Semi outdoor thermal comfort analysis is carried out in the bus terminus where buses will be coming and leaving the platforms. People generally waits on these platforms for the buses and vice versa.

In the current simulation Lions City G LE (18 mts) bus is used, as this bus is moving from the terminus. Please find the image below

There are two main heat loads from the bus

1. The heat load from the bus condenser
2. The heat load and flowrate of the exhaust gases from the exhaust tail pipe

1. The heat load from the bus condenser

Since there is no proper data available for the 18 mts bus, so condenser for 14 mts bus is considered for the current analysis

Attaching the images of the technical data and condenser fans below

---

The total flowrate from the condenser is 14400 m$^3$/hr

As per the above condenser images, there are 6 condenser fans present so splitting the flowrate into 6 parts

Flowrate of each condenser fan = 2400 m$^3$/hr = 0.67 m$^3$/s

The area of each condenser fan is 0.0706 m$^2$ based on 300 mm diameter.

The velocity of each fan = 0.67/0.0706 = 9.48 m/s

<table>
<thead>
<tr>
<th>Model</th>
<th>TCH13V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable for</td>
<td>M</td>
</tr>
<tr>
<td>Cooling Capacity</td>
<td>W</td>
</tr>
<tr>
<td>(R134)Refrigerant</td>
<td>KG</td>
</tr>
<tr>
<td>12.0-14.0</td>
<td>42000</td>
</tr>
<tr>
<td>10.5</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Core type</th>
<th>Tube and Fin(Internal Thread Tube Hydrophilic Aluminum Foil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Flow</td>
<td>m$^3$/h</td>
</tr>
<tr>
<td>Fan</td>
<td>273112X</td>
</tr>
<tr>
<td>Current</td>
<td>60</td>
</tr>
<tr>
<td>Size (LxWxH)</td>
<td>2218<em>1830</em>180</td>
</tr>
<tr>
<td>Weight</td>
<td>140</td>
</tr>
</tbody>
</table>
The technical specifications of the bus can be found in the below images:

2. The heat load and flow rate of the exhaust gases from the exhaust tail pipe

Considering Capacity of diesel engine and torque from the above images

Calculating the Revolutions per minute from rotations per minute

\[
Hp = \frac{(\text{torque} \times \text{RPM})}{5252}
\]

\[
Hp = 360 \text{ Kw}
\]

Torque = 1800 Nm

\[
\text{RPM} = 1050
\]

1 Rotation per minute = 1 Revolution per minute

Revolutions per minute (N) = 1050

Engine exhaust flow rate can be calculated by using the following formula:

---

\[ Q_e = (1.2)(D_{\text{eng}} \times N) \left( \frac{460 F + T_{\text{eng}}}{530 F} \right) \]

where: 
- \( Q_e \) = Exhaust Flow (acfm)
- \( T_{\text{eng}} \) = Engine tailpipe temperature (F)
- \( D_{\text{eng}} \) = Engine displacement (ft\(^3\))
- \( N \) = Engine revolutions per minute

\( D_{\text{eng}} = 10518 \text{ cm}^3 = 0.3714 \text{ ft}^3 \)

\( T_{\text{eng}} \) is assumed as 105 degree C = 221 F

Substituting all the values in the above equation

\( Q_e = 601.2 \text{ cfm} \)

Assuming the tail pipe diameter as 102 mm (based on lot of research papers)

So, area of tail pipe is 0.00817 m\(^2\)

Assuming two tail pipes since this is a large bus

m\(^3\)/s for each bus = 0.2836

for each tail pipe in m\(^3\)/s = 0.28364/2 = 0.1418

so, velocity of each tail pipe = m\(^3\)/s/m\(^2\) = 0.1418/0.00817 = 17.35 m/s