



COSTING STEELWORK #16

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

Business sentiment indicators rebounded strongly following the first full lockdown last year. Numerous surveys posted figures higher than their pre-lockdown levels. As surprising as this was given the severity of economic impacts wrought by covid lockdowns, many sentiment surveys have struggled to maintain these initial highs. Stronger economic undercurrents published in subsequent data releases highlight some of the eventual misalignment between early sentiment surveys and lagging economic data, in what was a highly unusual year. With renewed restrictions on economic activity from repeat lockdowns, it is expected that sentiment and economic activity measures will face ongoing pressure well into 2021. Current and ongoing vaccination programmes provide hope for some bounce-back in the economy. However, the end of the Brexit transition period brings inescapable uncertainty on a number of levels.

The UK's GDP yearly growth rate of -8.6% at Q3 2020 recovered from its largest ever fall, posted in the second quarter. Similarly, using historical comparisons, the quarterly growth at Q3 posted its largest ever gain at 16%. But the context of this is important, given the size of the decline in Q2 2020 and the impacts from the first lockdown. Latest GDP data suggests that the UK is set for a double-dip recession as subsequent lockdowns further dent economic activity.

Construction sector sentiment followed along a similar track, posting historically significant falls and then with sizeable rebounds following immediately afterwards. Projects were paused as a result of the economic turbulence. However, some of these made their way back into the marketplace in the latter months of 2020, providing something of a fillip for the new year.

Construction output regained visible momentum as more sites reopened fully throughout the second half of 2020. Before the recent third lockdown, reasonable optimism existed for 2021 workload. Some contractors claimed to have large parts of the 2021 orderbook secured last year. However, this is not a uniform picture across all the construction subsectors.

UK construction output posted increasingly better data points across the second half of 2020, reflecting the return of aggregate construction activity. The problem was that the data points remained negative

on a yearly change basis – in other words, comparing the data points to the same time 12 months previously, aggregate output was smaller. Orders, employment outlook and underlying demand paint a mixed picture, with some positive aspects and some negative risks. New orders data in Q3 2020 improved marginally compared with the same point in 2019, which offers a bright spot, especially following the precipitous fall in recorded new orders in Q2 2020.

Building cost inflation continues across several materials classifications. Aecom's composite index for building costs – comprised of materials and labour inputs – rose by just over 1% across the 12 months to Q4 2020. The quarterly movement from Q3 to Q4 2020 saw a larger nominal increase at 2.1%, reflecting rising demand from construction activity and tight supply chain conditions in some parts.

Brexit is also contributing to the situation, now that the UK's exit from the EU has been completed. Inflationary effects from significant non-tariff barriers have become evident, now that the UK has left the EU's customs union and single market. Aggregate wage levels continued to rise over Q4 2020 and into 2021, as renewed site activity increased workforce labour demand. Commodities prices have seen notable increases in the latter part of 2020 as well. There are various factors resulting in these recent commodities price increases, but the significant driver of the underlying trend in dollar-priced commodities is the weakening of the US dollar over the same period.

An aggregate measure of tender prices decreased by just over 1% provisionally in the 12 months to Q4 2020. But assessing price trends over shorter

timeframes, prices fell 1.5% between Q2 and Q3 2020, and by just under 1% between Q3 and Q4 2020.

Tender price inflation clearly slowed in 2020, with some trades offering much keener pricing. As with activity and sentiment measures, it was not a uniform picture. Firm-level pricing responses depended on their residual commercial and financial position going into the coronavirus lockdowns, levels of secured workload for 2021, and competitive positioning.

The prolonged period of market and economic uncertainty will continue to influence pricing decisions. Commercial pressures are expected from renewed input cost inflation – both materials and labour costs. Moreover, non-tariff barriers introduced as a result of the end of the Brexit transition period will now add additional costs into the supply chain. Whether these are inflationary cost pressures directly for supply chain firms, or from their suppliers, they are unwelcome factors when the market is already more competitive.

The second wave of the pandemic – possibly with higher virulence – introduces renewed risks for the construction sector. Social distancing restrictions on sites will impact productivity once more. Construction output figures will eventually bear out these working and social restrictions. Aecom's baseline outlook scenario sees a slower economic recovery after the initial V-shaped sentiment rebound last year. A corresponding V-shaped economic recovery is now unlikely, especially as Brexit's effects begin to work their way through the economy. On the positive side, however, there is an expectation of government spending that will offset declines in other private-sector focused areas of the construction industry.

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

| Quarter | 2017 | 2018 | 2019 | 2020 | Forecast | | |
|---------|-------|-------|-------|-------|----------|-------|-------|
| | | | | | 2021 | 2022 | 2023 |
| 1 | 110.9 | 113.2 | 117.9 | 120.4 | 119.1 | 120.6 | 123.3 |
| 2 | 111.3 | 113.6 | 118.3 | 119.9 | 119.4 | 121.2 | 124.2 |
| 3 | 112.2 | 115.4 | 119.3 | 119.3 | 119.7 | 121.8 | 125.1 |
| 4 | 112.6 | 117.3 | 120.0 | 118.8 | 120.0 | 122.4 | 126.0 |

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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:

$$£111.50 + £77.50 + £17.00 = £206.00$$

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



Christ the King Centre for Learning, Merseyside

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

| TYPE | Base index 100 (£/m ²) | Notes |
|--|------------------------------------|--|
| Frames | | |
| Steel frame to low-rise building | 101-122 | Steelwork design based on 55kg/m ² |
| Steel frame to high-rise building | 169-191 | Steelwork design based on 90kg/m ² |
| Complex steel frame | 191-226 | 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 | 101-142 | 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) | 75-98 | Steelwork design based on 35kg/m ² |
| Large-span single-storey building with high eaves (10-13m) | 86-117 | Steelwork design based on 45kg/m ² |

Figure 3: BCIS location factors, as at Q1 2021

| Location | BCIS Index | Location | BCIS Index |
|----------------|------------|------------|------------|
| Central London | 128 | Nottingham | 104 |
| Manchester | 99 | Glasgow | 93 |
| Birmingham | 96 | Newcastle | 92 |
| Liverpool | 94 | Cardiff | 94 |
| Leeds | 93 | Dublin | 96* |

*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 2021 are presented here.



One Kingdom Street, London

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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 2021. 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 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 4: Key costs £/m² (GIFA), for City of London office building

| Elements | Steel composite | Post-tensioned concrete flat slab |
|------------------------|-----------------|-----------------------------------|
| Substructure | 89 | 94 |
| Frame and upper floors | 437 | 471 |
| Total building | 2,627 | 2,768 |

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 Q1 2021. 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 £3,125/m² against £3,151/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 composite |
|------------------------|------------------------------------|----------------------------|-----------------|
| Frame and upper floors | 291 | 252 | 265 |
| Total building | 3,181 | 3,151 | 3,125 |

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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 Q1 2021. The steel portal frame provides optimum build value at £684/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 + northlights |
|-----------------------|--------------------|---|----------------------------------|
| Warehouse | 70 | 142 | 83 |
| Office | 130 | 171 | 129 |
| Total frame | 74 | 144 | 87 |
| Total building | 684 | 767 | 735 |

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 Q1 2021. The steel portal frame provides the optimum build value at £2,601/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 of this. 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 + northlights |
|---------------------------------|--------------------|---------------------------------|----------------------------------|
| Structural unit cost | 143 | 175 | 161 |
| Total building unit cost | 2,601 | 2,641 | 2,611 |

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 Q1 2021. The steel frame with composite deck continues to provide the optimum build value, with the overall building cost at £2,572/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 | 512 | 429 | 350 |
| Total building unit cost | 2,779 | 2,676 | 2,527 |