

EMSD

**Guidance Notes on Code of
Practice for Water-cooled Air
Conditioning Systems**

(November 2011)

Contents

1	Guidance Notes	1
Part A		
1.1	Minimum Horizontal Separation Distance for Cooling Towers	1
1.2	Cooling Tower Installation Location (Pedestrian Thoroughfare)	4
1.3	Cooling Tower Installation Location (Extended Ductwork)	6
1.4	Cooling Tower Installed on Roof and Affecting the Adjacent Buildings	8
1.5	Cooling Tower Installed on Podium Roof	10
1.6	Cooling Tower Installed at Indoor with Vertical Discharge through Roof or Horizontal Discharge through Side Wall	14
Part B		
1.7	Control of Bacterial Growth	16

Figures

Figure 1: Enquiries on measuring point in determining the minimum separation distance	1
Figure 2: Measuring point shall not be from the center of the cooling tower	2
Figure 3: Measuring point shall be from the nearest edge of the cooling tower exhaust / intake	2
Figure 4: Separation distance shall not be the sum of horizontal and vertical distance	2
Figure 5: Horizontal distance shall be considered separately from the vertical distance	2
Figure 6: Measuring point shall not be the directional distance as the separation distance	3
Figure 7: Measuring point shall be from the nearest edge of the cooling tower exhaust to the façade horizontally	3
Figure 8: Separation distance shall not be the sum of horizontal and vertical distance	3
Figure 9: Horizontal distance shall be considered separately from the vertical distance	3
Figure 10: Measuring point shall not be from the centre of the louvre	3
Figure 11: Measuring point shall be from the nearest edge of the exhaust / intake louvre	3
Figure 12: Separation between the cooling tower exhaust and pedestrian thoroughfare	4
Figure 13: Provide overhead cover above the walkway	5
Figure 14: Install discharge hood to re-direct the exhaust air away from the walkway	5
Figure 15: Cooling tower installed inside building with extended ductwork for discharge from facade louvre	6
Figure 16: Locked window and blank-off louvre on the same facade surface within the restricted zone	7
Figure 17: Cooling tower installed on roof surrounding by adjacent buildings	8
Figure 18: Horizontal separation requirement for cooling tower and the adjacent buildings	9
Figure 19: Cooling tower installed on podium roof	10
Figure 20: Horizontal separation requirement for cooling tower installation on podium roof	11
Figure 21: Vertical separation requirement between podium roof cooling tower and building's air intake and operable window below podium roof	12
Figure 22: Vertical separation requirement between podium roof cooling tower and building's exhaust air outlet below podium roof	12
Figure 23: Horizontal separation requirement between podium roof cooling tower intake and building's exhaust air outlet on podium roof	13
Figure 24: Horizontal separation requirement between podium roof / roof cooling tower and louvres on building façade	13
Figure 25: Cooling Tower installed in plant room with vertical discharge through roof and horizontal intake through side wall	14
Figure 26: Separation requirement between intake louvre / exhaust outlet of indoor cooling tower and the adjacent building air opening	15
Figure 27: Flowchart for Control Strategies for the presence of Legionellae	17
Figure 28: Flow Chart for Control Strategies for the presence of heterotrophic microorganism	18

1 Guidance Notes

Part A

1.1 Minimum Horizontal Separation Distance for Cooling Towers

Guidance notes are given below to clarify the following section of Code of Practice for Water-cooled Air Conditioning Systems (“CoP(WACS)”):

Section 4.1.3, Part 1 (p.17)

Background:

Enquiries on minimum separation distance for cooling tower installation are frequently received, especially on the measuring points and measurement method. CoP (WACS) users sometimes misinterpret the measuring points to be from the center of the cooling tower (for horizontal distance measurement) and/or from the top or bottom of the cooling tower (for vertical distance measurement). Furthermore, they sometimes mistakenly use the sum of horizontal and vertical separation distance or directional distance as the separation distance to meet the CoP (WACS) requirements.

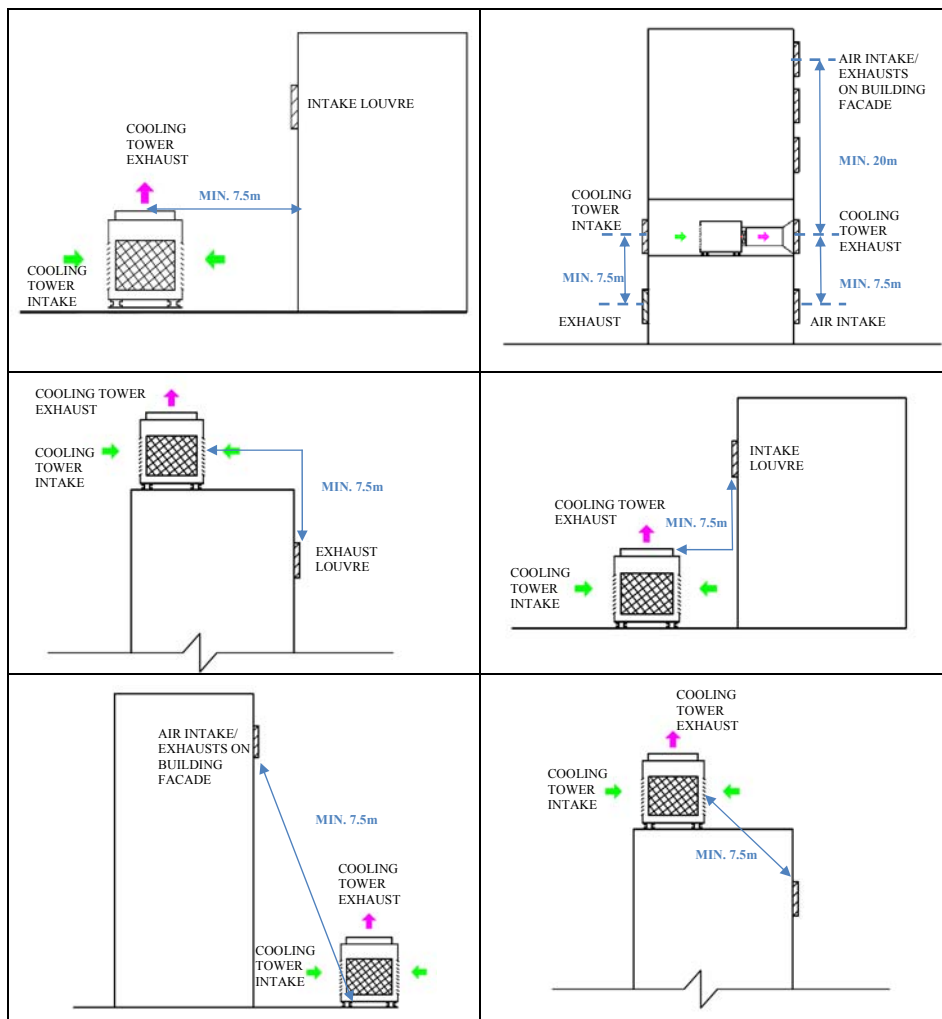


Figure 1: Enquiries on measuring point in determining the minimum separation distance

Guidance Notes:

The minimum horizontal separation shall be measured from ***the nearest edge of*** the cooling tower exhaust / intake to ***the nearest edge of*** the outdoor air intake, exhaust air outlet or operable window. Also, horizontal distance shall be considered separately from the vertical distance and they shall not be summed together or used directional distance to meet the minimum separation requirement. The figures below illustrate some common misinterpretations with respect to the CoP(WACS) requirement.

