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COVID-19: Standard Operating Procedure Improvement For Green Office Building Using Indoor Environmental Quality

Nur Hannani Binti Ab Rahman[1], Shazmin Shareena Ab. Azis[2], Ibrahim Sipan[3]

[1] Real Estate, Faculty of Built Environment and Surveying, University Teknologi Malaysia, 81310 Skudai, Johor Bahru, Malaysia, nanirhmn98@gmail.com
[2] Real Estate, Faculty of Built Environment and Surveying, University Teknologi Malaysia, 81310 Skudai, Johor Bahru, Malaysia, shazmin@utm.my
[3] Real Estate, Faculty of Built Environment and Surveying, University Teknologi Malaysia, 81310 Skudai, Johor Bahru, Malaysia, ibrahimsipan@utm.my

ABSTRACT

World health Organization (WHO) acknowledge that the coronavirus airborne transmission could be potentially indoors with crowded and poorly ventilated rooms. Thus, COVID-19 guideline is expected to be part of the 'new norms' in workplace. However, regarding the COVID-19 Standard Operating Procedure (SOP) issued by Ministry of Health Malaysia, there is lack of concentration on Indoor Environmental Quality (IEQ) attributes even it has been proven in many research that the transmission of COVID-19 actively occurs indoor environment and IEQ could mitigate the virus transmission. Therefore, this study aims to discover sustainable COVID-19 framework for office building which not only resilient to COVID-19 threat, but also resilient towards sustainability. There are three objectives outlined in this study: 1) To identify IEQ attributes for office building, 2) To analyse the important IEQ attributes that relate to the existing COVID-19 management guideline for office building, and 3) To develop a sustainable COVID-19 framework for office building. A total of 93 questionnaires is distributed among employees at Menara Majlis Bandaraya Johor Bahru, Malaysia and analysed using Mean Analysis and Cross Tabulation to achieve the research objectives. Overall, result shows that EQ7 Air Change Effectiveness is the most important IEQ attributes that can be selected to improve COVID-19 SOP, while wearing face mask/face shield, frequent hand washing/hand sanitizer, practice personal hygiene and respiratory etiquette, avoid handshaking, practice social/physical distancing, avoid public spaces, gatherings and crowds, avoid contact with people who could be high-risk, avoid meeting in large-scale size, relieve/stay home if feel unwell, avoid travelling who are in high-risk, and self-isolate who recently visited latest COVID-19 hotspots are the most important COVID-19 SOP for workplace. This study is significant for building manager or COVID-19 management in workplace to enhance their current SOP by integrating with IEQ to reduce COVID-19 spread in workplace.

Keywords: Green Office Building, COVID-19, Standard Operating Procedure, Indoor Environmental Quality.

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1. INTRODUCTION

Recently, the world has encountered by a new issue that caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or namely as the Coronavirus Disease 2019 (COVID-19) which could give impact to people's health. It was discovered in Wuhan, China on late December 2019 and has been rapidly spread to entire world (Zhou et al., 2020; Kabir et al., 2020), eventually could cause to death. As of 18th March 2020, Malaysia reported over 700 confirmed cases which forced government to implement Movement Control Order (MCO) to reduce the COVID-19 transmission. However, the implementation of the Movement Control Order (MCO) has led to almost 50% of self-employed Malaysians have lost their jobs due MCO. According to the

Labour Force Survey conducted by Department of Statistics Malaysia (DOSM) in March, it was found that 46.6% of self-employed respondents had reported losing their jobs following COVID-19 and MCO being enforced. Besides, the highest unemployment in 2020 was recorded which is achieved at 5.3%.

Due to the highest unemployment rate during MCO enforcement, government has issued a new regulation in May 2020 where include office sector started to open. However, employee is compulsory to comply with Standard Operating Procedures (SOP) issued by Ministry of Health Malaysia (MOH) where in workplace, they need to wear face mask, frequent hand washing or hand sanitiser, regular cleaning, and disinfection surface, avoid handshaking, avoid public spaces and crowds, avoid meeting in large scale size, and so forth. In spite of that, researchers from past pandemic believes that measurement control related to physical distancing, avoiding public meetings, isolating the diseased, and wearing face mask are the most successful measures to slow down the spread of pandemics (Peeri et al., 2020; Vaka et al., 2020).

Since World Health Organization (WHO) acknowledge that the coronavirus airborne transmission could be potentially indoors with crowded and poorly ventilated rooms which eventually required people to isolate themselves during lockdown, the new guideline is expected to be part of the 'new norms' for workplace. Pertaining to the existing COVID-19 guideline, there are several researchers suggest that green measurement would also ensure the long-term environmental protection (Bashir et al., 2020; Bogoch et al., 2020) as many people spend approximate 90% of their daily life indoors. In this crisis environment, recent researcher believes that environmental factors in buildings, including temperature, humidity, and ventilation and filtering systems by referring to indoor environmental quality criteria could leverage the gaps (Pinheiro & Luis, 2020). Dietz (2019) analysed that feature such as ventilation and indoor air quality, lighting, and the deposition on the surfaces of materials are several aspects that should be focused on in minimising the spread of COVID-19 inside buildings. On top of that, in previous study by Chan et al., (2011) claimed that high temperature at high relative humidity have stimulating impact on coronavirus inactivation, while lower temperatures and low humidity could enable the long-term existence of the virus on contaminated surfaces. However, by reviewing to COVID-19 Standard Operating Procedure issued by MOH, there is lack of concentration on Indoor Environmental Quality (IEQ) attributes even it has been proven in many researches that the transmission of COVID-19 virus actively occurs indoor environment and IEQ could mitigate the virus transmission.

