SPAULDING REHABILITATION HOSPITAL SETS THE STANDARD FOR RESILIENT HEALTH CARE BUILDINGS

Opened in April 2013, and built on remediated brownfield land adjacent to the former Charleston Navy Yard in Boston's Inner Harbor, the Spaulding Rehabilitation Hospital is a 132-bed rehabilitation teaching hospital designed with climate change resiliency in mind.

DESIGNED FOR RESILIENCY

Learning from Hurricane Katrina, and informed by scientific reports on climate change, the team responsible for Spaulding's design focused on making the hospital as resilient to rising sea levels as possible.

A significant and somewhat radical climate-proofing element of Spaulding includes the placement of all major mechanical components on the roof/penthouse level above the eighth floor of the hospital. This necessitated selling the local power company (NSTAR, now known as Eversource) on the merit of bringing their high-voltage electricity supply to the primary switchgear vault in the penthouse via a concrete chase from ground level where traditionally the vault would be located.

Resiliency features abound at Spaulding. The entry lobby and first floor amenities, for example, are situated 30 inches above the designated 500-year flood elevation[1] and water-deflecting berms, one of which must be driven over to access the underground parking facility, are integrated into the landscape. In fact, the first floor could be completely flooded and the upper levels of the building could continue to be occupied and operational. Many of the first floor fixtures, including those in the lobby, conference centre and cafeteria, are easily moved to prevent damage in the event of an impending flood.

Acknowledging that during a disaster, the hospital's occupants may be called upon to shelter in place for an extended period of time, Spaulding has design features that allow a higher degree of occupant comfort while waiting out the event.

Integral to the resiliency strategy are key-controlled, operable and screened windows in many offices, common spaces and patient rooms, which when opened can help ameliorate interior temperature by providing fresh outside air.

High building insulation values, exterior shade ledges and large high-performance triple glazed windows also assist in helping to maintain a high level of interior comfort. Many offices rely extensively on natural light during daylight hours and.

Adding to the building's climate change mitigation capabilities, the green roof over the inpatient gym, with its soil and vegetation layers, absorbs rainwater and reduce runoff that could otherwise exacerbate localized flooding.

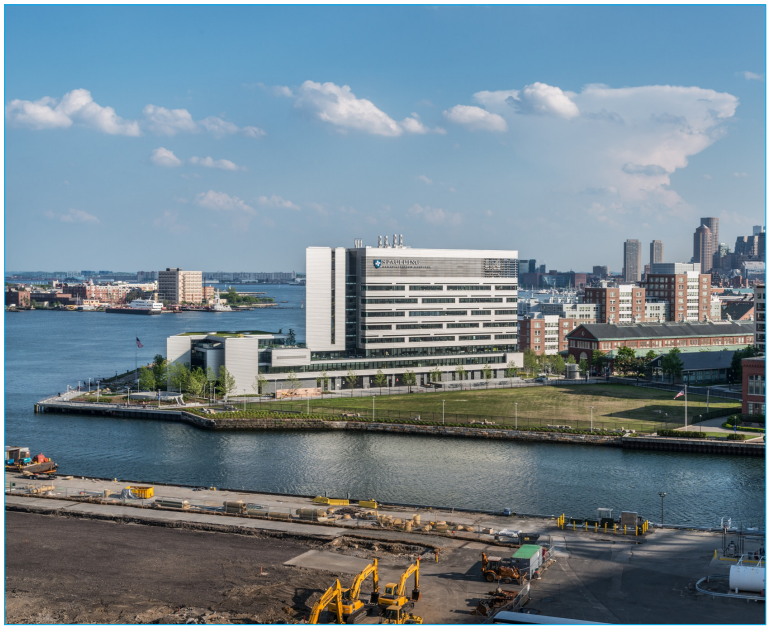
Cover photo credit: Steinkamp Photography

ENERGY-EFFICIENT DESIGN

Owners *Partners HealthCare* also made a commitment early in the design process to reduce energy consumption as much as possible at Spaulding. This was done through the inclusion of various technologies including energy efficient lighting and daylight harvesting through extensive use of natural light , high-efficiency heating, ventilation and air conditioning (HVAC), ENERGY STAR(R) certified appliances and equipment, and a high-performance building envelope with maximum 40% glass surfaces.

A small gas-fired 250 kW co-generation plant provides heat and power to shave peak energy loads throughout the year and the building has been designed with future renewable energy capabilities in mind with provisions for the mounting of photovoltaic panels on the roof when the technology becomes more efficient and cost effective. The complex also enjoys the following energy efficiency elements:

- *High efficiency chillers and boilers*
- *Energy-efficient lighting (Light Power Density - 0.85 watts/ s.f.)*
- *Fundamental and enhanced commissioning*
- *Enhanced refrigeration management*
- *Measurement and Verification - extensive metering allowing for monitoring of building's actual performance and adjustments to improve energy performance*
- *Green power purchases*
- *Operable windows with sensors tied to HVAC controls in therapy gymnasiums, multi-purpose rooms and patient/ family lounges.*



View of Spaulding Rehabilitation Hospital from the north, with Little Mystic Channel in the foreground and Boston Harbor beyond. Photo credit: Steinkamp Photography.

The roof-mounted 250 kW gas-fired co-generation plant produces both heat and power adding to Spaulding's ability to be energy efficient and remain operational during times of natural calamity.

This fuel gas booster or blower located in the penthouse mechanical room is used to raise the pressure of the fuel gas to the operating level of the combined heat and power (co-generation) plant located on the roof.

Climate-proofing measures added about half a percent to the total cost of the building.

Spaulding, which received LEED Gold certification for its renewable energy and sustainability commitments, is recognized as one of the most climate-resilient hospitals in North America.

According to Hubert Murray[2], Sustainability Initiatives Manager for *Partners HealthCare*, the not-for-profit owners of Spaulding, the climate-proofing measures added about half a percent to the total cost of the building, further adding that Spaulding has shared its climate-proofing criteria with the City of Boston which has now requires developers to develop a set of protocols similar to Spaulding's when making plans for a new building.[3]

Patients at Spaulding benefit from huge triple-glazed windows with a view of Boston Harbour. Smaller, key-controlled screened opening windows are integrated into the glazing to accommodate outside ventilation, as required, and link directly to the building's HVAC automation system. Photo credit: Anton Grassl/Esto.

Diesel fuel for the two emergency power generators located on the penthouse floor, is pumped from a waterproof tank in the basement via a 150-gallon reservoir in the generator room.

A bank of three, 200-hp high-efficiency gas-fired boilers in the penthouse mechanical room provide heat to the 262,000 square foot facility.

REFERENCES

[1] Wilson, Alex. *"How to Make A Hospital Resilient: A Tour of Spalding Rehab."* February 3, 2015. Resilient Design Institute website (Accessed February 10, 2015)

[2] Valentine, Katie. *"The Extraordinary Steps Health Care Providers Are Taking To Prepare for Climate Change."* Climate Progress, posted July 30, 2013 at 7:31 AM.

[3] Climate Change Resiliency and Preparedness Guidelines. Boston Redevelopment Authority website (accessed February 10, 2015)

Contact information:
Kent Waddington, Communications Director
Canadian Coalition for Green Health Care
kent@greenhealthcare.ca

Thank you to David Burson and Hubert Murray for images and technical assistance in developing this profile. Additional photos by Kent Waddington.

This project made possible by financial support from Health Canada.

http://greenhealthcare.ca/climateresilienthealthcare

CCGHC-RP-06E, Feb 24, 2015