INDOOR AIR QUALITY (IAQ)

By

Cawangan Kejuruteraan Mekanikal

PARLIMEN MALAYSIA

29-30 SEPTEMBER 2015

Content

1. Introduction
2. Objectives
3. Assessment Team
4. Findings
5. Recommendation
6. Photo
7. References

Introduction

1. This IAQ assessment was conducted on 29-30 September 2015 at Blok Menara and Blok Dewan, Parliament Malaysia,

2. This assessment was done as requested by Ketua Jurutera, Parliament Malaysia regarding indoor air quality at their workplace.

Objectives

1. To determine the **air temperature, relative humidity and air movement** at the place of work.

2. To determine **chemical contaminants**; CO, CO_2, formaldehyde, ozone, total volatile organic compound (TVOC) at the place of work.

3. To determine **respirable particulate** and at the place of work.

4. To **evaluate the exposure** of the occupants to the indoor air contaminants either from indoor or outdoor sources

5. To **recommend necessary action** to be taken to improve the indoor air quality at the place of work

CKM IAQ Assessment Team

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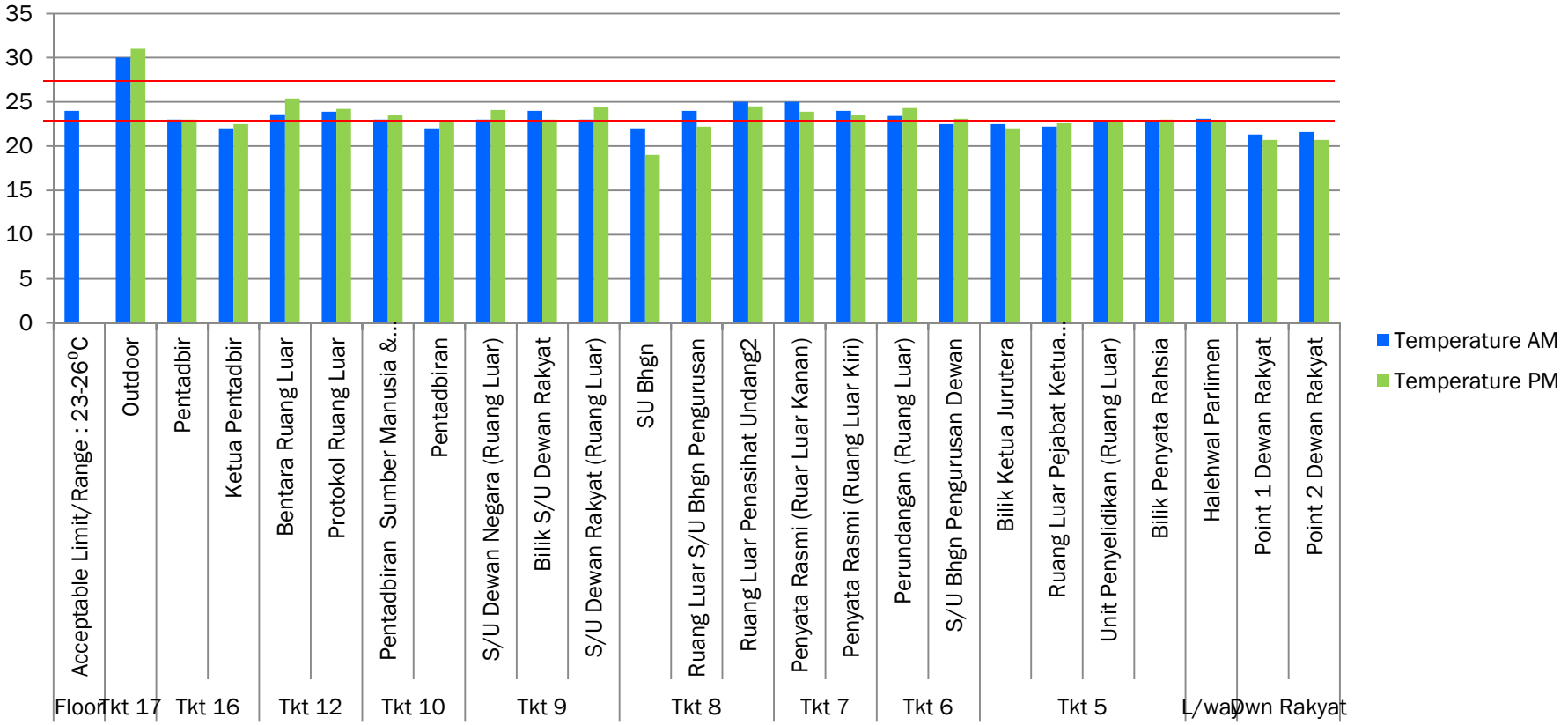
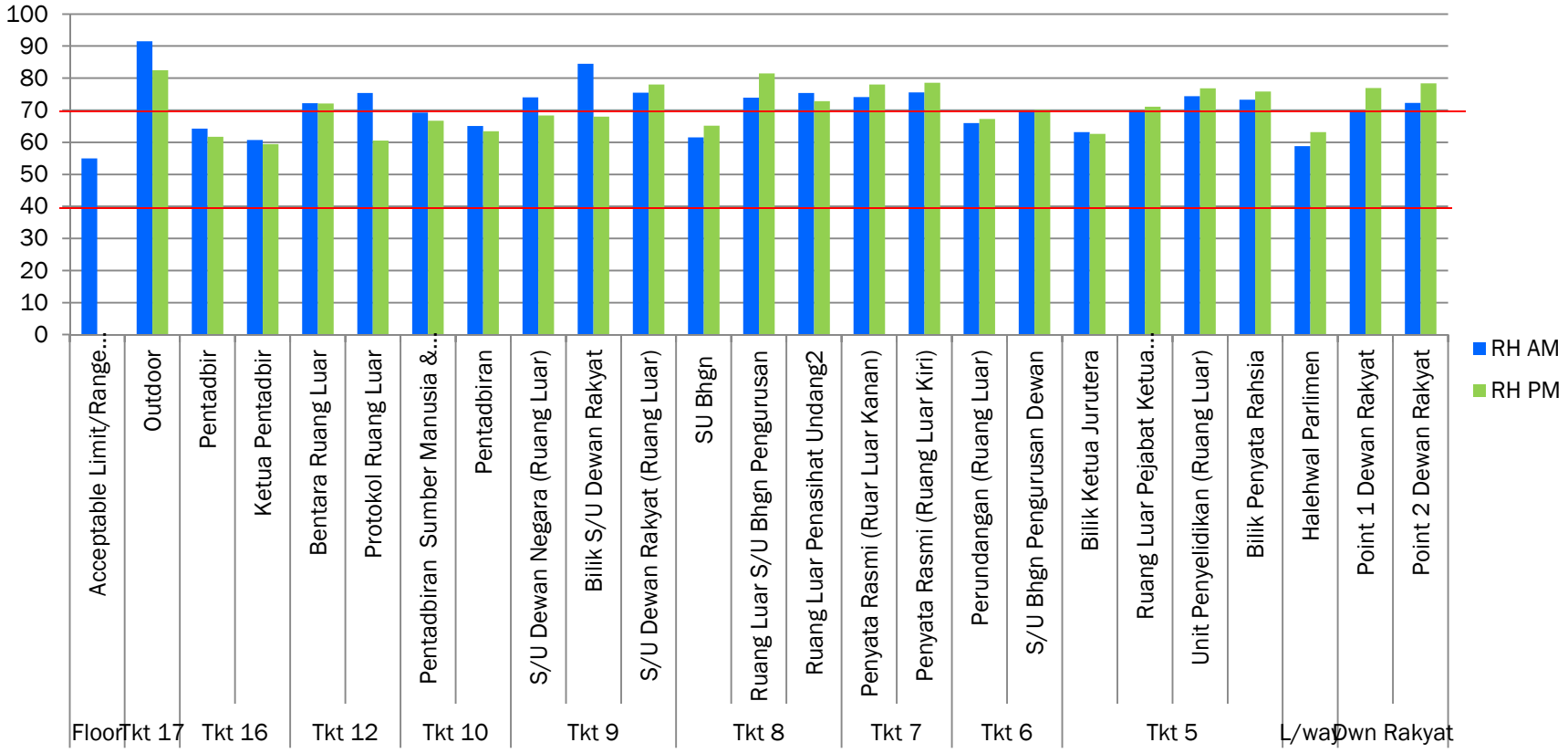
5. Mohd. Affendy Bin Sukarseh

