



DPC: 25 / 30499441 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 24 September 2025

Origin: National

Latest date for receipt of comments: 24 November 2025

Project No. 2024/02448

Responsible committee: B/525/2/5 Revision of PD 6687-1 - Background paper to the National Annexes to BS EN 1992-1 and BS EN 1992-

Interested committees: B/525/2

Title: Draft National Annex to BS EN 1992-1-1:2023 Eurocode 2: Design of concrete structures - Part

1-1: General rules and rules for buildings, bridges and civil engineering structures

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Responsible Editorial Project Manager: Sharon Nash

Direct tel:

E-mail: sharon.nash@bsigroup.com

Introduction

Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international and European standards, comments will be reviewed by the relevant UK national committee before submitting the consensus UK vote and comments. If the draft standard is approved, it is usual for the resulting published standard to be adopted as a British Standard.

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National Annex to BS EN 1992-1-1:2023, Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings, bridges and civil engineering structures

DRAFT

Contents

NA.1	Scope	5
NA.2	Nationally determined parameters	6
NA.3	Decisions on the status of informative annexes	20
NA.4	Complementary information	22
	Bibliography	50

Foreword

Publishing information

This National Annex is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on XX Month 202X. It was prepared by Subcommittee B/525/2, *Structural use of concrete*, under the authority of Technical Committee B/525, *Building and civil engineering structures*. A list of organizations represented on these committees can be obtained on request to the committee manager.

Supersession

There's a period of coexistence related to this document, see below (Information about this document) for further details.

This document is the National Annex to BS EN 1992-1-1:2023.

The National Annex+A2:14 to BS EN 1992-1-1:2004+A1:2014, NA to BS EN 1992-2:2005 and NA to BS EN 1992-3:2006 will be withdrawn on 30 March 2028.

Relationship with other publications

This National Annex is to be used in conjunction with BS EN 1992-1-1:2023. It cannot be used by itself.

Information about this document

This National Annex to the EN Eurocode contains the national choices to be used for buildings, bridges and civil engineering works constructed in the UK. It also includes complementary information that is non-conflicting with the Eurocode itself.

The first generation of EN Eurocodes will remain current until 30 March 2028 and will then be withdrawn. The second generation of EN Eurocodes will be current upon publication and both sets of documents will co-exist until 30 March 2028.

The first generation of EN Eurocodes was published between 2002 and 2007, with conflicting British Standards withdrawn in 2010. This National Annex forms part of the second generation of EN Eurocodes suite of documents. The second generation of National Annexes to Eurocodes are expected to be published between 2024 and 2026. These documents are being published as soon as they are available. This is being done to enable users to prepare for the transition from the first generation to second generation of EN Eurocodes suite of documents. National Annexes of the first generation of Eurocodes will be withdrawn alongside the first generation of EN Eurocodes by BSI on 30 March 2028.

Where reference is made to a BS EN Eurocode document that shall be understood to include the relevant National Annex where applicable.

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Presentational conventions

The verb "shall" expresses a requirement strictly to be followed and from which no deviation is permitted in order to comply with the Eurocodes and the NDP specified in this National Annex.

The verb “should” expresses a highly recommended choice or course of action. Subject to national regulation and/or any relevant contractual provisions, alternative approaches could be used/adopted where technically justified.

The verb “may” expresses a course of action permissible within the limits of the Eurocodes and the NDP specified in this National Annex.

The verb “can” expresses possibility and capability; it is used for statements of fact and clarification of concepts.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. “organization” rather than “organisation”).

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National Annex to BS EN 1992-1-1:2023, Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings, bridges and civil engineering structures

NA.1 Scope

This National Annex gives:

- a) the UK decisions for the Nationally Determined Parameters described in the following subclauses of BS EN 1992-1-1:2023 (see **NA.2**):

