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Healthy Workplaces: The Impact of Building Design on Health, Productivity, and Social Well-being of an Occupant

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***Abstract*— At present, the majority of individuals in developing countries, including India, are employed in the service industry, which necessitates spending a significant amount of time in built environments. With a high proportion of India's workforce working in the informal sector, it is critical to create a comfortable and healthy environment. This is because a healthy workplace and healthy employees are believed to increase a company's profits. Many countries have established design guidelines to improve building functionality and promote green buildings, which have been found to increase occupant efficiency. Thus, a connection between the building and its inhabitants has been established, and the Green Rating Building System has been implemented to improve building standards by regulating parameters. The Sustainable Development Goals (SDGs) have also been developed to ensure healthy living and promote well-being for all ages. Several studies have shown that a good physical environment has a positive impact on health and well-being, and the World Bank has emphasized the need for public health and other public sector reforms in India to achieve sustained economic growth. In addition, the Indian government has acknowledged the link between worker health and safety, increased production, economic growth, and social progress. Therefore, this paper investigates how the built environment affects individuals using a literature review and a case study as methodology.**

***Index Terms*—About four key words or phrases in alphabetical order, separated by commas.**

I. Introduction

The majority of people living in urban areas around the world work in offices and spend the majority of their time indoors [1]. Research suggests that creating sustainable, healthy, and aesthetically pleasing workplaces can lead to improvements in worker performance. When workplaces are designed responsibly, taking into account the needs of the people who use them, this benefits society as a whole by increasing the quality and quantity of work produced. There are various parameters that are used to measure workplace performance, including both objective and subjective components, and the standard of a person's surroundings can impact these parameters directly or indirectly. Gawande [2] argues that Green Building design principles and technological advancements can be used to improve the indoor work environment.

The LEED certification system [3], for example, includes a criterion for Indoor Environmental Quality (IEQ), which accounts for 16 out of 110 total points. By using these methods and technologies, indoor environments can be designed to support the comfort and productivity of their occupants [4]. One study found a strong association between low IEQ and poor workplace performance, highlighting the importance of considering IEQ during both the preliminary design stage and the employment stage[5] . Other factors besides vegetation, such as poor indoor air quality, noise, and distractions, have been shown to have negative effects on worker health and well-being, while environmentally conscious building design can promote healthy workplaces. A review of literature on the relationship between office interiors and employee health and well-being found evidence of a positive relationship [6], although many studies were limited to specific areas and focused on physical, psychological, and social well-being.

This paper aims to investigate the impact of all building design parameters on IEQ and indoor air quality (IAQ), which ultimately affect the health, well-being, and productivity of building occupants.

II. Methodology

This study consists of two parts: a literature review that examines previous research and evaluation systems, and case studies. For the literature review, relevant research papers published from 2013 to 2022 were selected and analyzed, with a focus on three main elements: physical parameters related to building and interior design, indoor environmental quality (IEQ) and indoor air quality (IAQ), and human perception. All parameters associated with these components were examined and enumerated based on previous studies. The Green Building Rating System includes specific IEQ criteria that are given a certain weighting in the overall rating system. The office building was also analyzed, including IEQ and measures to improve occupant health and well-being. The findings suggest that improving IEQ and IAQ in the workplace is essential.

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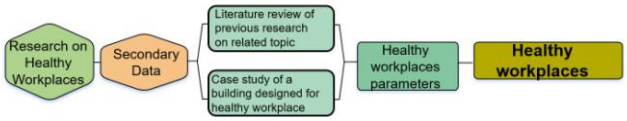

Figure 1: Research Methodology on Healthy Workplace

III. CONCEPT OF A HEALTHY ENVIRONMENT

The World Health Organization (WHO) defines health as not only the absence of illness or infirmity but also the state of complete physical, mental, and social well-being. Consequently, a healthy workplace is one that not only prevents negative effects on employees' health and well-being but also fosters their physical, mental, and social welfare. To examine how the physical environment can improve health and well-being, various concepts are utilized and can be classified into positive and negative impacts, including:

Positive	Negative
Healthy office	Sick building syndrome
Healing Office	Toxic workplaces
Healing Architecture	
Salutogenic Design	
Biophilic	

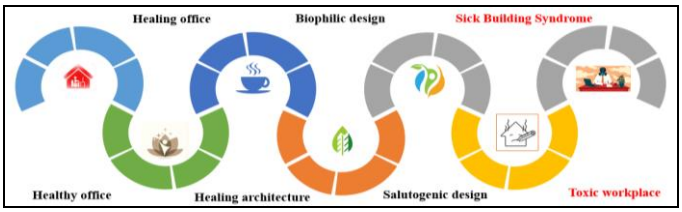

Figure 2: Concept of Healthy Environment

A. *Healthy Office*

A healthy office encompasses both environmental as well as mental comfort. Comfortable environmental comprises comfortable room temperature, relative humidity (RH), ventilation, and healthy lighting (daylight, correct illumination from artificial light, and their controls). Mental comfort includes nature (e.g., by potted plants and flowers and views on nature) and promoting healthy choices (e.g., by supplying a healthy diet, supporting mental balance by providing areas for meditation, yoga, naps, and chair massages, and "active workspaces" that encourage physical exercise) [7].

B. *Healing Office*

The ten qualities of a healing office are diversity (both functional and a good balance of complexity, mystery, coherence, and legibility), connectedness, daylight, contact with nature, sense of ownership of the workplace (including personal control), sustainability, physical activity, and opportunities to re-energize and recover [8] .

Figure 3: Design of an office on the concept of Healthy office, healing office and healing Architecture

C. *Healing Architecture*

'Healing Architecture' is defined as a sense of a continuous process; of creating an environment that is physically healthy and psychologically appropriate [9]. It is utilized in the healthcare industry to highlight the therapeutic benefits of daylight, plants, an ideal indoor climate, and a view of the outside (preferably of nature).

D. *Biophilic Design*

Biophilia is a love of nature and the innate emotional bond between humans and other living things [10]. Biophilic design focuses on strengthening the bond through natural light, views of nature, pictures of nature, plants, water, natural materials, textures, and patterns [11].

Figure 4: Biophilic Design

E. *Salutogenic Design*

Salutogenesis: the theory that binds health and design. The salutogenic design aims to produce a stimulating environment that fosters pleasure, creativity, contentment, and enjoyment [12].

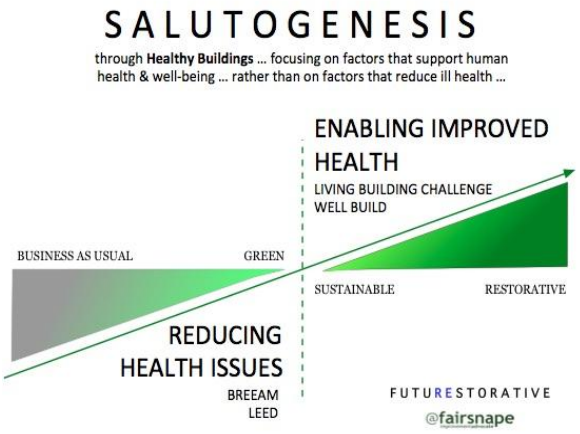

*Figure 5:*Salutogenesis Design Process

F. Sick Building Syndrome

Sick Building Syndrome is a term used to describe unhealthy indoor air quality and other elements that lead to symptoms of disease in the mucous membranes (such as the eyes, nose, and throat), dry skin, headaches, and fatigue [13].

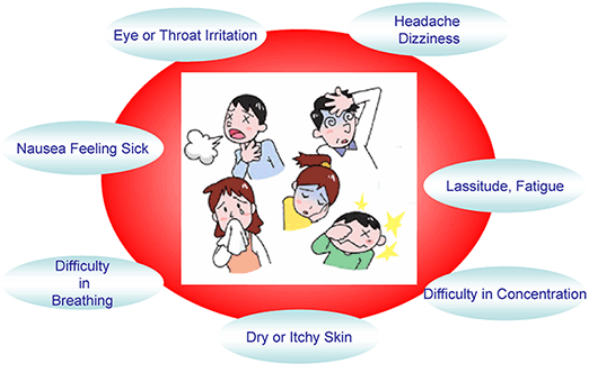

*Figure 6:*Sick Building Syndrome Symptoms

G. Toxic workplaces

Toxic workplaces have a negative, unpleasant, and diminished impact on employees' performance [14][15].

*Figure 7:*Signs of Toxic Workplace

IV. Literature Review

With the rise of airborne diseases and COVID-19, we are becoming more aware of the impact of the physical environment on people's health and well-being. The growing interest in healthy workplaces is also reflected in research and practice. To understand the impact of physical parameters on her IAQ/IEQ at work, recent studies on healthy workplaces were reviewed. Their results were then analyzed for human perception in the form of health and productivity.