Temperature (^{o}C)



Most of the workplace are below acceptable limit which is Temperature of 23^{0}C - 26^{0}C
According to ICOP by DOSH and JKR IEQ Guidelines 2013

Relative Humidity (%)



Some of the work places are above acceptable limit. Recommended RH comfort range is between 40%-70% for an office building

Recommendations

High Level of Relative Humidity

The lack of Outdoor Air Control appeared to be the most consistent cause of high RH in conjunction with mechanical issues. The malfunctioning of AC equipment often led to high Relative Humidity.

a) MVAC Maintenance

It is recommended that the Building Management ensure the maintenance of AC system periodically to control the RH level is within the recommended range so that IAQ Conditions with ventilation for occupants at 5 CFM / person are met.

In addition to the direct effect on occupants' comfort is that poorly ventilated areas will facilitates the growth of fungi (mould) and bacteria that can cause respiratory problems and/or allergic reactions. Thus, it provides the conditions for dust mite populations to grow, which can affect asthma sufferers.

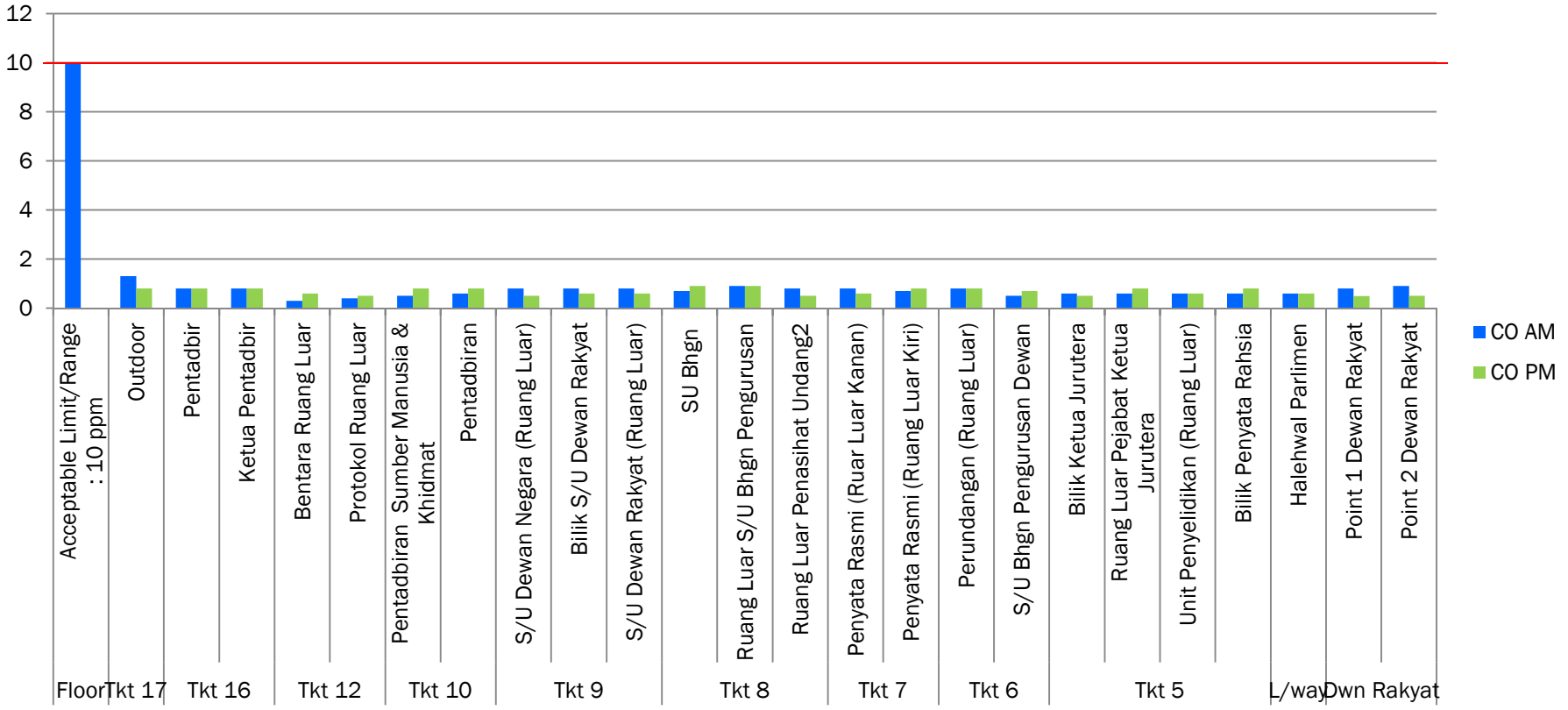
The results of odours in poorly ventilated spaces will cause condensation forming on windows, walls and ceilings. Condensation potentially will damage building materials.

b) Bacterial and Fungal Count

From the assessment done, it indicated that the level of RH is high. High level of RH can contribute to microbiological growth in the building. It is recommended that the Building Management conduct Microbial Decontamination Programme thoroughly the affected area immediately in order to rectify the contamination issue.

