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Workplace Requirements in New Normal Era due to COVID-19 Pandemic: Design Criteria and Health Environment Perspectives

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Abstract

Background: New normal era is being done in many countries after COVID-19 pandemic. This era allows people back to office with certain condition. Applying health protocol is one of the requirements that must be done by every people in the office. Another requirement is to identify workplace requirement itself to deal with pandemic. Thus, people can work safely and start new normal era in the office. This study aims to identify workplace requirements in new normal era.

Methods: This study was conducted by evaluating workplace requirements and analyzing them based on their suitability with those required in the new normal era. Evaluation of this study obtained from design engineering criteria and health environment perspective which used literature review method. The evaluation also considered workplace ergonomic aspect to arrange the best workplace design.

Results: Based on the analysis, it shows that there are many requirements that must be fulfilled to create a safety zone in the workplace in the new normal era such as workspace layout, ventilation, lighting, establishment of equipment, and thermal comfort. All of the requirements are mutually needed and sustainable each other to form a comfortable and safe workplace environment in order to deal with COVID-19 pandemic.

Conclusion: Design of ergonomic workplace and health environment are developed in this study. The appropriate workspace layout and equipment placement will also keep physical distancing easier to implement as one of the health protocols. By obeying the requirement in the workspace area, it can minimize the probability of spreading illness.

Keywords: workplace requirement; new normal era; health environment

Background

Coronavirus Disease (COVID-19) that was caused by SARS-CoV-2 virus has been pandemic and spread all over the world.^[1] China was listed at the first country that has reported the disease in 2019 after a number of local health authorities reported clusters of patients with unknown pneumonia related with seafood market in Wuhan, Hubei Province.^[2] Many researchers say that SARS-Cov-2 virus can be spread among people primarily through respiratory droplets produced during coughing.^[3] It can also be produced from sneezing and normal breathing that was called aerosol.^[3] In addition, the virus can spread by touching the surface of a contaminated object and then touching someone's face.^[4] Recently, new coronavirus was detected in the feces in confirmed patient that indicating that virus can exist and replicate in the digestive tract through fecal-oral transmission.^[5] However, it also important consider the asymptomatic cases which play critical role in transmission process.^[6]

Many countries have done variety of ways to overcome this pandemic. The method used is physical and social distancing that make many people work and study from home.^[7] Do something in online becomes usual habit nowadays. However, it is not easy to prevent the spread of COVID-19 disease, because of mobility of people and characteristic of human as social creature which needs other.

Therefore, the best way to deal with this virus in some countries and to improve the economic condition is applying the new normal era. New normal era means that people live as normal as usual like as before Covid-19 existence but using health protocol.^[8] This considers that some activities are still carried out face to face, like shopping groceries, coordination of activity, etc.

Meanwhile, the health protocol must be applied such as clean and healthy lifestyle, physical distancing with minimal distance 1 meter, use face mask, follow the correct ethics of coughing/ sneezing, etc.^[9]

Indonesia is the country that also apply new normal era.^[9] This country has been mapping the probability risk of COVID-19 area and divide into red zones, yellow zone, orange zone, and green zone.^[10] Many activities in industry, education, trading, transportation area can be done in green zone with health protocol. The other hand, the red, yellow, and orange area must reduce their cases and transmission to green zone so that they can apply the new normal life. Many activities such as industry can be done in that zone but restricted activities.^[10]

Due to health protocol, office environment is one of the affected. The procedures for employees to work in the office is changed. Besides health protocol for his or herself, workspace area is needed and must be prepared by office. Problem occurred because most of offices set the workplace very close to one person to another. This condition makes Corona virus's spread easily. At this moment, due to the deeper health needs, a better and ergonomic workplace design is needed. Ergonomic is a science focused on the study of human fit and decreased fatigue and discomfort through product design.^[11] Ergonomic design has benefit to reduce injuries of the workers and make better human performance because of safe and health culture. Thus, it can improve productivity of workers. As research by Mendis (2016) which has conclusion that workplace design is significantly correlated with employee job performance.^[12]

Based on the Covid-19 pandemic and requirement of health protocol in every sector, thus new requirement of workspace area is needed. Evaluation of this study obtained from design engineering criteria and health environment perspective. Thus, this study aims to identification workplace requirements in new normal era. Therefore, it is established healthy environment so that workers are comfortable and can have an impact on maximum working output.

