MID-RISE ELEVATOR

The mid-rise elevator case study described here is a steel and concrete structure with a concrete foundation. This structural type is heavy and in very close proximity to the neighboring structure therefore not suitable for elevation.

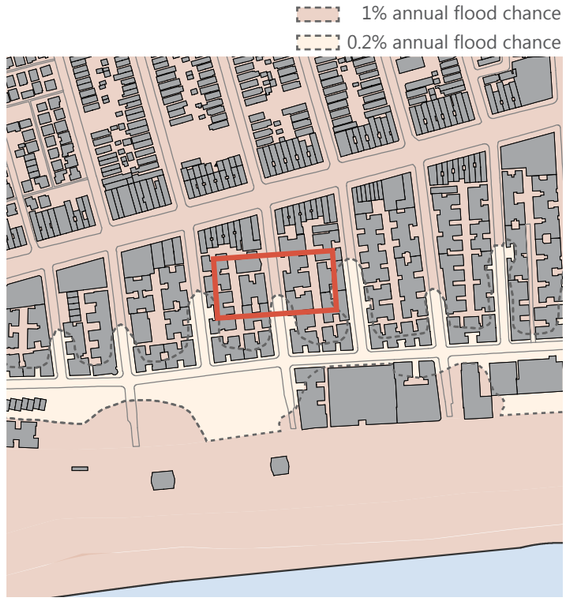
The retrofit strategy that will result in full NFIP reduction in flood insurance premiums requires filling the basement to the lowest adjacent grade, changing the first floor use from residential to community facility to allow for dry floodproofing the areas below the DFE, and wet floodproofing the residential lobby. Elevator equipment must be relocated above the DFE and the pit must be wet floodproofed. These mitigation strategies require significant structural reinforcement and lead to the loss of six units and the gain of additional community facility space, a reconfiguration that has implications for the property's financial viability. Additionally, because of the limited need for new community facility space, this strategy may not be applicable at a neighborhood scale, further restricting options for this typology. Critical systems can also be elevated within the building, on the roof, or in the rear yard if clearance is provided.

Alternative adaptation strategies, currently not recognized by NFIP, include leaving existing residential uses in the cellar and first floor, critical systems in the basement within a foodproof enclosure, and wet floodproofing below the DFE.

All floodproofing solutions require assessment of the building's structural integrity and a consideration of the impacts and implications for neighboring buildings.

KEY CHARACTERISTICS

FLOOD RISK	
Flood Zone/BFE	AE +11′
Grade Elevation	+6′ at sidewalk and property
Design Flood Elevation (DFE)	+12′ (6′ above sidewalk grade)
Lowest Occupiable Floor	+10′ (4′ above sidewalk grade)
Cellar Elevation	-1′ (7′ below sidewalk grade)
Critical Systems Location	Cellar
TYPOLOGY	
Lot Size	100′ x 100′
Building Size	100′ x 84′
Yards	3′ front; 14′ rear
Construction Type	Steel frame/concrete slab
Foundation Type	Concrete
Year Built	1930
Stories	6 + cellar
Residential Floor Area	50,400 s.f.
Residential Units	36
Elevator	Yes
SITE CONDITIONS	
Sidewalk Width	15′
Roadbed Width	34′
Zoning District	R7-1, Residential



