

Analysing the Application of Healthy Space in Office Buildings—Taking the Changjiang Urban Design Institute Building as an Example

Cui Dingchen^{1,a,*}

¹Gold Mantis School of Architecture, Soochow University, Suzhou, Jiangsu, China

^a1577634298@qq.com

*Corresponding author

Abstract: In the context of fast-paced and high-development, the term "health" has been more and more widely mentioned in architectural design. The application of health space has an important role in promoting the development of architectural design, which can satisfy the complexity and diversity of contemporary people's needs for architecture, and is gradually changing the traditional single function of architecture and the user's spiritual needs for architecture. The article will take the health space design in the project of Changjiang Urban Design Institute as an example to analyse the design method of health space in office buildings, and compare the design method of health building with the green building design method to explore the direction of sustainable development of health space in the design of office buildings.

Keywords: healthy spaces; architectural design; healthy building design; office building design

1. Introduction

With China's rapid economic and social development and the accelerated pace of urbanisation, people's living standards have improved and their health awareness has gradually increased, resulting in a growing demand for office environments. Traditional office environments often focus only on basic office needs, while ignoring the physical and mental health of employees and environmental protection. Nowadays, in the pursuit of high efficiency and comfort, health, environmental protection, convenience, safety and other factors have become the main criteria for measuring the quality of the office environment. Therefore, the application of healthy space in office buildings has become a new development trend. This paper takes the Changjiang Urban Design Institute building as an example to discuss the application of healthy space in office buildings, with a view to providing reference for the design of future office buildings.

2. Spatial health in office buildings

2.1. Overview of the development of office building space

Office building refers to the organs, organisations and enterprises and institutions to handle administrative affairs and engage in various types of business activities of the building. Office buildings should be based on the nature of the use, construction scale and standards of different types of rooms^[1].

I would summarise the development of office buildings into three stages.

The first stage is the embryonic stage. The beginnings of office architecture originated in Western Europe in the Middle Ages (6th-15th century) in monastic Scriptorium Scriptorium: "a place for writing" is a place where monks concentrated on copying, writing, binding and decorating hand-copied books^[2]. It was a medieval centre for the transmission of writing and played an important role in the preservation and dissemination of knowledge. As a precursor to the modern office space, it concentrated the main forms of writing at that time. Subsequently, the changes in production methods brought about by the first industrial revolution (the 18th century) led to an increase in the size of businesses and the need to deal with large numbers of business documents and records, resulting in the emergence of specialised office space. Big Ben, the headquarters for the Royal Navy, and the

headquarters of the East India Company were among the earliest large modern office buildings, providing the necessary office facilities for multinational business. The East India Company, which housed thousands of people due to colonial needs, was in a poor environment, and Charles Lamb once mentioned in his diary that he had "long working hours - on Fridays, I am in the office from 10am to 11pm. But you don't know what it's like to be stuck in four walls day after day. How tiresome the wall air is."

The second stage is the foundation stage. For a hundred years from 1890, the office was seen by Western culture as "the archetypal site of modernism and instrumental rationality". With the modern new building movement, the third leap in architecture was made, and early exclusive office spaces emerged. Typical of this is Taylorism, a scientific management philosophy that emerged in the early 20th century, and which profoundly influenced the development of the modern office with its core idea of improving work efficiency through scientific analysis and standardised work processes. Offices built with this philosophy are called Taylorist offices. "In terms of work routines, the office worker is more similar to the factory worker.^[3]" This sentence also shows the disadvantages of Taylorism and its ideas. The office was dehumanised and over-mechanised like a factory. open plan offices appeared in the early mid-20th century, Frank Lloyd Wright's headquarters for the Johnson Wax company was regarded as an open plan office environment, and this headquarters building had a profound influence on the design concept of the modern office space, laying a solid foundation for its subsequent development. 1960s the Quick Draw building in Germany was designed by Frank Lloyd Wright, and it is now the first office in the world to be built. The concept of the office landscape was proposed by the German Quickborner Team in the 1960s. The concept of the office landscape was introduced by the Quickborner Team in Germany in the 1960s, which broke away from the bureaucratic rigidity of the original structure. Workspaces were designed according to internal communication and needs. The concept of the office landscape had a profound impact on the later open plan office. At the same time, the furniture company Herman Miller introduced the office furniture system The Action Office. The office furniture system The Action Office was based on a model similar to that of an assembly building, in which a set of furniture serves as a working cell. The first generation of this design was more humane and comfortable, but it was so expensive that the second generation was simplified in order to reduce costs, and to some extent became the prototype of the much criticised 'cubicle'. The second generation brought a new style of office, with vertical zones enclosed on three sides defining everyone's workspace and making people like animals in a zoo. As a result, by the end of the 1980s, there was a concentration of "high-rise syndrome" in developed Western countries. This led to a "shortage of skilled office workers" in the 1990s^[4,5]. Office buildings were gradually transformed.

