Oregon
TIMBER FRAME ENGINEERING

Fact Sheet:

Thermal Mass

Thermal mass is the ability of a material to absorb and store heat – a concept frequently applied to building design, in particular when looking at the risk of summer overheating and higher fuel bills in the winter.

The risk of overheating is, paradoxically, a result of the current focus on reducing energy demand in UK housing. While increased levels of insulation and thermal efficiency of the fabric for all methods of construction have reduced fuel bills in the winter, it can result in buildings with poor levels of internal comfort during the summer.

How thermal mass works

In this context, thermal mass provides "inertia" against temperature fluctuations – absorbing heat when temperatures are high, releasing heat when the surroundings are cooler. The more dense a material (i.e. the less trapped air), the higher the thermal mass – for example, concrete has a high thermal mass, thermal blocks have a low thermal mass and insulation almost none.

From this, we can conclude that heavyweight construction, such as masonry, will always have a higher thermal mass than lightweight timber frame. However, false ceilings, plasterboard on dabs, raised floors and carpets effectively isolate the thermal mass of the structure and limit the ability to absorb heat within the occupied space – buildings like this can be described as thermally lightweight even though they may be structurally heavyweight. Consequently, it does not necessarily follow that a structurally heavyweight building will automatically provide high thermal mass.

Guidance

Ideally, all factors that affect overheating should be addressed at the design stage, whenever this is possible, eg:

Reduce solar gain	- avoid large West facing openings - use natural features, e.g. vegetation - use external shading on South facing windows
Minimise internal gains	- use efficient electrical appliances - use low energy lighting - insulate cylinders and primary pipe work - locate boilers and hot water cylinders together
Increase thermal mass	- introduce double layers of plasterboard - use a layer of dense plaster in lieu of the above - introduce hard coverings to floors - use trombe walls
Ventilation	- reduce day time ventilation - design high night time ventilation rates - provide secure openings
Innovation	- phase change material - water tanks

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