# The CSSBI and University of Waterloo Pursue **Carbon Neutrality** in Steel Building Systems

View of project from northeast corner. (Courtesy CSSBI)

**The Canadian Sheet Steel Building Institute (CSSBI), Canada's** foremost authority on sheet steel building products, has recently joined forces with the University of Waterloo School of Architecture and the Department of Civil Engineering, to lead the way towards a Carbon Neutral Steel Building System (CN-SBS).

Statistics show that the built up environment, including commercial/industrial buildings and homes, collectively represents one of the single largest sources of greenhouse gases in North America. While builders are achieving greener, more sustainable designs and pursuing certification programs, the efforts are not enough. The CSSBI and the University of Waterloo have created a Carbon Neutral Steel Building System (CN-SBS) Project Team to explore the aspects of design and construction required to achieve carbon neutrality.

The CN-SBS Project Team will evaluate three SBS building projects in terms of sustainable design and energy use using a variety of existing green building protocols. The project will propose new approaches for using steel, determining how Steel Building Systems can improve the energy efficiency of a building while decreasing its overall carbon footprint. The team will use a retail building of approximately 600 m² (6,458 ft²), which represents a large segment of the built environment.

## The Project Team

Leading the project are two Master's students from the University of Waterloo. Christopher Black, HBas, MArch candidate and LEED® AP, is focusing on the architectural design of the project, while Kevin Van Ooteghem, BASc. MASc. candidate, will be responsible for the engineering portion of the project. Both students have conducted research into existing information about how steel performs as a sustainable material and carbon neutrality, as well as the various existing "green" building rating systems.

Supervising the project as architectural consultant is Professor Terri Meyer Boake, LEED® AP, and Associate Director of the School of Architecture at the University of Waterloo and,

## What is Carbon Neutrality?

Carbon Neutrality is the new standard defining the next generation of green buildings. Carbon Neutrality addresses a host of new, more stringent requirements with respect to environmental standards in the building industry. There are at least four different levels of carbon neutral buildings, including Zero Net Energy; Carbon Neutral; Holistic Carbon Neutral; and Complete Carbon Neutral.

Net Zero Energy Buildings: Buildings that on an annual basis use no more energy than what's provided by on-site renewable energy sources. The building can still produce carbon by burning biofuels such as biomass, wood chips, other waste, etc. Only the operating energy is considered in the analysis.

Carbon Neutral Buildings: Like Net Zero Energy Buildings, but no carbon is produced from renewable energy sources (wind, solar, etc.). Only the operating energy is considered in the analysis.

Holistic Carbon Neutral Buildings: Reduce the carbon emissions associated with all aspects of the project. This includes the construction, materials and operating energy. Both operating energy and embodied energy of the building materials are considered in the analysis.

Complete Carbon Neutral Buildings: Like Holistic Carbon Neutral Buildings, but also includes the transportation energy, the building function and the carbon contribution from occupant transportation. This is the most rigorous definition of a carbon neutral building and includes all aspects of carbon emissions such as the operating energy, the embodied energy of the building materials, the transportation energy, and the overall building function.

as the project's structural engineering consultant, Professor Lei Xu, Associate Director of the Canadian Cold-Formed Steel Research Group, Department of Civil Engineering at the University of Waterloo.

Both professors are joined by the CSSBI General Manager, Steven R. Fox, PhD, P.Eng., who represents CSSBI members, many of which consist of Steel Building System manufacturers.

"Steel, as a construction material, has many environmental benefits already realized in SBS buildings around the world," says Dr. Fox. "We're trying to help the Canadian industry move beyond green. This CN-SBS project should create and collect data that building designers need to push our building infrastructures toward carbon neutrality. This whole process is only the beginning."

## Why is this project important?

One of the single largest contributors to $CO_2$ emissions worldwide is the building industry. The construction and operation of buildings consume over a third of the world's energy and 40 percent of all mined resources.

In Canada, this building sector accounts for about 30 percent of the total greenhouse gas emissions our nation produces. Though green protocols, such as LEED®, are in place, the pressure is on the building sector to develop net zero energy and carbon neutral projects to respond to the urgent challenges of climate change and urban growth. The CN-SBS research project will push the retail typology beyond current definitions of green building and address the issues of carbon neutrality.

Currently, there are only a handful of buildings that can be considered to be true carbon neutral buildings. The reality is that, as an industry, the building sector is still decades away from achieving carbon neutrality. However, given recent trends in energy prices over the last few years, the need and desire for carbon neutral buildings will only increase. Many challenges still face the building industry with respect to carbon neutral buildings, such as creating an accurate and standardized procedure for counting carbon, as well as finding ways to harvest and deliver renewable energy at an affordable cost.

## Project Status

The CN-SBS project is an ongoing endeavor that will carry through into 2010. A website dedicated to this project has been launched at http://cn-sbs.cssbi.ca to distribute all the information that will be generated through this project. To date, the initial background research into embodied and operating energy, life cycle assessment and carbon neutral buildings has been completed and is currently posted on the site. The initial design of the building and its analysis are forthcoming and will be available through the site in early 2010. Check this site often to stay apprised of any changes and updates in the project status. To obtain more information on the CSSBI, sheet steel products or the CN-SBS Project, visit www.cssbi.ca. ***GBD***