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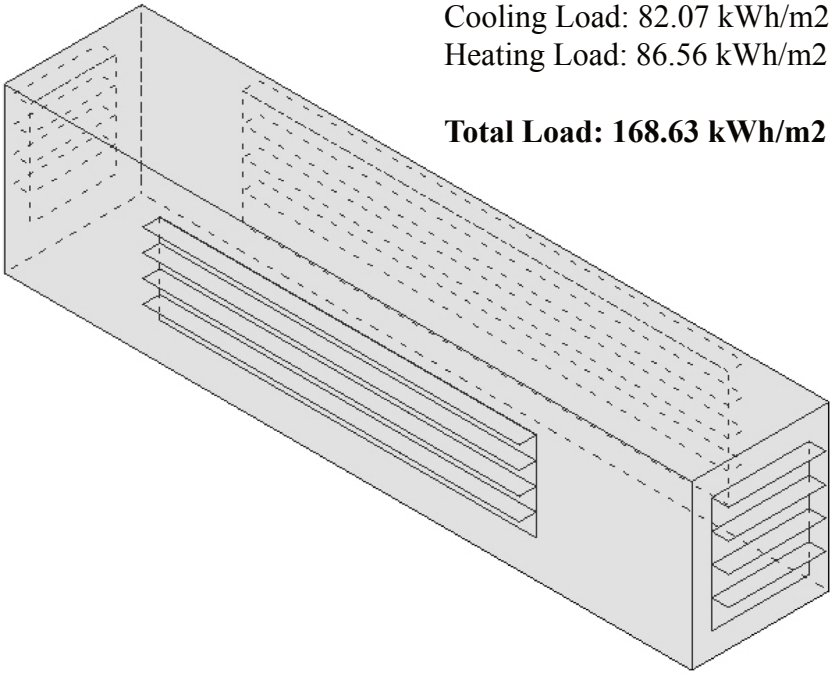
Environmental Systems I

BUILDING ENERGY BALANCE



Cooling Load: 82.07 kWh/m2
Heating Load: 86.56 kWh/m2

Total Load: 168.63 kWh/m2

Specifications:
- Window to Wall ratio:
  North: .5
  West: .4
  South: .3
  East: .5

- Blinds:
  Shading Depth: .3
  Number of blinds: 4

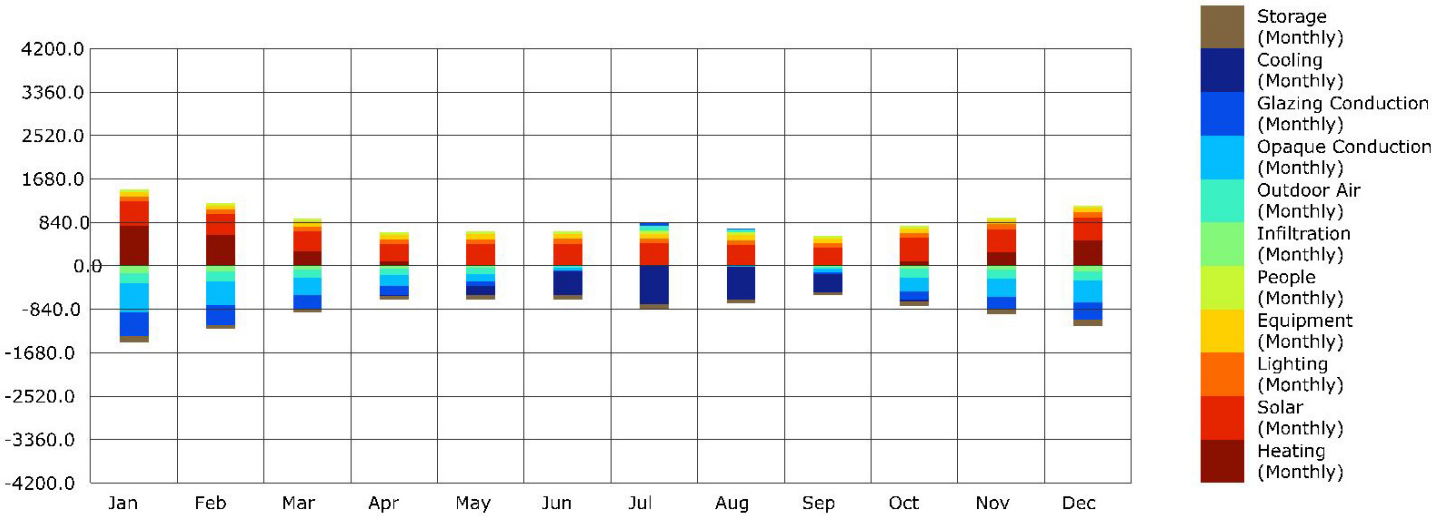
- Construction:
  Exterior Wall: R 34.4
  Exterior Window: R .7
  SHGC .65
  Exterior Roof: R 34.4
  Air Change per Hour: .5

