

## A Review on Office Space Management Post Pandemic COVID-19

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### ABSTRACT

Literature studies reveal that mankind spends 90% of their life indoors. The current COVID 19, pandemic situation has capped the socialization among the people due to diverse reasons. This situation has questioned as well as challenged the age-old practices and standards that have been adopted in designing spaces for various functions. This study reinstates the need to maintain the health of the occupants especially in corporate offices. Achieving the users' health and wellness that include some aspects of thermal comfort is challenging. The aim is to study, understand and achieve the key parameters that revolves around 'health' and 'wellness' of the occupants in corporate spaces that is expected to be occupied partially even during challenging situations. Exploratory methodology is adopted to identify and consolidate such parameters in this article. The data was collected from secondary resources such as 'Well Building Standard' by the International Well Building Institute, 'Indian Green Building rating system', 'pandemic guidelines' and 'research articles'. It is observed that parameters such as 'adequate and appropriate ventilation', 'indoor and native plants' and 'relative humidity' need to be considered while facilitating the functioning of corporate spaces with minimum occupancy in situations which demand physical and social distancing. The role and the impacts of these parameters need to be explored in real time contexts.

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### 1. Introduction

Man and nature have been connected in both tangible and intangible ways. The emergence of civilizations in various geographical contexts also depict such connections. However with the birth of industrial revolution, the focus slowly shifted to technology and economical development (Berg and Hudson 1992). Human being became money-oriented and the 'purchasing capacity' of the people became symbol of social status (Beder, 2004). The environment degraded slowly affecting all the realms of our planet. In the current scenario, the lifestyle as well as the habits have posed serious threats to us in

numerous ways. Strategies have been developed in architecture and construction industry so as to meet the natural disasters such as earthquakes, tsunami, floods, cyclones etc. The current pandemic scenario 'COVID 19' is a unique type of calamity that propound the people to remain indoors, maintaining physical and social distance from everybody questioning the age old statement that man is a 'social animal'. People spend approximately 90% of their time in indoors (EPA, 2018). The Organization has also noted that the pollution in indoors is observed to be five times worse than the outdoors. Broadly, wellness and health are interrelated posing a serious threat to the mankind even during normal situations. The current pandemic

situation has even brought us to a sticky situation, whereby the essence of ‘socialization’ is completely shattered which has questioned the functioning of various building typologies.

With respect to corporate spaces, individuals need to maintain a physical distance with the others in public, working as well as private areas. We have come across phrases such as ‘work from home’, ‘lock down’, ‘self quarantine’ etc. This in turn has had a great impact on corporate spaces that function with the support of information technology which is typically used within the context of business operations, is shrinking. Even though it is anticipated that ‘work from home’ might become a whip in the near future (Vyas. L, Butakhico. N, 2020) reducing the extent of corporate spaces, a minimum space is required to ensure the smooth functioning of such spaces. With an intention to comprehend such design strategies, designing spaces with a thrust on the health of the occupants, building standards with a focus on ‘well’ and rating systems in Indian context has been explored in this article.

World Health Organization (2021) has posited that ‘there has been a lack of consistency in national and sub-national policy recommendations to guide workplaces on how to prevent transmission and protect workers from COVID-19’. From studies and experience it has been observed that the transmission of SARS-CoV-2 among people occur when an infected person is in close contact with another person. Ventilation, physical distancing, hand hygiene, cleaning and disinfection of environmental surfaces and personal protective equipment are the action points that need to be implemented in working spaces (WHO, 2021). This paper focuses on the identification of parameters discussed in research articles apart from the building standards that need to be adopted to ensure the functioning of corporate spaces at least with minimum occupancy when situation demands physical and social distancing for the wellbeing of the individuals.

### **1.1 An insight into rating systems and building standards**

The Confederation of Indian Industry initiated the Indian Green Building Council for health and wellness of the occupants in the year 2017. Physical, emotional and social wellbeing are the three major modules. Green building rating systems focuses on achieving sustainability addressing social, economical and environmental aspects.

