

Apply a Range of Estimating Techniques in Building Estimations

Commercial Processes and Cost Management

M5X01871

Level 5

Semester 2

19/02/19

Submitted By:

Cameron Hockaday

1706551

Date Due: 19/01/19

Submitted To:

Dr. N Tobin

School of Architecture, Built and Natural Environments

Date Submitted: 19/01/19

Table of Contents

1.0. Introduction	Page 2
1.1. The aim of the Report	Page 2
1.2. Assumptions	Page 2
1.3. Preparing an Order of Cost Estimates	Page 3
1.4. Labour Cost Estimates	Page 4
1.5. Cost Data/Information and Their Limitations	Page 4
References	Page 5

1.0. Introduction

Estimation has different meanings according to the subject. Dagostino F and Peterson S (2014) state that building construction estimation is 'the determination of probable construction costs of any given project.' (p.1). The construction of buildings is unique in its production process. Unlike goods from a production line, each individual building is different and construction cost estimation must be performed for every individual construction project. Estimation is an important stage in determining the viability of a project. Bipat C (2018) states that 'When costs are underestimated, there are many unforeseen expenses during the construction phase. Based on how the contract is structured, these costs may affect the owner, the contractor, or both. When cost is overestimated, the owner ends up paying more than necessary or may decide not to proceed with the project.'

1.1. The aim of the Report

As the cost advisor for McLeod & Aitken, the aim of my report is to justify my estimates for the construction of a proposed building in Townhill, Swansea using the New Rules of Measure (NRM1). My report will help the client make an informed decision as to whether or not the proposed project is viable. The property in question is a two-bedroom semi-detached house, however, the estimation is to reflect the cost of one of the two properties not of both of the semi-detached houses.

1.2. Assumptions

- Weather – the proposed construction will take place over a span of 50 weeks meaning it will continue through all of the seasons, delays due to weather 'could not have been reasonably anticipated at the time' (Halpin 2005), therefore I will assume there are no delays due to inclement weather.
- Size of the proposed building – no data has been provided about the dimensions of the proposed building, I therefore took the average floor size of a UK semi-detached house stated as 'Average floor size 1033 sq. ft.' (David Wilson Homes) and converted it into meters squared using the following equation: $m^2 = \frac{ft^2}{10.764}$. Giving an average floor size of $95.96m^2$, which was rounded up to $96m^2$, this figure is per floor of the two semi-detached houses together. We must therefore double the figure but then divide it by two as we are only interested in the one building.
- Design fees – the sample property was taken from the Building Cost Information Service (BCIS) doesn't include design fees as it is a council house. Grant Erskine stated that for architects 'Fees are commonly quoted as being between 8 and 12%' (2018) so I have taken the median value of 10% and will use that for my Order of Cost Estimates.
- Site Conditions – no data relating to a site location other than a general area is given, therefore I will assume that there are no demolition works needed to be carried out and there is no contamination on the site. This should be investigated in the later parts of the pre-construction phase.
- Site Working Hours – I am assuming that craftsmen are on site Monday-Friday and the site is closed on Saturday and Sunday.
- Individual Working Hours – It is assumed the craftsmen complete a 39-hour week but do not work past this point, this means no overtime has to be accommodated for.
- Labour Commute – I am assuming that the labour for the proposed project resides less than 6 Kilometres from the site, so there is no fare for their travel.
- Holidays – It is assumed the only holidays the craftsmen take are public holidays.

- Summer-Winter Working Hours - It is assumed of the 50-week project span that 30 of these weeks will be in summer and the other 20 in winter.