Mofijur et al. (2021) has mentioned that governments, policy makers, and stakeholders is required to come up with necessary steps by focusing on the future building sustainability as indoor built environment plays a critical role in our overall well-being. Hence, in order to deal with COVID-19 pandemic, matters associated with the improvement of COVID-19 Standard Operating Procedure are taken into considerations by integrating IEQ attributes with existing COVID-19 guideline to prevent the COVID-19 spread as employee is still required to adhere to Standard Operating Procedure and adapt a ‘new norm’ environment in their workplace. Therefore, the aim of

this study is to discover a sustainable COVID-19 framework for office building which not only resilient to COVID-19 threat, but also resilient towards sustainability. Three objectives are outlined in this paper to achieve this aim. The first objective is to identify IEQ attributes for office building. The second objective is to analyse the important IEQ attributes that relate to the existing COVID-19 management guideline for office building, and last but not least, the third objective is to develop a sustainable COVID-19 framework for office building.

2. LITERATURE REVIEW

2.1. Coronavirus Disease 2019 (COVID-19)

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) are known as COVID-19 (Amoat et et al., 2020; Mehmood et al., 2020; Simon, 2020). The COVID-19 is discovered in Wuhan, China in the end of December 2019 and has been rapidly spread to entire world (Zhou et al., 2020; Kabir et al., 2020). At the beginning of 2020, the novel of COVID-19 is started to affect the entire world. In Malaysia, the first COVID-19 case is reported at the beginning of February 2020 where the person had a travel history to Singapore for an International Conference (Lodz et al., 2020).

According to Ministry of Health website, as of 3rd January 2021, Malaysia recorded a total of 119,077 cases from local and export cases and 0.4% from total cases is reported to death. However, the worldwide cases reported for death is 2.2% from the total of 85,056,808 cases (Worldometer, 2020). It shows that the COVID-19 is a highly portable and deadly infectious disease (Gorbalenya, 2020) and World Health Organization has declared the disease as pandemic (WHO, 2020).

2.2. COVID-19 Standard Operating Procedure (SOP)

In this current state, the solution of control the transmission of COVID-19 has been implemented especially within the behavioral control (Pinheiro & Luis, 2020). According to MOH Malaysia, SOP is enforced by government to combat the spread of COVID-19. Apart from that, most countries are currently trying to prevent the spread of COVID-19 by implementing the social distancing policies with an emphasis on the human being's health (Mofijur et al., 2021). Besides, recent researchers claimed that by closing the country boundaries could control the initial spread of COVID-19 (Chinazzi et al., 2020; Aldila et al., 2020; Beck & Hensher, 2020; Bruine de Bruin et al., 2020; de Haas et al., 2020). In addition, researcher believes that by isolating at home could control the infection disease (de Haas et al., 2020).

In workplace, researcher from past pandemics believe that measurement control related to physical distancing, avoiding public meetings, isolating the diseased, and wearing face mask are the most successful measures to slow down the spread of pandemics (Peeri et al., 2020). According to Cirrincione (2020), COVID-19 guideline is

expected to be part of the 'new norms' for office, not only in the period of the pandemic, but possibly as practices that will continue to operate for long term period as precautionary measures for future disease outbreaks. Therefore, MOH Malaysia has outlined the COVID-19 Standard Operating Procedure in workplace, as Tab. 1 below.

Table 1: COVID-19 Standard Operating Procedure in Workplace

No.	COVID-19 Standard Operating Procedure
1.	Wear face mask or face shield
2.	Frequent hand washing/hand sanitizer
3.	Practice personal hygiene and respiratory etiquette
4.	Limit food handling and food sharing
5.	Regular cleaning and disinfection surface
6.	Avoid handshaking
7.	Using alternate communication methods such as virtual platform
8.	Practising physical distancing
9.	Avoiding public spaces, gatherings, and crowds
10.	Avoiding contact with people who could be high-risk
11.	Avoiding meeting in a large-scale size
12.	Taking temperature or thermal screening
13.	Registering contact details to ease contact tracing
14.	Consider opening windows for natural lighting and better ventilation
15.	Avoid touching eyes, nose, and mouth
16.	Relieve/Stay home if get sick/ feel unwell
17.	Avoid travelling who are in high-risk
18.	Self-isolate (14 days) who has recently visited latest COVID-19 hotspots
19.	Encourage work from home whenever possible
20.	Self-declaration on travel

Ministry of Health Malaysia (MOH) (2020).

2.3. Indoor Environmental Quality (IEQ)

Indoor Environmental Quality (IEQ) is one of key criteria in Green Building Index (GBI) assessment to meet the concept of green building towards sustainable development. As described by Omer (2008), IEQ is the perceived condition of comfort that occupants experienced physically and psychologically from their surroundings. It acts as evaluation as one of the aspects of green building rating criteria which not only focused on achieving a healthy environment for occupants, but also to environment that promotes health and productivity of the occupants. This could be supported from previous study which IEQ could has significant impact to occupants' comfort, productivity, and health in office buildings (Fisk et al., 2012; Collinge et al., 2014; Esfandiari et al., 2017; Kaushik et al., 2016).

Clements-Croome (2000) emphasised that IEQ encompasses a range of environmental conditions including temperature, humidity, indoor air quality (IAQ), lighting, ventilation, noise, and crowdedness of workspace. Besides, Ravindu et al.

(2015) claimed that thermal condition quality, indoor air quality, lighting quality, and acoustic quality is the attributes of IEQ. Therefore, by referring to GBI assessment criteria (2011) for non-residential building, IEQ consists of four main assessment area and fifteen attributes involved that should be considered in assessing IEQ of a building to be recognised as a green, as Tab. 2 below.

