# COSTING STEELWORK #21

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 sector sentiment faded over Q2, as a collection of headwinds removed some of the shine from a steady rebound of activity. In general, most surveys covering the period report confidence levels across the sector that are neither overly optimistic nor overly pessimistic. Given the succession and array of issues impacting business operations, this is a fair reflection of the industry, its current momentum, and the backdrop against which it is operating.

Steady workload brought some stability to the operating environment, in spite of uncertainty and volatility in supplies and inputs. A tight labour market amplifies what is an otherwise mostly consistent workload environment and this will, doubtless, influence the qualitative assessments of industry confidence. The constrained labour and skills market will probably underpin the employment situation in the UK, even if a more subdued period of output and activity lies ahead.

Challenges reported in various economic and business surveys all confirm the same general themes: difficulties retaining, resourcing and recruiting people; additional trade red-tape burdens; and transport or logistics problems with the higher costs they bring. These issues cut across all economic sectors and affect businesses of all sizes. Larger firms typically have greater resources to call on to mitigate some of the problems, though. For construction, internal industry competition for resources accentuates the issue because of the skilled nature of trades required. Labour and workforce supply in the UK remains tight across most economic sectors, not least construction. The sector still has a workforce size smaller than its long-run average. This is one reason why the labour market is restricted. Labour rate inflation continues to rise year-on-year, and in the second quarter of 2022 wages increased by 4.5%. This is below the current rate of consumer price inflation, meaning construction wages are falling in real terms. There remains a spread of labour rates across construction trades and sectors, as these flex to meet demand and supply dynamics at points in time or to meet regional workload conditions.

Construction new work output increased by 2.8% between April and May 2022, according to the Office for National Statistics' latest data release. All work output also increased month-on-month by 1.5%, yet the largest improvement came from the year-on-year change metric in May, where all work output rose over the prior 12 months by 4.8%. Construction new work output, in constant prices, is now at broadly the level it was in February 2020, when it is believed the coronavirus pandemic started to take hold in the UK. Comparing the latest data to 2019, recent construction output is still a little way short of the output posted during the first quarter of 2019.

Input costs continue to rise unrelentingly across the economy and the construction sector. Aecom's building cost index – a composite measure of materials and labour costs – increased by 12.6% over the 12 months to June 2022. The second quarter saw a further pick-up in the rate of building cost inflation, predominantly driven by materials cost increases. The composition of the index is revealing, with 80% of the categories recording below 20% year-on-year change, and those with rates of change greater than this invariably being metal- and timber-related.

The war in Ukraine and its associated geopolitical impacts is one of the underlying reasons for the inflation pick-up over the second quarter. Commodities – primarily energy and metals markets – were notably affected, with higher prices recorded across the period. Clearly, these are essential inputs to manufacturing and production processes, and because the rises were so notable, it is almost certain that some or all of the cost increases will be passed through to consumers. Nonetheless, reversals in these Q2 rises have recently been seen in a number of commodities, largely in response to concerns on a slower global economy.

Over the near term, elevated cost inflation pressures are expected to continue – for both materials and labour components. Despite the increased rate of construction input cost inflation over Q2, there is a small prospect that some of the rapid inflation trends begin to ease a little over the second half of 2022. There is also a plausible scenario where the number of items with elevated inflation rates increases, but there are fewer items with extreme rates of inflation.

The medium term will see a number of inflationary elements combining to keep the commercial pressure on the supply chain. For example, increased costs from higher interest rates, wage demands, enduring supply chain constraints, and industry demographics are all notable factors. Exchange rates will play an increasingly large role in this commercial mix, especially as the pound comes under renewed pressure in currency markets. As sterling is weak already, this adds weight to the argument for raising interest rates to support the currency and avoid further depreciation.

Aecom's baseline forecast for tender prices is a 6% increase from Q3 2022 to Q3 2023, and a 4% increase from Q3 2023 to Q3 2024. Workload momentum and chronic input cost inflation will support upward tender price trends. The balance of risks to pricing are clearly still to the upside over the near term, because of the prevailing inflationary course. Although inflation is here to stay for some time, partial alleviation to high energy and commodity prices will arrive from any adverse course taken by the global economy. Additional concerns for the domestic economy in the UK could

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

| | | | | | Forecast | | |
|---|---|---|---|---|---|---|---|
| Quarter | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| 1 | 113.2 | 117.9 | 120.4 | 120.0 | 131.2 | 140.3 | 147.6 |
| 2 | 113.6 | 118.3 | 121.0 | 122.6 | 133.5 | 142.3 | 149.1 |
| 3 | 115.4 | 119.3 | 119.1 | 125.3 | 135.8 | 144.2 | 150.3 |
| 4 | 117.3 | 119.8 | 119.1 | 127.5 | 138.2 | 146.0 | 151.5 |

see some slowing of inflation too. The baseline forecast's core assumptions are a subdued path for the economy of Great Britain, elevated tender price inflation trends with some sector variability, and enduring supply chain disruption.

