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DESIGNING INTERIOR ENVIRONMENTS that Support Human Health



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The idea of 'sustainable design' has been central to architectural discourse and practice for more than 20 years. In the original definition of sustainability, we were encouraged to consider economic, environmental and social impacts. However, in practice, we have focused most of our attention on the environmental and economic aspects of sustainability and neglected the social implications of design.

This situation is changing, and issues relating to physical and mental health, as well as social and cultural considerations, are being re-introduced into the conversation. Thus architects and interior designers now face the challenge of embracing this more holistic approach to design; an approach that puts people at the centre of the process.

People-centred design intertwines a number of related strands of research, including biophilia, active design, the effects of lighting on circadian rhythm and the adaptability and livability of spaces. This article explains these aspects of design and illustrates them with examples from the work of the Vancouver-based Office of Mcfarlane Biggar Architects + Designers [OMB].

Why human health and wellbeing?

As defined by the World Health Organization, human health is, "... a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Our wellbeing depends on many factors, including our biological make-up, our experiences and our interactions with our environment. When we speak about health and wellbeing, the implications extend far beyond simple employee productivity - although for many years, this has been the sole metric by which we have measured occupant health.

Although we have known for a long time that Canadians spend over 90% of their time indoors, only recently have we consciously begun to design environments that not only meet health and safety regulations, but also actually improve occupant health and wellbeing.

BY KAITLYN GILLIS
AND MICHELLE BIGGAR



DAY LIT CLASSROOM AT COLLEGE OF NEW CALEDONIA TECHNICAL EDUCATION CENTRE, QUESNEL [1]. ABUNDANT NATURAL LIGHT IN CLASSROOMS, CIRCULATION SPACES AND TRADE SHOPS THROUGHOUT TWO TRADE BUILDINGS FOR THE COLLEGE OF NEW CALEDONIA [2].

Biophilia and Biophilic Design

As humans, we evolved in close proximity to nature. As societies became more settled, as cities grew, and as more and more occupations involved work in factories, offices and other indoor environments - so humans spent less and less time in nature. The revolution in information and communications technology has further exacerbated this problem.

At this time, there are few - if any - cities in the world that provide adequate exposure to nature. Even with parks, green sidewalks, living walls and roofs, the most nature-saturated city cannot compensate for the amount of time we spend indoors. While it is undoubtedly helpful to create views to these or other landscaped areas, the occupants of most buildings in most cities experience a 'nature deficit' that may be harmful to their health.

The introduction of biophilic design is an attempt to address this deficit by integrating nature and natural forms and processes into the built environment. The biophilia hypothesis proposes that we need contact with nature, and that without this contact our health will suffer. Biophilic design has been actively promoted by Stephen Kellert and Terrapin Bright Green and is now a part of the broader sustainability conversation. It has been included as an imperative in the Living Building Challenge since 2009 and more recently has been incorporated into the WELL Building Standard [2014].

Biophilic design is more than interior plants or living walls. It can also include the use of natural building materials, shapes and forms, natural light, and design features such as "prospect and refuge", all of which respond to natural inclinations and needs extending back to the beginning of human evolution.

While the marketplace may have struggled to quantify the other benefits of designing for people, these have long been a subject of academic research in the field of environmental psychology. To continue to focus only on productivity limits the value of the discourse and ignores the diversity of people that use, and are affected by, the multitude of different building types they experience.

As an example, for a traveller passing through an airport, a 'healthy' space will be one that creates a calm and reassuring environment, so relieving the stress that is often associated with travel. By contrast, for a worker in an office, it is productivity [or to use a better metric, performance], that makes a difference to their organization's bottom line.

However, what is becoming increasingly important to organizations is retaining good employees, something that requires both a supportive corporate culture and a well-designed work environment. It should be noted that the impact of the work environment on our health does not end the moment we leave the workplace; —its effect can linger, and influence our long-term health. For example, poor posture resulting from poor workplace ergonomic design can wreak havoc on the body, and cause chronic musculoskeletal pain that extends far beyond working hours. The same can be said for many of the health impacts, psychological and physiological, the built environment has on people.

CASE STUDIES

UBC Bookstore Expansion + Renovation

The UBC bookstore renovation and expansion project included reconfiguring the existing retail space and adding a new café and convenience store. The bookstore was physically disconnected from its surroundings due to significant changes in level that created unattractive cave-like spaces below grade.