<p>Figure 2: Measuring point shall not be from the center of the cooling tower</p>	<p>Figure 3: Measuring point shall be from the nearest edge of the cooling tower exhaust / intake</p>
<p>Figure 4: Separation distance shall not be the sum of horizontal and vertical distance</p>	<p>Figure 5: Horizontal distance shall be considered separately from the vertical distance</p>

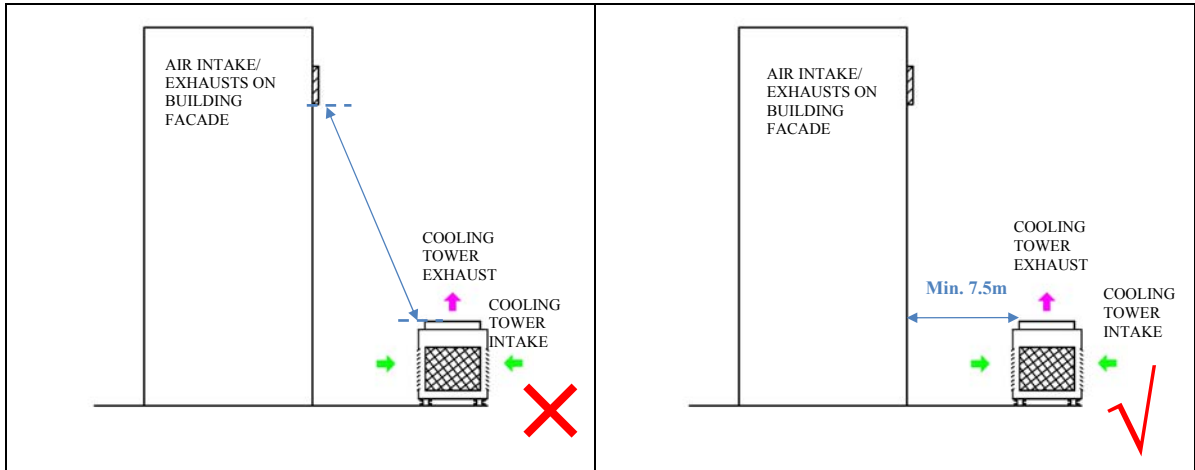


Figure 6: Measuring point shall not be the directional distance as the separation distance

Figure 7: Measuring point shall be from the nearest edge of the cooling tower exhaust to the façade horizontally

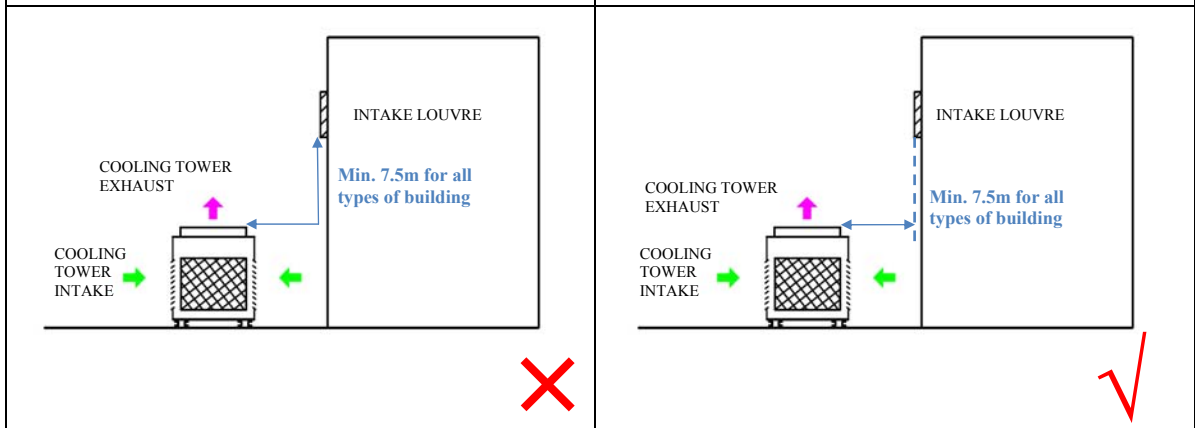


Figure 8: Separation distance shall not be the sum of horizontal and vertical distance

Figure 9: Horizontal distance shall be considered separately from the vertical distance

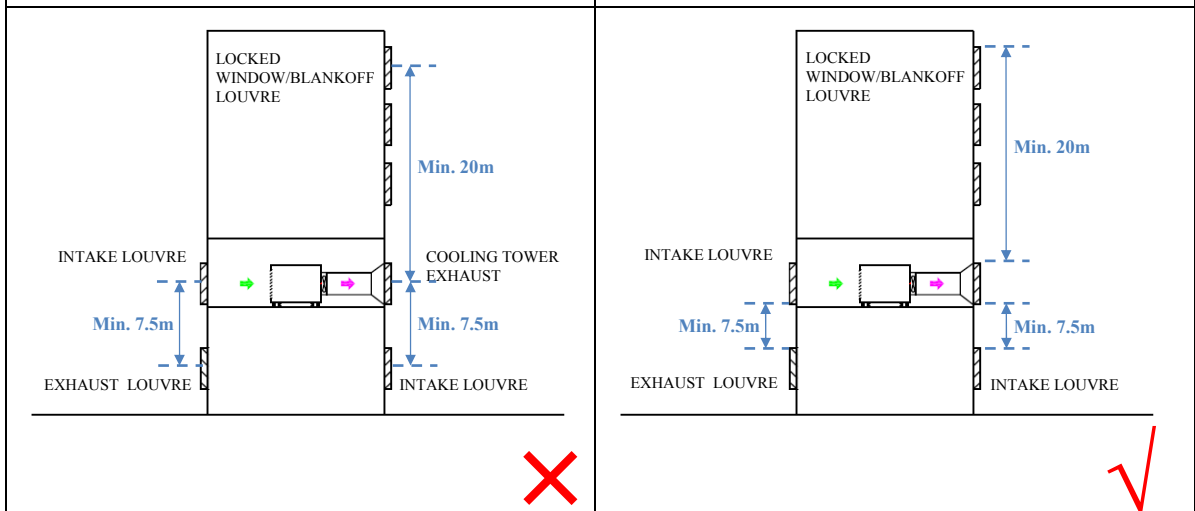


Figure 10: Measuring point shall not be from the centre of the louvre

Figure 11: Measuring point shall be from the nearest edge of the exhaust / intake louvre

