where k_r is given in Eq. 3.3. The maximum value of turbulance is assumed to be 3.5 times its standard deviation; that is

$$\bar{w}_{max} = 3.5\,\sigma_w \tag{3.7}$$

3.2.1. Turbulance intensity

Turbulance intensity, $I_w(z)$, represents the relative amplitude of turbulance with respect to mean wind velocity and varies with height. It is defined by the following equations:

$$\begin{aligned}
&\text{For } z_{min} \le z \le 200\,m: \quad I_w(z) = \frac{\sigma_w}{V_m(z)} = \frac{1}{C_t \ln(z / z_o)} \\
&\text{For } z \le z_{min}: \quad I_w(z) = I_w(z_{min}) \\
&\text{For } z \ge 200\,m: \quad I_w(z) = I_w(200)
\end{aligned} \tag{3.8}$$

z_o and z_{min} values are given in Table 3.1, and for Dubai, C_t =1.

3.2.2. Turbulance length

Another parameter that is used to describe the size of the turbulance is the turbulance length, *L(z)*. Turbulance length can be considered as the average wavelength of the air flow in the turbulance, and is expressed by the following equations:

$$\begin{aligned}
&\text{For } z \ge z_{min}: \quad L(z) = 300\left(\frac{z}{200}\right)^p \qquad \text{with} \qquad p = 0.67 + 0.05\ln(z_o) \\
&\text{For } z < z_{min}: \quad L(z) = L(z_{min})
\end{aligned} \tag{3.9}$$

The values of z_o and z_{min} are given in Table 3.1.

3.2.3. Power spectral density function of turbulance

Power spectral density function of turbulance, $S_L(z,f)$, shows the variation of turbulance energy with height and frequency, z and f. It is defined in terms of the nondimensional normalized frequency, $f_L(z,f)$, by the following equation: