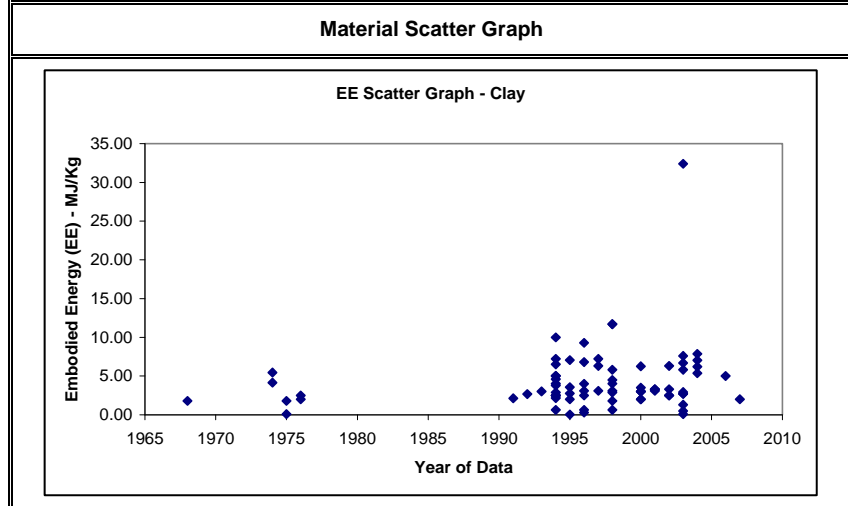


## Material Profile: Clay (including Bricks)

Embodied Energy (EE) ICE-Database Statistics - MJ/Kg						
Main Material	No. Records	Average EE	Standard Deviation	Minimum EE	Maximum EE	Comments on the Database Statistics:
Clay	80	4.30	4.12	0.02	32.40	There was a good sample size
Clay, General	80	4.30	4.12	0.02	32.40	
Unspecified	58	4.53	4.57	0.07	32.40	
Virgin	22	3.59	2.22	0.02	7.60	

Selected Embodied Energy & Carbon Coefficients and Associated Data						
Material	Embodied Energy - MJ/Kg	Embodied Carbon - Kg CO2e/Kg	Boundaries	Best EE Range - MJ/Kg		Specific Comments
				Low EE	High EE	
General simple baked clay products	3	0.24	Cradle to Gate	1	5	None
Tile	6.5	0.48		2.88	11.7	
Vitrified clay pipe DN 100 & DN 150	6.2	0.46		Estimated range +/- 30%		
Vitrified clay pipe DN 200 & DN 300	7.0	0.50				
Vitrified clay pipe DN 500	7.9	0.55				
General Clay Bricks	3.0	0.24		0.63	6	
EXAMPLE: Single Brick	6.9 MJ per brick	0.55 kgCO2 per brick		-	-	Assuming 2.3 kg per brick (Brick Development Association estimate)
Limestone Bricks	0.85	?	Cradle to Gate	0.7	1.01	

**Comments**  
Clay products release process related carbon dioxide emissions during their manufacturing. This is dependent upon the type of clay product. There was a large data range associated with all ceramic and brick products.

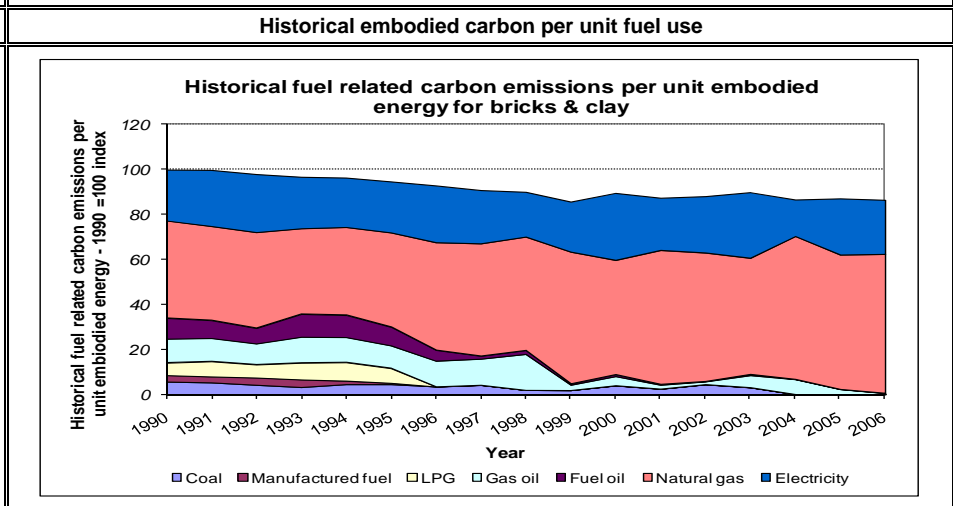


**Embodied Energy & Embodied Carbon Split (Bricks)**

Energy source	% of Embodied Energy from energy source	% of embodied carbon from energy source
Coal	0.0%	0.0%
LPG	0.0%	0.0%
Oil	0.4%	0.2%
Natural gas	74.6%	49.5%
Electricity	25.0%	17.3%
Other	0.0%	33.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>

**Comments:**  
The embodied carbon was estimated by using the UK typical fuel split in this industry.

**Note Space**



### Material Properties (CIBSE Data)

Material	Thermal conductivity (W-m-1 K-1)	Density (kg m -3)	Specific heat (J kg-1 K 1)	Thermal Diffusivity (M^2 S-1)	Comments
clay tiles	0.85	1900	840	5.32581E-07	
clay tiles, burnt	1.3	2000	840	7.7381E-07	
clay tile, hollow, 10.2mm, 1 cell	0.52	1120	840	5.52721E-07	
Clay tile, hollow, 20.3mm, 2 cells	0.623	1120	840	6.62202E-07	
Clay tile, hollow, 32.5mm, 3 cells	0.693	1120	840	7.36607E-07	
clay tile, pavior	1.803	1920	840	1.11793E-06	
<b>BRICKS</b>					
Brick A	0.72	1920	840	4.46429E-07	The CISBE guide presented multiple values for brick
Brick B	1.31	2080	921	6.8383E-07	
aerated	0.3	1000	840	3.57143E-07	
brickwork, inner leaf	0.62	1700	800	4.55882E-07	
brickwork, outer leaf	0.84	1700	800	6.17647E-07	
burned A	0.75	1300	840	6.86813E-07	
burned B	0.85	1500	840	6.74603E-07	
burned C	1	1700	840	7.0028E-07	
mud	0.75	1730	880	4.92643E-07	
paviour	0.96	2000	840	5.71429E-07	
reinforced	1.1	1920	840	6.82044E-07	
tile	0.8	1890	880	4.81E-07	