Table 2: Indoor Environmental Quality Attributes for Non-Residential Building

Criteria	Assessment Area	Attribute
Indoor Environmental Quality (IEQ)	Air Quality	EQ1 Minimum IAQ Performance
		EQ2 Environmental Tobacco Smoke (ETS) Control
		EQ3 Carbon Dioxide Monitoring and Control
		EQ4 Indoor Air Pollutants
		EQ5 Mould Prevention
	Thermal Comfort	EQ6 Thermal Comfort: Controllability of Systems
		EQ7 Air Change Effectiveness
	Lighting, Visual & Acoustic Comfort	EQ8 Daylighting
		EQ9 Daylight Glare Control
		EQ10 Electric Lighting Levels
		EQ11 High Frequency Ballasts
		EQ12 External Views
		EQ13 Internal Noise Levels
	Verification	EQ14 IAQ Before/During Occupancy
		EQ15 Occupancy Comfort Survey: Verification

Green Building Index (GBI) Assessment Criteria (2011).

3. METHODOLOGY

3.1. Study Area

This study mainly focuses on the green office building within the centre of Johor Bahru district which is Menara Majlis Bandaraya Johor Bahru (MBJB). A 15-storey office building of Menara Majlis Bandaraya Johor Bahru that located at Bukit Senyum, Johor Bahru was completed in the year of 2019 and was certified by Green Building Index (GBI), Malaysia. Menara MBJB is chosen because of the location is located in the high population density where many office buildings is available in the centre of the city. In this study, questionnaire regarding the improvement of COVID-19 Standard Operating Procedure for office building is focused.

3.2. Data Collection

Data are collected through two parts which is primary data and secondary data. Primary data comprises set of questionnaires which involved of the COVID-19 Standard Operating Procedure and IEQ attributes that have been prepared to be distributed to

employees who is working in the study area. Likert-scale is used in the questionnaire in order to determine the degree of importance level to express the perception of respondents. Five degree level of importance is used which are 'Not Very Important', 'Not Important', 'Neutral', Important', 'Very Important'. Meanwhile, the secondary data is gathered from literature review in various form such as journals, articles, thesis, conference papers, and related references book. Literature review is assessed regarding COVID-19 disease, Standard Operating Procedure, green office building, and IEQ. However, to identify the IEQ attributes and existing COVID-19 guidelines, the GBI assessment criteria for non-residential building and COVID-19 Standard Operating Procedure for workplace enforced by MOH is obtained, respectively.

3.3. Sample Size

There are two types of sampling which are the probability sampling and non-probability sampling. The probability sampling method for this study is used. As mentioned by Creswell (2012), individual is being selected to present the population of the groups. Therefore, to determine the improvement of COVID-19 Standard Operating Procedure in workplace, this study adopted probability sampling which is random sampling.

The targeted respondent for this study is employee who works in Menara MBJB. Therefore, the respondent of this study is assumed to have 1391 in population size which indicate the total number of employees in Menara MBJB. Therefore, the sample of this study is calculated by using Taro Yamane (Yamane, 1973) formula with 95% confidence level. The calculation formula of Taro Yamane is presented as follows:

$$n = \frac{N}{1 + N\,(e)^2}$$

where,

n = Sample size required
N = Number of people in the population
e = Sampling error (%)

By substituting numbers into this formula,

$$n = \frac{1391}{1 + 1391\,(0.1)^2}$$
$$= \mathbf{93}$$

After calculated the sample size by using the formula from Taro Yamane, the numbers of sample are 93 respondents. Therefore, sample size of this study confidence levels at 95% and error is ±10% due to the difficulties in collect data during pandemic era. From this research, there are 93 data of respondents is collected.

3.4. Data Analysis

There are some methods adopted to present and analysis of the data to achieve the research objectives. In this study, content analysis is used to achieve the first objective which is to identify IEQ attributes for office building. As for the expected finding for first objective, the list of IEQ attributes for office building is obtained. Besides, COVID-19 Standard Operating Procedure issued by MOH is also obtained using content analysis method. Subsequently, literature review that has been analysed using content analysis is used to achieve the second objectives which is to analyse the important IEQ attributes that relate to the existing COVID-19 management guideline for office building. Questionnaire is then evaluated using frequency and mean analysis to discover the important COVID-19 Standard Operating Procedure and IEQ attributes based on employee perspectives.

In this study, frequency and mean analysis is adopted in order to analysis the questionnaires collected from the survey. The results of frequency analysis have a percentage the highest indicates that the majority of respondents chose the preference as their priority in this study (Ahmad, 2010). Apart from that, an index is required to determine the position or degree of importance of each the importance level that has been analysed. On the other hand, the index range is obtained, and the position or degree of each importance level is determined. Therefore, this analysis is expected to gather the important existing COVID-19 guideline and IEQ attributes based on employee perspectives.

As for third objective which is to develop a sustainable COVID-19 framework for office building, the data is analysed using Cross Tabulation analysis. The highest degree of importance level will be adopted in developing sustainable COVID-19 framework for office building. Therefore, Tab. 3 below explains the overall methodology in this study.

Table 3: Research Methodology

No.	Objective	Data Collection	Data Analysis	Expected Findings
1.	To identify IEQ attributes for office building.	Secondary data – Green Building Index	Content analysis	List of IEQ attributes for office building.
2.	To analyse important IEQ attributes that relate to the existing COVID-19 management guideline for office building.	Secondary data – MOH's COVID-19 SOP in Workplace	Content analysis	List of existing COVID-19 guideline in workplace.
		Primary data – Questionnaire survey – Respondent: Employees	Frequency and Mean analysis	Important existing COVID-19 guideline and IEQ attributes based on employee perspectives.
3.	To develop sustainable COVID-19 framework for office building.	Based on findings from second objective	Cross Tabulation analysis	Sustainable COVID-19 framework for office building.