1.2 Cooling Tower Installation Location (Pedestrian Thoroughfare)

Guidance notes are given below to clarify the following section in the CoP(WACS):
Section 4.1.4, Part 1 (p.17)

Background:

It is common to propose locating cooling towers on low-rise podium roof of one, two or several storeys high building with an adjacent pedestrian thoroughfare or walkway below running along the building boundary or façade. The horizontal separation between the cooling tower exhaust and the pedestrian thoroughfare is less than 7.5 m. The designers often enquire the possible ways to meet the CoP (WACS) requirement and minimise nuisances to the public.

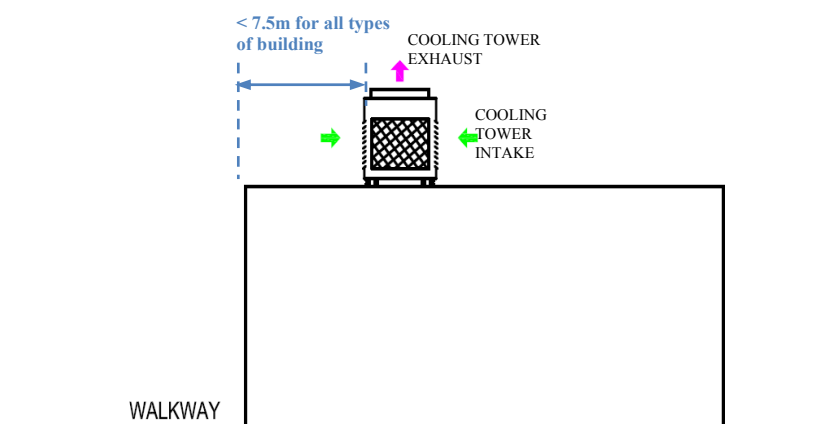


Figure 12: Separation between the cooling tower exhaust and pedestrian thoroughfare

Guidance Notes:

It is required under CoP(WACS) that no pedestrian thoroughfare, area of public access, or place where people gather together for activities shall be located within 7.5m from the nearest edge of the cooling tower exhaust. If such minimum separation requirement cannot be met due to site constraints (e.g. not enough space for setting back cooling towers from the parapet/building boundary), some mitigation measures may be considered where appropriate to enable compliance with the requirement, hence minimise nuisances to the public from the cooling tower. Below are some examples showing mitigation measures proposed for reference.

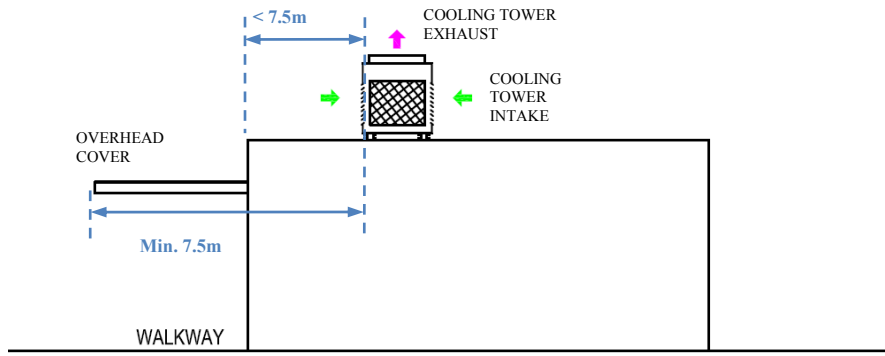


Figure 13: Provide overhead cover above the walkway

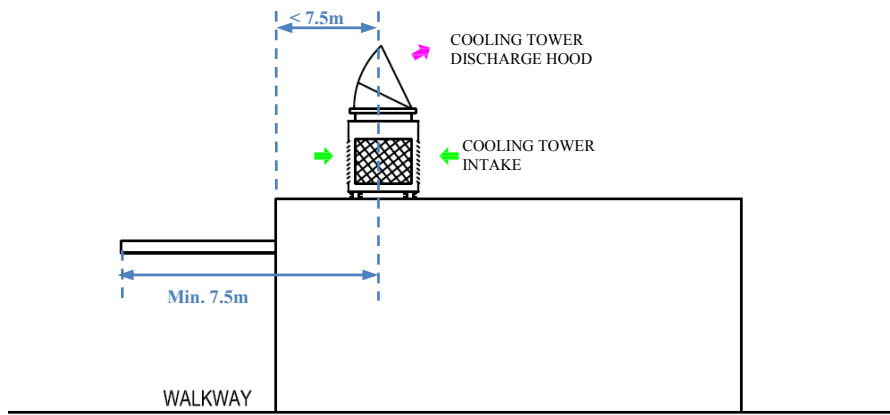


Figure 14: Install discharge hood to re-direct the exhaust air away from the walkway

1.3 Cooling Tower Installation Location (Extended Ductwork)

Guidance notes are given below to clarify the following section in CoP(WACS):

Section 4.1.6, Part 1 (p.17)

Background:

Some project designers found it is unclear in meeting the minimum separation requirements when cooling towers are designed to be installed inside a mechanical floor with extended ductwork to discharge through facade louvres. They find it difficult to arrange the air intake, exhaust air outlet and operable window on its vertical building façade distant from the cooling tower to meet the requirements.

