NEW YORK CITY AFTER SUPERSTORM SANDY: REBUILDING AND RESILIENCY

James P. Colgate, RA, Esq.
Assistant Commissioner for Technical Affairs + Code Development
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

Short-term Response
  - Rapid Assessments
  - Rapid Repairs
  - Emergency Ordinances
  - Training and Outreach

Longer-term
  - Comprehensive Zoning Changes
  - Building Resiliency Task Force
  - Special Initiative for Rebuilding and Resiliency
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

Short-term Response
  - Rapid Assessments
  - Rapid Repairs
  - Emergency Ordinances
  - Training and Outreach

Longer-term
  - Comprehensive Zoning Changes
  - Housing Recover Office
  - Building Resiliency Task Force
  - Special Initiative for Rebuilding and Resiliency
NEW YORK CITY DEPARTMENT OF BUILDINGS

975,000 buildings
1,044 employees
169 plan examiners
446,000 plan examinations/yr
281,000 inspections/yr
49,000 violations/yr
1,462 new building permits/yr
NEW YORK CITY DEPARTMENT OF BUILDINGS

975,000 buildings
1,044 employees
169 plan examiners
446,000 plan examinations/yr
281,000 inspections/yr
49,000 violations/yr
1,462 new building permits/yr

Not: HRO, SIRR, OLTPS, DDC, DPR, DCP, HPD, DOHMH
NEW YORK CITY DEPARTMENT OF BUILDINGS

Effective FIRMS (1983):

100-year floodplain:

<table>
<thead>
<tr>
<th></th>
<th>FIRM (1983)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residents</td>
<td>218,000</td>
</tr>
<tr>
<td>Jobs</td>
<td>190,000</td>
</tr>
<tr>
<td>Buildings</td>
<td>36,000</td>
</tr>
<tr>
<td>Floor area (sq. ft.)</td>
<td>374 million</td>
</tr>
</tbody>
</table>

1983 FEMA Flood Insurance Rate Maps, FIRMs

Source: FEMA

100-year floodplain:

<table>
<thead>
<tr>
<th></th>
<th>FIRM (1983)</th>
<th>ABFE 2013</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residents</td>
<td>218,000</td>
<td>447,000</td>
<td>105%</td>
</tr>
<tr>
<td>Jobs</td>
<td>190,000</td>
<td>341,000</td>
<td>79%</td>
</tr>
<tr>
<td>Buildings</td>
<td>36,000</td>
<td>71,000</td>
<td>97%</td>
</tr>
<tr>
<td>Floor area (sq. ft.)</td>
<td>374 million</td>
<td>589 million</td>
<td>57%</td>
</tr>
</tbody>
</table>

Source: FEMA
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

Short-term Response
  - Rapid Assessments
  - Rapid Repairs
  - Emergency Ordinances
  - Training and Outreach

Longer-term
  - Comprehensive Zoning Changes
  - Housing Recover Office
  - Building Resiliency Task Force
  - Special Initiative for Rebuilding and Resiliency
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

Short-term Response
  - Rapid Assessments
  - Rapid Repairs
  - Emergency Ordinances
  - Training and Outreach

 Longer-term
  - Comprehensive Zoning Changes
  - Housing Recover Office
  - Building Resiliency Task Force
  - Special Initiative for Rebuilding and Resiliency
SUPERSTORM SANDY – THE STORM

Hurricane Sandy was a highly idiosyncratic storm. For example, its wind field was almost three times that of Katrina...

Hurricane Katrina (August 28, 2005)

Gusts extended 300 miles

Hurricane Sandy (October 28, 2012)

Gusts extended 1,000 miles
SUPERSTORM SANDY – THE STORM

... Sandy’s path also included a rare “westward hook,” rather than a more traditional eastward track

**Cause of the Westward Hook:**

- **Jet stream:** Hurricane Sandy was steered between a blocking high pressure system in northern Canada and a low pressure trough over the Southeast U.S.

Source: Bostinno.com, NOAA, AGU Blogosphere, National Weather Service, Slate.com
SUPERSTORM SANDY – THE STORM

... And experienced, among other things, a record-shattering storm surge

<table>
<thead>
<tr>
<th>Event</th>
<th>Water Height (feet)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy</td>
<td>Oct. 2012</td>
</tr>
<tr>
<td>Irene</td>
<td>Aug. 2011</td>
</tr>
<tr>
<td>Donna</td>
<td>Sep. 1960</td>
</tr>
</tbody>
</table>

¹ Water height is in feet above 1983-2001 MLLW
Source: UCAR/ NCAR, NOAA
Among Sandy’s idiosyncrasies was its timing relative to the City’s normal tidal cycle…

Before the brunt of Sandy arrived, it was possible to observe the difference in the tidal cycle between the Sound and Ocean.

The arrival of Sandy’s storm surge largely coincided with high tide on the Ocean.

10/29 - Midnight
10/29 - 6:00am
10/29 - 6:00pm
10/29 - 7:00pm
10/29 - 8:00pm
Another trait of the storm was the shift in wind direction that occurred as Sandy’s surge reached its peak.
SUPERSTORM SANDY – THE STORM

These factors led to particularly significant damage along the Atlantic Coast and in the Southern Harbor.

