DUCTSOX®
Textile Air Dispersion Products

One of North America's Most Sustainable Buildings Innovates HVAC Strategies

Centre for Interactive Research on Sustainability uses geothermal, solar, UFAD, natural ventilation, & no conventional cooling/heating.

Vancouver, British Columbia--A cutting-edge HVAC system would be expected from one of North America's most sustainable buildings that utilizes innovative technologies such as geothermal, heat scavenging from neighboring buildings and the sun. Consulting engineering firm, Stantec--Vancouver, didn't disappoint as its state-of-the-art HVAC design surpassed all green expectations at the Centre for Interactive Research on Sustainability (CIRS) on Vancouver's University of British Columbia (UBC) campus.

Consequently, CIRS now showcases an HVAC system that is a role model for technology, building/occupant interactive research and energy conservation for decades to come. The four-story, 65,000-square-foot net-positive CIRS has achieved Leadership in Environmental and Energy Design (LEED®) platinum certification, and applied for Living Building Challenge recognition. Principal Jimmy Ng, P.Eng., LEED AP, led a Stantec HVAC design team that worked synergistically with the CIRS research team spearheaded by professor and CIRS project leader, John Robinson PhD., and architect firm, Perkins+Will, Vancouver.

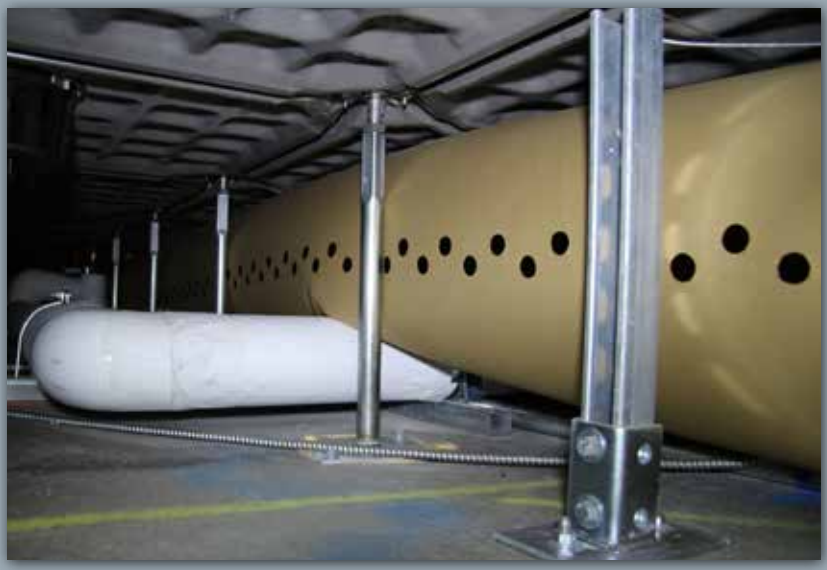
Stantec's indoor air quality (IAQ) design uses both natural and displacement ventilation through underfloor air distribution. In the CIRS project, the UFAD acts as an 18-inch-high ventilation plenum to distribute air strategically through floor diffusers. Consequently, air is discharged from the floor upward as opposed to over head with conventional air mixing ducts. Distributing heated air overhead requires an estimated 25-percent more fan horsepower and is less efficient in getting air to the occupied zone. CIRS' supply air is discharged to each floor's UFAD and is controlled with the building automation system (BAS).

