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History and development of light gauge steel within the construction industry

History and Development of Light Gauge Steel Within the Construction Industry

At the end of World War Two, many countries, including the United Kingdom, Japan, France and Germany were suffering from an acute housing shortage. It was at this time that the use of light gauge steel was introduced into the construction industry by using it as a cladding system within the building of steel framed 'pre-fab' houses. These 'pre-fab's' were poorly designed with little insulation causing cold bridging and ultimately condensation and dampness within the interior of the buildings. This has led to many of these buildings being demolished and traditional brick homes constructed in their place. Despite this, with improved insulation, light gauge steel has continued to be used as an infill structure on multi storey buildings built from hot rolled steel or concrete frames. Commercial and retail buildings in particular continued to benefit from its diverse capabilities, using it as a cladding system which can be formed into many different shapes. In the USA, since 1990 over 20% of all affordable homes are now built using this method and it is still growing year on year (Koones, 2006). However, in the UK, we are not using advances in technology as we should be, meaning the buildings that we construct are responsible for almost half of our carbon emissions, half of our water consumption, around a third of our landfill waste and a quarter of all raw materials used in the UK (Smith R A, et al. 2003). This means that the UK's sustainable development targets cannot be met without a fundamental change to the way in which buildings are constructed. The national targets for greenhouse gas emission reductions and the drive for buildings that generate zero carbon in operation present a huge challenge to the building industry (Corus. Sustainable Steel Construction). These drivers have forced the industry to radically change the way in which it constructs its buildings developing other forms of construction to comply with new building regulations and sustainability issues.

Advances in technology have led to improved building designs enabling many of the problems that were associated with light gauge steel in previous buildings to be overcome. Other forms of construction have also evolved, most of which are now capable of being manufactured in a factory and shipped to the site ready for assembly. These are known as Modern Methods of Construction (MMC) and their use has been encouraged by Government and the Building Research Establishment (BRE) due to their impact on the environment and benefits to the end user. In 2006, the MMC market split was: £414 million for volumetric (based on manufacturer's selling price), 52,797 timber frame units (houses and commercial), £61 million for light gauge steel frame (which equates to around 6,100 units), 750 SIPS units (estimate) (BRE 2nd March 09).

Today the properties of light gauge steel are being utilised, not only as a cladding system but as a complete building product, replacing bricks and blocks with thin studs of steel fixed together to form non-load bearing or load bearing walls. The studs that are used are formed by folding the strips of galvanised, light gauge steel into the required shape, of which there are many. The most common shape being C sections which are usually formed for use within walls. These vary in size from 40 - 225 mm and between 0.56 - 3.2mm in diameter depending on whether or not they are to be used in exterior, interior, load bearing or non-load bearing elements of the building. The steel used is galvanized, providing it with a

protective coating for internal applications and has a standard coating of G275 (275 grams/m²). As it is only suitable for interior applications then the entire light gauge steel structure has to be enclosed within a protective covering. This is referred to as the 'envelope' or a 'warm frame structure' and is formed using insulation and a protective vapour barrier. The warm frame structure enables the building to have excellent thermal properties, surpassing the minimum U-Value levels of the Building Regulations 2000. Within the UK the design code for light gauge steel is BS9590 part 5; European design code is Eurocode 3 part 1.3 these are intended to be set of technical rules for the design of buildings using this method of construction.





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Light gauge steel has the best strength to weight ratio over any other building material and these high strength to weight ratios equate to six tonnes of steel achieving the same performance as 120 tonnes of concrete (SCI, 2007) and as a consequence of its light weight, dependant on ground conditions, less substantial foundations, even the use of prefabricated ground beams assembled to form the foundations may be suitable. Its light weight also inevitably means fewer deliveries to site, in turn causing less disruption to the local community.

There are a number of ways in which the elements of a light gauge steel building can be constructed, one of which has taken its name from timber framed buildings where each element of the building is cut to length and fixed together on site. This is referred to as 'stick' building and is a very labour intensive method which, along with a carpenter for timber frames, requires several years of training. This is similar to traditional construction but instead replacing the bricks and mortar with light gauge steel, a good method for 'one off' buildings but it also prevents the benefits gained by off site manufacture to be achieved. The opposite to stick building is the volumetric system. This is the most factory based form of construction and involves the delivery on site of, usually, a complete room fully fitted out with all fixtures and fittings. This minimises on site installation work and only requires the individual 'pods' to be fixed together increasing the rate of construction of the building. This form of construction is very good for buildings where a repeated style of room is required such as student accommodation blocks or a hospital. When the design of a building is more complex then the cost of producing individual 'pods' significantly rises. The factory based fabrication of the 'pods' ensures a high standard of workmanship with a precision of +0 to -2mm tolerance being achievable and also minimises the traffic, waste, labour, and time spent constructing the buildings resulting in savings for the developer whilst minimising the impact on the environment.