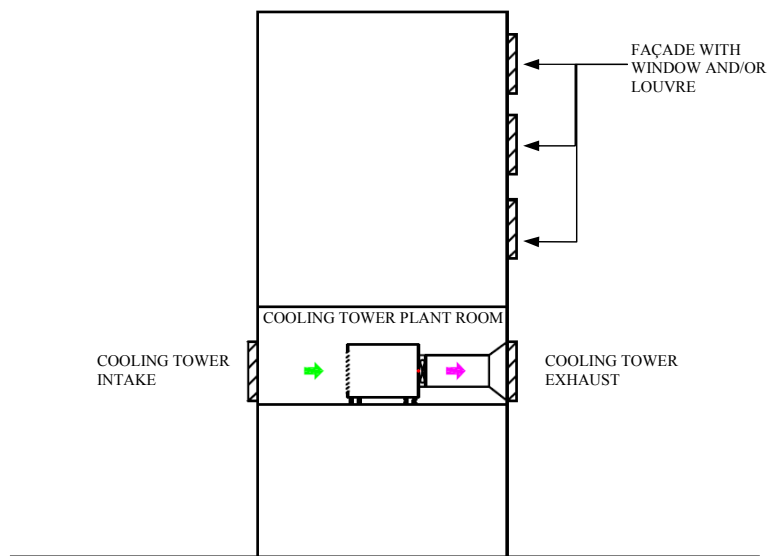


Figure 15: Cooling tower installed inside building with extended ductwork for discharge from facade louvre

Guidance Notes:

If a cooling tower is installed indoor with an extended ductwork for exhaust air, the measurement shall be from the **nearest edge** of the exhaust louvre on the building façade. Air intakes, exhausts air outlet and operable windows of the vertical building facade shall be distant from the **nearest edge** of the cooling tower exhaust by minimum distance of 7.5 m below and/or 20 m above, as the case may be.

If the requirement cannot be adequately met, the designer may consider in consultation with their building design counterpart and/or the facility management whether mechanical locking devices can be provided to the operable windows and the louvres can be blanked off to comply with CoP(WCAS) under normal conditions. ***Cautionary signage shall be provided near the locked windows to alert occupants.***

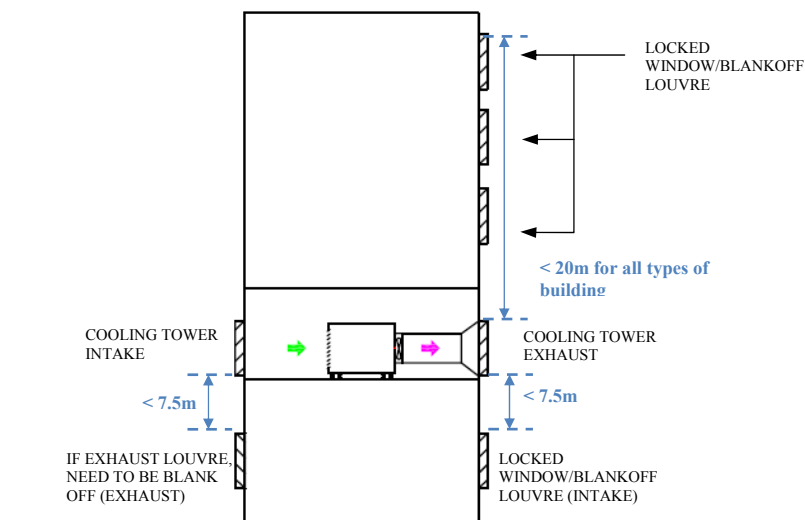


Figure 16: Locked window and blank-off louvre on the same facade surface within the restricted zone

1.4 Cooling Tower Installed on Roof and Affecting the Adjacent Buildings

Guidance notes are given below to clarify the following section in the CoP(WACS):

Section 4.2, Part 1

Background:

Some project designers found themselves unclear on how to meet the minimum separation requirement between the cooling tower and the air intake, exhaust air outlet and operable window on the adjacent building façades. The measuring points are often incorrect and result in the cross-contaminations between the cooling tower and the adjacent buildings.

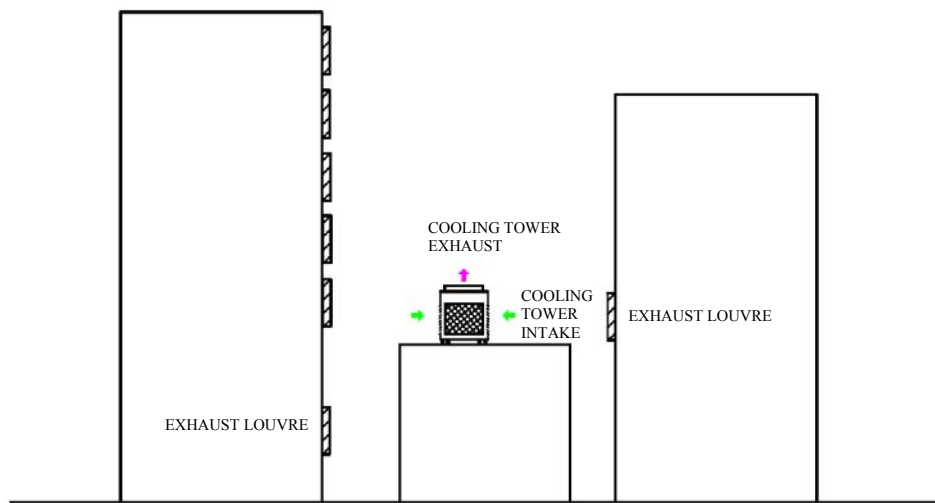


Figure 17: Cooling tower installed on roof surrounding by adjacent buildings

Guidance Notes:

In order to minimise nuisance caused by the cooling tower to the adjacent buildings and vice-versa the nuisance caused by the adjacent buildings to the cooling tower; the minimum horizontal separation distance shall be imposed. The measurement point shall be from the **nearest edge** of the cooling tower intakes /exhausts to the **nearest edge** of air intake and operable windows of the adjacent buildings.

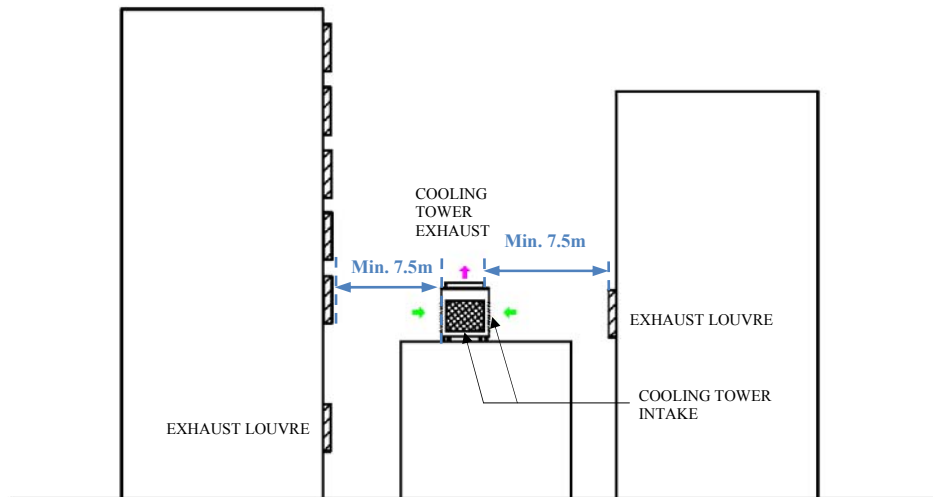


Figure 18: Horizontal separation requirement for cooling tower and the adjacent buildings

1.5 Cooling Tower Installed on Podium Roof

Guidance notes are given below to clarify the following section in the CoP(WACS):

Section 4.3, Part 1

Background:

In a composite building, it is common to have building blocks located on the podium roof. Project designers may wish to install cooling towers on the podium roof to provide air-conditioning for the commercial floors. If the cooling towers are located too close to the surrounding building blocks, contaminants from the cooling tower, as well as generated noise, may affect the building users through the air openings (air intakes/exhausts/operable windows) on the building blocks.

