

Considering Policies and Regulations to Reduce Risks Caused by Urban Flooding

Remnants of Hurricane Ida caused significant urban flooding and damage in New York City in September 2021. This fact sheet summarizes the recommendations from technical reports FEMA prepared after that event. Communities use different mechanisms to put recommendations into practice. They may adopt new policies or adjust existing ones. Depending on the nature of a recommendation, communities may adopt new regulations or amend existing ones.

Hurricane Ida in New York City

During Hurricane Ida, heavy rainfall overwhelmed the stormwater drainage systems in many areas. Surface water accumulated in streets and low-lying areas throughout New York City, causing significant urban flooding in Queens, Brooklyn, the Bronx, and Staten Island. In some areas, floodwater entered and damaged homes and multi-family buildings with below-grade areas and basements. New York City reported 13 fatalities attributed to the flooding, including 11 people who were trapped in flooded basements.

FEMA Hurricane Ida New York City Mitigation Assessment Team Technical Reports

As part of the Federal Emergency Management Agency response to significant urban flooding and damage resulting from Hurricane Ida, the FEMA Building Science Disaster Support program deployed a Mitigation Assessment Team (MAT) to assess damage. FEMA publishes reports to document what MATs observe and recommend. Table 1 summarizes the MAT's three technical reports for this event.



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Table 1. Summary of Three NYC MAT Technical Reports

<i>Hurricane Ida Technical Reports</i>	<i>Summary</i>
<p>Report 1: Building Performance: Basement Buildings and Urban Flooding</p>	<p>Technical Report 1 provides information to help New York City and similar urban areas prepare better for future urban flooding events. The information is also useful for property owners, building managers, and design professionals. The report offers a number of recommendations to improve the performance of buildings with floodprone basements and the safety of their occupants.</p>
<p>Report 2: Building Performance: Egress from Floodprone Basements</p>	<p>Technical Report 2 describes the MAT’s observations related to the egress of occupants from basements flooded when the capacity of stormwater drainage systems is exceeded. It briefly summarizes some of New York City’s requirements for building egress and emergency access. The report makes recommendations to improve the safety of occupants in floodprone basements and options to improve egress from floodprone basements.</p>
<p>Report 3: Reducing the Effects of Urban Flooding in New York City</p>	<p>Technical Report 3 explains the basics of rainfall runoff, urban flooding, and stormwater drainage systems. It summarizes some of New York City’s stormwater infrastructure programs and its initiatives to address urban flooding.</p>
<p>Download the Hurricane Ida NYC FEMA technical reports and fact sheets at: FEMA P-XXXX, 2023. <i>Title of the NYC Ida MAT compendium & URL</i></p>	

Tools to Put Recommendations into Practice: Policies and Regulations

Communities can put recommendations into action by adopting new policies or adjusting existing ones. Depending on the nature of a recommendation, communities may adopt new regulations or amend existing ones.

POLICIES

In general, policies are statements of intent, guidelines, and directions for implementing objectives. Policies may interpret statutory or regulatory requirements and state how a community will fulfill those requirements. They do not impose legally enforceable requirements. Some policies might be framed as standard operating procedures and practices. They are followed to be consistent in implementing requirements. Examples of community policies include:

- **Comprehensive Plans:** Comprehensive plans are used by communities to express long-term objectives related to growth and development.
- **Resolutions:** Elected bodies often pass resolutions to establish policy, and sometimes to set objectives that community staff can pursue within existing authorities.
- **Multi-Hazard Mitigation Plans:** Communities develop multi-hazard mitigation plans to identify hazards, assess risks, and evaluate strategies and actions to mitigate risks. The plans satisfy federal requirements for certain types of disaster assistance and grants for mitigation projects. The actions and activities described in these plans include policies. Examples of policy actions include exploring grant funding opportunities, executing public information initiatives, obtaining better information about risks, and studying alternatives to reduce specific risks associated with a hazard.
- **Stormwater Master Plans and Stormwater Design Manuals:** Stormwater master plans developed by communities typically examine flooding problems caused by rainfall runoff that exceeds the capacity of existing stormwater drainage systems. Design manuals outline how the community and developers can design measures to manage rainfall runoff when required by stormwater management regulations. Examples of policy actions that may be identified in plans include finding drainage solutions through existing public works authority and budget, and establishing incentives for developers to use green infrastructure measures.

