St. Paul's Hospital
Vancouver, BC
Architect: HDR + Stantec
PCL Construction

Healthcare resiliency

Seven ways we can design more resilient healthcare projects today

BY SHANE O'HANLON

St. Paul's Hospital
Vancouver, BC
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Stantec completed a complex and detailed climate hazard and vulnerability assessment, as required by the City of Vancouver for the St. Paul's Hospital project site.

Hospitals are essential buildings. During an extreme weather event or natural disaster, health care institutions must remain operational, providing emergency services to the populations they serve.
When we are designing new or updated healthcare projects, we must adhere to the applicable building codes for health and safety. But we also ask ourselves, can we do more?

In light of the changing climate and increased frequency of extreme weather events, it is critical for designers to build in resilience to projects so that they can safely provide for their communities decades from now. With our deep expertise in the health sector, we've developed several approaches to designing for healthcare resiliency that go beyond currently prescribed approaches and address resiliency more broadly.

1. Think regionally, engage with utility providers
Healthcare projects differ from the typical commercial design project in their large scale and complexity. Rather than focus solely on the building scale as one might with a commercial project, we look at the healthcare facility's role in its municipality and region. One of the first things we do on healthcare projects is to engage with our utility providers—gas, electricity, water—so we have a strong understanding of what's happening in the region and how our project fits into it. We promote robust stakeholder engagement with utility providers, transportation authorities, regional authorities, and entities around healthcare project resiliency.

We recognize that the hospital, unlike an office building or residential tower, will see a surge in use during an emergency, natural disaster, or extreme weather event. We examine regional vulnerabilities and connections to networks offsite. We must consider how the transportation network and the supply chain are essential to the continued operations of healthcare facilities.

How resilient is the facility to the threat of regional hazards? For example, how could the risk of wildfire beyond your site affect air quality issues at your facility? How vulnerable is the facility to offsite hazards such as flooding or downed trees that can disrupt access to the site during an emergency?

2. Facilitate engagement between disciplines
We facilitate communication regarding resiliency between the various design disciplines to find the right solutions. For example, we see extreme heat in many areas. One response to that is upsizing the building's cooling systems. But that approach will likely lead to increased energy use to provide that cooling. Instead, we engage early in the project and look for alternatives. Can we address part of that need for cooling

South Niagara Hospital *Niagara Falls, ON*

through the building facade design? Can we reduce our window-to-wall ratio and reduce solar gain on that building? Is there another discipline that can support, perhaps civil engineering or landscape architecture? Can we plant more trees on site to provide more ground level cooling and reduce the heat island effect, for example?

By involving as many disciplines as possible as early as possible we can facilitate holistic approaches to achieve resiliency, eliciting ideas from a multi-disciplinary team. Another example is how we might address changing precipitation patterns and more intense rainfall that accompanies climate change. Instead of simply oversizing the stormwater network to cope with increased demand and thus prevent flooding, we could incorporate landscape architecture elements to increase the infiltration on site or adjust the grading to lessen the impact in such an event.

3. Future proofing for climate change

In Canada, we have new guidelines for large capital healthcare projects that require designers to carry out hazard exposure screening and climate risk assessments on projects.

Climate risk assessments generally indicate that peak and average temperatures will be higher in decades to come. We can anticipate that healthcare buildings will require increased cooling ability as the climate warms. Rather than design to our current climate, we want to size and select systems according to climate change prediction data thereby building resilience from day one. But we want to be smart about it. Once we have considered how each discipline may support strategies to reduce cooling, e.g. the above-mentioned changes to window-to-wall ratio, or site orientation and solar gains, we can then look to the mechanical engineers to consider the HVAC systems. We may not want to put in an oversized cooling unit today, just the appropriate one for the next 15-20 years.

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In 25 years, the current unit will be inadequate, so we can then replace it with one that has a larger capacity. We need to anticipate that. Did we size the mechanical room in the building to be large enough to fit a larger unit,

North Island Hospitals *Comox Valley, BC*

VA Puget Sound – Mental Health & Research Building *Seattle, Washington*

or did we limit ourselves and undersize our room based on today's units that don't allow for future modifications. Can we access that room and replace that unit easily? Did we size the ducting in the building for that future load? Because we can't rip out all of the ductwork for airflow at a later date, not without huge expense and disruption to healthcare service delivery.

It's about recognizing where you can have flexibility with the space for the system, the ductwork, and the cooling unit itself. It's about allowing for the possibility of an auxiliary connection in 10 or 15 years to meet changing cooling needs.

Thus, we can anticipate what systems will be required in 2080 toward a facility's end of life. Where systems will not be accessible (above ceilings and in shafts) we should install 2080-sized equipment or ductwork now. Where systems are accessible (like in mechanical rooms or on the roof) we should simply allocate space for the future/replacement systems.

4. Flexible spaces for triage

The pandemic has demonstrated the need for flexible thinking around space use. It made us look at space on the healthcare campus differently. Can we reconfigure waiting areas, outdoor spaces like courtyards and plazas, even parking garages and other parts of the hospital in an emergency to deal with triaging patients? Can we convert those spaces quickly and make them useful? Flexibility and multi-use space informs a great deal of our thinking about design for healthcare campuses today.

← **VA Puget Sound – Mental Health & Research Building**
Seattle, WA
Upgrades at VA Puget Sound included seismic corrections to meet VA Seismic Standard H-18-8 for nursing tower, a community living center and replacement of 168 buckling restraint braces. Resilient features include water storage tanks which allow the hospital to stay operational for three days if service is disrupted.

5. Increased need for storage spaces

Another thing we see is the increased need for storage spaces inside buildings. During the pandemic, the need for PPE (personal protective equipment) in hospitals ramped up. And many hospitals realized that to be resilient they needed more reserve PPE on site rather than rely on just-in-time delivery. In light of supply chain disruptions and extreme weather events, healthcare institutions are looking for space where they can store materials and supplies so they're ready for anything.

6. Shading on site/ using outdoor spaces

Taking an architectural perspective, we see a different set of needs emerging with the recognition that an extreme event can cause a surge in demand for healthcare services. Seen through that lens, we obviously need more shading on site. But is there more we can do? During an extreme heat event, can we convert the plaza into a cooling center? Have we provided space to put up white shaded tents to shelter people outside who need shade and water before they can receive medical care?

Our architectural solutions are leaning into consideration for flexibility of spaces, particularly adjacent space outdoors.

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Royal Columbian Hospital – Mental Health & Substance Abuse Wellness Centre
Vancouver, BC

7. Overland flooding and access routes

Ambulances and emergency vehicles must be able to reach the hospital during extreme weather events and extreme rainfall. So, on large healthcare projects, we must consider the possibility of overland flooding and the maximum allowable depth of standing water on the site that is safe for these vehicles to pass through.

We must explore opportunities to ensure that the site is graded to minimize overland flooding on essential routes and for ways to maintain access at the various entry and exit points, main entrances, roads, and parking areas. We configure these routes with consideration for the client's emergency access and operational needs. In other words, we must make sure that they know which routes are the safest to traverse if the site is flooded and they can't ascertain the water depth. Together, these approaches along with a mindset that anticipates the risk to resiliency posed by climate change helps us design more responsive healthcare complexes that support our communities in crisis.

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Based in Vancouver, Shane O'Hanlon is a project manager, facilitator, and senior climate risk and resilience consultant.