The design objective was to transform an inward looking brutalist building into a bright and vibrant retail and social space at the heart of the campus. Biophilic design principals were introduced in several ways:

- Creating strong visual connections between the new at-grade interiors with a series of well-defined outdoor terraces and the larger university community. Introducing a new mezzanine around the perimeter of the double height volume to provide a strong connection to nature through a much-needed gathering and independent study space.
- Connecting new and old architecture with a wide concrete stair, complete with integrated wood seating, which enables a biophilic connection [natural light] to penetrate deep into the existing below-grade store, inviting people down, and providing another informal gathering space.
- Creating a holistic environment and contextual connections with the natural environment by featuring wood in the hybrid wood and steel roof structure, as well as in the series of birch millwork elements, bench seating and the connecting stair.

The project is evidence that simple design interventions can have transformative and grand effects creating vibrant spaces that are a pleasure to work and play in.

Active design

Humans are meant to move, but unfortunately we have created lifestyles that often prevent much movement throughout the day. Canadians spend on average 10 hours daily sitting down. Even those of us who sit all day and exercise after work are not really reversing the impacts of constant sitting.

This has become such a huge problem that many researchers are claiming that 'sitting is the new smoking', contributing to various types of illness, including heart disease, cancer, diabetes and obesity. For employers, this has a direct effect on the bottom line. The benefits of more active employees include reduced absenteeism, disability and turnover .

One key to improved health is exercise. Many of our cities have begun to promote active transportation - cycling, walking and transit - which involves walking at either end of every journey. However, even this is not enough if we spend our entire work day sitting down.

Design can help reduce sedentary behaviour. Activity can be encouraged with access to services and amenities such as gyms, bicycle storage and green space, some of which may be inside the office building or office grounds, or in the local vicinity. There is a complex relationship between the office worker and her or his co-workers, the tasks they carry out and the physical environment in which these take place. The way the interior of an office is configured has a profound impact on concentration, collaboration, confidentiality and creativity - and can therefore either enable or limit performance, the retention of existing employees, or the attraction of new ones.

The interior layout of workspaces requires considerable attention to maximize the benefits to both employees and employers. In this context, interior layout incorporates workstation density, task-based spaces, breakout spaces and social features, as well as providing opportunities for regular activity, such as sit-stand desks, treadmill desks, and open and attractive stairs. Opportunities and design responses will vary from one business sector or culture to another. Furthermore, design alone is not enough. To create a "workplace in motion" employers need to champion and promote physical activity in their workplace.

TELUS Garden **

Flexibility was at the forefront of the strategy to create an active workplace for the new TELUS headquarters in Vancouver's TELUS Garden development.

Active Design concepts were integrated throughout the nine-storey fit-out, including sit/stand workstations, shared treadmill stations and flexible spaces that could host small or large groups for a variety of physical activities. To foster different work styles, OMB provided fewer private offices, varied working spaces and many collaborative areas from formal meeting rooms and telepresence conference facilities to collaborative lounge and meeting spaces as well as spaces designed for impromptu collaborations such as touchdown workstations.

OMB EXPOSED THE HYBRID WOOD AND STEEL ROOF STRUCTURE IN THE UBC BOOKSTORE [3]. BIOPHILIC CONNECTIONS ARE APPARENT THROUGHOUT THE UBC BOOKSTORE [4]. OMB INTRODUCED A MEZZANINE TO PROVIDE A GATHERING SPACE IN THE UBC BOOKSTORE [5].



Outdoor terraces dedicated to TELUS staff include a large lunch area and a vegetable garden maintained by those who use it. A custom steel spiral staircase was also created as a dramatic design feature connecting the two top executive floors, encouraging an alternative to the elevator. A variety of workspaces, a well-considered layout and carefully controlled acoustics, support a balance of creative interaction, intimacy and quietude within a cohesive environment that is essential to a productive and satisfying workplace.

Lighting + Daylighting

Light is a 'zeitgeber' —an environmental cue that regulates our circadian rhythm, sometimes referred to as our biological clock. The unintended consequence of having light available to us 24-hours per day, is that such exposure can disturb our circadian rhythm.

Our circadian rhythm is influenced by the production of the hormone melatonin in the brain. Melatonin production is suppressed by bright, blue [morning] light, and stimulated by dim, red [evening] light - resulting in a natural rhythm of waking and sleeping.

