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Introduction

Appointed by McLeod + Aitken Ltd, my employer to act on behalf of their client CALA Homes as cost consultant for a proposed construction of a residential property in the Townhill area of Swansea.

Aim of the report

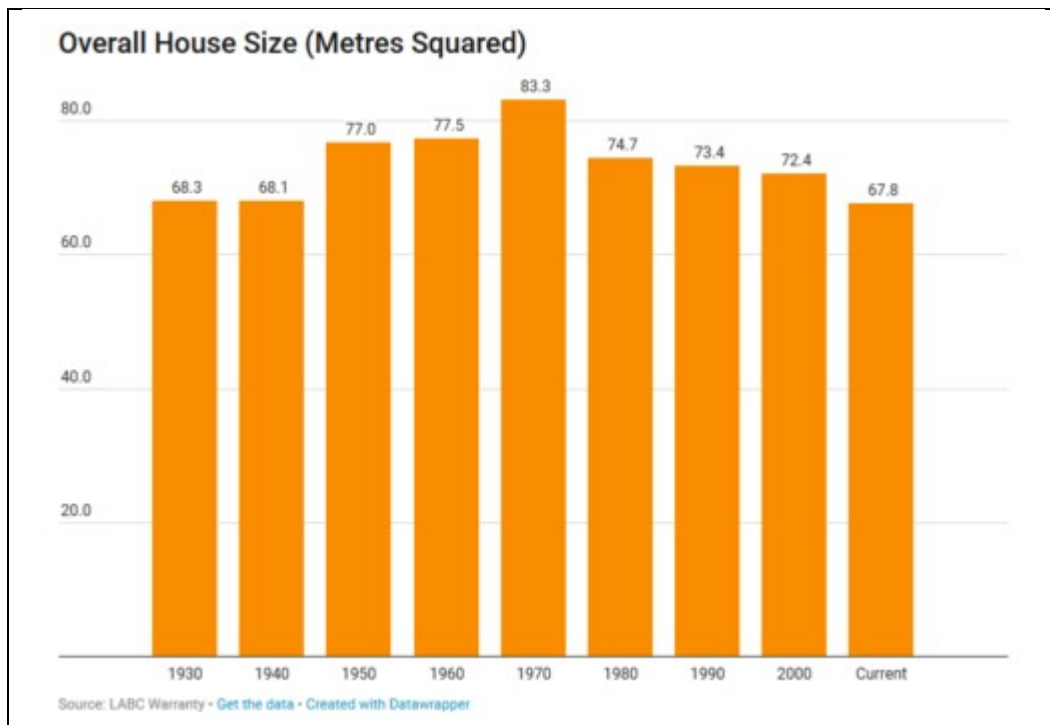
The report will be used by CALA Homes as a benchmarking exercise into the cost of developing one unit of a three bedroomed semi-detached property to the NRM1 order of estimate. Also included will be a detailed breakdown of costs associated with the employment of four craftsmen for the duration of the build and links to reliable information sources from where these costs have been obtained. Finally an analysis of the various cost data available to the UK construction industry and the limitations of this data.

UK Housing Market – Key statistics

'Semi-detached houses - Average floor size (1033 sq. ft.) - Average number of bedrooms – 3