4. RESULTS AND DISCUSSION

4.1. List of Indoor Environmental Quality (IEQ) Attributes for Office Building

The first objective in this study is to identify IEQ attributes for office building. Tab. 4 below presents the attributes for overall IEQ attributes based on content analysis.

Table 4: Indoor Environmental Quality Attributes for Office Building

Criteria	Assessment Area	Attribute
Indoor Environmental Quality (IEQ)	Air Quality	EQ1 Minimum IAQ Performance
		EQ2 Environmental Tobacco Smoke (ETS) Control
		EQ3 Carbon Dioxide Monitoring and Control
		EQ4 Indoor Air Pollutants
		EQ5 Mould Prevention
	Thermal Comfort	EQ6 Thermal Comfort: Controllability of Systems
		EQ7 Air Change Effectiveness
	Lighting, Visual & Acoustic Comfort	EQ8 Daylighting
		EQ9 Daylight Glare Control
		EQ10 Electric Lighting Levels
		EQ11 High Frequency Ballasts
		EQ12 External Views
		EQ13 Internal Noise Levels
	Verification	EQ14 IAQ Before/During Occupancy
		EQ15 Occupancy Comfort Survey: Verification

4.2. List of Existing COVID-19 Guideline in Workplace

Prior to the important existing COVID-19 guideline, the list of COVID-19 Standard Operating Procedure is essentially obtained. Tab. 5 below presents the COVID-19 Standard Operating Procedure in workplace derived from Ministry of Health Malaysia.

Table 5: COVID-19 Standard Operating Procedure in Workplace

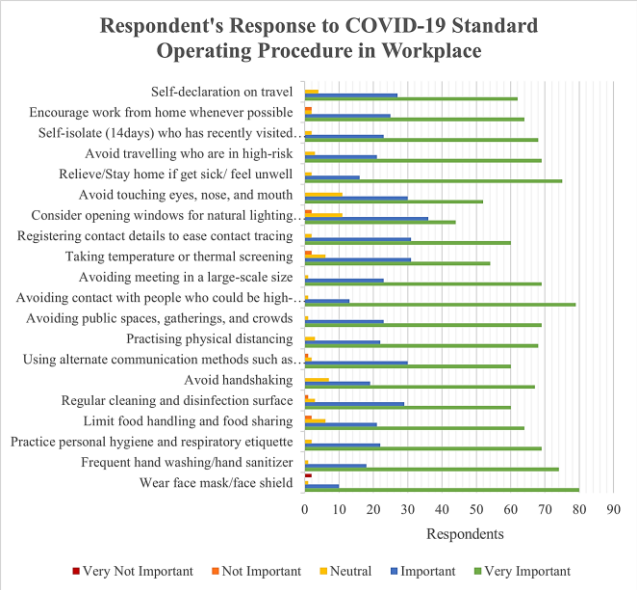
No.	COVID-19 Standard Operating Procedure
1.	Wear face mask or face shield
2.	Frequent hand washing/hand sanitizer
3.	Practice personal hygiene and respiratory etiquette
4.	Limit food handling and food sharing
5.	Regular cleaning and disinfection surface
6.	Avoid handshaking
7.	Using alternate communication methods such as virtual platform
8.	Practising physical distancing
9.	Avoiding public spaces, gatherings, and crowds
10.	Avoiding contact with people who could be high-risk
11.	Avoiding meeting in a large-scale size

12.	Taking temperature or thermal screening
13.	Registering contact details to ease contact tracing
14.	Consider opening windows for natural lighting and better ventilation
15.	Avoid touching eyes, nose, and mouth
16.	Relieve/Stay home if get sick/ feel unwell
17.	Avoid travelling who are in high-risk
18.	Self-isolate (14 days) who has recently visited latest COVID-19 hotspots
19.	Encourage work from home whenever possible
20.	Self-declaration on travel

4.3. Important Existing COVID-19 Guideline and IEQ Attributes

As findings for second objective which is to analyse important IEQ attributes that relate to the existing COVID-19 management guideline for office building, there are total of 20 questions regarding COVID-19 Standard Operating Procedure in workplace and 15 questions regarding the IEQ attributes and mean analysis is conducted to analyse the findings. Fig. 1 below shows the respondent's response to COVID-19 Standard Operating Procedure in workplace.

Figure 1: Respondent's Response to COVID-19 Standard Operating Procedure in Workplace



The result shows that most respondents believe that wearing face mask or face shield is the most important action to prevent the spread of COVID-19 in workplace. However, there are also some respondents who believe that wearing face mask or face shield is very not important action to prevent the spread of COVID-19 in workplace. Considering opening windows for natural lighting and better ventilation shows the most least important to prevent the spread of COVID-19. Therefore, from this, mean analysis