4.2.1.5(3)	4.3.1(1)	4.3.2(1)	4.3.2(2)
4.3.3(1)	4.3.3(4)	5.1.3(3)	5.1.4(2)
5.1.5(4)	5.1.6(1)	5.1.6(2)	5.2.1(5)
5.2.2(1)	5.3.1(3)	5.3.2(1)	5.4.1(1)
6.3(3)	6.3(5)	6.4(1)	6.5.2.1(2)
6.5.2.2(1)	6.5.2.2(2)	6.5.2.2(3)	6.5.2.2(4)
6.5.2.2(5)	6.5.2.2(6)	6.5.2.2(9)	6.5.3(1)
7.3.2(5)	8.2.1(3)	8.2.2(5)	8.4.2(1)
8.4.4(4)	8.4.4(5)	8.4.4(6)	9.2.1(6)
9.2.3(2)	11.4.2(2)	11.4.2(3)	11.5.2(2)
11.6.3(2)	12.3.1(1)	12.4.1(1)	12.6(1)
12.7(2)	12.9.3(1)	14.2(1)	14.4.5.2(1)
A.3(1)	A.3(3)	A.3(6)	B.3(1)
B.6(1)	C.6(1)	C.7(1)	C.8(2)
E.4.2(1)	F.5.2(1)	F.7(2)	F.7(8)
H.4.2(4)	I.4.2.1(2)	I.5.2.1(3)	I.5.2.2(1)
I.8.3.1(1)	I.9.1(2)	J.4(1)	J.5.1(2)
K.5(2)	K.6(2)	K.6(3)	K.6(4)
K.7(2)	K.7(3)	K.8(2)	K.8(3)
K.8(4)	K.8(5)	K.8(6)	K.9(2)
K.9(3)	K.10.1(2)	K.11(2)	K.11(3)
K.11(4)	K.11(5)	K.12.2(1)	K.13(2)
K.13(4)	K.15(1)	L.4(1)	L.5.1(1)
L.5.5.2(1)	L.6(4)	L.7(1)	L.11.2(1)
L.12.3.1(2)	Q.3(1)	Q.4(2)	R.4(1)
R.5.1(2)			

- b) the UK decisions on the status of BS EN 1992-1-1:2023 informative annexes (see **NA.3**):

Annex A	Annex D	Annex F	Annex H
Annex I	Annex J	Annex L	Annex N

Annex O

Annex P

Annex R

Annex S

c) complementary information (see **NA.4**).

NA.2 Nationally determined parameters

COMMENTARY ON NA.2

The headings of this clause are set out with the National Annex clause number before the Eurocode clause number and then text to make it easier to navigate between the separate Eurocode and National Annex documents.

The NDPs are presented in Roman (i.e. upright) type and are expressed as a set of statements/instructions, or in sentences in which the principal auxiliary verb is "shall".

NA.2.1 4.2.1.5(3) Prestress: values of r_{sup} and r_{inf}

The following values shall be used in all situations:

- $r_{sup} = 1,0$; and
- $r_{inf} = 1,0$.

NA.2.2 4.3.1(1) Partial factor for shrinkage action: value of γ_{SH}

The default value shall be used.

NA.2.3 4.3.2(1) Partial factors for prestress action: values of $\gamma_{P,fav}$ and $\gamma_{P,unfav}$

The values of $\gamma_{P,fav}$ and $\gamma_{P,unfav}$ shall be as given in Table NA.1 shall be used.

Table NA.1 – Partial factors for prestress action for ultimate limit states

Factor for prestress	Value	Applied to	ULS verification type
$\gamma_{P,fav}$	0,9	Prestress force for bonded and unbonded tendons	Verifications where an increase in prestress would be favourable.
$\gamma_{P,unfav}$	1,20		Verifications where an increase in prestress would be unfavourable.
$\gamma_{\Delta P,sup}$	1,00	Change in stress in unbonded tendons	Verifications where increase in stress would be favourable
$\gamma_{\Delta P,inf}$	1,20		Verifications where increase in stress would be unfavourable
$\gamma_{\Delta P,sup}$ $\gamma_{\Delta P,inf}$	1,0		Verifications where linear analysis with uncracked sections, i.e. assuming a lower limit of deformations, is applied

NA.2.4 4.3.2(2) Partial factors for prestress action: values of $\gamma_{\Delta P,sup}$ and $\gamma_{\Delta P,inf}$

The values for $\gamma_{\Delta P,sup}$ and $\gamma_{\Delta P,inf}$ given in Table NA.1 shall be used.

NA.2.5 4.3.3(1) Partial factors for materials: values of γ_S , γ_C , γ_{CE} and γ_V

The default values shall be used.

NA.2.6 4.3.3(4) Partial factors for materials: value of k_{cip}

$k_{cip} = 1,1$ shall be used.

NA.2.7 5.1.3(3) Strength: applicable strength classes

The default strength classes should be used. Strength classes intermediate between classes in the BS EN 1992-1-1:2023, Table 5.1, may be used with appropriate modification of strength values.

NA.2.8 5.1.4(2) Elastic deformation: value of k_E

Where specific data does not exist the following values for k_E may be taken:

- Basalt 11 500
- Quartzite 9 500
- Limestone 8 500
- Sandstone 7 500
- Flint gravel 10 500
- Granite 9 500

NA.2.9 5.1.5(4) Creep and shrinkage: shrinkage at 50 years $\varepsilon_{cs50,y}$

The default values should be used unless experimental values or experience justifies an alternative value for the situation being considered.