Whilst the CoP(WACS) has generally specified a horizontal separation distance of minimum 7.5 m from the cooling tower to the nearby air outlets/windows, some cases have raised issues in situations where the air outlets/windows are far above the cooling tower but with a horizontal separation distance less than 7.5 m. How will the separation distance requirement apply to these cases?

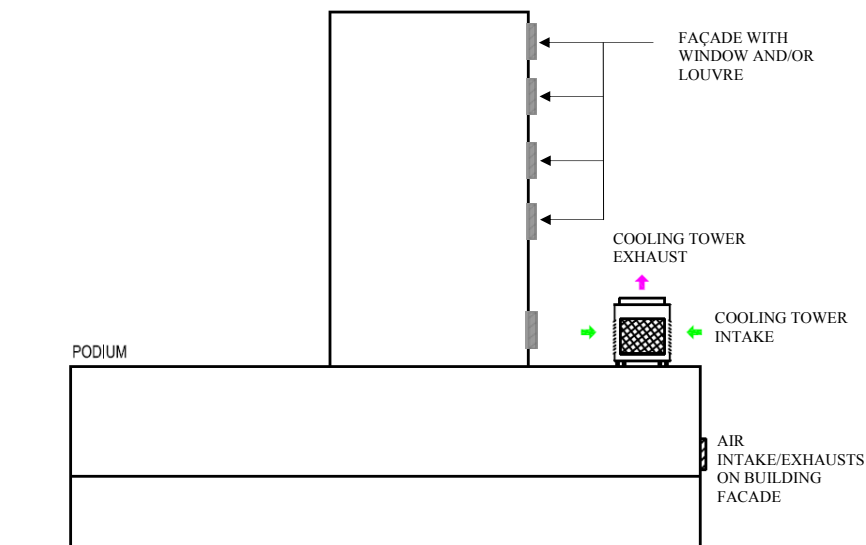


Figure 19: Cooling tower installed on podium roof

Guidance Notes:

Scenario 1: Separation distance between the cooling tower exhaust and the building's air openings (air intake, exhaust air outlet and operable window) above podium roof.

Cooling towers on the podium roof shall generally be located away from the building façade to meet the minimum horizontal separation distances specified in Table 1.1 of Part 1 of the CoP(WACS). In particular, the cooling tower exhaust should be away from air intake, exhaust air outlet and operable windows with a minimum horizontal distance of 7.5 m to avoid potential risk of nuisance or spread of Legionella bacteria (if any) arising from the cooling towers. For

cooling tower on the podium roof with adjacent tall building, all cases with horizontal separation less than 7.5 m will not be considered acceptable.

Please note that clause 4.3.3 of Part 1 of the CoP(WACS) requires the cooling tower exhaust shall be discharged away from the operable windows and outdoor air intakes. This can be achieved by a cooling tower discharge hood to direct the exhaust away from the building façade.

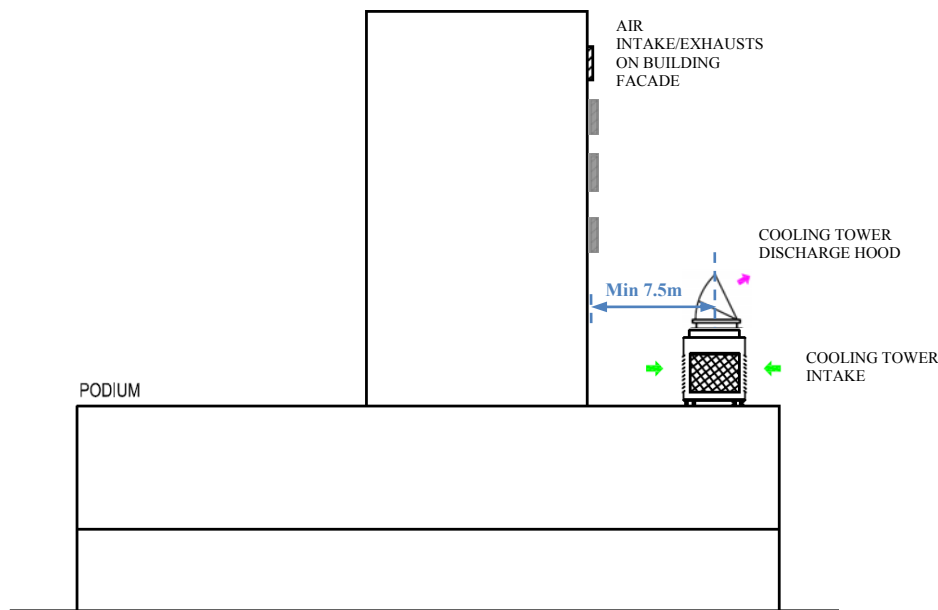


Figure 20: Horizontal separation requirement for cooling tower installation on podium roof

Scenario 2: Separation distance between the cooling tower intake/exhaust and the building's air openings (air intake, exhaust air outlet and operable window) below podium roof.

Cooling towers on the podium roof should generally be set back from the building parapet with a minimum horizontal separation distance of 7.5 m to avoid potential risk of nuisance or spread of Legionella bacteria (if any) arising from the cooling towers to air openings (air intake, exhaust air outlet and operable window)

In cases where the cooling tower cannot meet the minimum horizontal separation requirement (i.e. separation is less than 7.5 m), designers may consider alternative location. That location shall have adequate vertical separation distance for the building's air openings in relation to the cooling tower. Such distances are shown below (similar to the minimum separation distances in Table 1.1 in Section 4.1 of CoP (WACS) Part 1):

- (a) Between the **nearest edge** of cooling tower exhaust and the **nearest edge** of podium's air intake, exhaust air outlet and operable window: minimum vertical separation of 7.5 m ;
- (b) Between the **nearest edge** of cooling tower intake and the **nearest edge** of podium's air exhaust outlet: minimum vertical separation of 7.5 m and

- (c) Between the ***nearest edge*** of cooling tower intake and the ***nearest edge*** of podium's air intake and operable window: minimum vertical separation of 5 m.