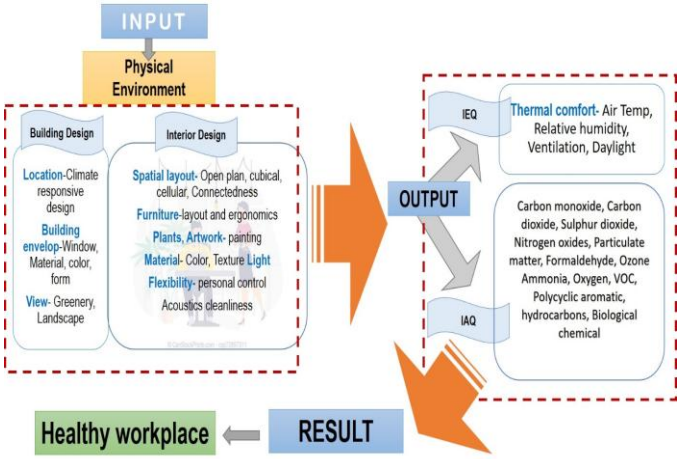

Figure 8: Physical Parameters considered for IEQ/IAQ

V. Benefits of Healthy Workplace

Following are the benefits of Healthy Workplaces: -

- Individual benefits - better health and well-being, Better Quality of Life
- Benefits for the organization -Healthier employees, less sick leave
- Societal benefits- Less labor market dropouts, Lower health care costs
- Added Benefits-
    - Employee satisfaction
    - Organizational culture
    - Image
    - Productivity
    - Adaptability
    - Innovation and creativity
    - Costs
    - Value of assets

-Corporate Social Responsibility

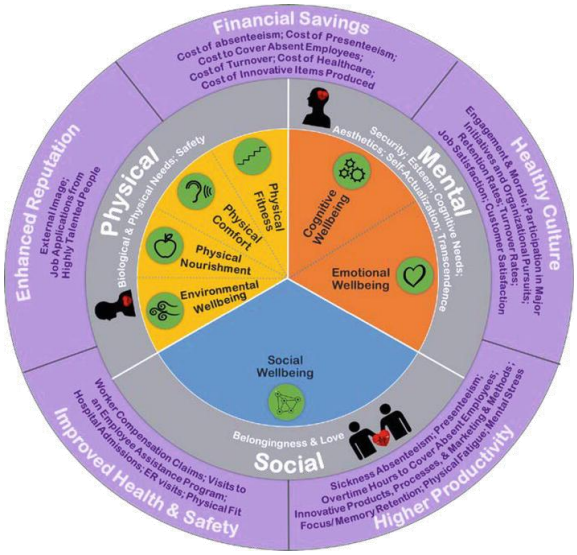

Figure 9: Benefits of a Healthy Workplace

VI. Building Design its Impact on IAQ

Kamaruzzaman's [16] research indicates that a building's size, location of vents, aspect ratio, distance to neighboring structures, quality of building materials, and exterior finish affect its heat exposure. These factors also impact energy consumption and indoor air quality, with exhaust fans being a cost-effective way to increase thermal comfort [16]. Additionally, Reda [17] recommend using both natural ventilation and fans to improve indoor air quality and thermal comfort.

Architectural features of interior spaces can significantly impact workplace occupants, with case studies demonstrating positive relationships between the physical environment and work productivity, social connectivity, physical health, and mental well-being [18]. Prioritizing occupant well-being in the workplace is important because the physical, attitude, social, and demographic components of a building all impact occupants. Recent cross-sectional study data from six countries highlights the interconnectedness of these factors and their impact on occupant health and productivity [19]. The appearance of the office environment also influences occupant comfort and satisfaction, with a good office layout including aesthetic elements that support organizational ideals and impress employees.

A. Windows

Windows have been found to have a positive impact on well-being in the workplace by providing access to natural views and natural light. Early studies in hospitals have shown a link between windows and improved patient outcomes, and Bill's case study on offices also demonstrates that windows have positive effects on discomfort, stress, productivity, job satisfaction, and overall well-being. Although many of these studies relied on self-reported data, more recent research has shown how factors such as window size and configuration can impact individual measures of room satisfaction and emotional response, as well as reduce self-reported unpleasant arousals. Douglas et al. [18] found that windows can have a significant impact on stress levels, and highlight the importance of considering window placement and design in workplace environments to promote well-being.

