

This mixed-use attached example is a five-story unreinforced masonry building with ground-floor retail, a residential lobby and residential units above. Because the structure is so heavy and in such close proximity to the neighboring building, it is unsuitable for elevation.

Retrofit strategies that will result in partial NFIP reduction in flood insurance premiums and full NYC Construction Code compliance involve dry floodproofing all areas below the DFE through structural reinforcement and the use of flood shields at the commercial façade. Where flood shields are used egress is provided through the

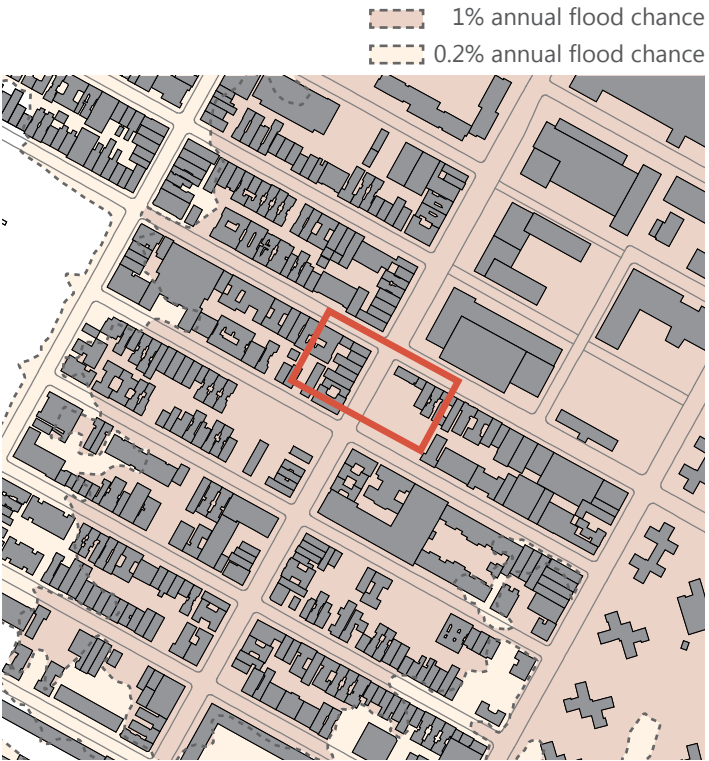
residential lobby. At the residential lobby wet floodproofing is used and requires reconfiguration of the layout to accommodate for engineering requirements of the flood vents as well as egress from the commercial unit.

Existing federal regulations do not foresee the co-existence of residential spaces or lobbies and commercial spaces on the same floor, which complicates retrofit strategies for mixed-use buildings.

Alternative adaptation strategies, currently not recognized by FEMA and NFIP, include leaving existing commercial uses on the ground-floor as is or wet floodproofing.

