

Aggregate Concrete Blocks

Normalised strength of aggregate concrete blocks

Introduction

Eurocode 6 (BS EN 1996) commonly referred to as EC6, replaced BS 5628 as the UK masonry design code on 1 April 2010 when BS 5628 was withdrawn. EC6 differs from BS 5628 in that it requires the Normalised strength values of units to be used in design calculations rather than the unit strength required by BS 5628. It is permitted to design to withdrawn codes and designs to BS 5628 will continue to be produced and accepted for several years to come but it is anticipated that designs to Eurocode 6 will become steadily more common.

Normalised strengths of units require a shape factor (based on height to width relationship) to be applied to establish a cube strength and are based on the unit air dry strength. Normalised strengths are a means of taking into account the different unit shapes and moisture contents at test found around Europe.

Under BS EN 771-3 it is required that the air dry strength is given. Under the previous UK standard, BS 6073-1, the saturated strength was declared. 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. BS 5628 is based on traditional UK brick and block sizes but the 2005 edition gives unit strengths to BS EN 771-3. BS 6073-2: 2008 gives guidance on specifying units to BS EN 771-3 and commonly available unit strengths.

To obtain the Normalised 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 generally require interpolation to establish the factors for common UK block sizes. Table 1 gives interpolated shape factor corrections.

Table 1

Interpolated shape factor corrections

Unit Height	Unit widths					
	75mm	90mm	100mm	140mm	190mm	215mm
65mm	0.90	0.87	0.85	0.77	0.71	0.69
100mm*					0.82**	0.79***
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

*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 and manufacturers should be contacted to establish unit laid flat air dry strengths for their products. The laid flat air dry strength should be multiplied by the appropriate shape factor from table 1

**Shape factor for units 190mm high in normal aspect when laid flat

***Shape factor for units 215mm high in normal aspect when laid flat

Normalised strengths

Table 2a

Normalised strengths (in N/mm²) for 215mm high units

Unit strength (in N/mm ²) to BS 5628-1	Normalised strengths (in N/mm ²) for unit widths of:					
	75mm	90mm	100mm	140mm	190mm	215mm
2.9	4.1	4.1	4.0	3.8	3.5	3.4
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	14.4	13.5	12.5	12.1
17.5	25.0	24.5	24.2	22.8	21.0	20.3
22.5	32.2	31.5	31.1	29.3	27.0	26.1
30.0	42.9	42.0	41.4	39.0	36.0	34.8
40.0	57.2	56.0	55.2	52.0	48.0	46.4

Normalised strengths *cont.*

Table 2b

Normalised strengths (in N/mm²) for 190mm high units

Unit strength (in N/mm ²) to BS 5628-1	Normalised strengths (in N/mm ²) for unit widths of:					
	75mm	90mm	100mm	140mm	190mm	215mm
2.9	4.0	3.9	3.8	3.6	3.3	3.2
3.6	4.9	4.8	4.8	4.5	4.1	4.0
7.3	10.0	9.8	9.6	9.1	8.3	8.0
10.4	14.2	13.9	13.7	12.9	11.9	11.4
17.5	24.0	23.5	23.1	21.7	20.0	19.3
22.5	30.8	30.2	29.7	27.9	25.7	24.8
30.0	41.1	40.2	39.6	37.2	34.2	33.0
40.0	54.8	53.6	52.8	49.6	45.6	44.0

Table 2c

Normalised strengths (in N/mm²) for 140mm high units

Unit strength (in N/mm ²) to BS 5628-1	Normalised strengths (in N/mm ²) for unit widths of:					
	75mm	90mm	100mm	140mm	190mm	215mm
2.9	3.5	3.4	3.4	3.1	2.8	2.7
3.6	4.4	4.3	4.2	3.9	3.5	3.4
7.3	8.9	8.6	8.5	7.9	7.2	6.9
10.4	12.7	12.3	12.1	11.2	10.2	9.8
17.5	21.4	20.7	20.3	18.9	17.2	16.5
22.5	27.5	26.6	26.1	24.3	22.1	21.2
30.0	36.6	35.4	34.8	32.4	29.4	28.2
40.0	48.8	47.2	46.4	43.2	39.2	37.6

Table 2d

Normalised strengths (in N/mm²) for 65mm high units

Unit strength (in N/mm ²) to BS 5628-1	Normalised strengths (in N/mm ²) for unit widths of:					
	75mm	90mm	100mm	140mm	190mm	215mm
2.9	2.6	2.5	2.5	2.2	2.1	2.0
3.6	3.2	3.1	3.1	2.8	2.6	2.5
7.3	6.6	6.4	6.2	5.6	5.2	5.0
10.4	9.4	9.1	8.8	8.0	7.4	7.2
17.5	15.8	15.2	14.9	13.5	12.4	12.1
22.5	20.3	19.6	19.1	17.3	16.0	15.5
30.0	27.0	26.1	25.5	23.1	21.3	20.7
40.0	36.0	34.8	34.0	30.8	28.4	27.6

References

BS 5628-1 Code of practice for the use of masonry – Part 1: Structural use of unreinforced masonry

BS 5628-2 Code of practice for the use of masonry – Part 2: Structural use of reinforced and prestressed masonry

BS 5628-3 Code of practice for the use of masonry – Part 3: Materials and components, design and workmanship

BS 6073-2 Precast concrete masonry units – Part 2: Guide for specifying precast concrete masonry units

BS EN 771-3 Specification for masonry units – Part 3: Aggregate concrete masonry units (Dense and lightweight aggregates)

BS EN 1996 Eurocode 6 – Design of masonry structures

To receive other data sheets in this series, a list of CBA members or for further information please visit our website at www.cba-blocks.org.uk
CBA Technical Helpline: 0116 232 5165

© The Concrete Block Association 2007

Although The Concrete Block Association does its best to ensure that any advice, recommendation or information it may give is accurate, no liability or responsibility of any kind (including liability for negligence) is accepted in this respect by the Association, its servants or agents.

This datasheet is manufactured from ECF (Elemental Chlorine Free) pulp sourced from certified or well managed forests and plantations. It is totally recyclable, biodegradable and acid-free.