1.3. Preparing an Order of Cost Estimate

Group Element	Element		Cost per m2	Total Cost
1 Substructure			£ 172.00	£ 16,512.00
2 Superstructure	2.1 Frame		£ -	£ -
	2.2 Upper Floors		£ 57.00	£ 5,472.00
	2.3 Roof		£ 129.00	£ 12,384.00
	2.4 Stairs and Ramps		£ 21.00	£ 2,016.00
	2.5 External Walls		£ 228.00	£ 21,888.00
	2.6 Windows and External Doors		£ 144.00	£ 13,824.00
	2.7 Internal Walls and Partitions		£ 47.00	£ 4,512.00
	2.8 Internal Doors		£ 60.00	£ 5,760.00
	Superstructure		£ 686.00	£ 65,856.00
3 Internal finishes	3.1 Wall Finishes		£ 75.00	£ 7,200.00
	3.2 Floor Finishes		£ 76.00	£ 7,296.00
	3.3 Ceiling Finishes		£ 28.00	£ 2,688.00
	Internal Finishes		£ 180.00	£ 17,280.00
4 Fitting, Furnishings and Equipment	Fitting, Furnishings and Equipment		£ 34.00	£ 3,264.00
5 Services	5.1 Sanitary Appliances		£ 13.00	£ 1,248.00
	5.2 Services Equipment		£ -	£ -
	5.3 Disposal Installations		£ 10.00	£ 960.00
	5.4 Water Installations		£ 25.00	£ 2,400.00
	5.5 Heat Source		£ -	£ -
	5.6 Space Heating and Air Conditioning		£ 36.00	£ 3,456.00
	5.7 Ventilation		£ 19.00	£ 1,824.00
	5.8 Electrical Installations		£ 79.00	£ 7,584.00
	5.9 Fuel Installations		£ 9.00	£ 864.00
	5.10 Lift and Conveyor Installations		£ -	£ -
	5.11 Fire and Lighting Protection		£ -	£ -
	5.12 Communications, Security and Control Systems		£ 10.00	£ 960.00
	5.13 Special Installations		£ -	£ -
	5.14 Builders' Work in Connection with Services		£ 11.00	£ 1,056.00
	Services		£ 211.00	£ 20,256.00
6 External Works	External Works		£ 401.00	£ 37,496.00
7 Preliminaries	Preliminaries		£ 264.00	£ 25,344.00
8 Contingencies	Contingencies		£ 160.00	£ 15,360.00
9 Design Fees	Design Fees		£ 189.00	£ 18,111.00
10 Total Cost	Total Cost		£ 2,286.00	£ 219,479.00

1.4. Labour Cost Estimates

To accurately estimate the overall labour cost the all-in labour rate is required. The all-in labour rate is 'a rate which includes payments to operatives and associated costs which arise directly from the employment of labour' (Flanagan R, 2009).

With craftsmen assumed to be working 39 hours over a 5-day working week the average time spent working in a day is 7.8 hours. As part of the 50-week span of the project, it will continue through from summer into winter during which time there is a total of 9 public holidays, so we multiply 7.8 by 9 to calculate the number of hours of pay that needs to be paid over the public holidays. $7.8 \times 9 = 70.2$ hours.

	Plumber	Electrician	Bricklayer	Carpenter
Basic Weekly Wages	£611 (Total Jobs, 2018)	£506 (Payscale, 2018)	£500 (Payscale, 2018)	£635 (Total Jobs, 2018)
Hourly Rate (1/39)	£15.67	£12.98	£12.84	£16.30
Holiday Pay	£1,100	£911	£901	£1,144
Total Productive Pay	£29,464	£24,411	£24,137	£30,643
Total earnings over 50 week period	£30,564	£25,311	£25,038	£31,787
Weekly National Insurance (NI) Contribution	£84.31	£69.83	£69	£87.63
Total National Insurance (NI) Contribution	£4,217	£3,492	£3,450	£4,381
Total Labour Cost	£34,781	£28,803	£28,488	£36,168

Total productive pay is the wages paid to the craftsmen for time spent working, this is different to total pay as that includes holiday pay.

Employers have to pay National Insurance (NI) Contributions at a different rate to employees when an employee is paid over £162 a week the employer must pay 13.8% on top of that. The employer must pay a higher tax rate for employees earning over £892 a week but this does not apply to any craftsmen on site, so the NI rate shown in the graph is 13.8%.

1.5. Cost Data/Information and Their Limitations

Cost Data is 'information concerning the cost of labour, material, overhead and other cost elements which are expected to be incurred' (Justia, 2019). There are many different types of cost data within construction pertaining to various different costs within the construction process. Contractor costs are a type of cost data that show a contractor's expenditure on plant, labour, and materials, however, contractor costs are an overall figure of the three different expenditures mentioned and don't give a detailed breakdown of how the figure is reached. There has been a lack of study into what determines the cost of a project, due to this lack of research we instead have to make assumptions. In this report, I have based my cost of the building on the Gross Internal Floor Area (GIFA) of the building, but in actuality, this is a rather poor method as it fails to take into account the varying shapes of buildings, the floor-to-ceiling height, and the overall quality of the building itself. Cost data itself has many different levels of detail with the total cost being the least detailed. The Royal Institute of Chartered Surveyors (RICS) defines a bill of quantities as 'a list of items giving detailed identifying descriptions and firm quantities of the work comprised in a contract.' (RICS, 2012). This is a much more detailed form of cost data than a total cost and a breakdown of a rebased build using the BCIS online resource. However even a bill of quantities isn't always reliable, Allan Ashworth stated that bill of quantities whilst 'applicable to an actual project, include a wide variation of rates.' (1999). This is due to the fact that material costs are always changing, and a bill of quantities based off another similar project from a month ago could already be vastly different in cost. A bill of quantities is also not compatible with some forms of tendering processes such as design-build where work begins before all of the designs are complete, as a bill of quantities needs a complete and finished design to be useful.