**SURGE AND WAVE ACTION**

_Atlantic Coast_ shorelines faced inundation _plus_ impact wave action

- Structures are primarily low-rise residential
- Severe structural damage concentrated in areas directly facing shoreline

**STILLWATER FLOODING**

_Upper Harbor_ and other areas to the north generally experienced inundation only

- Damage primarily to mechanical, electrical, and telecommunication systems and building contents
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

Short-term Response
- Rapid Assessments
- Rapid Repairs
- Emergency Ordinances
- Training and Outreach

Longer-term
- Comprehensive Zoning Changes
- Housing Recover Office
- Building Resiliency Task Force
- Special Initiative for Rebuilding and Resiliency
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

**Short-term Response**
- Rapid Assessments
- Rapid Repairs
- Emergency Ordinances
- Training and Outreach

**Longer-term**
- Comprehensive Zoning Changes
- Housing Recover Office
- Building Resiliency Task Force
- Special Initiative for Rebuilding and Resiliency
SHORT-TERM RESPONSE – Rapid Assessments

DOB retained 8 private engineering firms
  over 200 engineers teamed with city inspectors/engineers

80,000 Inspections Performed

ATC 45 Safety Evaluations
  Red, Yellow, Green

Inspectors met individually with 800 homeowners
SHORT-TERM RESPONSE – Rapid Assessments

LESSON 1:
Communication!
Hand Holding for public
• Very important
• Requires lots of resources

Google images, downloaded 6/10/2013
1/2 of all impacted residential units were outside 100-year floodplain

60% of all impacted buildings were outside 100-year floodplain

23% of all red-tagged buildings were outside 100-year floodplain
SHORT-TERM RESPONSE – Rapid Assessments

LESSON 2:
FIRMs are Estimates

• 2007 Map Errors
• 2013 Methodologies
• Mother Nature
• Importance of Freeboard

Staten Island
FEMA/Walt Jennings
SHORT-TERM RESPONSE – Rapid Assessments

Post-FIRM buildings account for 14% of buildings in inundation area.

Post-FIRM buildings account for only 4% of red tags

<table>
<thead>
<tr>
<th>Year Built</th>
<th>Inundation area</th>
<th>Red tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1983</td>
<td>84%</td>
<td>95%</td>
</tr>
<tr>
<td>1983-2001</td>
<td>9%</td>
<td>3%</td>
</tr>
<tr>
<td>2002 or later</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>No Data</td>
<td>2%</td>
<td>1%</td>
</tr>
</tbody>
</table>
SHORT-TERM RESPONSE – Rapid Assessments

Flood Type by Geography

Number Damaged Buildings by Tag & Flood Type

Total = 1502 (84% of Tags)

Surge & Wave Action responsible for majority (84%) of tags and almost all severe damage

Total = 287 (16%) of Tags

Notes: 1. Based on DOB tag information as of 12/20/12. Excludes 55 buildings with "dummy" Building Identification Numbers without detailed PLUTO data. Flood type based on geographic data in PLUTO.
SHORT-TERM RESPONSE – Rapid Assessments

Multi-story buildings suffered fewer structural issues but experienced relatively larger losses to equipment:

- Electrical
- Heating & Air Conditioning
- IT/Telecommunications

Mechanical and electrical equipment frequently was in basements or elevated to base flood elevations that were too low.
LESSON 3:
Building codes --> resilient buildings
Older buildings are more at risk

LESSON 4:
Analyze post-disaster data
SHORT-TERM RESPONSE – Rapid Repairs

Sheltering and Temporary Emergency Power (STEP)

1st community to partner with FEMA
Reduces costs of Transitional Shelter Assistance (TSA)
Repaired heat, hot water, electricity
NYC retained construction managers to perform repair work
By March 2013, restored services to 11,700 homes/20,000 housing units

New York Times, 12/17/2013
SHORT-TERM RESPONSE – Rapid Repairs

LESSON 5:
Think outside the box!
SHORT-TERM RESPONSE – Emergency Ordinances

Streamline Processed
Remove obstacles
Ensure resiliency

Waiver of building permit fees
Emergency Zoning Relief
Emergency Freeboard Rule

“There is no such thing as a zoning emergency”
1 or 2 family residence

This drawing illustrates a 1 or 2 family home as it existed on October 28, 2012. If this home were to be elevated to standards recommended by FEMA advisory maps in order to protect it from future flooding, it would violate zoning height limitations. The Executive Order suspends those height limitations if the home is elevated to any level selected by the homeowner that is at least as high as the Advisory Base Flood Elevation (ABFE), but not higher than 2 feet above the ABFE (an additional level of protection known as “freeboard”). The level selected in this range is referred to in the Executive Order as the Zoning Design Flood Elevation (ZDFE).

