COSTING STEELWORK #14

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

Large impacts to economies and domestic industry sectors are now evident. For how long they continue and the shape of the route out of this downturn is the principal economic question. Hopes for a V-shaped recovery are waning but not entirely gone. But the longer that economic and construction activity remains subdued, the more the realisation grows that a recovery will probably take a different shape.

UK business sentiment indicators plummeted at historic speed as lockdown descended across the UK. Early estimates and assessments of the UK's GDP annual growth rate dipped to -1.6% in Q1 of 2020. Further deterioration in this metric is expected for Q2 2020, once ONS data is available.

Initial data covering March saw construction new work output fall by 45% year-on-year, and by an almost similar value for the February to March monthly movement. All construction sub-sectors posted significant falls in output as lockdown and site closures hit hard. Positively, the sites and projects that were paused will restart, and this will eventually improve the output data. However, productivity will be significantly impaired by the social distancing required on site. This is likely to mean that prior output levels, if they are reached, are not seen until later in 2020.

Aecom's composite index for building costs – comprising materials and labour inputs – rose by 1.1% over the year to Q1 2020. This is a notable slowing of the rate of input cost inflation, but is still an increase over the year. All materials classifications fell between Q4 2019 and Q1 2020. Labour cost inflation continued to move up to the point when the coronavirus lockdown was implemented. Weekly earnings for construction grew by 2.7% over the same period to Q1 2020. Similar to output data, labour-only wage inflation also started to see significant falls after the lockdown was implemented. Some reduction here is understandable, given that prevailing wage rates are a function of labour demand. Wage rates returning to pre-lockdown levels will be a closely watched indicator of how strongly industry activity is returning.

As site activity picks up again, a combination of restart demand, prevailing lockdown constraints and low supply inventories is expected to create a short-term spike in cost inflation over Q3 2020. Until distribution and supply channels return to some form of normal sequencing, some constraints will endure and impact the procurement of both domestically sourced and imported construction materials.

Much of the construction supply chain is expected to experience increased financial stress during 2020. This is in addition to the already weak margin situation of the industry. Even a short lockdown period inevitably tests the financial resilience of many firms, but protracted disruption will lead to financial stress horizontally and vertically throughout the industry. Paused, delayed or deferred projects reduce cash flow. Balance sheet strength then becomes a determining factor in the survival of supply chain firms through this period of industry dislocation. Rising numbers of insolvencies are an expected consequence of this financial strain.

Tender price inflation was just over 2% in the 12 months to Q1 2020. Keener pricing was evident, although not uniformly across trades. UK regions showed variation in the rate of price change, most of which relates to a region's position in the market cycle. Reduced demand for construction should, all things being equal, exert downward pressure on tender prices.

