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Interior Landscapes

The use of indoor plants in office and commercial buildings is a quickly evolving trend in modern architecture, and possibly a growing niche service for BSCs.

If you have noticed a growing number of indoor plants in the office you service, it likely isn't just because of a general appreciation of greenery. Many business owners and managers have come to believe that indoor plants can increase worker productivity, reduce worker stress, and even improve indoor air quality. Generally, the newer the building and the higher the rent, the more likely it is to have incorporated extensive plantings into the design of the building itself.

A joint 2-year study by NASA and the Associated Landscape Contractors of America (ALCA) indicates that plants are useful in absorbing potentially harmful gasses and cleaning the air inside modern buildings.

The number of plants required to have any substantial impact on air quality is still a matter of study, and researchers don't expect that a few house plants scattered throughout a large building would have any appreciable effect. However, plants that are designed into buildings as an integral element of the space can have a significant impact on air quality.

Today, architects are taking plants into consideration in many of their current projects. "Plants are something that we embrace just due to the basic physics of plants taking in carbon dioxide and giving out oxygen," says Joyce Lee, Chair of the American Institute of Architects Committee on the Environment. "We believe the NASA study on the effect of plants in sealed environments remains some of the best available research on the subject."

Architects were among the first proponents of extensive use of plants in buildings. The process of moving plants from architects' drawings to existing buildings has required building owners, engineers, and maintenance workers in turn to understand the financial benefit of interior plants.

Link to Air Quality

The NASA/ALCA study used approximately a dozen popular varieties of ornamental plants to determine their effectiveness in removing several key pollutants associated with indoor air quality.

Plants that thrive in environments with low levels of natural light have the ability to remove significant quantities of formaldehyde, xylene, and ammonia from sealed chambers according to a report published in the Aug./Sept. 1993 issue of the Journal of the Mississippi Academy of Sciences, BC Wolverton and John D. Wolverton. Both the leaves of the plants and the microorganisms in the soil act as natural air scrubbers.

In a separate report in the 1996, Vol. 30, No. 14 edition of Atmospheric Environment, Virginia Lohr and Caroline Pearson-Mims reported that experiments had documented that adding foliage plants can reduce accumulate particulate matter on horizontal surfaces by 20%.

Joyce Lee sees plants playing a substantial role in the impact of buildings on the local environment as well. "Our group advocates the use of planting on building roofs as well as interiors," says Lee. "We are trying to help people understand the importance of a green roof, rather than the common heat-absorbing black asphalt roofs."

In addition to reducing air conditioning costs, and by extension the exterior air quality, green roof techniques also help to reduce the immediate rainwater runoff that can contribute to flooding and water pollution.

Stabilizing Humidity Levels

One of the largest concerns for today's building manager is toxic mold. But the dangers of humidity exist as much at low levels as they do at high. Relative humidity levels in excess of 75 percent in plant-free buildings can cause health problems associated with mold growth. But according to some studies, more health problems have stemmed from low humidity levels which increase the effective danger of indoor pollutants.

Cold winter air is naturally low in humidity, and once heated by furnaces or other heating devices becomes even drier. For office workers, the dry air irritates sensitive membranes in the nose, drying them out and eliminating the body's defense mechanism to indoor air

pollution, chemicals, viruses, and allergens.

Placing a layer of aquarium gravel on the top of the plant soil also deters any potential mold growth on the surface.

Assessing the Market

The market for plant service is growing, according to Gary Mangum, a partner in Premier Plantscapes in the Metropolitan Washington, DC area. "Our company has grown about 15 to 18 percent a year. We seem to be a little ahead of that pace this year. As an industry we are probably still only reaching 50 percent of the clients who would be appropriate for this kind of service."

Most start-up companies have one to two people who have cared for their own house plants. According to Mangum, "The larger and more successful businesses have more formally trained staff. The management comes from business backgrounds, and the technicians in the field have some training as horticulturalists."

There was a trend several years ago to develop more efficient workspaces and capitalize on maximum use of square footage. "Prior to that time the use of plants seemed to be primarily in private offices," says David Liu, Executive Vice President/General Manager of Foliage Design Systems. But the trend seems to have reversed course. "In open office planning, plants are becoming as important as furnishings and artwork, and they are part of the original plans in most new buildings," says Liu. "In my opinion, the space utilization drive created a lot of dissatisfied employees, so now they are trying to reclaim an environment that is more conducive to good employee health and productivity."

Liu has been in the industry for more than 20 years, and now oversees the day-to-day operation of the 40-office franchise and its subsidiary Foliage Design Systems of Central Florida. Liu characterizes interior landscape maintenance as a competitive field, but one that is experiencing tremendous growth due to customer demand. According to Interiorscape magazine, Foliage Design Systems is the 2nd largest company in the industry, grossing more than $20 million last year.

