

# MIXED-USE SEMI-DETACHED

This mixed-use example is a two-story wood frame structure with a party-wall and rubble foundation. The structure has one shared bearing wall and is not suitable for elevation.

Retrofit strategies that will result in full NFIP reduction in premiums require filling the basement to the lowest adjacent grade and reconfiguring the commercial space to a new elevated floor above the DFE. This strategy results in the relocation of the critical systems, partial loss of storage space for the commercial tenants and relocation of the active commercial space further away from the street frontage, which can be a major impediment to the viable operation of retail space. The residential space is relocated to a third story addition and the critical systems are placed in a rear addition or can be placed on the roof. All of these strategies

require significant structural reinforcement.

Another approach, which would also lower premiums, would be to dry floodproof the commercial space through the use of flood shields integral to the building structure, fill the cellar, add reinforcement, and relocate critical systems to the roof.

Alternative adaptation strategies, currently not recognized by FEMA and NFIP, include leaving existing commercial uses in place, wet floodproofing below the DFE, and relocating the critical systems within a rear-yard addition above the DFE. This would maintain the usability of the retail space but would allow the flooding of the basement and storage space in the event of a storm. Another alternative solution would be to leave all uses in place and dry floodproof the cellar.

## KEY CHARACTERISTICS

### FLOOD RISK

Flood Zone/BFE	AE +10'
Grade Elevation	+4' at sidewalk and property
Design Flood Elevation (DFE)	+11' (7' above sidewalk grade)
Lowest Occupiable Floor	+5' (1' above sidewalk grade)
Cellar Elevation	-2' (6' below sidewalk grade)
Critical Systems Location	Cellar

### TYOLOGY

Lot Size	40' x 100'
Building Size	37' x 65'
Yards	2' front; 35' rear; 2' at each side
Construction Type	Wood Frame
Foundation Type	Rubble
Year Built	1900
Stories	2 + cellar
Residential Floor Area	2,400 s.f. total
Residential Units	2
Commercial Floor Area	2,400 s.f. total
Commercial Units	2

### SITE CONDITIONS

Sidewalk Width	8'
Roadbed Width	70'
Zoning District	R7A + C1-3 Overlay, Mixed-Use



