

NATIONAL ANNEX

UK National Annex to Eurocode 6: Design of masonry structures –

Part 1-1: General rules for reinforced and unreinforced masonry structures

ICS 91.010.30; 91.080.30



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April 2013	Amended to reflect changes introduced by CEN amendment A1:2012 to BS EN 1996-1-1:2005

National Annex (informative) to BS EN 1996-1-1:2005, Eurocode 6: Design of masonry structures – Part 1-1: General rules for reinforced and unreinforced masonry structures

Foreword

This amendment to the National Annex for BS EN 1996-1-1 has been prepared to take into account the first amendment to BS EN 1996-1-1.

The start and finish of text introduced or altered by National Amendment No. 1 is indicated in the text by tags **A1** **A1**

In revising the NA, account has been taken of the experience of users of the Eurocode where it has been found that some concrete blockwork designs are more conservative than those that would have been carried out conforming to BS 5628-1. It was the intention when preparing the NA in 2005 that broadly similar results should be obtained from the Eurocode compared with those that had resulted from BS 5628-1. The main change in respect of concrete blockwork is the increase in the K factor in Table NA.4. Other changes have been made to some detailed requirements relating to compressive strength.

The partial factors for materials have been revised slightly.

The mortar requirements have been aligned with the 2012 NA to BS EN 998-2: 2010.

The calculation of eccentricity to Annex C of the Eurocode can be complicated and conservative. A note has been added to allow use of the BS 5628-1 approach of empirical eccentricities.

Table NA.8 has been revised to recognize revisions to BS EN 845-3:2013.

Introduction

This National Annex has been prepared by BSI Subcommittee B/525/6, *Use of masonry*. It is to be used in conjunction with BS EN 1996-1-1:2005+A1:2012.

NA.1 Scope

This National Annex gives:

- a) decisions for the Nationally Determined Parameters described in the following subclauses of BS EN 1996-1-1:2005:

2.4.3(1)P	ultimate limit states;
2.4.4(1)	serviceability limit states;
3.2.2(1)	specification of masonry mortar;
3.6.1.2(1)	characteristic compressive strength of masonry other than shell bedded;
3.6.2(3), (4) and (6)	characteristic shear strength of masonry;
3.6.3(3)	characteristic flexural strength of masonry;
3.7.2(2)	modulus of elasticity;
3.7.4(2)	creep, moisture expansion or shrinkage and thermal expansion;
4.3.3(3) and (4)	reinforcing steel;
5.5.1.3(3)	effective thickness of masonry walls;
6.1.2.2(2)	slenderness ratio γ_c below which creep may be ignored;
6.2.2	design value of the limiting shear resistance $\overline{A_1}$
8.1.2(2)	minimum thickness of wall;
8.5.2.2(2)	cavity walls;
8.5.2.3(2)	double-leaf walls;
8.6.2(1)	vertical chases and recesses;
8.6.3(1)	horizontal and inclined chases.
- b) decisions on the status of BS EN 1996-1-1:2005 informative Annexes A to J (see **NA.3**);
- c) references to non-contradictory complementary information to assist the user to apply BS EN 1996-1-1:2005 (see **NA.4**).

NA.2 Nationally determined parameters

NA.2.1 Ultimate limit states

[see BS EN 1996-1-1, 2.4.3(1)P]

The values for γ_M are given in Table NA.1.

Table NA.1 Values of γ_M for ultimate limit state

Class of execution control:	γ_M	
	1 A)	2 A)
Material		
Masonry		
When in a state direct or flexural compression		
Unreinforced masonry made with:		
units of category I	2,3 B)	2,7 B)
units of category II	2,6 B)	3,0 B)
Reinforced masonry made with $\boxed{A_1}$ mortar M6 or M12 $\boxed{A_1}$:		
units of category I	2,0 B)	C)
units of category II	2,3 B)	C)
When in a state of flexural tension		
$\boxed{A_1}$ in laterally loaded wall panels when removal of the panel would affect the overall stability of the building $\boxed{A_1}$		
units of category I and II	2,3 B)	2,7 B)
$\boxed{A_1}$ in laterally loaded wall panels when removal of the panel would not affect the overall stability of the building		
units of category I and II	2,0 B)	2,4 B) $\boxed{A_1}$
When in a state of shear		
Unreinforced masonry made with:		
units of category I and II	2,5 B)	2,5 B)
Reinforced masonry made with $\boxed{A_1}$ mortar M6 or M12 $\boxed{A_1}$:		
units of category I and II	2,0 B)	C)
Steel and other components		
Anchorage of reinforcing steel	1,5 D)	C)
Reinforcing steel and prestressing steel	1,15 D)	C)
Ancillary components – wall ties	$\boxed{A_1}$ 3,0 $\boxed{A_1}$ B)	$\boxed{A_1}$ 3,0 $\boxed{A_1}$ B)
Ancillary components – straps	1,5 E)	1,5 E)
Lintels in accordance with BS EN 845-2	See NA to BS EN 845-2	See NA to BS EN 845-2