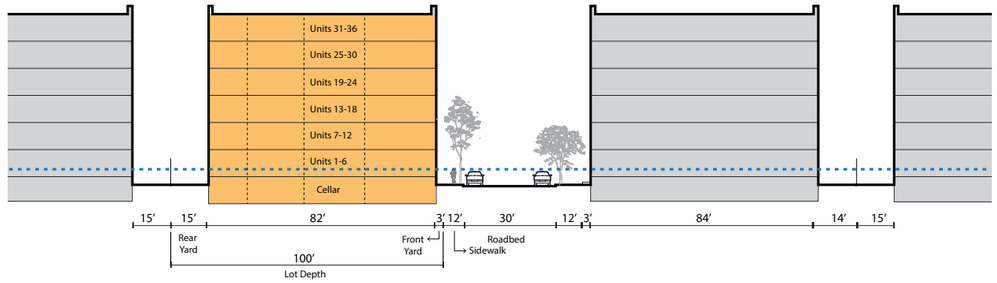
SITE & BUILDING CONDITIONS

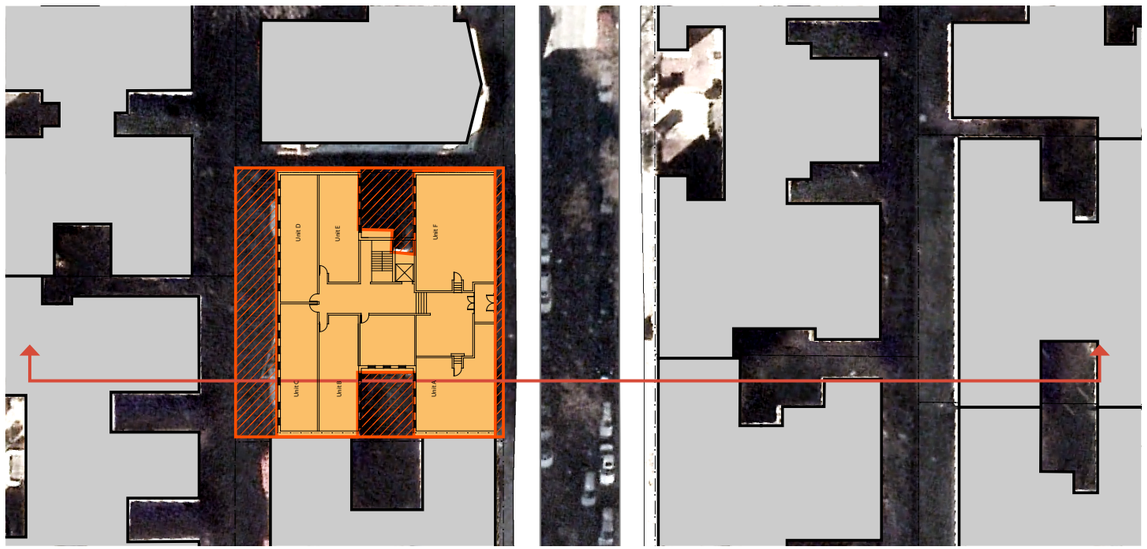
SITE CONDITIONS

Sites with wide 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, and streets and sidewalks are typically of standard width.

BUILDING TYPOLOGY

Buildings are five to six-story steel encased in concrete structure and masonry or concrete foundation. Vertical circulation is provided by an elevator and stairs, and egress is provided by fire escapes and pathway through the fire-separated cellar. Critical systems are located in the basement/cellar. Entrances located at or above the sidewalk grade.