NA.2.10 5.1.6(1) Design assumptions: value of $f_{ck,ref}$

The default value shall be used.

NA.2.11 5.1.6(1) Design assumptions: value of k_{tc}

The default value shall be used.

NA.2.12 5.1.6(2) Design assumptions: k_{tt}

The default value shall be used.

NA.2.13 5.2.1(5) Reinforcing steel

BS 4449, BS 4483 and BS 8666 shall be used.

NA.2.14 5.2.2(1) Properties of reinforcing steel

The default values shall be used.

NOTE Only B500 is included in BS4449. See PD 6687:202X.

NA.2.15 5.3.1(3) Prestressing steel

BS 5896 and BS 4486 shall be used.

NA.2.16 5.3.2(1) Properties of prestressing steel

For intermediate classes BS 5896 shall be used for wire and strand and BS 4486 shall be used for bar.

NA.2.17 5.4.1(1) Standards for prestressing systems

EAD 160004 [N1] should be used.

NA.2.18 6.3(3) Environmental exposure conditions: exposure classes related to environmental conditions

Instead of Table 6.1 of BS EN 1992-1-1:2023, BS 8500-1:2023, Table A.1 should be used for informative examples of exposure classes for the UK. For XM environments the default examples of exposure classes shall be used.

NA.2.19 6.3(5) Note 1 Environmental exposure conditions

BS 8500-1:2023, **A.4.5** and **A.4.6** and associated tables should be used instead of Table 6.2 of BS EN 1992-1-1:2023.

NA.2.20 6.3(5) Note 2 Environmental exposure conditions

The exposure classes relevant to ground conditions in the UK given in BS 8500-1:2023, Table A.2 should be used instead of Table 6.2 of BS EN 1992-1-1:2023.

NA.2.21 6.4(1) Note 1 Exposure resistance classes (ERC)

The durability performance of concrete (corrosion induced by carbonation and chlorides, freeze thaw, chemical attack and abrasion) using the minimum covers and limiting values of BS 8500-1:2023, Table A.4 and Table A.5 should be assumed to be equivalent to the ERCs noted in BS EN 1992-1-1:2023. See also NA.4.18 and NA.4.19 for further guidance.

NA.2.22 6.4(1) Note 2 Exposure resistance classes (ERC)

Recommendation in **NA 2.21** should be followed. BS EN 1992-1-1:2023, Annex P shall not be used.

NA.2.23 6.5.2.1(2) Note Concrete cast against soil

The following values of $\Delta c_{\min}$ should be used:

- + 0 mm for casting against a vertical soil surface.
- + 0 mm for casting against a horizontal soil surface.

NA.2.24 6.5.2.2(1) Minimum cover for durability: carbon reinforcing steel

BS 8500-1:2023, Table A.4 (design life 50 years) and BS 8500-1:2023, Table A.5 (design life 100 years) shall be assumed to give appropriate values of $c_{\min, \text{dur}}$ for the corresponding concrete properties for the relevant exposure class. Δc in the BS 8500 series tables corresponds to $\Sigma \Delta c$ in BS EN 1992-1-1:2023, Formula (6.2).

NOTE $c_{\min, \text{dur}}$ can be governed by the minimum cover required for chemical attack, see NA.2.19.

NA.2.25 6.5.2.2(2) Minimum cover for durability: temporary structures

$\Delta c_{\min, 30} = 0$ should be used unless demonstrated otherwise. Specific guidance for offshore structures of 30-year design life is given in BS 6349-1-4.

NA.2.26 6.5.2.2(3) Minimum cover for durability: execution conditions

$\Delta c_{\min, \text{exc}} = 0$ should be used.

NA.2.27 6.5.2.2(4) Minimum cover for durability: prestressing tendons

$\Delta c_{\min, p}$
= 0 mm generally;

= 10 mm when verifying pretensioned members that do not meet the decompression requirements under quasi permanent loading (see Table NA.2);

= 10 mm when verifying prestressed members with bonded tendons and Protection Level 1 that do not meet the decompression requirements under quasi permanent loading (see Table NA.2).

NOTE Definitions for Protection Levels can be found in 5.4.1(4) of BS EN 1992-1-1:2023.

NA.2.28 6.5.2.2(5) Minimum cover for durability: concrete with additional protection

The default value should be used.

NA.2.29 6.5.2.2(6) Minimum cover for durability: concrete abrasion

The default values should be used.

