with some additives the wax PCM can be rendered self extinguishing. With any particular organic PCM this point should be carefully checked and tested.

Another issue of interest with all types of PCM surface elements when the heat source is the indoor air is the indoor air temperature range which is needed to effectively melt the PCM during the day and to freeze it during the night. When the heat transfer is mainly by convection the temperature range of the indoor air has to be significantly larger than the range of the PCM, in order to provide a temperature gradient between the indoor air and surfaces sufficient to yield the required heat flows.

In some cases the indoor air temperatures which would be needed to melt the PCM imbedded in the walls might be too high for human comfort and/or the air temperature needed for freezing it might be too low.

A possible design solution is to provide an air space behind a relatively thin layer of elements containing PCM (e.g. wall boards about 1"), and to blow the warm or cool air in this air space.

The "charging" of the PCM would need a fan to circulate the warm air during the sunny hours (in the case of solar heating), but the discharge at night would be passive, by natural heat flow from the "freezing" PCM into the indoor space. In a similar way, the PCM could be freezed at night by fan assisted cool air flow behind it while it will absorb heat from the interior when melting during the daytime. The thickness of the surface element should be limited to that depth which would enable sufficient "passive" heat flow to melt and freeze the PCM across the whole depth of the element.

c) Latent Heat Storage in Air Spaces of Ceilings and walls

PCM elements are usually of very limited thickness and therefore also of limited heat storage potential per unit surface area. However, in frame type walls and ceilings there are integral air spaces. It is possible to place PCM elements inside the air spaces in such a way that longitudinal channels are formed, containing the PCM elements. Hot or cooled air can flow through the space, charging the PCM.

An example of the use of such ceiling channels for thermal storage, although with a conventional material (concrete), is the Barra - Constantini passive solar system which has been developed and implemented in many buildings in Europe. A description of this system is given in Section 3. Here only its main features will be mentioned.

In the Barra-Constantini system a solar collecting element is placed in front of an insulated southern wall,(e.g. a number of metal lath layers), covered by glazing. Thus the wall forms a vertical air heating solar collector extending from the South wall to the North wall.

During sunny hours hot air rises and flows into and across "channels" imbedded within a concrete ceiling, heating on its way the mass of the ceiling, before exiting from the channels near the northern wall of the building. The northern rooms are heated by the warm air exiting from the ceiling channels. Thus