WBS (Well Building Standard, well v2, 2020) framed by International Well Building Institute (IWBI) with a thrust on the health and wellbeing of the occupants. The well building standard focuses on 11 modules such as ‘air, water, nourishment, light, movement, thermal comfort, sound, materials, mind, community and innovations.’ Relating to the current COVID -19 context where the spread of the virus is through air, the authors have focused on ‘indoor air quality and environment’.

### **1.2 Comprehending ‘well’**

The essence of “well” can be traced back in the ancient historic traditions of Asia, Greece and Rome (Global Wellness Institute, 2017). The three parts of wellness are identified as ‘physical, psychological, and spiritual’ that are associated with body, mind and soul respectively (Shah. S, 2017). However, we have forgotten that ‘health is wealth’. With tremendous growth in technology, human beings have been leading mechanical life.

The term ‘well’ is defined as the active pursuit of activities, choices and lifestyles that lead to a state of holistic health (Global Wellness Institute, 2017). According to World Health Organization, the term ‘health’ is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. Maintaining health of the occupants in the built environments even during normal situations is challenging. The current pandemic situation has posed new challenges forcing the need to maintain ‘wellness’ and ‘health’ by maintaining physical and social distance. It is against this background, this paper focuses on the study strategies that need to be adopted in corporate space to function with a minimum occupancy during pandemic situations.

### **1.3 Working culture**

On an average, the mankind spends eight hours in a day at work, that is the one third of a day’s time is spent at work and the indoor environmental quality is given a secondary concern in most of the developing and under developed countries. According to Environment Protection Agency (EPA, 1991), Sick Building Syndrome increases with people spending their working hours in the indoors. As per Global Wellness Institute, the wellness in corporate spaces are maintained through expenditures on programs, services, activities, and equipment by employers aimed at improving their employees’ health and wellness. These expenditures aim to raise awareness, provide education, and offer incentives that address specific health risk factors and behaviors and encourage employees to lead a healthy life. Assuring wellness among the occupants in corporate spaces is challenging.

This article focuses on understanding and analysing the guidelines and strategies which can help in design of work places that can function even during pandemic situations with a minimum occupancy. The indoor air quality in an office helps in occupant’s productivity, lesser sickness levels, less numbers of absenteeism (Al Horr et al, 2016). The quality of indoor air is a non-legal right for all living being on the Planet. With an intention to explore, consolidate and synthesize the parameters discussed in the various secondary resources, exploratory methodology is adopted.

## **2. Methodology**

Gray (2013) has posited that exploratory study ‘tends to explore about what is happening.’ The primary thrust is on the discovery of ideas and insights (Kothari, 2004); explore a phenomenon that is in the nascent phase (Creswell, 2009). According to

Swedberg (2018), exploratory methodology is adopted when a specific topic is emerging and given a first tentative analysis.

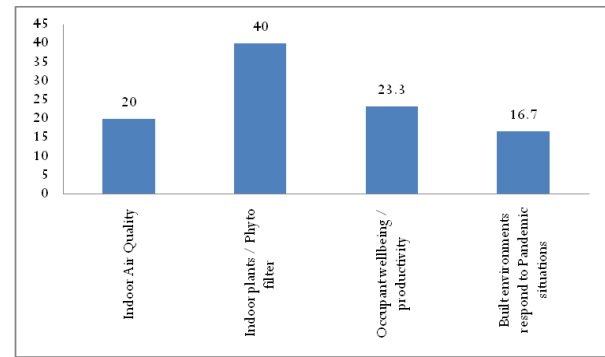
In this context, the authors have adopted ‘exploratory methodology’ to comprehend the current pandemic situation where scientists, corporates, academicians, researchers etc are in the process of finding alternative solutions in diverse domains to manage the COVID -19. The thrust of this article is to explore the ways to achieve wellness in ‘corporate spaces’ during pandemics. The authors intend to identify parameters and strategies from ‘rating systems’, ‘pandemic guidelines’ and ‘research articles’ that need to be adopted to ensure smooth functioning with at least minimum occupancy in constrained contexts which advocates social and physical distancing.