KEY CHARACTERISTICS

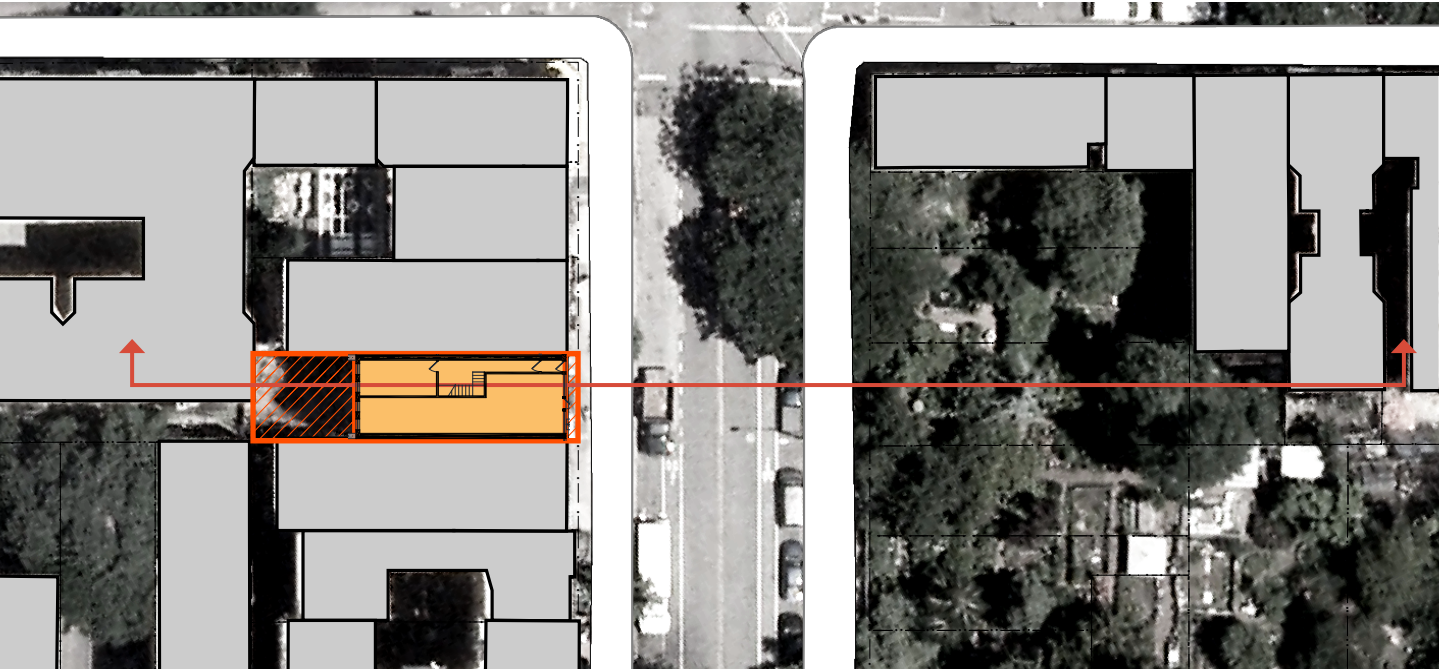
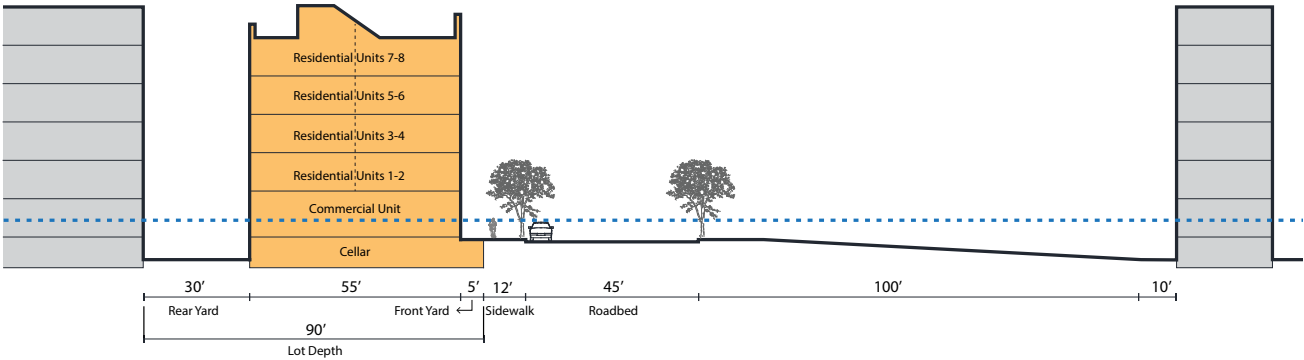
FLOOD RISK	
Flood Zone/BFE	AE +11'
Grade Elevation	+7' at sidewalk, +2' at rear property
Design Flood Elevation (DFE)	+12' (5' above sidewalk grade)
Lowest Occupiable Floor	+8' (1' above sidewalk grade)
Cellar Elevation	+1' (6' below sidewalk grade)
Critical Systems Location	Cellar
TYOLOGY	
Lot Size	23' x 83'
Building Size	23' x 54'
Yards	5' front; 30' rear
Construction Type	Masonry with wood joists
Foundation Type	Rubble
Year Built	1900
Stories	5 + cellar
Residential Floor Area	4,800 s.f. total
Residential Units	8
Commercial Floor Area	1,000 s.f. total
Commercial Units	1
SITE CONDITIONS	
Sidewalk Width	12'
Roadbed Width	45'
Zoning District	R7A + C1-5 Overlay, Mixed Use



SITE & BUILDING CONDITIONS

SITE CONDITIONS
Sites with narrow lot size and shallow rear yard depth. Rear yards typically range from 0 to 6 feet below the sidewalk grade. No side yards are provided. Standard width public streets and standard to wide sidewalk widths are typical of this commercial corridor typology.