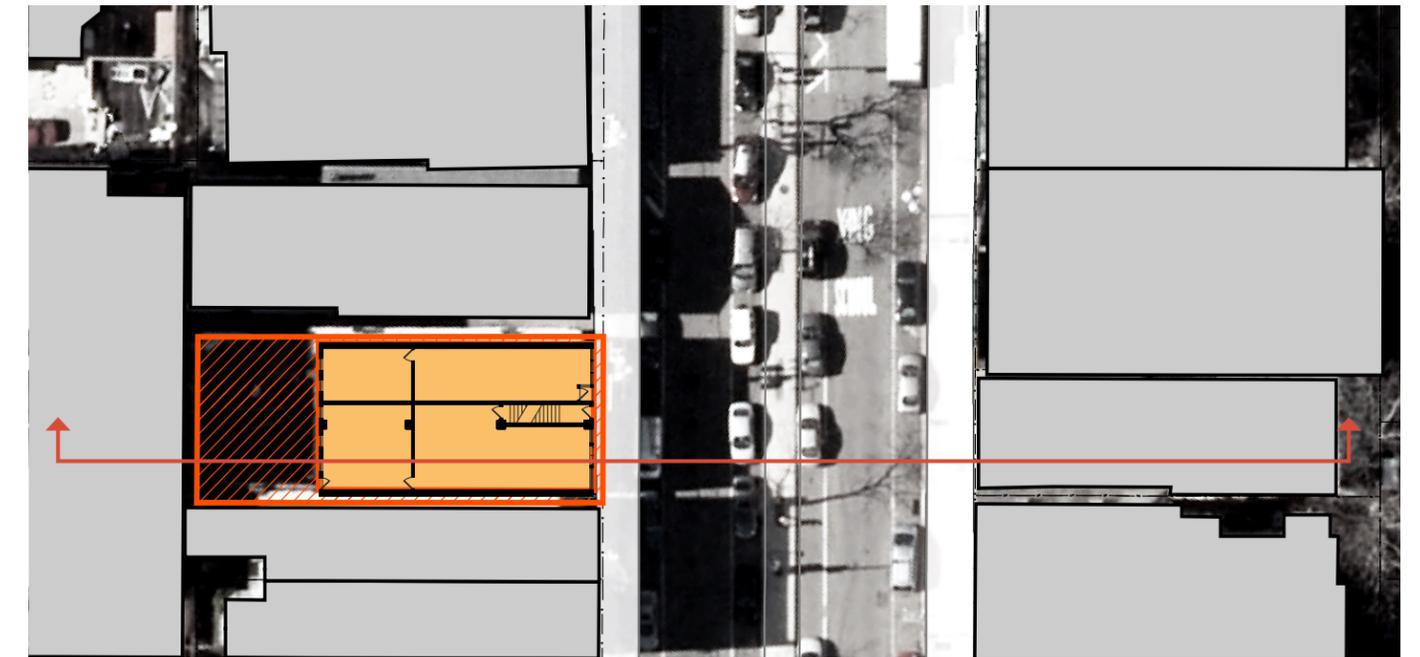
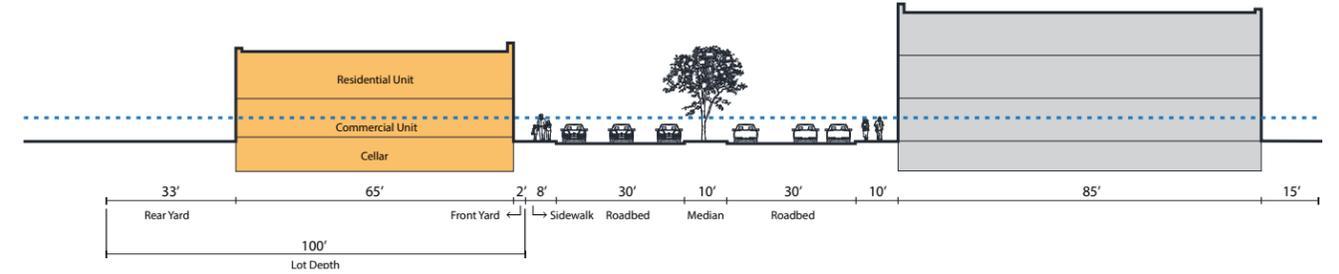
## SITE & BUILDING CONDITIONS

### SITE CONDITIONS

Sites with standard lot size and one side yard. Wide public streets and sidewalks are typical of this commercial corridor typology. On-street parking with no on-site parking is most common.