This pattern can be disrupted by exposure to blue light - including computer screens, cell phones and some high efficiency artificial lighting. While this may not be a problem during the day, it can be disruptive and dangerous at night as it suppresses melatonin production at a time when it is needed by the body.

Suppression of melatonin has been linked to many health issues, including several types of cancer, diabetes, and obesity. In response to this concern, new products are being developed, including tunable LEDs that can be programmed to change colour, and AM and PM lighting, that are specifically designed to reduce the amount of blue light in the evening.

Numerous studies have demonstrated the benefits of natural light in building design. These benefits include improved productivity, performance and an enhanced sense of wellbeing. Designing for lots of natural light, without direct exposure to the sun is a way to reap the benefits of daylight while minimizing the effects of ultraviolet radiation. Natural light, even if not associated with views to nature, provides positive health outcomes both directly, through hormonal regulation [including melatonin and serotonin] and indirectly by elevating our mood and reducing stress, by supporting the synchronization of our circadian rhythms.

Even though all of these benefits are known, they are not always capitalized upon. According to data from the CaGBC, achieving 75% of daylighting for regularly occupied spaces is difficult, with only 7% of all CaGBC NC projects achieving the credit requirements for IEQc8.1, Daylight and Views. This makes it one of the least often achieved credits in LEED NC projects.

College of New Caledonia Trade buildings *

In 2011 OMB designed and built two Technical Education Centres for The College of New Caledonia. The building programs include workshops, classrooms, and laboratories for industrial trades such as welding, carpentry, plumbing, automotive and power engineering. Both buildings take advantage of solar orientation with central atria arranging workshop spaces to the north and classroom and staff areas overlooking south-facing gardens.

The architecture promotes natural ventilation and admits generous amounts of daylight throughout; continuous clerestory glazing naturally illuminates the long circulation spaces, classrooms each have a wall of full-height windows while the shops each have five-metre wide by four-metre high bi-fold doors allowing them to open up to external yards for outside teaching when weather permits, while also accommodating equipment and material deliveries. The shops also have large clerestory glazing either in polycarbonate or channel glazing and polycarbonate skylights to allow the natural daylight to penetrate year round while controlling the glare which was essential to the technical learning environments.

Aesthetics + Livability

The livability of buildings is essential for their longevity, which is a fundamental sustainable responsibility in an industry that is inherently wasteful and damaging to the environment. For spaces not to require renovation or replacement over time, they need to not only balance economic and environmental concerns, but must also be grounded in their place, promote physical and mental health and happiness, and address social and cultural concerns. Essentially, they must be loved by their occupants.

FEATURE STAIR CONNECTING FLOORS IN TELUS GARDEN [6]. DIVERSE AND UNIQUE WORKSPACES PROVIDE FLEXIBILITY IN TELUS' NEW HEADQUARTERS [7]. BOOKABLE TREADMILL STATIONS PROMOTING AN ACTIVE WORKPLACE IN TELUS GARDEN [8].

The potential impact of the aesthetics of a space on the mood and wellbeing of users is an area that needs more research. Many spaces accommodate a huge diversity of users, differentiated by their gender and age or their social and cultural influences. This makes this aspect of design very subjective, although some research studies are beginning to emerge. One example suggests that the use of wood not only provides sustainable benefits through its reduced carbon footprint, strength and durability; but it can also enhance user experience when left exposed to view.

The presence of wood “provides natural, inviting and calming environments and enhances acoustic properties”. The layout and organization of interior spaces can also have a profound effect on health and wellbeing, affecting levels of stress, concentration, privacy, interaction and productivity.

Fort McMurray Airport **

The Fort McMurray International Airport Terminal creates a meaningful portal for the Regional Municipality of Wood Buffalo in the northern reaches of Alberta. In this remote location, rapid industrial development and severely inflated construction costs mean that the ‘boom-town’ ethos prevails. Here, the most important priorities are cheap and fast, with quality and durability almost universally ignored. With the new terminal, OMB sought an alternate path, leveraging local constraints into architectural opportunities that celebrate the unique qualities of the place and the spirit of its people.