Existing on October 28, 2012

*Grades and elevations are for illustration only, and will differ depending upon location

**North American Vertical Datum (NAVD) of 1988

Elevated to Zoning Design Flood Elevation

EFFECTIVE PER EXECUTIVE ORDER:
Height limitations are suspended to the extent necessary to raise the level of the lowest habitable floor (LHF) previously located above grade to the zoning design flood elevation (ZDFE).

The lowest habitable floor (LHF) is raised 5’ to the maximum zoning design flood elevation (ZDFE).

Any level selected within this range is the zoning design flood elevation (ZDFE).

ABFE = +12’*
LHF = +9’*
GRADE = +6’*

NAVD = 0’**

ZDFE = +12-14’**
ABFE = +12’*
GRADE = +6’*

NAVD = 0’**
EXAMPLE
1 or 2 family residence, non-complying as to yards

This diagram illustrates a single or two family home, non-complying as to yards as of October 28, 2012. This home can be elevated to the zoning design flood elevation (ZDFE), and an increase in existing non-compliances and the creation of new non-compliances would be permitted pursuant to Section 3, paragraph (a)(f) of the Executive Order.

EFFECTIVE PER EXECUTIVE ORDER:
Height limitations are suspended to the extent necessary to raise the level of the lowest habitable floor (LHF) previously located above grade to the zoning design flood elevation (ZDFE).

Existing on October 28, 2012
Zoning design flood elevation (ZDFE) may be set at any level within this range
*Grades and elevations are for illustration only, and will differ depending upon location
**North American Vertical Datum (NAVD) of 1988
***Example utilizes an R3 district bulk envelope

Elevated to Zoning Design Flood Elevation

NYC Buildings
SHORT-TERM RESPONSE – Emergency Ordinances

- **Existing (pre-FIRM) building built at grade**
- **Previous Building Code requirements**
- **Building Code requirements with freeboard rule**

**Emergency rule requiring freeboard**
LESSON 6:
Make sure zoning works with floodplain ordinance

LESSON 7:
Determine what emergency powers your community has

LESSON 8:
Consider fee waivers for building permits
SHORT-TERM RESPONSE – Training and Outreach

Website updates
- Guides
- FAQs
- Best Practices
- Links

Email address

Presentations
- Local AIA, engineering and trade associations
- Community forums

Field offices

Free technical consultations

http://vimeo.com/60855077
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

Short-term Response
- Rapid Assessments
- Rapid Repairs
- Emergency Ordinances
- Training and Outreach

Longer-term
- Comprehensive Zoning Changes
- Housing Recover Office
- Building Resiliency Task Force
- Special Initiative for Rebuilding and Resiliency
OUTLINE: NYC AFTER SUPERSTORM SANDY

New York City Department of Buildings

Superstorm Sandy – the Storm

Short-term Response
  - Rapid Assessments
  - Rapid Repairs
  - Emergency Ordinances
  - Training and Outreach

Longer-term
  - Comprehensive Zoning Changes
  - Housing Recover Office
  - Building Resiliency Task Force
  - Special Initiative for Rebuilding and Resiliency
LONGER-TERM – Comprehensive Zoning Changes

Draft issued May 20, 2013

46 Pages of amendments to the NYC Zoning Resolution

(total 3,592 pages)
LONGER-TERM – Comprehensive Zoning Changes

Draft issued May 20, 2013
46 Pages of amendments to the NYC Zoning Resolution

Proposal: When lowest floor is located 5–9 feet above curb level, choose 1
When lowest floor is 9 feet or more above curb level, choose 2

- Planting
- Stair turn
- Roofed porch
- Raised yard
LONGER-TERM – Housing Recovery Office

Community Development Block Grants

Housing portion:
$306 million for 1- and 2-family houses;
$225 million for multi-family buildings;
$108 million for public housing;
$9 million for rental assistance
LONGER-TERM – Building Resiliency Task Force

About to release recommendations
Building Code and other legislative proposals
Best Practices
LONGER-TERM – SPECIAL INITIATIVE FOR REBUILDING AND RESILIENCY (SIRR)

SIRR builds on Mayor Bloomberg’s focus on climate change . . . .

"We face two urgent challenges - both of which we’re responding to as part of PlaNYC. First, we have to shrink our carbon footprint to slow climate change. Second, we have to adapt to the environmental changes that are already beginning to take place...”

- Mayor Michael Bloomberg, Aug. 12, 2008
LONGER-TERM – SPECIAL INITIATIVE FOR REBUILDING AND RESILIENCY (SIRR)

LONGER-TERM – SPECIAL INITIATIVE FOR REBUILDING AND RESILIENCY (SIRR)

SIRR will develop comprehensive planning on climate change issues.

### Citywide Infrastructure/Built Environment Areas of Focus:
- Coastal Defenses
- Built Environment (housing, commercial, not-for-profit)
- Energy (power, gas, fuel, steam)
- Hospitals & Healthcare Facilities
- Telecommunications
- Transportation
- Solid Waste
- Water & Wastewater
- Parks
- Food Supply

### Community Rebuilding & Resiliency Areas of Focus:
- East/South Shores, Staten Island
- South Brooklyn
- Southern Queens
- Brooklyn/Queens Waterfront
- Southern Manhattan