References

Her Majesty's Revenue and Customs (HMRC), H. M. R. a. C., 2019. *GOV UK*. [Online] Available at: <https://www.gov.uk/national-insurance-rates-letters> [Accessed 19 02 2019].

C, B., 2019. *New York Engineers*. [Online] Available at: <https://www.ny-engineers.com/blog/construction-cost-estimation> [Accessed 11 12 2018].

D, H., 2005. *Construction Management*. 3rd ed. New York: Wiley.

Erskine, G., 2018. *Design Buildings*. [Online]

Available at: https://www.designingbuildings.co.uk/wiki/Architect%27s_fees
[Accessed 19 02 2019].

F Dagostino, S. P., 2014. *Estimating in Building Construction*. 7th ed. s.l.:Pearson.

Homes, D. W., 2017. *David Wilson Homes*. [Online]

Available at: <https://www.dwh.co.uk/library/Average-UK-house-sizes/>
[Accessed 19 02 2019].

Justia, 2006. *Justia US Law*. [Online]

Available at: https://law.justia.com/codes/new-mexico/2006/nmrc/jd_13-1-46-75a9.html
[Accessed 19 02 2019].

Payscale, 2019. *PayScale*. [Online]

Available at: https://www.payscale.com/research/UK/Job=Electrician/Hourly_Rate
[Accessed 19 02 2019].

Roger Flanagan, C. J., 2009. *New Code of Estimating Practice*. 7th ed. s.l.:Chartered Institute Of Builders.

Totaljobs, 2019. *Total Jobs*. [Online]

Available at: <https://www.totaljobs.com/salary-checker/average-plumber-salary>
[Accessed 19 02 2019].

2 Semi-detached Houses, Limpsfield Avenue - #32241

➤ Rebased to 1Q 2019 (321; forecast) and Swansea (85; sample 17)

Summary

2 Semi-detached Houses, Limpsfield Avenue

Location: Wimbledon Park, London SW19

Date: 18-May-2016

Building cost: £293,848 **rebased**

Cost/m²: £1,484 **rebased**

Floor area: 198m²

Main construction: Brick construction

Storeys: 2

Level of analysis: Elemental 

Detail

Building function: 820.2 - 'One-off' housing semi-detached (3 units or less)

Type of work: New build

District: London Borough of Wandsworth (Wandsworth)

Grid reference: TQ2372

Postcode: SW19 6DL

Receipt date: 18-May-2016

Base date: 8-May-2016

Project details: 2Nr 2 storey affordable semi-detached houses together with external works including site preparation, macadam access and parking, PCC paving, fencing, walls, railings, landscaping, drainage and services. 2Nr cycle sheds and 2Nr replacement garages.

Site conditions: Demolish 8Nr council owned garages. Forecourt/garage infill site in residential area with restricted access and working space.

Client: Wandsworth Council

Tender documentation: Schedule of works

Selection of contractor: Competitive

Contract: JCT Standard Building Contract 2011 edition

Contract period (weeks): Stipulated: 38; Agreed: 38

Cost fluctuations: Firm

Contract breakdown

Measured work:	£323,635	rebased
Prime cost sums:		
Provisional sums:	£9,794	rebased
Preliminaries:	£52,273	rebased
Design fees:		
Risk (client's contingencies):	£31,723	rebased
Contract sum:	£417,426	rebased

Accommodation and design features

2Nr 3B4P 2 storey, rectangular on plan, semi-detached houses. Strip foundations. PCC ground floor. Timber upper floor, stairs and pitched roof with artificial slates. Facing brick/block insulated cavity walls. Aluminium windows. Block and metal stud partitions. Flush doors. Plasterboard to walls and ceilings. Vinyl flooring. Fittings. Sanitaryware. LTHW gas central heating. MVHR. Power, light and photovoltaics. Fire detection, door bells and TV. External works. Replacement of 2Nr garages.

Areas

Basement:	0m ²
Ground floor:	105m ²
Upper floors:	93m ²
Gross floor area:	198 m ²

Dimensions

Number of units:	2
Functional units	
No bedrooms (6)	£48,974.71 rebased

No of persons (8)£36,731.04 **rebased****Floor area percentages****1 storey** (5.90%)**2 storey** (94.10%)**Accreditations****Lifetime Homes Compliant****Code for Sustainable Homes: Code 4****Credits****Submitted by:** Wandsworth Council**Client:** Wandsworth Council**Architect:** Wandsworth Council**Quantity Surveyor:** Wandsworth Council**Structural Engineer:** Walter Scott Partnership**Services Engineer:** Wandsworth Council**General Contractor:** HA Marks Ltd

