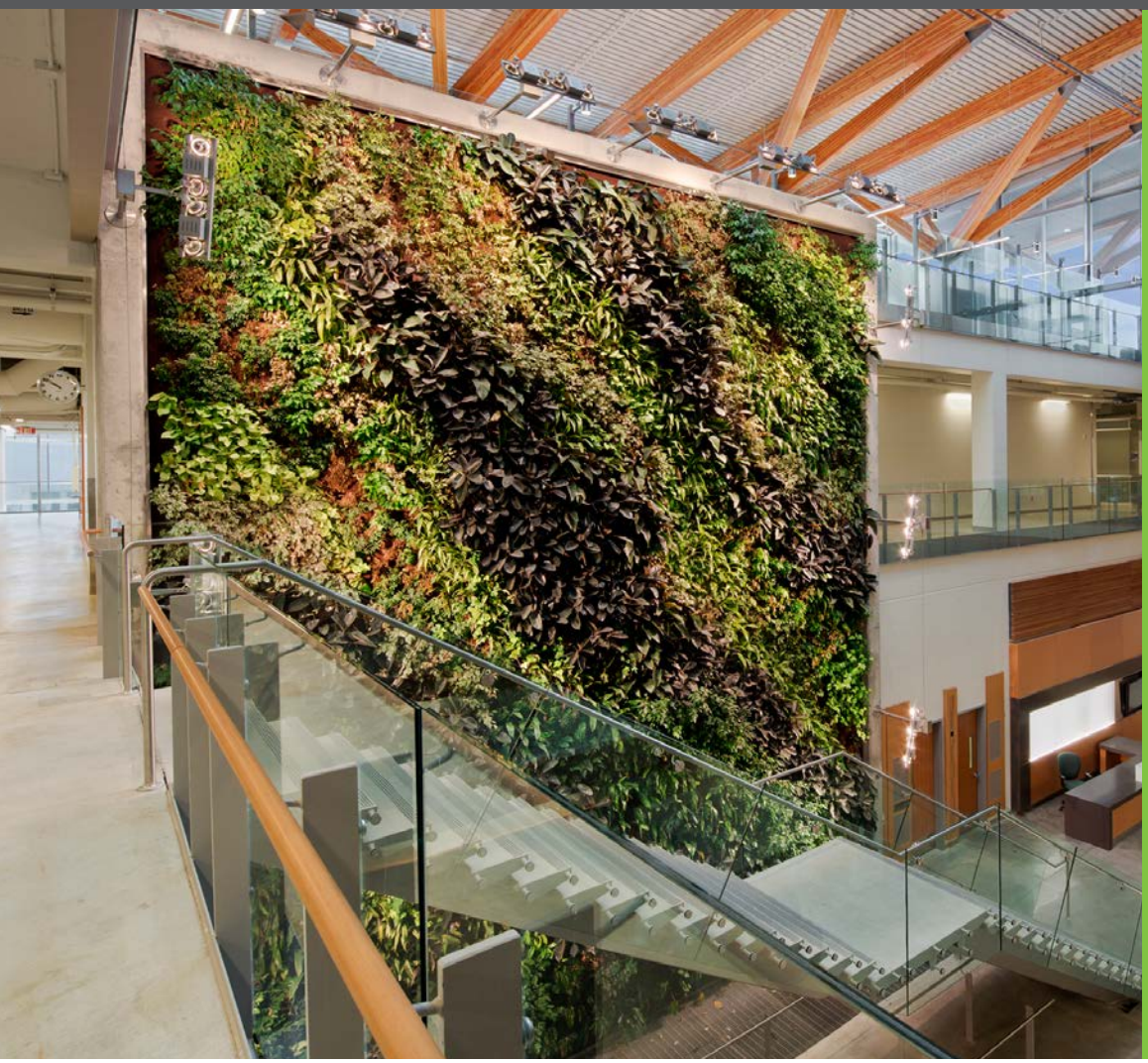
# Cleaning Indoor Air with Nedlaw Living Wall Biofilters



A Technical Note by Dr. Alan Darlington

NEDLAW LIVING WALLS

Rejuvenate with science.™

## The Air Quality Dilemma

North Americans spend over 90% of their time indoors and as much as 30% of the energy consumed by the building is used to generate an adequate environment for these occupants. Facility managers are therefore caught in the bind of trying to provide a good environment for their clients while trying to run the building as economically as possible. An Indoor Air Biofilter Living Wall helps solve this dilemma.

