COSTING STEELWORK #18

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 reached near record highs recently, and general business sentiment continued to rise as the UK economy reopened more. Improving construction workload powers this optimism. However, significant supply-side issues around workforce constraints and materials procurement muddy the waters with the belief that everything is due to higher output levels across all sectors.

Activity is expected to remain busy through to the end of the second half of 2021, as consumer demand returns across a larger number of economic sectors. Business sentiment conditions therefore are likely to remain elevated as a mixture of expected and real improved sales and revenue occur over the remainder of this year.

But real risks remain, of further bumps in the road from the pandemic and a potential return of restrictions in some form should events deteriorate again. What will become clearer is the proportion of the rebound that is from the short-term cyclical spike, and that which is driven from the strength of underlying demand and structural factors propelling economic activity.

After faltering in early 2021, construction output regained its momentum and took another leg up in the second quarter of the year, according to the latest data from the Office for National Statistics (ONS). This helped push new work output back up towards pre-pandemic totals, but the level was still about 5% shy of this milestone. Underscoring the undulating nature of the rebound, all work construction output volume declined for the fourth month in a row with the release of July's data.

Across the UK, the private housing and infrastructure sectors led the way in output rebounds. Infrastructure workload continued its strong growth trend out of 2020, rising to a level that now clearly surpasses its pre-pandemic levels. Within this sector, electricity, gas, and communications utilities work all recorded strong rates of growth over the two-year period from the start of 2019. In a further sign of construction industry durability, the largest sector by volume – private housing – has now recovered a substantial part of the ground lost during 2020. The commercial and private industrial sectors are still some way off returning to a pre-pandemic level.

Aecom's composite index for building costs – comprised of materials and labour inputs – increased by 8.5% in the 12 months to Q2 2021. This is a headline figure, aggregating many different materials classifications, and one which masks a wider range of inflation rates for individual items. The largest increases continued to be in metals and timber products, especially those that are imported. A rolling quarter-to-quarter change for the composite index at June 2021 recorded a movement of 2.6%. The month-on-month change at June for materials only was 0.91%, which is equivalent to 11% annualised approximately. This underlines the notably elevated rate of input cost inflation currently.

Labour rates are increasing healthily again, after dipping last year in response to lockdowns and impaired demand for site trades and skills. Year-on-year change of broadly 8% for a collection of site trades is the current headline rate for wage inflation. However, similar to materials classifications, this does not convey the broader range of wage inflation for the different trades that make up the headline figure. Steelwork trades and bricklayers are seeing wage inflation of between 15% and 20% over the year to Q2 2021, although this figure is influenced by the dip in wages at the same time last year. Nevertheless, it highlights the strength of demand for key trades.

An aggregate measure of tender prices increased by 1% in the 12 months to Q2 2021. A denominator calculation effect influences this rate of change as Q2 2020 was the point at which tender prices peaked, according to Aecom analysis. Provisionally, Q3 2021 sees an approximately 4% increase over the year from Q3 2020 to Q3 2021. There is clear momentum now to increase prices in response to better output and demand for construction services, and also to address the acute pressure to recover significantly higher input cost trends over the latter parts of Q1 and Q2 2021. Overwhelmingly, trades that involve metals saw the steepest price rises in the last quarter. Materials input cost inflation is the largest driver of tender price rises but is also pushed higher by labour rate increases.

Not all of the materials cost inflation is being transferred through into tender prices at the moment, because not all of it can be without some impact on companies' competitive positioning. Price changes will take longer to secure than the quick changes to input costs that were experienced over the first half of the year. Some of the input cost inflation is being absorbed at various stages along the supply chain. But the high cost inflation adds commercial pressure to the supply chain, and is difficult to sustain over an extended period without creating problems for companies' financial management.

Aecom's baseline forecast for tender prices are an increase of 4% from Q3 2021 to Q3 2022, and of 4% from Q3 2022 to Q3 2023. Risks are to the upside across the first 12-month period and with upside risks again over the second 12-month forecast period. The baseline forecast scenario sees a continuation of the incomplete economic recovery. Significant inflationary pressures will remain.

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	120.0	126.5	131.2
2	111.3	113.6	118.3	121.0	122.2	127.7	132.5
3	112.2	115.4	119.3	119.1	123.7	128.8	133.9
4	112.6	117.3	119.8	119.1	125.3	130.0	135.3

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:

£141.00 + £93.50 + £19.50 = £254.00

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

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	127-155	Steelwork design based on 55kg/m²
Steel frame to high-rise building	214-242	Steelwork design based on 90kg/m²
Complex steel frame	242-286	Steelwork design based on 110kg/m²
Floors		
Composite floors, metal decking and lightweight concrete topping	73-114	Two-way spanning deck, typical 3m span with concrete topping up to 150mm
Precast concrete composite floor with concrete topping	114-161	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)	16-23	Factory applied intumescent coating
Fire protection to steel columns and beams (90 minutes resistance)	19-33	Factory applied intumescent coating
Portal frames		
Large-span single-storey building with low eaves (6-8m)	95-123	Steelwork design based on 35kg/m²
Large-span single-storey building with high eaves (10-13m)	108-149	Steelwork design based on 45kg/m²

Figure 3: BCIS location factors, as at Q3 2021

Location	BCIS Index	Location	BCIS Index
Central London	128	Nottingham	104
Manchester	102	Glasgow	92
Birmingham	96	Newcastle	92
Liverpool	97	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 Q3 2021 are presented here.

One Kingdom Street, London

This Costing Steelwork article produced by Patrick McNamara (director) and Michael Hubbard (associate) of Aecom is available at www.steelconstruction.info.
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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 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 4% 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	498	475
Total building	**3,174**	**3,252**

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 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 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 £3,495/m² against £3,524/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	336	287	305
Total building	**3,558**	**3,524**	**3,495**

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 2021. The steel portal frame provides optimum build value at £800/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	109	163	127
Office	157	197	157
Total frame	111	165	129
Total building	**800**	**865**	**839**

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 2021. The steel portal frame provides the optimum build value at £2,909/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	165	202	186
Total building unit cost	**2,909**	**2,954**	**2,920**

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 2021. The steel frame with composite deck continues to provide the optimum build value, with the overall building cost at £2,981/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	602	460	411
Total building unit cost	**3,221**	**3,058**	**2,981**