### 2.1 Data Collection

Secondary data were collected from books, reports, videos, magazines, research articles and official websites revolving around the Well Building Standard (WBS), Indian Green Building Council (IGBC) and guidelines for designing spaces during pandemic times to maintain health and wellbeing of occupants were studied to understand the parameters which are related to create pollution free indoor environment. In the building standards and rating systems, the thrust is on the creation of ‘pollution free’ spaces. However, there is a need to identify the other parameters that play significant roles in maintaining the health of the occupants in extreme situations also.

For this purpose, strategies which can be adopted in indoor built environment to improve the ‘indoor air quality’ were identified from literature studies. Phrases such as ‘wellness,’ ‘indoor air quality,’ ‘thermal comfort,’ ‘indoor plants,’ ‘natural air purifiers,’ ‘phytofilters,’ ‘occupants wellbeing,’ ‘occupants productivity,’ ‘wellness in offices,’ ‘post pandemic built environment,’ ‘pandemic work spaces,’ ‘positive wellbeing,’ ‘corporate spaces,’ ‘healthy indoor space’ were adopted to identify related articles from secondary resources using search engines such as ‘Scopus,’ ‘Google,’ ‘Google Scholar,’ ‘Academia,’ ‘Scribd,’ ‘Research Gate’ from 12th September to 15th October 2020.

The authors identified thirty articles and classified under four heads ‘indoor air quality, indoor plants / phyto filter, occupant wellbeing / productivity and building environments that respond to pandemic situations.’ It is observed that around 40% of the articles emphasize the need for indoor plants / phyto filters to maintain indoor air quality as in Figure 1.



**Figure 1.** Classification of the articles under four heads expressed in percentage

### 2.2 Data analysis

The parameters identified from the various articles and the guidelines stated by the building standards including the unique strategies evolved to maintain the health of the occupants were consolidated and synthesized as in Table 1. The authors have identified ‘orientation, air purification with indoor plants, landscape with native plants and relative humidity’ discussed in pandemic guidelines that need to be incorporated in the building standards to ensure the well being and health of the occupants.

## 3. Findings

The parameters that were identified in the WBS, IGBC, and pandemic guidelines have been consolidated and synthesized as in Table 1. The authors have identified ‘orientation, air purification with indoor plants, landscape with native plants and relative humidity’ discussed in pandemic guidelines need to be incorporated in the building standards to ensure the wellbeing and health of the occupants.

### 3.1 Ventilation

The ventilation plays an important and principal role in avoiding the air borne transmissions in the indoor environment. The fresh air supply takes the primary part in sufficient ventilation and this is possible with operable openings. In addition to ventilation air filtration helps in filtering the pathogens and other pollutants present in the indoor environment. The buildup of pathogens can be avoided with appropriate and adequate ventilation methods. (Morawska, L., 2020)

ASHRAE / ISHRAE and other regulatory nurture the use of air filters (special filters) for both natural and mechanical ventilation to remove the pathogens present in the interior spaces. Hence, along with the natural air purifiers / natural air purifying plants, the natural ventilation needs to be achieved for the pathogen free indoor spaces. (Burrige, H. C et al 2021)

Once the world gets geared up for normal operation, ventilation will be a prerequisite criterion in all buildings especially for buildings with inadequate in ventilation (Morawska et. Al, 2020). The existing guidelines for the rate of air changes need to

be dynamic which can result in avoiding recirculation of the air. (Van Dijken. F, Boerstra. A, 2021). Further research on measuring the absence of pathogens while using plants as air filters with sufficient ventilation is required.