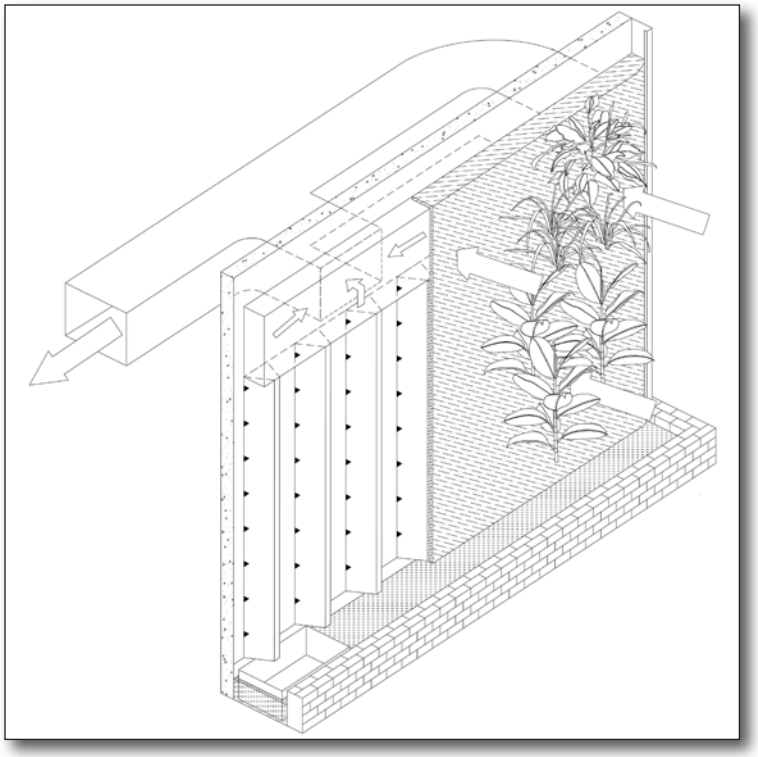
The Nedlaw Biofilter is the result of close to 20 years of research at the University of Guelph.

*Living Wall Biofilter at Drexel University in Philadelphia, PA*

## Indoor Air Biofilters

The Nedlaw Biofilter is the result of close to 20 years of research at the University of Guelph. This research started at the Canada Life Environmental Room at the Toronto head office of Canada Life Assurance (now part of GWL) in the mid '90's. At first glance, the living wall appears as a vertical hydroponic green wall containing a wide range of foliage tropical plants.

Air is actively forced through the wall of plants where pollutants such formaldehyde and benzene in the air are biologically degraded into their benign constituents of water and carbon dioxide.



*Schematic of Indoor Air Biofilter*

However, the plant wall is actually an integrated part of the handling system for the building. Air is actively forced through the wall of plants where pollutants such formaldehyde and benzene in the air are biologically degraded into their benign constituents of water and carbon dioxide. The clean air is then distributed throughout the space by the mechanical system.

The biofilter is an adaptation of two industrial processes. The first being *biofiltration* which is the passing of contaminated air stream through a biologically active substrate where beneficial microbes use the pollutants (such as VOCs) as a food source. The second is *phytoremediation*; where green plants help the growth of these beneficial microbes.

The indoor air biofilter can be thought of as a biofilter with the plants integrated within. Behind the scenes, a pump constantly circulates water and nutrients from a reservoir at the base to the top of the wall. The water then flows down the wall through a porous synthetic root media in which the plants are rooted.

Air from the occupied space is actively drawn through the plant wall by either the HVAC system or on-board fans and then returned to the occupied space. As the dirty air from the space comes in contact with the growing (rooting) media, contaminants move into the water phase where they are broken down by the beneficial microbes.

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*Although Biofilters are often integrated into the building's air handling system, stand alone versions are also possible by using built in fans as seen with this biofilter at Grimshaw Architects Manhattan Office*

## Indoor Air Biofilters Improve Air Quality

The biofilter improves the indoor environment through a number of ways; first in terms of its impact on air's contaminant levels. A single pass through the Nedlaw Living Wall removes 75% of the harmful chemicals, generating air the same quality as found outdoors. University studies indicate that a properly sized Biofilter can reduce the indoor pollutants by 30%. The biofilter can generate this clean air for up to 90% less energy than conventional ventilations systems in the heat of the summer or cold of winter.