### BUILDING TYPOLOGY

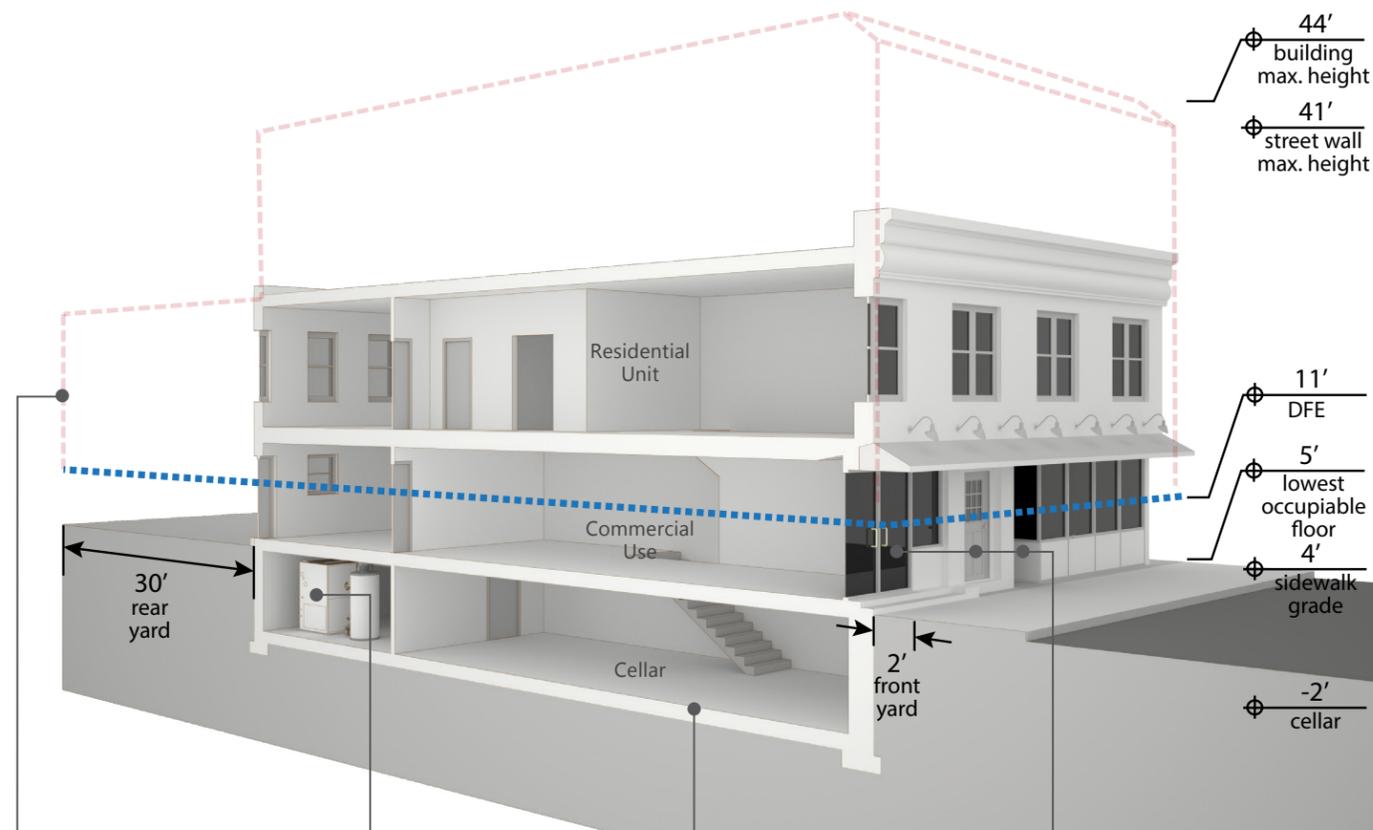
Commercial use and residential lobby is located at the ground floor with residential use above. Buildings are two to three-story with masonry or wood frame party-wall and wood joists on a rubble foundation. Critical systems are located in the cellar with the commercial space storage. Entrances are provided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



# EXISTING CONDITIONS

## FLOOD ELEVATION

- 11' DFE = BFE + freeboard
- = 6' above lowest occupiable floor
- = 7' above lowest property grade



### ZONING ENVELOPE

The allowable building height is measured from the DFE. The building has a non-compliant rear yard. 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.

### CRITICAL SYSTEMS

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

### STRUCTURAL SYSTEMS

Two-story combustible construction with wood frame party-wall and wood joists on a rubble foundation.

### ACCESS

Building access is provided at three front entry locations - two commercial uses and one residential lobby - at 1' above the sidewalk grade. The building access at the rear yard is provided at two locations, both 1' above the rear yard grade.

# ILLUSTRATIVE RETROFIT STRATEGY

MIXED-USE SEMI-DETACHED



## ELEVATE & WET FLOODPROOF

- Elevate the commercial floor to the DFE by relocating a portion of the floorplate, creating a double height space and mezzanine level for both commercial spaces.
- Fill cellar to lowest adjacent grade
- Elevate critical systems above the DFE at rear addition.
- Relocate residential unit to new addition at third story
- Wet floodproof area below the DFE by installing flood vents located at all exterior and interior walls and replacing all windows, doors, structure and finishes with flood damage resistant materials.



