Structural steelwork accounts for about 70% of multi-storey building frames built in the UK. Steel Insight will appear quarterly to provide a source of reliable information for users of this key material.

01 | Introduction

For most projects, the decision on the frame material and form happens early in the design process, often on the basis of early design principles, limited information and budget costings. Once selected, the frame material is unlikely to change, as doing so can have significant programme implications, such as consequential impact on the design of other major elements, including cladding and M&E installations.

While for most developments the decision on frame type will not be based on cost alone, it is nevertheless a key consideration in the decision-making process and it is vital to support informed decision making with realistic cost information at this early stage before refining during the detailed design stages.

This is a challenging task as the cost of structural steel has been difficult to adjust accurately and project-specific key material prices information with returned tender prices is not always straightforward. Steel frame costs are also heavily affected by project-specific key cost drivers, such as programme, access, span and building form, making accurate adjustment of recently tendered rates or cost models difficult.

For those with limited previous experience of steel-framed construction, the unique characteristics of the sector may not be immediately apparent. Anecdotal stories point to design decisions being made on the basis of non- or poorly-adjusted historic steel rates, suggesting that the complexities of the industry and the significance of key cost drivers are not necessarily widely understood.

On average across the last 10 years, steel frames have accounted for 70% of all non-domestic framed multi-storey UK construction. (see figure 1 above) and in 2010 structural steel had a 68% market share of the education sector, 55% of the health sector and 65% of the retail sector.

These statistics and a review of recent industry trends highlights the importance of maintaining current, market tested cost advice for structural steelwork.

As figure 2 (overleaf) shows, there has been significant historic volatility in structural steelwork material prices. This makes cost models, benchmarks and previous project data difficult to adjust accurately and the use of indices not as useful a tool as for some other materials.

Similarly, the cost of structural steelwork can vary significantly between projects, which at first glance appear broadly similar. Project specific factors must be considered in order to produce a project specific cost.

It has also been historically difficult to get valuable input from the marketplace during the early design stages, reducing the extent to which current market conditions can be assessed.

02 | The importance of realistic steel pricing

As the selection of frame material is a key design decision and impacts on so many related building elements – foundations, finishes, wall-to-floor ratios and cladding, to name but a few – once the decision has been made and design has progressed it is disruptive and generally abortive to make fundamental changes to the frame type or form. To do so would involve going back over design stages already completed and would involve most of the design disciplines. Where there is a programme to be maintained, this is almost impossible to achieve. Therefore, although the period of time to identify and select the best value frame is not a long one, it should not be rushed.

By its very nature therefore, the decision is commonly based on outline design proposals, with a limited amount of information available to the cost consultant. Where the initial budget estimates of steel frame costs are not realistic, the wrong frame solution can be selected at a higher cost of not only the frame but potentially also the related building elements. It can also have an effect on buildability, logistics and the construction programme, as the frame construction is a critical path activity.

Getting it wrong can result in higher frame costs, higher costs of associated elements, longer programme and abortive design work.

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03 | Recent output trends

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04 | Steel Insight 2011: Market for Domestic Frames

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FIG 1: MARKET FOR NON-DOMESTIC STRUCTURAL FRAMES

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic Steel</th>
<th>Non-Domestic Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>10%</td>
<td>90%</td>
</tr>
<tr>
<td>2001</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>2002</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>2003</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>2004</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>2005</td>
<td>35%</td>
<td>65%</td>
</tr>
<tr>
<td>2006</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>2007</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>2008</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2009</td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>2010</td>
<td>60%</td>
<td>40%</td>
</tr>
</tbody>
</table>


The steel industry is a key part of the UK’s construction sector and structural steelwork is a key material used in construction. Steel Insight will provide a source of reliable information for users of this key material.
The steel industry experienced a period of overcapacity and oversupply in the early 2000s, which led to steep rises in the price of steel material, as the initial optimism in early 2008 saw steep rises in the price of steel material, with concrete reinforcing bars increasing by 8% between January and June. Moreover, the most recent data from June and July 2011 shows a slight decline in material prices, as the initial optimism in early signs of economic recovery from the start of the year have largely failed to materialise. The steel data clearly shows volatility in structural steel material prices over the last three years and periods of increase over the last 18 months. However, an analysis of returned tender prices for steel-framed buildings over the same period shows that after an initial fall in tender rates for structural steel in 2008 and 2009, the subsequent increases in material prices have been absorbed by the supply chain in the face of continuing weak demand in the construction sector and as part of tender pricing strategies.

At the early design stages of any project, cost models, benchmarks and historic cost data are key tools used by cost consultants in the estimating of all building elements.

At this stage elemental costs, including those of the structural frame, will usually be based on the Gross Internal Floor Area (GIFA).

Typical cost ranges for different frame types can be developed through cost models - and there are some indicative ranges given as part of the building area, which will not account for variances in floor-to-floor heights.

If, for a specific project, there are outside the normal range utilised in cost models, a higher or lower rate should be considered to tailor indicative rates to the project.

2. Form, site conditions and complexity

The complexity of the structure is closely related to its material and function, as well as specific site conditions.

The building form will have an impact on the regularity of the structural grid and the need to introduce non-standard sections, a wide range of different connections and connections in order to achieve structural stability.

Complex structural solutions, such as transfer structures and made-up beams may also need to be introduced to accommodate specific features or restrictions such as retained facades, adjacency of other buildings, ground level structures, and so on.