B. Outdoor View

According to Garg [5], the presence of vegetation and natural surroundings in office buildings has a significant impact on occupant comfort. According to Hahn [4], employees working in office buildings can experience discomfort depending on the orientation of the walls. According to Soderlund [11], open-plan offices have better visibility and greater visual clarity, reducing discomfort for building residents. Additionally, subjective factors such as landscape, position, and orientation can affect appearance quality [20].

*Figure 10:*Outside view from office

VII. Interior Design & its Impact on IAQ

Workplace aesthetics have been shown to have a significant impact on occupant satisfaction with indoor environments[20].

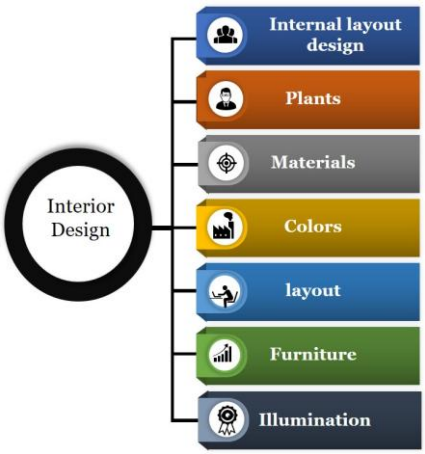

*Figure 11:*Components of Interior Design

A. Internal layout/ design

Beyond the IEQ, research has explored how satisfaction with facilities, workplace design, and office layout influences well-being[18].

B. Plants

Studies have shown that certain biocompatible ingredients, such as plants and green walls, promote well-being while reducing negative emotions, reducing state anxiety, enhancing creativity, and improving cognitive function[18].

C. Materials

It was also discovered that wood use affected physiological responses, emotional states, and cognitive functions of residents through visual exposure in real life and virtual reality, as well as other senses such as touch and smell. Most relevant to our study, study participants reported lower levels of intrasubject stress, as measured by salivary cortisol levels, in rooms with wooden furniture than in rooms with artificial furniture. That is what I did. Natural materials dramatically reduced physiological and self-reported measures of acute stress responses in participants [18].

D. Colors

Numerous studies have investigated the relationship between office wall color layouts and occupant productivity by having participants perform tasks in test rooms with different color schemes. Some authors have contrasted detail-oriented tasks with creative tasks to determine the optimal colors for improving cognitive performance [6]. Experimental methods typically involve surveys to assess people's preferences and attitudes towards interior design.

The "hue heat hypothesis" suggests that an object's color affects how hot it appears to the human eye, with colors closer to the red end of the spectrum feeling warmer and colors closer to the blue end feeling cooler. Recent research has revisited this theory and found that the use of warm and cool colors indoors (via furniture, wall, or lighting color temperature) can improve occupant perception of heat compared to actual heat conditions, potentially leading to energy savings. However, this study is still in its early stages and its results have been inconsistent and contradictory [19].

E. Layout

An office's physical arrangement and layout are referred to as its "layout" [21]. Activity-based working (ABW) setups are considered more desirable than open-plan or enclosed offices [22][23]. Working in an open workspace with six or more people, without a designated workspace for concentration as provided in an ABW environment, has been found to have a negative association with well-being [6].

Various environmental factors, such as office type (e.g., cell office, flexible office, open plan office), telecommuting, office layout, desk location, architecture, comfort (e.g., air quality, lighting, temperature, humidity, noise, acoustics), window size and access, levels of carbon dioxide and monoxide, presence of plants, and workspace privacy (versus open space) all have an impact on creating healthy workspaces. As a result, there are numerous independent factors to consider.

F. Furniture

The papers that were reviewed assessed the health benefits of two types of furniture: ergonomic furniture that is designed to fit the user's body or promote different working postures to reduce discomfort and activating furniture that aims to encourage physical activity or reduce sitting time. Ergonomic chairs that are adjustable can reduce discomfort, but this may not solely be due to the furniture itself as it is often accompanied by ergonomics training. Smart chairs that provide tactile feedback have not been effective in decreasing discomfort or improving physical health. Activating furniture such as sit-stand workstations and bike desks have had mixed results on physical health parameters, but have led to beneficial changes in blood pressure and blood glucose level. However, the results regarding musculoskeletal or visual comfort using this furniture have been mixed, with positive, negative, and no relationship found in various studies. The impact of the furniture intervention on health was measured through changes in anthropometrics, physiological parameters, or self-reported health, but psychological or social well-being was not addressed in most studies [21].