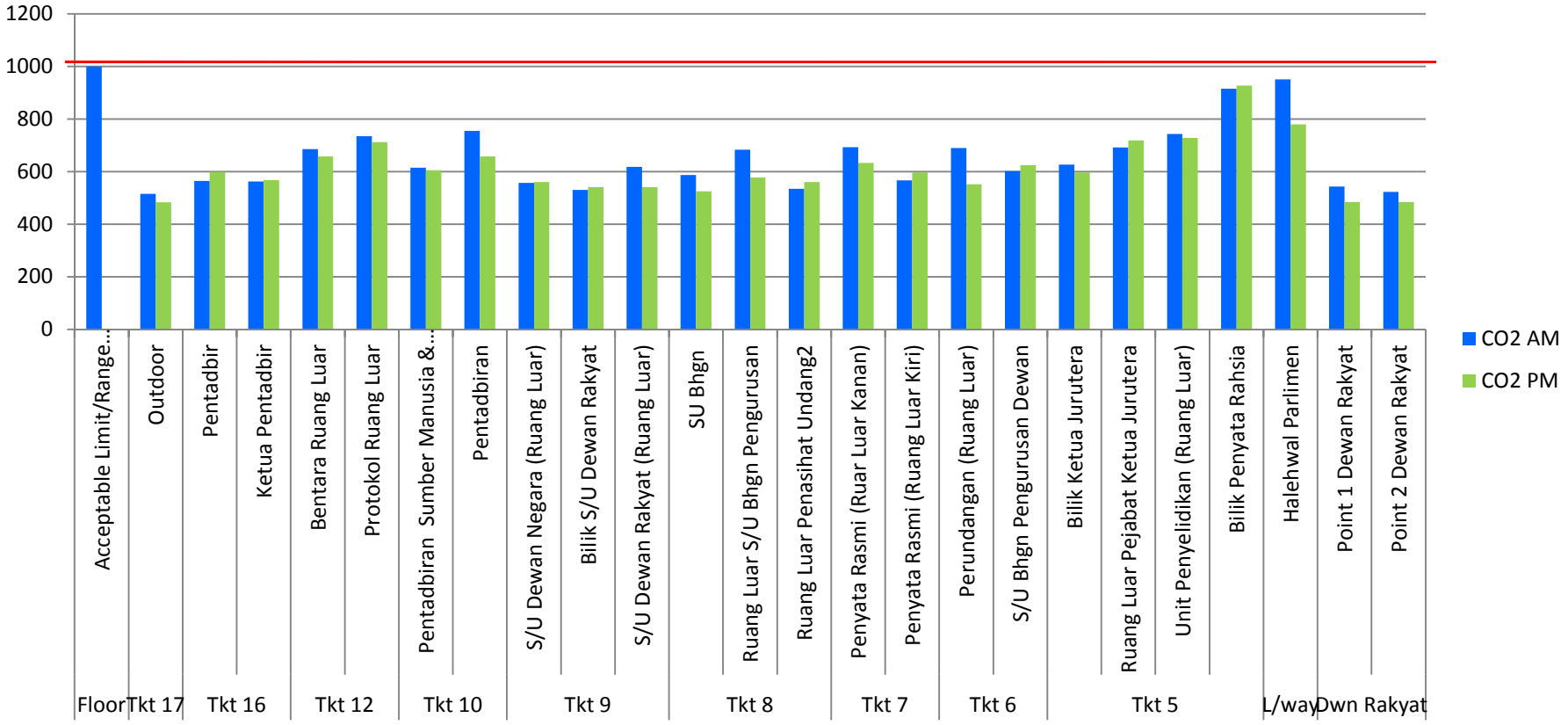
It is recommended to install air purification devices to purify and disinfect the contaminated air during working hours. The air purifier shall be capable of removing and to disinfecting microorganism including bacteria, fungi and viruses.

CO (ppm)



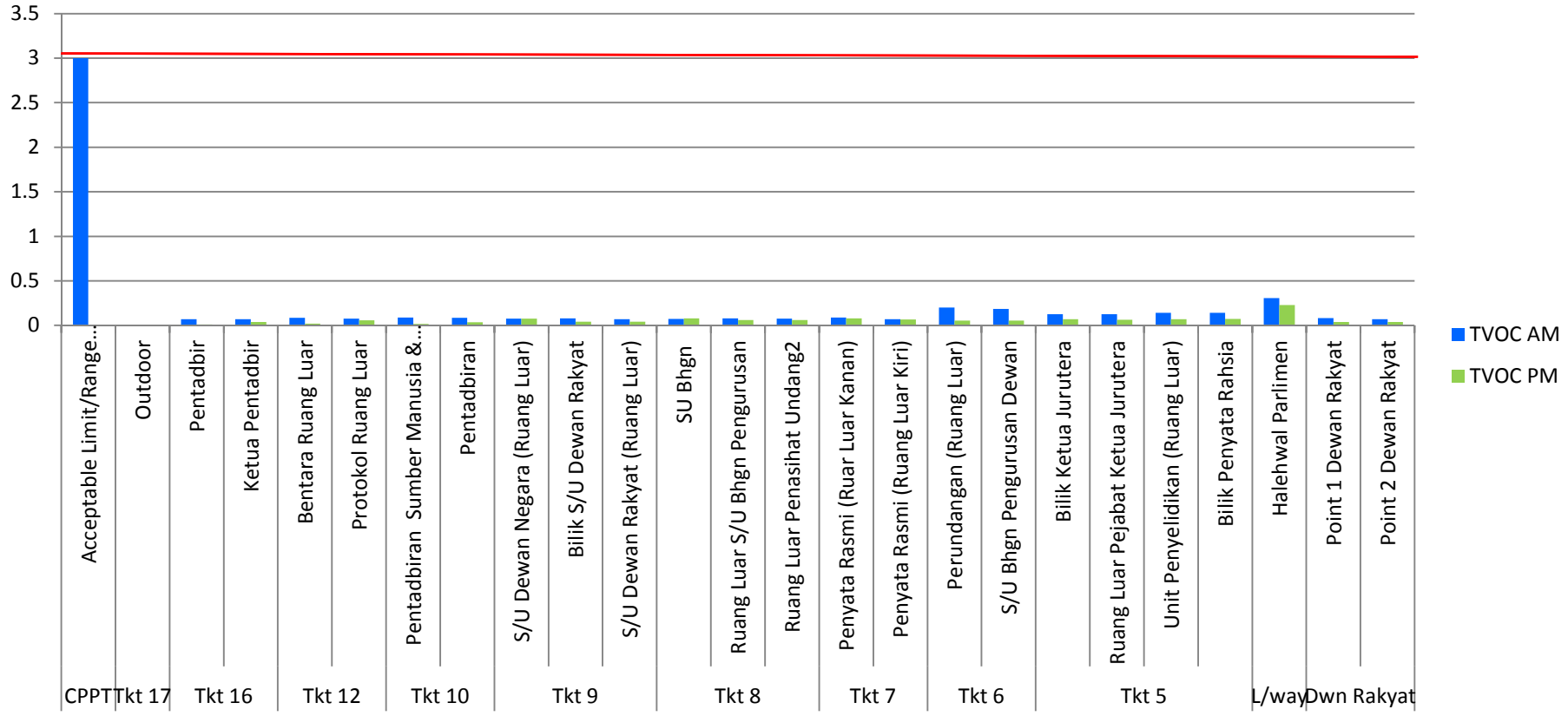
CO level is below acceptable limit which refer to ICOP and JKR IEQ Guidelines stipulate that CO level is 10ppm