Methods

This study was done in June-July 2020 with two steps. The first step was used of literature review method from the journals, regulations, and books which appropriates to identify the workspace requirement in new normal era. Workspace requirement in this study is evaluated by two aspect, design engineering criteria and health environment perspective. As Mendis's research (2016) showed that elements of workplace design have relationship with performance of employee. The elements are workplace layout, ventilation, lighting, establishment of equipment, and thermal comfort.

Second, this study also develops the architecture design of ergonomic workplace based on that elements so that appropriate elements can be known and also from health environment perspectives.

Results and Discussion

Workplace Requirement in New Normal Era

Ergonomic design of workplace becomes thing that must be considered nowadays in COVID-19 pandemic for facilitating employee and still keep the job performance. The ergonomic workplace design aims at improving work performance

through:^[13]

- minimizing the physical strain and workload of the working person,
- facilitating task execution, i.e. ensuring effortless information exchange with the environment, minimization of the physical constraints, etc.,
- ensuring occupational health and safety,
- achieving ease of use of the various workplace elements

Others office upgrades are:

- Touching free from starting the door handle and trash
- One-way walking paths to avoid collisions between people
- Using furniture materials easy to clean such as vinyl, plastic, faux leather, and other non-porous materials
- Using the partition which is transparent

Workspace design includes dimensions, materials. Whereas a healthy environment can cover air circulation, lighting, humidity, etc. As Mendis's research (2016) showed that workplace layout, ventilation, lighting, establishment of equipment, and thermal comfort are elements which must be considered for making well workspace. Good design can affect human physical and psychological health and increase creativity, innovation, and work products.^[12]

There are aspects of workplace design element:

1. Workspace layout
There are several aspects which contribute to workspace layout. Marmaras and Nathanael (2005) give ergonomic requirements to

determination of available space that has to easy access to doors, windows, and radiators. Meanwhile, design of workstation must fit to workstation to its users and tasks, and easy access to workstation.^[13]

According to Ministry of Health Regulation Number 70-year 2016 on Health Environment Standard and Requirement in Industry Area, the minimum volume per person is 11 m³ and the minimum area is 2.3 m²/ person. This standard is for general conditions.^[14]

However, in this study, condition due to Covid-19 is reviewed. Therefore, for the design of this workspace minimal used 3.3 meters high, 2 meters long and 2 meters wide so that it has a volume of 13.2 m³ and an area of 4 m². The choice of high dimensions due to the city of Semarang, the weather is quite hot because it is located in a coastal area. Therefore, the distance between the floor and the height of the ceiling is made higher so that the air exchange can be better.

Meanwhile for building material requirements are as follows:^[14]

- a. Building materials that use paints and coatings with low levels of volatile compounds (Volatile Organic Compounds-VOC).
- b. Building materials in the form of wood and adhesives contain low formaldehyde.
- c. The floor is easy to clean and not slippery to prevent injury

- d. Tightly closed building thus insects and disease-carrying animals cannot enter.

Based on the above requirements, it is recommended for walls to use wood material so that it can provide a warm feel and make the workers feel at home. The use of this wood material needs to be coated with termites to prevent damage cause to insect to the material. If use concrete material, can use paint with shady colors that are comfortable and inconspicuous. On the floor can use material in the form of ceramic or granite which is not slippery type.

2. Ventilation

Ventilation is an opening in the wall and/ or roof that has purpose as a place for the entry of natural light and air from outside into the building. With good ventilation, it can have benefit for health and comfort of workers. The best ventilation opening is in the direction of the wind. Even though at this time many workspaces use air conditioners which do not require windows as a means of comfort, but still windows and vents are needed for healthy air circulation.^[14]

In new normal era, it should be consider to use natural ventilaltion i.e opening windows if possible and safe to do so to increase outdoor air dilution of indoor air when enverionmental condition and building requirements allow.^[15]

It also need to improve air filtration and airflow supply to occupied spaces if possible. Another consideration also use portable high-efficiency particulate air (HEPA) fan or filtration system to help air cleaning.^[15]

It's important to ensure ventilation systems in building can operate properly. For building heating, ventilation, and air conditioning (HVAC) systems that have been shut down or on setback can be used.^[15]

3. Lighting

Lighting is an important thing in a workspace because with good lighting workers can be more focused. For work space, lighting needs 200 Lux.^[14] In addition, a good window placement is needed in order to get natural lighting so that it can also support the concept of green building.

