BUNGALOW

The bungalow example described here is a structural type that is not entirely dissimilar to the structures anticipated by NFIP standards — a lightweight wood-frame building without a sub-grade foundation — but site conditions are highly constrained, making retrofitting (as well as reconstruction) difficult.

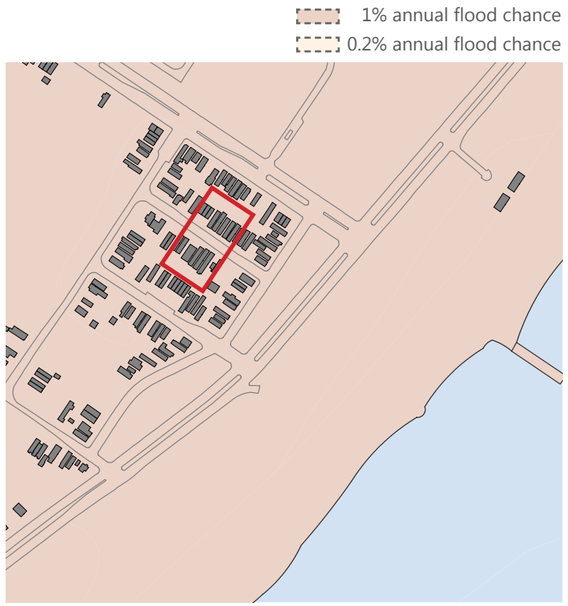
Retrofit strategies that will result in full NFIP reduction in flood insurance premiums include elevating the structure and shifting it to the rear yard to make room for new stair access in the front yard. The area below the elevated structure can be left open or enclosed and wet floodproofed. Critical systems can be elevated within an enclosure at the rear of the building or simply be elevated within the building. The costs associated with elevation are high considering the small size of the resulting building.

The vulnerability of the wood frame structure limits alternative adaptation strategies, which might include elevating critical systems to minimize damage and disruption.

Even though the light structure is conducive to elevation, the proximity of neighboring buildings may make it difficult to stage construction. Successful elevation requires assessment of the building's structural integrity and any implications of site excavation for the neighboring buildings.

KEY CHARACTERISTICS

FLOOD RISK	
Flood Zone/BFE	AE +12′
Grade Elevation	+4′ at sidewalk and property
Design Flood Elevation (DFE)	+14′ (10′ above sidewalk grade)
Lowest Occupiable Floor	+5.5′ (1.5′ above sidewalk grade)
Cellar Elevation	N/A
Critical Systems Location	Accessory structure at rear
TYPOLOGY	
Lot Size	20′ x 100′
Building Size	13′ x 60′
Yards	5′ front; 2′ side; 4′ side; 35′ rear
Construction Type	Wood frame
Foundation Type	Shallow masonry footing
Year Built	1915
Stories	1
Residential Floor Area	800 s.f.
Residential Units	1
Elevator	N/A
SITE CONDITIONS	
Sidewalk Width	12′
Roadbed Width	30′
Zoning District	R3-2, Residential District



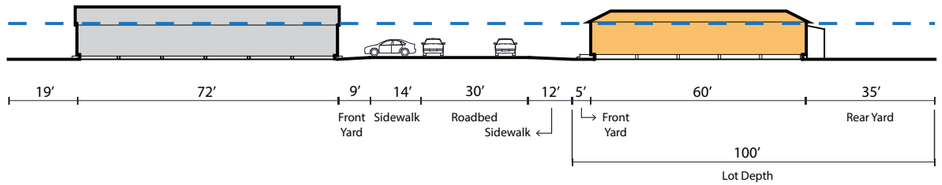
SITE & BUILDING CONDITIONS

SITE CONDITIONS

Sites with a narrow lot size with high building coverage, and limited side and front yards that lead to tight building adjacencies. Streets are typically of sub-standard width and sidewalks are not always provided.

