



COSTING STEELWORK #10

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 updates the five cost models previously featured in Costing Steelwork

Business sentiment remains subdued as political and economic uncertainty weighs on confidence. Many business sentiment indicators underscore the prevailing uncertainty at regional, national and international levels, all pointing to flatter or slightly weaker expectations of current and near-term economic activity. Ongoing tension from slower global market conditions and trade, weaker investment intentions and international macroeconomic disagreements all contribute to the sense of drift.

Confidence remains negative on headline measures, with sales growth slowing and a subdued profit outlook. Investment plans are muted, reflecting a backdrop of uncertainty. Spare capacity is also emerging or already available. The surveys also confirm anecdotal information and trends reported by the Office for National Statistics (ONS) and the Bank of England in respect of GDP growth. Without stockpiling at the end of 2018 and early 2019 by firms across the UK in preparation for a 'no deal' Brexit in March, GDP growth would have been notably weaker. Latest GDP data confirms this dynamic.

Construction all work output recorded some reasonable growth at 2.9% on a yearly change basis in Q1 2019. According to the ONS' latest data, new work and repair and maintenance classifications saw increases in output. However, this growth measure in Q1 only reverses a variable set of year-on-year change rates through 2018, where no definitive trend was evident. The most recent data indicates that still-respectable levels of overall workload and the nominal levels of total new work posted in the latter half of 2018 will make this year feel comfortably busy, combined with existing workload momentum.

Demand for labour and staff resources eased at the start of 2019. Available capacity corresponds with a trend of softening workloads. However, wages for site trades increased on a yearly change basis, which is consistent with acceptable levels of overall workload and demand for site labour.

Sterling seems unable to gain any traction and strengthen against its major currency pairs – principally the US dollar and Euro. Although there

have been some shorter-term increases since the beginning of 2019, most of these have been reversed quickly, often responding to political events rather than economic happenings. As sterling extends the period of weakness against major currencies, the ongoing commercial pressure from imported inflationary trends are set to remain.

Aecom's composite index for building costs – comprised of materials and labour inputs – continued to rise at Q1 2019. The yearly change at Q4 2018 was 4.1% and, although elevated, marks a slowdown

in the rate of change experienced through 2018. The yearly rate of change for input costs is expected to stay firmly positive in 2019, most likely remaining on parity with or marginally higher overall than output prices in 2019. These dynamics will maintain commercial pressure across the supply chain.

Tender prices increased by 4.5% over the year to Q1 2019. The continuing trend of rising prices is reflective of the overall workload still evident. The supply chain has a balancing act to contend with though: there is enough available work not to cut prices too much, but

Figure 1: Material price trends

Price indices of construction materials 2010=100. Source: Department of Business, Energy and Industrial Strategy

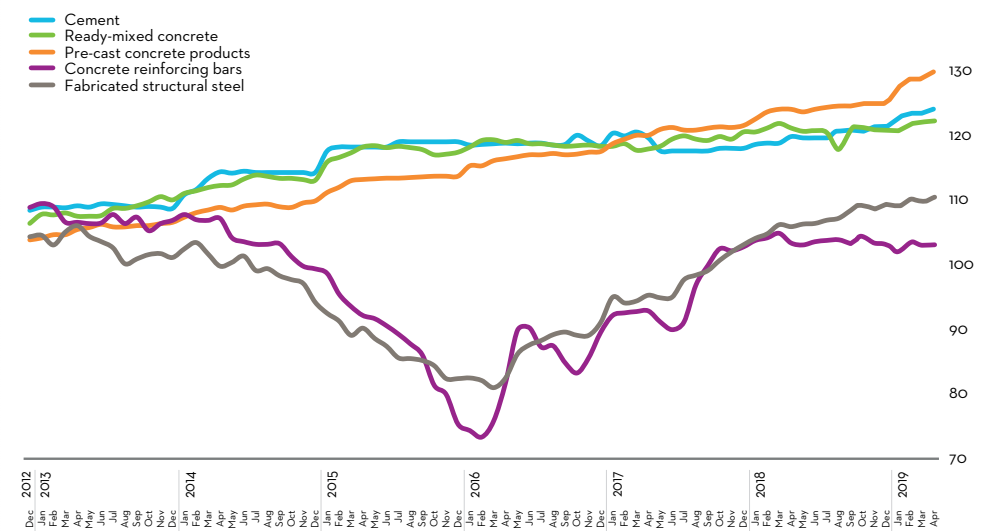


Figure 2: Tender price inflation, Aecom Tender Price Index, 2015 = 100

| Quarter | 2015 | 2016 | 2017 | 2018 | Forecast | | |
|---------|-------|-------|-------|-------|----------|-------|-------|
| | | | | | 2019 | 2020 | 2021 |
| 1 | 96.0 | 105.8 | 110.9 | 113.2 | 118.3 | 121.2 | 123.4 |
| 2 | 98.6 | 107.7 | 111.3 | 113.6 | 118.9 | 121.6 | 123.9 |
| 3 | 101.5 | 108.7 | 112.2 | 115.4 | 119.6 | 122.2 | 124.5 |
| 4 | 103.8 | 109.9 | 112.6 | 117.3 | 120.6 | 123.0 | 125.3 |

AECOM

STEEL
for life

there is not enough potential work to push up prices notably. Downside risks are linked to a disorderly Brexit process. Alternative outcomes resulting from a “softer” Brexit arrangement – or no Brexit at all – would generate positive risks. A synchronised upturn in activity might follow when projects on hold due to uncertainty would all commence at the same time, providing a fillip to workload and taking up available capacity quickly. This might offset some of the larger prevailing headwinds emanating from global macroeconomic trends.