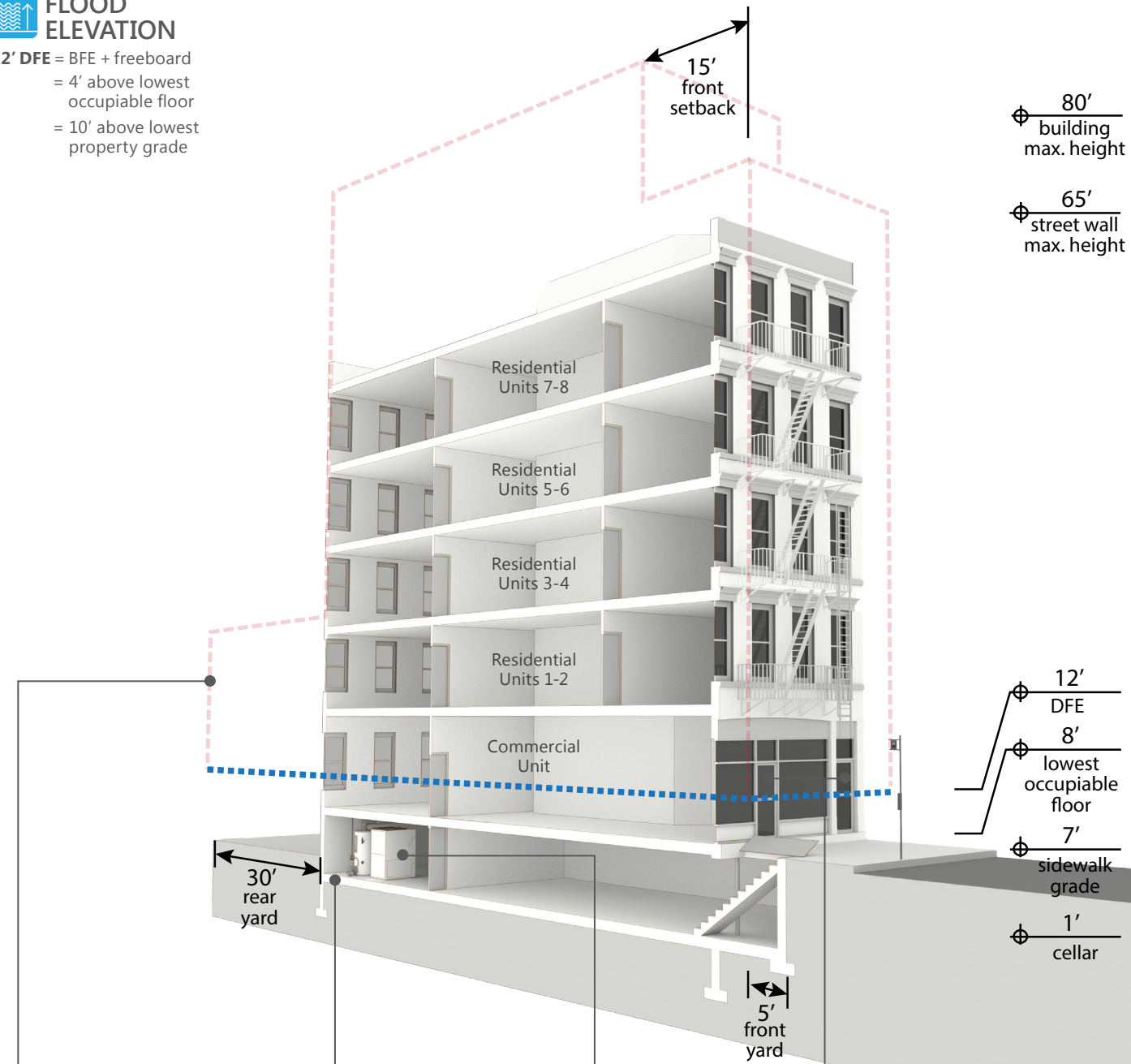
BUILDING TYPOLOGY
Commercial and residential use is located at the ground floor with residential use above. Buildings are four to six-story masonry party-walls with wood joists and a rubble foundation. Vertical circulation is provided by stairs and egress is provided by fire escapes. Critical systems are located in the basement/cellar. Entrances located above and below the sidewalk and property grade.



EXISTING CONDITIONS

FLOOD ELEVATION

12' DFE = BFE + freeboard
= 4' above lowest occupiable floor
= 10' above lowest property grade



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

Five-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 basement.

ACCESS

Building access is provided at two front locations - one for commercial use and one residential lobby, both 1' above the sidewalk grade. The building access at the rear yard is provided at two locations, one 5' above rear yard grade and the other 3' below the rear yard grade.

ILLUSTRATIVE RETROFIT STRATEGY

MIXED-USE
MID-RISE WALK-UP



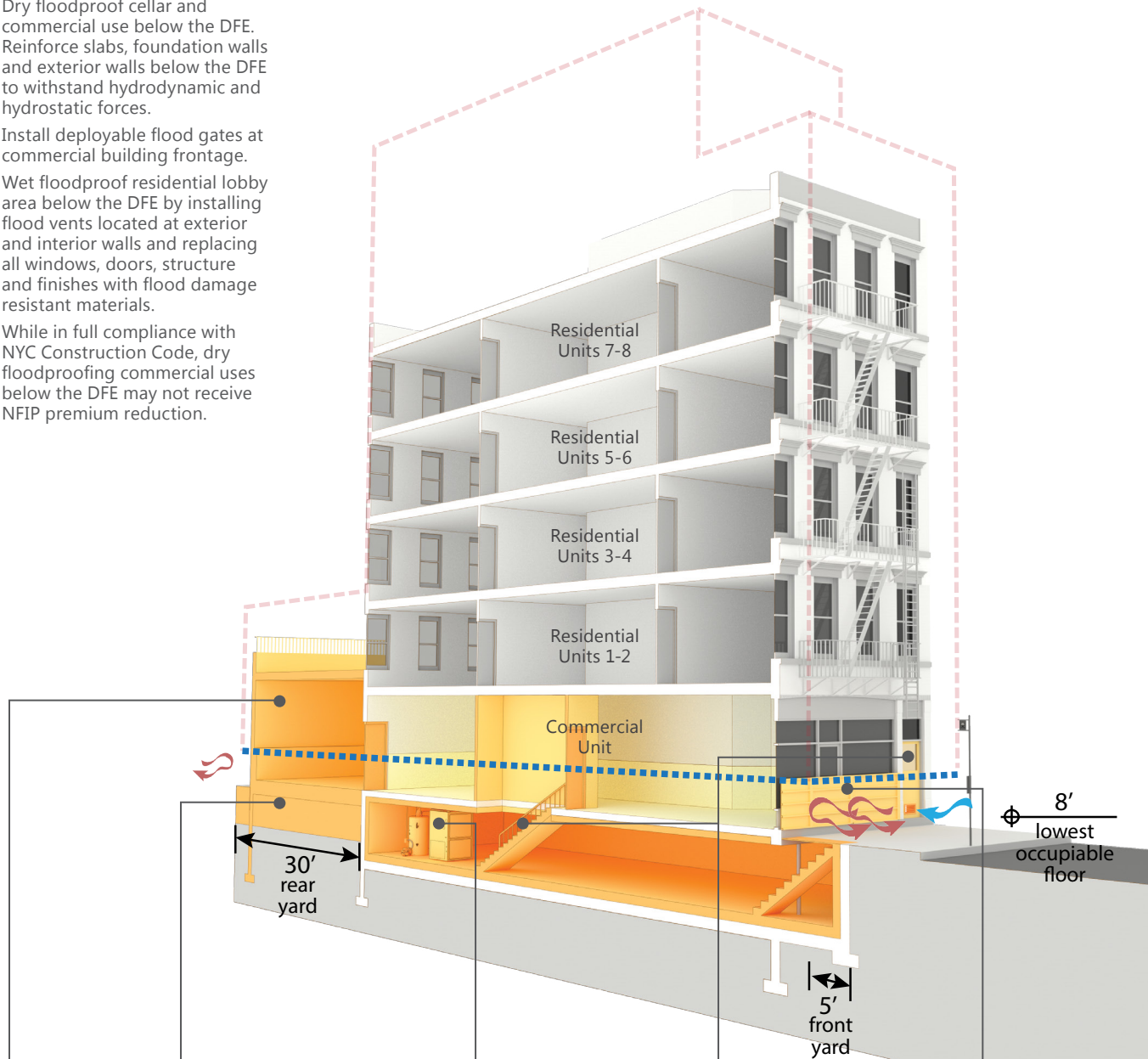
DRY & WET FLOODPROOF

Dry floodproof cellar and commercial use below the DFE. Reinforce slabs, foundation walls and exterior walls below the DFE to withstand hydrodynamic and hydrostatic forces.

Install deployable flood gates at commercial building frontage.

Wet floodproof residential lobby area below the DFE by installing flood vents located at exterior and interior walls and replacing all windows, doors, structure and finishes with flood damage resistant materials.