The open panel method is another design used with light gauge steel structures. It involves the assembly of the walls, floor or roof within a factory based environment and delivered to the site when needed. All insulation, services, cladding and internal finishes are then fitted on site. The direct factory based savings for the open panel method is reduced due to the fact that the superstructure of a building only amounts to about 15% of the total construction costs. Any savings made using the system would be modest but the reduced

made.

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The closed panel method also involves the production of the elements of the building within a factory but will also have the insulation and vapour barrier fixed to it. The services, internal finishes, doors, windows etc may also be in place and the different elements of the building would only require fixing together on site which is usually achieved, as in other methods, by welding, riveting, screwing or crimping.



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Costs of MMC have been muted as a barrier to the progression of their use and the Barker Review of Housing Supplies (2004) stated that "At the present time, traditional brick and block methods of construction remain cheaper, in many cases, than modern methods of construction, including off-site manufacture (OSM). Only four years later a 2008 BRE report (SmartLIFE - Lessons Learned), published its findings on a pilot project in the Fenland district of Cambridgeshire. It found that light gauge steel construction was in fact, cheaper than the traditional method of brick and block and also that of other MMC used, including timber framed and insulated concrete formwork. According to the SmartLIFE report the advantage of an ongoing partnership and understanding between the light gauge steel manufacturer and the main contractor was a factor in the methods cost effectiveness. The SmartLIFE project was undertaken to find the best ways the UK can deliver a greater volume of sustainable, affordable and high quality construction in less time, using both traditional and innovative methods of construction.

In comparison to other MMC, light gauge steel offers a range of benefits and floor span capabilities also add to its diversity. Rooms can be changed or added to the building by simply moving interior walls which do not require the use of other methods. They can also be disassembled and reused or recycled. Unlike timber framed buildings, insulated concrete formwork walls. Whilst there are benefits to using light gauge steel there are also disadvantages including the metals thermal conductivity. Unlike a timber framed building, heat can quickly conduct across a metal stud and with many studs in a wall this can reduce the temperature within a room ensuring the U value of the wall is reduced. To rectify this additional exterior insulation is required at extra cost to the developer. There are also fears about corrosion problems. If the building is not kept within its 'warm envelope' then deterioration of the metal could be a problem. A counter argument is that timber rots far easier and quicker than metal and timber can also be a food source for a variety of animals.

The electric conduciveness of the frame also means that extra work is needed to ensure the wiring does not come into contact with the frame. In modular and closed panel construction this would be undertaken in factory conditions and would be easily overcome but with on site installation it inevitably means further responsibility falls on to the sub-contractor electrician. Perhaps the most serious of its disadvantages is the thermal conductivity of the metal frame and its ability to cause the structure to collapse. To tackle this problem the fixing of two layers of gypsum plasterboard at staggered joints gives the metal frame a fire resistant time suitable to exceed the minimum fire safety requirements of Part B (Fire Safety) of the Building Regulations 2000. The acoustic performance of light gauge steel has also been questioned but the necessary double layer of plasterboard also takes the level of acoustic performance past the necessary requirements outlined in Part E (Resistance to the passage of sound) of the Building Regulations 2000. The high embodied energy of light gauge steel is also a disadvantage to people who have no knowledge of its reusability and recyclability. To calculate the embodied energy within construction components the World Steel Association uses the 'system expansion' method of lifecycle assessment, which is the preferred approach of the International Organisation for Standardization (ISO) 14040 series of environmental standards. Although it is high in proportion to other MMC it is its ability of indefinite re-use and recycling without its qualities ever decreasing which differentiates it from all other methods of construction.

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Unlike traditional forms of construction light gauge steel benefits from low waste, adaptability, off site manufacture, re-usability, recyclability and resource efficiency making it one of the most sustainable building methods available within the UK. The buildings that can be produced by this method are light, open and very adaptable meaning old buildings would not have to be demolished when they are deemed unsuitable. The interiors would be simply rearranged to meet the end users requirements thus prolonging the life span of the building.