The third stage is the development of office buildings and interior spaces. Office design is once again taking a 'flexible' turn. From Free Silicon Valley and other technology companies in the contemporary office space changes. With Agile working, Activity Based Working dynamic workplace proposed. Office buildings are not only used for office work, but also opened up more rest areas, dining areas and other spaces, the user does not have to be confined to a cubicle seat, but according to the current work to choose the appropriate space. On the basis of the open space and then the development of biophilic office is integrated into the natural elements of the office space, this kind of office allows people to feel the body and mind immersed in theThe natural environment helps to reduce work pressure and enhance physical and mental health. Sustainable and humanised; for example, introducing more natural light, creating indoor gardens with indoor greenery, using natural materials such as wood, bamboo and stone, natural ventilation, and maintaining the right temperature and humidity. This phase continues to this day.

2.2. Spatial characteristics of office buildings

The spatial characteristics of office buildings can be derived from the above developments are:

1) Concentration of large spaces:

The reason why it is necessary to concentrate the office building in a larger space: firstly, according to the development of office buildings, the influence of economic factors has always occupied a major position, centralised office can save the cost of the site, so that enterprises in the lease, decoration, maintenance and other aspects of the cost of a more centralised, easy to manage, so as to reduce the cost of business operations. Secondly, the office building from the beginning of the scribe room to the East India Company, the centralised layout allows people to communicate better to avoid mistakes, and the same large space also avoids the interference that affects the work. Centralised offices provide a more efficient working environment for efficiency-conscious workplaces. Colleagues work together,

which facilitates communication and collaboration, reduces communication costs and improves work efficiency.

2) Variability and adaptation:

With the development of the times and social change, office space also changes, from the beginning of a single copy function to the later composite function, and space from the beginning of a single space into the back of the composite space requires that the office building has the variability and adaptability. Firstly, with the rise of new types of work such as telecommuting and flexible work, office space needs to adapt to these changes. Through the design of variability, office space can be made more flexible to meet the needs of different ways of working. Secondly, at the same time, the office space also pays more attention to the humane design of the office space needs to be more flexible, comfortable office space; through the variability of the design, can better meet the individual needs of employees, improve their work efficiency and satisfaction. Third, improve space utilisation: through the design of variability and flexibility, office space can be more fully utilised. For example, the use of movable partition walls and furniture can be freely combined according to specific work tasks and team size, thus improving space utilisation and reducing waste.

3) Comfort and safety:

The medieval "zoo" and 20c80s "office building disease" and now the "white-collar disease" are elaborating that the office building should have its own unique comfort and safety. Firstly, it improves the efficiency and productivity of the staff: a comfortable office environment can make the staff more relaxed and in a better mood, thus improving the efficiency and productivity of the staff. Secondly, a comfortable office environment can provide protection for the physical and mental health of employees. An unfavourable office environment, such as poor air quality, unsuitable temperature, noise interference, etc., may lead to physical discomfort and psychological stress. A comfortable office environment can alleviate these discomforts. Thirdly, office buildings must be equipped with various safety facilities and measures, such as fire prevention, burglary prevention and disaster prevention, in order to protect the personal safety and work safety of employees.