BUILDING TYPOLOGY

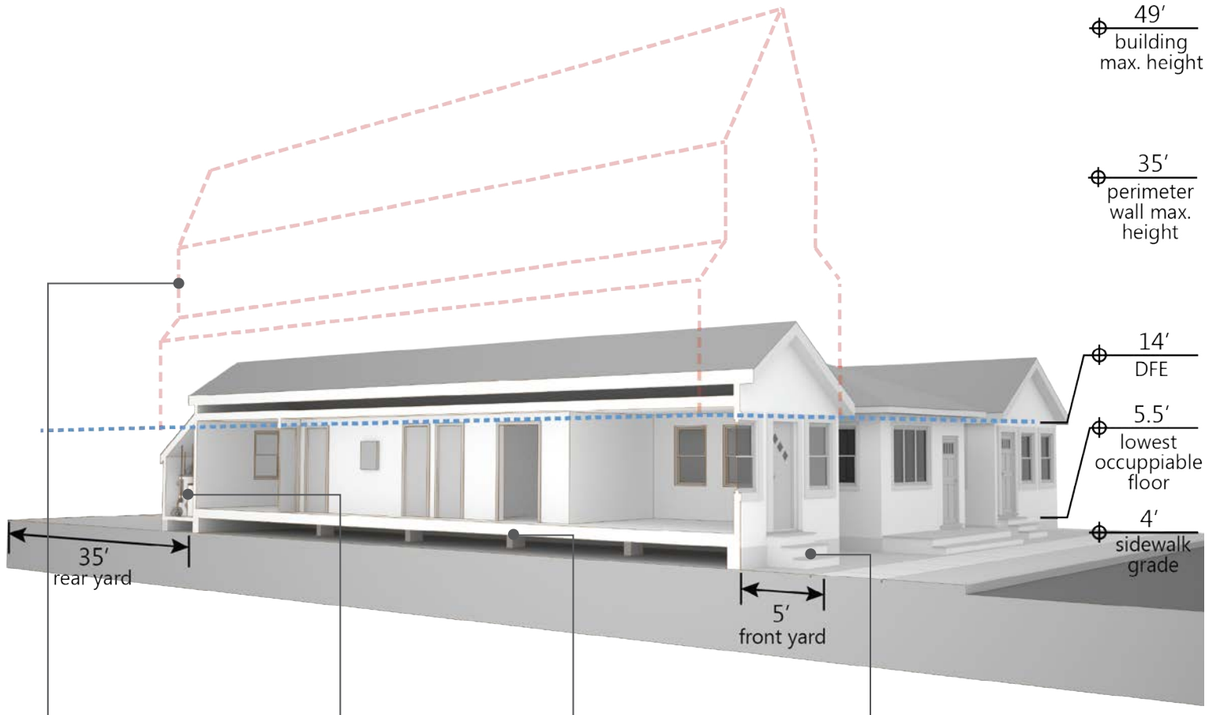
Buildings are one-story wood frame structure with a shallow spread footing foundation. The structure is not sufficiently tied to the foundation and has no basement or cellar. Critical systems are located in an accessory structure or within the building.



EXISTING CONDITIONS

FLOOD ELEVATION

14′ DFE = BFE + freeboard
= 8.5′ above lowest occupiable floor
= 10′ above lowest property grade



ZONING ENVELOPE

The allowable building height is measured from the DFE.

The existing building has non-compliant front and side yards, and does not provide required parking. These non-compliances must be considered when retrofitting.

The floor area is not maximized. 200 square feet can be added pursuant to underlying floor area ratio and within the adjusted bulk envelope.

CRITICAL SYSTEMS

All systems are located in a rear enclosure below the DFE.

STRUCTURAL SYSTEMS

Single story wood frame combustible construction type on shallow unreinforced masonry foundation. The wood structure is not sufficiently tied to the foundation.

ACCESS

Building access is provided at the front and rear entrances 1.5′ above the sidewalk grade.

