▲ Patients at Spaulding benefit from huge triple-glazed windows with a view of Boston Harbour. *Photo courtesy Anton Grassl/Esto.*

DESIGNED FOR DISASTER

Spaulding Rehabilitation Hospital sets the standard for climate-resilient healthcare facilities

By Kent Waddington

Built on a remediated brownfield adjacent to the former Charleston Navy Yard in Boston's Inner Harbour, Spaulding Rehabilitation Hospital is one of the largest rehabilitation facilities in the U.S. Measuring 300,000 square feet, it is also one of the most resilient hospitals in the country, designed specifically with climate change in mind.

FLOOD RISK MITIGATION

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.

The entry lobby and first floor amenities are situated 30 inches above the designated 500-year flood elevation and water-deflecting berms, one of which was constructed to help keep water out of the underground parking garage. By raising the building above code

requirements, the upper levels of the building can remain occupied and operational if the first floor is ever flooded. In the event of an impending flood, many of the first floor fixtures, including those in the lobby, conference centre and cafeteria, can be easily moved to prevent damage.

The green roof atop the in-patient therapy gym helps reduce the stress on stormwater and sewer systems, which can become overwhelmed during big storms. Its soil and vegetative layers absorb rainwater, reducing runoff that could otherwise exacerbate localized flooding.

A significant and somewhat radical climate-proofing element includes the placement of all major mechanical components on the roof/penthouse level above the eight hospital floors. This necessitated selling the local power authority on the merit of transferring their high-voltage electricity supply to the primary switchgear vault in the penthouse via a concrete chase from ground level (where the vault would traditionally be located).

THE COMFORT ZONE

Acknowledging that hospital occupants may be called upon to shelter in place for an extended period of time during disaster, Spaulding was designed to allow a higher degree of occupant comfort while waiting out an incident.

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

High insulating values, exterior shade ledges and large high-performance triple-glazed windows also help to maintain a high level of interior comfort. Many offices rely extensively on natural light during daylight hours. As a result, if there is a power outage, daytime electric lighting could be kept to a bare minimum. This would help conserve energy used by Spaulding's two emergency generators, which are necessary to keep hospital equipment functioning in order to sustain human life.

ENERGY SHIFT

In addition to Spaulding's resilience features, the hospital has taken steps to reduce its ecological footprint. Its high-performance building envelope with 40 per cent window-to-wall ratio, daylight harvesting systems, energy-efficient lighting, Energy Star certified appliances and equipment, high-efficiency chillers and boilers, and 250 kilowatt gas-fired combined heat and power (CHP) co-generation plant all serve to reduce energy consumption year-round. Extensive metering allows for monitoring of the building's actual performance and adjustments to be made to improve energy efficiency.

This LEED (Leadership in Energy and Environmental Design) gold building was also designed with future renewable energy capabilities in mind. For instance, photovoltaic panels are to be mounted on the roof when the technology becomes more efficient and cost-effective. ■

Kent Waddington is the communications director at the Canadian Coalition for Green Health Care. He can be reached at kent@greenhealthcare.ca.

▼ Opened in April 2013, Spaulding is a 132-bed rehabilitation teaching hospital located on the Boston waterfront. *Photo courtesy Steinkamp Photography.*

▲ The fuel gas booster 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. *Photo courtesy Kent Waddington Photography.*

▲ The roof-mounted 250 kilowatt 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. *Photo courtesy Kent Waddington Photography.*