

A Comparison of :-

**Durisol^{uk} D365 PIR against traditional Cavity
and Timber Frame Construction.**

Introduction

Carbon Green Consulting has been commissioned to complete a study to compare 3 different types of construction methods, two traditional and the third, Durisol^{UK} D365 PIR which is a permanent woodcrete formwork for the construction of concrete buildings. Durisol^{UK} presents an innovative alternative to current practice.

This document will investigate the thermal performance of Durisol^{UK} against standard construction methods, namely cavity construction and timber frame.

The comparison will use an “average” semi-detached dwelling of 86m² and standard elemental values. All values have been calculated using STROMA FSAP 2012 version 1.0.0.30 for Building Regulations Part L 2013 compliance.

All major thermal bridge calculations have been developed for Durisol^{UK} D365 PIR Psi values for other lintels, cills, jambs, Ground floor. Therefore, these will be used in this analysis and standard default values will be used in the traditional build comparators unless otherwise stated.

Table 1.0 - Durisol^{uk} D365 PIR v. full fill 100mm Cavity and 89mm Timber Frame in Standard Construction

Durisol^{uk}	Thickness (mm)	Cavity Construction	Thickness (mm)	Timber Frame	Thickness (mm)
Any external layer	Any external layer	Any external layer	Any external layer	Any external layer	Any external layer
Durisol D365 PIR	365	Concrete Block (7Newton)	100	Vented Cavity	50
		Celotex CG5000	100	Ply	9
		Concrete Block (3.6 Newton)	100	Mineral Wool batt in 89 timber frame	89
				Celotex GA 4000	50
				Unvented Cavity	38
Plaster finish		Plaster finish		Plaster finish	
	365mm		300mm		236mm

Table 2.0 - Durisol^{uk} D365 PIR v. full fill 100mm Cavity and 89mm Timber Frame

Wall make up	Wall Thickness (mm)	Wall U value	Floor	Roof	Thermal Bridging Psi Values	Glazing U value	Heating and hotwater	ALT	TER	DER	TFEE	DFEE
Durisol ^{uk}	365	0.15	0.11	0.16	As Supplied by Durisol ^{uk}	1.0	Gas Combi Boiler 89.9% Efficiency	4	18.8	18.39	53.4	44
Cavity	300	0.18	0.11	0.16	Default	1.0	Gas Combi Boiler 89.9% Efficiency	4	18.72	21.5	52.9	58.6
Timber Frame 89mm frame	338	0.2	0.11	0.16	Default	1.0	Gas Combi Boiler 89.9% Efficiency	4	18.73	21.21	53.0	57.9

In table 1 above, the Durisol^{uk} passes Building compliance with a 5.5% reduction in CO2 over Building Regulations Part L 2013. Neither the Standard Cavity construction nor timber frame designs achieve the Building Regulations Compliance Targets using building regulations compliant standard wall construction and default Thermal Bridging values.

Table 3.0 - Durisol^{uk} D365 PIR v Enhanced values for 125mm Cavity and 140mm Timber Frame Construction - All with wall U values 0.15

Durisol^{uk}	Thickness (mm)	Cavity Construction	Thickness (mm)	Timber Frame	Thickness (mm)
Any external layer	Any external layer	Any external layer	Any external layer	Any external layer	Any external layer
Durisol D365 PIR	365	Concrete Block (7Newton)	100	Vented Cavity	50
		Celotex CG5000	125	Ply	9
		Concrete Block (3.6 Newton)	100	Mineral Wool batt in 140 timber frame	140
				Celotex GA 4000	50
				Unvented Cavity	38
Plaster finish		Plaster finish		Plaster finish	
	365mm		325mm		287mm

Table 4.0 - Durisol^{uk} D365 PIR v Enhanced U values for 125mm full fill Cavity and 140mm Timber Frame
Construction - All Wall U values 0.15

Wall make up	Wall Thickness (mm)	Wall U value (W/m ² K)	Floor (W/m ² K)	Roof (W/m ² K)	Thermal Bridging Psi Values	Glazing U value (W/m ² K)	Heating and hot water	ALT	TER	DER	TFEE	DFEE
Durisol ^{uk}	365	0.15	0.11	0.16	As Supplied by Durisol ^{uk}	1.0	Gas Combi Boiler 89.9% Efficiency	4	18.8	18.39	53.4	44.0
Cavity 125mm full Fill	325	0.15	0.11	0.16	Default	1.0	Gas Combi Boiler 89.9% Efficiency	4	18.7 2	21.07	52.9	56.8
Timber Frame 140mm frame	287	0.15	0.11	0.16	Default	1.0	Gas Combi Boiler 89.9% Efficiency	4	18.7 3	19.72	53	55.4

Table 4 shows Enhanced wall U values of 0.15 W/m²k for the cavity and timber frame construction compared to standard Durisol^{uk} D365 PIR, (see wall make up in Table 3.0). Cavity and Timber Frame Construction still fail to achieve Part L compliance targets for Target Emissions Rates and Dwelling Fabric Energy Efficiency. Therefore, further enhancements for dwellings under cavity or timber frame construction will be required.

Table 5.0 - Additional Requirements to achieve Part L 1A Building Regulations 2013

	Durisol^{uk}	Thickness (mm)	Cavity Construction	Thickness (mm)	Timber Frame	Thickness (mm)
	Any external layer	Any external layer	Any external layer	Any external layer	Any external layer	Any external layer
	Durisol D365 PIR	365	Concrete Block (7Newton)	100	Vented Cavity	50
			Celotex CG5000	125	Ply	9
			Concrete Block (3.6 Newton)	100	Mineral Wool batt in 140 timber frame	140
					Celotex GA 4000	50
					Unvented Cavity	38
	Plaster finish		Plaster finish			Plaster finish
Total Thickness (mm)		365mm		325mm		287mm
Additional Measures to achieve Part L 2013	NONE		0.25 kWp of PV and ACDs on major junctions		ACDs on major junctions	

Table 6.0 - Additional Requirements to achieve Part L 1A Building Regulations 2013

Wall make up	Wall Thickness (mm)	Wall (W/m ² K)	Floor (W/m ² K)	Roof (W/m ² K)	Thermal Bridging Psi Values	Glazing (W/m ² K)	Heating / hot water	To achieve Part L 2013
Durisol ^{uk}	365	0.15	0.11	0.16	As Supplied by Durisol ^{uk}	1.0	Gas Combi Boiler 89.9% Efficiency	NONE
Cavity 125mm full Fill	325	0.15	0.11	0.16	Default	1.0	Gas Combi Boiler 89.9% Efficiency	0.25kWp PV + ACDs*
Timber Frame 140mm frame	287	0.15	0.11	0.16	Default	1.0	Gas Combi Boiler 89.9% Efficiency	ACDs*

*ACDs – Accredited Construction Details on major junctions

Tables 5 and 6 demonstrate the additional requirements needed by Cavity and Timber Frame constructions to achieve Part L 2012 Compliance when compared to Durisol^{uk} D365 PIR .

Table 7.0 – Code for Sustainable Homes Energy Credits for ENE1 and ENE2 Comparing Durisol^{uk} D365 PIR to Cavity and Timber frame + enhanced construction wall values + additional requirements

Wall make up	ENE 1 Credits	ENE 2 Credits	Total Credits (ENE1+ENE2)
Durisol^{uk}	0.7	7.5	8.2
Cavity + Enhanced U values + Additional requirements	0.4	6.7	6.7
Timber Frame+ Enhanced U values + Additional requirements	0.4	5.8	6.2