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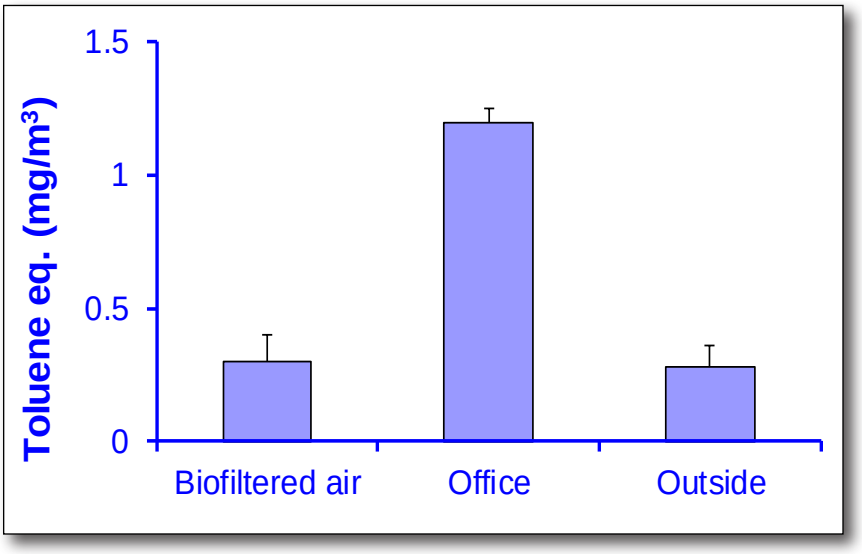


## Other Benefits of Indoor Air Biofilters

The living wall improves the aesthetics of the indoor space. There are increasingly strong links between indoor air quality, greening the indoor space and the well-being of the occupants. Greening the space and improving air quality reduces the stress levels, increases the productivity and reduces absenteeism.

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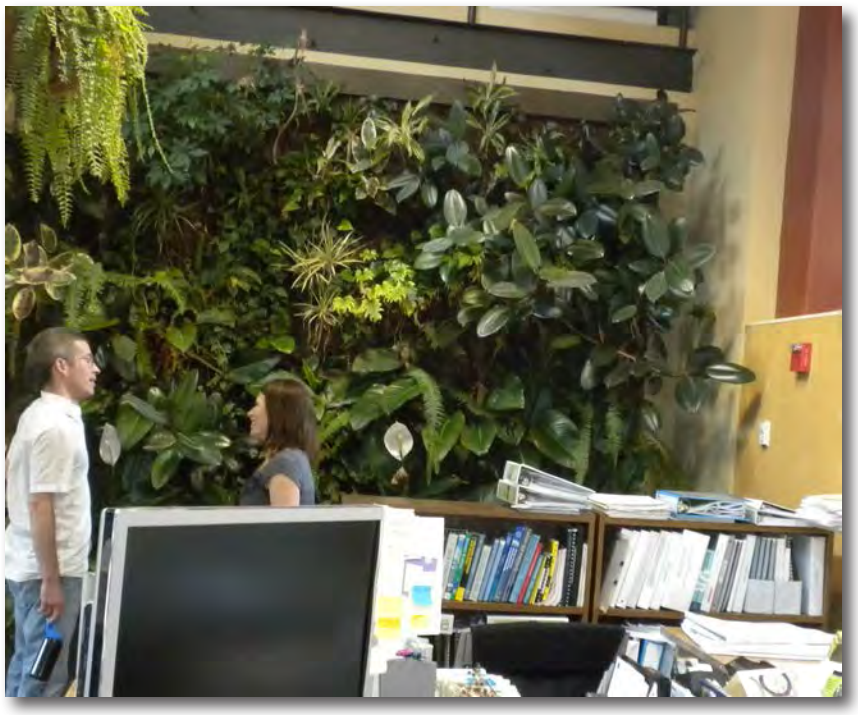


*Biofilters create the environment for causal and more formal gatherings at this biofilter at Biohabitat Bioengineering. (Baltimore, MD)*

