Compare costs per year:

SEER = 17 vs. SEER = 13
over 1yr operation.

Heat gain into building:

\[ q = \frac{UA \Delta T}{\text{area}} \]

\( \Delta T \) = Design temp. diff.

Overall heat transfer coefficient

- Soak, walls, roof, floor over open spaces, windows,
bush or walls

- Direct solar gain through windows
- Infiltration, ventilation, duct losses
- Heat gains inside space (people, equipment)

What about total heat gain over a year?

\[ Q_{\text{total}} = \int_{x_{\text{start}}}^{x_{\text{end}}} (UA) \Delta T \, dt = UA \int_{x_{\text{start}}}^{x_{\text{end}}} \Delta T \, dt \]

"Degree Days" vs. "Degree Hours"

Look at the "NCDC" website:

NCDC site Alabama 2006 → 2093 F-days
2007 → 2234 F-days
\[ Q_{\text{total}} = UA \times DD \times \frac{24 \text{ hrs}}{\text{day}} = \text{Btu} \]

4 Tons of Air Conditioning for every 400-500 ft² space

Guide line:

2500 ft² house \( \rightarrow 8 \) tons cooling

\[ T_{\text{design}} = 95 \text{F} \quad T_{\text{jndesign}} = 70 \text{F} \]

Estimate UA from unit and design condition:

\[ UA = \frac{\text{Tons} \times 12000 \text{ Btu/h}}{25 \text{F}} = \frac{12000 \text{ Btu}}{5 \text{ tons} \times 25 \text{F}} = 2400 \text{ Btu/ton} \]

\[ Q_{\text{total reqd}} = UA \times DD \times \frac{24 \text{ hrs}}{\text{day}} \]

\[ = 2.4 \times 2.1 \times 24 \text{MMBtu/yr} \]

\[ = 121 \text{ MMBtu/yr} \]

\[ \text{SEER} = \frac{Q_{\text{cooling}}}{\text{Welee}} = \frac{\text{Btu}}{\text{Wh}} = \frac{\text{MBtu}}{\text{kWh}} \]

\[ \text{Welee reqd} = \frac{Q_{\text{total reqd}}}{\text{SEER}} = \frac{121,000 \text{ MMBtu}}{17 \text{ MBtu/kWh}} = 7,118 \text{ kWh} \]

\[ 17 \text{ SEER} \quad \$\text{reqd} = \text{Welee reqd} \times \$/\text{kWh} = \$498/\text{yr} \]

\[ 13 \text{ SEER} \quad \$\text{reqd} = \$652/\text{yr}. \]