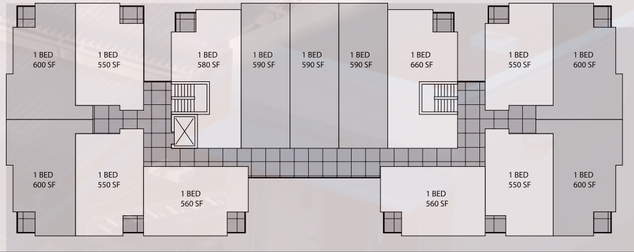
The team had their work cut out for them. By the time the City made a commitment to the Net Zero target, much of the programming for the building had already been determined. "The building was already massed, the site chosen, the proportions already set. Within this context, it was up to the design team to explore how to tweak the form to maximize energy efficiency and how to generate energy onsite," says Ramslie. "It became clear early on that technology alone would not get us there. Getting there would require an integrated approach."

gBL Architects was responsible for the design of the Net Zero building. "The building was designed around a lot of opportunities for passive design," says Stu Lyon, Principal at gBL Architects. "We implemented a significant amount of passive strategies that will affect livability, maximize daylight and natural ventilation and eliminate the need for air conditioning." These strategies were instrumental to lowering the building's energy demand.

The team considered a number of potential layouts for the residential units, with a view to improved comfort and energy efficiency. "We had to maximize cross-ventilation and daylighting from two sides. The typical floor plan for the building evolved around creating as many – if not all – suites either on a corner or with two sides. To achieve this, we eliminated the concept of the interior corridor and put both the corridors and the stairs on the outside perimeter of the building," says Lyon. This resulted in energy savings associated with ventilation and the elimination of mechanical cooling and air conditioning of corridors and stairwells.

We combined a green roof with the solar array – so the rooftop does more than one thing.

Stu Lyon, Principal, gBL Architects



The floor plan in the Net Zero building was designed to maximize cross ventilation and daylighting.

SYSTEMS DESIGN

A Low-Tech Solution

A myth about carbon neutral buildings is that they must incorporate futuristic, state-of-the-art technology. "Some Net Zero buildings rely heavily on technology – it takes a person with a PhD to operate them," says Albert Bicol of Cobalt Engineering. "But in our case we really tried to max out the KISS principle: keep it simple, stupid. We didn't rely on high-tech equipment, just high quality materials and smart design."

The building relies first and foremost on passive design. The building features an enhanced envelope, including triple-pane windows. The walls are insulated on the outside, a practice that can be costly, but pays off in energy efficiency (see Chapter 4, Exterior Insulated Wall Assemblies). In the interior, thermal mass is used to regulate the temperature. The envelope has an effective exterior wall R-value of R20, roof R-value of R30 and glazing effective U-value of 0.25.

The team reduced thermal bridging, wherein building components (such as floor slabs) conduct energy (heat) from the inside to the outside. This was accomplished by applying insulation on the upper surface of the slab extensions (under the walking surface) and partially insulating the underside of these balcony and walkway structures. The building's other innovative design features include vertical ventilation shafts. The shafts are kept at a negative pressure, so air is expelled by passive means out of the suites and upward to the roof.

"This isn't really a high-tech building or a technological marvel," says Ramslie. "What it does have is really good insulation, well-placed glazing and a number of other key passive design features. What we really learned is that buildings of the future are really buildings of the past."

Ostojic agrees. "In many senses, the more we rely on technology, the worse off we are," he says. "Take this building. Years from now, the (solar) technology applied on this building will be obsolete – but the smart design will remain."