



# COSTING STEELWORK #23

MARKET AND COST MODELS UPDATE

# COSTING STEELWORK

## MARKET UPDATE

● Costing Steelwork is a series from Aecom, BCSA and Steel for Life that provides guidance on costing structural steelwork. This quarter provides a market update and revises the five cost models previously featured in Costing Steelwork

Construction new work output rose by almost 4% over the 12 months to Q3 2022 in the latest construction output data release from the Office for National Statistics. Using the monthly data points, the yearly change at November was slightly lower at 3% than the headline measure. Housing output remained the primary driver of industry growth. A solid contribution came from the private commercial sector in the third quarter, with a 7.4% increase over the year at Q3 and a strong quarter-on-quarter improvement. An area of concern was a drop in volume in the repair and maintenance sector between Q2 and Q3. This is the largest construction sub-sector, so is influential to headline measures of recorded construction output.

Construction sector sentiment maintained its broadly neutral level across the fourth quarter, as most sub-sectors saw continuing good workload levels. This momentum is likely to hold, in spite of the notable operational issues in play. Overall construction output settled into a steady rate of growth over 2022, hitting something of a sweet spot in consistency after the topsy-turvy preceding two years. With economic clouds gathering elsewhere, the construction sector still offers consistency of workload going into this year.

Business sentiment surveys almost all report subdued or gloomier assessments of the domestic trading environment. Many have extended trends that started back in the second quarter of 2022. In spite of the neutral GDP report in December, the collection of business sentiment surveys are mostly in line with each other – confirming emerging trends, the challenges facing businesses, and an outlook that is less certain. The likelihood of a low-growth environment across 2023 is therefore high.

Specific business issues mentioned often in the surveys all reference now perennial issues, many of which pre-date the invasion of Ukraine and its spill over into higher energy costs. This issue alone would be the cause for significant business problems. Instead, there are a range of significant disruptive and challenging issues that firms are grappling with at present. There are also structural industry issues around labour supply. The impact of these challenges and the pressures they are creating are evident on financial

statements and will continue into the medium term.

Costs of borrowing and finance will be one of the major issues facing all businesses in 2023. Tighter financing conditions extend into the operational aspects of businesses. Short-term lending will inevitably be more costly, as will longer-term funding mechanisms too. The tighter cost of borrowing environment has implications for the construction sector – either directly or indirectly – with downside risks increasing for related construction activity. Higher funding costs for construction projects do not usually help to support the viability equation, especially as costs of borrowing have been historically low over an extended period of time.

By way of better news, construction input cost inflation continued to slow over the fourth quarter. Aecom's building cost index – a composite measure of materials and labour costs – increased by 8.5% over the 12 months to Q4 2022. This is a notably reduced rate of inflation from the mid-year peak when it was nearer to 14%. The lower rate of inflation will help the supply chain eventually; however, immediate relief for projects will be minimal and depend on where each project is in its build programme. Newer projects are likely to feel greater benefit from this lower rate of input cost inflation, especially since there is likely to be a narrower difference currently between input costs and recent tender prices. At 8.5%, though, input cost inflation is still well above any long-run average.

Metals and timber-based work items were the index items recording the lowest or negative rates of inflation. This reflects the deflationary trends seen for metals and timber commodities for much of the last six months,

now coming through into related construction products and trades. A range of chunky materials price list increases are scheduled for early 2023, which is a sign that despite the headline, aggregate rate of input cost inflation slowing, there are still pockets of exceptionally high cost pressure working their way through the supply chain. Sterling rose slightly in Q4, which should act to temper some of the imported inflationary trends. However, the rise was more related to marginal US dollar depreciation on the prospects for less aggressive changes to US monetary policy rather than to an improving outlook for the UK economy.

It is generally believed that the UK is in the early stages of an economic downturn, in spite of ONS data yet to confirm this. It seems unlikely that organisations such as the Bank of England would expressly state this gloomy prognosis without their own supporting data to justify this position. The Bank has often highlighted the “narrow path” it is treading between raising interest rates to engineer a fall in the rate of inflation, and consequent impacts to the economy from higher interest rates. Combined with the relentless inflationary trends already affecting most areas of the country, rising costs of borrowing and lending are certain to further impact business and household spending.