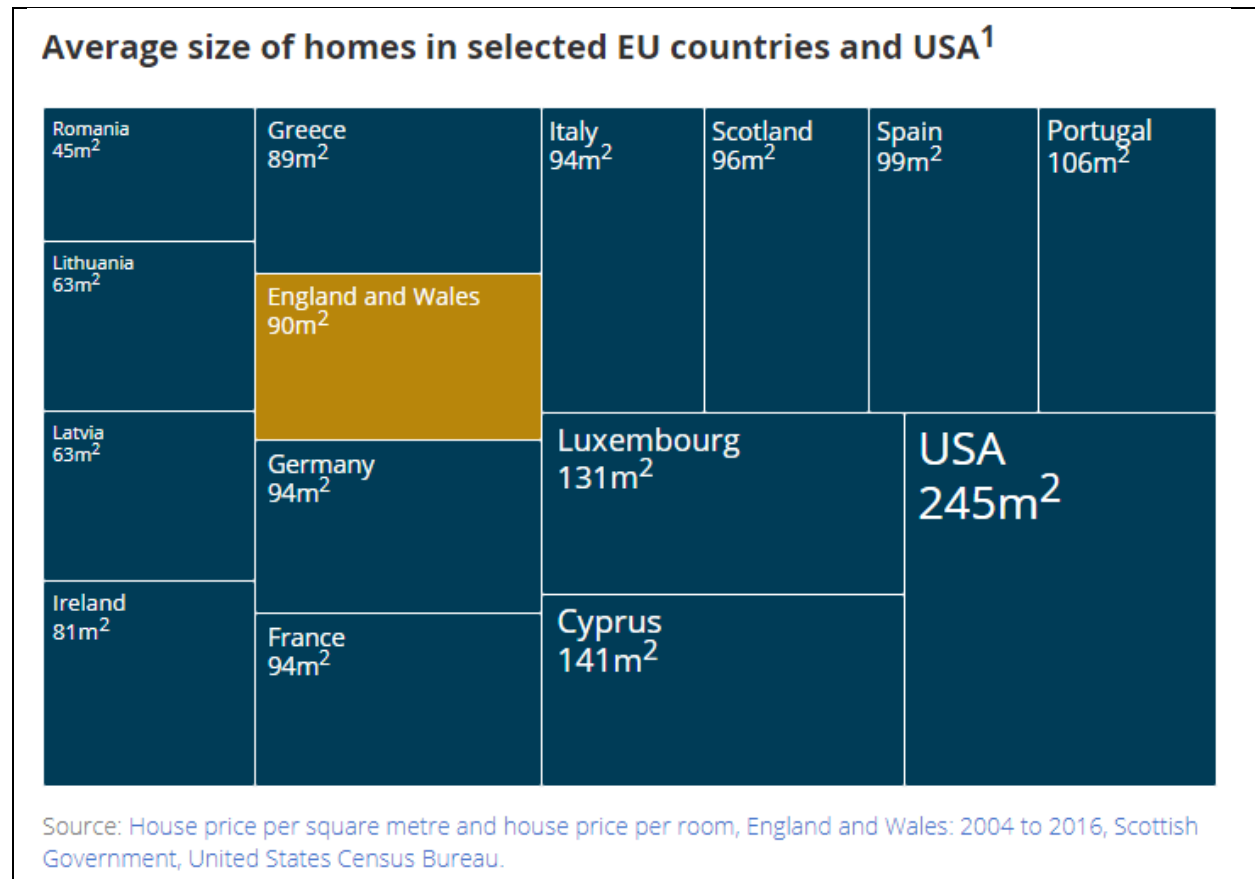
The most common type of family home in England is a semi-detached three-bedroom house, and it has remained the same for decades.' (David Wilson Homes, Unknown)

Average house size over the years is illustrated in the graph below. These figures don't include the likes of hall, stairs and landing or other rooms such as utility or WC. They are the general make up of a living room, kitchen, bathroom and three bedrooms.



(Local Authority Building Control (LABC), 2018)

South Wales and Lancashire are the cheapest places to buy property. In Blaenau Gwent, Merthyr Tydfil, Neath Port Talbot, Burnley and Hyndburn, homes cost less than £1,000 per square metre.
(Office for National Statistics (ONS), 2017)



(Office for National Statistics (ONS), 2017)

The average house sold in England and Wales in 2016 had a floor area of 104 metres squared – that's about two-fifths the size of a tennis court, or 70 times smaller than the football pitch at Wembley.
(Office for National Statistics (ONS), 2017)

CALA Homes Building Estimate

Assumptions

Building Plot Size/Footprint. From the information taken from previously mentioned sources such as the ONS and David Wilson Homes, we will assume a footprint of **110M²**.

