COMPLIANCE OF AIR CONTAMINANTS WITHIN THE MAIN PRAYER HALL OF MASJID SAYYIDINA ABU BAKAR UTEM, MELAKA WITH MALAYSIA'S INDOOR AIR QUALITY STANDARD

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Bachelor of Mechanical Engineering Technology (Refrigeration And Air Conditioning System) with Honours

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2023

DECLARATION

I declare that this Choose an item. entitled “Compliance Of Air Contaminants Within the Main Prayer Hall Of Masjid Sayyidina Abu Bakar UteM, Melaka with Malaysia’s Indoor Air Quality Standard” is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology (Refrigeration and Air Conditioning System) with Honours.

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Date : 20 January 2023

DEDICATION

To my beloved parents, dear lecturers and fellow friends

ABSTRACT

Poor air quality have been a serious issue that nowadays people always talked about. It has become a global problem as it happen in almost every part of the world. How do we know that it is poor air quality?. In the air contains many particles, matters and gases which human breath in every single time as it part of photosynthesis sycle. In general, the method to measure the level of air quality need a lot of procedure to be taken into because it is a complex and require many resources to refer. This research expected to assess the level of concentration of air contaminants in the main prayer hall of Masjid Sayyidina Abu Bakar UteM, Melaka to see whether it compliance with guideline limit in Industrial Code of Practice ICOP IAQ 2010. In the guideline already provided the acceptable ranges of air contaminants for better quality of air in the a building for its occupant comfort. The parameters to be record is carbon dioxide, particulate matter, total volatile organic compound (TVOC), air temperature and relative humidty. There are variety of sources for air contaminants such as smoke from vehicles, building material, furnishing and many more. These contaminants can lead to serious effect on health as the body breath in more toxins gas. This research use 3M-EVM as an equipment to measure all of the air contaminants as it is an accurate device to assess the level of concentration and identify the contaminants.

ABSTRAK

Kualiti udara yang buruk telah menjadi isu serius yang selalu diperkatakan oleh orang ramai. Ia telah menjadi masalah global kerana ia berlaku di hampir setiap pelusuk dunia. Bagaimana kita tahu bahawa ia adalah kualiti udara yang buruk?. Di udara mengandungi banyak zarah, jirim dan gas yang dihirup oleh manusia setiap masa sebagai sebahagian daripada kitaran fotosintesis. Secara umumnya, kaedah untuk mengukur tahap kualiti udara memerlukan banyak prosedur yang perlu diambil kira kerana ia adalah kompleks dan memerlukan banyak sumber untuk dirujuk. Penyelidikan ini dijangka dapat menilai tahap kepekatan bahan cemar udara di solat utama Masjid Sayyidina Abu Bakar UteM, Melaka untuk melihat sama ada ia mematuhi had garis panduan dalam Kod Amalan Perindustrian ICOP IAQ 2010. Dalam garis panduan tersebut sudah disediakan julat yang boleh diterima. untuk kualiti udara yang lebih baik di dalam bangunan untuk keselesaan penghuninya. Parameter yang perlu direkodkan adalah karbon dioksida, bahan zarah, jumlah sebatian organik meruap (TVOC), suhu udara dan kelembapan relatif. Terdapat pelbagai sumber pencemar udara seperti asap dari kenderaan, bahan binaan, perabot dan banyak lagi. Bahan cemar ini boleh membawa kepada kesan yang serius terhadap kesihatan kerana badan menghirup lebih banyak gas toksin. Penyelidikan ini menggunakan 3M-EVM sebagai peralatan untuk mengukur semua bahan cemar udara kerana ia merupakan alat yang tepat untuk menilai tahap kepekatan dan mengenal pasti bahan cemar.

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LIST OF SYMBOLS AND ABBREVIATIONS

IAQ	Indoor Air Quality
ICOP	Industry Code of Practice
AQI	Air Quality Index
IEQ	Indoor Environmental Quality
TVOC	Total Volatile Organic Compound
PM	Particulate Matter
CO_2	Carbon Dioxide
RH	Relative Humidity
DOSH	Department of Occupational Safety and Health

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CHAPTER 1

INTRODUCTION

1.1 Background

Every day, Muslims visit their mosques to pray and engage in other acts of worship. Mosques are considered to be holy places by Muslims. Being in the mosque can help us feel more at ease and relaxed, which is especially beneficial when we are praying in the mosque's main hall. It has also become a location where tourists come to see and see for themselves the one-of-a-kindness and beauty of the mosque with its many unusual wall carvings and the majestic architecture of the mosque. In addition, it has become a place where people gather to pray.