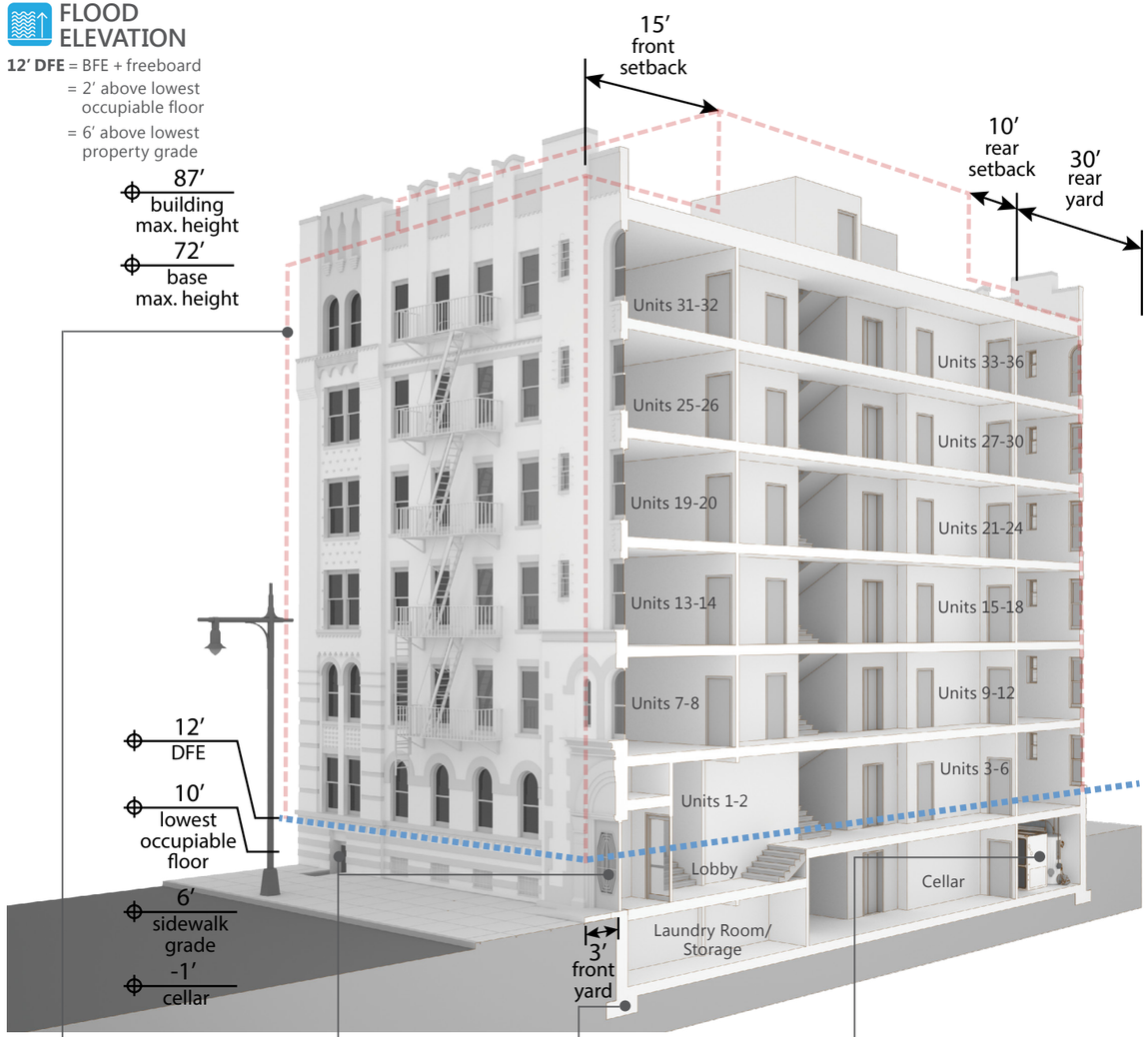




EXISTING CONDITIONS

FLOOD ELEVATION

12′ DFE = BFE + freeboard
= 2′ above lowest occupiable floor
= 6′ 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. To comply with zoning standards, the floor area below the DFE can be relocated within the adjusted bulk envelope.

ACCESS

Building access is provided at three front entrances; one residential lobby entrance at 1′ above the sidewalk grade; two egress doors are located 5′ below the sidewalk grade.

The building access at the rear yard is provided 5′ below the rear yard grade and serves as the required egress path.

STRUCTURAL SYSTEMS

Six-story non-combustible steel frame structure on a concrete foundation. All steel is encased in concrete.

CRITICAL SYSTEMS

All systems are located in the mechanical room in the basement.