While in full compliance with NYC Construction Code, dry floodproofing commercial uses below the DFE may not receive NFIP premium reduction.



USE

Maximize commercial use with new addition at rear. There is a total gain of 700 s.f. of commercial use.

STRUCTURAL SYSTEMS

Dry floodproofing all areas below the DFE requires reinforcing the foundation walls and slab. Underpin slab with helical piles. Repoint stone walls and fill all voids prior to membrane application. Fill all voids between joists with approved insulation membrane. New reinforced concrete slabs and walls poured over membranes. Reinforce interior and exterior walls above grade to withstand flood loads and flood gates. Reinforce interior walls separating wet and dry floodproof areas.

CRITICAL SYSTEMS

Systems to remain in place within dry floodproofed cellar. 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.

ACCESS

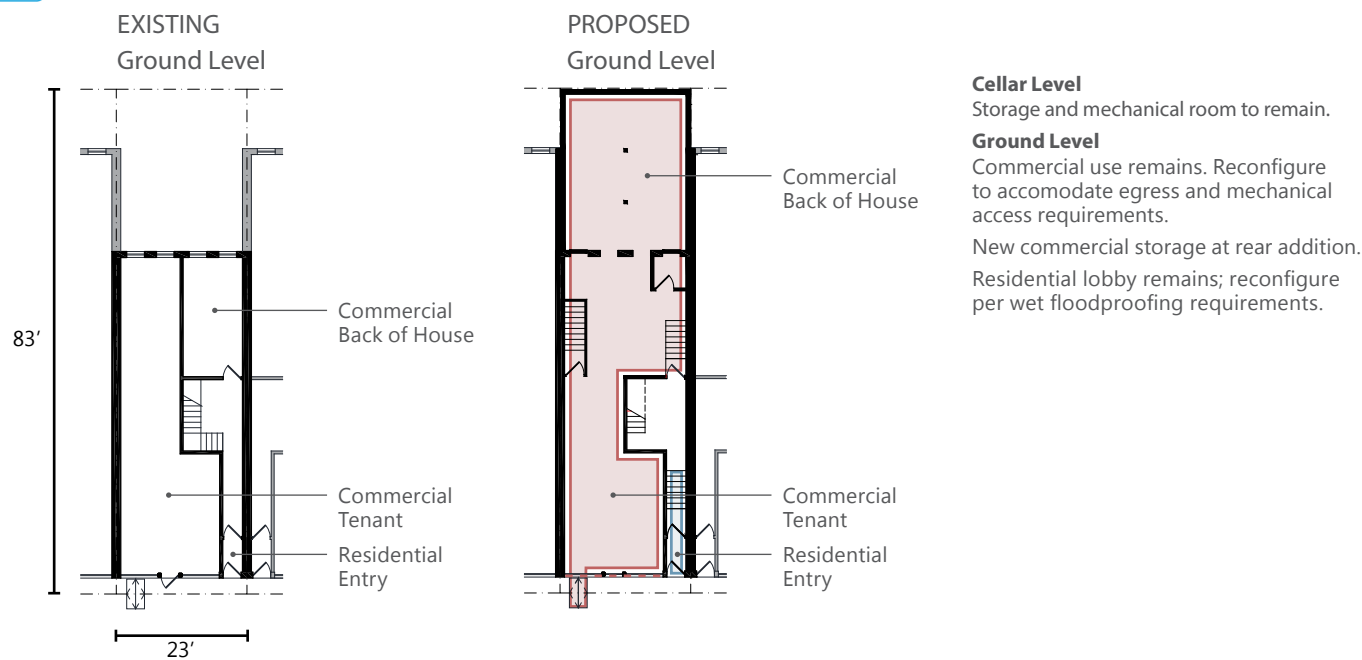
Reconfigure residential lobby per wet floodproofing requirements. Provide new interior access to cellar. Replace access hatch at sidewalk with floodproof compliant model. When deployable flood shields are in use all egress paths must be provided via temporary stairs up and over the gates. Obtain DOT permit as required.

STREETSCAPE

Residential and commercial storefront entries to remain. Deployable flood shields and temporary stairs installed per DOT revocable consent regulations.