The inclusion of non-standard sections will also increase the overall frame rate as fabrication of the higher and more complex connection details may also impact on installation costs, tolerances and interfaces.

3. Location, logistics and access

The location of a project is a key factor in price determination and indices are available to enable the adjustment of cost data across different regions.

4. Programmes, risk and procurement route

The rates given in this article can be considered suitable for the cost planning of projects where the structural works would commence in the final quarter of 2011 or the first quarter of 2012.

Beyond this timeframe, accurate forecasts of steel frame costs are difficult due to the uncertainty of general economic conditions and the historic volatility of material prices experienced in the UK steel industry.

One feature of the economic recession has been an increase in the relative prevalence of single-stage procurement routes, particularly design and build, compared with the previously dominant two-stage approach.

This has aligned contractor selection and price establishment more closely and has increased the emphasis on “market pricing strategies”, where, while risks may be identified, they may not be priced in to tender returns as cost has been further strengthened as the major determinant of contractor selection.

There were initial signs of improvement in the financial services sector in early 2011 and optimism that the commercial sector may begin to see renewed demand. These have so far largely failed to materialise and the economic outlook remains challenging.

Even with forecasts of material prices continuing to rise over 2011 and 2012, the relatively low position of demand in relation to capacity in the structural steelwork industry – and continued intense competition in the construction industry generally – means that contractor pricing strategies will remain an important feature in securing work.

This is expected to act as a deterrent pressure on prices.

Gardiner & Theobald’s final quarter 2011 Tender Price Indices forecast an overall decline in UK average tender prices across 2011, with a 0.5% rise forecast across 2012 and 2% rise across 2013, adjusted down from earlier forecasts.
### 07 | Current costs

This article seeks to give some current indicative cost ranges for structural steel frames for three key building types:

1. **Low rise and short span buildings**
   - High rise concrete (10-15 storeys) is a typical feature of city centre construction. These buildings will often require larger vertical structural grid spans to achieve more open space in the lettable floor areas, increasing the weight of the steel frame.
   - To maximise floor-to-ceiling heights, and increase flexibility for the building fit-out, cellular beams may be adopted with openings through the web for the services of City centre buildings are generally constructed on existing confined or irregular sites, which influence the building form. This is likely to prevent the use of a regular column grid and may result in alterations to floor plates on the upper storeys.

2. **High rise and longer span buildings**
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3. **Industrial buildings**
   - Industrial buildings can cover a range of uses, including warehouses, food-offices, and retail space in the lettable floor areas, increasing the weight of the steel frame.

### FIGURE 3: INDICATIVE COST RANGES BASED ON GROSS INTERNAL FLOOR AREA

<table>
<thead>
<tr>
<th>TYPE</th>
<th>GIFA Rate (£)</th>
<th>BCIS Index 100</th>
<th>GIFA Rate (£)</th>
<th>City of London</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame - low rise, short spans, repetitive grid / sections, easy access</td>
<td>75 - 100/m²</td>
<td>90 - 120/m²</td>
<td>140 - 150/m²</td>
<td>165 - 195/m²</td>
</tr>
<tr>
<td>Floor - metal decking and lightweight concrete topping</td>
<td>50 - 65/m²</td>
<td>60 - 75/m²</td>
<td>65 - 80/m²</td>
<td>85 - 100/m²</td>
</tr>
<tr>
<td>Portal frames - low eaves (6-8m)</td>
<td>45 - 65/m²</td>
<td>55 - 75/m²</td>
<td>65 - 80/m²</td>
<td>85 - 100/m²</td>
</tr>
<tr>
<td>Portal frames - high eaves (10-15m)</td>
<td>55 - 75/m²</td>
<td>65 - 90/m²</td>
<td>75 - 100/m²</td>
<td>90 - 120/m²</td>
</tr>
</tbody>
</table>

### FIGURE 4: BCIS LOCATION FACTORS, AS AT 7 OCT 2011

<table>
<thead>
<tr>
<th>Location</th>
<th>BCIS Index Location</th>
<th>BCIS Index Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of London</td>
<td>119 Leeds 97 197</td>
<td>197 Nottingham 98 229</td>
</tr>
<tr>
<td>Birmingham</td>
<td>97 Glasgow 103</td>
<td>103 Manchester 97 64</td>
</tr>
</tbody>
</table>

### 08 | The cost table

The cost table included as figure 3 summarises every structural steel frame cost of the three building types and also provides some indicative cost information on floor types and fire protection.

While precast concrete products have not been the market price variability experienced by structural steel during the economic recession, it is worth mentioning that the sector has experienced change. Fewer firms are now involved in the supply of precast units, so the timeline of projects can have a significant impact on the rate. This is another sector where it is very important to liaise with the supply chain as soon as possible to get real market feedback.

### 09 | Summary

The selection of structural frame material and form is a key early decision in the design process. It should be regarded as an opportunity to maximise value by ensuring that the selection is based on project-specific costings and avoiding unnecessary impacts on related elements or overall programmes.

The challenge to the cost consultant is to recognise and overcome the historic volatility in material prices in relation to returned tender prices. The use of accurate cost data is essential in order to make steel frame rates project specific.

Communication with the design team to clarify the steel frame weight, potential for complex sections and required fire protection design assumptions are all essential.

Finally, consultation with the supply chain will confirm current information on order books and material prices to be considered.

The identification of the key factors relevant to each project and the adjustment of typical rates accordingly, the accuracy of budget structural steelwork estimating can be significantly improved.