	Element	Specification
1	Substructure	Insitu concrete trench fill strip foundations. Blockwork foundation walls with precast concrete beam & block suspended ground floor.
2B	Upper Floors	Timber Joist & chipboard upper floors
2C	Roof	Timber pitched trusses covered with tiling to meet local street scene. Flat roof elements (Assumed 145M ² as per below calculation rounded up.)
2D	Stairs	Softwood staircases with handrails
2E	External Walls	Loadbearing brick & block cavity walls
2F	Windows & Doors (External)	Composite windows and doors glazed with double glazed units
2G	Internal Walls	Loadbearing internal walls and party walls. Timber stud partitions with plasterboard
2H	Internal Doors	Veneered pre finished internal flush doors
3A	Wall Finishes	Plastered with emulsion finish. Tiled areas in kitchen & bathrooms
3B	Floor Finishes	Sheet vinyl floors to wet areas
3C	Ceiling Finishes	Plaster finish painted with emulsion
4	Fittings	Kitchen – Provisional Sum £8,000
5A	Sanitary	Premium brand sanitary fittings (Armitage Shanks/Rocca)
5B	Services	Electrical & Gas appliances (Provisional sum £1000)
5C	Disposal installations	UPVC Waste and Soil Pipes
5F	Heating	Gas fired boiler & radiator heating.
5G	Ventilation System	Extract fans to kitchen
5H	Electrical Installation	Light & power to all services and mechanical items. Ventilation, TV points, thermostatic control and other appliances

House Base Area

Roof Pitch

Calculate 

Roofing Area Calculator

Result

The estimated roof area is **143.2** square meters

The estimated roof area in other units are 1,541 square feet or 171.3 square yards or 221,942 square inches or 1,431,879 square centimeters.

(Calculator.net, Unknown)

		Element	Total Cost	Cost M2	Element Unity Qty Nr	Element Unit Qty M2	Element Unit Rate	
	1	Substructure	9790	89		110		
2A		Frame	0					
2B		Upper Floors	2200	20		110		
2C		Roof	18415	127		145		
2D		Stairs	3238		2		1619	
2E		External Walls	17270	157		110		
2F		External Windows & Doors	2688	96		28		
2G		Internal Walls & Partitions	12060	36		335		
2H		Internal Doors	1440		10		144	
	2	Superstructure	67101					
3A		Wall Finishes	17420	52		335		
3B		Floor Finishes	3740	34		110		
3C		Ceiling Finishes	3080	14		220		
	4	Fittings	3740	34		110		
5A		Sanitary Appliances	3300	30		110		
5B		Service Equipment	1980	18		110		
5C		Disposal Installations	1540	14		110		
5F		Space Haeting (inc 5D, 5E)	10780	98		110		
5G		Ventilating Systems	550	5		110		
5H		Electrical Installations	10080	36		280		
	5	Services	28230					
		Total	108861					

Estimation of Labour Costs

To deliver this property it is assumed that it will take four craftsmen fifty weeks from start to finish.

In the UK construction industry there are various methods of making payments as a 'contractor' to a 'sub-contractor' and as a 'sub-contractor' receiving payments from a 'contractor'. CIS (Construction Industry Scheme) and PAYE (Pay as you earn) are the most common and fall within the UK tax laws for the industry.

'The Construction Industry Scheme (CIS) covers most construction work to buildings, including site preparation, decorating and refurbishment.' (Gov.UK, Unknown)

The CIS scheme involves paying a craftsmen their agreed hourly or daily rate but with 20% deducted by the contractor which is paid to the HMRC as tax. (30% if you're not registered with CIS, cannot be verified by HMRC or give incorrect details)

'Your contractor should give you monthly statements of payments and deductions. Use them to calculate whether you still owe tax and National Insurance to HM Revenue and Customs (HMRC) or are due a refund.' (Gov.UK, Unknown)

The advantage to CALA Homes in using this method is that there is one gross rate agreed per (Daily or Hourly) and this is multiplied by time worked (Daily or Hourly) with CIS deductions taxed at source. i.e. A craftsman working at an agreed rate of £15 per hour working eight hours per day Monday to Friday for 50 weeks is – $(£15 \times 40) \times 50 = £30,000$

The agreed rate is usually a gross rate, comparable to a PAYE rate once holiday pay, pension and employers national insurance have been added. The individual craftsperson is responsible for ensuring HMRC obligations are met in regard to paying tax and national insurance.

