

Report

Mechanical Services Ventilation Review

General Overview

Government of Western Australia – Department of Health

Confidential

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About PDF Engineering

PDF Engineering provides practical building mechanical services advice. Our skills encompass design, construction and facilities management of mechanical services including heating, ventilation and air-conditioning systems, cooling towers, building controls and tri-generation plant.

We have the breadth of skills and experience required to deliver total, integrated and sustainable mechanical services solutions that are both technically and commercially astute and are able to draw on over 50 years' experience.

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1 Introduction

1.1 PURPOSE

PDF Engineering have been asked by the Government of Western Australia Department of Health to perform a review of the ventilation systems in place in the quarantine hotels being used in Perth. The purpose of this review is to understand the air pathways that currently exist and to identify possible methods of reducing the risk of contaminated air being spread from hotel rooms to the corridors.

The PDF Engineering report considers the ventilation factors in isolation of other mitigating controls that influence the risk of transmission to workers and therefore may rate the hotels differently based on ventilation design and efficiency alone. The primary role of Dr Laurie Glossop was to assess the risk of transmission to the security guards and other personnel working in quarantine hotels.

1.2 SCOPE

PDF Engineering Pty Ltd have been engaged to perform the following as part of this assessment.

Review of existing ventilation system to assess the following:

- the suitability (with regard to ventilation and air-handling) of each of the 9 existing premises and 1 possible new premise to be used as State controlled quarantine hotels.
- any improvements or additions to building mechanical ventilation systems to prevent infection to hotel staff, guests and visitors.
- system improvements to reduce the risk of transmission within a hotel environment (e.g. factors to consider in hotel selection, room allocation and positioning of security guard stations).

This report is specifically addressing the ventilation and air movement pathways. This report does not intend commenting on any clinical, hygienic items nor does it claim that this is the sole pathway for viruses and other pathogens to be transmitted in a building such as a hotel.

This report should be read in conjunction with the report provided by Occupational Hygienists – Glossop Consultancy.

1.3 CLARIFICATIONS

It should be noted that the items mentioned in this report as issues, are not design or installation issues with the hotel ventilation and air conditioning systems. This report does not suggest that the hotel is not code compliant in its current state. This report is intended to identify issues with air movement in respect of the use as an isolation facility for the protection against COVID-19. The hotels in question were not originally designed with isolation in mind as an alternative use.

1.4 ANALYSIS CRITERIA

Ventilation of Rooms

- On the basis that containment is most likely to help isolate any pathogens in the air to the room and hence the patients involved, quarantine rooms are preferably at negative pressure relative to the corridors of the hotels. Neutral pressure rooms can be used, but each room should be checked before use, to confirm neutral pressure still exists. This criterion will prevent air moving between occupied spaces, such as from a room into the corridor or into opposite facing rooms. Negative pressure rooms are preferred as they ensure any suspended droplets and aerosols of the virus stay within the room when the door is opened.

- Operable windows in rooms are not preferred as this can cause fluctuations in room pressure as a function of wind direction and speed. If the windows can be made inoperable it would be preferred.
- Preferentially only 100% fresh air / outside air is being supplied to rooms.
- In a hotel where the airflow for the supply air and the exhaust can be varied to achieve a negative or neutral pressure to the rooms, but still be able to keep the rooms sufficiently cool and the carbon dioxide at acceptable levels, this would be among the more preferred.
- Entrance doors to rooms have reasonable seals which helps minimise leakage assist in limiting exposure. More recently built hotels have fire/smoke drop blade seals on the bottom of the doors which essentially seal the bottom of doors to floors when closed. Good seals around the three other sides of the doors are important to maintain neutral pressure and in new hotels these are required to have seals which are fire resistant. This pressure needs to be checked for all rooms.

2 Summary

2.1 SUMMARY

The following items represent the key findings from the investigation.

<u>Hotel</u>	<u>Rooms tested</u>	<u>Room Pressurisation status</u>	<u>Lobby airflow type</u>	<u>Operable Windows?</u>	<u>Improvements possible</u>	<u>General Comments</u>
Four Points Hotel	Room 329	Positive pressure	Relief air from corridor	No	NA	Aged system and difficult to alter. This hotel has a recirculating AC system. It is not 100% fresh air.
Pan Pacific	Rooms 1817 and 1808	Positive pressure but some negative.	Nil	No	NA	Aged system and difficult to alter. OA system running on 100% fresh air.
Novotel Langley	Rooms 115, 105 and 106	Positive pressure	Nil	No	NA	Side rubber door seals. OA system running on 100% fresh air.
Westin	Rooms 2205 and 2201	Negative pressure	AC to lift lobby only	No	Yes.	Room doors have rubber fire seals and door drop blade seals. OA system running on 100% fresh air. Building manager has already reduced supply air and increased exhaust quantity which has improved protection.
Novotel Murray	Room 219	Negative Pressure	Relief air from corridor	No	System arrangement didn't allow much scope for change.	Room doors have rubber fire seals and door drop blade seals. OA system running on 100% fresh air. The adjacent rooms tested had a mixture of results and the room tested was inconsistent between the tests performed. This hotel may be suitable if all the rooms are smoke tested with a smoke pencil and the negatively pressurised rooms only are used.
Mercure	Room 308	Positive pressure	Nil	Yes	NA	Openable windows cause uncontrollable pressure profiles room by room and may cause potential for air pathways between rooms. Not able to gain consistent results. OA system running on 100% fresh air.

<u>Hotel</u>	<u>Rooms tested</u>	<u>Room Pressurisation status</u>	<u>Lobby airflow type</u>	<u>Operable Windows?</u>	<u>Improvements possible</u>	<u>General Comments</u>
Hyatt	Room 114 and 938	Neutral or negative	Rooms open into atrium which has relief	No but some balconies on the ground are a high risk.	Toilet exhaust system non VSD. Fresh air is on VSD.	Central atrium provides significant dilution outside of the rooms. OA system running on 100% fresh air.
Holiday Inn Murray Street	Room 502	Negative pressure	Fresh air provided to corridor then relief into rooms	Yes	None required.	Security guard within 1m of the door to a room. But corridor is a protected zone. OA system running on 100% fresh air. Due to the specific unique configuration of the fresh air system in this hotel, it is unlikely for the rooms to become positive pressure relative to the corridor even with the openable windows.
Intercontinental Murray St	Rooms 604 and 805	Neutral pressure	AC to lift lobby only	No	Fresh air AHU and toilet exhaust on VSD. Could reduce supply and increase exhaust by 10% each.	Room doors have rubber fire seals and door drop blade seals. OA system running on 100% fresh air.
The Adnate Hotel Hay St	Rooms 2410 and 302	Negative Pressure	AC to lift lobby only	No	Toilet exhaust on constant flow. Fresh air on constant flow.	Room doors have rubber fire seals and door drop blade seals. OA system running on 100% fresh air.