The main prayer hall of the mosque is an indoor area that is open to the public and serves as the location for Muslims to say their prayers five times a day. This area is always full of worshippers. The primary prayer halls are designed to provide the worshippers with an appropriate level of thermal comfort, allowing them to entirely focus on their prayers without being distracted by their surroundings. To ensure that the worshippers have an appropriate environment to pray in, the majority of mosques in Malaysia place carpeting on the floor of the main prayer hall, which is equipped with air conditioning. Because the mosque is open to the public and is used on a regular basis, the air quality needs to be maintained and checked on a regular basis because it is subject to contamination from both interior and outside sources (N. Rasli, 2019).

There are many various types of pollutants that can be found in the air, including carbon monoxide (CO), carbon dioxide (CO2), particulate matter, and many others. Lack of ventilation, bad air quality outside, a lack of maintenance, and many other factors can all have a negative impact on the air quality. All of these factors have the potential to influence the persons inside the prayer hall, whether they are engaged in the act of praying or some other activity. There are standards for Malaysia's Indoor Air Quality that each and every mosque in the country needs to follow in order to maintain a healthy environment and higher standards for air quality (Al-Ajmi, 2017)..

1.2 Problem Statement

Various factors can affect indoor air quality in the main prayer hall of the mosque and there are many indoor air contaminants need to be measure its degree of compliance whether it is acceptable with the guideline limit. For better air quality, all the data obtained need to be within the range set by Malaysia's Indoor Air Quality Standard so that people who come to the mosque can have comfortable and peacefulness while completing their activities.

In order to gather accurate data, the equipments that are used in the process of measuring the levels of indoor air contaminants need to be prepared and properly set up at the location that has been determined. The research is carried out in the middle of the Dhuhr prayer on Friday and the Asr prayer in the afternoon. It takes a significant amount of time to acquire the data.

1.3 Research Objectives

Main objective:

- To assess the extent to which five air contaminants comply to the standards limit outlined in the Industrial code of practise (ICOP) IAQ 2010 during the Dhuhr/Friday and Asr prayer times in the mosque's main prayer halls

Specific objectives

- To measure the mean concentration of five air contaminants in the main prayer halls of Masjid Sayyidina Abu Bakar Utem Melaka.
- To evaluate the level of contamination in the air in relation to the guideline limit recommended by the ICOP IAQ in 2010.

1.4 Scope of Research

The Industry Code of Practice (ICOP) Indoor Air Quality 2010 was used as the base for the standard usage in this research. The primary objective of this study is to assess the extent to which air contaminants are in compliance with the guidelines limit. The main prayer hall of Masjid Sayyidina Abu Bakar Utem, will serve as the location for the study area.

Carbon dioxide, total volatile organic compounds, particulate matter, and relative humidity are the air quality parameters that need to be collected. The research will be conducted over a period of five hours, beginning at noon and continuing through the evening prayer times of Dhuhr and Asr. In order to determine whether there is a significant difference in the air quality outside and inside the mosque, samples will be taken both places.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The level of cleanliness or filthiness of the air is referred to as the "air quality." Because polluted air can be hazardous to both human health and the environment, the quality of the air must be carefully monitored. The Air Quality Index, often known as the AQI, is used to evaluate the quality of the air. The Air Quality Index (AQI) is similar to a thermometer with a temperature range of 0 to 500 degrees. The Air Quality Index is a daily air quality report index that displays an overall rating of how clean or unclean the air is as well as the potential adverse effects on one's health. The AQI is a tool that measures the potential adverse effects on one's health that can arise from breathing contaminated air within a few hours or days (American Lung Association, What is the air quality index, 2020). When air quality is poor, it can create health problems such as poor respiratory health, which can be traced back to toxins in the surrounding air that have a harmful influence both in the short term and the long term (J. Beitler, 2020).

Due to the steady circulation of air, the quality of the air might change from day to day and even from hour to hour. Both the flow of air through a region and the ways in which people interact with it directly contribute to the quality of the air in that location. Mountain ranges, coastlines, and changes in land use are all factors that can affect whether air pollutants concentrate in a certain location or diffuse away from that place. On the other hand, the kinds and amounts of pollutants that are released into the air have a bigger influence on the quantity of air that is present. Some pollutants are introduced into the

atmosphere as a result of natural processes, such as erupting volcanoes or dust storms; however, the vast majority of pollutants are the result of activities carried out by humans. Aside from that, wind is another factor that plays a role in determining the quality of the air we breathe. A coastal region that contains an island mountain range may experience higher levels of air pollution during the day, but lower levels of air pollution during the night as a result of the breeze blowing in the opposite direction (Rinkesh, 2020).