G. Illumination

The quantity and quality of light in an office space depend on how much light reflects off surfaces such as windows, translucent materials, and shiny surfaces. Studies have shown that adequate levels and quality of light can improve mood and physical health, but it doesn't necessarily improve alertness [22][23][24]. Getting more natural sunlight can improve the quality of sleep and reduce absenteeism due to illness [25], as well as increase organizational support [26]. However, dynamic lighting, such as changes in color temperature or the ratio of direct to indirect light, has not been found to affect health. Bjornstad [27] recommends incorporating more natural light into workspaces for better health outcomes.

H. Greenery

Research has shown that interaction with nature, such as exposure to plants, has a positive impact on humans and can aid in patient recovery. Studies on this topic in the office setting focus on green views, which can be either real or artificial [27][28][29]. Both types of green views have been found to have positive effects on health, with actual office plants having beneficial effects on health based on field studies [30][31]. Additionally, studies have shown that observing nature outdoors can have positive effects on health, while nature posters have been shown to be beneficial in laboratory studies [32]. However, viewing nature on plasma screens does not have the same effect [30]. Overall, there is little evidence to suggest that office greenery is harmful and not beneficial to health

I. Thermal Comfort

Comfort is subjective and influenced by factors such as individual metabolism, wardrobe preferences, activity patterns, and indoor climate [33]. Thermal comfort in tropical climates is achieved by reducing temperatures and improving natural ventilation. Ideal temperature and humidity levels

affect both health and comfort, with humidity levels below 70% recommended to avoid promoting mites, corrosion, and mold [34].

Activity-based work has advantages in engagement, communication, time and space control, and job satisfaction, but disadvantages in privacy and focus. The impact of sit-stand desks on office workers' health and behavior has been evaluated, with successful behavior modification but small health impacts. Workplace stress is correlated with absentee costs, disability costs, work-related injuries, and turnover costs [17].

Providing a healthy workplace is important for employee satisfaction, productivity, and financial benefits. Green buildings offer benefits in mitigating climate change, creating sustainable communities, and promoting economic development. They also have positive social impacts on the health and well-being of people working in these environments. However, it can be difficult to identify causal relationships between a healthy work environment and health-related value dimensions due to interrelated variables [35].

VIII. AQI & ITS EFFECT

There is limited research on how different indoor climate elements interact and how specific satisfaction criteria impact overall worker satisfaction. Studies have shown that occupants of naturally ventilated or passively cooled buildings have subjective preferences that do not correspond to indoor temperature limits but rather temperature ranges that depend on outdoor temperatures. However, residents of green buildings report feeling mentally better [36]. It is crucial to find the right balance between economic success, social awareness, and environmental responsibility for sustainable development. The built environment can strongly influence building occupant psychology, job satisfaction, and productivity [37].

In Hungary, ministerial decrees regulate comfort standards for office spaces, which comply with EU policies. These regulations include requirements for office lighting, workplace air quality, maximum airspeed, ambient temperature, and sound pressure levels. Studies have found that job satisfaction is positively correlated with perceived personal control and that individuals with more control over their external environment tend to be happier in their workplaces [38].

IX. IMPACT OF IAQ ON HEALTH AND PRODUCTIVITY

Considering people-centric factors, such as employee perceptions, is important when creating performance measures. It is also true that sustainable building techniques can help create healthier buildings, which in turn can lead to increased productivity and happier employees. Research is needed to better understand building user perceptions of indoor comfort and sustainable structures.

Measuring the economic benefits of health promotion initiatives is also important, and the 12 value parameters you mentioned are a good starting point. Systematic interventions such as exercise programs, healthy eating, weight management, hygiene, pet-friendly workplaces, burnout prevention, health codes, and bullying and violence prevention can all contribute to a healthier workplace.

It is important to remember that creating a healthy workplace is not just beneficial for employees, but it can also have a positive impact on the organization as a whole, including increased productivity and reduced healthcare costs.

