

## Technical Information Sheet P409

# Value Benefits of Light Steel Construction

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Light steel construction is used extensively in the UK in a wide range of building applications. The precise nature of the value benefits of light steel construction will depend on the application and project specifics. However, there are generally three over-riding value benefits associated with light steel construction; speed, light-weight and quality. These lead to supplementary advantages, such as early completions, fewer snags and minimal re-work.

### Key benefits

The value benefits of light steel construction are:

- Speed of construction leading to potential cost savings by:
  - Reduction in site preliminaries.
  - Reduction in plant costs.
  - Earlier return on capital expenditure.
  - Shorter borrowing period required by the developer.
- Quality, accuracy and reliability of completed building with minimal call-backs and snagging.
- U-values of less than 0.15 W/m<sup>2</sup>K can be achieved cost effectively by light weight construction without leading to excessively thick walls and loss of usable floor area.
- The risk and consequences of fire during construction are extremely low as steel is non-combustible and does not add to the fire load of the building.
- High levels of acoustic performance are achieved by utilising double skin separating walls with multiple layers of board.
- Predictability during construction; light steel framing is less dependent on site conditions and weather, leading to fewer problems for the main contractor.

### Background

In 1998, The Steel Construction Institute published *Value and benefit assessment of light steel framing in housing* (P260). The publication provides information and data on the value assessment and financing aspects of housing construction using light steel framing.

The background study included a detailed comparison between housing built with light steel framing and those built with blockwork walls and timber floors. Costs for all items were evaluated for two typical house types. The study developed a model used to consider the benefits of light steel frame in financial terms. The model derived financial costs on a month-by-month basis and the total costs for the two systems were compared.

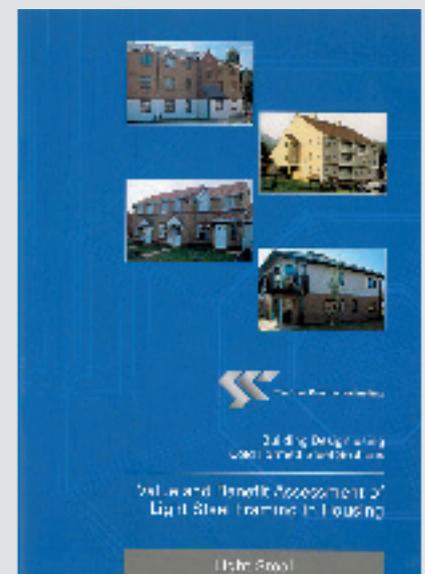
The overall conclusion was that housing constructed using light steel framing offers better quality and additional benefits for both developer and owner/occupier at no extra cost. The same conclusions are applicable today.



Light steel frame housing development in Leeds



Large residential development using light steel framing in London



Value and benefit assessment of light steel framing in housing (P260)

## Value Engineering

### System Benefits

A systematic approach to value engineering may be used to quantify the benefits of light steel framing. Direct financial benefits exist but other benefits may be considered in a broader value engineering assessment including life-cycle costings and business related benefits. Value benefits may be attributed to the builder or developer, and the building purchaser or user.

Often for light steel framing, the builder may be an institutional body such as a housing association, which has a long term interest in maintenance and flexibility of use of the building. Therefore, a different level of importance may be attributed to the value of various construction systems as perceived by the builder or client.



Figure 1 Construction of multi-storey light steel frame residential development

Light steel framing offers quicker construction and therefore earlier rental or return on investment, as well as better flexibility and utilisation of space. High levels of thermal and acoustic performance can be achieved without adding significantly to cost.

From the point of view of the developer, 'value' may be quantified in terms of:

- Financial benefits arising from speed of construction, leading to greater profitability.
- Economy of scale through reduced factory production costs in comparison to site intensive building.
- Reduction in 'call-backs', which is achieved through better quality control and more precise construction.
- Less 'down-time' due to bad weather.
- Less wastage of materials and associated site management.

### Speed of Construction

When compared to traditional construction (i.e. brick and block) light steel framing provides considerable benefits in terms of speed of construction.