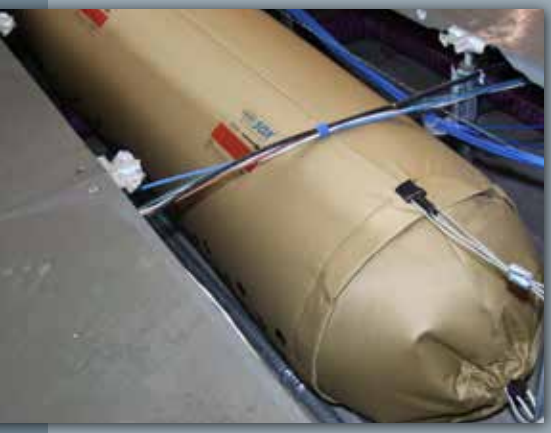
Fabric HVAC Duct Inside of UFAD

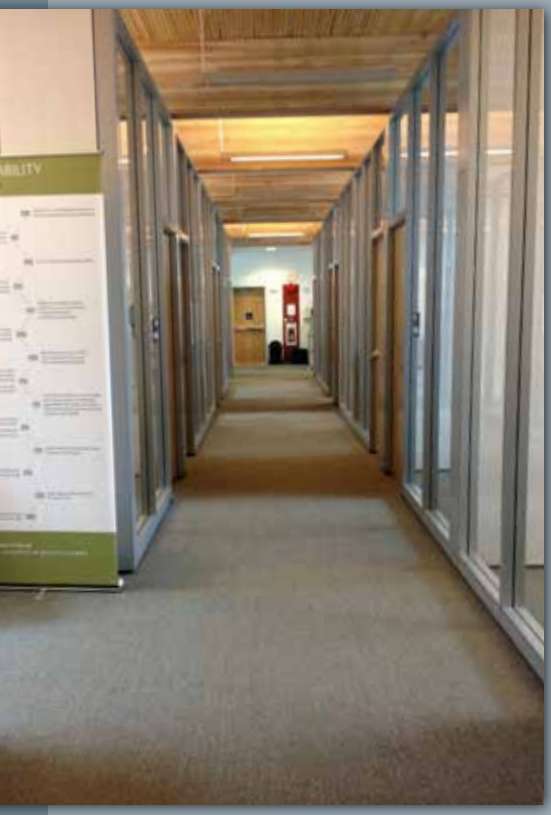
Pressurized UFAD systems contribute to the achievement of several LEED credits, however they sometimes suffer thermal degradation at the perimeter. This challenge leads to longer and inefficient mechanical equipment runtimes, according to Ng. Therefore one ventilation innovation Ng specified is UnderFloorSox (UFSox) by DuctSox Corp., Peosta, Iowa. Installed by project mechanical contractor, Eagle Ridge Mechanical, Port Coquitlam, BC, UFSox is fabric ductwork designed specifically and UL-approved for installation inside UFAD systems to distribute air closer to all floor diffusers and the perimeter. Ng worked with manufacturer's representative Progressive Air Products, Delta, BC, to size the underfloor fabric duct for minimal static pressure drops.

UFAD systems certainly lend a ventilation advantage in sustainable building approaches, but they need fine tuning, according to Ng. Air leakage in UFAD and its interior electrical junction boxes can add up to 20 to 30-percent efficiency losses when not sealed properly with code-compliant fire stop materials.

Therefore, general contractor Heatherbrae Builders, Richmond, British Columbia, pressure tested the UFAD for any leakage after construction. Furthermore, supply air







inside UFAD systems, in many instances, would be better distributed via fabric ducts to assure it's dispersed where it's most needed, according to Ng.

Installing metal duct with registers and dampers inside UFAD is an alternative, however fabric duct's inherent linear diffusion characteristics distributes air more evenly, plus its flexibility easily circumvents utility piping obstacles and can be quickly rerouted during floor reconfigurations.

One of two centralized air handlers in the basement's mechanical room provide conditioned air to each floor's UFAD metal plenum that supplies each fabric duct. Each plenum has dampers that the BAS can automatically shut off by zone during unoccupied periods or when the building mostly relies on natural ventilation. CIRS also has manual or automatically-operated high and low level windows, which occupants or the BAS can open for free cooling and natural ventilation when temperature and humidity conditions allow. The UFAD areas also rely on a high performance envelope and high R-value building design that utilizes materials specified by Perkins+Will and engineering firm, Morrison Hershfield, Vancouver. The design limits solar gain while using the building's sustainable geothermal, heat scavenging and solar panels to maintain a 65°F UFAD discharge temperature.

In addition to the ventilation strategy, CIRS uses both photovoltaic electric and hot water solar panels. The panels are used to convert sunlight into electricity and to harvest heat for pre-heating water in the building. Both panel technologies are also integral in shading the four-story atrium skylight, the south and southwest facades and part of the south roof from direct sunlight.

The geothermal field supplies one 118-kW and two 196-kW heat pumps. The building itself produces no emissions, therefore a 200-kW electric boiler for back-up and peak-demand was specified versus gas-fired models.

Other sustainable measures are:

- rainwater harvesting for potable uses; wastewater treatment and recycling (water reclamation) for toilet flushing and landscaping irrigation. Both rainwater treatment and water reclamation systems use a multi-phase filtration, ultra-violet disinfection system and chlorination.
- exhaust heat scavenging from a neighboring laboratory building to supply the CIRS heat pumps utilized in both space and water heating. Excess heat from CIRS' net positive profile is fed into the same lab building to reduce that building's reliance on fossil fuel energy and thus the campus green house gas emissions. The geothermal field supplies backup heat to CIRS in the winter and rejects CIRS' heat into the ground during the summer.
- radiant heating is utilized through radian slabs and perimeter radiators.

While Alberto Cayuela, P.Eng., PMP, LEED AP, CIRS' director of operations and business development, reports good indoor air comfort reviews of the building's HVAC systems, the true test will come after a "post occupancy" evaluation reveals recorded data of energy savings and confirm the anticipated net-positive status.

Regardless, CIRS will continue to be a living building and the design team will continue to optimize its performance, according to Ng.