CO_2 (ppm)



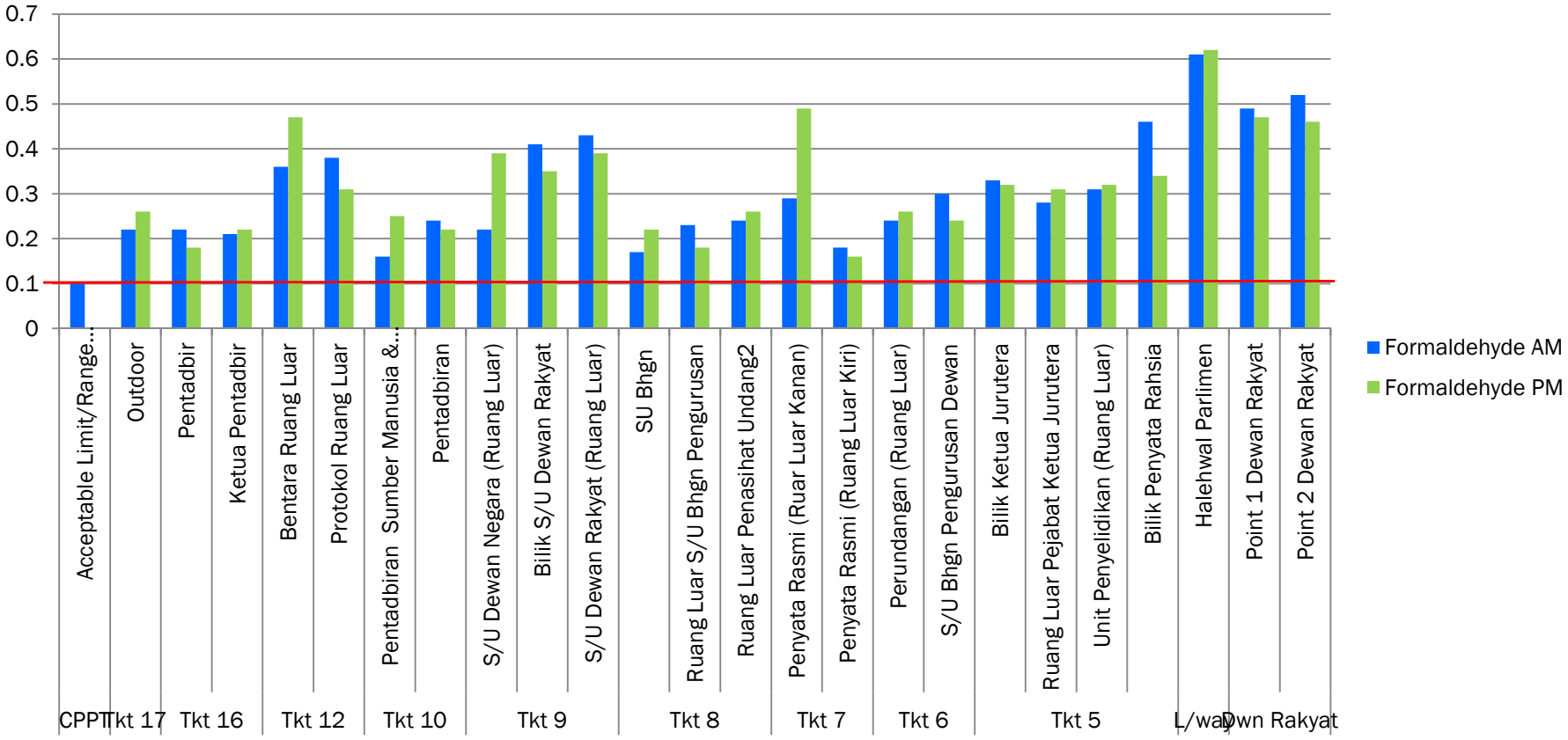
CO2 level inside this building were within the ceiling limit of 1000ppm as recommended by ICOP and JKR IEQ Guidelines