It will take some time for any downturn to evolve, and in the meantime the construction industry's current momentum will provide some insulation and cover to a slowdown taking hold in other economic sectors. However, we are currently experiencing a softening of steel prices with the base costs in Q1 2023 slightly lower than in Q4 2022. Overall 2023 is still

Figure 1: Tender price inflation, Aecom Tender Price Index, 2015 = 100

Quarter	2018	2019	2020	2021	Forecast		
					2022	2023	2024
1	113.2	117.9	120.4	120.0	131.2	143.0	149.8
2	113.6	118.3	121.0	122.6	134.5	144.6	151.0
3	115.4	119.3	119.1	125.3	138.1	146.2	152.2
4	117.3	119.8	119.1	127.5	141.8	148.3	153.4



likely to be a tale of two halves, each with contrasting narratives and underlying currents. The ongoing mix of perennial issues and current workload momentum will propel tender price inflation over the first half of 2023, with expected adjustments over the second half of the year. Aecom's baseline forecast for tender prices is a 5% increase from Q4 2022 to Q4 2023, and a 3.5% increase from Q4 2023 to Q4 2024. The balance of risks to forecasts of price trends remain to the upside over the near term.

### SOURCING COST INFORMATION

Cost information is generally derived from a variety of sources, including similar projects, market testing and benchmarking. Due to the mix of source information it is important to establish relevance, which is paramount when comparing buildings in size, form and complexity.

Figure 2 represents the costs associated with the structural framing of a building, with a BCIS location factor of 100 expressed as a cost/m<sup>2</sup> on GIFA. The range of costs represents variances in the key cost drivers. If a building's frame cost sits outside these ranges, this should act as a prompt to interrogate the design and determine the contributing factors.

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. The variances in these indices, such as the BCIS location factors (figure 3), highlight the existence of different market conditions in different regions.

#### To use the tables:

1. Identify which frame type most closely relates to the project under consideration
2. Select and add the floor type under consideration
3. Add fire protection as required.

For example, for a typical low-rise frame with a composite metal deck floor and 60 minutes' fire resistance, the overall frame rate (based on the average of each range) would be:

$$£165.00 + £110.00 + £26.00 = £301.00$$

The rates should then be adjusted (if necessary) using the BCIS location factors appropriate to the location of the project.



Asda food store, Stockton-on-Tees

Figure 2: Indicative cost ranges based on gross internal floor area

TYPE	Base index 100 (£/m <sup>2</sup> )	Notes
<b>Frames</b>		
Steel frame to low-rise building	149-181	Steelwork design based on 55kg/m <sup>2</sup>
Steel frame to high-rise building	251-284	Steelwork design based on 90kg/m <sup>2</sup>
Complex steel frame	284-335	Steelwork design based on 110kg/m <sup>2</sup>
<b>Floors</b>		
Composite floors, metal decking and lightweight concrete topping	86-134	Two-way spanning deck, typical 3m span with concrete topping up to 150mm
Precast concrete composite floor with concrete topping	125-176	Hollowcore precast concrete planks with structural concrete topping spanning between primary steel beams
<b>Fire protection</b>		
Fire protection to steel columns and beams (60 minutes resistance)	22-31	Factory applied intumescent coating
Fire protection to steel columns and beams (90 minutes resistance)	26-42	Factory applied intumescent coating
<b>Portal frames</b>		
Large-span single-storey building with low eaves (6-8m)	109-143	Steelwork design based on 35kg/m <sup>2</sup>
Large-span single-storey building with high eaves (10-13m)	132-170	Steelwork design based on 45kg/m <sup>2</sup>

Figure 3: BCIS location factors, as at Q1 2023

Location	BCIS Index	Location	BCIS Index
Central London	127	Nottingham	103
Manchester	103	Glasgow	92
Birmingham	97	Newcastle	91
Liverpool	98	Cardiff	94
Leeds	92	Dublin	100*

\*Aecom index



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# COST COMPARISON UPDATES

● This quarter's Costing Steelwork provides an update of the five previously featured cost comparisons covering: offices, education, industrial, retail and mixed-use

These five projects were originally part of the Target Zero study conducted by a consortium of organisations including Tata Steel, Aecom, SCI, Cyril Sweett and the BCSA in 2010 to provide guidance on the design and construction of sustainable, low- and zero-carbon buildings in the UK. The cost models for these five projects have been reviewed and updated as part of the Costing Steelwork series. The latest cost models as of Q1 2023 are presented here.