The PAYE scheme which is used throughout all industries in UK employment involves a more complicated calculation of costs that link in with UK employment legislation relating to holiday pay, employers national insurance and pension payments.

The BESA (Building Engineering Services Association) table of day works for 2018 outlines these the additional costs over the agreed PAYE rate, which once added together are similar to the gross rate of CIS.



Table 1A

Calculation of hourly base rate of labour for all main grades (excluding Northern Ireland)

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Calculation of hourly base rate of labour for all main grades (excluding Northern Ireland)

	Building Services Engineering Supervisor	Foreman	Senior Craftsman (+ supervisory responsibility & 2 units of responsibility allowance)	Senior Craftsman (+ supervisory responsibility & 1 unit of responsibility allowance)	Senior Craftsman (+ supervisory responsibility)	Senior Craftsman (+ 2 units of responsibility allowance)	Senior Craftsman (+ 1 unit of responsibility allowance)	Senior Craftsman	Craftsman (+5 units of responsibility allowance)	Craftsman (+2 units of responsibility allowance)	Craftsman (+1 unit of responsibility allowance)	Craftsman
Rate	£20.50	£16.81	£16.09	£15.54	£14.99	£14.99	£14.44	£13.89	£14.44	£13.89	£13.34	£12.79
Annual pay	£35,208.75	£28,871.18	£27,634.58	£26,689.95	£25,745.33	£25,745.33	£24,800.70	£23,856.08	£24,800.70	£23,856.08	£22,911.45	£21,966.83
Weekly holiday credit	£95.19	£78.06	£74.77	£72.21	£69.65	£69.65	£67.09	£64.51	£67.09	£64.51	£61.99	£59.40
Annual holiday credit	£4,949.88	£4,059.12	£3,888.04	£3,754.92	£3,621.80	£3,621.80	£3,488.68	£3,354.52	£3,488.68	£3,354.52	£3,223.48	£3,088.80
Annual earnings	£40,158.63	£32,930.30	£31,522.62	£30,444.87	£29,367.13	£29,367.13	£28,289.38	£27,210.60	£28,289.38	£27,210.60	£26,134.93	£25,055.63
National Insurance	£4,379.38	£3,381.87	£3,187.61	£3,038.88	£2,890.15	£2,890.15	£2,741.42	£2,592.55	£2,741.42	£2,592.55	£2,444.11	£2,295.16
Combined weekly holiday credit, welfare and pension contributions	£143.28	£119.23	£114.59	£111.00	£107.41	£107.41	£103.82	£100.21	£103.82	£100.21	£96.66	£93.04
Weekly welfare and pension contribution	£48.09	£41.17	£39.82	£38.79	£37.76	£37.76	£36.73	£35.70	£36.73	£35.70	£34.67	£33.64
Combined annual welfare and pension contribution	£2,500.68	£2,140.84	£2,070.64	£2,017.08	£1,963.52	£1,963.52	£1,909.96	£1,856.40	£1,909.96	£1,856.40	£1,802.84	£1,749.28
Annual prime cost	£47,038.69	£38,453.00	£36,780.86	£35,500.83	£34,220.80	£34,220.80	£32,940.76	£31,659.55	£32,940.76	£31,659.55	£30,381.88	£29,100.07
HOURLY PRIME COST	£27.39	£22.39	£21.42	£20.67	£19.92	£19.92	£19.18	£18.43	£19.18	£18.43	£17.69	£16.94

(Building Engineering Services Association and Royal Institute of Chartered Surveyors, 2018)

CITB Levy

The UK construction industry uses a Levy & Grants system to ensure construction standards remain high and also to ensure new technologies and methods of construction are maximised through providing necessary training to employees in the sector. The training is paid for via Levy fund collected like a tax on companies wage bills. The current rates of CITB Levy are:-

- 0.35% on PAYE workers, and
- 1.25% on CIS subcontractors that you deduct CIS tax from.