Consider using ultraviolet germicidal irradiation (UVGI) as a supplemental technique to inactive potential airborne virus in upper room.^[15]

4. Establishment of Equipment

Placement of equipment (chairs, tables, sofas, cabinets, etc.) is expected not to disturb the free space of workers to work. Placement of cabinets and sofas is better placed in the corners of the room, whereas if the room is large then it can be given a divider to restrict it so that it does not interfere with workers walking or moving.^[13]

In new normal era, it recommended to set the chair worker place with minimum distance 6 feet or approximately 1,8 meters.^[15]

5. Thermal comfort

Generally, workers work for 8 hours every day from 8:00 to 16:00. In the morning the weather is quite fresh, but in the afternoon it gets hotter. This temperature change needs to be watched out especially for workers with low immunity because it can cause illness. Therefore, it can be anticipated with the preparation of air conditioning and window openings in the morning so that no extreme temperature changes occur from morning to noon.^[13]

Architecture Design of Workplace in New Normal Era

Based on many requirements of workplace in new normal era. The researchers try to build the architecture design of workplace that can be implemented in new normal. It was shown in Figure 1 and Figure 2.

Figure 1 shows 3 x 3 meters room which has two tables and two cabinets. There is also one sofa for guest who queue. This room can be one of solution for people for facing Covid-19. The distance between the table and sofa is quite far, more than 1 meter. Meanwhile, there are also three windows for air circulation and lighting. Nevertheless, if there is room on the left or right the room, thus the two windows on the left or right can be removed. As a replacement, it can be assembled two windows behind the wall of the room



Figure.1. Workspace in a Narrow Area



Figure. 2. Workspace on a Large Area

Figure 2 shows large area which has 10 x 5 meters room. This room is intended for 5 people in office. There are 5 tables, 5 cabinets, 2 waiting room which divided by cubicle bulkheads, 1 set chair and table for meeting coordination in the middle of the room, and 1 pantry in the corner of the room. There are also 2 doors and 9 windows for air circulation and lighting. The distance between table more than 1.0 meter and there is also a bulkhead placement at locations that are estimated to be too close. It needs of transparant partition in every table in meeting coordination.

Both of two figures above, facilitate the room with cubicle bulkheads. The advantage of using this workplace

design is cubicle bulkheads can be used for deal with Covid-19, but it affects to spend more money. Thus, design of Figure 1 and Figure 2 can be used but still pay attention in distance among of people.

Reduce the cubicle bulkheads can facilitate coordination between people and working up speed of completion work, but this is more risk although the aesthetically is look better and make comfort to employee.

Based on Central for Disease Control and Prevention (CDC), to maintain social distancing of 6 feet between employees, there are many strategies that can be done. The first install transparent shields or other physical barriers where possible to separate employees and visitors where social distancing not option. Second, arrange chair in reception or meeting and draping or covering chair with tape or fabric so seats cannot to be used, spacing, or removing chairs to maintain social distancing.^[15]

Conclusion

New normal era because the Covid-19 pandemic has been applied to various countries such as Indonesia. The application of new normal to daily activities besides applying health protocols also limits the distance between people. One thing to consider is the situation at the office because there are many people. Workspace area requirements are needed to deal with Covid-19 and get the safety zone. Workspace layout and equipment placement need to be considered in order to keep implementing physical

distancing. In addition, it is also the position of ventilation and windows so that air circulation, temperature, and lighting can be smoother. By obeying the requirement in workspace area, it can minimize the probability of spreading illness. This study provides a workplace design in new normal era. However, employee still keep applying health protocol in office.

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