For typical sites, the construction of light steel framing can be 30 to 35% faster which will produce savings on contract preliminaries. This means that property sales can commence approximately 30% sooner giving earlier return on capital and release of the developer's investment.

The construction programme for brick and block is compared with that for light steel framing in Figure 2.

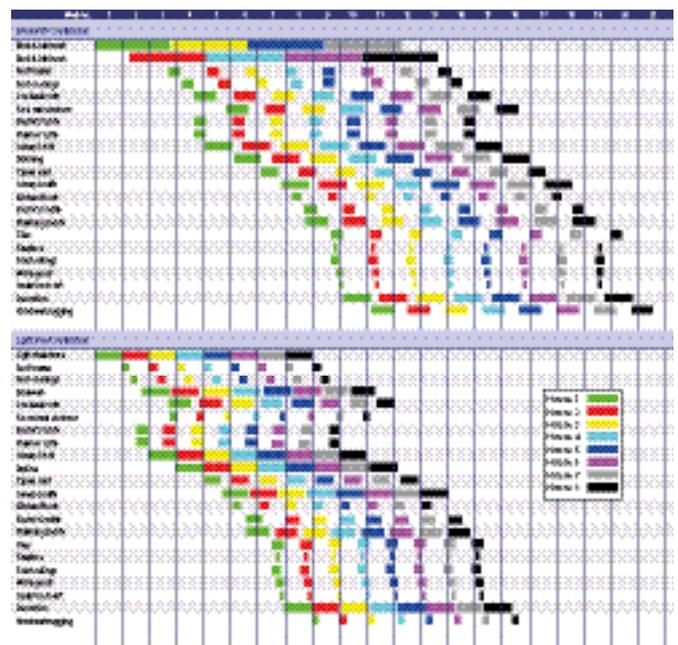


Figure 2 Construction programmes for a project cycle of houses using blockwork construction and light steel framing

### Improved Quality

Quality may be defined broadly by:

- Dimensional accuracy and freedom from non-load related movement.
- Robust nature of the construction system with reliable structural behaviour.
- Long life and freedom from rot.
- Ability to be modified or extended later as requirements change.
- Single point procurement.

All these beneficial characteristics apply to light steel framing.

## Sustainability Benefits

### Modern Methods of Construction

A study carried out by SCI has identified the benefits of modern methods of construction relating to the reduced disruption caused to local residents by the construction operations. The study quantified these benefits in terms of the reduction in dust, noise, vehicle movements and the environmental impact of site-generated waste (see SCI publication: P350).

A similar study by NAO showed that highly prefabricated systems can reduce construction periods by 60% and require 75% fewer operatives on site, with consequential benefits for the client, contractor and the local community.

Construction on confined urban sites presents developers with various challenges including:

- Lack of working and storage space.
- Need to minimise the impact of all aspects of construction work on the local residents.
- Shortage of skilled labour for site construction.

These challenges can be met by replacing a high proportion of the building that is constructed using site-intensive activities with off-site manufactured components. For example two dimensional light steel panels or three dimensional steel frame modules may be used instead of traditionally constructed walls and floors. Off-site manufactured components are delivered to site on a 'just-in-time' basis to suit local conditions and require no storage space on site.

Figure 3 shows Oriel High School in Crawley, built using a concrete frame with light steel infill wall panels. The panels were supplied with cement board, insulation and glazing pre-installed. This led to a 29% reduction in the total construction period compared to traditional blockwork wall construction. Additionally, waste from site was reduced by two thirds and there were zero defects.



Figure 3 Oriel High School, Crawley, West Sussex

### Waste Reduction

The SmartLIFE project was a site measurement research programme undertaken by BRE. The purpose was to study and compare the construction process for 106 homes. The study's specific aim was to compare four different construction methods:

- Conventional brick and block construction.
- Open panel timber frame.
- Light gauge steel frame.
- Insulated concrete formwork.

The waste generated using light steel frame construction was reduced by 4.8 m<sup>3</sup> per 100 m<sup>2</sup> of floor space (22%) or 4.2 m<sup>3</sup> per £100k project value (22%) compared to brick and block construction.



