

Celcon Foundation blocks are used in a range of thicknesses below DPC level. Offering excellent thermal performance, they are suitable for the support of cavity or solid walls, framed construction or suspended floors, including beam and block floors and Celcon Flooring System.

Celcon Foundation Blocks

Stronger, faster, easier foundations – It all builds up to as much as 24% cost saving*

* Independent research by Davis Langdon LLP



Celcon Foundation blocks have long been approved by the British Board of Agrément (BBA) for use below DPC and have been awarded type approval by Local Authority Building Control (LABC) for suitability of use.

Celcon Foundation blocks save time – and time is money:

Cost-effective

- Solid foundations cost less due to the speed of construction and the reduction in materials (wall ties, lean mix and perpend mortar joints)

Faster

- One Celcon Foundation block replaces two 100mm concrete blocks which means that the laying rate is twice as fast as two skins of dense block
- Trenches can be back filled as soon as installation is complete

Stronger

- Impressive load-bearing capabilities can be achieved for multi-storey buildings
- They are exceptionally resistant to freeze/thaw conditions
- They are resistant to sulfate attack up to DS4 below DPC
- They do not rot or decay

Easier

- They can be cut on-site for ease of use and to minimise wastage
- There is no need for either wall ties or lean mix nor for perpendicular mortar joints if butted together (as approved by BRE)
- They are LABC Type Approved and BBA certified for ease of acceptance

Lighter

- They weigh a third of an equivalent dense aggregate block

Safer

- Most thicknesses/sizes are below the CONIAC one-person handling regulations, reducing the risk of injury

Sustainable

- 80% of materials used for Celcon aircrete production are recycled
- 99% of raw materials are sourced within the UK



	Strength	Conductivity	Density
Foundation	3.6N/mm ²	0.25 W/mK	600kg/m ³
Foundation 7	7.3N/mm ²	0.32 W/mK	750kg/m ³
Foundation 10°*	8.7N/mm ²	0.32 W/mK	750kg/m ³



* Foundation 10° is equivalent to 10.4N/mm²

The Research

With many other benefits, cost is a key issue when deciding on which foundation products to use, so H+H UK Limited commissioned Davis Landon LLP to conduct a cost comparison to cover all aspects of the foundation construction between Celcon Foundation blocks and other well-known foundation solutions.



Davis Langdon LLP is a global project and cost consultancy, acknowledged as one of the world's leading providers of cost management services, with services underwritten by the guarantees of knowledge, research, experience and professionalism. Davis Langdon's cost management services include cost planning, value management, benchmarking, procurement advice, risk management and cost control. Davis Langdon is ISO 9001 and Investors in People accredited, as well as being voted one of the Top 100 Employers in the U.K. It is the recipient of a number of industry awards including being voted Top International Construction Consultant for fourteen successive years and was named Building magazine's Construction Consultant/Surveyor of the Year 2007.

Peter Fordham, B.Sc (Hons) MRICS, is Davis Langdon's Cost Research Associate with over 20 years' experience with the company, specialising in cost research and analysis, construction price monitoring, cost modelling and estimating. He is the author of numerous articles in the technical press, including the regular Market Forecasts and Cost Updates featured in Building magazine.

1. Instructions

Davis Langdon was commissioned to research the required data and report on the comparative costs including labour and materials of the construction types listed below (by region) across the UK.

Instructions were given by H+H UK Limited that Davis Langdon must act independently in the completion of this project, and provide an unbiased, fair and independent report.

2. Rationale

Prices for labour and materials were to be established from a representative selection of current live jobs that met the criteria at Davis Langdon's disposal as well as primary research from Builders Merchants and Contractors within the different regions.

