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## **Resilient facility design: Climate change has exacerbated storm events in New England - by Frank Ricciardi and Adria Boynton**

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Boston experienced significant coastal flooding during two Nor'easters in 2018, including a record high tide of more than 15 feet during the January Nor'easter. This flooding inundated the downtown area, closed MBTA Aquarium Station, and stranded motorists. Images of Seaport Blvd. and

Northern Ave. flooding became commonplace. The investment in properties in the Seaport district has been unprecedented in the city's history and major studies have been funded to evaluate protection measures from sea level rise and storm surge in this area and other neighborhoods of Boston.

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

Resilient 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. Solutions such as installing deployable flood barriers in the short-term, or elevating interior first floors in the long-term, may be possible.

How do you get started? Property owners should identify climate risks, assess a building's existing condition and vulnerability, and identify solutions tailored to their property. Implementing resiliency strategies is a complex process, and an incremental approach is critical. Resiliency professionals will 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.

One tool that can assist with this process is a facility checklist. A facility checklist can assist in comprehensively assessing a property by evaluating existing conditions (and the adaptive capacity) of the site, building, and electrical, plumbing, and HVAC systems. O&M staff can continue to use this tool to monitor assets for improvement, deterioration, or necessary follow-up investigations. The information collected with a facility checklist can be augmented with site photos, video, a GPS point cloud survey, interviews with building tenants and facility staff, and a review of existing documentation.

The Massachusetts Division of Capital Asset Management & Maintenance's (DCAMM) Statewide Resilience Master Plan (SRMP) project is one example of this process. This work included assessing vulnerability to a range of climate impacts, reviewing 8,000+ state assets, and developing a process for addressing adaptation and implementing resilient design for thousands of DCAMM facilities across the state, including office buildings, educational facilities, data centers, and judicial and correctional facilities; many with multi-tenant, multi-use occupancies. Owners of multiple facilities should consider ways to prioritize these facilities for future climate adaptation investments. This may include evaluating vulnerabilities to natural hazards, facility interdependency between other buildings and utilities, and potential severity of loss or damage.

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 save on the cost of recovery after an extreme event. 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.

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