streets and sidewalks. Given that a portion of the flood shield assembly and stairs falls into the sidewalk, the property owner would be required to apply for revocable consents from the City which, if approved, grants the right to an individual or organization to construct and maintain certain structures on, over or under the inalienable property of the City – the streets and sidewalks.



ACCESS & STREETScape



NON-SUBSTANTIAL DAMAGE/IMPROVEMENT STRATEGIES

Non-substantially improved buildings within the floodplain are not required to comply with Appendix G of the NYC Building Code. This allows for greater flexibility in adapting buildings for flood resiliency. The alternatives illustrated below lower the risk for buildings and provide practical pathways for adaptation. Under current NFIP regulations, these measures may not lower insurance premiums.

The blue icons below illustrate adaptive measures that receive full reduction of NFIP premiums. Icons in gray indicate strategies that improve building resilience, but receive no or partial reduction of NFIP premiums.

If the lowest occupiable floor is left below the DFE, life safety must be considered. Residents should always follow evacuation procedures.

-  Occupied Space
-  Critical Systems
-  Dry Floodproof
-  Wet Floodproof
-  Open Structure
-  NFIP Premium Reduction

-  Dry floodproof below DFE. Install deployable flood shields at front and rear prior to flood event. Provide alternate means of egress over flood shields.
-  Existing residential, residential lobby, commercial and storage use below DFE are to remain. Cellar below lowest adjacent grade to remain.
-  Add reinforcement to party walls, exterior walls and foundation slab at dry floodproof enclosure and ensure changes do not impact neighboring property's structural integrity.
-  Critical systems to remain in place within dry floodproofed enclosure. Provide emergency shut off above the DFE.

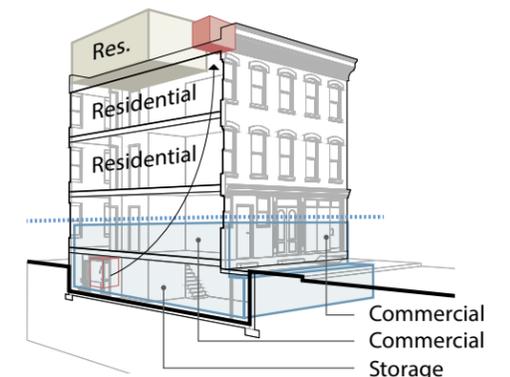
 No or partial reduction in NFIP premiums. Critical systems and residential uses remain below the DFE. Cellar remains. Dry floodproofing is not permitted at residential use. Lowest occupiable floor is below the DFE.



 No or partial reduction in NFIP premiums. Residential use remains located below the DFE and the structure is not filled to the lowest adjacent grade. Lowest occupiable floor is below the DFE.



 No or partial reduction in NFIP premiums. The structure is not filled to the lowest adjacent grade. Wet floodproofing is not permitted at commercial use.



-  Relocate residential and commercial systems within fire-rated and vented enclosure in rear-yard addition above the DFE.
-  Addition in rear for mechanical room and dry storage. Cellar below lowest adjacent grade to remain. Residential, commercial, and storage uses below the DFE remain.

-  Wet floodproof below the DFE. Install flood vents and replace all windows, doors and finishes with flood damage-resistant materials.
-  Convert residential space below the DFE to commercial use. Cellar below lowest adjacent grade to remain. Relocated residential use and critical systems to roof addition.
-  Relocate critical systems to the roof within a fire-rated and vented enclosure. Raise electrical utilities above DFE within electrical closet on the ground level.