### 3.2 Indoor Air Quality

The indoor air quality is the most important and primary parameter which plays a vital role in health and wellbeing of the occupants. As per the WBS rating systems for health and wellbeing, air quality is the first criterion to be addressed which also adheres to AHSRAE 62.1 – 2016 guidelines (American Society of Heating, Refrigerating and Air Conditioning Engineers). ASHRAE’s recommended ventilation rates for offices varies from 0.35 – 8 air changes per hour, when dealing with places that may contain viruses, the recommended air changes per hour are higher, approximately 6-12 times. The IGBC rating system recommends ISHRAE 10001:2016 (Indian Society of Heating, Refrigerating and Air Conditioning Engineers) standards for the air quality and ventilation requirements for the indoors.

#### 3.2.1 Indoor plants as natural air purifiers

The indoor plants such as Areca Palm (*Chrysalidocarpus lutescens*), Mother in law’s tongue (*Sansevieria trifasciata*) and money plant (*Epipremnum aureum*) can help to grow our own fresh air (Meattle, 2009). It was tested and proved in Paharpur Business centre that these plants give mountain fresh air for the occupants in the building and it is owned by Meattle (2009). The air purification technique used with plants in the office building, Paharpur Business Center at New Delhi, India (Makkar. Y, Deepshika, 2014) is shown in Figure 2.

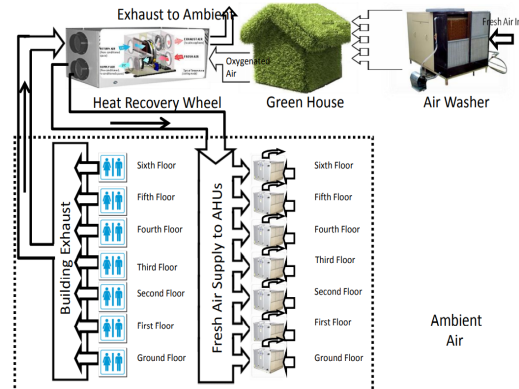


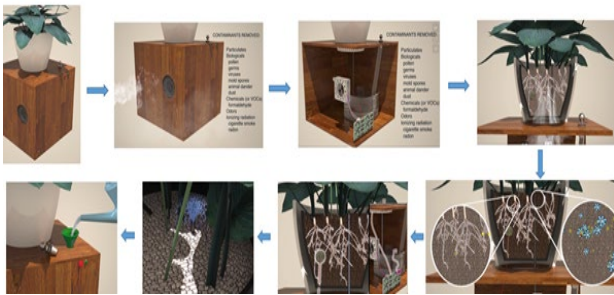
Table 1. Classification of parameters based on content analysis

Parameters	Building standards	Pandemic Guidelines	Literature studies
Ventilation	WBS/IGBC	Ahlawat,2020	Arif, 2016
Day lighting	WBS/IGBC	Ateck, 2020	Al Horr, 2016
Orientation			Esfandiari, 2017
Materials	WBS/IGBC	Apte, 2010	Apte, 2010
Connectivity to nature	WBS/IGBC	Ateck, 2020	
Air purification (indoor plants)			Wolverton, 1997
Landscape – native plants			Meattle, 2009
Indoor environmental comfort	WBS/IGBC	Arif, 2016	Al Horr, 2016
Thermal comfort	WBS/IGBC		Al Horr, 2016
Sound comfort	WBS/IGBC		
Physical activity – positive spaces	WBS/IGBC		Petermans, 2014
Mind and productivity	WBS/IGBC		Al Horr, 2016
Social sustainability	WBS/IGBC		Petermans, 2014
Nourishment	WBS/IGBC		
Relative Humidity		Ahlawat, 2020	

Figure 2 The technology used for air purification at the Paharpur Business Center, India (Makkar. Y, Deepshika, 2014)

### 3.2.2 Phyto filters

According to Whole Building Design Guide, a Phyto filter is a plant filter ("Phyto" being the Greek word for plant) which removes airborne contaminants from indoor air and it comprises of a filter in which plants and root microbes grow, a porous artificial soil that is usually composed of activated carbon and expanded shale or clay, an induction fan and a moisturizing system which keeps the filter damp so it can act as a wet scrubber. This technology was developed by National Aeronautics and Space Administration in 1980s which can be used in outer space where ventilation was not possible as in Figure 3.