NA.2.30 6.5.2.2(9) Minimum cover for durability: special measures other than coating

$\Delta c_{dur,red2} = 0$ mm should be used. Where reliable data and long proven experience exist a value up to 10 mm may be used.

NA.2.31 6.5.3(1) Allowance in design for deviation in cover: nominal cover c_{nom}

The values for Δc_{dev} given in Table NA.2 shall be used.

Table NA.2 – Table 6.7 (NA) – Allowance for deviation Δc_{dev}

	Case	Δc_{dev}
1	In general: for execution in tolerance class 1 according to BS EN 13670	10 mm
2	For execution in tolerance class 2 according to BS EN 13670	5 mm
3	Where fabrication is subjected to a quality assurance system, in which the systematic monitoring includes measurements of the cover	5 mm
4	Where it can be assured that an accurate measurement device is used for systematic monitoring and non-conforming members are rejected (e.g. precast elements)	0 mm
5	Not used	-
6	For concrete cast against surfaces with exposed aggregate (e.g. interfaces)	5 mm
7	For concrete cast against unevenness due to formwork or excavation sheeting (e.g. ribbed finishes or architectural textures)	10 mm + dimension of unevenness
8	Concrete cast against prepared ground (including uneven blinding layer)	15 mm
9	Concrete cast directly against unprepared soil ^a	50 mm ^a
10	Bored piles designed in accordance with BS EN 1992-1-1:2023 and installed in accordance with BS EN 1536	25 mm
11	Post-installed reinforcing bars	5 mm or according to project specification

^a The allowance for deviation also applies for diaphragm walls designed according to BS EN 1992-1-1:2023.

NA.2.32 7.3.2(5) Linear elastic analysis with redistribution

The default value should be used.

NA.2.33 8.2.1(3) General verification procedure: members without geometric discontinuities

d_{nom} should be used in the design of new structures.

NA.2.34 8.2.2(5) Detailed verification for members without shear reinforcement

The default formula should be used.

NA.2.35 8.4.2(1) Shear-resisting effective depth

The default formula should be used.

NA.2.36 8.4.4(4) Definition of parameter c_v

The default values should be used.

NA.2.37 8.4.4(5) Values for η_{sys}

BS EN 1992-1-1:2023, Formula (8.110) and Formula (8.111) should be replaced with the following values for η_{sys} :

$$\eta_{sys} = 0,77 + 0,69(b_0 / d_v)^{1/4} \geq 1,0 \text{ for studs.}$$

$$\eta_{sys} = 0,55 + 0,69(b_0 / d_v)^{1/4} \geq 1,0 \text{ for links and stirrups.}$$

NA.2.38 8.4.4(6) Value of η_{pm}

The default values should be used.

NA.2.39 9.2.1(6) Limiting value of $w_{lim,cal}$

The default values should be used for appearance criterion.

NA.2.40 9.2.1(6) Stress limitations and crack control

The limits in stress and the values given in Table NA.3 should be used for the durability criterion. Prestressed members with bonded tendons with Protection Level 1 according to BS EN 1992-1-1:2023 5.4.1(4) should not be used for XD and XS exposure classes.

Table NA.3 – Table 9.2 (NA) – Verifications, stress and crack width limits for durability

Exposure Class	Reinforced members and prestressed members without bonded tendons and with bonded tendons with Protection Levels 2 or 3 according to 5.4.1(4)		Pretensioned members.			Prestressed members with bonded tendons with Protection Level 1 according to 5.4.1(4) ^d		
	combination of actions		combination of actions			combination of actions		
	quasi-permanent	characteristic	quasi-permanent	frequent	characteristic	quasi-permanent	frequent	characteristic
X0, XC1	—	—	Decompression ^b or $w_{lim,cal} = 0,1\text{mm}$ when $\Delta C_{min,p} = 10\text{ mm}$	$w_{lim,cal} = 0,2\text{ mm} \cdot k_{surf}$		—	$w_{lim,cal} = 0,2\text{ mm} \cdot k_{surf}$	—
XC2, XC3, XC4	$w_{lim,cal} = 0,3\text{ mm} \cdot k_{surf}$					$w_{lim,cal} = 0,1\text{mm}$ when $\Delta C_{min,p} = 10\text{ mm}$		
XD1, XD2, XD3 XS1, XS2, XS3		$\sigma_c \leq 0,6f_{ck}^{a,c}$	Decompression ^b	$w_{lim,cal} = 0,2\text{ mm} \cdot k_{surf}$	$\sigma_c \leq 0,6f_{ck}^{a,c}$	^d		
XF1, XF3 XF2, XF4	—							
NOTE 1 Crack widths are verified at the member surface								
NOTE 2 The factor k_{surf} considers the difference between an increased crack width at the member surface and the required mean crack width according to durability performance of the minimum cover: $1,0 \leq k_{surf} = c_{act}/(10\text{ mm} + c_{min,dur}) \leq 1,5$.								
<i>c_{act}</i> is a specified actual cover $\geq c_{nom}$ due to detailing or execution reasons.								
^a No limitation in serviceability conditions is necessary for stresses under bearings, partially loaded areas and plates of headed bars.								
^b The decompression limit requires that all parts of the bonded tendons or duct lie at least 25 mm within concrete in compression. The decompression check is only relevant in the direction of the prestressed reinforcement.								
^c The compressive stress σ_c may be increased to $0,66f_{ck}$ if the cover is increased by 10 mm or confinement by transverse reinforcement is provided.								
^d Not permitted for XD and XS exposure								