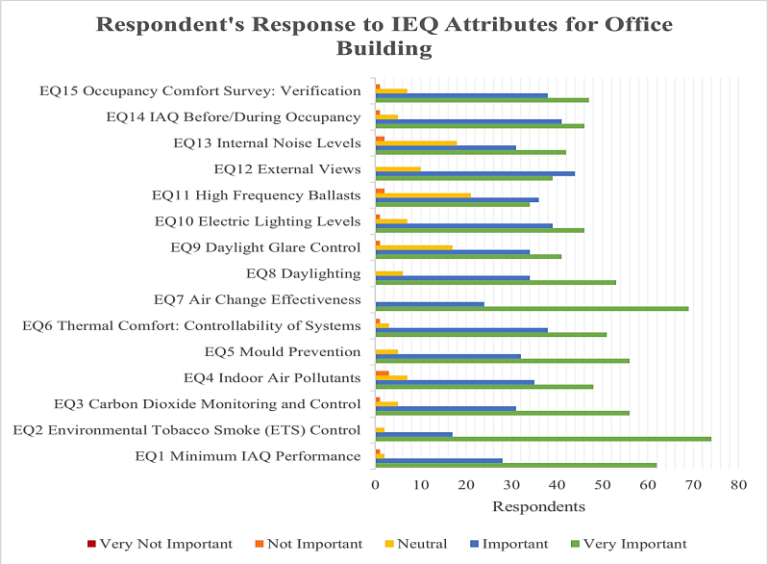
adopted in this study to analyse their importance level of COVID-19 Standard Operating Procedure to prevent spread of COVID-19 in workplace by looking into their mean value and ranking. Those results will assist in identifying the most important existing COVID-19 guideline based on employee perspectives, as tabulated in Tab. 6 below.

Table 6: Mean Value and Ranking of the COVID-19 Standard Operating Procedure

COVID-19 Standard Operating Procedure	Mean	Rank
Wear face mask or face shield	4.84	1
Frequent hand washing/hand sanitizer	4.78	2
Practice personal hygiene and respiratory etiquette	4.78	3
Limit food handling and food sharing	4.78	4
Regular cleaning and disinfection surface	4.73	5
Avoid handshaking	4.73	6
Using alternate communication methods such as virtual platform	4.72	7
Practising physical distancing	4.71	8
Avoiding public spaces, gatherings, and crowds	4.71	9
Avoiding contact with people who could be high-risk	4.70	10
Avoiding meeting in a large-scale size	4.65	11
Taking temperature or thermal screening	4.62	12
Registering contact details to ease contact tracing	4.62	13
Consider opening windows for natural lighting and better ventilation	4.62	14
Avoid touching eyes, nose, and mouth	4.60	15
Relieve/Stay home if get sick/ feel unwell	4.59	16
Avoid travelling who are in high-risk	4.58	17
Self-isolate (14 days) who has recently visited latest COVID-19 hotspots	4.47	18
Encourage work from home whenever possible	4.44	19
Self-declaration on travel	4.31	20

As a result, by looking into their mean value, it presents that the highest ranked for COVID-19 Standard Operating Procedure is avoiding contact with people who could be high-risk which the mean value is 4.84. It is followed by the Standard Operating Procedure of wearing face mask or face shield, frequent hand washing or use hand sanitiser, as well as relieve or stay home if get sick or feel unwell where their mean value is the same which are 4.78. Considering opening windows for natural lighting and better ventilation also ranked the least important to prevent the spread of COVID-19 where their mean value is 4.31. However, in order to identify the importance level based on their ranking, rescale is conducted as in Tab. 11. In the perspective of IEQ Attributes for office building, Fig. 2 below shows the respondent's response to IEQ attributes for office building.

Figure 2: Respondent's Response to IEQ Attributes for Office Building



The result shows that most respondents believe that EQ2 Environmental Tobacco Smoke (ETS) Control is the most important attributes to be captured in the sustainable COVID-19 framework, followed by the EQ7 Air Change Effectiveness. EQ11 High Frequency Ballasts shows the least important attributes for office building. From this, mean analysis is adopted in this study to analyse their importance level of IEQ attributes for office building to be captured in the sustainable COVID-19 framework that resilient to sustainability by looking into their mean value and ranking. Those results will assist in identifying the most important IEQ attributes for sustainable COVID-19 framework, as tabulated in Tab. 7 below.

Table 7: Mean Value and Ranking of the Indoor Environmental Quality Attributes

Indoor Environmental Quality Attributes	Mean	Rank
EQ2 Environmental Tobacco Smoke (ETS) Control	4.77	1
EQ7 Air Change Effectiveness	4.74	2
EQ1 Minimum IAQ Performance	4.62	3
EQ5 Mould Prevention	4.55	4
EQ3 Carbon Dioxide Monitoring and Control	4.53	5
EQ8 Daylighting	4.51	6
EQ6 Thermal Comfort: Controllability of Systems	4.49	7
EQ14 IAQ Before/During Occupancy	4.42	8
EQ15 Occupancy Comfort Survey: Verification	4.41	9
EQ10 Electric Lighting Levels	4.40	10
EQ4 Indoor Air Pollutants	4.38	11
EQ12 External Views	4.31	12
EQ9 Daylight Glare Control	4.24	13
EQ13 Internal Noise Levels	4.22	14
EQ11 High Frequency Ballasts	4.10	15

As a result, by looking into their mean value, it presents that the highest ranked for IEQ attributes is the EQ2 Environmental Tobacco Smoke (ETS) Control which the mean value is 4.77. It is followed by the IEQ attributes of EQ7 Air Change Effectiveness and EQ1 Minimum IAQ Performance where their mean value is 4.74 and 4.62, respectively. As mentioned before, EQ11 High Frequency Ballasts shows the least important attribute for office buildings. From this ranking, EQ11 High Frequency Ballasts also shows the least important attribute where their mean value is 4.10. However, in order to identify the importance level based on their ranking, rescale is conducted as in Tab. 12.

By reviewing to their average mean according to area of assessment, it could be seen that thermal comfort has the highest average mean value, which is 4.62, followed by air quality which is 4.57. Verification and lighting, visual and acoustic comfort recorded 4.42 and 4.28, respectively. From this, the overall average mean value for IEQ attributes according to their assessment area is 4.47. the overall results of average mean value of IEQ attributes according to their assessment area is presented as Tab. 8 below.