Total VOC (ppm)



Total VOC level is below acceptable limit compliance with ICOP and JKR IEQ Guidelines is 3ppm

Formaldehyde (ppm)



Formaldehyde level is **above acceptable limit** of 0.1ppm set by ICOP and JKR IEQ Guidelines

Recommendations

High Level of Formaldehyde

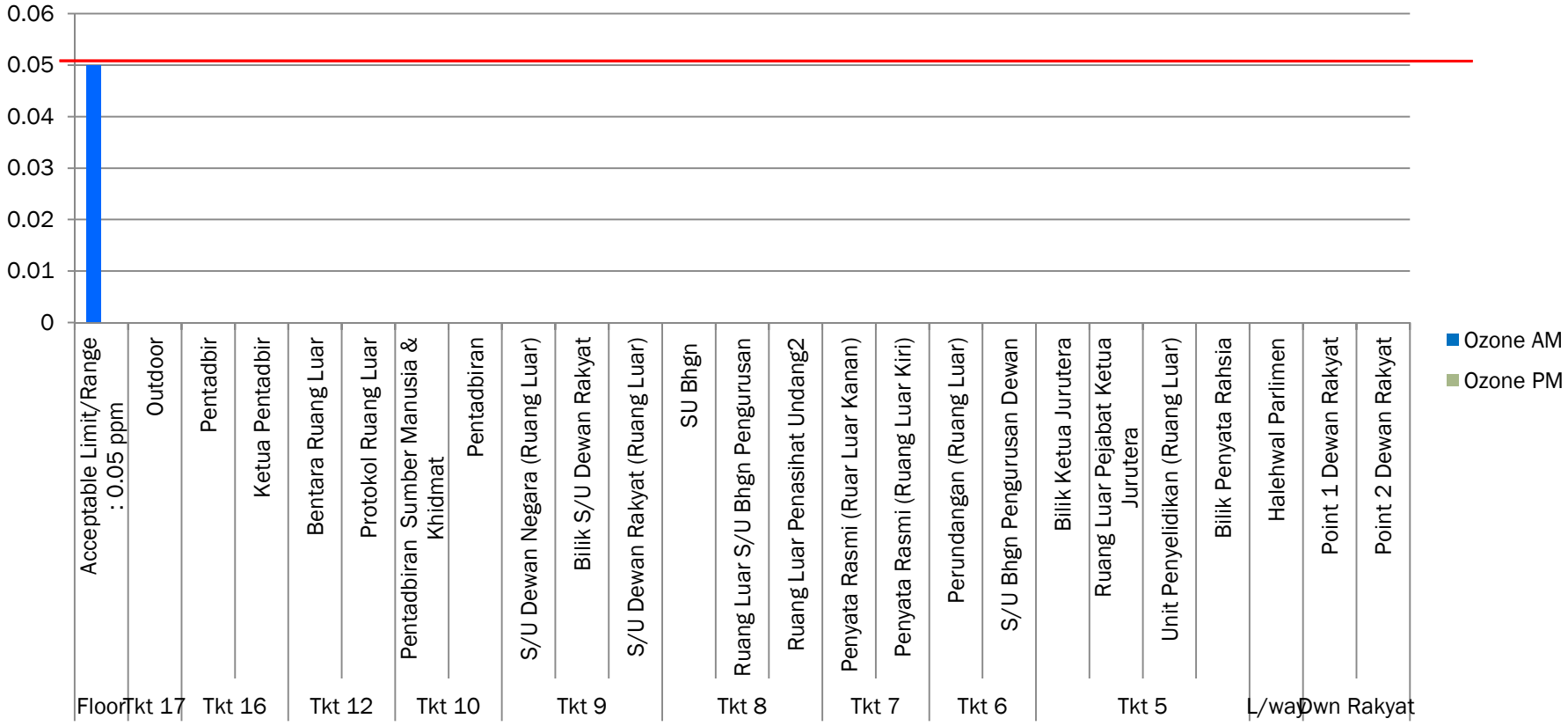
Formaldehyde is a strong irritant from VOC gases that cause watery eyes, respiratory irritation and other major health problems. Sources of formaldehyde include adhesive material from furniture and building interior products.

