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TO: Rep. Liz Reyer

FROM: Richard Graves, AIA - Director, Center for Sustainable Building Research (CSBR), University of Minnesota

Re: HF2081: B3 and Resilience

Sustainable design seeks to reduce negative impacts on the environment, and the health and comfort of building occupants, thereby improving building performance. The basic objectives of sustainability are to reduce consumption of non-renewable resources, minimize waste, and create healthy, productive environments. - US General Services Administration

Resilient design is the intentional design of buildings, landscapes, communities, and regions in order to respond to natural and manmade disasters and disturbances—as well as long-term changes resulting from climate change—including sea level rise, increased frequency of heat waves, and regional drought. - Resilient Design Institute

In 2018, CSBR completed a study funded by MPCA titled Resilient Adaptation of Sustainable Buildings. The study looked at the potential integration of resilient design into the Minnesota Sustainable Building Guidelines known as “B3”. B3 is a set of tools and programs designed to make building more energy efficient and sustainable. The B3 programs have been developed for and are required on all state-funded projects in Minnesota. The B3 Guidelines for new buildings and qualifying renovations has five sections, performance management, site and water, energy and atmosphere, indoor air quality, and materials and waste. The study found that some of the existing guidelines have both sustainability and resilience such as:

Site + Water

- **Flood Prevention:** If the building is constructed within a flood plain, the project shall follow the Regulatory Flood Protection Elevation requirements of FEMA. The site must also be designed so it will not flood in the event of a ten-year 24-hour rainfall.
- **Stormwater Management:** The project site will manage stormwater to result in site infiltration, evapotranspiration, on-site reuse, and run off in amounts according to the soil type on site.
- These measures make progress in protecting the building from flooding that may cause system failures, and incorporate water systems that will operate in a disaster situation and allow the building to remain habitable.

Energy & Atmosphere

- The Sustainable Building 2030 Energy Standard required for B3 is a progressive standard leading to net-zero carbon buildings in 2030. The requirements benefit resiliency goals by lowering the critical load demand, day to day energy use in buildings, and the size of on-site renewable energy and battery storage need to achieve net-zero energy.

While the B3 guidelines provide a good base for a resilient building, there is opportunity to expand the guidelines to create more robust buildings that are better able to handle a disaster situation. Some measures should be modified, and some new measures should be incorporated.

Potential measures:

- Use on-site renewables to generate energy needed to meet critical loads. Include battery storage in renewable energy system, capable of storing critical load energy demand for some length of time
- Enable micro-grid strategies to share reserved power or generation capacity in campus or community scenarios.
- Elevate mechanical and electrical equipment to avoid flood damage
- Elevate buildings and provide enhanced site stormwater design for sites with high risk of flash flooding or localized flooding.
- Consider design for dual-mode operation – day-to-day and emergency low-power including water pumping within building for power outage even if municipal water supply remains available, and electronic ignitions for any natural gas powered equipment.
- Enhance structure and façade elements and site landscape to withstand extreme weather events
- Educate building owners, operators, users, and stakeholders on resilient features and operations

Inclusion of these measures will lead to buildings and building users better able to deal with disaster events and emergencies. New guidelines will continue to be reviewed to be cost effective both in the initial capital costs, but also long term operational costs.