

Expanded polystyrene – formwork for the future?

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Expanded polystyrene (EPS) permanent formwork has been used in Germany and The Netherlands for around 30 years. However, despite the publication of the BRE Information Paper IP9/98 *Energy efficient concrete walls using EPS permanent formwork*⁽¹⁾, the system has not been readily adopted in the UK.

Hythe, near Folkstone, Kent was an unlikely location for the UK relaunch of a construction system. However, in July 2001 on a quiet residential estate, a project took place that could be good news for the UK concrete construction industry.

The owner of a 1950s bungalow in a desirable location, attracting high property values, decided to build a two-bedroom bungalow with single garage in his generous back garden. Although retired, and not a professional builder, he wanted to undertake the majority of the work himself and looked around for construction methods that were quick and easy. It was during his research that he discovered the Styrostone system.

Originally patented in the late 1940s, the system uses lightweight EPS blocks with a density of 30kg/m³. Approved to ISO 9001, the blocks interlock and are used as permanent formwork. They consist of two EPS skins with a cavity bridged by integral ties made from EPS or polyethylene (PE). The blocks are easily cut to size using hand or power saws at junctions or to accommodate door and window openings. Conduits and pipes for utilities are installed within the cavities and are lightly held in position so they withstand the concrete pour.

No adhesive or mortar is required between the blocks, and a system of trestle supports is used to secure them in windy conditions.

After the internal and external house walls have been constructed up to roof level, a high workability ready-mixed concrete is pumped into the cavity. For most applications, a Grade C25 pumped concrete is used with a 10mm maximum aggregate size. On this project, reinforcement was unnecessary, but for basements a C35 concrete is used with reinforcement bar installed on a moulding within the blocks to combat soil and groundwater pressures. Subject to geotechnical conditions, Styrostone can be used to form foundations.

After initial curing of the foundation and floor slab, the bungalow walls were constructed from the blocks in just two-and-a-half days by two operatives, including a six-hour delay due to a power cut. Operatives do not have to be skilled bricklayers and, with training, the system is suitable for the self-builder. A total of 18m³ of concrete was required for the entire project including internal walls up to plate height. Styrostone claim that three or four experienced operatives can, without interruption, complete the walls of an average-size bungalow in one day, including concreting. Elevations of 2.5–3m can be completed in a day, using a single continuous pour and, in Europe and the USA, the system has been used to construct buildings up to five storeys. After 12 hours' curing, it is possible to start roof construction. Styrostone has also introduced a system of producing floors using a polystyrene beam-and-block system upon which mesh reinforcement is placed.



Figure 1: The blocks mesh together perfectly and do not require mortar or grout.



Figure 2: The 250mm-thick 'standard' blocks with PE ties.



Figure 3: The 'Super R' block in position.



Figure 4: Reinforcement can be inserted on a moulding in the blocks.

Styrostone is suitable for many projects, including residential, industrial and commercial buildings. Three block types are available:

- 250mm-thick 'standard' blocks with EPS ties. These are the most inexpensive, suitable for bungalows or small houses. In the final construction, they have a 30-minute fire rating.
- 250mm-thick 'standard' blocks with PE ties. These are more expensive and are suitable for a variety of applications. They are particularly useful for multiple occupancy residential properties where noise insulation is required. These blocks provide a 90-minute fire rating.