Aecom's baseline forecasts for tender price inflation are 2.3% from Q2 2019 to Q2 2020, and 1.9% from Q2 2020 to Q2 2021. Assumptions underpinning the forecasts include construction industry output reverting to a long-run average without excessive volatility, elevated input costs as a result of weak sterling and some ongoing resource constraints, particularly around site labour. Downside skew to the assessed risks accompanying the price forecasts results from sustained economic and political uncertainty.

SOURCING COST INFORMATION

When sourcing cost information, it is important to recognise that it is derived from various sources, including similar projects, market testing and benchmarking, and that relevance is paramount when comparing buildings in size, form and complexity.

Figure 3 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 4), 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:

$$£110.50 + £77.50 + £17.00 = £205.00$$

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

Figure 3: Indicative cost ranges based on gross internal floor area

| TYPE | Base index 100 (£/m ²) | Notes |
|--|------------------------------------|--|
| Frames | | |
| Steel frame to low-rise building | 100-121 | Steelwork design based on 55kg/m ² |
| Steel frame to high-rise building | 168-190 | Steelwork design based on 90kg/m ² |
| Complex steel frame | 190-225 | Steelwork design based on 110kg/m ² |
| Floors | | |
| Composite floors, metal decking and lightweight concrete topping | 61-94 | Two-way spanning deck, typical 3m span with concrete topping up to 150mm |
| Precast concrete composite floor with concrete topping | 100-141 | 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) | 14-20 | Factory applied intumescent coating |
| Fire protection to steel columns and beams (90 minutes resistance) | 16-29 | Factory applied intumescent coating |
| Portal frames | | |
| Large-span single-storey building with low eaves (6-8m) | 75-97 | Steelwork design based on 35kg/m ² |
| Large-span single-storey building with high eaves (10-13m) | 85-117 | Steelwork design based on 45kg/m ² |

Figure 4: BCIS location factors, as at Q2 2019

| Location | BCIS Index | Location | BCIS Index |
|----------------|------------|------------|------------|
| Central London | 125 | Nottingham | 106 |
| Manchester | 100 | Glasgow | 92 |
| Birmingham | 96 | Newcastle | 92 |
| Liverpool | 95 | Cardiff | 85 |
| Leeds | 90 | Dublin | 96* |

*Aecom index

Steel for Life sponsors:

Headline



Gold

Ficpe UK Ltd | National Tube Stockholders and Cleveland Steel & Tubes | Peddinghaus Corporation | voestalpine Metsec plc | Wedge Group Galvanizing Ltd

Silver

Jack Tighe Ltd | Kaltenbach Ltd | Tata Steel | Trimble Solutions (UK) Ltd

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 Q2 2019 are presented here.



Holiday Inn tower, MediaCityUK, Manchester

This Costing Steelwork article produced by Patrick McNamara (director) and Michael Hubbard (associate) of Aecom is available at www.steelconstruction.info. The data and rates contained in this article have been produced for comparative purposes only and should not be used or relied upon for any other purpose without further discussion with Aecom. Aecom does not owe a duty of care to the reader or accept responsibility for any reliance on the article contents.

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 5):

- 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 Q2 2019. Movement has remained relatively static from Q1 2019. The costs, which include preliminaries, overheads, profit and a contingency, are summarised in figure 5.

The cost of the steel composite solution is 7% lower than that for the post-tensioned concrete flat slab alternative for the frame and upper floors, and 5% lower on a total building basis.

Figure 5: Key costs £/m² (GIFA), for City of London office building

| Elements | Steel composite | Post-tensioned concrete flat slab |
|------------------------|-----------------|-----------------------------------|
| Substructure | 88 | 93 |
| Frame and upper floors | 435 | 469 |
| Total building | 2,618 | 2,759 |

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 6), 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 Q2 2019. The comparative costs highlight the importance of considering total building cost when selecting the structural frame material.

The concrete flat slab option has a marginally 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 £3,114/m² against £3,140/m². This is because of lower substructure and roof costs, alongside lower preliminaries resulting from the shorter programme.

Figure 6: Key costs £/m² (GIFA), for Merseyside secondary school

| Elements | Steel + precast hollow-core planks | In situ concrete flat slab | Steel composite |
|------------------------|------------------------------------|----------------------------|-----------------|
| Frame and upper floors | 290 | 251 | 263 |
| Total building | 3,170 | 3,140 | 3,114 |



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 Q2 2019. The steel portal frame provides optimum build value at £682/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. Other additional costs relate to the glazing of the northlights.

Figure 7: Key costs £/m² (GIFA), for Stoke-on-Trent distribution warehouse

| Elements | Steel portal frame | Glulam beams + purlins + concrete columns | Steel portal frame + northlights |
|-----------------------|--------------------|---|----------------------------------|
| Warehouse | 70 | 141 | 83 |
| Office | 128 | 170 | 128 |
| Total frame | 74 | 142 | 86 |
| Total building | 682 | 763 | 732 |

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 8) 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 Q2 2019. The steel portal frame provides the optimum build value at £2,592/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 8: Key costs £/m² (GIFA), for Stockton-on-Tees food store

| Elements | Steel portal frame | Glulam timber rafters + columns | Steel portal frame + northlights |
|---------------------------------|--------------------|---------------------------------|----------------------------------|
| Structural unit cost | 142 | 174 | 160 |
| Total building unit cost | 2,592 | 2,632 | 2,602 |

COSTING STEELWORK: MIXED-USE UPDATE

Below is an update to the mixed-use cost comparison originally published in the Costing Steelwork mixed-use focus 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 Q2 2019. The steel frame with composite deck continues to provide the optimum build value with the overall building cost at £2,563/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 and hence the original Slimdek design was constructed.

Figure 9: 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 | 510 | 426 | 349 |
| Total building unit cost | 2,770 | 2,667 | 2,563 |