ILLUSTRATIVE RETROFIT STRATEGY

MID-RISE ELEVATOR

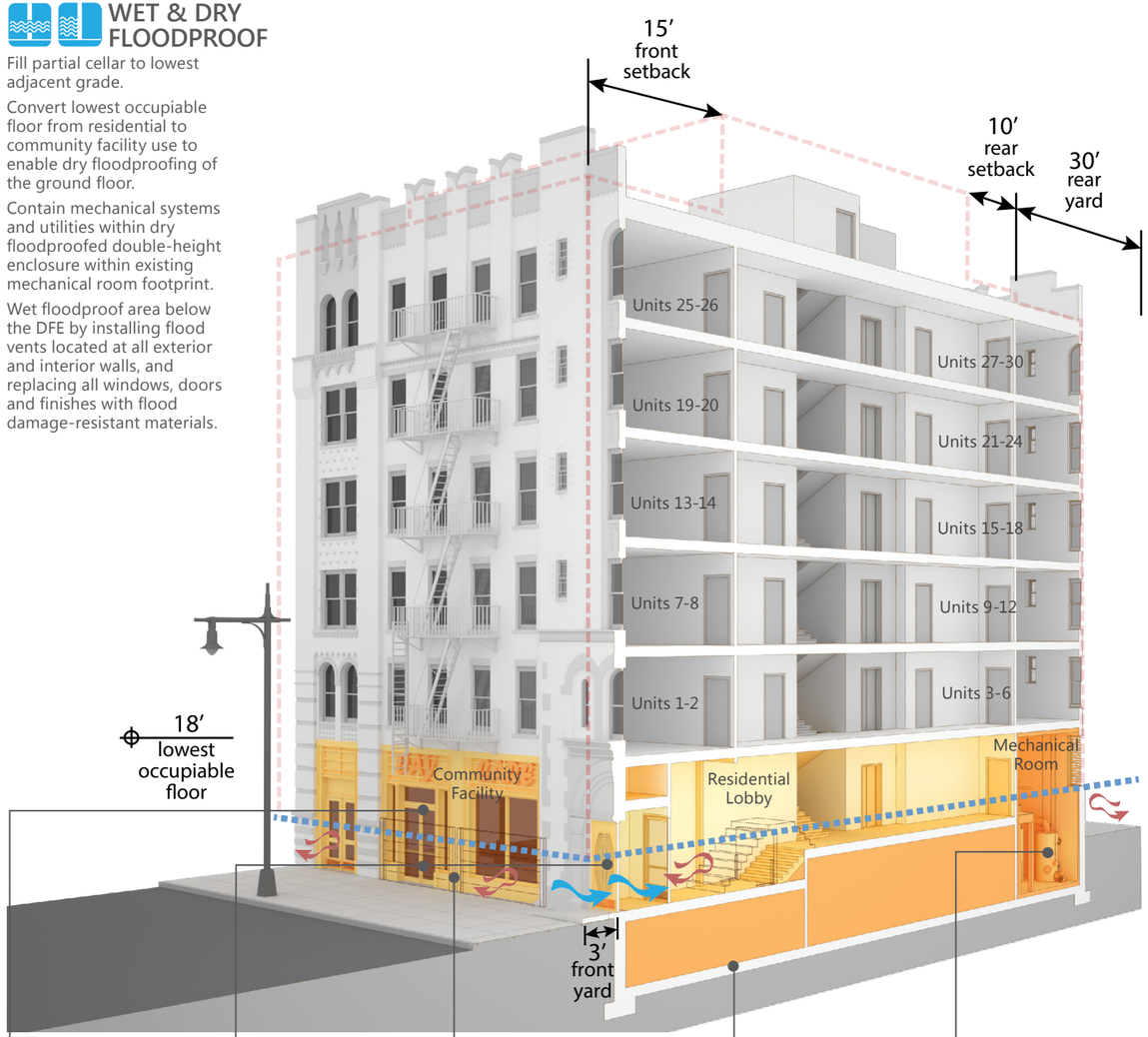
WET & DRY FLOODPROOF

Fill partial cellar to lowest adjacent grade.

Convert lowest occupiable floor from residential to community facility use to enable dry floodproofing of the ground floor.

Contain mechanical systems and utilities within dry floodproofed double-height enclosure within existing mechanical room footprint.

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



STREETSCAPE

Converting to community facility use activates the ground floor and increases transparency.

ACCESS

Residential lobby to remain. Install deployable flood shields and stairs 24 hours prior to flood event.

Two new access points at grade for community facility use.

One new residential egress route is provided to replace existing exit discharge to the street.

USE

Convert lowest level residential units to community facility with separate entrances from residential lobby. Residential lobby to remain.

Partial loss of floor area at the cellar storage and laundry facility where it has been filled to grade

Reconfigure mechanical room to double height space with mezzanine level.

Loss of 6,000 s.f. residential floor area, or six units, due to conversion to community facility; Gain 5,000 s.f. of community facility use.

STRUCTURAL SYSTEMS

Fill cellar, with exception of the mechanical room, to the lowest adjacent grade. Reinforce the foundation walls and modify the floor slab as required in cellar to account for new load.

Ensure structure at the mechanical room meets structural loads required for dry floodproofing.

Reinforce interior walls separating wet and dry floodproof areas.

CRITICAL SYSTEMS

Systems to remain in place; reconfigure mechanical space to include a mezzanine level in double-height dry floodproofed enclosure.