The design highlights several innovative sustainable approaches and has set a new standard of sustainability for the community. Most significantly, the building is distinguished by its early adoption and creative application of a mass timber construction system for the entire roof structure. OMB used cross laminated timber [CLT] as an expressive design element, demonstrating that mass timber construction can compete economically with steel and concrete solutions. Equally importantly, it confirms that exposed wood can create a warm and inspiring interior environment that contributes to community identity.

ACOUSTIC WOOD WALL SPANNING THE HOLDROOM IN THE NEW FORT MCMURRAY INTERNATIONAL AIRPORT [9 AND 10].

Wood defines the interiors, not only through the dramatic roof structure but also in a long acoustic wall that visually unifies the departures level.

With a focus on wellness, OMB aimed to reduce the often-stressful experience of travel through the terminal’s design. The spatial organization of the airport provides a sequence that lends itself to very efficient passenger flow and a reduction in visual clutter, thus fostering a feeling of wellbeing for travellers. Clear, intuitive wayfinding also helps alleviate stress. The interior spaces feature clear large-scale wayfinding graphics and use abundant natural light with views celebrating the sun, sky and horizon to help orient passengers in transition.

Conclusion

We need to raise the expectations for the places we live, work and play in by providing environments that promote the health, wellbeing and productivity of the occupants. With respect to Interior design, this applies to all aspects, from the more familiar quantitative considerations of natural daylighting and artificial lighting control, air quality, thermal comfort, and material selection to more progressive concepts such as the layout, aesthetics, and the integration of nature and ergonomics of the interiors.

These considerations are closely connected to more traditional green design strategies as choices such as material selection and lighting/daylighting have not only quantitative impacts but also influence a user’s experience of a space. Sustainable design is more than about reducing environmental impact; it must also foster a symbiotic relationship with the world we live in so both people and planet can flourish. ◀

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*This project was completed by omb’s predecessor firm **McFarlane | Green | Biggar Architecture + Design.**

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Designing Interior Environments that Support Human Health

By Kaitlyn Gillis and Michelle Biggar

Purpose of Article:

The article looks at how designers can create interior environments that promote human health, wellbeing and productivity of the occupants. The article talks the reader through the various aspects of interior design that impact human health and wellbeing, and introduces strategies that can help achieve a healthier indoor environment.

Learning Objectives:

1. Understand the impact the design of an interior environment can have on its occupants in terms of health, wellbeing and productivity.
2. Understand how human health and wellbeing is now an important and essential aspect of holistic sustainable design.
3. Understand the connection between environmentally-focused design strategies commonly seen in green building rating systems, and human health-focused interior design strategies.
4. Differentiate the various interior design strategies that can positively impact different aspects of human health and wellbeing.

Questions:

1. Of the three pillars of Sustainability, Social, Environmental, and Economic, "Sustainable Design" has always focused primarily on the "Social" aspect.
 - a. True
 - b. False
2. Which has been the primary metric for the last few decades when measuring occupant health?
 - a. Number of employee sick days used
 - b. Productivity
 - c. Happiness
 - d. Reported stress
3. Biophilic Design and the Biophilic Hypothesis suggest:
 - a. Humans should not work indoors
 - b. Humans should not work in cities
 - c. Humans need contact with nature
4. Living walls, natural building materials and forms, natural light and areas of prospect and refuge, are all examples of:
 - a. Healthy Design
 - b. Human Design
 - c. Responsible Design
 - d. Biophilic Design
5. How many hours a day do North Americans spend sitting down?
 - a. 16 Hours
 - b. 8 Hours
 - c. 13 Hours
 - d. 10 Hours

6. This activity has been dubbed “the new smoking” by many researchers and contributes to various illnesses, including heart disease, cancer, diabetes and obesity.

- a. Eating Fast Food
- b. Consuming alcohol
- c. Sitting

7. Interior layout and design is not enough to foster active employees. Employers must also:

- a. Promote physical activity in the workplace
- b. Provide all employees with standing or treadmill desks
- c. Mandate daily physical activity

8. Having light available to us 24-hours per day can impact our:

- a. Circadian rhythm
- b. Sleep cycle
- c. Melatonin production
- d. All of the above

9. Blue light _____ melatonin production:

- a. Suppresses
- b. Stimulates

10. Interior layout of spaces in a building has no effect on occupant health, it is only the introduction of windows, natural light, natural building materials and vegetation that impacts positive mental health.

- a. True
- b. False