B.4 Perlite Impregnated with PCM

Another approach to the incorporation of PCM into conventional materials is that of William A. Cordon (Patent application-private communication). He has applied for a patent for "energy storing insulation", which is obtained by mixing liquid PCM, such as sodium sulfate (Glauber Salt) or calcium chloride, with expanded perlite. Expanded perlite is a porous volcanic material with a very large number of tiny pores, usually serving as insulation material. The expanded perlite particles serve as a carrier for the PCM.

The liquid PCM is absorbed within the pores of the perlite, which can absorb more liquid than its awn weight and still remain surface dry. This leaves the perlite particles moist but not wet.

Cordon suggests that the perlite/PCM mixture can be used to fill in the air space between the sheeting and the wall board in stud-walls. Another suggested application is as loose insulation over a ceiling, with a sealant sprayed over the entire surface.

Two problems have to be solved, in my opinion, for this form of PCM application to be practical. The first is that of the heat transfer rate in and out of the Perlite/PCM volume. The conductivity of Perlite (an insulating material) is very low and may be the limiting factor of the performance when the energy input is from the indoor space into the PCM, as is the case in Direct Gain solar heating or in night ventilation cooling.

The second problem is that of the need for "absolute" prevention of vapor flow in and out of the PCM, as its properties are highly sensitive to the water content.

B.5 Comments on Potential Applications of PCM

Containerized PCM Ceiling Tiles

The PCM tiles tested in the MIT building are in effect shallow containers with about one half of the total volume filled with "pure" PCM. The problem of cost of the containers with such tiles still exist.

The project of the MIT building has demonstrated that it is possible to produce conventional building elements with PCM storage capacity. In this case these were containerized PCM tiles but other "integrated" thin elements, like e.g. PCM impregnated ceiling panels or wallboards, may also perform a similar function. Other PCM materials can also be used in ceiling tiles or other surfacing elements, like waxes.

In the MIT case the "charging" of the storage was by reflection of direct penetrating solar radiation to the ceiling tiles. This mode of heat transfer enables charging the PCM with a small temperature difference between the indoor air and the tiles. But the area of the PCM ceiling is limited to the area onto which the solar energy is reflected in practice, an area which