Excessive exposure of formaldehyde can cause burning sensations in the eyes, nose and throat, wheezing and coughing, fatigue, skin rashes, headaches, loss of concentration and nausea. Larger doses can cause asthma attacks as well as damage to the liver, kidneys and the central nervous system.

a) Building Flushing

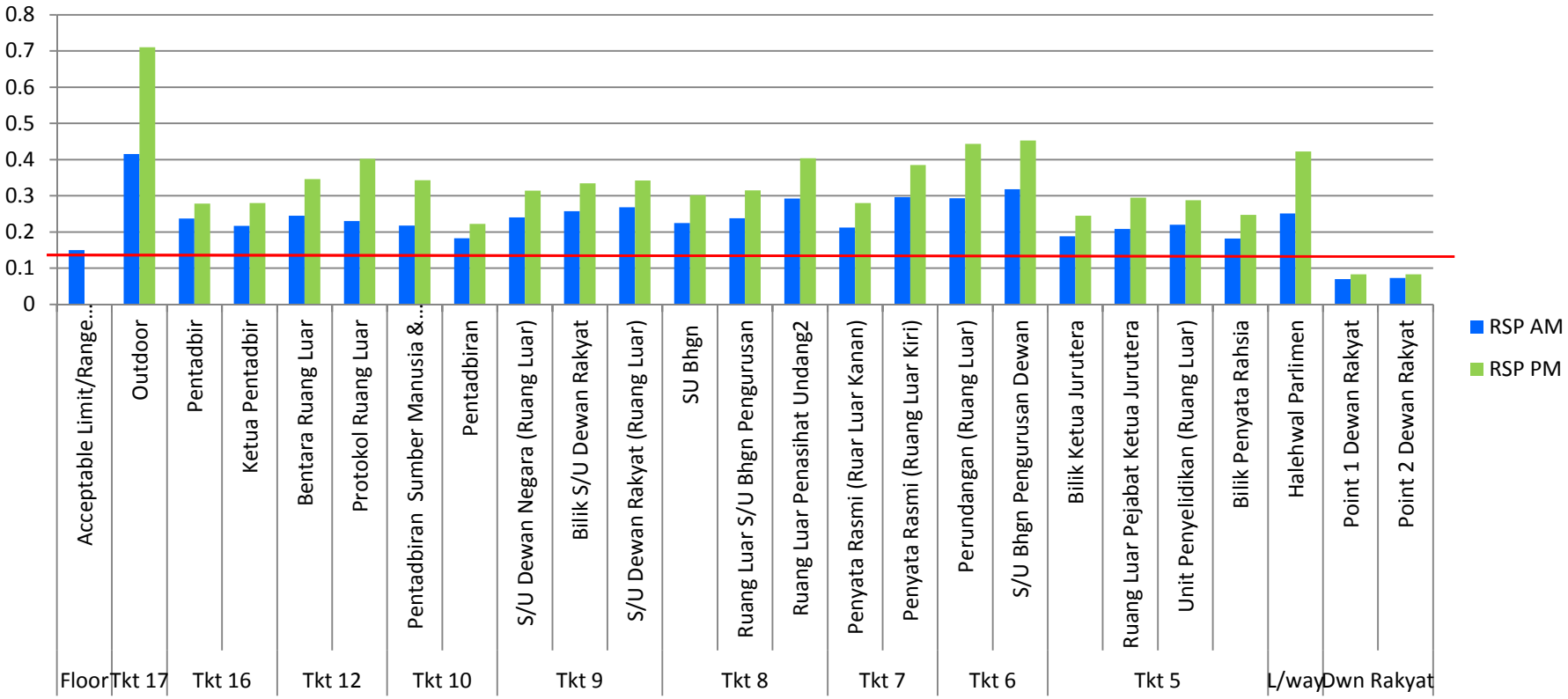
High level of formaldehyde in parliament's building might be detected from the sources of perfumes/ potpourri, air freshener , wooden furniture and latex/ PVC chairs. The low level of air movement also causes the chemical gases trapped inside the building. It is recommended to Building Management to conduct building flushing to remove the chemical gases detected inside the building.

Ozone (ppm)



Ozone level is below acceptable limit 0.05ppm recommended by ICOP and JKR IEQ Guidelines

Respirable Particulates (ppm)



Most of the work place the respirable particulate are above acceptable limit 0.15mg/m3 recommended by ICOP and JKR IEQ Guidelines

Conclusions & Recommendations

High Level of Respirable particulate

a) Inspection and Maintenance the AC Unit

It is strongly proposed that the Building Management conduct an inspection at the AC ducting/filter to identify any possible high dust content due to the AC lifetime duration.

The component of AC system shall be cleaned and maintained with scheduled cleaning programme. The components of units shall be cleaned in such a way that the indoor air quality is not adversely affected by the cleaning and maintenance activities.

b) Housekeeping

It is recommended to have a frequent cleaning schedule for the carpet. It is required to replace the carpet if the carpet is damaged.