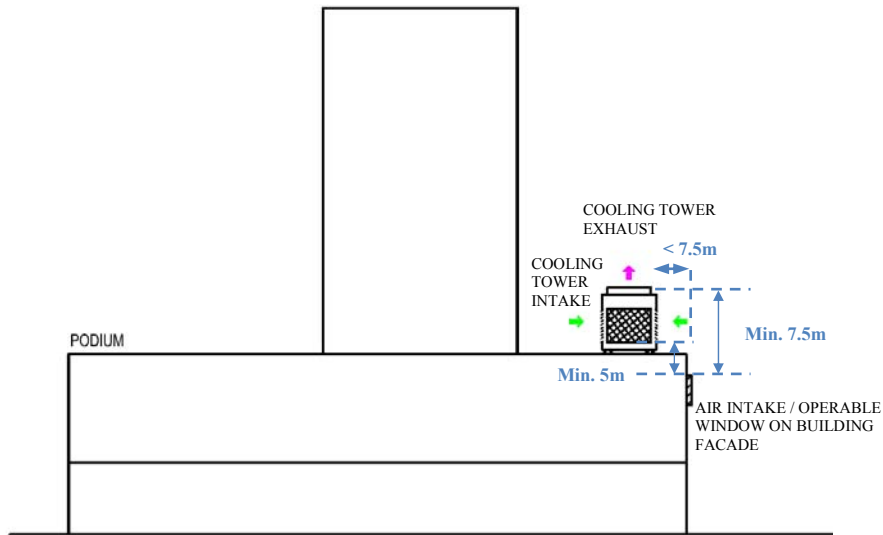


Figure 21: Vertical separation requirement between podium roof cooling tower and building's air intake and operable window below podium roof

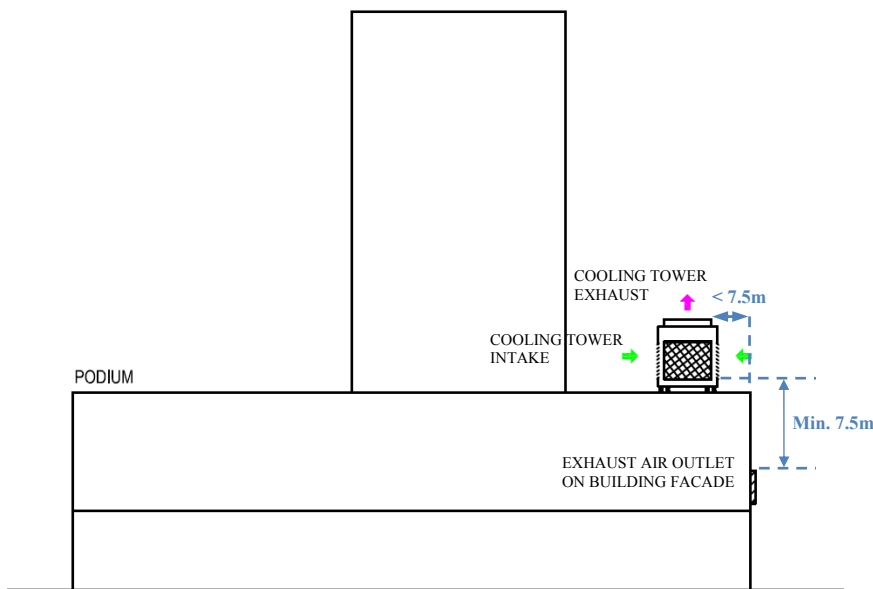


Figure 22: Vertical separation requirement between podium roof cooling tower and building's exhaust air outlet below podium roof

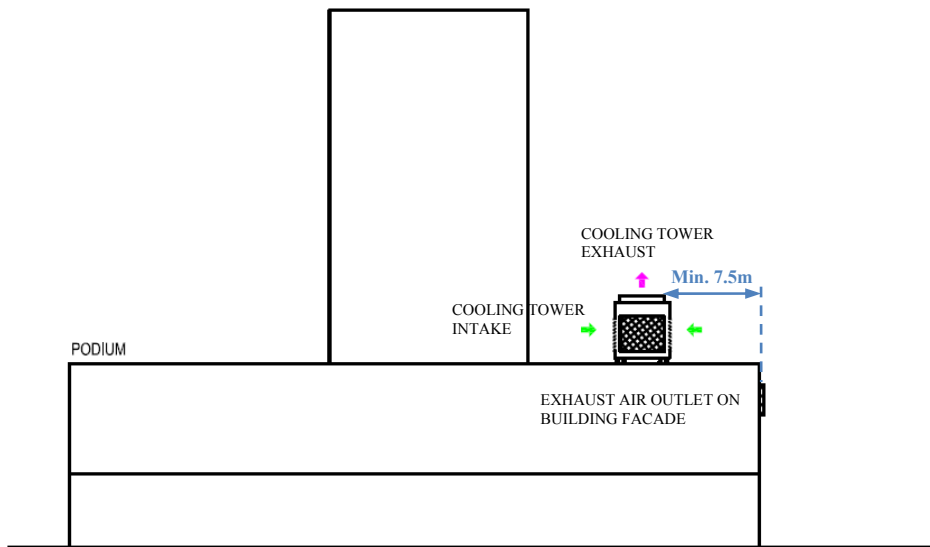


Figure 23: Horizontal separation requirement between podium roof cooling tower intake and building's exhaust air outlet on podium roof