Plant companies in general expect anywhere from 12 to 20 percent return on investment per year.

On the average office account, a technician would use one of several watering machines, which are pressurized tanks on wheels that carry 12 to 14 gallons of water. Larger accounts will use tanks that carry up to 40 gallons. They will also carry scissors and pruners in a tool holder, dusters, sponges, and pesticides in a spray bottle.

"It's a low-tech industry that doesn't rely on a lot of machinery," says Liu. "The rating for workman's comp claims is very good. The incidents we do see are slip and fall, minor cuts due to pruners, and back injuries due to lifting heavy plant containers. In general, incidents which result in substantial lost work time are very few."

In general, one supervisor can manage 5 - 10 technicians. That number rises and falls according to the skills of both the supervisor and the employees. "The average front line worker in this field is probably getting around $10 an hour," says Liu. "But some technicians secure in excess of $18 per hour in urban environments that warrant such pay levels. In the progressive companies, employees are entitled to a comprehensive health benefits program, vehicle reimbursement, vacation and sick leave."

According to Mangum, "Industry wide, employee turnover is about 15 to 20 percent."

The bulk of accounts prefer their plants serviced during the daytime, so the ability to interact with office residents is deemed critical by most plant service companies. Typically, after-hours plant service occurs in malls where pedestrian traffic prohibits servicing during the day.

"Interior landscape businesses vary widely on how much inventory they maintain and lease to clients," says Liu. Some care exclusively for client-owned plants, though companies that supply plants tend to report higher profits. Companies that lease a lot of plants have to have some initial financial stamina to bear the cost of the plants up front, as well as the containers which are an important part of the package. Across the nation, leasing plants probably consists of 30 to 50 percent of the operating contracts.

Indoor Air Pollution

Beginning in the 1970s, both new and remodeled buildings were tightly sealed to reduce energy consumption. The building industry also turned away from natural building products and furnishings to synthetic products. Indoor Air Quality (IAQ) became a major issue as airborne contaminants (microbes, chemicals and human bioeffluents) were trapped in the indoor environment.

Carpeting is one of the major sources of indoor air pollution. Although newly installed carpeting produces the most complaints from emission of irritating chemicals, older carpets harbor dust, dust mites and microbes. Even though the outgassing of chemicals from some carpeting is known to cause serious health concerns, the building industry continues to rely heavily upon its use. In August 1989, the Environmental Protection Agency (EPA) submitted a report to Congress that listed more than 900

volatile organic chemicals (VOCs) identified in newly constructed buildings, and that some levels were 100 times greater than normal levels. This report also stated "that sufficient evidence exists to conclude that indoor air pollution represents a major portion of the public's exposure to air pollution and may pose serious acute and chronic health risks." EPA estimated that indoor air pollution is costing tens of billions of dollars per year in medical costs and lost worker productivity.

Building Industry Solutions
Because of health concerns and vocal complaints by building occupants, ventilation was increased to purge the

stale indoor air and introduce outside air. However, there are two inherent problems with increasing ventilation rates. First, energy efficiency is compromised. Secondly, outside air is not always clean, especially in metropolitan areas. The building industry still has not adequately addressed the two-fold problem of providing indoor air quality and energy efficiency.

Sustainable Indoor Ecosystems
Plants were an essential component of the evolutionary process that converted the earth from a highly toxic environment into the life-supporting ecosystem it is today. Therefore, the concept of using plants to create a healthy ecosystem within an indoor environment has a historical and scientific basis. However, simply placing a few interior plants in a building with poor IAQ will not significantly impact the indoor environment. On the other hand, placing a plant within one's personal breathing zone (generally an area of six to eight cubic feet surrounding an individual) can have an impact.

The use of interior plants to create a sustainable ecological system within hermetically sealed buildings is gaining acceptance within the building industry and the general public. Progressive scale-up of indoor ecosystem technology has answered many of the skeptics' concerns. Integration of plants and their root-associated microbes with highly adsorbent filtering media and mechanical air movement has increased filtration capacity and significantly reduced the number of plants needed. This hydroponic system also eliminates the growth of mold spores that is commonly associated with soil use. Thus, true sustainability in the indoor environment is beginning to emerge.

MJ Gilhooley of Plants at Work and Dr. B.C. Wolverton, president of Wolverton Environmental Services, contributed to this article. For more information see Dr. Wolverton's book entitled, "How to Grow Fresh Air - 50 House Plants that Purify Your Home or Office," (Penguin, 1997). Dr. Wolverton rates each plant for its ability to remove chemical vapors, ease of growth and maintenance, resistance to insect infestation, and transpiration rates. This book was originally published as "Eco-Friendly House Plants" (Weidenfeld & Nicolson, 1996), and has been translated into ten languages.