



Investment in Infrastructure at Sea-Level Hospital Will Pay Off by Reducing Risk

Built very close to sea level, Spaulding Rehabilitation Hospital in Boston implemented innovative strategies to keep critical infrastructure and patient care above future flood levels.

Case Studies › Investment in Infrastructure at Sea-Level Hospital Will Pay Off by Reducing Risk ›

Climate stressors and impacts

Climate scientists project that global sea levels will rise one to four feet by 2100, depending in large part on how much the Greenland and West Antarctic Ice Sheets melt over that time. However, studies also project that sea level rise along most of the United States' northeast coast will exceed the global average rise. The region could see even greater regional sea level rise if the Gulf Stream weakens, as some models suggest.¹ The 2014 National Climate Assessment notes that even without a change in the frequency and intensity of storms, sea level rise of two feet would more than triple the frequency of dangerous coastal flooding in the Northeast. In the context of such risk, hospitals are well-served to build resilience to flooding, as Spaulding Rehabilitation Hospital in Boston, Massachusetts, has done.

Recognizing and addressing vulnerabilities

In 2005, Partners HealthCare purchased a contaminated brownfield parcel of land in the Charlestown Navy Yard and constructed a replacement for their existing Spaulding Rehabilitation Facility on the site. The site is located on a promontory where the Little Mystic Channel meets Boston Harbor, essentially right at current sea level. When Hurricane Katrina devastated the health care infrastructure in the Gulf of Mexico region in 2005, Partners recognized their potential vulnerability and developed a set of voluntary best-practice requirements for the new facility. When it opened in 2013, the facility became the first building on the Boston waterfront designed for resilience to projected sea level rise.

Building strategically

One of the key decisions Partners HealthCare made to promote resilience against flooding was to place the first floor elevation 30 inches above the FEMA 500-year flood elevation (this is the elevation that flood waters would reach during a flood so extreme it has only a .2 percent chance of occurring each year). This elevation was much higher than required by code, and Partners also ensured that, despite the elevation, there would be universal access for rehabilitation patients. Designers also placed all critical infrastructure and patient care functions above the first floor. In fact, even if the entire first floor of the building floods, the upper floors can remain fully occupied and operational. All mechanical and electrical infrastructure (incoming electrical service switchgear and panels, as well as emergency generators) is located on the roof, minimizing the chance that a flood will disrupt service.

The building also features a gas-fired, on-site combined heat and power (CHP) system. This system provides energy-efficiency benefits as well as redundancy for power generation in the event that the grid loses power or the diesel generator experiences problems. CHP infrastructure is also on the roof, as are emergency diesel generators.

The building has extensive granite and landscape berms that can absorb and deflect incoming waves from Boston Harbor and the Little Mystic River. The building's extensive drainage network also allows floodwaters to dissipate quickly if flooding does occur. The hospital's extensive green roofs also help to reduce stormwater discharge during heavy rainfalls.

The building's high-performance exterior features triple-glazed windows and sun shades that block heat. These features improve thermal performance and prevent low interior temperatures or freezing if heating capacity is lost in winter, as well as overheating if cooling or ventilation is lost in summer. Patient rooms also have key-operable windows, which can reduce the impact of indoor overheating and allow patients to shelter-in-place if the building's cooling or ventilation system is inoperable. This feature enables the facility to avoid the situation that occurred in New Orleans hospitals after Katrina—in some cases, indoor temperatures in sealed New Orleans hospitals exceeded 100 degrees, prompting staff to break windows with furniture to provide ventilation.

Additional benefits in the near term

The measures Partners HealthCare took to improve its resilience against future flooding collectively added between 0.3 and 0.5 percent to the initial cost of construction. These changes were not mandated by federal, state, or local codes. In fact, Partners had to overcome substantial resistance from utilities that were reluctant to place major electrical switchgear above the ground floor. Nevertheless, in addition to enhancing resilience to likely future flooding, the building's envelope and energy conservation measures are reducing energy demand

in normal operation, thereby reducing carbon emissions. The building uses an estimated 30 percent less energy than a conventional building of comparable size. The ongoing operational savings from these envelope and system measures more than offset the initial additional capital investment.

1. Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2

Banner Image Credit© Steinkamp Photography. Used with permission.

Last modified10 May 2024 - 12:01pm

Steps to Resilience

This content supports the highlighted step.

(Started
U	erstand Exposure
A	s Vulnerability & Risk
I	tigate Options
F	ize & Plan
1	Action

Hazards

Flooding – Coastal ›

Flooding – Rainfall-induced ›

Assets

Critical Facilities ›

Tools

Sustainable and Climate-Resilient Health Care Facilities Toolkit ›

Partners

Spaulding Rehabilitation Network ›