Heating & Cooling Loads with annual Energy Demand

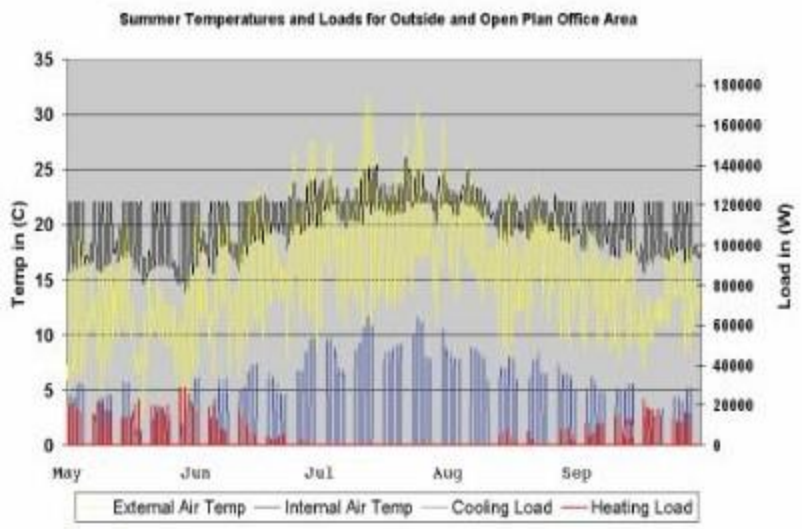
Sizing heating and cooling loads is an important function of TAS Engineering. You can use it to compare the relative merits of different heating and cooling strategies. TAS can evaluate newer systems such as displacement ventilation or floor supply of fresh air with chilled beams or ceilings, as well as calculating loads for standard systems such as fan-coil or vav.

Displacement Ventilation

When designing displacement ventilation the model is created with floor void zones below the occupied zones. Conditioned air is specified to pass through the floor voids and on into the occupied spaces. The heat exchange between the supply air and the surfaces of the floor voids is simulated to give a temperature pick up to the air. The cooling effect in the void results in lower floor and ceiling temperatures. If the occupied space is further divided into two volumes, for example the lowest 1.5m for the first, and up to ceiling level for the second, then the stratification effect of displacement may be modelled.

The graph opposite was created in Excel through an automatic data export from Tas. It shows office temperatures for each hour through a summer period with a displacement system. You can clearly see the difference between weekdays and weekends when the system is off. When outside air temperatures go above about 25oC, the limited cooling fails to hold the ideal 22°C and internal temperatures rise. However, when outside temperatures reach 32°C, internal temperatures only rise to 25oC, which is probably acceptable.

Graph showing summer temperatures:



Chilled Ceilings

For chilled ceilings with floor displacement a reduced amount of air is passed through the floor void and an additional cooling capacity placed in the occupied zones. You can set the radiant proportion of heating or cooling for the simulation, as well as the radiation exchange coefficient between the ceiling and the occupants. This gives an accurate analysis of the true effect of chilled ceilings on occupant comfort. With accurate modelling of thermal inertia, direct and diffuse solar shading and real weather data, TAS Engineering demonstrates that design solutions are successful when cruder calculation may indicate failure to meet comfort conditions. The result of simulations provides data on relative peak loads, annual energy demand and occupant comfort levels.