There is an exemption from CITB Levy if your total wage bill is under £80,000 and this is called small business exemption. (Total wage bill includes PAYE and Net CIS)

There is a reduction in the CITB Levy for companies that have a wage bill of between £80,000 and £399,999 (Total wage bill includes PAYE and Net CIS) and this is called small business levy reduction, where the company will receive a 50% reduction in its Levy payment.

For the purpose of this report we will use the Craftsman rate from the BESA and assume the hourly prime cost of £16.94 includes CITB Levy.

Total Craftsman Costs

Using the craftsman rate from the 2018 BESA/RICS Dayworks cost report below, we will assume an hourly rate of £16.94 per hour as the gross cost to CALA Homes per individual tradesman/craftsman. (Gross rate including provision for pay rate, holiday allowance, employers' national insurance and CITB Levy)

For the purpose of this report we will also assume that each craftsman will work 39 hours per week working 08:00 to 16:30 Monday to Thursday, and 08:00 to 15:30 on Friday.

Hourly Rate	Weekly Hours Worked	Weekly Cost	Project Cost (50 Weeks)
16.94	39	660.66	33033
	Total Cost of 4 Craftsmen		132132
			£132,132

	Craftsman
Rate	£12.79
Annual pay	£21,966.83
Weekly holiday credit	£59.40
Annual holiday credit	£3,088.80
Annual earnings	£25,055.63
National Insurance	£2,295.16
Combined weekly holiday credit, welfare and pension contributions	£93.04
Weekly welfare and pension contribution	£33.64
Combined annual welfare and pension contribution	£1,749.28
Annual prime cost	£29,100.07
HOURLY PRIME COST	£16.94

(Building Engineering Services Association and Royal Institute of Chartered Surveyors, 2018)

*The calculation of these rates for this report assumes each individual craftsman working 50 continuous weeks. No allowance has been made for holiday to be taken or for periods of inclement weather that may delay the build programme of 50 weeks.

Sources of Cost Data Information

Quotes from material suppliers and specialist sub-contractors

Whilst obtaining quotes for material, plant, labour and professional fees from enquiries relating to the works can be time consuming and involve the collation of a whole host of prices and specifications, the information, technology and associated price will be accurate and up to date. Limitations include the time taken for suppliers and subcontractors to respond to price enquiries and the various forms the information is returned in and stored.

Cost Data

BCIS (Building Cost Information Service)

BCIS is the RICS approved costing and benchmarking service used by Quantity Surveyors, Cost Consultants, Developers and Project Managers to determine what a building should cost. It analyses over 20,000 building cost reports and can provide average £/m² and per unit for the various elements of a project such as substructure, roof, stairs and fittings.

The data can be location and time adjusted to rebase costs to the current annual quarter and also incorporate regional variations.

Its limitations are that it is an online subscription service which has a substantial cost per user. Whilst the information is useful there is no guarantee that a project similar to that you are trying to estimate exists in BCIS and therefore you may sometimes not be comparing like for like.

Bill of Quantities

A bill of quantities can be described as a catalogued pricing document for specified items in a construction or building maintenance contract. The pricing document will contain itemised actions or descriptive forms of work, measured in number, length, area, volume, weight or time.

The bill of quantities can be priced usually by the cost consultant and be relevant to the contract being undertaken. In this case all items of work carried out and completed are added up according to their unit price.

Unpriced bills of quantities are usually used as a form of tender document where by the specific items to be carried out are listed and bidding contractors are invited to price each item on a competitive basis.

A priced bill of quantities provides a useful source of accurate and relevant cost information, usually formed specifically for the contract it is intended with real life items and scopes of work. Limitations to bills of quantities are the fact that more than one bill of quantities can be used on a project especially if unpriced, creating an unequal or incomparable information source. There is also need for confidentiality in the source of cost information in in a BOQ.