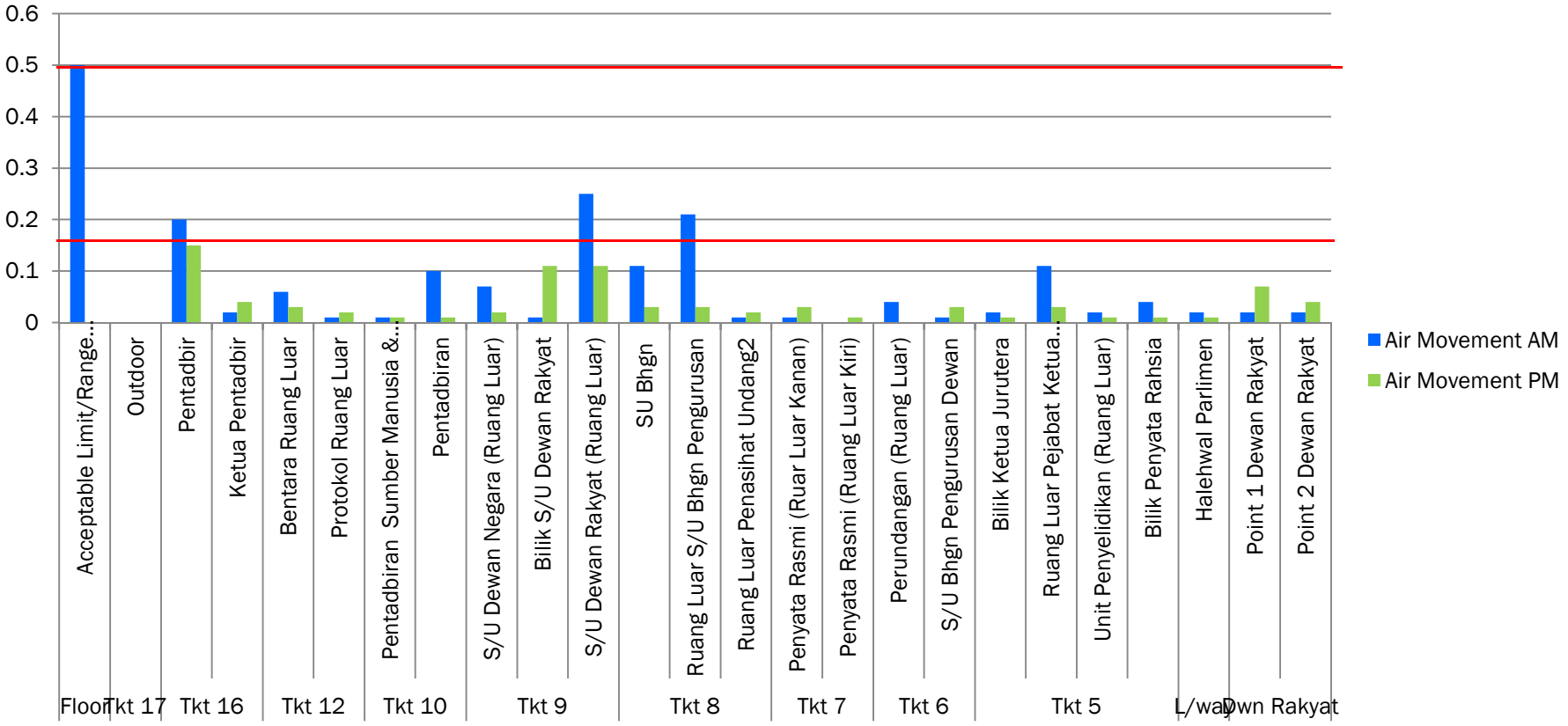
c) Occupant Activity

It is recommended to restrict the occupant from having meal in the office or in the workplace and use only pantry or areas dedicated for eating. The use many of stand fans should be avoid because it will generate the dust deposited in the carpet spread into the air.

Health effect

Excessive exposure to high particulate matters may cause irritation to eyes and lungs. Commonly reported health syndrome includes sneezing, asthma, coughing, itchy eyes, respiratory disease and cardiopulmonary mortality.

Air Movement (m/s)



The indoor air movement at most of the sample points were **below acceptable limit** . Allowable limit is between 0.15m/s-0.5m/s at the work place.

Recommendations

Low Level of Air Movement

The poor airflow can be due to the space layout and certain design or renovation issue. Nevertheless, it is not a major concern as the air supply rate at the assessment area can be adjusted to meet respective occupancy comfort due to recommended acceptable limit range.

References

1. *Industry Code of Practice on Indoor Air Quality 2010, Department of Occupational Safety and Health, Ministry of Human Resources Malaysia*

2. *Guidelines on Indoor Environmental Quality (IEQ) for Government Office Building 2013, Jabatan Kerja Raya Malaysia*

3. *Indoor Air Quality: A System Approach, Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA)*

Thank You !!!

- *The End*