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Building resiliency to flooding - by Ricciardi and Seidel

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Frank Ricciardi
Weston & Sampson

Robin Seidel
Weston & Sampson

This is an update to a 2019 article by Frank Ricciardi and Adria Boynton on climate resilient buildings.

Climate change has already exacerbated storm events in New England, and future climate change projections continue to be refined as scientific models for such hazards improve. As an example, the Massachusetts Coast Flood Risk Model (MC-FRM), released this year by Woods Hole Group for MassDOT, provides the latest and greatest coastal flood modeling for Massachusetts. Many communities in the Commonwealth are already using this model and its predecessor, the Boston Harbor Flood Risk Model, to set the standard for new and major retrofits of existing buildings.

The Commonwealth of Massachusetts Resilient MA Action Team (RMAT) recently released new Climate Resilience Design Standards and Guidelines along with a preliminary climate risk screening output tool to help state agencies assess and adapt to climate change. This tool is publicly available for use by anyone and utilizes the MC-FRM to identify buildings and infrastructure at risk during the 2030, 2050, and 2070 timeframes.

Commercial real estate owners and managers will continue to require innovative and tailored solutions for resilience. Effective resilient design can allow these properties to adapt, thrive, and survive both chronic and catastrophic changes in the natural environment. Building designers have demonstrated the potential for resilient design to allow buildings to be active parts of the public realm during inclement weather while also providing protection during extreme storms.

Most International Building Code (IBC)-based state building codes refer to FEMA maps to identify whether a property is at risk of flooding and Flood Resistant Design and Construction (ASCE 24-14) for criteria for designing buildings and structures identified as at-risk. FEMA provides a current risk of flood as compared to models which include climate projections. To mitigate a building's vulnerability to flooding, consider the future flood elevation to ensure the building is protected throughout its expected lifecycle.

Resilient building designs should consider multiple layers of contingency and connections to the surrounding site. These strategies can include short-term solutions that emphasize immediate protection and recovery, as well as mid-and long-term solutions that promote adaptation and resilience. Potential building-scale flood protection depends on building type and location and whether the approach involves new construction or retrofits.

When trying to determine how much flooding your property might experience, an important consideration is to confirm that the data/climate projections you are using are in the same elevation datum. Many flood elevations are provided in North Atlantic Vertical Datum 1988 (NAVD88) while many municipalities have their own datums, which are shown on plans.

How do you get started? Property owners should identify climate risks, assess a building's existing condition and vulnerability, and identify solutions tailored to each individual property. Implementing resiliency strategies is a complex process and an incremental approach is critical. Resiliency professionals can develop an implementation roadmap that identifies near-term catalyst actions to facilitate flood protection and mid-and long-term critical milestones to further advance resilient design. Recommendations for implementation should consider phasing, design, planning, O&M, cost estimates, permitting, and zoning.

Ideally, integrating resiliency into a new or significant renovation through the design process is the most beneficial in terms of cost. If located in a floodplain, strategies for resiliency could include elevating critical systems or occupied spaces above the future flood elevations. Consider using more robust building materials for dry floodproofing, such as concrete exterior walls, and minimizing low glass curtainwalls. Sometimes, including a 1-2 ft concrete curb below a window can provide enough protection. Incorporate site strategies such as green infrastructure or blue roofs to store peak rainfall.

If you are retrofitting an existing property and not sure where to start, first assess how water might enter the building. Likely places are through doors, windows, low openings, and possibly through exterior walls. There are options for retrofitting existing buildings such as deployable barriers and passive protection such as concrete walls. Consult an architect or structural engineer to determine if systems will provide needed levels of protection.

In recognition that building-level resilience is ideally supported by district-level resilience, property owners should assess opportunities to link site strategies to the surrounding context, including links to transportation infrastructure, above and below-ground utilities, and adjacent natural resources such as parks.

If property owners apply this proactive approach to resilience to their portfolio, they may realize significant savings in recovery costs after an extreme event or a reduction in flood insurance. In fact, a National Institute of Building Sciences report found that every dollar of federal mitigation funding saved six dollars in recovery costs. This systems approach to resilience can also facilitate the adoption of long-term adaptation strategies and promote the recognition that individual properties are part of a larger urban network that will need to collectively prepare for climate impacts. No building is an island.

Frank Ricciardi, PE, LSP, is vice president, and Robin Seidel, AIA is climate resiliency architect project manager at Weston & Sampson, Reading, Mass.