Residential Flood Retrofitting in Urban Areas
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Primary Issues

- Population density
- Common mitigation techniques not always applicable
- More variation in residential building types at-risk

Mitigation Considerations

**Typical Elevation Techniques**
- Elevate on open or closed foundations
- Typical approaches address simple single-family dwellings
- Equipment and materials are stored on-site and work can be completed within the lot

**Challenges to Overcome**
- Numerous basements, below grade living spaces which include utilities
- Many older homes (much of it pre-1960s and many pre-1940s)
- Row houses and structurally connected homes
- Adjacent properties or households are impacted with common walls or narrow lots

*Figure 5: Elevating tightly spaced homes, such as these in Breezy Point, NY, presents construction challenges.*
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Residential Flood Retrofitting in Urban Areas
Breezy Point Case Study

Foundation Options

- Elevate on Columns or Piers
- Utilize Micro-Piles and Helical Anchors

Hurricane Sandy Recovery Fact Sheet 2

- Eliminates need to move building
- Addresses limited overhead clearance
- Compares possible foundation options
High Velocity Water
Narrow Lots and Streets

Breezy Point

No Room To Move
Houses
Foundation Options

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- Utilize Micro-Piles and Helical Anchors

Photo Courtesy of +LAB Architect PLLC - Eric Soltan
Figure 8: Example of a grouted micropile (8a) and a helical pile (8b)
Foundation Requirements and Recommendations for Elevated Homes

Many homes in New York and New Jersey damaged during Hurricane Sandy experienced flood levels that exceeded the base flood elevation (BFE). The Federal Emergency Management Agency’s (FEMA) Mitigation Assessment Teams (MATs) observed several construction and foundation types in the disaster area. The assessment teams also observed narrow building lots and lots with constrained access that will pose construction challenges if those homes are required to be elevated or if more tools to elevate them to reduce exposure to future flooding (Figure 1).

**Base Flood Elevation (BFE):** The height of the base floodplain flood elevation of 1% annual chance flood (100-year flood) in areas subject to flooding. This also applies to homes in areas subject to flooding in the community.

**Special Flood Hazard Area (SFHA):** This is the area subject to a 1% chance of flooding in any given year. This area includes all areas that lie in floodplains and are subject to flooding.

This fact sheet is intended to assist owners, builders, code officials, planners, and engineers with reconstruction and new construction to avoid or reduce flood-related damage. The purpose is to help provide engineers and designers with information to make informed design recommendations when working on current homes and when faced with new construction. This fact sheet assumes the reader is familiar with the National Flood Insurance Program (NFIP) Special Flood Hazard Area (SFHA) zone designations, including Coastal A Zones. For more information about the coastal SFHA zone designations, visit https://www.fema.gov/ coastal-flood-plain-maps.

- Eliminates need to move building
- Addresses limited overhead clearance
- Compares possible foundation options
Long Island City, Queens
Figure 5: A row house with the floor levels being elevated to maximize living area above the BFE in Zone A.

Notes:
1. Units located on both sides
2. Flood openings at front and back of building
Residential Flood Retrofitting in Urban Areas
Red Hook Case Study

Elevation Option: Re-purpose Lowest Floor
Conversion of wood-framed walls into shear walls
Can maintain the historic look of a building

Historic Building Example
Red Hook, NY
Originally constructed 1840
- Filled crawlspace to LR
- Abandoned Lowest Floor

Hurricane Sandy Recovery Advisory?
Provides homeowners an opportunity to:
- Improve flood resistance
- Lower NFIP flood insurance premiums
Covers a variety of building types
- Converting ground floors to compliant spaces
- Filling basements
- Elevating homes
Elevation Option: Re-purpose Lowest Floor

Conversion of wood-framed walls into shear walls

Can maintain the historic look of a building
Communities must adopt specific language in their floodplain management regulations in order for homes with converted wood-framed shear walls to be considered for reduced flood insurance premiums.

Note: Drawing is not to scale. The number of flood openings shown is for illustration purposes only; the total number of openings depends on the square footage of the enclosure and the type and design of the opening.
Historic Building Example

Red Hook, NY
Originally Constructed: 1860
- Filled Crawlspace to LAG
- Abandoned Lowest Floor
Hurricane Sandy Recovery Advisory 7

Provides homeowners an opportunity to:

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Residential Flood Retrofitting in Urban Areas
Conclusions

- Allows us to maintain the character of our cities
- The problems are the same, but we have to be more creative with the solutions
  - Limited options for acquisition
  - Different techniques due to tight spaces
  - Consider both engineering and lowering insurance premiums
QUESTIONS?

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