COSTING STEELWORK #19

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 sentiment settled at a long-run equilibrium level at the end of 2021 – a Goldilocks level, neither too hot nor too cold. After an undulating year, the industry has found a broadly steady state. Construction activity is expected to plot a stable course over the first half of 2022. Existing workload momentum will ensure that activity holds up over the industry as a whole, but sector variance will continue – reflecting broader economic trends. Nevertheless, the cumulative effect of the last two years – in addition to the structural and systemic industry issues that pre-date the pandemic – mean there is work still necessary to recover lost ground. General business sentiment gained ground, reflecting the improved but not stellar economic activity. It is widely reported that supply issues continue to act as a drag on output and production efficiency. On-going constraints from labour, materials and components shortages are reported across most economic sectors.

The Office for National Statistics reported recently that all work construction output is now higher than it was immediately prior to the pandemic, with the output rebound regaining momentum after some fitful periods of recorded output in 2021. An important additional comparator for current workload is to all work output recorded in 2019. Evidently, the industry has a way to go still to match this level of activity before the pandemic began. New work output in Great Britain at Q3 2021 was broadly 10% higher than at the same point in 2020, in constant prices. However, it was 7% smaller than for the same quarter in 2019. Until pandemic effects wash through the yearly change calculations, it is instructive to compare current levels of industry workload to steady state 2019 output values, in order to understand the true levels of activity now. At a sub-sector level, infrastructure workload is digging the industry out of a hole. By way of a counterfactual, were this sub-sector currently posting output nearer to its long-run 10-year average, overall new work construction output across the country would be a long way short of the pre-pandemic peak level of H2 2019.

Input cost pressure remains elevated and in certain cases is still acute. Q4 2021 saw this stress dissipate slightly across more of the basket of items comprising Aecom's composite building cost index. Nonetheless, the index increased by 10% in the 12 months to Q4 2021. The calendar year average rate of change of 8% for 2021 versus 2020 is the highest in Aecom's building cost index for over 30 years. The range of inflation change has narrowed across the basket comprising the index, with fewer items at the extremely high rates of changes recorded in previous quarters. Nonetheless, there are still many items where inflationary pressures are extreme compared with historical norms. Despite the narrowing spread of inflation rates for individual components, the aggregate headline run rate will stay elevated over 2022, notably so through the first quarter of this year, and most likely over the second quarter too.

Metals and timber components are still the classifications with the highest rates of change over the year. Labour rates continue to rise steadily, reflecting robust workforce demand, and a very high number of construction vacancies. An aggregate measure of site trades recorded a year-on-year change of 4.7% between Q4 2020 and Q4 2021. This calculation includes some carry-over effects from 2020, so a comparison against a pre-pandemic year sees a 2% increase versus Q4 2019. Wage pressure is not likely to fade, unless there is a significant adverse change in workload trends or output over 2022.

Aecom's tender price inflation index rose by 7% over the 12 months to Q4 2021. This is the highest rate of yearly tender price change since 2015 and 2016, when the post-financial crisis construction recovery was in full swing. Price momentum gathered pace in H2 2021, buoyed by good demand and the push from all areas of the supply chain to recover higher input costs. Absorption of cost increases across the supply chain was a reluctant position enforced by high uncertainty during the pandemic. But this effect is now dissipating to a large degree, which pushes more of this input cost inflation through into higher tender prices. The pricing power pendulum has swung back towards the supply chain as companies find a balance between navigating the pandemic and on-going business operations.

Improving industry confidence has pushed up overheads and profit levels, with preliminaries also seeing rising trends. Similar pressures exist for the indirect cost side of commercial pricing, as the demand for staff and skills impacts much of the industry. Procurement routes are flexing in both subtle and overt ways, to assist the successful route to market for projects and programmes. Fixed-price contracts are less likely to be accepted as a matter of course now. Programme durations will be subject to more scrutiny and negotiation. Longer delivery times will result in extended build programmes. Historical productivity norms are not necessarily a given, due to a broad array of procurement and operational issues occurring at the same time.

Inflationary pressures will remain throughout 2022, as this collection of constraints and challenges continue to affect the economy and the construction industry. Further, input cost pressure will be a key operational and financial issue to grapple with in the first half of 2022 as rising input cost trends increase the pressure on working capital requirements – whether through the use of existing company cash reserves, adjustments to payment terms, or through new or extended lines

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

					Forecast		
Quarter	2018	2019	2020	2021	2022	2023	2024
1	113.2	117.9	120.4	120.0	129.4	135.8	140.5
2	113.6	118.3	121.0	122.6	131.2	137.0	141.7
3	115.4	119.3	119.1	125.3	132.9	138.2	142.9
4	117.3	119.8	119.1	127.5	134.7	139.4	144.0

of credit. Strong balance sheets and focused financial management are crucial to navigating 2022. Margin erosion is also likely to be referenced more often, given the lagged effect between the purchase of inputs and the selling of a finished product.

Aecom's baseline forecast for tender prices are a 5% increase from Q1 2022 to Q1 2023, and 3.5% from Q1 2023 to Q1 2024. Growing confidence and demand for construction services, along with rising input costs, all contribute towards the higher likelihood of strong price inflation being maintained. Risks to pricing remain to the upside across the next 12 months, and similarly over the second forecast period. The baseline forecast core assumptions are an inconsistent recovery across the economy, some variability in construction sector pricing as a result of differing output trends and related competition levels, and enduring operational disruption arising from the permanent changes to the UK's internal and external trading status.

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:

£145.00 + £96.00 + £25.00 = £266.00

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

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

TYPE	Base index 100 (£/m²)	Notes
Frames		
Steel frame to low-rise building	131-159	Steelwork design based on 55kg/m²
Steel frame to high-rise building	220-249	Steelwork design based on 90kg/m²
Complex steel frame	249-294	Steelwork design based on 110kg/m²
Floors		
Composite floors, metal decking and lightweight concrete topping	75-117	Two-way spanning deck, typical 3m span with concrete topping up to 150mm
Precast concrete composite floor with concrete topping	116-164	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)	21-29	Factory applied intumescent coating
Fire protection to steel columns and beams (90 minutes resistance)	25-40	Factory applied intumescent coating
Portal frames		
Large-span single-storey building with low eaves (6-8m)	97-127	Steelwork design based on 35kg/m²
Large-span single-storey building with high eaves (10-13m)	112-153	Steelwork design based on 45kg/m²

Figure 3: BCIS location factors, as at Q1 2022

Location	BCIS Index	Location	BCIS Index
Central London	126	Nottingham	104
Manchester	102	Glasgow	93
Birmingham	96	Newcastle	92
Liverpool	97	Cardiff	94
Leeds	94	Dublin	102*

*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 2022 are presented here.

Christ the King Centre for Learning, Merseyside

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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 2022. 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 5% 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	511	485
Total building	**3,237**	**3,300**

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 2022. 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 £3,556/m² against £3,578/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	343	293	319
Total building	**3,613**	**3,578**	**3,556**

AECOM STEEL for life BCSA

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 2022. The steel portal frame provides optimum build value at £816/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	114	165	133
Office	164	200	164
Total frame	116	167	134
Total building	**816**	**878**	**855**

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 2022. The steel portal frame provides the optimum build value at £2,957/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	172	205	194
Total building unit cost	**2,957**	**2,998**	**2,969**

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 2022. The steel frame with composite deck continues to provide the optimum build value, with the overall building cost at £3,038/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	628	467	429
Total building unit cost	**3,287**	**3,104**	**3,038**