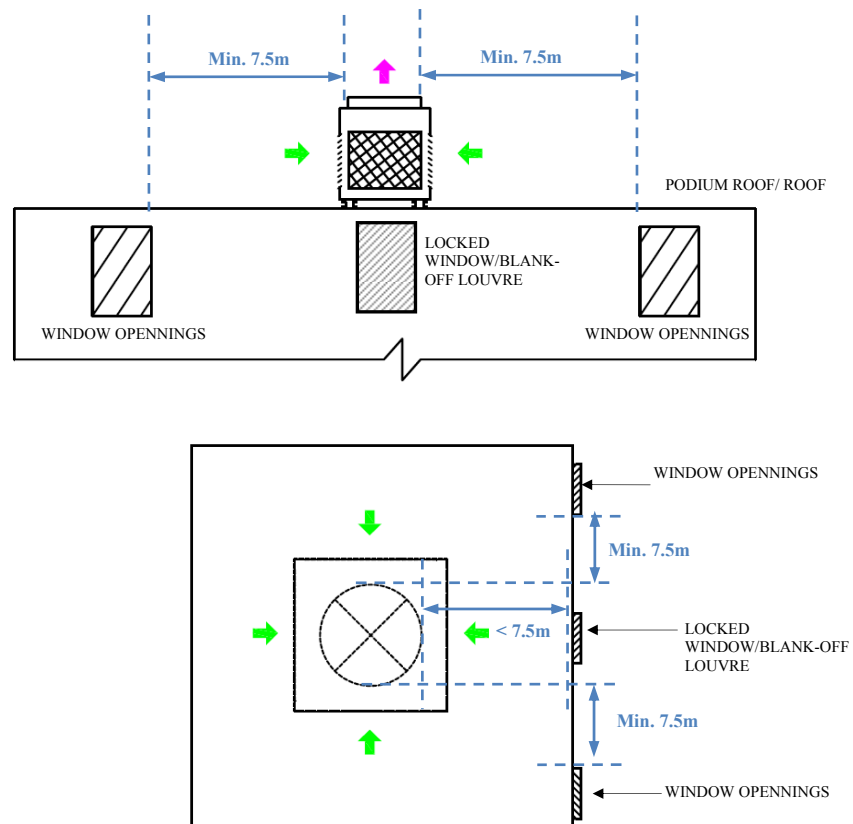


Figure 24: Horizontal separation requirement between podium roof / roof cooling tower and louvres on building façade

1.6 Cooling Tower Installed at Indoor with Vertical Discharge through Roof or Horizontal Discharge through Side Wall

Guidance notes are given below to clarify the following section in the CoP(WACS):

Section 4.4, Part 1

Background:

For some high-rise buildings, cooling towers may be housed in a plant room with discharge/intake through the roof/side walls of the plant room. The discharge and/or intake may affect or be affected by adjacent buildings if they are not correctly located.

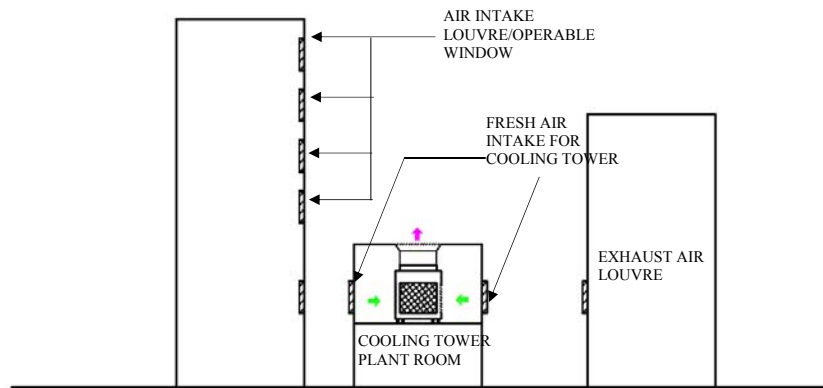


Figure 25: Cooling Tower installed in plant room with vertical discharge through roof and horizontal intake through side wall

Guidance Notes:

In cases where the plant room houses the cooling tower, the horizontal distance between the plant room structure/edge and the nearby building's air opening (air intake, exhaust air outlet and operable window) is allowed to be less than 7.5 m. However, the exhaust air outlet of the cooling tower shall have a horizontal separation distance of 7.5 m to the air opening of the adjacent building regardless the position of the plant room. Furthermore, the plant room air intake for the cooling tower intake shall have a horizontal separation distance of 7.5 m to the exhausts outlet of the adjacent buildings. The plant room air intake for the cooling tower shall have a horizontal separation distance of 5 m from air intake and operable window of adjacent buildings.

The measurement point shall be from the **nearest edge** of the cooling tower exhaust to the **nearest edge of** the air intake, exhaust air outlet and operable window of adjacent buildings.

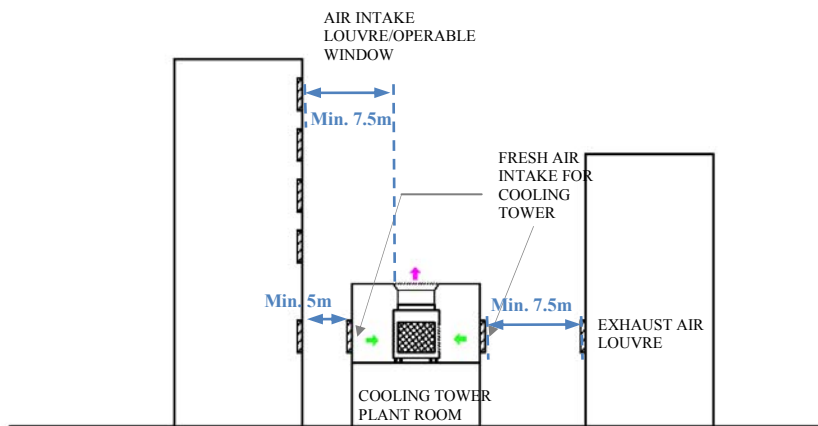


Figure 26: Separation requirement between intake louver / exhaust outlet of indoor cooling tower and the adjacent building air opening

Part B

1.7 Control of Bacterial Growth

Guidance notes are given below to illustrate the following section in the CoP(WACS):

Section 2.6, Part 2 (p.7)

Guidance Notes:

Control Measures for Legionella

Regarding detection of Legionella in water samples collected from cooling towers, the control strategies and procedures stated in Section 2.6.1 of Part 2, CoP (WACS). The flow chart below (Figure 27) illustrate the flow chart of Part 2, CoP(WACS) for easy reference.

