New York must prepare for the storms of tomorrow - by Kevin Paul

September 10, 2024 - Long Island

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New York is in the throes of hurricane season. This year, the National Oceanic and Atmospheric Administration predicts an Atlantic hurricane season comprising 17-25 storms, including 4-7 major hurricanes. New York City, Long Island, and the Hudson Valley — as well as parts of New Jersey and Connecticut — recently braced against powerful winds, heavy rainfall, and destructive flooding that damaged or destroyed homes, businesses, and infrastructure.

The New York State Climate Impacts Assessment projects that these types of storms will increase in severity, creating storm surges that reach farther inland to areas that are otherwise not prone to flooding. A property or piece of infrastructure may not be located in an area currently designated as high-risk, but that could change in 5-10 years.

Given how rapidly these changes are occurring, property owners should plan ahead and implement storm resiliency measures that address both the storms of today as well as the storms of the next decade.

Elevate According to Future Flood Risk

Elevating primary function spaces and important equipment is one of the most universal and effective precautions one can take when designing for storm resiliency. The correct elevation will not be the same for every area, however, and is largely dependent on the area's flood risk.

The U.S. Federal Emergency Management Agency (FEMA) has developed nationwide flood maps divided into different risk designation zones in order to calculate the requirements and costs of flood insurance policies. These designations are based on the frequency and severity of floods, distance from floodplain boundaries, and the base flood elevation (BFE) of each zone. BFE is determined based on data from the zone's flood history over the previous 100 years.

Because BFE does not account for future storm surge, storm resiliency measures should be designed around the zone's design flood elevation (DFE). Unlike BFE, the DFE is based on "freeboard," a factor of safety usually expressed in feet above a flood level for purposes of floodplain management. Freeboard can compensate for the many unknown factors that could contribute to greater flood heights than calculated, such as wave action and bridge openings.

For areas susceptible to coastal flooding, any code-compliant items that sit below the DFE should be secured to prevent them from becoming dangerous projectiles, and elevated structural foundations should be reinforced to resist at least 1,000 lbs. of impact. By adhering to the DFE and elevating important spaces and items, facility managers can protect their most vital assets from both typical and atypical flooding events.

Through initiatives like New York State's NY Rising and New York City's Build It Back and Resilient Neighborhoods, communities have been able to rebuild and raise their homes. In the wake of Superstorm Sandy, our firm supported the reconstruction and elevation of hundreds of homes in New York City neighborhoods such as Gerritsen Beach, Canarsie, and Sheepshead Bay. Raising

neighborhoods not only helps protect them from storm damage, it provides whole communities with the security to bounce back from disaster. However, because the storms are also increasing in severity, it is vital that these measures are accompanied by other resiliency strategies.

Flood-Proofing Your Structure

Even with primary function spaces safely above the DFE, floodwaters can still wreak havoc on a structure. Flood protection systems defend against flooding by either acting as a buffer or by redirecting floodwaters. These are known as dry flood-proofing and wet flood-proofing, respectively.

Dry flood-proofing involves insulating the structure such that it does not allow more than four inches of water to enter within a 24-hour period. This type of flood-proofing includes flood-proof doors that compress against the door frame as the water increases pressure, creating a watertight seal. This technique can only be used if the walls are strong enough to withstand the hydrostatic force of the flood waters.

Wet flood-proofing, meanwhile, utilizes vents and breakaway wall systems to allow flood waters to infiltrate the structure and flow to areas that are designed to be resilient to water damage. Allowing a certain amount of water to enter the structure creates an equal pressure on both sides of the flood-prone foundation, reducing the risk of structural failure.

Even when dry and wet flood-proofing techniques are applied, water can still find its way beneath the structure. A structural slab tied to perimeter foundation walls will resist upward buoyancy pressure as water builds up beneath the structure. Reinforced concrete performs exceptionally well under compression and tension and can be formed to fit within the constraints of the existing building envelope.

Consulting with Experts

Even as rising sea levels and worsening storms pose a threat to communities along the East Coast, there are a myriad of effective ways to insulate your property from the worst of it. The specifics of any flood mitigation plan will differ between property owners and depend on the location of the property and the integrity and layout of the structure. The best way to determine which approach to take to flood mitigation is to consult with experienced architects and engineers who specialize in designing for storm resiliency.

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