'The user in attempting to make use of the rates from priced bills, should not forget their confidentiality, and should not disclose their source to third parties.' (Allan Ashworth, 2013)

Building Price Guides

Price guides are a traditional method of obtaining construction material, plant hire, labour and professional fees and costs. Professionally published and developed by experienced personnel with product & service knowledge specific to the construction & building maintenance sector.

Whilst widely used and still seen as a good source of information to the industry, price guides have limitations. They are not real time guides and can therefore be considered 'dated' sooner or later. They don't take into account supply and demand, material shortages and fluctuations in materials and services. Regional variations of construction materials and services also differ widely throughout the UK. A 'one price fits all' approach to cost for the UK isn't true or accurate reflection.

Examples of building price guides include –

SPON's

Architects & Builders

Mechanical & Electrical

Civil Engineering & Highways

LAXTON's

SMM Price Book

NRM Price Book

NSR Schedule of Rates

Building Works

Electrical Services

Highways Maintenance

Housing Maintenance

TSI LUCKINS

Electrical Installation Times Guide

HVAC & Plumbing Installation Times Guide

Specifically produced for public sector pricing is a range of pricing guides called the PSA schedule of rates. These publications were created and developed by the British multinational facilities management and Construction Company that prior to its liquidation in 2018 was the largest ever trading liquidation in the UK.

'On Monday 15 January 2018, the High Court appointed the Official Receiver as liquidator of Carillion Plc and several of its subsidiary companies on the petition of the Companies' directors.' (PWC, 2018)

References

Allan Ashworth, S. P., 2013. *Cost Studies of Buildings*. Revised ed. London: Routledge.

Building Engineering Services Association and Royal Institute of Chartered Surveyors, 2018.

Definition of the prime cost of daywork. [Online]

Available at: <https://www.thebesa.com/media/3071/20180406-april-2018.pdf>

[Accessed 17th February 2019].

Calculator.net, Unknown. *Roofing Area Calculator*. [Online]

Available at: [https://www.calculator.net/roofing-](https://www.calculator.net/roofing-calculator.html?acarea=110&acareaunit=meter&roofpitch=10&tp=ar&x=73&y=17)

[calculator.html?acarea=110&acareaunit=meter&roofpitch=10&tp=ar&x=73&y=17](https://www.calculator.net/roofing-calculator.html?acarea=110&acareaunit=meter&roofpitch=10&tp=ar&x=73&y=17)

[Accessed 17th February 2019].

David Wilson Homes, Unknown. *Average house sizes in UK*. [Online]

Available at: <https://www.dwh.co.uk/library/Average-UK-house-sizes/>

[Accessed 17th February 2019].

Gov.UK, Unknown. *What you must do as a Construction Industry Scheme (CIS) contractor*. [Online]

Available at: <https://www.gov.uk/what-you-must-do-as-a-cis-contractor/who-is-covered-by-cis>

[Accessed 17th February 2019].

Local Authority Building Control (LABC), 2018 . *What is the average house size in the UK?*. [Online]

Available at: [https://www.labc.co.uk/news/what-average-house-size-](https://www.labc.co.uk/news/what-average-house-size-uk?language_content_entity=en)

[uk?language_content_entity=en](https://www.labc.co.uk/news/what-average-house-size-uk?language_content_entity=en)

[Accessed 17th February 2019].

Office for National Statistics (ONS), 2017. *House prices: how much does one square metre cost in your area?*. [Online]

Available at:

<https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/housepriceshowmuchdoesonesquaremetrecostinyourarea/2017-10-11>

[Accessed 17th February 2019].

PWC, 2018. *Appointment of Official Receiver and Special Managers*. [Online]

Available at: <https://www.pwc.co.uk/services/business-recovery/administrations/carillion.html>

[Accessed 17th February 2019].

Appendix

BCIS Report of Costs – REBASED

BESA – Dayworks Costs