Table 1: Common Indoor Pollutants and their Effects

POLLUTANTS	**SOURCES**	**HEALTH IMPACTS**
PM	Outdoor environment, cooking, combustion activities (burning of candles, use of fireplaces and chimneys, cigarette smoking), cleaning activities	Premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, increased respiratory symptoms
VOCs	Paints, stains, varnishes, solvents, pesticides, adhesives, wood preservatives, waxes, polishes, cleansers, lubricants, sealants, dyes, air fresheners, fuels, plastics, copy-machines, printers, tobacco products, perfumes, dry- cleaned clothing, building materials, and furnishings	• Eye, nose and throat irritation • Headaches, loss of coordination and nausea • Damage to liver, kidney and central nervous system • Some organics can cause cancer
NO_2	Gas-fueled cooking and heating appliances	• Enhanced asthmatic reactions, • Respiratory damage leading to respiratory symptoms
O_3	Outdoor sources, photocopying, air purifying, disinfecting devices	DNA damage, lung damage, asthma, decreased respiratory functions
SO_2	Cooking stoves, fireplaces, outdoor air	• Impairment of respiratory function • Asthma, chronic obstructive pulmonary disease (COPD) and cardiovascular diseases
COX	Cooking stoves, tobacco smoking, fireplaces, generators and other gasoline	Fatigue, chest pain, impaired vision, reduced brain function

	powered equipment, outdoor air	
HEAVY METALS	Pb, Cd, Zn, Cu, Cr, As, Ni, Hg, Mn, Fe Outdoor sources, fuel- consumption products, incense burning, smoking, and building materials	• Cancers, brain damage • Mutagenic and carcinogenic effects: respiratory illness, cardiovascular deaths
AEROSOLS	Tobacco smoke, building materials, consumer products, incense burning, cleaning and cooking	Cardiovascular diseases, respiratory diseases, allergies, lung cancer, irritation, and discomfort
RADON(Rn)	Soil gas, building materials, and tap water Outdoor air	Lung cancer
PESTICIDES	• Termiticides, insecticides, rodenticides, fungicides, disinfectants, and herbicides • Building material: carpet, textiles, and cushioned furniture • Outdoor environment	Irritation to eye, nose, and throat; Damage to central nervous system and kidney; increased risk of cancer
BIOLOGICAL ALLERGENS	House dust, pets, cockroaches, mold/dampness, pollens originating from animals, insects, mites, and plants	Asthma and allergies Respiratory infections, sensitization, respiratory allergic diseases and wheezing
MICROORGANISM	Bacteria, viruses, and fungi are carried by people, animals, and soil and plants	Fever, digestive problems, infectious diseases, chronic respiratory illness

Source: [39][40]

Table 2: Indoor air quality guidelines for major indoor air pollutants

Indoor air quality guidelines for major indoor air pollutants			
Pollutants	Concentration levels (mg/m3)	Exposure time	Organization
CO	100	15 min	WHO
	60	30 min	
	30	1h	
	10	8 h	
	29	1h	USEPA
	10	8h	
CO2	1800	1H	WHO
NO_2	0.4	1H	WHO
	0.15	24H	
	0.1	1 Year	USEPA
PM	0.15	24H	USEPA
	0.05	1 YEAR	
O_3	0.15-0.2	1H	WHO
	0.1-0.12	8H	
	0.235	1H	USEPA
SO_2	0.5	10 Min	WHO
	0.35	1H	
	0.365	24H	USEPA
	0.08	1 Year	
Pb	0.0005-0.001	1 Year	WHO
	0.0015	3 MONTHS	USEPA
Xylene	8	24h	WHO
Formaldehyde	0.1	30 min	WHO
Radon	100Bg/m3	1 year	WHO

Source: [41][40][42]

Figure 12: Impact of Unhealthy Building

X. Indian Context

India has taken steps to improve the protection of workers through the strengthening of its national occupational safety and health (OSH) policy framework. The government issued the National Policy on Occupational Health and Safety in 2009 after consulting with representatives from both employers and employees. Additionally, India has completed its first National Occupational Health and Safety Profile. The Indian Constitution contains clear provisions on individual rights and guiding principles of state policy, which are applicable to the activities of her ILO state in India. Governments should regulate all economic activity to control workplace safety and health risks and ensure safe and healthy working conditions for all workers, including men and women. Governments recognize that worker health and safety have a positive impact on production, economic growth, and social development. Prevention is an essential aspect of economic activity, as both new and established industries require high standards of occupational health and safety. However, since current regulations only apply to mining and industry, equivalent standards should be proposed or established for other work environments. (National Policy on Safety, Health, and Environment at Work, Ministry of Labor and Employment, Government of India) [8].