Light gauge steel can and does exceed the requirements of today's low level building requirements and in conjunction with other methods of construction its benefits are also widened to medium and high rise buildings. However, a number of barriers will have to be overcome if light gauge steel is to become a prominent method of construction. Consumer confidence and the stigma of pre-fab buildings will have to be improved upon which can only be achieved by educating the consumer on the benefits of light gauge steel, including its whole life cycle properties. Finally financial aspects will have to be challenged including mortgage lenders and insurers who will essentially become a part of the education system. Their own education in the use of light gauge steel will enable them to encourage the use of and be involved in the progression of Modern Methods of Construction.

Bibliography

AMA Research Ltd, Current Practices and Future Potential in Modern Methods of Construction, waste and resources action programme. (2007)

Barker K, Review of Housing Supply, Delivering Stability: Securing Our Future Housing Needs. Final Report and Recommendations, (2004), HM Treasury.

BRE, Assessing the Sustainability of Prefabricated Construction Techniques: Building Research Establishment, (2003)

BRE, Designing Quality Buildings, HIS BRE Press, (2007)

CABE. Design and Modern Methods of Construction: Commission for the Built Environment, (2004)

Communities and Local Government, Code for Sustainable Homes, Technical Guide, Department for Communities and Local Government, (2009)

Corus & BCSA. Sustainable Steel Construction, Building a sustainable future, (date unknown)

Corus. Start Building With Finished Rooms, Modular Building System, (2006).

Currie D M, The use of Light- Gauge Cold - Formed Steelwork in Construction, developments in research and design, Bre report, IHS BRE Press, (1989)

Davison B & Owens G, Steel Designers Manual, Blackwell publishing, Sixth Edition, The Steel Construction Institute, (2003)

Dye A et al, Environmental Construction Handbook, RIBA, (2008)

GRUBB P J et al, Light Steel Framing in Residential Construction, SCI Publication P301, (date unknown)

GVA Grimley, Cities, Commerce & Carbon: The Role of Property, (2009)

Koonen, S. (2006), Steel Frames Enter the Mainstream, Free Press, Smart Home Owner, May/June 2006.

ODPM, Sustainable Communities: Building for the Future, Office of the Deputy Prime Minister, (2003)

Perkins M Z, The Utilization of Light Gauge Steel In Residential Construction In The State Of Utah, Thesis, (2009)

Ross Keith et al, A Guide to Modern Methods of Construction, NHBC Foundation, HIS BRE Press, (2006)

ROSS Keith, Modern Methods of House Construction. Building Research Establishment, (2005)

Sir John Egan. Rethinking Construction, Report of the Construction Task Force, Office of the Deputy Prime Minister. (1998)





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Sir

John Egan, Egan Review of Skills for Sustainable Communities: Office of the Deputy Prime Minister, (2004)

SmartLIFE - Lessons Learned, (2008), HIS BRE Press. BRE Report BR500

Smith R A, et al, The Construction Industry Mass Balance: resource use, wastes and emissions, Viridis Report VR4 (Revised), 2003, ISSN 1478-0143

Steel Construction Sector Sustainability Committee. Sustainable Steel Construction - Building a Better Future. (2001)

The Steel Construction Institute, Handbook of Structural Steelwork, 4th Edition, The British Constructional Steelwork Association Limited, (2007)

TRADA, Manual for the Design of Timber Building Structures to EuroCode 5, (2007)

Modern Methods of Construction, Evolution or Revolution? BURA, (2005)

Unknown author, <http://www.hm-treasury.gov.uk/> (2009), Her Majesty's Treasury, accessed 9th December 2009.

Unknown author, <http://www.planningportal.gov.uk/england/public/> (2009), HMSO, accessed 9th December 2009

Unknown author, <http://www.communities.gov.uk/corporate/>, (2009), accessed 3rd December 2009

Unknown Author, <http://www.hexaport.com/> (2009), Hexaport International, accessed 7th December 2009

Unknown author, <http://www.bre.co.uk/> (2000 - 2009), The Building Research Establishment Trust, accessed 9th December 2009

Unknown author, <http://www.azobuild.com/> (2009), AZoM.com Pty Ltd, accessed 8th December 2009

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