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Structurally Insulated Concrete Panels - Precast Plus

Stephen Maddalena, chairman Architectural Cladding Association, offers his views on the potential of precast cladding to help meet Part L

The direct and incidental advantages of precast cladding construction are many and varied. Importantly, they valuably contribute to enhancing quality and safety, to improving efficiency and productivity and to providing programme and price certainty. Specifications for precast concrete wall cladding panels have usually included a requirement for their thermal performance to be enhanced to achieve a U-value of $0.35\text{W/m}^2\text{K}$ as a minimum. However requirements to achieve $0.3\text{W/m}^2\text{K}$ and even better are becoming the norm. These are generally satisfied by simply lining the internal face of the precast panel with an insulation board, often before its delivery to site. Typically, a zero ODP and CFC/HCFC-free high-performance rigid urethane insulation board with low GWP is used.

Alternatively, reconstructed stone or similarly finished precast panels or units with stone, brick or an even wider variety of other facings may be produced with insulation as a core between two wythes, or thicknesses, of reinforced concrete to form a sandwich panel. The necessary ties between the concrete wythes may be stainless steel dowels or plates or, for a more fully thermally-broken solution, proprietary fibre composite connectors. The internal layer of a sandwich panel may additionally be designed for it to act as a structural element within the building's frame. For a concrete building, the panels are suitably reinforced with projecting bars or links to facilitate their incorporation into the frame. Architects have been quick to recognise the potential of load-bearing sandwich panels, especially for medium-rise residential buildings. For example, the Spencer Dock development in Dublin, designed by Scott Tallon Walker Architects and described as 'the biggest and most ambitious urban regeneration project in Ireland's history', includes 12 apartment blocks from four to ten storeys: the precast concrete structures include a load-bearing outer skin of precast concrete sandwich panels with a honed, reconstructed Portland stone finish.

For the seven-storey offices on the corner of Savoy Street and the Strand, London, architects Squire and Partners opted for a structural insulated concrete panel system. As the precast perimeter panels act as the floor-to-floor structure, the walls were erected and the concrete slab cast before moving on to the next floor. Each storey took only two

weeks, the building being effectively constructed from the inside. The principal facades are formed from structural panels at six metre centres with infills of window or non-load-bearing insulated panels.

At the University of Nottingham's Portland Hill Centre for Career Development, architects Michael Hopkins & Partners adopted a technically advanced precast concrete structure with integral sandwich panel cladding. The structure is exposed and self-finished, external units being cast in a white reconstructed stone mix and internally in ordinary grey concrete. 'Hardwall' insulated cladding panels with full-face Thermomass insulation combined with composite fibre connecting pins, minimises cold bridging. The beams and columns of the structural frame having been left exposed to maximise the thermal capacity of the concrete, and painted white to maximise light levels, additionally contributing to energy efficiency.

Load-bearing sandwich panels provide a strong, durable, energy-efficient, fire-resistant wall system, at the same time minimising on-site labour cost and speeding construction. A secondary benefit of such sandwich panels is that they offer better acoustic properties – another area where Building Regulations are helping the quality of life.

The precast concrete element need not be a wall cladding panel: buildings for the high-rise residential sector typically include balconies within their design. Larger balconies have projecting reinforcement bars to enable them to be incorporated into the main structure, in which case cold-bridging is dealt with by lining the top and soffit faces of the adjacent floor slab, thereby extending the thermal gradient sufficiently into the core of the building frame. For smaller balconies, the units can be connected using proprietary systems where the rebar is projected through the insulation which acts as a thermal break between the unit and the structural frame.

Precast concrete cladding produced in accordance with BS CP 8297:2000 has a life expectancy of 60+ years and is generally maintenance-free. Dense concrete is air- and water-tight, giving superior weathering performance and corrosion resistance. Joints between panels are usually filled with sealant. The thermal mass of concrete serves to reduce peak heating and cooling loads.