4) A certain spirit of place:

The design of office space should not only focus on the psychology of environmental behaviour as described above, but also on the identity of the enterprise itself, reflecting its own spirit of place. There are two main functions of physical space in service industries such as offices, "one is to influence behaviour and the other is to create an image"^[6]. Research has shown that there is a positive correlation between the symbolic nature of office space and the cultural impact of the company, for example, well-designed and atmospheric office space has a more pronounced effect on outsiders, and also promotes unity within the office, e.g. government offices use uniform symbols, such as red slogans, to enhance cohesion and create a spirit of place.

Office buildings, as representative buildings of modern city beautification, are an important part of the composition of modern buildings and play a vital role in urban construction^[7].

2.3. Emerging health issues in development

China's office buildings and their space has made great progress in recent years, the early days of reform and opening up or to hire foreign designers to design, passive acceptance of their ideas did not cut from the field of office buildings in our country need to consider. And now we can also build their own applicable, economic, beautiful office buildings, but which with the accelerated process of modernisation, the demand for enhancement, in the face of the situation of more people and less land, China's office buildings in the development of a number of health problems, such as:

1) Lack of consideration for humanisation:

In order to have a high volume, office buildings are generally tower-type and have low standard floor heights, lacking natural lighting and ventilation and requiring mechanical lighting and ventilation, and the lack of sunlight all day and the low floor heights are prone to office diseases. The interior landscape of the office is scarce; there is a lack of interpersonal space; the ratio of male and female toilets is unbalanced; and there is a lack of humanised rooms. At the same time, the irrational vertical traffic arrangement leads to long waiting time for lifts and low usage rate of stairs, which easily affects the work efficiency as well as the physical and mental health of people. The "people-centred" design was not considered from an economic point of view.

2) Insufficient sustainability:

The use and operation of office buildings entails significant energy consumption. In terms of building facades, most office buildings use curtain walls as facades, which are prone to light pollution. The majority of office buildings have a large window-to-ground ratio, which does not pay attention to local realities and leads to the impairment of thermal insulation and other properties. The choice of materials and equipment is based on economic considerations, while environmental protection is a secondary consideration, which has a great impact on air and human health and also affects the sustainability of the building; artificial light is overly relied upon, and clean energy such as solar energy is not utilised. Conventional office buildings are not only not ecologically sustainable, but also not sustainable enough for the working environment of the office workers.

3) Poor spatial layout:

Each department plans its own layout without overall planning, leading to duplication of certain functions and confusion in building functions. Sometimes the pursuit of functional self-improvement leads to a waste of resources. The layout of certain office buildings is also unreasonable, interfering with each other, people walking in an orderly manner and interspersed with meandering, resulting in poor privacy, easy to produce noise interference with work efficiency and the physical and mental health of the staff. For example, the meeting room of Shanghai Pan City Design is under the office lounge, which has a certain impact on the staff moving around and resting during the meeting.

4) Single function and configuration of building space:

There is a lack of green space for sports, such as basketball courts, and there is no provision for healthy living. There is a lack of space for humanisation, communication and interaction in the building, and the third space is not used. Fitness space, rest and breastfeeding space are seldom taken into consideration. Work pressure and mental health problems cannot be released and solved. Office supplies, desks, chairs and other traditional office facilities are not equipped with intelligent and humanised features.

2.4. The relationship between health and space

Space is closely related to human health. As Tadao Ando said, "Architecture should be a space where people can be spiritually enriched and empowered"^[8]. The most important part of a building is the space, which affects the user's body and mind in terms of height, scale, shape, size and function. According to the research of Jinpan.com, the height of the space has a significant impact on human health by affecting both indoor air quality and the feeling of thermal comfort of human beings; a pilot study in a warm area of China showed that the test subjects felt more pronounced carbon dioxide inside the rooms with a net height of 2.4m, 2.5m and 2.6m, and most of them responded to the presence of bad odour in the room, which was significantly higher than that of the test subjects in the rooms with a net height of 2.8m and 3m. The majority of the respondents in the 2.8m and 3m clear height rooms responded to bad odour, which was significantly higher than the respondents in the 2.8m and 3m rooms^[9]. The scale of the space also has a greater impact on human health, with long, narrow and high spaces feeling oppressive, as shown in medieval Gothic churches, while open and wide spaces are more relaxing.

