# COSTING STEELWORK #17

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 surveys are holding at or around long-run averages for the respective data series. Recent rebounds have further improved some of the indices in response to the ending of lockdown, combined with a vaccine rollout programme. Expectations of improved business conditions in 2021 are high, with most sectors forecasting better sales and revenue outcomes this year. Still, everything is relative, and "better" sales and revenue compared with 2020 are certainly more likely for many firms, given the substantial disruption to a range of economic sectors.

Confidence and sentiment do not always translate to hard economic data. Although there have been improvements here, there is some way to go before a recovery can be declared. The second wave of the pandemic in the UK, and its accompanying lockdowns, interrupted the improving economic activity across the final months of 2020. The UK's GDP yearly growth rate was -7.3% at Q4 2020, which is marginally higher than the Q3 rate of change but still negative over the yearly period.

Construction sector sentiment posted similarly strong rebounds over Q1 2021. This improved sentiment reflects the relatively strong return of activity. Construction output rallied through the second half of 2020, as more sites either reopened or improved productivity against the backdrop of covid-19 restrictions. Construction output grew by 1.6% between January and February 2021. However, on a quarter-to-quarter measurement, output fell slightly, by approximately 1%. The yearly change for total construction output shows that the industry in February 2021 was still more than 4% smaller than in February 2020. Following data revisions, 2020 annual construction growth has been revised down 1.5 percentage points to an annual decline of 14.0%. This is now the largest decline in annual growth since annual records began in 1997. Looking ahead, new orders data in Q4 2020 slipped again after posting a modest improvement over the 12 months to Q3 2020.

Building cost inflation continues across almost all materials classifications. Aecom's composite index for building costs – comprised of materials and labour inputs – increased by 3.1% in the 12 months to Q1 2021. The cost index continued to move higher from the combination of higher international logistics costs, non-tariff barriers introduced as a result of Brexit, and on-going demand from sound industry workload and activity. The quarterly movement from Q4 2020 to Q1 2021 saw an increase of 1.3%, which would equate to a larger annualised rate of change greater than 5%. Elevated input cost inflation can be expected throughout 2021, as the current mix of supply and demand factors continue.

Aggregate wage levels are nominally rising as lockdown ends, the economy reopens, and more construction activity picks up. But this aggregate measure shows that wage levels are 3%-4% shy of those seen immediately prior to the pandemic. Despite the strong sentiment indicated for the sector, wages data belies this somewhat, alluding to the gap that construction output has yet to make up before it returns to pre-pandemic levels.

A number of metals commodities continued rising in price up until March this year. Further, a significant pick-up in the yearly rate of change was recorded for structural steelwork in the first two months of 2021, as post-pandemic global demand propelled prices higher. For the months of January and February 2021, price rises of approximately 25% were recorded over the 12 months from their respective points in 2020. Global metals prices saw significant increases too. However, more recent price movements for these metals have not marked any defining trend – rather, they are moving sideways within a range.

Up until the start of 2021, and following their typical correlation, global metals prices moved in sync with the US dollar. Since the early part of 2021, though, this relationship moved out of sync, propelled by other market factors that more strongly influenced the trend of dollar-priced commodities such as copper and steel. Demand for underlying inputs to the steel-making process – scrap in the case of steel reinforcement – higher demand for finished steel products, and global supply constraints have contributed to this above-average rate of change in the short term.

The correlation between the US dollar and dollar-priced commodities will move back into sync in the future. US economic conditions strongly influence the strength or weakness of the US dollar, and recent evidence that US consumer price inflation is not increasing as quickly as forecast last year has undermined some of the recent support for the US dollar. If the dollar continues to weaken over the near term, this is likely to underpin the current inflationary drivers for steel prices over the next quarter.

An aggregate measure of tender prices declined marginally in the 12 months to Q1 2021. After a slowing of tender price inflation in 2020, and some deflationary trends seen in parts of the supply chain, pricing is maintaining a steady course at the moment. There is still some capacity in the pipeline which is allowing for continued competition where some trades are offering keener prices. Ordinarily, with the combination of present input cost strength and reasonable current activity levels, tender prices should plot an inflationary course through 2021. Expectations of higher future workload also adds pressure to this mix. But any mismatch between expectations for new orders and the reality further into 2021 will squeeze existing commercial dynamics for supply chain firms.

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

| | | | | | Forecast | | |
|---|---|---|---|---|---|---|---|
| Quarter | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** |
| 1 | 110.9 | 113.2 | 117.9 | 120.4 | 119.0 | 123.7 | 127.5 |
| 2 | 111.3 | 113.6 | 118.3 | 121.0 | 121.0 | 124.6 | 128.5 |
| 3 | 112.2 | 115.4 | 119.3 | 119.1 | 122.0 | 125.5 | 129.5 |
| 4 | 112.6 | 117.3 | 120.0 | 119.0 | 122.8 | 126.5 | 130.5 |

## 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:

£124.00 + £82.00 + £18.50 = £224.50

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

Distribution warehouse, Prologis Park, Stoke-on-Trent

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

| TYPE | Base index 100 (£/m²) | Notes |
|---|---|---|
| **Frames** | | |
| Steel frame to low-rise building | 112-136 | Steelwork design based on 55kg/m² |
| Steel frame to high-rise building | 188-212 | Steelwork design based on 90kg/m² |
| Complex steel frame | 212-251 | Steelwork design based on 110kg/m² |
| **Floors** | | |
| Composite floors, metal decking and lightweight concrete topping | 64-100 | Two-way spanning deck, typical 3m span with concrete topping up to 150mm |
| Precast concrete composite floor with concrete topping | 108-152 | 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) | 15-22 | Factory applied intumescent coating |
| Fire protection to steel columns and beams (90 minutes resistance) | 18-30 | Factory applied intumescent coating |
| **Portal frames** | | |
| Large-span single-storey building with low eaves (6-8m) | 83-108 | Steelwork design based on 35kg/m² |
| Large-span single-storey building with high eaves (10-13m) | 95-130 | Steelwork design based on 45kg/m² |

**Figure 3:** BCIS location factors, as at Q2 2021

| Location | BCIS Index | Location | BCIS Index |
|---|---|---|---|
| Central London | 128 | Nottingham | 104 |
| Manchester | 100 | Glasgow | 93 |
| Birmingham | 96 | Newcastle | 92 |
| Liverpool | 95 | Cardiff | 94 |
| Leeds | 93 | Dublin | 103* |

*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 Q2 2021 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 Q2 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 6% 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 | 91 | 96 |
| Frame and upper floors | 450 | 480 |
| **Total building** | **2,671** | **2,815** |

## 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 Q2 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 of £3,178/m² against £3,204/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 | 300 | 257 | 272 |
| **Total building** | **3,234** | **3,204** | **3,178** |

## 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 2021. The steel portal frame provides optimum build value at £695/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 | 73 | 146 | 84 |
| Office | 135 | 176 | 133 |
| Total frame | 77 | 148 | 90 |
| **Total building** | **695** | **780** | **747** |

## 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 Q2 2021. The steel portal frame provides the optimum build value at £2,645/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 + north-lights |
|---|---|---|---|
| Structural unit cost | 147 | 180 | 166 |
| **Total building unit cost** | **2,645** | **2,685** | **2,655** |

## 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 Q2 2021. The steel frame with composite deck continues to provide the optimum build value, with the overall building cost at £2,615/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 | 528 | 442 | 361 |
| **Total building unit cost** | **2,826** | **2,721** | **2,615** |