Figure 4 Light steel framing in Cambridgeshire studied in BRE SmartLIFE project

### Safety Benefits

HSE data shown in Figure 5 confirms that there are significantly fewer fatal injuries per 100,000 employees for factory based manufacturing activities than onsite construction by a ratio of approximately 3:1.

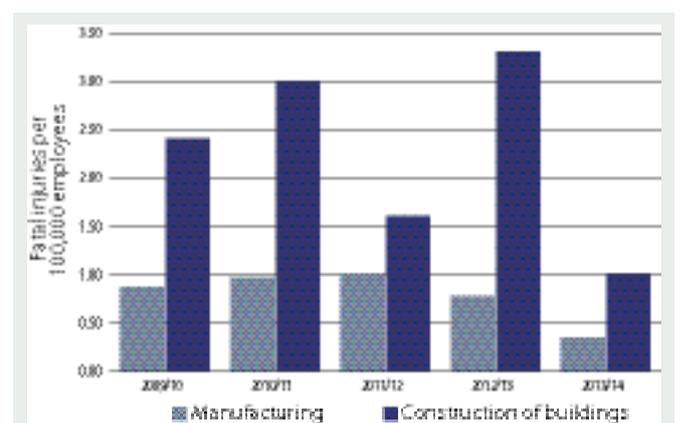


Figure 5 Fatal injury rates 2009 to 2014 (Source of data: HSE RIDIND)

## Sources of Information

### Other technical information sheets

The following technical information sheets give further details on specific topics related to light steel construction.

- ED010: Light steel solutions for all applications
- ED011: Light steel residential buildings
- ED012: Light steel framed housing
- ED013: Light steel infill walls
- ED014: Light steel modular construction
- ED015: Acoustic performance of light steel construction
- ED016: Fire safety of light steel construction
- ED019: Thermal performance of light steel construction
- ED020: Sustainability of light steel construction
- ED021: Robustness of light steel construction
- ED022: Durability of light steel construction
- P407: BIM and 3D modelling in light steel construction
- P408: Light steel load-bearing walls

### Best Practice Guidance

The Light Steel Forum have produced a series of information sheets which provide guidance on best practice in light steel framing. These cover four key areas of the design and construction process:

- ED027: Design and construction
- ED028: Pre-start requirements
- ED029: Installation
- ED030: Follow-on trades

### Bibliography

The following publications may be referred to for more information on value benefits of light steel construction.

- Rogan, A.L. and Lawson, R.M.  
*Value and benefit assessment of light steel framing in housing* (P260).  
The Steel Construction Institute, 1998.
- Heywood, M.D. and Raven, G.K.  
*Benefits of steel construction in urban locations* (P350).  
The Steel Construction Institute, 2006.
- Cartwright, P., Moulinier, E. and Nowak, F.  
*SmartLIFE site measurement final report* (BR500).  
BRE, 2008.
- Using modern methods of construction to build more homes quickly and efficiently.*  
National Audit Office, 2005.
- Taylor, S.  
*Offsite production in the UK construction industry - A brief overview.*  
HSE, 2008.

### Manufacturers

The following manufacturers are members of the Light Steel Forum and are active in the light steel framing and modular construction sector and may be contacted for further information.

- Ayrshire Metals Ltd - [www.ayrshire.co.uk](http://www.ayrshire.co.uk)  
BW Industries Ltd - [www.bw-industries.co.uk](http://www.bw-industries.co.uk)  
Fusion Building Systems - [www.fusionbuild.com](http://www.fusionbuild.com)  
Hadley Steel Framing Ltd - [www.hadleygroup.com](http://www.hadleygroup.com)  
Kingspan Steel Building Solutions - [www.kingspanpanels.co.uk/sbs](http://www.kingspanpanels.co.uk/sbs)  
Metek UK Ltd - [www.metek.co.uk](http://www.metek.co.uk)  
Saint-Gobain - [www.saint-gobain.co.uk](http://www.saint-gobain.co.uk)  
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