ASTRAE - set standards & establish methods for heating/cooling load calculations.

Current state of the art for cooling loads is a heat balance method.

An older, simpler form of this is the CLTD, CLF, and SHTF method.

Basically, heat gain by a building is computed as:

\[ q = U A \Delta T \]

Temperaturer difference

Overall heat transfer coefficient

Thermal capacitance of the structure is important - it causes lag of the heat gain to space.

To account for the thermal capacitance, ASTRAE developed the "CLTD" - Cooling Load Temperature Difference.

So:

\[ q = UA \times \text{CLTD} \text{ (from table)} \]
\[ U = ? \] overall heat transfer coefficient

For a series of thermal resistances:

\[ UA = \frac{1}{\sum R_{hi}} \]

Note: if \( A \) is same for all, \( U = \frac{1}{\sum \frac{1}{h_i} + \sum \frac{\Delta x}{k_i}} \)

Top view

\[ \frac{1}{h_o A_o} + \frac{\Delta x_{brick}}{k_{brick} A} + \frac{\Delta x_s}{k_s A_o} + \frac{\Delta x_{ins}}{k_{ins} A_o} + \frac{\Delta x_{w6}}{k_{w6} A_o} = \frac{1}{h_i A_i} \]

Note \( h_o \) depends on outdoor wind velocity.

So, for wall with 10\% framing \( A_{wall} = 0.9 A_{wall} \)

\[ q_{wall} = (U, 0.9 A_{wall} + U_2 \times 0.1 A_{wall}) \Delta T \]

\[ = A_{wall} (0.9 U_1 + 0.1 U_2) \Delta T \]