### CRITICAL SYSTEMS

Relocate systems to rear addition within fireproof and vented mechanical room. Tie all systems back into building systems following re-location. Install isolation and/or vibration pads as required.

### STRUCTURAL SYSTEMS

Fill cellar to grade. Reinforce foundation walls and modify floor slab, as required, in cellar where fill is added. If adjacent properties are not infilling their sub-grade spaces, reinforce foundation walls to account for new load. Reinforce foundation for new addition on roof. Add new foundation system for addition at rear. Relocate existing joists from the existing second story to the new lowest floor level and add support as required.

### USE

Relocate the two commercial spaces to elevated floor with one entrance lobby and showpit area for both commercial spaces. Addition at rear for critical systems and storage. This addition results in loss of rear yard and addition of terrace for residential use. Relocate residential space to new third story addition. There is a total loss of 400 s.f. of commercial use plus 2,400 s.f. of storage and systems use in the cellar. Gain of 1,000 s.f. for systems and storage at the new rear addition.

### ACCESS

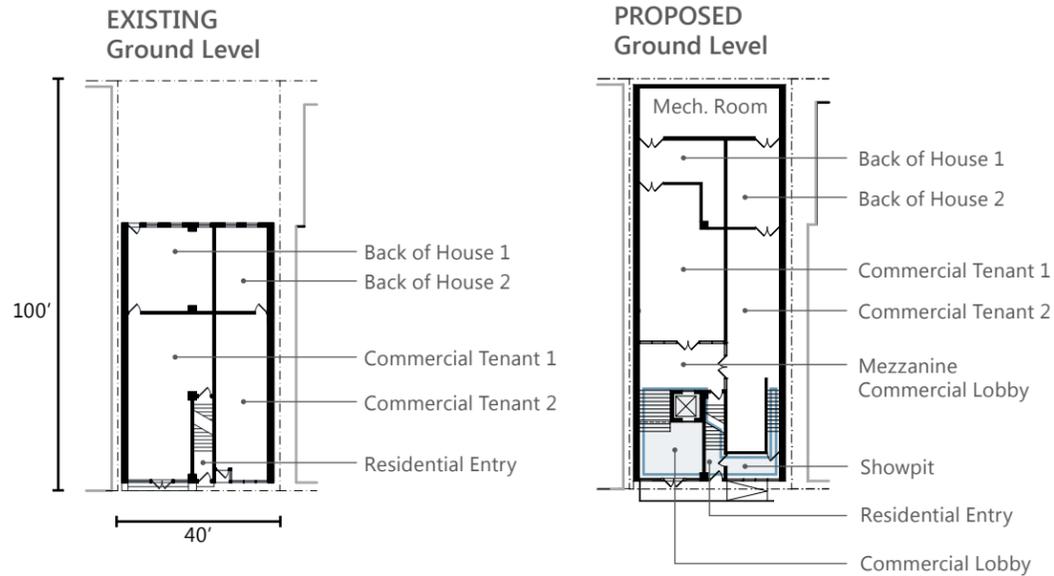
Residential lobby to remain. Reconfigure if necessary for wet floodproofing requirements. New access for commercial uses in new interior lobby accessible via ramp at streetwall entry. Commercial spaces accessible by stair or lift at commercial lobby.

### STREETSCAPE

Add ramp to commercial and residential entries. Convert one commercial entry to showpit area and replace all windows, doors and finishes with flood damage-resistant materials.



## CHANGE OF USE



**Cellar Level**  
Fill to lowest adjacent grade.  
Loss of mechanical room and commercial storage.

**Lower Ground Level**  
New commercial lobby, egress path and showpit area.  
Residential lobby remains, reconfigure per wet floodproofing requirements.

**Upper Ground Level**  
The raised ground level story becomes the lowest occupiable floor.  
Relocate commercial units to elevated floor.  
Relocate mechanical room and commercial storage to new commercial addition at rear.

