

## Normalized block strengths

### Guidance to support masonry design to Eurocode 6

#### Normalized compressive strength

Increasingly masonry designs will be determined in accordance with Eurocode 6 (BS EN 1996). Although there are many similarities between the approaches of Eurocode 6 and the more familiar BS 5628 series of design standards, there are some changes that will be new to designers. One of these is the requirement to determine the 'normalized strength of masonry units. Eurocode 6 requires the normalized strength values of units to be used in design calculations, rather than the unit strength required by BS 5628.

Normalized strengths of units take into account the shape factor (height to width relationship) and are based on the unit air dry strength. Normalized strengths should be seen as a means of taking into account the different unit shapes and moisture contents at test found around Europe. In comparison BS 5628 is based on traditional UK brick

and block sizes and the moisture contents resulting from the conditioning of units at test.

Under BS EN 771-3 it is required that the air dry strength is given. Previously concrete block strengths were based on declaring the saturated strength of the units. On the introduction of the BS EN 771 series of masonry unit standards, declared UK unit strengths were corrected to take account of the moisture content at test.

To obtain the normalized strength from the declared unit strength to BS EN 771-3, a correction for shape is needed, factors for which are given in the compressive strength test method (BS EN 772-1). The factors given in BS EN 772-1 allow interpolation to establish the factors for common UK block sizes. Table 1 gives interpolated shape factor corrections.

*“Increasingly masonry structures will be designed to meet the requirements of Eurocode 6”*



**Table 1 Interpolated shape factors for common masonry unit sizes**

Unit height	Unit widths					
	75mm	90mm	100mm	140mm	190mm	215mm
65mm	0.90	0.87	0.85	0.77	0.71	0.69
100mm <sup>*(1)</sup>	-	-	-	-	0.82 <sup>(2)</sup>	0.79 <sup>(3)</sup>
140mm	1.22	1.18	1.16	1.08	0.98	0.94
190mm	1.37	1.34	1.32	1.24	1.14	1.10
215mm	1.43	1.40	1.38	1.30	1.20	1.16

#### Notes

<sup>(1)</sup> 100mm high units are units laid flat. Unit strengths are usually given for units laid in their normal aspect and not laid flat. Laid flat strengths are usually several times greater than the normal aspect strength. The laid flat air dry strength should be multiplied by the appropriate shape factor from table 1

<sup>(2)</sup> Shape factor for units 190mm high in normal aspect when laid flat

<sup>(3)</sup> Shape factor for units 215mm high in normal aspect when laid flat



## Category of manufacturing control

In Eurocode 6, special category of manufacturing control is superseded by the publication of the BS EN masonry product standards and the revisions to BS 5628 which were published towards the end of 2005. Masonry units are now described either as Category I or Category II.

Category I masonry units are units with a declared compressive strength with a probability of failure to reach it of not exceeding 5%. This is determined using the mean value.

Category II are masonry units not intended to comply with the level of confidence of Category I units.

The manufacturing controls exercised by Lignacite Ltd ensure that all blocks can be regarded as Category I masonry units.

## Further information on Eurocode 6

A dedicated web site has been set up and supported by the masonry industry to provide useful design related information to Eurocode 6, including design examples.

[www.eurocode6.org](http://www.eurocode6.org)

## Normalized compressive strengths for Lignacite products

To aid designers in determining the normalized compressive strength that is applicable to the specified product/s from Lignacite's extensive range of common and facing masonry products, the following tables can be used.

These have been determined by applying the conversion factor from table 1 and applying this to the block size (height/thickness) and declared unit compressive strength.

**Table 2 Normalized strengths for 215mm high units**

Unit strength to BS EN 771-3	Normalized strengths for unit widths of:					
	75mm	90mm	100mm	140mm	190mm	215mm
3.6	5.1	5.0	5.0	4.7	4.3	4.2
7.3	10.4	10.2	10.1	9.5	8.8	8.5
10.4	14.9	14.6	14.3	13.5	12.5	12.1
17.5	-	24.5	24.1	22.7	21.0	20.3
22.5	-	31.5	31.0	29.2	27.0	26.1
30.0	-	42.0	41.4	39.0	36.0	34.8

**Table 3 Normalized strengths for 190mm high units**

Unit strength to BS EN 771-3	Normalized strengths for unit widths of:		
	90mm	140mm	190mm
3.6	4.8	4.5	4.1
7.3	9.8	9.0	8.3
10.4	13.9	12.9	11.9
17.5	23.4	21.7	19.9
22.5	30.1	27.9	25.7

**Table 4 Normalized strengths for 140mm high units**

Unit strength to BS EN 771-3	Normalized strengths for unit width of:
	140mm
7.3	7.9
10.4	11.2
17.5	18.9
22.5	24.3

Note: The availability of blocks in all the above widths and strengths as shown in Tables 2, 3 and 4 should be checked with Lignacite Ltd.

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