Figure 1: Material price trends

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

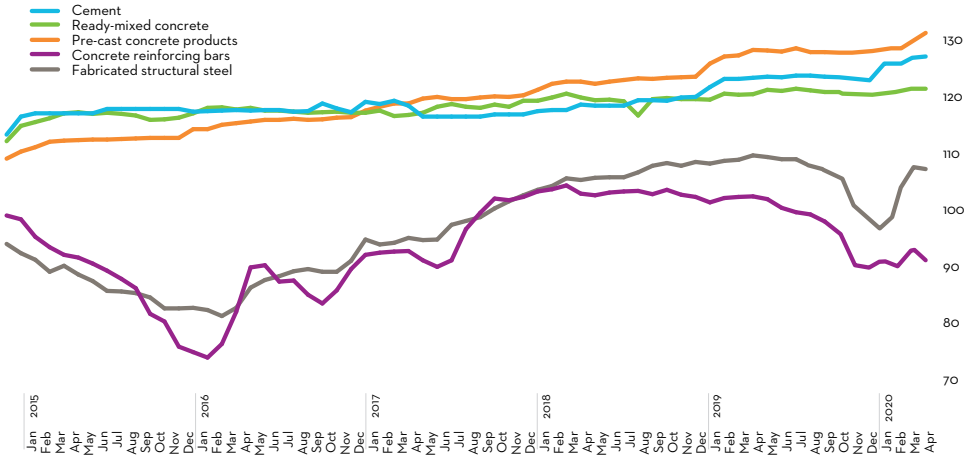

Figure 2: Tender price inflation, Aecom Tender Price Index, 2015 = 100

					Forecast*		
Quarter	2017	2018	2019	2020	2021	2022	2023
1	110.9	113.2	117.9	120.4	–	–	–
2	111.3	113.6	118.3	120.4	–	–	–
3	112.2	115.4	119.3	–	–	–	–
4	112.6	117.3	120.0	–	–	–	–

* Meaningful forecasts are not possible at this time on the basis that the short- to medium-term impact of the covid-19 pandemic on the industry is unknown.

For the purposes of developing a baseline forecast scenario, the current situation is deemed to be a pause to industry activity, albeit significant. If activity levels return to, or start to approach, pre-lockdown levels over Q3 2020, then pricing should see a resumption of inflationary but softer trends over the remainder of 2020. A capped forecast of 1% over the rest of 2020 is then the forecast outcome of this scenario.

Different scenarios see larger falls in tender prices, particularly where output remains depressed for an extended period, and where broader recessionary economic trends begin to influence the demand for construction services. This is a major emerging risk for the construction sector, now that some of the impacts from the lockdown are visible on economic activity and business confidence. It should be stressed that Brexit is an added complication to these scenarios and its specific impacts are excluded from the tender price forecasts for the time being. Nonetheless, a spectrum of disarrangement will occur, with no-deal Brexit bringing the largest amount of disruption to trading conditions and supply chains later this year.

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 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:

£113.00 + £78.50 + £17.50 = £209.00

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 (£/m²)	Notes
Frames		
Steel frame to low-rise building	102-124	Steelwork design based on 55kg/m²
Steel frame to high-rise building	171-193	Steelwork design based on 90kg/m²
Complex steel frame	193-228	Steelwork design based on 110kg/m²
Floors		
Composite floors, metal decking and lightweight concrete topping	62-95	Two-way spanning deck, typical 3m span with concrete topping up to 150mm
Precast concrete composite floor with concrete topping	102-144	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)	15-20	Factory applied intumescent coating
Fire protection to steel columns and beams (90 minutes resistance)	17-29	Factory applied intumescent coating
Portal frames		
Large-span single-storey building with low eaves (6-8m)	75-98	Steelwork design based on 35kg/m²
Large-span single-storey building with high eaves (10-13m)	86-119	Steelwork design based on 45kg/m²

Figure 4: BCIS location factors, as at Q2 2020

Location	BCIS Index	Location	BCIS Index
Central London	128	Nottingham	104
Manchester	99	Glasgow	93
Birmingham	96	Newcastle	92
Liverpool	94	Cardiff	95
Leeds	93	Dublin	97*

*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 2020 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 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 2020. Movement has continued to be relatively static from Q1 2020. 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	89	95
Frame and upper floors	442	476
Total building	**2,655**	**2,798**

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 2020. 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 £3,159/m² against £3,185/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 comp-osite
Frame and upper floors	294	254	267
Total building	**3,216**	**3,185**	**3,159**

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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 Q2 2020. The steel portal frame provides optimum build value at £691/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 + north-lights
Warehouse	71	144	84
Office	131	173	131
Total frame	75	145	88
Total building	**691**	**774**	**743**

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 2020. The steel portal frame provides the optimum build value at £2,629/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 + north-lights
Structural unit cost	145	177	163
Total building unit cost	**2,629**	**2,669**	**2,639**

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 2020. The steel frame with composite deck continues to provide the optimum build value, with the overall building cost at £2,600/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 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	518	433	354
Total building unit cost	**2,809**	**2,705**	**2,600**