COSTING STEELWORK #9

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

Economic and business sentiment in the UK held up until the final quarter of 2018. Now, though, many economic and business indicators are signalling a weaker picture for the economy. Individually, UK regions report along the same lines, with no divergence between economic sectors or size of firm.

In turn, overall construction sentiment is being affected by Brexit uncertainty and falling new orders. Whether the former is the sole reason for the latter is a moot point. Nevertheless, a faltering economic situation – globally and in the UK – is certainly a key factor in pushing the cyclical picture. This said, trade and specialist contractors retain a slightly more positive outlook than main contractors on enquiries and workload further out into 2019.

Despite prevailing uncertainty, operational challenges remain for the supply chain as current workload and projects are built out. Availability of labour and staff resources remains a management issue for supply chain firms. Last year saw some reduction in this pressure, but recruiting and retaining labour is still an operational consideration for many firms. Wage growth for site trades through 2017 and 2018 recorded a trend of being comfortably ahead of general consumer price inflation. The final quarter of 2018 saw a marginal yearly increase in wage growth, notably across later trade disciplines. However, early building trades posted weaker, if not negative, yearly rates of change, which probably reflects changing market dynamics in respect of new orders and output.

Materials and labour input costs continue to push up a composite index for building costs. At Q4 2018 the overall index increased by 4.7% compared with the same quarter in 2017. This is the highest rate of building cost inflation in the last quarter of any year since 2008. Further increases on a yearly basis are expected through 2019, but the rate of change is forecast to slow from the recent peak late last year.

Metals commodities prices have responded to a number of global themes throughout 2018: US dollar strength, slowing China economic data and global trade tensions. Some of the factors affecting the outlook for commodities have been demand-creating and some have been demand-eroding. However, commodities are finding it difficult to maintain upward direction, which is a clear indicator of faltering global economic activity.

Input costs will remain a primary commercial pressure for the supply chain in 2019. For more than 18 months now, input costs have run at a higher yearly rate of change than tender prices. This dynamic weighs heavily on commercial operations for much of the supply chain, especially as prices sought for work are constrained to some extent by achievable output prices. Although there has been some pass-through into output prices, there is likely still to be an inability to recover all of the input cost pressures, particularly as competition increases on a weaker overall outlook on future work. Clearly, this assumes a continuation of current input cost trends.

Tender prices rose over the year by 3.5% at Q4 2018. Construction price inflation maintained a steady trend through 2018, but received another leg-up as output figures saw a boost in the final quarter. Market dynamics are seeing emerging changes in risk allowances within tender submissions,

Figure 1: Material price trends

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

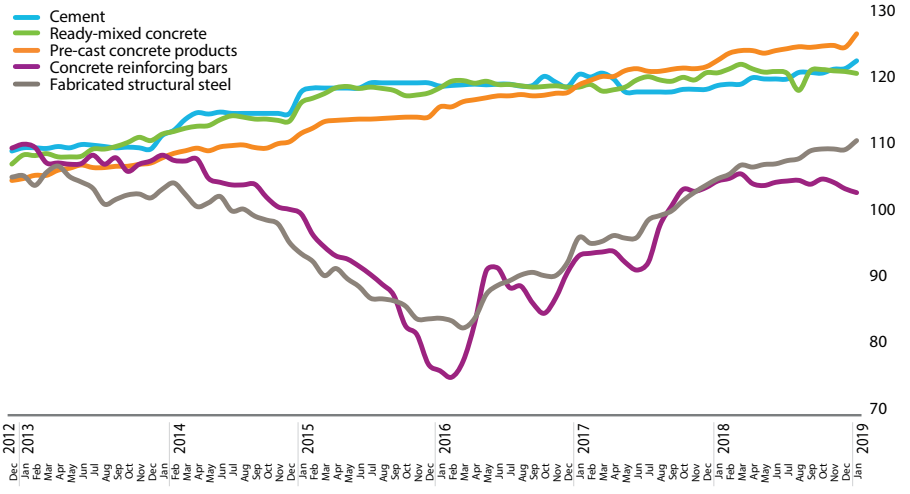

Figure 2: Tender price inflation, Aecom Tender Price Index, 2015 = 100

					Forecast		
Quarter	2015	2016	2017	2018	2019	2020	2021
1	96.0	105.8	110.9	113.2	117.3	119.0	121.1
2	98.6	107.7	111.3	113.6	117.7	119.5	121.2
3	101.5	108.7	112.2	115.4	117.9	120.0	121.6
4	103.8	109.9	112.6	116.5	118.2	120.3	121.8