The South and West windows were reduced in size so as to reduce the amount of sunlight directed at them. A subsequent enlarging of the North and East windows resulted in a higher heating load so those windows were left at a .5 ratio.

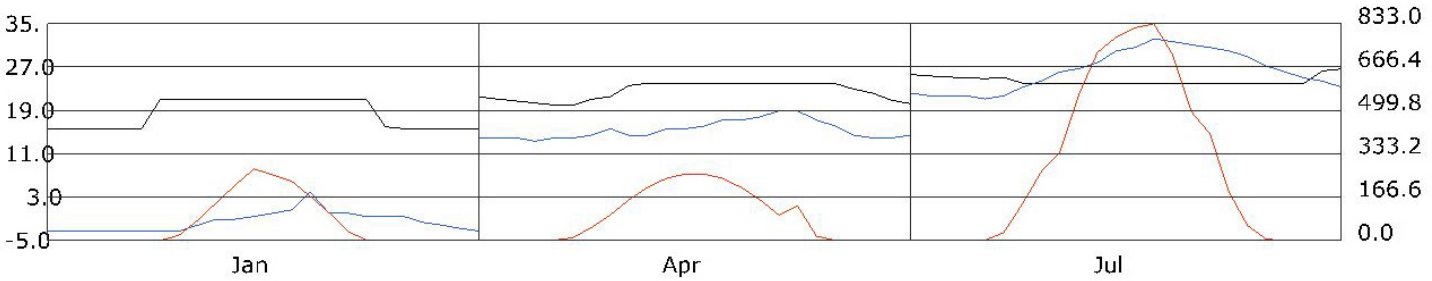
As the cooling load was still high, blinds were added to reduce the amount of cooling needed but adjusted so as not to add to the heating load.

Through several tests, the ideal configuration of the construction, given the window to wall ratios and blinds setup I set before, are high R-values for the roof and walls and a low R-value for the windows.

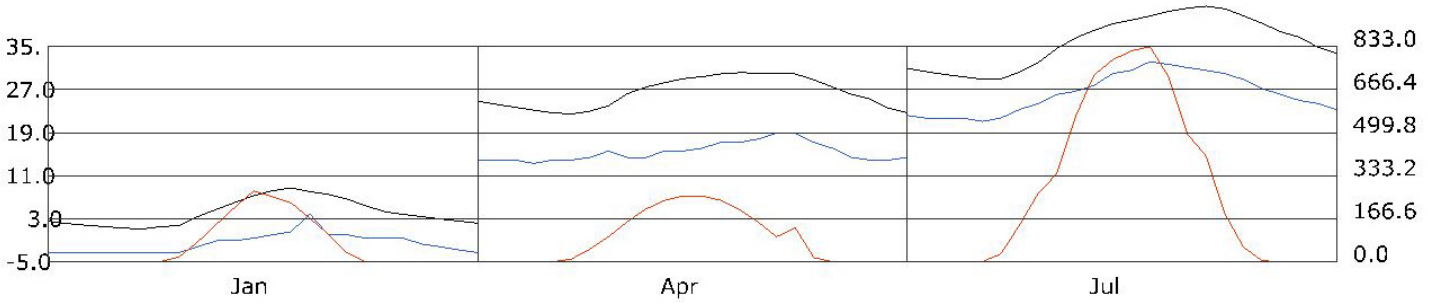
Finally, because our shelter is a shipping container, I assumed it would not be inhabited by humans and therefore, not need a high air change rate.



Radiation, Dry Bulb and Air Temperature (° C) with and Without Systems:



With the systems in place, the air temperature range between the winter and summer seasons is 15 °C - 26 °C. A difference of 11 degrees.



Without the systems in place, the air temperature range between the winter and summer seasons is 3 °C - 45 °C. A difference of 42 degrees.