Table 8: Average Mean Value According to Assessment Area of IEQ Attributes

Assessment Area	Average Mean
Air Quality	4.57
Thermal Comfort	4.62
Lighting, Visual & Acoustic Comfort	4.28
Verification	4.42
Overall Average Mean Value	**4.47**

In order to identify the important existing COVID-19 guideline and IEQ attributes, rescaling is conducted by using the index range formula. As for the index range for COVID-19 Standard Operating Procedure The maximum and minimum mean values for the COVID-19 Standard Operating Procedure are 4.84 and 4.31, respectively. Therefore, the index range for COVID-19 Standard Operating Procedure is 0.106. This indicates that there are 20 COVID-19 Standard Operating Procedure in this study, with mean value between 4.31 to 4.84. Tab. 9 below presents the overall index range for COVID-19 Standard Operating Procedure based on their scale category. From this, this shows that the important COVID-19 Standard Operating procedure in workplace is between the mean value of 4.63 to 4.84 and will be selected to develop a sustainable COVID-19 framework as an improvement for existing COVID-19 Standard Operating Procedure. However, the mean value between 4.31 to 4.62 indicates that this range of COVID-19 Standard Operating Procedure is not important to improve the current COVID-19 Standard Operating Procedure in workplace.

Table 9: Index Range for COVID-19 Standard Operating Procedure

Category of Scale	Range of Mean Value
Very Important	4.74 – 4.84

Important	4.63 – 4.73
Neutral	4.53 – 4.62
Not Important	4.42 – 4.52
Very Not Important	4.31 – 4.41

As for the index range for IEQ attributes, the maximum and minimum mean values for the IEQ attributes are 4.77 and 4.10, respectively. Therefore, the index range for IEQ attributes is 0.134. This indicates that there are 15 IEQ attributes in this study, with mean value between 4.10 to 4.77. Tab. 10 below presents the overall index range for IEQ attributes based on their scale category. From this, this shows that the important IEQ attributes is between the mean value of 4.52 to 4.77 and will be selected to develop a sustainable COVID-19 framework as an improvement for existing COVID-19 Standard Operating Procedure. However, the mean value between 4.10 to 4.51 indicates that this range of IEQ attributes is not important to integrate with COVID-19 Standard Operating Procedure in order to improve the current COVID-19 Standard Operating Procedure in workplace.

Table 10: Index Range for IEQ Attributes

Category of Scale	Range of Mean Value
Very Important	4.65 – 4.77
Important	4.52 – 4.64
Neutral	4.38 – 4.51
Not Important	4.23 – 4.37
Very Not Important	4.10 – 4.22

From the result above, Tab. 11 and Tab. 12 below presents the overall rescale for COVID-19 Standard Operating Procedure and IEQ attributes according to their mean value, respectively.

Table 11: Rescale for COVID-19 Standard Operating Procedure According to Mean Value

Standard Operating Procedure	Mean	Scale
Avoid contact with people who could be high-risk	4.84	Very Important
Wear face mask/face shield	4.78	Very Important
Frequent hand washing/hand sanitizer	4.78	Very Important
Relieve/Stay home if get sick/ feel unwell	4.78	Very Important
Avoid public spaces, gatherings, and crowds	4.73	Important
Avoid meeting in a large-scale size	4.73	Important
Practice personal hygiene and respiratory etiquette	4.72	Important
Avoid travelling who are in high-risk	4.71	Important
Self-isolate (14days) who has recently visited latest COVID-19 hotspots	4.71	Important
Practice physical distancing	4.70	Important
Avoid handshaking	4.65	Important
Register contact details to ease contact tracing	4.62	Neutral
Encourage work from home whenever possible	4.62	Neutral

Self-declaration on travel	4.62	Neutral
Perform alternate communication methods such as virtual platform	4.60	Neutral
Regular cleaning and disinfection surface	4.59	Neutral
Limit food handling and food sharing	4.58	Neutral
Temperature or thermal screening	4.47	Not Important
Avoid touching eyes, nose, and mouth	4.44	Not Important
Consider opening windows for natural lighting and better ventilation	4.31	Very Not Important

Tab. 11 presents the rescale for the COVID-19 Standard Operating Procedure according to their range of mean value. By referring to COVID-19 Standard Operating Procedure range of mean value for 'Very Important' which is 4.74 to 4.84, avoiding contact with people who could be high-risk, wear face mask/face shield, frequent hand washing/hand sanitizer, and relieve/Stay home if get sick/ feel unwell are located under 'Very Important' level since their mean value is in between the range of 4.74 to 4.84. Apart from that, avoid public spaces, gatherings, and crowds, avoid meeting in a large-scale size, practice personal hygiene and respiratory etiquette, avoid travelling who are in high-risk, self-isolate (14days) who has recently visited latest COVID-19 hotspots, practice physical distancing, and avoid handshaking is recorded under 'Important' level according to their range of mean value which is in between 4.63 to 4.73. From this, the 'Very Important' and 'Important COVID-19 Standard Operating Procedure will be selected to develop sustainable COVID-19 framework.

The COVID-19 Standard Operating Procedure of registering contact details to ease contact tracing, encourage work from home whenever possible, self-declaration on travel, perform alternate communication methods such as virtual platform, regular cleaning and disinfection surface, and limit food handling and food sharing are recorded in between the range of 4.53 to 4.62 where it indicates their importance level of 'Neutral'. Followed by the 'Not Important' level which are temperature or thermal screening and avoid touching eyes, nose, and mouth, their range mean value is recorded in between 4.42 to 4.52. Last but not least, as for "Very Not Important' level which is considering opening windows for natural lighting and better ventilation, it is recorded in between the range of 4.31 to 4.41. From this, the 'Neutral', 'Not Important', and 'Very Not Important' level are not important COVID-19 Standard Operating Procedure as they are ranked below than mean value of 4.63.