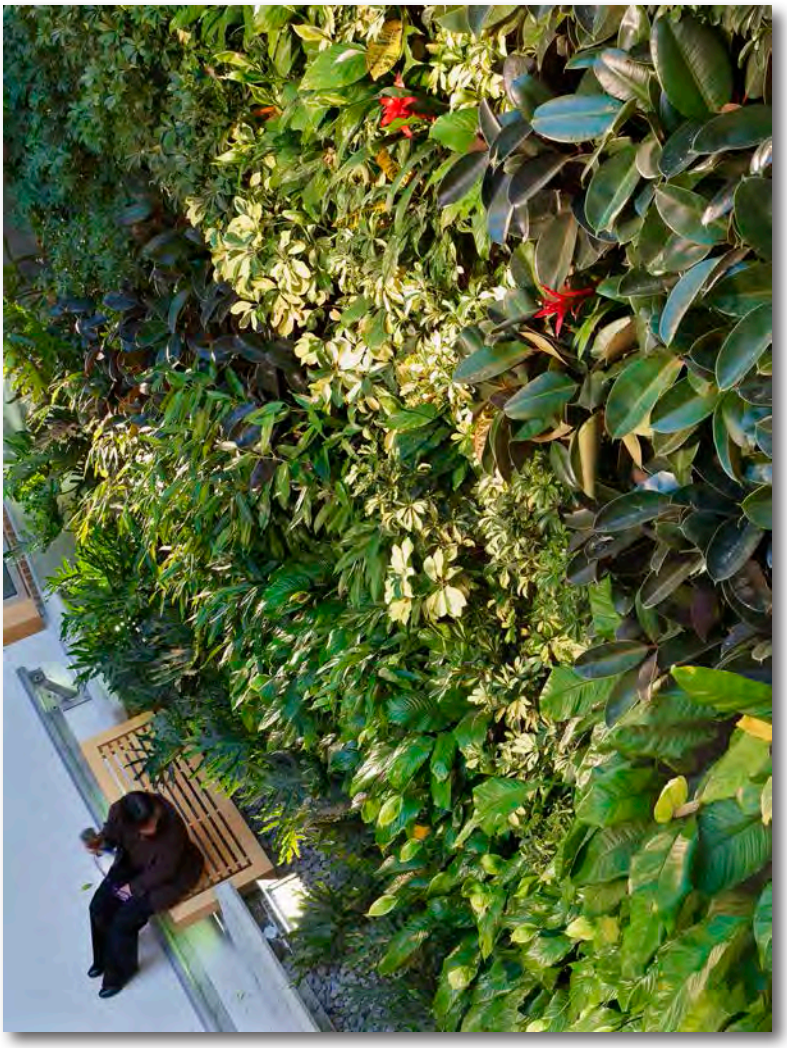
The biofilter also affects the sound environment of the indoor space. In office spaces the "business buzz" is steady and can in itself add to employee stress. The sound of abatement and white noise feature of the biofilter can help overcome these stresses.

The cost of employees is a major line item in most company's budgets, recognizing the correlation between indoor environmental quality, absenteeism, illness, and worker productivity is important.

Some estimates put worker salaries at 35-40% of the typical company's budget such that even small investments in employee health, productivity, or employee retention can have enormous impacts on the overall profitability of the company.

A Nedlaw Living Wall brings the psychological benefits of nature, indoors.

A Nedlaw Living Wall brings the psychological benefits of nature, indoors. “When a person exclaims that being in nature makes her feel healthy, it is typically a purely emotional response, but increasingly it is backed by scientific evidence” (Hester, 2006, p. 303). Indeed, numerous studies have demonstrated the various physical and psychological benefits of buildings that incorporate natural features and plant life



*Seating built into the base of this Biofilter at University of Windsor invites students to spend to moment and gather their thoughts*

## Design of Indoor Air Biofilters

The aesthetic appeal of the biofilters makes their installation well suited for central foyers or atria. The technology behind the Indoor air biofilter is extremely robust and has been used in venues ranging between high end restaurants and animal housing; and swimming pools and food retailers. The Biofilter offers a focal point in the space which can be used as a place for casual or more formal gatherings. Integration of seating either into or near the biofilter can help create this sense of community.

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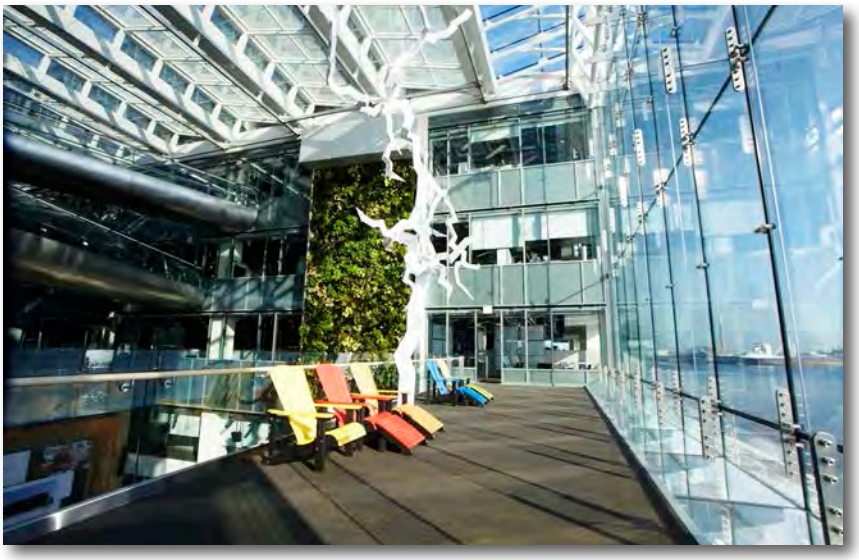
*Sassafraz Restaurant, Toronto, Ontario*