2.2 Indoor Environmental Quality (IEQ)

The term "indoor environmental quality" (IEQ) refers to how a building environment affects the health of its occupants. IEQ is affected by many factors, such as illumination, air quality, and moisture. It has an impact on the comfort and well-being of residents. In the research of IEQ, other issues including sick building syndrome and poor indoor air quality are also taken into account. The interactions that these factors have with one another complicate the relationship between occupant comfort and well-being parameters and IEQ even more (Al Horr Y, 2016). The environment within is pretty complicated. Building occupants may be exposed to a variety of contaminants, such as office equipment, cleaning supplies, water-damaged building materials, furniture, carpets, and microbiological growth including mould, fungal, and bacterial, in the form of gases and particles.

Construction work, pollution from outside sources, and cigarette smoke are all examples of potential pollutants. Relative humidity, ventilation, and indoor temperatures can all affect how people react to their surroundings. Workers may be able to avoid or recover from illnesses related to the building by comprehending and removing the sources of toxins in the indoor environment. There is practical advice for improving and

maintaining the indoor environment (NIOSH, 2013). People inside a building may get dissatisfied if the inside environment is poor. these factors include thermal comfort, ventilation, indoor air quality, electromagnetic radiation, and many others. Environmental regulations that are improved will make people happier. Figure 2.1 shows the indoor environment quality components.

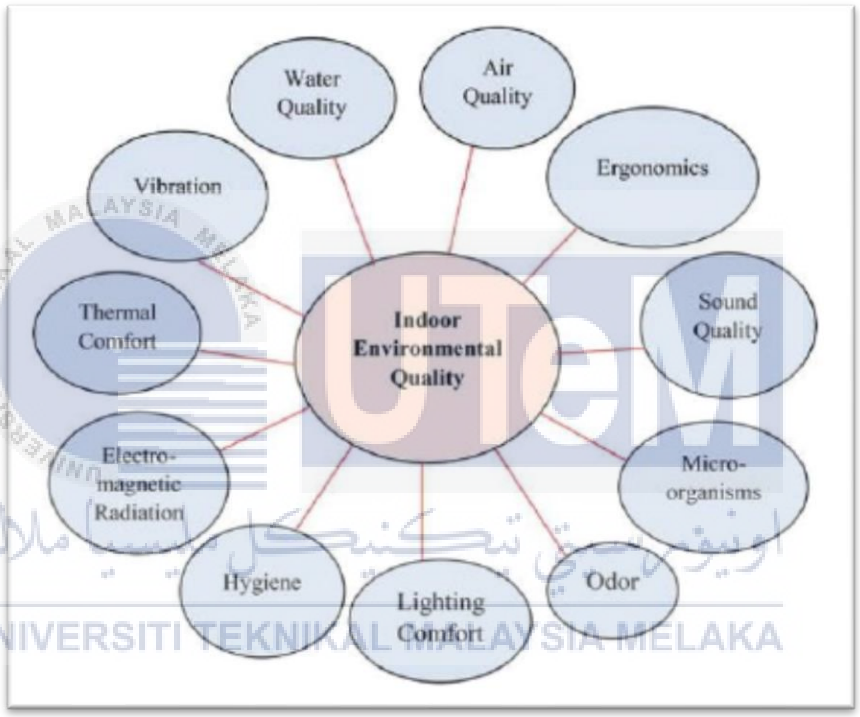

Figure 2.1 Components of IEQ

2.3 Indoor Air Quality (IAQ)

Indoor air quality (IAQ) is the term used to describe the air quality inside and around buildings and other structures, especially as it relates to the health and comfort of occupants. Lowering the probability of having an indoor health issue can be done by identifying and removing prevalent indoor contaminants. The health effects of indoor air pollution may manifest right away or years later**.** (EPA, 2021). Indoor pollutants have many different sources. Studies are conducted into the potential health impacts of indoor combustion products from cooking, heating, and smoking tobacco. Volatile Organic Compounds (VOCs), which are produced by paints, varnishes, solvents, and preservatives, may be particularly significant. If the building's structure keeps deteriorating, exposure to asbestos may also be a substantial risk factor for developing long-term respiratory conditions. (Jones, 1999).

As a result of the fact that individuals spend up to 90 percent of their time indoors, virtually everyone has the potential to be subjected to indoor air pollution, the severity of which is determined by the buildings in which they reside as well as any preexisting health conditions they may have. Children are at a greater risk of suffering the negative health effects of polluted indoor air because of the amount of time they spend in educational institutions. Schools are particularly vulnerable because they frequently suffer from poor interior air quality due to age and a lack of resources to address issues related to the environment found indoors. This presents a challenge on a national scale. Schools are particularly vulnerable because they house children. Because their systems are still developing, children are especially susceptible to this risk because it is physically more difficult for children to process toxins than it is for adults. This makes children more at risk than adults. (Bridger, What cause poor indoor air quality?, 2021).