

# NEW INSULATING PRECAST CONCRETE PANELS

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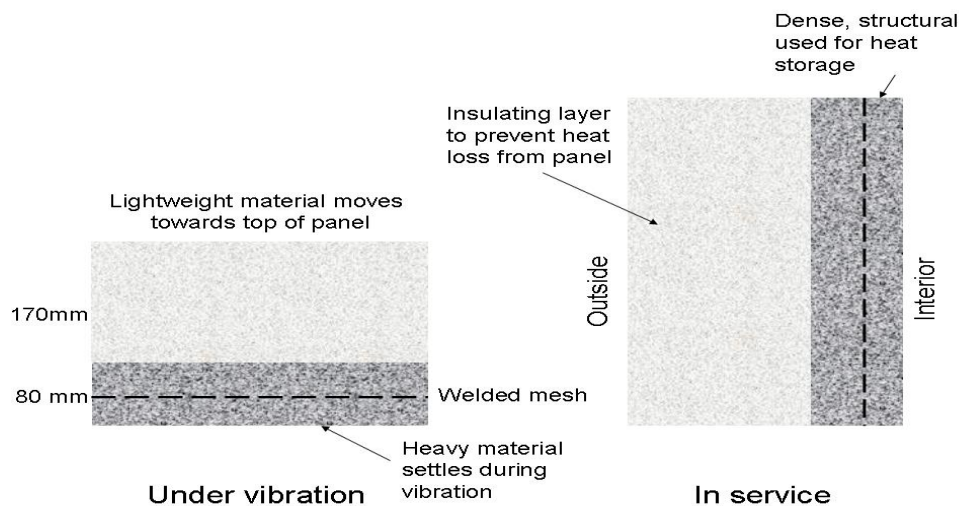
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Conventional concrete is a poor insulating material despite its good thermal mass capacity while lightweight concrete has higher insulation value at the price of thermal mass capacity. The use of precast panel systems for walls in residential homes would provide high quality end product. To some degree precast concrete is not suitable for residential construction due to its poor thermal and acoustic performance. Several concrete wall systems are currently manufactured with improved insulation values using various insulating mediums, such as polystyrene sheeting. These products on the other hand prevent the full thermal mass of concrete being utilized.<sup>1</sup> These insulation forms are therefore not ideal in terms of energy efficiency, cost and labour requirements.

Combining thermal storage and insulation of different concretes Bellamy and McSaveney proposed the concept of a panel produced from a single concrete mix with:

- Lightweight insulating top (outside) layer with low thermal conductivity providing good insulation.
- Heavy material dense bottom (inside) layer with high specific heat to provide thermal mass and sufficient strength for construction handling and to withstand service loads.

The controlled segregation was achieved under vibration using aggregates of different density and a moderately sticky paste.



**Figure 1: Illustration of variable density concrete panel<sup>2</sup>**

Some trial panels were made using waste materials such as fly ash, slag and expanded glass beads together with either Portland cement or inorganic polymer cements.<sup>3</sup> Despite obvious benefits in thermal performance there are several major technical concerns that need further investigation:

- Controlling the segregation.
- Controlling warping and bending of the panels.

<sup>1</sup> CCANZ, Cement & Concrete Association of New Zealand. 2007.

<sup>2</sup> JR Mackechnie, YS Park, T Saevarsdottir & L Bellamy. 2007.

<sup>3</sup> JR Mackechnie, YS Park, T Saevarsdottir & L Bellamy. 2007.

- Provide sufficient strength as well as thermal performance.
- Ensuring sufficiently durability and serviceability.<sup>4</sup>

Research shows promising potential of producing variable density concrete panels. These panels can be manufactured with a simple and energy efficient processes using mostly recycled materials. As well as being simple in construction they are also energy saving during the life time of the building by providing good thermal efficiency.

## References

- CCANZ, Cement & Concrete Association of New Zealand. 2007, 20<sup>th</sup> of January. *Residential Precast Concrete Systems*. Web site: <http://www.cca.org.nz>.
- JR Mackechnie, YS Park, T Saevarsdottir & L Bellamy. 2007. *Variable Density Precast Concrete Panel Development*. Unpublished paper. University of Canterbury, New Zealand.

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<sup>4</sup> JR Mackechnie, YS Park, T Saevarsdottir & L Bellamy. 2007.