REGULATIONS

Government regulations establish rules and mandates, typically to impose requirements on the public. The types of regulated activities and the action a person or entity proposes usually determine whether that person or entity must comply with the requirements. Examples of regulations include:

- **Building Codes:** Building codes specify how buildings and structures must be designed and constructed to provide reasonable levels of safety, public health, and general welfare. Fire codes, which may be separate, specify requirements specific to fire safety and emergency preparedness.
- **Housing Maintenance Codes:** Housing maintenance codes typically set minimum standards for health and safety, fire protection, light and ventilation, cleanliness, repair, and maintenance to protect tenants.
Enforcing

these minimum standards preserves safe housing, minimizes deterioration of housing, and improves living conditions.

- **Stormwater Management Regulations:** These regulations usually specify which property owners and developers must manage increases in rainfall runoff caused by proposed changes to the land. These changes include construction of buildings and impervious surfaces, such as parking lots and driveways.

Putting Recommendations into Practice Through Policies and Regulations

The Hurricane Ida NYC MAT technical reports include FEMA's recommendations based on the MAT's observations and evaluation of a number of relevant New York City codes, programs, and initiatives. The recommendations address the safety of occupants in floodprone basements and ways to improve the performance of buildings with floodprone basements and below-grade areas. Some recommendations suggest actions for building owners. Others suggest actions for New York City.

New York City will determine which recommendations may warrant taking action. Action by the city may be to adopt or modify one or more policies and programs. Some actions may require adoption or amendment of regulations and building codes. Table 2 summarizes the recommendations in Technical Reports 1, 2, and 3. Table 2 also indicates whether a recommendation might be put into practice by policy or regulation. If the city decides that any of these actions are appropriate to pursue, it will also determine the appropriate mechanism.

Table 2. FEMA Hurricane Ida MAT Recommendations: Options to Put into Practice

Source	Summary of Recommendations	Policy	Regulation
Technical Report 1	Recommendation 1. Water Sensors in Basements. Require or encourage owners of buildings with floodprone basements to install water sensors that are integrated with sump pump systems to warn occupants and emergency responders when water levels exceed the capacity of the pump.	Yes	Yes
Technical Report 1	Recommendation 2. Risks of Unreinforced Basement Walls. Identify one- and two-family homes with basements and cellars that were constructed before building codes required reinforced foundation walls and foundation drainage. Inform owners and occupants of the risk of basement flooding and foundation wall collapse if exposed to urban flooding.	Yes	No
Technical Report 1	Recommendation 3. Safely Pumping Floodwater from Basements. Develop guidance and messaging to let building owners know how to safely pump floodwater from basements without risking structural damage.	Yes	No
Technical Report 1	Recommendation 4. Encourage Building Owners to Act. Evaluate options to encourage building owners to improve the performance of buildings with basements that are known to be prone to urban flooding. Some options include:	Yes	No