## 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/m² 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:

£162.50 + £108.50 + £26.00 = £297.00

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

Ben Page Photography

Holiday Inn tower, MediaCityUK, Manchester

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

| TYPE | Base index 100 (£/m²) | Notes |
|---|---|---|
| **Frames** | | |
| Steel frame to low-rise building | 147-178 | Steelwork design based on 55kg/m² |
| Steel frame to high-rise building | 247-279 | Steelwork design based on 90kg/m² |
| Complex steel frame | 279-330 | Steelwork design based on 110kg/m² |
| **Floors** | | |
| Composite floors, metal decking and lightweight concrete topping | 85-132 | Two-way spanning deck, typical 3m span with concrete topping up to 150mm |
| Precast concrete composite floor with concrete topping | 123-173 | Hollowcore precast concrete planks with structural concrete topping spanning between primary steel beams |
| **Fire protection** | | |
| Fire protection to steel columns and beams (60 minutes resistance) | 21-31 | Factory applied intumescent coating |
| Fire protection to steel columns and beams (90 minutes resistance) | 26-42 | Factory applied intumescent coating |
| **Portal frames** | | |
| Large-span single-storey building with low eaves (6-8m) | 107-140 | Steelwork design based on 35kg/m² |
| Large-span single-storey building with high eaves (10-13m) | 130-167 | Steelwork design based on 45kg/m² |

**Figure 3:** BCIS location factors, as at Q3 2022

| Location | BCIS Index | Location | BCIS Index |
|---|---|---|---|
| Central London | 125 | Nottingham | 103 |
| Manchester | 103 | Glasgow | 92 |
| Birmingham | 97 | Newcastle | 91 |
| Liverpool | 98 | Cardiff | 93 |
| Leeds | 92 | Dublin | 100* |

*Aecom index

# 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 Q3 2022 are presented here.


Asda food store, Stockton-on-Tees

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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 Q3 2022. 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 5% 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 £/m² (GIFA), for City of London office building

| Elements | Steel composite | Post-tensioned concrete flat slab |
|---|---|---|
| Substructure | 90 | 95 |
| Frame and upper floors | 533 | 505 |
| **Total building** | **3,351** | **3,416** |

## 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
- 591m² sports hall (with glulam frame), 770m² 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 Q3 2022. 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 £3,679/m² against £3,705/m². This is because of lower substructure and roof costs, alongside lower preliminaries resulting from the shorter programme.

**Figure 5:** Key costs £/m² (GIFA), for Merseyside secondary school

| Elements | Steel + precast hollow-core planks | In situ concrete flat slab | Steel comp-osite |
|---|---|---|---|
| Frame and upper floors | 355 | 304 | 328 |
| **Total building** | **3,741** | **3,705** | **3,679** |

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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 34,000m²
- Office: 1,400m², 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 Q3 2022. The steel portal frame provides optimum build value at £847/m²; 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 £/m² (GIFA), for Stoke-on-Trent distribution warehouse

| Elements | Steel portal frame | Glulam beams + purlins + concrete columns | Steel portal frame + north-lights |
|---|---|---|---|
| Warehouse | 120 | 171 | 139 |
| Office | 173 | 208 | 173 |
| Total frame | 123 | 173 | 141 |
| **Total building** | **847** | **908** | **888** |

## 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 9,393m²
- 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 Q3 2022. The steel portal frame provides the optimum build value at £3,064/m², 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 £/m² (GIFA), for Stockton-on-Tees food store

| Elements | Steel portal frame | Glulam timber rafters + columns | Steel portal frame + north-lights |
|---|---|---|---|
| Structural unit cost | 180 | 213 | 203 |
| **Total building unit cost** | **3,064** | **3,104** | **3,077** |

## 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
- 7,153m² of open-plan office space on five floors (floors two to six)
- 9,265m² of hotel space on eight floors (floors eight to 15)

The gross internal floor area of the building is 18,625m². The 67m-high building is rectilinear 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 Q3 2022. The steel frame with composite deck continues to provide the optimum build value, with the overall building cost at £3,154/m².

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 £/m² (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 | 656 | 488 | 453 |
| **Total building unit cost** | **3,409** | **3,218** | **3,154** |