Elements (BCIS Standard Form of Cost Analysis (2008 revision)) **rebased**

Element	Total cost	Cost per m ²	Element unit qty	Element unit rate	Percent age
1 Substructure	£34,015	£172			8%
2A Frame	£0	£0			
2B Upper Floors	£11,378	£57			3%
2C Roof	£25,650	£129			6%
2D Stairs	£4,160	£21			1%
2E External Walls	£45,075	£228			11%
2F External Windows and Doors	£28,425	£144			7%
2G Internal Walls and Partitions	£9,199	£47			2%
2H Internal Doors	£11,922	£60			3%
2 Superstructure	£135,810	£686			33%
3A Wall Finishes	£14,990	£75			4%
3B Floor Finishes	£15,067	£76			4%
3C Ceiling Finishes	£5,574	£28			1%
3 Finishes	£35,631	£180			9%
4 Fittings and Furnishings	£6,728	£34			2%
5A Sanitary Appliances	£2,558	£13			1%
5B Services Equipment	£0	£0			
5C Disposal Installations	£1,919	£10			
5D Water Installations	£4,901	£25			1%
5E Heat Source	£0	£0			
5F Space Heating and Air Conditioning	£7,284	£36			2%
5G Ventilating Systems	£3,807	£19			1%
5H Electrical Installations	£15,507	£79			4%
5I Fuel Installations	£1,745	£9			
5J Lift and Conveyor Installations	£0	£0			
5K Fire and Lightning Protection	£0	£0			
5L Communications and Security Installations	£1,959	£10			
5M Special Installations	£0	£0			
5N Builder's Work in Connection	£2,162	£11			1%
5O Management of the Commissioning of Services	£0	£0			
5 Services	£41,841	£211			10%
Building Sub-total	£254,024	£1,283			61%
6A Site Works	£25,179	£127			6%
6B Drainage	£9,871	£50			2%
6C External Services	£11,579	£59			3%
6D Minor Building Works	£9,438	£48			2%
6E Demolition and Work Outside the Site	£23,339	£118			6%
6 External Works	£79,406	£401			19%
7 Preliminaries	£52,273	£264			13%
8 Contingencies	£31,723	£160			8%
Total (less Design Fees)	£417,426	£2,108			100%
9 Design Fees	£0	£0			
Total Contract sum	£417,426	£2,108			100%

Specification

Element	Specification
1 Substructure	Strip foundations. PCC beam and block ground floor.
2B Upper Floors	Timber.
2C Roof	Low pitch timber trussed gabled roofs with Eternit artificial slate coverings. Aluminium bargeboards, fascias, soffits and gutters.
2D Stairs	Timber straight flight stairs, balustrades and handrails.
2E External Walls	Facing brick and block insulated cavity walls.
2F External Windows and Doors	Grey colour coated double glazed aluminium windows and doors.
2G Internal Walls and Partitions	Block and metal stud partitions.
2H Internal Doors	Painted softwood or flush doors.
3A Wall Finishes	Plasterboard drylining with emulsion. Ceramic tiles.
3B Floor Finishes	Vinyl flooring. Entrance matting.
3C Ceiling Finishes	Plasterboard and emulsion.
4 Fittings and Furnishings	Curtain battens, kitchen units and worktops, hooks. Venetian blinds to WC, kitchen and bathrooms.
5A Sanitary Appliances	Sanitaryware.
5C Disposal Installations	Soil and waste.
5D Water Installations	Pressurised hot and cold water installations.
5F Space Heating and Air Conditioning	Gas combination boilers, LTHW to underfloor heating and radiators.
5G Ventilating Systems	Mechanical ventilation systems with heat recovery.
5H Electrical Installations	Power and light including photovoltaics.
5I Fuel Installations	Gas installation.
5L Communications and Security Installations	Smoke and fire detection. Door bells. TV/satellite installation.
5N Builder's Work in Connection	Builder's work in connection with services.
6A Site Works	Site preparation. Macadam access and parking. PCC paths and paving. Landscaping including turfing rear gardens and hedges. Softwood close boarded fencing to sides and rear, low level walls with railings above to front. Water butts.
6B Drainage	Foul, surface water and land drains including French drains to front elevation.
6C External Services	Utilities.
6D Minor Building Works	2Nr replacement garages to match existing using reclaimed bricks from demolitions. 2Nr sheds for cycle storage.
6E Demolition and Work Outside the Site	Demolish 8Nr council owned garages and 9Nr store sheds. Break-up garage forecourt paving.
7 Preliminaries	15.68% of remainder of Contract sum (excluding Contingencies).
8 Contingencies	9.51% of remainder of Contract sum (excluding Preliminaries).