



GROWING UP IN THE WORLD

Living walls gaining ground in building industry

BY ALAN DARLINGTON

People are becoming an indoor species. On average, Canadians spend close to 90 per cent of their time inside — at home, at work and in recreational environments. This means that for much of people's lives they're breathing indoor air, unaware of the effects this can have on their health.

Living predominantly in an artificial world also means less time to interact with nature. Resultantly, people are missing out on the positive interactions between human health and the environment.

To overcome both of these indoor environmental concerns, it has become common to incorporate plants indoors. However, potted plants alone only have limited impacts.

An emerging option that is more effective and appealing is a living wall of plants, also known as a green wall. Designed properly, a green wall not only provides a connection to nature; it can provide a real and substantial improvement to indoor air quality (IAQ).



The 80-foot tall biofilter in Drexel University's Papadakis Integrated Sciences building in Philadelphia can purify 15 cubic metres of air per second. *Photo courtesy Nedlaw.*

AESTHETICALLY APPEALING AND HEALTHY

Green walls are touted for their aesthetic, and health and wellness benefits. These vertical gardens create a unique living work of art that is both beautiful and functional, and connect building occupants to the natural world while occupying only a minimum footprint. Studies have found that there are increasingly strong links between greening the indoor environment and the psychological well-being of building occupants. Green spaces have shown to reduce stress levels, increase work productivity and reduce absenteeism.

Further, research has established that indoor air biofilters (a special subgroup of green walls) can improve the physical qualities of indoor environmental quality (IEQ) by breaking down volatile organic compounds (VOCs) and assisting with the removal of particulate matter in the air. A recent study by the University of Guelph found that an indoor living wall biofilter can reduce common indoor air pollutants by 30 per cent.

The strength of the green wall biofilter is that it is actually an integrated part of the building's air handling system. Ambient air is actively forced through the wall of plants and growing or rooting media — a one to two-inch thick permeable mat — where air pollutants, such as formaldehyde and benzene, are biologically degraded into their benign constituents of water and carbon dioxide by beneficial microbes. The clean air is then distributed throughout the space by the mechanical system. The plants' role in the system is to create an environment that maximizes the efficiency of the beneficial microbes.

The green wall biofilter works because of the combination of all parts of the system. Filling an area in a building with potted plants (either on the wall or floor) does not achieve the same or even similar results. This is because the removal of air contaminants is not by the leafy parts of

GREEN WALL TECHNOLOGY

There is increasing interest in integrating living systems such as green walls and green roofs into the built environment. Of the two, the green wall industry is still in the early phases of development. But, according to independent research and advisory firm, Lux Research, the demand for green walls will surge in the next few years as the green roof market becomes saturated. In fact, the firm predicts a 16-fold increase in the accumulated area of green walls between 2012 and 2017.

There are two major categories of green walls: plant facades and plant walls.

Plant facades are wall systems where climbing plants grow upwards through a specially designed supporting structure. The plants are rooted in soil at the base

of the wall. This system is well-suited to exterior applications and a broad range of climates.

A plant wall is composed of plants that have been rooted into a material that is affixed to a structural vertical surface. There are two planting approaches to this type of green wall. The first is a modification of conventional potted plant culture. Plants are rooted into separate pots that may be arranged anywhere on the wall. The second approach modifies traditional hydroponics to the vertical condition. Hydroponics is a method of growing plants using a nutrient solution rather than traditional soil. As a result, the role of hydroponic planting media is reduced to little more than a support substrate to keep the plants from falling over.



The living wall in the dining area of TEDCO's Corus Quay building in Toronto was designed by Diamond Schmitt Architects. Photo courtesy Nedlaw.

the plants but by microbes living on and around the roots. In potted plants, the roots and their associated microbes are contained in soil, which gives them little or no exposure to the air. Further, the pot itself stops airflow through it. So the room air rarely reaches the roots or microbes that can filter out contaminants.

AN ENERGY-SAVING SOLUTION

A green wall biofilter offers an energy-efficient means of improving IAQ. It uses between 80 to 95 per cent less energy to generate the same volume of "virtual outside air" as traditional systems in the heat of summer and cold of winter.

This air can be integrated into the building in one of two ways. The first involves maintaining outside air makeup rates and augmenting it with biofiltered air. This allows occupants to enjoy a higher IAQ without increasing the amount of outside air being brought into the building. The preferred method, though, is to reduce the amount of outside air brought in and replace the loss differential with biofiltered air. Building occupants experience no change in IAQ while property owners

may benefit from reduced capital costs — larger HVAC units are no longer required — and/or reduced operating costs (due to the reduction in the amount of outside air that needs to be conditioned and moved).

MAINTAINING THE GREEN FACADE

Maintenance is critical for the overall success of any living or mechanical system. Approximately 70 per cent of the maintenance of a green wall involves standard horticultural practices. General housekeeping of plants should be carried out at least once a month, although a more frequent maintenance program may be necessary depending on the plant types and climatic conditions. The other 30 per cent focuses on maintaining the mechanical aspects of the green wall. This involves checking the various pumps, filters and controllers in the system. ■

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