Distribution warehouse, Prologis Park, Stoke-on-Trent

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## COSTING STEELWORK: OFFICES UPDATE

Below is an update to the offices cost comparison originally published in the Costing Steelwork Offices feature in Building magazine in April 2017.

### One Kingdom Street, London, key features

- 10 storeys, with two levels of basement
- Typical clear spans of 12m x 10.5m
- Three cores – one main core with open atrium, scenic atrium bridges and lifts
- Plant at roof level

### Cost comparison

Two structural options for the office building were assessed (as shown in figure 4):

- Base case – a steel frame, comprising fabricated cellular steel beams supporting a lightweight concrete slab on a profiled steel deck
- Option 1 – 350mm-thick post-tensioned concrete flat slab with a 650mm x 1,050mm perimeter beam.

The full building cost plans for each structural option have been reviewed and updated to provide current costs at Q1 2023. Over the course of the year increased costs have been largely offset by contractors working on reduced or no margin. The costs, which include preliminaries, overheads, profit and a contingency, are summarised in figure 4.

The cost of the steel composite solution is 2% higher than for the post-tensioned concrete flat slab alternative for the frame and upper floors, but 2% lower on a total building basis. The lighter frame and faster erection result in reduced foundations and a shorter programme. The latter is the main reason for the lower cost.

Figure 4: Key costs £/m<sup>2</sup> (GIFA), for City of London office building

Elements	Steel composite	Post-tensioned concrete flat slab
Substructure	90	95
Frame and upper floors	553	542
<b>Total building</b>	<b>3,480</b>	<b>3,563</b>

## COSTING STEELWORK: EDUCATION UPDATE

Below is an update to the education cost comparison originally published in the Costing Steelwork Education feature in Building magazine in July 2017.

### Christ the King Centre for Learning, Merseyside, key features

- Three storeys, with no basement levels
- Typical clear spans of 9m x 9m
- 591m<sup>2</sup> sports hall (with glulam frame), 770m<sup>2</sup> activity area and atrium
- Plant at roof level

### Cost comparison

Three structural options for the building were assessed (as shown in figure 5), which include:

- Base case – steel frame, 250mm hollowcore precast concrete planks with 75mm structural screed
- Option 1 – in situ 350mm reinforced concrete flat slab with 400mm x 400mm columns
- Option 2 – steel frame, 130mm concrete topping on structural metal deck.

The full building cost plans for each option have been updated to provide current costs at Q1 2023. The comparative costs highlight the importance of considering total building cost when selecting the structural frame material.

The concrete flat slab option has a lower frame and floor cost compared with the steel composite option, but on a total-building basis, the steel composite option has a lower overall cost of £3,825/m<sup>2</sup> against £3,861/m<sup>2</sup>. This is because of lower substructure and roof costs, alongside lower preliminaries resulting from the shorter programme.

Figure 5: Key costs £/m<sup>2</sup> (GIFA), for Merseyside secondary school

Elements	Steel + precast hollow-core planks	In situ concrete flat slab	Steel composite
Frame and upper floors	369	322	337
<b>Total building</b>	<b>3,892</b>	<b>3,861</b>	<b>3,825</b>

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## COSTING STEELWORK: INDUSTRIAL UPDATE

Below is an update to the industrial cost comparison originally published in the Costing Steelwork Industrial feature in Building magazine in October 2017.

### Distribution warehouse in ProLogis Park, Stoke-on-Trent, key features

- Warehouse: four-span, steel portal frame, with a net internal floor area of 34,000m<sup>2</sup>
- Office: 1,400m<sup>2</sup>, two-storey office wing with a braced steel frame with columns

### Cost comparison

Three frame options were considered:

- Base option – a steel portal frame with a simple roof solution
- Option 1 – a hybrid option: precast concrete column and glulam beams with timber rafters
- Option 2 – a steel portal frame with a northlight roof solution.

