



Polymer Composites as Construction Materials

Application Summary Sheet 17

Title: Walling Systems and Partitioning

Target Audience: Architects, Building services engineers,

Keywords: Partitioning, internal, space saving, panels, modular, composite, sandwich panels,

Overview of application / summary:

The vast majority of internal walling systems are of panel construction. Composite Panels can consist of single skin sheet, or the more popular sandwich panel. Composite walling systems are now found in numerous situations including domestic and portable housing, offices, schools, hospitals, hotels, airports or any mass transit area. They are also particularly useful where access is limited or the floor cannot support high loads. One example is the use on cruise ship interiors, where FRP panel systems minimise critical weight usage. In office applications they simply consist of modular, decorative panels joined with a universal system to facilitate re-arrangement. These systems can be full or part room height. Domestic internal wall panels generally consist of a thin, strong layer of composite bonded to either side of PVC I beams.

Major benefits arise from the relative lightness of the panels, meaning they are cheaper and easier to transport and handle on site. Sandwich panels have influenced construction and installation practices in recent years. They are effortlessly deployed and rapidly fabricated by unskilled fitters, causing minimal disruption to the surrounding environment. Developments in manufacturing processes and materials are bringing the cost in-line with other building materials, however, lower transportation costs coupled with reduced maintenance and increased service life indicates the through life cost is lower than the alternatives.

FRP materials offer imaginative decor options and surface finishes, and the desirable properties of durability, strength and fire resistance means that the constructions readily comply with building and fire regulations. A new generation of composite panels are now making use of recycled materials as the core medium, with significant environmental benefits. Domestic plastic waste, wood chippings and cardboard are common waste products that can be incorporated into the core, while a high performance skin still provides the required properties.

Impact of application

Engineering:

- The low density of FRP panels is a major advantage, whilst still possessing the necessary properties to comply with relevant building regulations.
- Versatility - FRP panels may be bonded to other building materials to widen the range of applications and increase functionality (eg. the ability to add shelving units etc.) The panels are more flexible than wood and are easily machined and fitted on site with standard tools.
- FRP panel sections are made with continuous manufacturing processes which increase the efficiency of production. The latest CAM (Computer Aided Manufacturing) technology allows manufacturers to produce panels within high tolerance of customer specification. The only limitation is the width of the die in the process, which dictates maximum panel width.
- The development of specific resin and coating systems for the composite skins has improved fire performance to the extent where the most stringent of fire regulations can be met.
- The panels can exhibit a number of textured surface finishes and can effectively simulate natural wood or stone finishes.
- The panels possess good thermal properties and can maintain or potentially increase the energy efficiency of a building.

Financial:

- Unlike wood, composite panels do not require surface finishing or regular maintenance. Although initial cost is now similar to wood panels, reduced maintenance and longer life expectancy means better value.
- A high proportion of internal walling applications do not have large structural requirements (such as space dividers) and therefore cheap and/or recycled core materials can be incorporated to dramatically reduce the unit cost.
- The light weight of composite panels significantly reduces transportation and installation costs.
- Skilled fitters do not have to be employed to install the panels.

Environmental:

- Walling panels can utilise recycled core materials, the thin skin adding value, structural and aesthetic properties.
- The panels themselves are thus recyclable into core materials for future products.
- Continuous manufacturing processes use less energy in the production of a unit area of panel compared to 'single shot' processes.

- Reduced depletion of natural timber resources.

Social:

- The surface skins resist impact and stains. The non-porous surfaces can actually repel water and dirt and are easy to clean.
- The ease of movement and superior acoustic properties promote a pleasant working environment where this type of panel is used in offices and working areas.

Robustness of research

Although academic interest in this type of product is low, extensive research is conducted at commercial establishments such as BRE in the UK. This research is driven by the requirement for more affordable and durable internal walling and eventually complete housing systems. The rapid uptake in use of this type of product in the US, particularly for complete housing systems, provides evidence of the cost effectiveness and applicability of composite panel systems.

Future developments

It is envisaged that the development of manufacturing processes will increase production efficiency and reduce the cost of composite panels, eventually making them cheaper than wood or metallic alternatives. Domestic, lightweight housing (of which composite panels are a major factor) is seen as a potentially large market in the UK, following that of the US and other developing countries.

Where to get further information

Companies

Office Style Interiors (Composite partitioning systems)(UK)
www.officestyle.co.uk

Finney Acoustics (Composite partition systems)(UK)
www.finneyacoustics.co.uk

Trespa (Virtuon wall panels) (US):
www.trespanorthamerica.com

Apex Wall Panels Ltd:
www.panelizedwalls.com

Fiberfab (US) (Structural composite walls)
www.fiberfab.com

Omnia (UK) (Suppliers of "Comptech" thermo-composite sandwich panels)

Prepared by BRE and Trend 2000 Ltd (Partners in Innovation Project)
For further information please consult the project website:
www.polymercomposites.co.uk

www.sothfields.co.uk/comptech

Active Research

BRE (UK)(formerly The Building Research Establishment):

www.bre.co.uk

The Composites Performance and Design (CPD) Programme - A government initiative under the general materials programme. managed by the National Physical Laboratory (NPL): Specific research in to the performance and properties of composite sandwich panels.

www.npl.co.uk

The National Association of Homebuilders Research Centre (NAHBRC) (US):

www.nahbrc.com

WRAP Programme (Waste Resources Action Programme) - A government funded Industrial and Academic consortium tasked with developing high value added thermo-composite recyclable sandwich panels utilising domestic waste as a core material.

www.wrap.org.uk