ILLUSTRATIVE RETROFIT STRATEGY

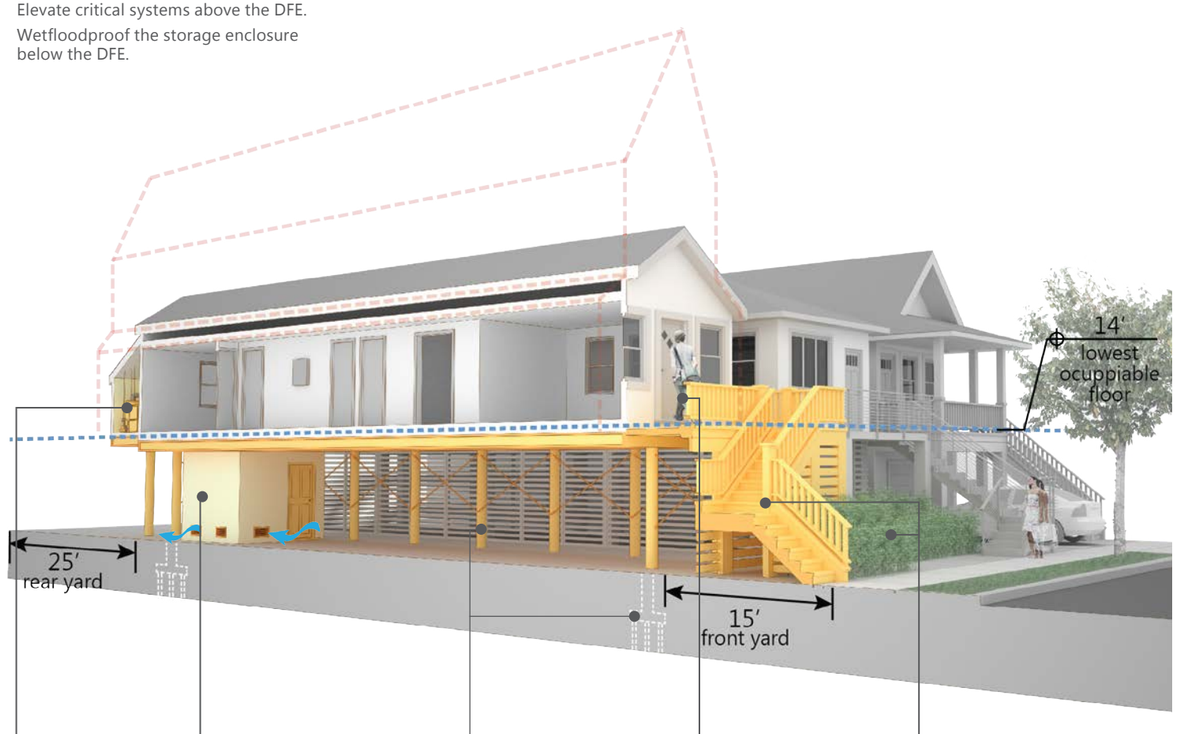
BUNGALOW

ELEVATE & WET FLOODPROOF

Elevate the existing structure on a new foundation system to bring the lowest occupiable floor above the DFE. To accommodate access to the elevated structure, shift the existing building footprint back from the front property line into the rear yard.

Elevate critical systems above the DFE.

Wetfloodproof the storage enclosure below the DFE.



CRITICAL SYSTEMS

Elevate systems above the DFE within a fireproofed and vented accessory structure at the rear.

USE

There is no loss of usable space because the existing home is elevated in place.

If loss of usable space occurs by relocation of access or critical systems within habitable space, that loss of usable floor area can be recaptured as an addition within the permitted bulk envelope.

The non-compliant yards remain.

The wet floodproofed area below the structure may only be used for vehicular parking, crawl space, storage or access.

STRUCTURAL SYSTEMS

Elevate the structure on columns with a spread footing foundation system. Piles may be required depending on soil conditions or by the flood hazard area designation.

Elevate the accessory structure containing the critical systems on structural columns or piles.

Insulate and fireproof underside of lowest floor to enclose building envelope.

ACCESS

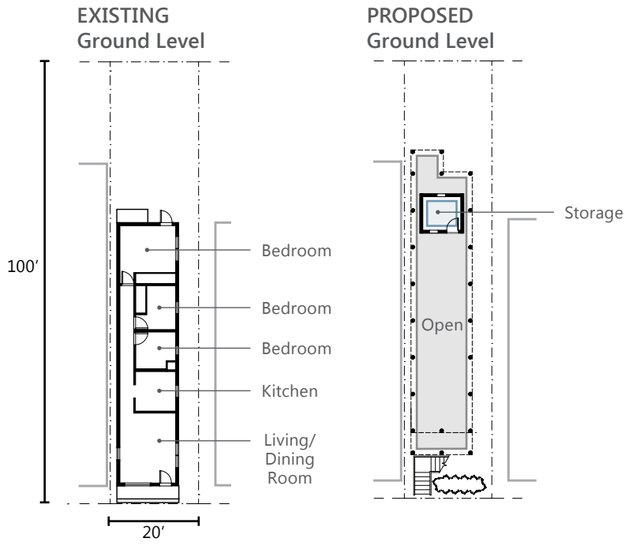
The building entrance is relocated to 10′ above sidewalk grade. The stairs may be located underneath or adjacent to the structure depending on available yard space and clearance underneath the structure. Here the building is shifted towards the rear property line to accommodate the stair run and porch depth.