XI. Case Study

The literature review analyzed the Paharpur Business Center, which is an internationally accredited and award-winning building in India. It was ranked among the top 10 buildings in India by the ACREX report in 2017. The building aligns with Long-term Development Goal 3, which emphasizes promoting healthy lives and well-being for all ages. The Paharpur Business Center was designed to enhance well-being, cognitive performance, and productivity while also reducing energy costs. It achieved this by using an innovative approach to combat air pollution through roped walls that line office corridors and windows containing 7,000 plants, including Areca palm, Sansevieria Laurentii, and Pothos. These plants provide distinct health benefits, as reported by the Central Pollution Control Board, MoEF, GOI, and Chittaranjan National Cancer Institute, Kolkata. They reduce eye irritation by 52%, respiratory symptoms by 34%, and increase headaches, pulmonary dysfunction, and asthma by only 12%. Indoor residents who spend 8-10 hours a day in the building for several days have a 42% chance of a 1% increase in saturated blood oxygen (BOL), leading to increased productivity by approximately 20%. The green plants have also reduced absences due to sickness or low blood pressure among residents [43].

Air Quality Indoors, at PBC conforms to ASHRAE & WHO standards: [44]

- Temperature Maintained - 22±1° C in winters & 25±1° C in summers.
- R.H. 70 % ± 10 %
- PM 2.5 < ~15µg /m3 all the time
- Sox, BDL and in any case < 80 ug /m3, as per ASHRAE standards
- Nox, BDL and in any case < 100 ug /m3, as per ASHRAE standards
- Ozone, BDL and in any case < 51 ppb
- TVOC's are under 500 ug /m3
- CO2 level is ~ 200 - 250 ppm over ambient

Figure 13: Paharpur Business Center
Source: (https://www.youtube.com/watch?v=x-2i0qUGJBI)

Figure 14: Paharpur Business Center

Source: (https://www.youtube.com/watch?v=x-2i0qUGJBI)

1. Areca palm 2. Sansevieria Laurentii (mother-in-law tongue) 3. Pothos plant

Figure 15: Plants in Paharpur Business Center
Source: (https://www.youtube.com/watch?v=x-2i0qUGJBI)

The real time data monitored from his office shows Ambient PM10 at 92 ug /m3 while inside the building it valid from 3 to 9 ug /m3 for PM2.5 when ambient value was 60 ug /m3 inside the building it varies between 2-7 ug /m3.

Test - 10:30 AM on July 25, 2017

Location	PM10 µg/m3	PM2.5 µg/m3	PM1 µg/m3	CO2 ppm	Ozone ppb	TVOC µg/m3	Sound Level dB
Ambient	92	60	45	429	3	34	70
Green House	5	3	2	390	2	25	62
Lattice	9	7	5	386	3	37	63
6th Floor	6	4	3	490	3	152	53
5th Floor	4	2	2	517	2	184	54
4th Floor	4	2	1	540	-	179	47
3rd Floor	3	2	1	610	3	251	51
2nd Floor	-	-	-	-	3	-	-
1st Floor	3	2	1	592	2	262	48
Ground Floor	4	2	1	624	3	351	69
Cafe	2	1	1	580	3	316	62

Following are the standards
Indoor CO2 < 700 ppm over Ambient (USGBC) &
As per Harvard University Study, October 2016 < 600 ppm - www.thecogfxstudy.com -
For Increase in cognitive ability
Ozone (O3) < 51 ppb (USGBC WELL)
TVOC's < 500 µg.m3 (USGBC WELL)

Special Tests

Parameters	Test Done on	Ambient	Green House	In PBC (avg)
Aerobic Plate Count cfu/m3	05/05/17	86	23	38
Total Fungal Count cfu/m3	05/05/17	75	21	27
Formaldehyde ppb	28/06/17	10	0	11
Chlorine µg/m3	15/05/17	14	3	3.5
Lead µg/m3	14/05/17	0.09	-	0.03

Following are the standards
Aerobic plate count < 50 cfu /m3 (WHO)
Total fungal count < 150 cfu /m3 (WHO)
Formaldehyde < 81 ppb (ASHRAE)
Chlorine < 21 µg /m3 (USEPA)
Lead < 1.5 µg /m3 (ASHRAE)

Figure 16: Real time Data Monitored from Paharpur Business Center
Source: (https://www.youtube.com/watch?v=x-2i0qUGJBI)

XII. Acknowledgement

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