3. Creating a "healthy" Cheung Kong Urban Design Institute building

3.1. Site planning and graphic design

The site is flat and the surrounding area is easily accessible for people travelling to work. The design of the site includes not only green areas but also communication areas and sports areas. The design of the communication space meets the diversified needs of the people and is also in line with the concept of multi-purpose third space, so that the flexibility of space can be applied. Diversified sports options, the use of levied green space to set up a number of outdoor sports venues and walking paths, and the installation of basketball courts, etc., to advocate the fitness of all people. Artistic sculptures are arranged in the site to promote corporate culture through sculptures, and their formal beauty and expressive power stimulate people's emotional response and bring them aesthetic pleasure and enjoyment at the same time.

The graphic design focuses on the creation of diverse, humane and personalised spaces. It includes

the optimisation of office space and traffic system, indoor fitness space and variable multi-purpose halls, humanistic space, multi-level indoor greenery, etc. to reflect the application of healthy space.

Optimisation of office space is achieved by optimising the layout for noise reduction: breaking the tradition of setting the core in the middle and moving the core to the north side where ventilation and lighting are the most unfavourable, which improves the efficiency of space use and is economically and environmentally friendly, and saves 80 tonnes of steel; reducing the impact of noise on the office area, by concentrating the noise sources and reducing them through the tube wells, stairwells and aisles; and motivating employees to use the stairs, by making stairwells visible before lift rooms, which helps to advocate the use of stairs. This layout makes the stairwells visible before the lift rooms, which is conducive to advocating the use of stairs by employees. According to the layout of the traffic system is also optimised, the concept of vitality design is integrated into the design and layout of the internal traffic system of the building^[10], and the opportunity to exercise is integrated into daily life, and public communication areas and leisure coffee areas are set up in the walking flow line of each floor not exceeding 100m, which advocate employees to leave their workstations to carry out activities to avoid being sedentary. The design of the walking corridor combines vertical greenery, landscape pictures, pictures of company activities and other design elements to create a humanistic corridor design that is close to nature, allowing employees to immerse themselves in the natural vision and humanistic scenery, promoting positive emotions and relieving work pressure.

The design is not only improved in terms of functional layout, but also focuses on creating a healthy space from the details, such as setting up a cosy mother and baby room and sleep pods in the units, which also provide mattresses and charging facilities, so that the staff can feel the humanistic care and at the same time have the effect of psychological adjustment. Bright reading spaces are provided through the use of intelligent modular skylights on the top floor, and the intelligent switching of skylights and sunshade systems to provide bright reading spaces while allowing the building to breathe with the seasons. The carpeted floor reduces noise, and the warm yellow light provides spiritual warmth and eye care.

3.2. Application of health-specific technologies

To ensure healthy air quality the design features a highly efficient de-haze fresh air system PM. The fresh air system is equipped with linkage control, Schedule control, manual control and other modes are applicable to a variety of operation and maintenance scenarios, and the filtration efficiency reaches more than 90%. It is also equipped with a perfect air quality monitoring and distribution system. 93 all-in-one air quality sensors are set up in the building to monitor temperature and humidity, PM25, PM10, CO, and TVOC to obtain information, and then real-time information is released on the big screen to let the staff grasp the air status in the building at all times.

4. How healthy building concepts are used in office space design

4.1. Thinking in terms of master planning

In the overall planning and design of office space, the physical and mental health of employees and environmental protection should be fully considered. For example, the proportion and distribution of office areas and rest areas can be reasonably planned; the proportion of natural lighting and artificial lighting can be reasonably arranged; at the same time, the installation of green areas or green spaces such as rooftop gardens can also be considered to improve the quality of the office environment.