STREETSCAPE

As per the Zoning Resolution, homes elevated over 5′ above the sidewalk grade require one streetscape mitigation, and over 9′ require two. These enhancements can be selected from a list of options specified in the Zoning Resolution, such as: plantings, covered and uncovered porches, stairs with 90-degree turns, or elevated front yards. Here, plantings and the stair turn are counted toward streetscape mitigations.

RETROFIT FLOOR PLAN

CHANGE OF USE



Ground Level
Parking, access, and storage.

Two required streetscape mitigations: plantings and stair turn.

Level One
This becomes the lowest occupiable floor.

The critical systems are relocated within an accessory structure.

Additional streetscape mitigation: porch.

In order to drive wood piles or rebuild a foundation, typically the building must be moved out of the way and then back onto the new foundation. Where site conditions make elevation difficult due to restricted access to the building, consider elevating several buildings at once in order to accomodate the project equipment requirements.

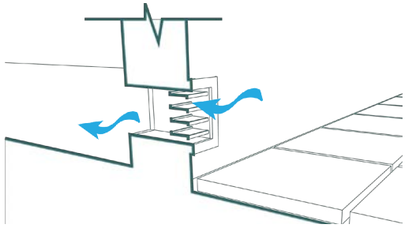
ADAPTATION CONSIDERATIONS

ACCESS

Materials within non-complying side yards must be of fire rated construction type.

When elevating buildings in residential neighborhoods, designers should consider adding elements that enhance visual connectivity to the street. Zoning requires homes to provide specific streetscape mitigations such as planting along the streetwall, open or covered porches, stair turns, or raised yards.

WET FLOODPROOFING



When wet floodproofing, openings for water penetration and exit must be engineered according to ASCE 24 requirements. A minimum of two openings is required for each enclosed area below the DFE, to be installed on at least two sides of each enclosed area. The opening should be located no higher than 1 foot above the grade immediately under each opening.

STREETSCAPE

ALTERNATIVE STRATEGIES

BUNGALOW

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

Elevate the lowest floor above the DFE. Wet floodproof enclosed area below the DFE by installing flood vents and flood damage-resistant materials.

New addition of mechanical room at rear is within the adjusted bulk envelope. Restrict all uses below the DFE to parking, crawl space, access or storage.

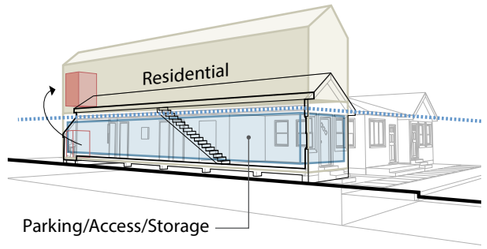
Elevate the entire structure on a new foundation system. Walls below the DFE have openings to allow automatic entry and exit of flood waters.

Elevate critical systems above the DFE. Relocate to new mechanical room at rear.

Stair access provided from below the elevated building within the wet floodproofed enclosure.

Due to the elevated height of the lowest occupiable floor 10 feet above the sidewalk grade, two streetscape mitigations are required.

Full NFIP premium reduction.



Elevate the lowest floor above the DFE. Open structure below the DFE may be used as parking, access, crawl space or storage.

Relocate floor area lost to mechanical room to a new second story addition within the adjusted bulk envelope. Restrict all uses below the DFE to parking, crawl space, access or storage.

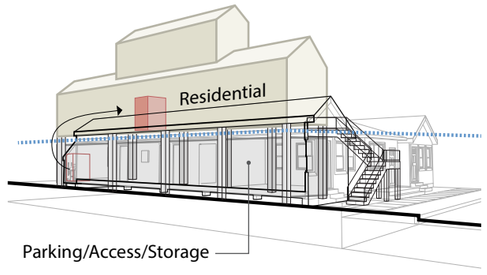
Elevate the entire structure on a new foundation system.

Elevate critical systems above the DFE. Relocate to new mechanical room within existing structure.

Stair access provided from below, adjacent to or in front of the elevated building.

Due to the elevated height of the lowest occupiable floor 10 feet above the sidewalk grade, two streetscape mitigations are required.

Full NFIP premium reduction.



Protect systems by elevating the systems above the DFE.

If the DFE is within a few feet of the lowest occupiable floor consider keeping the strucure in place and using flood damage-resistant materials below the DFE.

Due to the wood frame construction type, extensive structural damage may occur. Create a continuous load path by connection of the frame to the roof and foundation.

No or partial reduction in NFIP premiums. Residential use and lowest occupiable floor remain located below the DFE.