



## PRECAST FLOORING FEDERATION

technically sound solutions

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### **Carbon Neutral Precast Flooring**

*George Pickard of the Precast Flooring Federation's marketing committee puts the case for thermally insulated precast concrete floors*

Responding to energy conservation and other concerns. Conventional masonry houses incorporating precast concrete floors at ground floor and upper floors can, by taking advantage of their thermal mass, offer significant whole life savings compared with timber-framed housing.

A recent independent study, carried out by Arup Research and Development, is the most comprehensive examination to date of embodied and operational carbon dioxide emissions. The carbon emissions of a house in use in fact have far more impact than the embodied energy of the materials and labour utilised to build it. Some 50% of the UK's emissions are produced by the energy used to heat, cool and light buildings, making it essential that energy consumption over a building's lifetime are taken into account when evaluating construction materials.

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*Phil Harris, Chairman of the PFF Marketing Committee.*

In Arup's analysis of energy consumption and CO<sub>2</sub> emissions of timber homes and concrete homes, it was found that the latter has the lowest total energy consumption and CO<sub>2</sub> emissions. One reason for this is that the thermal mass in concrete homes reduces the need for air-conditioning in summer months and, by capturing solar gains, also reduces the consumption of winter heating fuel. Indeed, the winter savings alone from using concrete offset its slightly higher level of embodied CO<sub>2</sub> compared with lightweight form of construction in as little as 11 years. Looking at this in the light of the BRE durability target of 120+ years, the concrete/masonry specification would therefore outperform timber for more than a century.

Summer savings are also significant as concrete acts as a thermal store, absorbing heat during the day and releasing it at night: a moderating effect referred to as 'fabric energy storage' or FES. Compared with air-conditioning, FES can reduce CO<sub>2</sub> emissions by up to 50%, since around 90% of the environmental impact from buildings comes from heating or cooling.

"Timber houses with timber floors may have less embodied CO<sub>2</sub> than those built from concrete, but concrete homes win the carbon battle hands down," says Jeff Dyson, head of housing solutions at The Concrete Centre.

The government's consultation document sets out ways to cut CO<sub>2</sub> emissions by 30% and make all new building carbon neutral by 2016. Following the EU's Energy Performance of Buildings Directive, which requires the energy performance of buildings to be calculated in accordance with a national standard.

"Concrete's thermal efficiency and adaptability means it is not only well placed to deliver the government's carbon emission reductions. but it can do so in a sustainable way," says Andrew Minson, director technical services, The Concrete Centre.

So how do we actually achieve this? While everyone understands how a thermos flask with its vacuum keeps drinks hot, it is the insulating properties of air that is the basis of all domestic insulation materials such as polystyrene and polyurethane. In particular, expanded polystyrene (EPS) offers excellent insulation in a lightweight easily worked form, at the same time minimising the use of the raw material. a by product of the petroleum industry.

Members of the PFF have been working on improving the thermal efficiency of their floors for over 30 years, combining the benefits of EPS with the thermal mass of the concrete beams and concrete screed. As precast floors can, in most cases, be specified at no extra cost, this is a clear case of simple equalling designed sustainable specification standards without pushing the boundaries.

Recognising the synergy of high strength structural concrete prestressed beams and the excellent thermal resistance values provided by EPS members can provide a range of solutions. Excellent insulation - with U-values of  $0.20\text{W/m}^2\text{K}$  - are achievable with these systems. The design of the EPS infill panels minimises cold bridging at the floor beam, and the EPS panel does not degrade during its lifespan. The environmental integrity of EPS is meanwhile excellent:

- Zero ODP (Ozone Depletion Potential)
- Zero GWP (Global Warming Potential)
- BRE Ecopoints rating from 0.043
- CFC, HCFC and HFC free
- Contains recycled content
- Recyclable
- BRE Green Guide summary A rating

For several years, members of the PFF have been using high carbon steel containing a high proportion of recycled metal as well as recycling aggregates.

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Members of the PFF offer advice on all of the technical issues raised in this article. The products themselves have been thoroughly tested and exceed the standards required by the NHBC.