Fire-rated walls required.

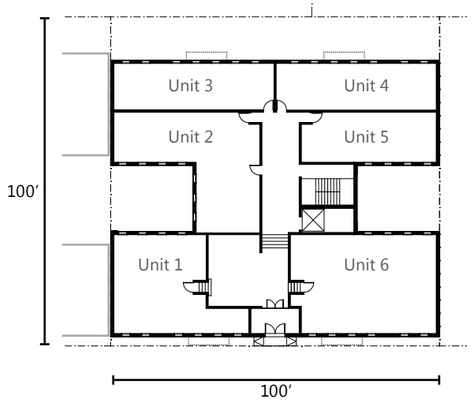
Relocate electrical panels to mezzanine level above the DFE.

Natural air intake or ventilation located above the DFE.

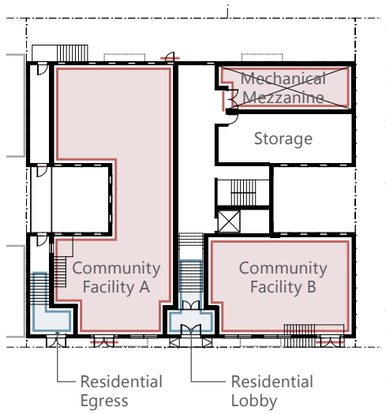
RETROFIT FLOOR PLAN

CHANGE OF USE

EXISTING
Level One



PROPOSED
Level One



Cellar Level
Fill to the lowest adjacent grade with expection of the mechanical room (modified to remain) and the elevator pit (remains).

Loss of storage, laundry room and egress path from rear.

Level One
Level one becomes the lowest occupiable floor.

Residential lobby to remain; reconfigure to accomodate new community facility layout.

New community facility spaces, storage, egress path and mechanical room mezzanine.

ADAPTATION CONSIDERATIONS

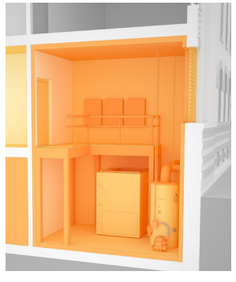
ACCESS

Converting the residential use to community facility use activates the ground floor of the building. The new facade on the public street creates a sense of security and comfort for pedestrians.

CRITICAL SYSTEMS

Converting a mechanical room to a dry floodproofed enclosure involves:

- Reinforcing spaces to limit water infiltration by hydrostatic and hydrodynamic loads
- Converting walls, floors, and ceilings to fire-rated enclosures
- Locating ventilation above the DFE



STREETSCAPE

ALTERNATIVE STRATEGIES

MID-RISE ELEVATOR

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

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. Wet floodproofing is not permitted at residential use. Lowest occupiable floor is below the DFE.

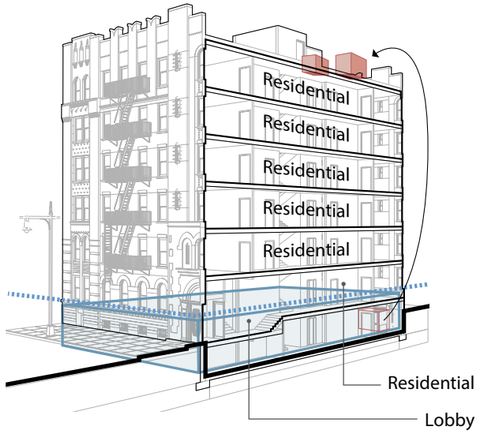
Elevate critical systems above the DFE.

Wet floodproof below the DFE. Install flood vents and replace all windows, doors and finishes with flood damage-resistant materials.

All existing uses to remain.

Add reinforcement at roof to support relocated critical systems.

Relocate critical systems to the roof within a fire-rated and vented enclosure. Raise electrical utilities above the DFE.



No or partial reduction in NFIP premiums. Residential use and partial critical systems remain located below the DFE and the structure is not filled to the lowest adjacent grade. Dry floodproofing is not permitted at residential use. Lowest occupiable floor is below the DFE.

Systems to remain in place below the DFE in dry floodproofed enclosure. Install outdoor natural gas emergency generator in rear yard to backup essential electrical infrastructure.

All existing building uses below the DFE remain.