*Corus Quay, Toronto, Ontario - Landscape Ontario Award of Excellence Winner*

## Indoor Air Biofilters and LEED

These indoor air biofilters are the only indoor use of green plants to be recognised by the LEED program as an innovative means of improving the indoor environment. They recognise this approach as a unique use of green plants which leads to a substantial impact on the environment. These active Living Walls are an opportunity to improve the quality of the entire indoor environment not just air quality; potentially reduce the energy consumption of the building and improve the well-being of the occupants through both physical and psychological means.

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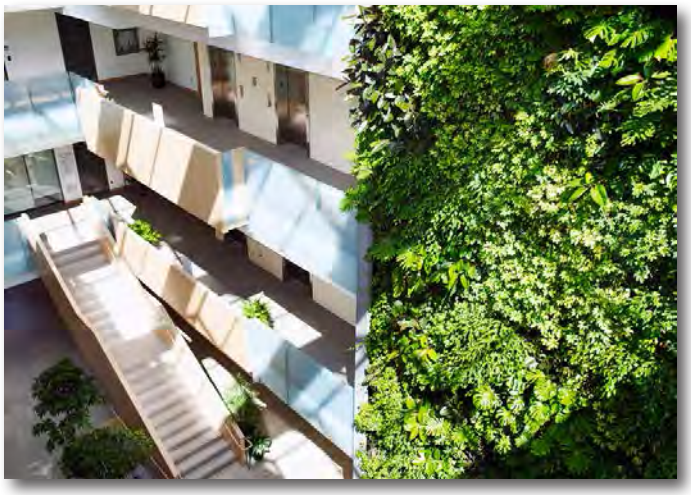
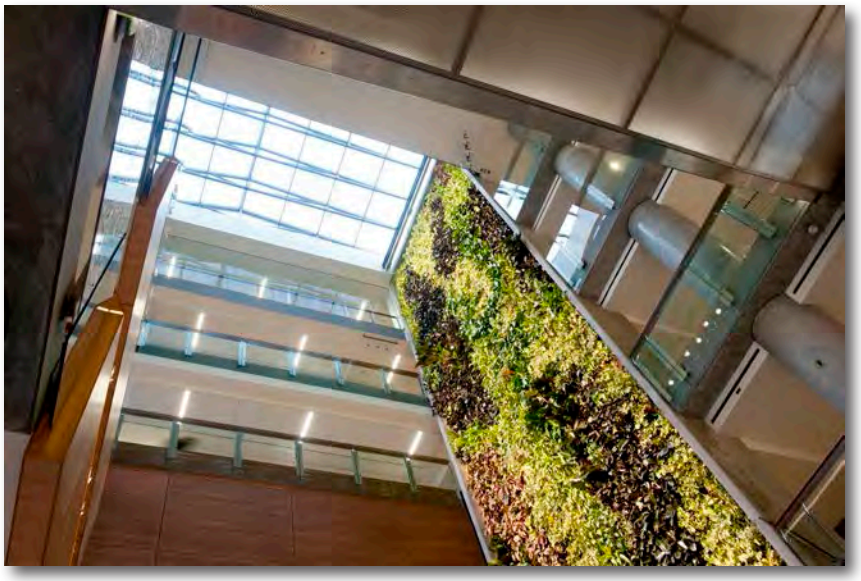


*Cambridge City Hall, Cambridge, Ontario - LEED Gold Building*



*University of Ottawa, Ottawa, Ontario*

## Maintenance

It is very important to maintain the highest level of quality control after your wall is completed. About 70% of the maintenance of these biofilters is standard horticultural practices: if the plants are happy then the biofilter is happy.

This works includes roughly monthly visits to prune and clean the plants as well as general housekeeping of the plants. The other 30% of the maintenance focuses on the hydroponic nature of the wall. This includes checking the various pumps, filters and controllers in the system. Specifically trained personnel are available for this work or in house people can be trained by Nedlaw.

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*Although much of the maintenance of the Living Walls can be considered 'routine', there are times when the maintenance occurs 20 metres off the ground*

## Contact Information

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