**Level Two (New)**  
Relocate residential units.

## NON-SUBSTANTIAL DAMAGE/IMPROVEMENT STRATEGIES

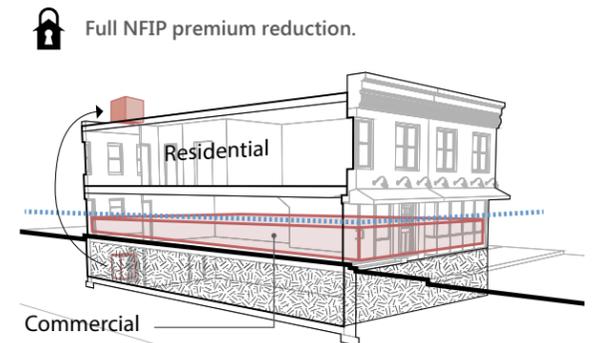
Non-substantially improved buildings within the floodplain are not required to comply with Appendix G of the NYC Building Code. This allows for greater flexibility in adapting buildings for flood resiliency. The alternatives illustrated below lower the risk for buildings and provide practical pathways 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 commercial space. Install deployable flood shields at front and rear openings below the DFE. Provide alternate means of egress through residential lobby.
- Wet floodproof residential lobby. Install flood vents and replace all windows, doors, and finishes with flood damage-resistant materials.
- Fill the cellar to lowest adjacent grade. Elevate the critical systems above the DFE.
- Loss of use at the cellar. Existing commercial space and residential lobby uses below the DFE are to remain.
- Fill cellar to the lowest adjacent grade, remove cellar slab and add reinforcement. Ensure changes to party-walls do not impact neighboring property's structural integrity. Add support at roof for relocated systems.
- Relocate critical systems to the roof within a fire-rated and vented enclosure. Raise electrical utilities above DFE within an electrical closet on the ground level.



## ADAPTATION CONSIDERATIONS

### ACCESS & STREETScape

An active streetscape along a retail corridor is a key aspect to its economic strength. While the challenges of adhering to new flood regulations can be counter to this, there are a number of ways property owners can meet the requirements while still providing transparency and activity at the ground level.

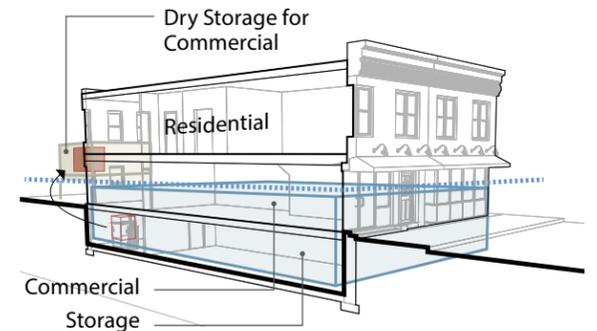
Here, the illustrated alternative strategy applies wet floodproofing to the space below the DFE in the application of flood damage-resistant materials yet the use of this area as a seating area is non-compliant.



### ACCESS & STREETScape



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.



- Wet floodproof below the DFE. Install flood vents and replace all windows, doors and finishes with flood-damage-resistant materials.
- New addition at rear used as mechanical room and dry storage. Existing commercial, storage and residential lobby uses below the DFE are to remain. Cellar to remain.
- Relocate critical systems within fire-rated and vented enclosure at rear-yard addition above the DFE.
- Commercial entrances and residential lobby to remain, Reconfigure residential lobby as required per wet floodproofing engineering requirements.

No or partial reduction in NFIP premiums. The critical systems remain located below the DFE and the structure is not filled to the lowest adjacent grade. Dry floodproofing below the lowest adjacent grade is not recognized.



- Dry floodproof below the DFE by strengthening the foundation, floors and walls and sealing all penetrations. Install deployable flood shields, front and rear windows, and doors.
- Existing commercial, residential lobby and cellar uses below the DFE are to remain. Provide egress route up and over flood shields at commercial and residential uses.
- 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.