the significant reduction in the strength. It is the opinion of the author that in considering the weakening of the concrete and the modest gain in the heat capacity it is doubtful whether there might be many application for the PCM in this form.

Using PCM Pellets as Aggregates in Concrete Blocks

No data was given in the paper of Salyer on the density of the pellets, and on the maximum fraction that the pellets can fill in concrete. The density of the PCM material is about 0.78. Still, even with the limited available information it is possible, with some assumptions, to estimate the properties and the outcome of several ways of application.

A simple use for thermal storage might be to incorporate the pellets in non-structural solid concrete blocks used exclusively for thermal storage, where strength is not a factor, and where the pellets can be packed at the maximum volume fraction. Assuming it would be possible to have about 50% pellets (by volume) and that the PCM fills 80% of the pellets, the heat capacity of the block's material would be about 15.8 cal/gr/day (0.78*0.5*40+0.5*2*0.2), namely about 8 times the specific heat capacity of concrete in a direct gain situation (2*0.2*5).

However, it should be noted that the limiting factor which will determine the actual heat storage capacity of such walls might be not the intrinsic capacity of the wall but the rate of heat flow into and out of the PCM in the wall, a factor depending on the thermal conductivity of the material. The conductivity will, in effect, determine the useful thickness of such walls. The design details of the "assembly" of blocks can also determine the effective heat capacity of the PCM.

Concrete/PCM solid "thin" blocks could be used in Direct Gain buildings as non bearing partitions, as well as lining of load bearing walls. As the heat input into the wall is from the interior, and the acceptable indoor temperature swing is rather small, the "usable" thickness of the wall would be quite limited. Concrete/PCM pellets blocks could also be used as thermal storage (Trombe) walls. In this application, with common thickness of a thermal storage wall (20-40 cm.), the wall will have a very high thermal time constant with a long time lag of few days. The thermal conductivity of the composite material may be the limiting factor determining the maximum useful thickness of such walls.

After a sequence of several cloudy days it might take several sunny days till the new heat wave will "cross" a wall with conventional thickness of concrete blocks, e.g. 20 cm. Therefore, provisions for fast heat gain, e.g. by southern and/or western windows providing direct solar gain, would be advisable.

On the other hand, after a sequence of several sunny days, with the melting of all the PCM, the wall will contain many times more heat than a conventional concrete wall. The latent heat capacity of the PCM in a wall 30 cm.thick of 50/50 mix, for example, is 0.5*30*10,000*0.78*40 = 4680 Kcal/sqm. The sensible heat capacity of the concrete, with 5 oC temperature swing (the melting-freezing temperature difference) is 0,5*30*10,000*2*0.2*5 = 300 Kcal/sqm. The combined heat capacity is 4980 Kcal/sqm. For comparison, a 30 cm. water wall, undergoing