Table 12: Rescale for IEQ Attributes According to Mean Value

Indoor Environmental Quality Attributes	**Mean**	**Scale**
EQ2 Environmental Tobacco Smoke (ETS) Control	4.77	Very Important
EQ7 Air Change Effectiveness	4.74	Very Important
EQ1 Minimum IAQ Performance	4.62	Important
EQ5 Mould Prevention	4.55	Important
EQ3 Carbon Dioxide Monitoring and Control	4.53	Important
EQ8 Daylighting	4.51	Neutral
EQ6 Thermal Comfort: Controllability of Systems	4.49	Neutral
EQ14 IAQ Before/During Occupancy	4.42	Neutral

EQ15 Occupancy Comfort Survey: Verification	4.41	Neutral
EQ10 Electric Lighting Levels	4.40	Neutral
EQ4 Indoor Air Pollutants	4.38	Neutral
EQ12 External Views	4.31	Not Important
EQ9 Daylight Glare Control	4.24	Not Important
EQ13 Internal Noise Levels	4.22	Very Not Important
EQ11 High Frequency Ballasts	4.10	Very Not Important

Tab. 12 presents the rescale for the IEQ attributes according to their range of mean value. By referring to IEQ attributes range of mean value for 'Very Important' which is 4.65 to 4.77, EQ2 Environmental Tobacco Smoke (ETS) Control and EQ7 Air Change Effectiveness are located under 'Very Important' level since their mean value is in between the range of 4.65 to 4.77. Apart from that, EQ1 Minimum IAQ Performance, EQ5 Mould Prevention, and EQ3 Carbon Dioxide Monitoring and Control is recorded under 'Important' level according to their range of mean value which is in between 4.52 to 4.64. From this, the 'Very Important' and 'Important IEQ attributes will be selected to integrate with COVID-19 Standard Operating Procedure in order to improve the current COVID-19 Standard Operating Procedure for workplace.

The IEQ attributes of EQ8 Daylighting, EQ6 Thermal Comfort: Controllability of Systems, EQ14 IAQ Before/During Occupancy, EQ15 Occupancy Comfort Survey: Verification, EQ10 Electric Lighting Levels, EQ4 Indoor Air Pollutants are in between the range of 4.38 to 4.51 where it indicates their importance level of 'Neutral'. Followed by the 'Not Important' level which are EQ12 External Views and EQ9 Daylight Glare Control, their range mean value is in between 4.23 to 4.37. Last but not least, as for "Very Not Important' level which are EQ13 Internal Noise Levels and EQ11 High Frequency Ballasts, they are recorded in between the range of 4.10 to 4.22. From this, the 'Neutral', 'Not Important', and 'Very Not Important' level are not important IEQ attributes as they are ranked below than mean value of 4.52.

4.4. Sustainable COVID-19 Framework for Office Building

As for the third objective which is to develop sustainable COVID-19 framework for office building, the Cross Tabulation analysis is conducted regarding the important COVID-19 Standard Operating Procedure and IEQ attributes based on the findings from second objective which is to analyse the important IEQ attributes that relate to the existing COVID-19 management guideline for office building. As for the main purpose, important COVID-19 Standard Operating Procedure and important IEQ attributes is selected to construct the cross tabulation analysis in order to observe the main IEQ attributes that relate to the context of COVID-19 Standard Operating Procedure in workplace. Thus, this analysis is conducted to examine the relationship between these two variables based on employee perspectives.

The data from respondents has been verified through the index range scale. Tab. 13 below presents the COVID-19 Standard Operating Procedure and IEQ attributes are

chosen based on the level of 'Important' and 'Very Important' which the range of mean value are in between 4.63 to 4.84 for COVID-19 Standard Operating Procedure and 4.52 to 4.77 for IEQ attributes. From this analysis, the data presents the total number of respondents that have chosen the 'Very Important' and 'Important' level between these two variables to access the IEQ attributes that can assist in improving the COVID-19 Standard Operating Procedure. Most of the COVID-19 Standard Operating Procedure and IEQ attributes that being clustered in the index range scale has higher respond from the employees.

Based on the results below, most of employee has the same option in rating the importance level of COVID-19 Standard Operating Procedure and IEQ attributes. In other words, most of employees believe that IEQ attributes of EQ7 Air Change Effectiveness can be integrated with COVID-19 Standard Operating Procedure to develop sustainable COVID-19 framework for office building in order to improve the existing COVID-19 management guideline in workplace.

In spite of that, EQ7 Air Change Effectiveness is reviewed under thermal comfort. Reflecting to the average mean value according to assessment area of IEQ attributes in Tab. 8 above, thermal comfort has the highest ranking among other assessment area of IEQ. This reflects to this finding where EQ7 Air Change Effectiveness is the most important IEQ attributes in relations to the COVID-19 context. Therefore, a sustainable COVID-19 framework for office building is developed referring to the existing COVID-19 guidelines with green element which is EQ7 Air Change Effectiveness.