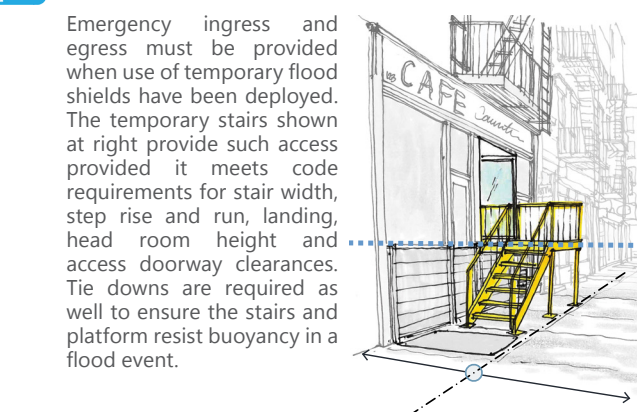
RETROFIT FLOOR PLAN

CHANGE OF USE

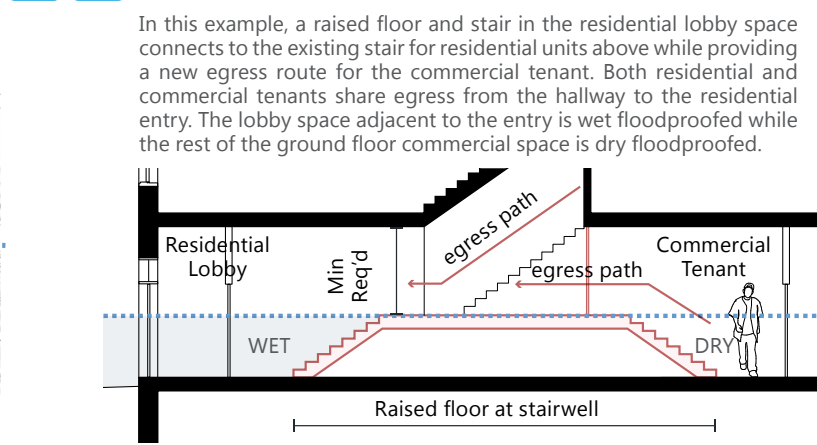


ADAPTATION CONSIDERATIONS

ACCESS



WET & DRY FLOODPROOFING



ACCESS & STREETScape



ALTERNATIVE STRATEGIES

MIXED-USE
MID-RISE WALK-UP



NON-SUBSTANTIAL DAMAGE/IMPROVEMENT STRATEGIES

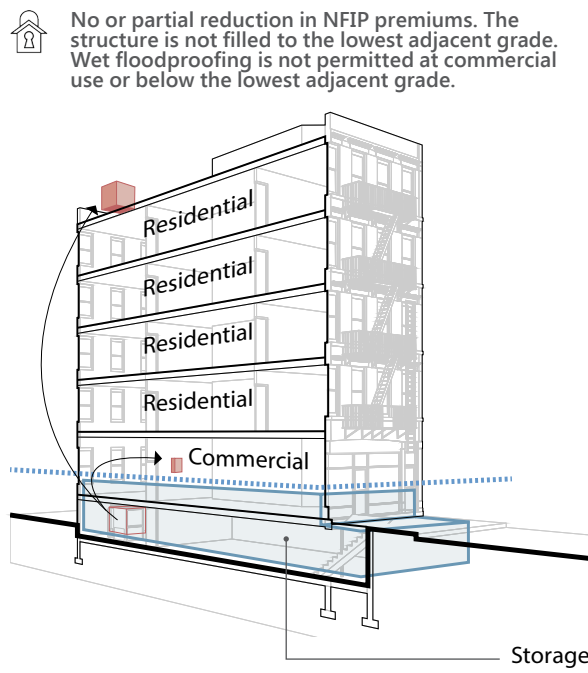
Non-substantially improved buildings within the floodplain are not required to comply with Appendix G of the NYC Building Code. This allows for greater flexibility in adapting buildings for flood resiliency. The alternatives illustrated below lower the risk for buildings and provide practical pathways 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

- Wet floodproof below the DFE. Install flood vents and replace all windows, doors and finishes with flood damage-resistant materials.
- Restrict cellar use to storage. Ground floor commercial and residential lobby uses remain.
- Add reinforcement for relocated systems on roof.
- Relocate critical systems to the roof within a fireproof and vented enclosure. Raise electrical utilities above the DFE.



- Wet floodproof below the DFE. Install flood vents and replace all windows, doors and finishes with flood damage-resistant materials.
- Addition in rear for mechanical room and dry storage. Existing commercial, storage and residential lobby uses below the DFE remain. Basement filled to lowest adjacent grade and converted to crawl space.
- Fill basement to the lowest adjacent grade. Ensure changes to party-walls do not impact neighboring property's structural integrity.
- Relocate systems to rear addition.