**Figure 3** Phytofilter by WBDG and NASA's Green solution for unhealthy air (<https://www.wbdg.org/resources/phyto-purification-systems>, <http://phytofilter.com/>)

The findings of the study with various plant species resulted with list of plants and their benefits in absorbing the pollutants like formaldehyde, particulate matter, VOCs (Volatile Organic compounds), airborne toxins, etc. (Wolverton,1997). However, indoor plants that cap and destroy the harmful microorganisms need to be identified and also investigate the efficacy.

### 3.2.3 Relative Humidity

The low relative humidity (20-30%) as well as the high relative humidity (>80%) can contribute to development of the airborne pathogens in the indoor built environment (Dietz. L et al, 2020, Horve. P. F et al 2020). Relative humidity is found to affect the infectivity (the ease with which infection can take place) of virus through the respiratory route (Taylor, 2019). Thus, maintaining relative humidity level at least 40% in the indoor environment is challenging for extreme climatic conditions. Specific species of plants such as Peace Lily (*Spathiphyllum 'Petite'*) and Kentia Palm (*Howea forsteriana*) can help in controlling the relative humidity at the same time achieving wellness for the occupants by removing the pollutants present in the environment (Ahlawat, 2020).

The Xerophytic plants such as Aloe Vera can be used in a Hot and Humid climatic zone, where these plants can absorb the excess moisture present in the indoor air (Wahjutami, 2016).

The Aloe vera is a superior plant and it can purify as equal to nine air purifiers (Inbathamizh, 2020)

Further studies required to quantify the reduction of Relative humidity by using the Xerophytic plants to address with respect to pathogen free indoor environment in Hot and Humid climatic conditions.

### 3.3 Thermal Comfort

In situations where mechanical heating, ventilation and air condition systems should be curtailed, the occupants need to be thermally comfortable. To achieve thermal comfort in a passive mode, natural ventilation plays a significant role in hot regions.

### 3.4 Materials

The indoor air quality is also affected by the materials used which have high volatile organic compounds and hazardous cleaning products which affect the wellness of the occupants. Besides, interiors need to be treated uniquely so as to absorb or destroy the microorganisms that are harmful to the occupants.

## 4. Conclusion and Discussion

The authors have observed that in the rating systems such as WBS and IGBC with a focus on 'wellness' depict that 'indoor environmental quality' plays a significant role in facilitating the corporate spaces to function with minimum occupancy in the current pandemic situation where physical and social distancing are mandatory. From the various secondary resources, the various strategies revolve around incorporating 'indoor plants' that facilitate the fighting against the pathogens without any mechanical systems is mandatory.

Natural ventilation helps a lot in maintaining the indoors pathogen free. Plants such as Areca Palm (*Chrysalidocarpus lutescens*), Mother in law's tongue (*Sansevieria trifasciata*) and money plant (*Epipremnum aureum*) need to be integrated with phytofilter technique to remove the pathogens in the interior environments. Native plants need to be identified and used for the air purification and maintaining relative humidity for creating virus free interiors is recommended as a unique strategy to mitigate a pandemic situation, COVID 19.

Besides, the use of plants has been related to connect the space with nature, which contributes to the 'wellness of mind and soul' and also helps in achieving thermal comfort. The findings are limited to the articles identified during the data collection phase. The spaces designed with the discussed strategies will contribute in maintaining pathogen free interiors in contexts which require physical and social distancing. Further, the functioning as well as performance of spaces incorporating the strategies needs to be investigated in real time contexts.

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