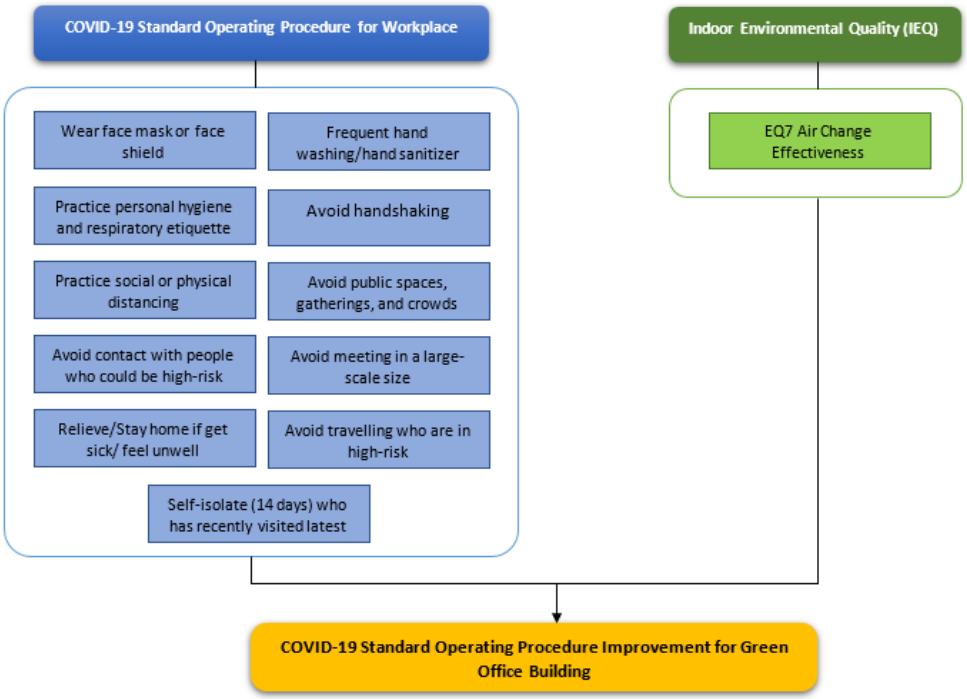
Since WHO acknowledge the transmission of COVID-19 virus is through airborne, thus, this result is relatable in providing the suitable COVID-19 framework for office building to prevent the spread of COVID-19 whereby providing an effective clean air delivery could limit the spread of viruses since people are spend their time mostly indoors. This finding aligned with Rendana (2020). Therefore, in the context of COVID-19, EQ7 Air Change Effectiveness is the most important attributes that can be integrated with COVID-19 Standard Operating Procedure in workplace. From this, the building manager or COVID-19 management team could use this finding as a reference or guidance in order to prevent or reduce the spread of COVID-19 in workplace from getting worst.

Nevertheless, the result from cross tabulation analysis is contributed to the outcome of this study in order to develop a sustainable COVID-19 framework for office building which not only resilient to COVID-19, but also resilient to sustainability. The data is chosen based on higher results from cross tabulation analysis between COVID-19 Standard Operating Procedure and IEQ attributes, as Tab. 13 above. Therefore, Figure 3 below presents the framework of the most highly important of IEQ attributes that can be contributed in COVID-19 Standard Operating Procedure improvement.

Table 13: Cross Tabulation Between COVID-19 Standard Operating Procedure (SOP) and Indoor Environmental Quality (IEQ) Attributes

COVID-19 SOP / **IEQ Attributes**	Air Quality				Thermal Comfort
	EQ1 Minimum IAQ Performance	EQ2 Environmental Tobacco Smoke (ETS) Control	EQ3 Carbon Dioxide Monitoring and Control	EQ5 Mould Prevention	EQ7 Air Change Effectiveness
Wear face mask or face shield	87	88	85	85	**90**
Frequent hand washing/hand sanitizer	89	90	86	87	**92**
Practice personal hygiene and respiratory etiquette	88	89	85	86	**91**
Avoid handshaking	84	85	81	82	**86**
Practice social or physical distancing	88	88	85	85	**90**
Avoid public spaces, gatherings, and crowds	89	90	86	87	**92**
Avoid contact with people who could be high-risk	89	90	86	87	**92**
Avoid meeting in a large-scale size	89	90	86	87	**92**
Relieve/Stay home if get sick/ feel unwell	88	89	85	87	**91**
Avoid travelling who are in high-risk	87	88	85	85	**90**
Self-isolate (14 days) who has recently visited latest COVID-19 hotspots	88	89	85	87	**91**

Figure 3: Sustainable COVID-19 Framework for Office Building



5. CONCLUSION

There are eleven important COVID-19 Standard Operating Procedure to prevent the spread of COVID-19 based on employee perspectives which are avoiding contact with people who could be high-risk, wear face mask/face shield, frequent hand washing/hand sanitizer, relieve/stay home if get sick/feel unwell, avoid public spaces, gatherings, and crowds, avoid meeting in a large-scale size, practice personal hygiene and respiratory etiquette, avoid travelling who are in high-risk, self-isolate (14 days) who has recently visited latest COVID-19 hotspots, practice physical distancing, and avoid handshaking. Meanwhile, there are five important IEQ attributes based on employee perspectives which are EQ2 Environmental Tobacco Smoke (ETS) Control, EQ7 Air Change Effectiveness, EQ1 Minimum IAQ Performance, EQ5 Mould Prevention, and EQ3 Carbon Dioxide Monitoring and Control. However, EQ7 Air Change Effectiveness presents the most important IEQ attributes that relate to the context of COVID-19 Standard Operating Procedure to prevent COVID-19 spread.

Those results obtained could be beneficial as it could be used as guidance for COVID-19 management team in workplace in order to improve the COVID-19 Standard Operating Procedure in workplace to prevent the spread of COVID-19. By identifying and producing a framework of sustainable COVID-19 framework for office building, the building manager or COVID-19 management team in workplace is encouraged to set up a

sustainable COVID-19 framework as an improvement for existing COVID-19 guideline by integrating with IEQ. However, this framework is not only resilient to COVID-19, but also resilient to sustainability and can be used as future reference in context of sustainability.

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