Estimation of $D_d$ (daily ratio of the number of hours during which Temperature Humidity Index – THI – is above threshold THI – THI\text{thresh} –)

St-Pierre et al. [1] proposed that THI follows a sine distribution throughout the day, where the daily minimum THI is reached at 4:00 and the daily maximum THI is reached at 16:00. We used a sine model approximation to estimate $D_d$, as suggested by St-Pierre et al.

\[
D_d = \begin{cases} 
0 & \text{for } \text{THI}_{\text{thresh}} > \text{THI}_{\text{max}}_d \\
1 & \text{for } \text{THI}_{\text{thresh}} < \text{THI}_{\text{min}}_d \\
\text{ELSE} & \\
\text{for } \text{THI}_{\text{thresh}} > \text{THI}_{\text{mean}}_d \left( \frac{\pi - 2 \cdot \arcsin \left( \frac{\text{THI}_{\text{thresh}} - \text{THI}_{\text{mean}}_d}{\text{THI}_{\text{max}}_d - \text{THI}_{\text{mean}}_d} \right)}{2\pi} \right) \\
\text{for } \text{THI}_{\text{thresh}} < \text{THI}_{\text{mean}}_d \left( \frac{\pi + 2 \cdot \arcsin \left( \frac{\text{THI}_{\text{mean}}_d - \text{THI}_{\text{thresh}}}{\text{THI}_{\text{max}}_d - \text{THI}_{\text{mean}}_d} \right)}{2\pi} \right)
\end{cases}
\]

Where THI\text{mean}_d is the mean of THI\text{max}_d and THI\text{mean}_d on day d.

**Reference**