

# 업무환경에서 바이오필릭 디자인 요소 적용에 관한 기초연구: 스트레스 감소이론 및 웰빌딩 인증을 받은 사례를 중심으로

## Primary Study on the Application of Biophilic Design Elements in Work place Environment: Focusing on Stress Reduction Theory and Well Building Certification

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**Abstract** As the cities developed, they lost green space; driving the extinction of nature experiences for urban communities and considering the amount of time spent by an individual within a built environment along with the workplace, it seems that humans are living in concrete jungles and this detachment from nature has impacted on the work and productivity levels in workplaces. This study was conducted to emphasize the importance of human connection with nature in a workplace and how connecting with nature through interior design considerations. As an active solution to bring the nature to the indoor spaces, WELL certification suggests “Access to nature” under the Mind category, which encouraged many designers to apply the biophilic design in interiors. This paper conducted case studies of WELL-certified office spaces and analyze their biophilic design features. As a basic theory to support this design solution in workplaces, this paper also introduced Roger Ulrich’s stress reduction theory. The result from this study would present the features of biophilic design applications in workplaces and envision the future directions of workplace to reduce the space users’ stress.

**Keywords** Roger Ulrich, Stress Reduction Theory, Biophilia, Workplace, Office environment.

### 1. Introduction

People often spend approximately 90% of their time indoors (Environmental Protection Agency, 2021), and with the rapid growth of the urban population and the decline in the availability of natural areas within the built environment. There has thus been a gap in the connection between humans and nature (Hähn et al., 2020). This connection is thought to be vital in promoting a healthy, high-performing, and efficient workplace environment (Nieuwenhuis et al., 2014). Evidence also confirms that incorporating sustainable, healthy, and pleasant biophilia in workplaces can encourage enhancements in human health, well-being, and performance (Haghlesan 2013; WGBC 2014). Availability

and proximity of the natural environment can encourage and have positive impacts on both the mental and physical health of the employee, even if the employee does not spend a great amount of time in the natural settings or outdoors (Kaplan, 1993).

The WELL Building Certification emphasizes this contact to nature in indoor spaces. It encourages bringing the natural elements to various interior spaces which includes workplaces. This type of consideration to bring nature to indoor spaces is recognized as biophilic design and there have been diverse attempts to implement biophilic design in offices through WELL-certified projects (IWBI, 2021).

This study was conducted to identify the features of biophilic design implemented in WELL-certified workplace projects and discuss its benefits in terms of stress reduction for the space users through a lens of

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the *stress reduction theory* established by Ulrich (1981). This research conducted case studies of WELL-certified projects and analyze their biophilic design features. The outcome of this research is expected to promote a better understanding of relations between workplace environments and the presence of biophilia as a resource for employee health.

## 2. Literature Review

### 2.1. Stress Reduction Theory

The theory of stress reduction by Roger Ulrich (1981) explains emotional and physiological reactions to natural spaces and also proposes that natural environments help in stress relief. As either being able to access a natural environment, without any threats, or even have a view of natural elements, such as greenery, plantation, or water, immediately triggers a positive emotional response, which involves reduced levels of negatively toned feelings and reductions in elevated physiological conditions (such as high heart rate or high blood pressure), (Wolf, Krueger, & Rozance. 2014).

It has also been observed that even with visual connection with nature has positive effects on various psychological and physiological states of well-being. For instance, views of nature induce higher aesthetic responses and more positive feelings of well-being than the views of non-natural environments (Chang & Chen, 2005). Nature also is important in encouraging feelings of attachment to particular places and types of environments (Kaplan, 1973; Ulrich, 1981).

Built environments such as cities, and urban areas with high levels of visual complexity, noise, intensity, and movement, can affect people negatively by producing stressful and fatiguing levels of physiological and psychological stimulation, and on the contrary natural environment tends to be lower in intensity and less perceptually chaotic than many urban environments, and therefore has comparatively positive, stress-reducing effects on people (Ulrich et al., 1991).

### 2.2. Benefits of Biophilic Design Elements in the Workplace Environment

Biophilic design is an approach to architecture that seeks to connect building occupants more closely to nature by incorporating elements like natural lighting and ventilation, natural landscape features, visual access

to the natural environment, indoor plants, and several other elements for creating a more productive and healthy built environment for people (Gloede, 2015).

Contact with nature is emphasized by biophilic design, which is a vital aspect considered by architects and designers while designing spaces, including office interiors (Freeman, 2018) According to Hatalaska (2017), the spaces enriched with elements of nature has become an integral part of the office buildings such as green terraces, roofs, and facades, indoor and outdoor gardens, as well as walls full of plants, do not only have a decorative function but has a positive effect on the human psyche, contributing to reducing stress and increasing employee job satisfaction.

Browning (2015) explains that contact with greenery and sunlight has a positive impact on employees' creativity, and it not only improves their well-being but also increases their productivity at work. Although plants help reduce air pollution, lower the level of noise and catch dust, researchers argue that biophilia means more than putting just plants in buildings, as it also means to design a space that allows the users to have connectivity with nature either in form of daylight and views through the windows or wooden floors (Heerwagen & Hase, 2001).

### 2.3. WELL Building Standard

The WELL Building Standards are administered by the International WELL Building Institute (IWBI), being focused on the effect of the environment to the individuals, both physiologically and psychologically (Garofalo, 2016). The WELL Building Standard is an evidence-based system for measuring, certifying, and monitoring the performance of building features that impact space users' health and well-being (Knox, 2015). The Standard sets performance requirements in seven concepts relevant to occupant health in the built environment - air, water, nourishment, light, fitness, comfort, and mind (Garofalo, 2016).

According to the International WELL Building Institute (2021), the biophilic design is a subcategory of feature called Mind, and it is labled as "Biophila I - Qualitative." Its intent is "to nurture the innate human-nature connection within the project." It is further divided into three sub-parts: (1) nature incorporation; (2) pattern incorporation; (3) nature interaction.

To enhance the nature incorporation, a biophilia plan

is developed that includes a description of how the project incorporates nature through the following: a. environmental elements. b. lighting. c. space layout.

The second item, pattern incorporation, indicates that a biophilia plan is developed that includes a description of how the project incorporates the nature's patterns throughout the design.

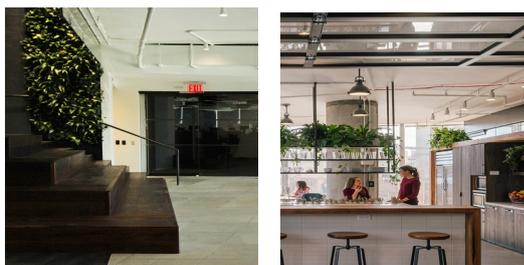
The third item, *nature interaction*, indicates that a biophilia plan is developed that provides sufficient opportunities for human-nature interactions: a. within the building. b. within the project boundary, external to the building.

### 3. Case Studies

#### 3.1. WELL-Certified Workplace 1

The first case study is about WELL platinum certified workplace, Delos Headquarter. The entrance of the office has an abundance of natural light and a sense of biophilia. The office is enclosed by large glass curtain walls and filled with an array of plant life. The main office area allows its space users to freely move to where they feel most comfortable. Each desk is adjustable and includes a temperature control-able task light. There are 22 green walls placed throughout the office, which are used to purify the air (Delos HQ | Living-Future.Org, n.d.).

As major biophilic design features, this project offers active green walls, natural light, and window views to nature. This case shows living walls, constructed from plants bring the outdoors in to improve productivity and remove contaminants from the air. In terms of natural light, this workplace provides bright light during daytime hours, which can promote productivity and alertness. Low glass partitions between desks ensure every employee has access daylight as well as to the views of the outdoors. <Figure 1-2> show these features.



<Figs. 1-2> Living walls and indoor plants  
(Source: <https://living-future.org/lbc/case-studies/23524/>)

#### 3.2. WELL-Certified Workplace 2

The second case study is about Edge Technologies Headquarters in Netherlands. All workplaces offer natural daylight through glass facades, glass atriums and biophilic design principles such as organic forms, texture, patterns, and rhythm are present all over the workplace, supporting good acoustics, interior planting, orientation to daylight, and unobstructed views alongside the facades and atrium edges (Morris, 2017).

To bring some nature to interior spaces, the building design considered the path of the sun. To bring more daylight, the North facades are highly transparent and use thicker glass to dampen noise from the motorway. Atrium façade is transparent. Office has a biophilic living room for studying and meditation, where one can relax and spend quiet time without any outside noise disturbance. Images in <Figure 3> shows these biophilic design features.



<Fig. 3> Edge Technologies Headquarters  
(Images Credit: Ronald Tilleman)

Additional case studies support these features to connect the natural elements to the workplaces. Many of them implement indoor plans, indoor gardens, window views to nature, and plenty windows to bring more daylight.

### 4. Conclusion and Discussion

Humans had evolved their lifestyles to reconnect with nature, as many previous studies suggest that this connection remains influential to human's mental and physical health, productivity, and well-being. That understanding has brought the concept of biophilia to the forefront when it comes to creating healthy built environments. WELL Building Certification prioritizes biophilic design that optimizes human wellness within a built environment and allowing architects, designers, and clients to shift their mindsets to provide more

contact to nature and create people-friendly buildings. Maximizing natural light in the workplace is not only beneficial for the employees but as well as in reducing energy bills. Indoor plants in the workplace are one of the simplest and most obvious solutions as it increases oxygen levels and subsequently improves concentration levels and decrease mental fatigue. This would eventually reduce space users' stress.

Indeed, the restorative qualities of nature can be replicated in the workplace through biophilic design through implementing indoor plants, providing access to natural light where possible, even including natural wood and stone finishes, color schemes inspired by nature, and more importantly providing the employees with a choice of work settings and a comfortable work environment.

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