The full building cost plans for each option have been updated to provide costs at Q1 2023. The steel portal frame provides optimum build value at £879/m<sup>2</sup>; glulam is least cost-efficient. This is primarily due to the cost premium for the structural members necessary to provide the required spans, which are otherwise efficiently catered for in the steelwork solution.

With a hybrid, the elements are from different suppliers, which raises the cost. The northlights option is directly comparable with the portal frame in relation to the warehouse and office frame. The variance is in the roof framing as the northlights need more of this. Other additional costs relate to the glazing of the northlights.

Figure 6: Key costs £/m<sup>2</sup> (GIFA), for Stoke-on-Trent distribution warehouse

Elements	Steel portal frame	Glulam beams + purlins + concrete columns	Steel portal frame + northlights
Warehouse	122	178	141
Office	180	216	180
Total frame	125	180	143
<b>Total building</b>	<b>879</b>	<b>945</b>	<b>921</b>

## COSTING STEELWORK: RETAIL UPDATE

Below is an update to the retail cost comparison originally published in the Costing Steelwork Retail feature in Building magazine in January 2018.

### Asda food store, Stockton-on-Tees, key features

- Total floor area of 9,393m<sup>2</sup>
- Retail area based on 12m x 12m structural grid

### Cost comparison

Three frame options were considered (as shown in figure 7) to establish the optimum solution for the building, as follows:

- Base option – a steel portal frame on CFA piles
- Option 1 – glulam timber rafters and columns on CFA piles
- Option 2 – a steel portal frame with a northlight roof solution on driven steel piles.

The full building cost plans for each option have been updated to provide costs at Q1 2023. The steel portal frame provides the optimum build value at £3,185/m<sup>2</sup>, with the glulam option the least cost-efficient. The greater cost is due to the direct comparison of the steel frame solution against the glulam columns and beams/rafters. A significant proportion of the building cost is in the M&E services and fit-out elements, which reduce the impact of the structural changes.

The northlights option is directly comparable with the portal frame in relation to the main supermarket – the variance is in the roof framing as the northlights require more. Additional costs beyond the frame are related to the glazing of the northlights and the overall increase in relative roof area.

Figure 7: Key costs £/m<sup>2</sup> (GIFA), for Stockton-on-Tees food store

Elements	Steel portal frame	Glulam timber rafters + columns	Steel portal frame + northlights
Structural unit cost	183	221	207
<b>Total building unit cost</b>	<b>3,185</b>	<b>3,230</b>	<b>3,198</b>

## COSTING STEELWORK: MIXED-USE UPDATE

Below is an update to the mixed-use cost comparison originally published in the Costing Steelwork Mixed-use feature in Building magazine in April 2018.

### Holiday Inn tower, MediaCityUK, Manchester

- 17-storey tower
- 7,153m<sup>2</sup> of open-plan office space on five floors (floors two to six)
- 9,265m<sup>2</sup> of hotel space on eight floors (floors eight to 15)

The gross internal floor area of the building is 18,625m<sup>2</sup>. The 67m-high building is rectangular with approximate dimensions of 74m x 15.3m.

### Cost comparison

Three frame options were considered to establish the optimum solution for the building:

- Base option – steel frame with Slimdek floors
- Option 1 – concrete flat slab
- Option 2 – composite deck on cellular beams (offices) and UCs used as beams (hotel).

The full building cost plans for each option have been updated to provide costs at Q1 2023. The steel frame with composite deck continues to provide the optimum build value, with the overall building cost at £3,277/m<sup>2</sup>.

Options 1 and 2 are arguably more typical for this building type. The base case structure is an unusual solution due to a decision to change the residential accommodation to office floors at a very late stage – time constraints precluded redesign of the tower block, hence the original Slimdek design was constructed.

Figure 8: Key costs £/m<sup>2</sup> (GIFA), for hotel/office building in Manchester

Elements	Steel frame with Slimdek	Concrete flat slab	Composite deck on cellular beams (offices) and UCs used as beams (hotel)
Structural unit cost	681	517	465
<b>Total building unit cost</b>	<b>3,546</b>	<b>3,358</b>	<b>3,277</b>