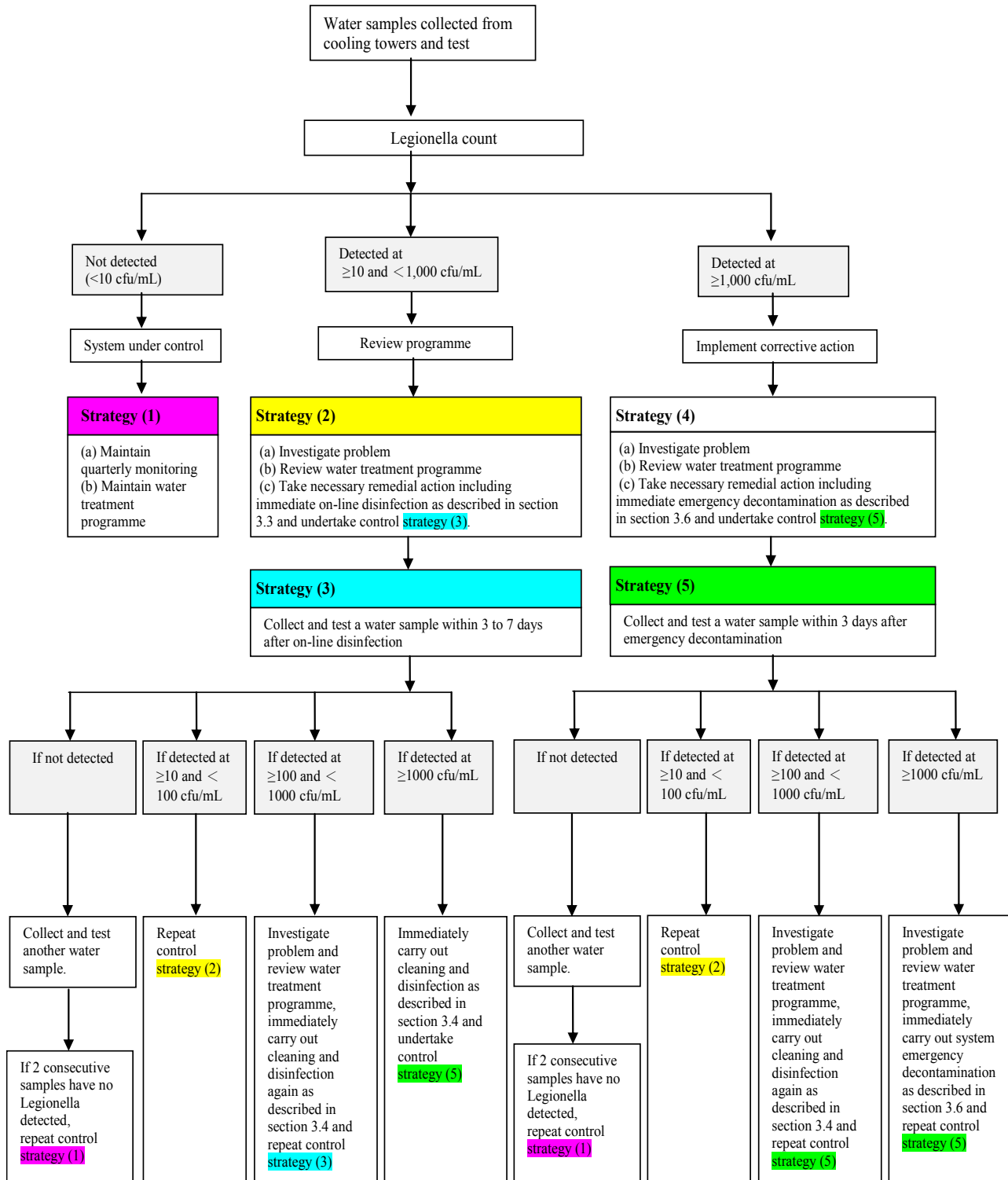


Figure 27: Flowchart for Control Strategies for the presence of Legionellae

Control Measures for Heterotrophic Micro-organisms

Regarding the Heterotrophic Colony Count (HCC) test results of water samples collected from cooling towers, the control strategies and procedures stated in Section 2.6.3 of the CoP (WACS), Part 2 are illustrated in the flow chart below (Figure 28) for easy reference and observation.

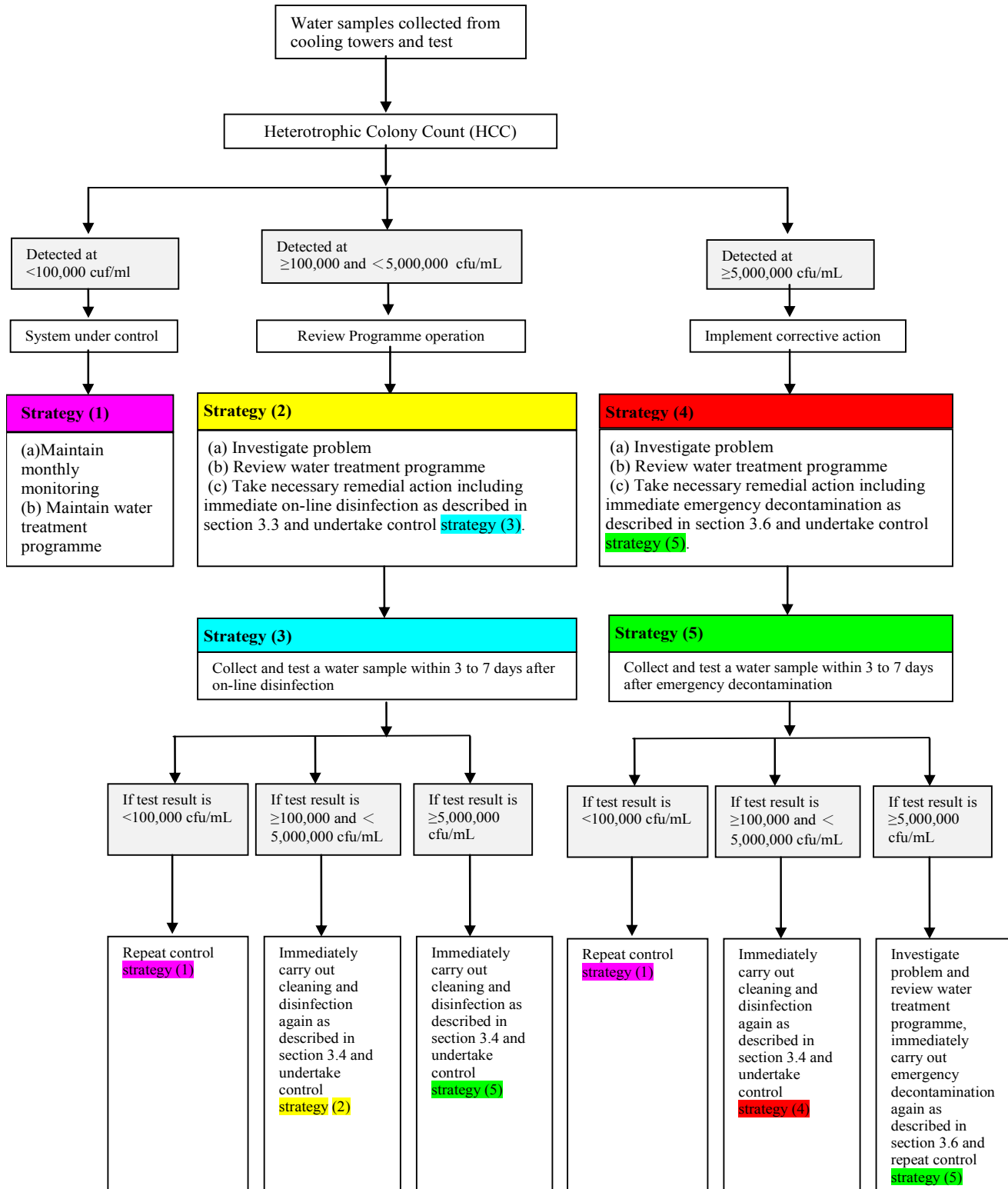


Figure 28: Flow Chart for Control Strategies for the presence of heterotrophic microorganism