Harmonious symbiosis between the building and the surrounding environment should be considered in the master plan design. Reasonable layout of buildings, roads, greenery and public facilities should be used to create a pleasant office environment that gives people both material and spiritual needs, and at the same time, the reliance on artificial lighting and mechanical ventilation should be reduced, and emphasis should be placed on natural lighting and ventilation design.

4.2. Thinking about the functional layout of office space

The functional layout of the office space also needs to consider the physical and mental health of employees and environmental protection. For example, reasonable setup of rest area, fitness area, pantry and other public space, to provide employees with a comfortable rest and communication place, to facilitate employees to rest and relaxation; at the same time, you can also set up a number of fitness

facilities or sports venues to encourage employees to do physical exercise and so on. The design can also improve indoor air quality and noise control by changing the functional layout and plan partition.

4.3. Thinking in terms of composite spatial configurations

In the office space composite space configuration also need to consider the physical and mental health of employees and environmental protection. At the same time, you can also set up some cultural display areas or artistic decorations to enhance the cultural atmosphere of enterprises and employees' sense of belonging. Reasonable configuration of composite space can also increase the fun and flexibility of office space. For example, multi-functional conference rooms, open office areas and other types of workspace can be set up in the office space to meet the different needs of employees and improve work efficiency.

4.4. Reflections on the application of relevant physical technologies

In the design of office space, it is also necessary to consider the impact of the application of physical technology on the physical and mental health of employees. Through the introduction of intelligent control systems or energy-saving and environmental protection technologies to improve the comfort of the office environment and energy efficiency; at the same time, you can also set up some intelligent facilities such as air purification equipment to improve the quality of indoor air and other strategies to improve employee satisfaction.

5. Conclusion

Today, healthy space in office buildings is getting more and more attention from the architectural world, and healthy buildings have also made great development. In this context, architects should better integrate healthy space into office buildings and continuously improve the efficiency and quality of architectural design. Design activities are inseparable from you, me and him; they cannot be separated from culture; they cannot get rid of the social system; and they also need to keep up with the times.

Therefore, the concept of healthy building in office space design should be widely used and promoted, and actively improve and innovate to make it more in line with the needs of users, to benefit more users not only to improve the quality of their work and life is also conducive to the comprehensive social benefits, and further promote the sustainable development of the society, so that human beings can enjoy the results of the development of the construction of the same time to enjoy the green health of the office environment.

References

- [1] *Architectural Design Sourcebook (3rd ed.)* [J]. *Architecture*, 2019(18):41.
- [2] Cheng, Delin. *Knowledge Diffusion in Late Medieval Western Europe* [D]. *Capital Normal University*, 2003.
- [3] Lee Galloway. *Office Management: Its Principles and Practice* [J]. *New York: The Ronald press company*, 1919. p75.
- [4] David Tong and Adrian Leaman. *Sick Building Syndrome: Strategies and Tactics for Managers* [J]. *Facilities*, 1993, 11(4): pp19-23.
- [5] Jeremy Myerson. *After Modernism: The Contemporary Office*. McKellar S, Sparke Peds. *Interior Design and Identity* [J]. *Manchester and New York: Manchester University Press*, 2004, p 193.
- [6] Mary Jo Bitner. *Servicescapes: the Impact of Physical Surroundings on Customers and Employees* [J]. *Journal of Marketing*. 1992. 56 (2): p57.
- [7] Wang Ying. *Discussion on the main points of an office building design based on examples* [J]. *Urban Construction Theory Research (Electronic Edition)*, 2023, (26): 68-70.
- [8] Tadao Ando. *Tadao Ando on architecture* [M]. *Tianjin: Tianjin University Press*, 2003.56-78.
- [9] Xiang Bingren. *Characteristics and Problems of New Office Buildings in China in Recent Years* [J]. *Urban Architecture*, 2008(08):7-8.
- [10] *Surfing News City Hall*. *Vibrant urban design (7) How buildings make people exercise more: stairs* [EB /OL]. (2022-07-05).