A) Class 1 of execution control should be assumed whenever the work is carried out following the recommendations for workmanship in BS EN 1996-2, including appropriate supervision and inspection, and in addition:

- a) the specification, supervision and control ensure that the construction is compatible with the use of the appropriate partial safety factors given in BS EN 1996-1-1;
- b) $\boxed{A_1}$ the mortar conforms to BS EN 998-2, if it is factory made mortar. If the mortar is site mixed, preliminary compressive strength tests, in accordance with BS EN 1015-2 and BS EN 1015-11, are carried out on the mixture of sand, lime (if any) and cement that is intended to be used (the proportions given in Table NA.2 may be used initially for the tests) in order to confirm that the strength requirements of the specification can be met; the proportions may need to be changed to achieve the required strengths and the new proportions are then to be used for the work on site. Regular compressive strength testing is carried out on samples from the site mortar to check that the required strengths are being achieved. $\boxed{A_1}$

Class 2 of execution control should be assumed whenever the work is carried out following the recommendations for workmanship in BS EN 1996-2, including appropriate supervision.

B) When considering the effects of misuse or accident these values may be halved.

C) Class 2 of execution control is not considered appropriate for reinforced masonry and should not be used. However, masonry wall panels reinforced with bed joint reinforcement used:

- a) to enhance the lateral strength of the masonry panel;
- b) to limit or control shrinkage or expansion of the masonry,

can be considered to be unreinforced masonry for the purpose of class of execution control and the unreinforced masonry direct or flexural compression γ_M values are appropriate for use.

D) When considering the effects of misuse or accident these values should be taken as 1,0.

E) For horizontal restraint straps, unless otherwise specified, the declared ultimate load capacity depends on there being a design compressive stress in the masonry of at least 0,4 N/mm². When a lower stress due to design loads may be acting, for example when autoclaved aerated concrete or lightweight aggregate concrete masonry is used, the manufacturer's advice should be sought and a partial safety factor of 3 should be used.

NA.2.2 Serviceability limit states

[see BS EN 1996-1-1, 2.4.4(1)]

The recommended value for γ_M for all of the materials listed in Table NA.1 is 1,0.

NA.2.3 Specification of masonry mortar

[see BS EN 1996-1-1, 3.2.2(1)]

NA.2.3.1 Mortars

The proportions of the prescribed constituents required to provide the stated “M” values for prescribed masonry mortars are given in Table NA.2.

Table NA.2 Acceptable assumed equivalent mixes for prescribed masonry mortars

Compressive strength class ^{A)}	Prescribed mortars (proportion of materials by volume) (see Note)				Mortar designation	Suitable for use in environmental condition
	Cement ^{B)} : lime : sand with or without air entrainment	Cement ^{B)} : sand with or without air entrainment	Masonry cement ^{C)} : sand	Masonry cement ^{D)} : sand		
M12	1 : 0 to 1/4 : 3	1 : 3	Not suitable	Not suitable	(i)	Severe (S)
M6	1 : 1/2 : 4 to 4 1/2	1 : 3 to 4	1 : 2 1/2 to 3 1/2	1 : 3	(ii)	Severe (S)
M4	1 : 1 : 5 to 6	1 : 5 to 6	1 : 4 to 5	1 : 3 1/2 to 4	(iii)	Moderate (M)
M2	1 : 2 : 8 to 9	1 : 7 to 8	1 : 5 1/2 to 6 1/2	1 : 4 1/2	(iv)	Passive (P) ^{A1)}

A) The number following the M is the compressive strength for the class at 28 days in N/mm²

B) Cement or combinations of cement in accordance with NA.2.3.2, except masonry cements

C) Masonry cement in accordance with NA.2.3.2 (inorganic filler other than lime)

D) Masonry cement in accordance with NA.2.3.2 (lime)

NOTE 1 When the sand portion is given as, for example, 5 to 6, the lower figure should be used with sands containing a higher proportion of fines whilst the higher figure should be used with sands containing a lower proportion of fines.

^{A1)} NOTE 2 For Class 2 of execution control site compressive strength testing is not required for these traditional mixes and checking of prescribed mortars should only be done by testing the proportions of the constituents. ^{A1)}