The regions, which were chosen for the comparison, were:

- South East
- London
- South West
- Midlands
- North
- Scotland

The research highlighted the following types of foundations to be compared:

1A	275mm Celcon Foundation (Standard grade)*
1B	300mm Celcon Foundation (Standard grade)*
1C	275mm Celcon Foundation (Hi-Seven grade)*
1D	300mm Celcon Foundation (Hi-Seven grade)*
2A	275mm Celcon Foundation (Standard grade)**
2B	300mm Celcon Foundation (Standard grade)**
2C	275mm Celcon Foundation (Hi-Seven grade)**
2D	300mm Celcon Foundation (Hi-Seven grade)**
3A	100mm Celcon Standard blocks in cavity wall
3B	100mm in cavity wall Celcon Hi-Seven blocks***
4A	Mass fill poured concrete (450mm bucket size)
4B	Mass fill poured concrete (600mm bucket size)
5A	Dense aggregate blocks 100mm in cavity wall***
6A	100mm Celcon Standard inner, common brick outer leaf***
6B	100mm Celcon Hi-Seven inner, common brick outer leaf***

* bed joints only
 ** bed and perpend joints
 *** 100mm cavity

2.1 Specification

The costs are based on the following specification:

- The quantities relate to a site of 20 dwellings
- Each dwelling is assumed to be 8m by 6m, giving a perimeter length of 28m
- All foundations are to be 1m deep from ground level
- All foundations (except option 4A) are based on a 600mm wide trench
- All cavities are to be assumed as 100mm wide

2.2 Basis of pricing

- The costs in this report are based on a notional housing development of 20 units.
- The site within each region has been chosen as representative of that region but costs within each region may vary depending on distance from manufacturing works and local labour rates. For London, the site has been taken as an outer London borough.
- Rates are based on labour and materials costs prevailing in March 2007.
- Materials prices have been sourced from builders' merchants and represent trade prices applicable to the quantities involved. Prices represent full loads delivered direct to site.
- Labour rates represent the cost to a contractor, whether directly employed with bonuses paid and including all employer's costs such as National Insurance, or based on self-employed labour.
- Labour constants shown have been determined with reference to published price books, previous work undertaken for H+H UK and discussion with brick sub-contractors.
- Costs include contractor's profit and overheads but no allowance for site specific preliminaries such as site supervision, welfare or storage facilities.
- Contract rates used have been checked and verified against actual tenders received.

- All materials, goods and workmanship will be in accordance with good building practice and the current British Standard Specifications or Codes of Practice.

10. All costs exclude V.A.T.

2.3 Assumptions

- Ground conditions are assumed to be good with no obstructions or ground water present.
- Topsoil and reduced level excavation are assumed to already have occurred.
- The rates shown in the table represent rates per metre run of straight length of foundation. No allowance has been included for changes in direction, steps in foundations, movement joints, weep holes or damp proof courses.
- Rates include for disposal of surplus excavated material off site to a suitable place of disposal. If surplus excavated material is used on site, all rates will reduce slightly with the greatest effect applying to mass filled foundations.
- Excavated material has been used as back-fill to trenches. If granular fill or hardcore is specified, the total rate for the foundations (excluding mass filled foundations) will increase.

3. Comparative results

The costs per metre run for each foundation option in each region are summarised below.

Foundation Block Study							
SUMMARY	Total rate per metre of foundation						
	S/East £/m	London £/m	S/West £/m	Midlands £/m	North £/m	Scotland £/m	Average £/m
1A 275mm Celcon Foundation (Standard grade)*	57.99	60.15	54.27	55.70	55.20	54.57	56.31
1B 300mm Celcon Foundation (Standard grade)*	61.32	63.55	57.40	58.94	58.36	57.66	59.54
1C 275mm Celcon Foundation (Hi-Seven grade)*	66.38	68.59	62.31	63.95	63.26	62.49	64.50
1D 300mm Celcon Foundation (Hi-Seven grade)*	70.20	72.47	65.93	67.68	66.91	66.07	68.21
2A 275mm Celcon Foundation (Standard grade)**	58.33	60.49	54.60	56.04	55.63	54.90	56.67
2B 300mm Celcon Foundation (Standard grade)**	61.69	63.91	57.77	59.31	58.73	58.03	59.91
2C 275mm Celcon Foundation (Hi-Seven grade)**	66.71	68.92	62.64	64.28	63.59	62.82	64.83
2D 300mm Celcon Foundation (Hi-Seven grade)**	70.56	72.83	66.29	68.04	67.28	66.44	68.57
3A 100mm Celcon Standard blocks in cavity wall	67.90	71.45	62.80	64.50	64.54	63.89	65.85
3B 100mm in cavity wall Celcon Hi-Seven blocks***	71.78	75.34	66.69	68.39	68.43	67.78	69.74
4A Mass fill poured concrete (450mm bucket size)	55.59	58.25	52.23	52.57	52.80	54.22	54.28
4B Mass fill poured concrete (600mm bucket size)	73.15	76.58	68.75	69.20	69.44	71.33	71.41
5A Dense aggregate blocks 100mm in cavity wall***	82.88	75.34	74.75	79.71	77.25	75.61	77.59
6A 100mm Celcon Standard inner, common brick outer leaf***	70.71	75.06	65.41	66.94	67.54	66.98	68.77
6B 100mm Celcon Hi-Seven inner, common brick outer leaf***	74.19	78.55	68.90	70.43	71.03	70.47	72.26