Source	Summary of Recommendations	Policy	Regulation
	<ul style="list-style-type: none"> ▪ Develop messaging and a checklist for owners and managers to evaluate their buildings to decide whether to engage qualified professionals for more detailed inspections and assessments. ▪ Develop training for building managers and design professionals to conduct inspections and identify feasible mitigation options. ▪ Encourage design professionals and dry floodproofing special inspectors to learn how to evaluate buildings and identify mitigation options. ▪ Consider providing financial assistance to owners of buildings in areas prone to surface flooding to have evaluations performed and implement feasible mitigation options. 		
Technical Report 1	<p>Recommendation 5. Evaluate and Mitigate Risks to Basements and Below-Grade Areas. Owners of buildings with floodprone basements should consider feasible options to keep surface flooding out and mitigate damage. Options include:</p> <ul style="list-style-type: none"> ▪ Permanently raise the lowest points of entry for surface water. ▪ Reinforce basement walls, or fill in basements, of homes with unreinforced concrete or masonry basement walls. ▪ Obtain temporary barriers and develop emergency implementation plans to deploy the barriers to block points of entry. ▪ Raise critical components of mechanical systems above basement floors and relocate electrical systems to higher locations. ▪ Use materials that resist flood damage for basement interiors. 	Yes	No
Technical Report 1	<p>Recommendation 6. Retrofit Dry Floodproofing. Some buildings in areas where surface water has entered basements and below-grade areas may be candidates for retrofit dry floodproofing measures. These measures should be designed for site-specific conditions. Owners should be aware that dry floodproofing measures can fail or may be overtopped if water rises higher than the depths used for design. Failure is likely if the measures are not maintained or if those who are responsible are not adequately trained to deploy measures that require action.</p>	No	No
Technical Report 2	<p>Recommendation 1. Communication with Basement Occupants. Focus messages to occupants of floodprone basements, tailor messages for delivery through NotifyNYC and the NYC Alerts 911 system, and continue to encourage residents to sign up to receive alerts.</p>	Yes	No
Technical Report 2	<p>Recommendation 2. Augment Inspections of Illegal Conversions. Add a flood vulnerability element to the potentially hazardous conditions that the NYC Quality of Life Unit checks in response to complaints of illegal conversions of dwelling units in basements and cellars that are known to be prone to surface flooding and when the buildings are in FEMA-mapped floodplains.</p>	Yes	No

Source	Summary of Recommendations	Policy	Regulation
Technical Report 2	<p>Recommendation 3. Examine Options to Improve Egress From Floodprone Basements. Develop guidance for building owners to examine their buildings with floodprone basements to determine appropriate ways for occupants to leave when emergency conditions are expected. The guidance for multiple family buildings should encourage owners to identify spaces where basement occupants can shelter. For one- and two-family dwellings, the guidance should advise occupants to evacuate to safe locations when warnings are issued. Consider whether to require owners to perform this examination. Specific building characteristics will determine whether one or more options to improve emergency egress are feasible. Options that may be feasible include:</p> <ul style="list-style-type: none"> ▪ Provide interior routes to the first floor of multiple family buildings. ▪ Replace existing small or fixed basement windows with windows that open and are large and accessible enough for occupants to be able to climb out. ▪ Modify doors that lead to exterior basement stairs or driveway ramps when the doors open outward by installing small “blow-out” panels near the bottom of doors. ▪ Install water sensors that are integrated with sump pump systems to warn occupants and emergency responders when water levels exceed the capacity of the pump. ▪ Explore the feasibility of installing wireless speakers in the common areas of multiple family buildings with floodprone basements, to broadcast warnings. 	Yes	Yes
Technical Report 2	<p>Recommendation 4. Supplement Assessments for Buildings with Floodprone Basements. The in-home assessments offered by the NYC Department of Housing Preservation and Development should be supplemented include information for owners of buildings with basements in areas known to experience urban flooding. Consider supplementing the inspections conducted when complaints of illegal conversions of basements and cellars are submitted or violations are observed.</p>	Yes	No
Technical Report 2	<p>Recommendation 5. Require Permanent Posting of Emergency Information. Rather than posting emergency information temporarily, the NYC Housing Maintenance Code should require owners of residential buildings to post permanent notices. The notices should be required when buildings with basements are in FEMA-mapped floodplains and areas known to be prone to surface flooding.</p>	No	Yes
Technical Report 2	<p>Recommendation 6. Supplement Fire Protection and Emergency Preparedness Plans and Notices. Develop example language to address flood emergencies for inclusion in fire protection and emergency preparedness plans and notices required to be posted in buildings with multiple dwelling units, especially for buildings with occupied basements</p>	Yes	Yes

Source	Summary of Recommendations	Policy	Regulation
	in FEMA-mapped floodplains and areas known to be prone to surface flooding.		
Technical Report 3	Reinforces recommendations in Technical Reports 1 and 2 that the city should evaluate options to encourage or require building owners to act to reduce risks of flooding of occupied basements.	Yes	Yes

For More Information

See the FEMA Building Science Frequently Asked Questions at <https://www.fema.gov/emergency-managers/risk-management/building-science/faq>.

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