on-going pressure from elevated input costs and some recruitment pressures. In combination, these trends are creating commercial pressures for the supply chain as output prices are constrained by prevailing competition levels and client willingness to pay.

Aecom's baseline forecasts for UK tender price inflation are 1.4% from Q1 2019 to Q1 2020, and 1.8% from Q1 2020 to Q1 2021. The rate of tender price inflation over the year ahead is based on output reverting to a long-run average without excessive volatility, elevated input costs as a result of weak sterling and general resource constraints. Higher expected economic and political turbulence has led to a pronounced downside skew to the assessed risks accompanying the price forecasts.

Prevailing uncertainty around Brexit and a smooth departure for the UK from the EU is covered within these forecasts. However, extreme volatility from a no-deal or disorderly Brexit, for example, are excluded from these inflation forecasts.

SOURCING COST INFORMATION

When sourcing cost information it is important to recognise that it is derived from various sources, including similar projects, market testing and benchmarking, and that relevance 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:

£109.50 + £77.00 + £17.00 = £203.50

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	99-120	Steelwork design based on 55kg/m²
Steel frame to high-rise building	167-189	Steelwork design based on 90kg/m²
Complex steel frame	189-224	Steelwork design based on 110kg/m²
Floors		
Composite floors, metal decking and lightweight concrete topping	61-93	Two-way spanning deck, typical 3m span, with concrete topping up to 150mm
Precast concrete composite floor with concrete topping	99-140	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)	75-97	Steelwork design based on 35kg/m²
Large-span single-storey building with high eaves (10-13m)	85-116	Steelwork design based on 45kg/m²

Figure 4: BCIS location factors, as at Q1 2019

Location	BCIS Index	Location	BCIS Index
Central London	124	Nottingham	105
Manchester	101	Glasgow	91
Birmingham	96	Newcastle	96
Liverpool	96	Cardiff	85
Leeds	90	Dublin	96*

*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 Q1 2019 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 Q1 2019. There has been no real cost movement from Q4 2018. 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	88	93
Frame and upper floors	433	467
Total building	**2,605**	**2,745**

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 Q1 2019. 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 (£3,098/m² against £3,124/m²).

This is because of lower substructure and roof costs, and 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	289	250	262
Total building	**3,154**	**3,124**	**3,098**

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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 34,000m^2
- Office: 1,400m^2, 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 2019. The steel portal frame provides optimum build value at £679/m^2; 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 £/m^2 (GIFA), for Stoke-on-Trent distribution warehouse

Elements	Steel portal frame	Glulam beams + purlins + concrete columns	Steel portal frame + north-lights
Warehouse	70	140	82
Office	127	169	127
Total frame	73	141	85
Total building	**679**	**759**	**728**

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 9,393m^2
- 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 Q1 2019. The steel portal frame provides the optimum build value at £2,579/m^2, 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 £/m^2 (GIFA), for Stockton-on-Tees food store

Elements	Steel portal frame	Glulam timber rafters + columns	Steel portal frame + north-lights
Structural unit cost	141	173	159
Total building unit cost	**2,579**	**2,619**	**2,589**

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
- 7,153m^2 of open-plan office space on five floors (floors two to six)
- 9,265m^2 of hotel space on eight floors (floors eight to 15)

The gross internal floor area of the building is 18,625m^2. 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 2019. The steel frame with composite deck continues to provide the optimum build value with the overall building cost at £2,550/m^2.

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 and hence the original Slimdek design was constructed.

Figure 9: Key costs £/m^2 (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	507	424	347
Total building unit cost	**2,756**	**2,654**	**2,550**