* bed joints only

** bed and perpend joints

*** 100mm cavity

4. Analysis of Results

4.1 Blockwork foundations comparison

Where laying like for like 7N blockwork foundations, the results from the study highlight the benefits of laying a lighter Celcon aircrete block.

	Average (£/m)	
Dense aggregate block cavity foundation	77.59	10% SAVING
Celcon Hi-Seven cavity foundation	69.73	

The initial saving is achieved with the use of a solid 7N block foundation. Practically this removes the need for setting out and laying two walls but also eliminates the inclusion of wall ties and lean mix fill within the construction.

	Average (£/m)	
Dense aggregate block cavity foundation	77.59	11.5% SAVING
Celcon Hi-Seven 300mm solid foundation	68.57	

However, in most housing applications there is no need for a foundation to be 7N in strength, therefore, in many cases the 3.6N strength of a Celcon Standard block will be more than adequate to meet the structural requirements of the buildings foundations further reducing in cost outlay required.

	Average (£/m)	
Dense aggregate block cavity foundation	77.59	22% SAVING
Celcon Standard 300mm solid foundation	59.91	

This cost can be still further reduced by omitting the perpendicular mortar joints within the solid foundation construction as stated in the Building Research Establishments (BRE) IP 05/07, removing both the cost of the mortar and the associated labour cost.

	Average (£/m)	
Dense aggregate block cavity foundation	77.59	24% SAVING
Celcon Standard 300mm solid foundation (no perp joints)	59.54	

In addition to the cost savings shown above there is also the health and safety benefits from handling lighter blocks and the practical advantages of the workability of Celcon aircrete and the reduced wastage by reusing any off cuts. Where a solid block foundation has been specified further speed savings can be achieved by being able to back-fill the foundations as soon as once the construction is complete.

4.2 Mass fill comparison

For mass fill poured concrete foundations the beneficial cost comparison will be dependent on the width of the trench excavated. The figures quoted only allow for the trench to be a constant width from top to bottom. On-site this is unlikely to be the case as the sides of the trench are likely to collapse depending on the ground conditions and cause the trench to be 'V' shaped.

Where this is the case, to fill the trench with poured concrete to the top would become more expensive and in the main it is more cost effective to lay the last two courses using Celcon Foundation blocks to keep construction cost to a minimum, whilst also enhancing the thermal efficiency of the floor due to Celcon aircrete's beneficial thermal properties.

Where solid block foundations have been specified further cost savings can be achieved by being able to back-fill the foundations once the construction is complete, thus making further construction possible prior to that of mass filled foundation construction.

5. Conclusions

Celcon aircrete Foundation blocks provide an overall 24% cost saving over aggregate block foundation.

Celcon Solid Foundation blocks are easier to handle than dense aggregate blocks with less movements required.

Using Celcon Foundation blocks eliminates the need for wall ties and lean mix fill, whilst saving the time required for the cavity wall mortar to cure prior to the lean mix being added.

Celcon Foundation blocks offer enhanced thermal benefits which means the floors require less additional insulation to meet the required U-value.



For further information regarding Celcon Foundation blocks see www.hhcelcon.co.uk/foundations

Technical Hotline 01732 880580 or tsd@hhcelcon.co.uk

Sales: 01732 886444 Marketing: 01732 880520

H+H UK Limited, Celcon House, Ightham Sevenoaks, Kent TN15 9HZ

Tel: 01732 886333 www.hhcelcon.co.uk