NA.2.41 9.2.3(2) Value of k_w for control of cracking

The default values should be used.

NA.2.42 11.4.2(2) Anchorage of straight bars

The default values should be used.

NA.2.43 11.4.2(3) Anchorage of straight bars

The default values should be used for k_{lb} .

For n_σ the following values shall be used:

$n_\sigma = 1,0$ for $\sigma_{sd} \leq 435$ MPa and $n_\sigma = 1,5$ for $\sigma_{sd} > 435$ MPa for both persistent and accidental design situations.

NA.2.44 11.5.2(2) Laps for reinforcement steel in tension and compression and mechanical couplers

$k_{ls} = 1,0$ should be used.

NA.2.45 11.6.3(2) Maximum transverse bearing stress on the prestressing tendon – Table 11.4 (NDP)

The default values should be used.

NA.2.46 12.3.1(1) Detailing requirements for reinforcement in beams

The default values should be used.

NA.2.47 12.4.1(1) Detailing requirements for reinforcement in slabs

The default values should be used.

NA.2.48 12.6(1) Detailing requirements for reinforcement in columns

The default values should be used. For concrete with $f_{ck} > 50$ MPa, transverse reinforcement should be anchored using BS EN 1992-1-1:2023, Figure 12.2f) or BS EN 1992-1-1:2023, Figure 12.2a) as appropriate.

NA.2.49 12.7(2) Detailing requirements for walls and deep beams

The default values given in Table NA.4 should be used.

Table NA.4 – Table 12.4 (NA) – Detailing requirements for reinforcement in walls and deep beams

Description		Symbol	Requirement
1	Minimum amount of vertical reinforcement (each surface): - where the member carries in-plane normal and shear stresses and designed/verified by use of 8.5 or Annex G - where the member is only loaded by vertical in-plane compression and out of plane bending.	$A_{s,min,v}$	$0,25A_c \cdot f_{ctm} / f_{yk}$ $0,001A_c$
2	Minimum amount of horizontal reinforcement (each face): - where the member carries in-plane normal and shear stresses and designed/verified by use of 8.5 or Annex G - where the member is only loaded by vertical in-plane compression and out of plane bending	$A_{s,min,h}$	$0,25A_c \cdot f_{ctm} / f_{yk}$ $0,25A_{s,v} \geq 0,05\%A_c$
3	Maximum spacing of vertical reinforcement		$\min\{3h^a; 400 \text{ mm}\}$
4	Maximum spacing of horizontal reinforcement		400 mm
5	Maximum spacing of orthogonal-to-the-surface reinforcement where $A_{s,v}$ exceeds $0,02A_c$ and is utilized in compression (end region is taken as $\geq 4h^a$)		see BS EN 1992-1-1:2023, 12.6(3)
a) h – thickness of wall			

NA.2.50 12.9.3(1) Required resistance for ties

The default values should be used.

NA.2.51 14.2(1) Reduction factors for plain concrete $k_{c,pl}$ and $k_{t,pl}$

$k_{c,pl} = 0,6$ shall be used.

$k_{t,pl} = 1,0$ shall be used.

NA.2.52 14.4.5.2(1) Creep factor φ_{eff} in Formula (14.11)

50% of the creep factor given by BS EN 1992-1-1:2023, Formula (7.27) should be used for φ_{eff} in BS EN 1992-1-1:2023, Formula (14.11).

NA.2.53 A.3(1) Adjustment of partial factors for materials

Table NA.5 and Table NA.6 should be used instead of BS EN 1992-1-1:2023, Table A.1 (NDP). Table A.2 (NDP) of BSEN 1992-1-1:2023 should be used.

Table NA.5 – Table A.1a (NA) – Values of adjusted material factors to account for use of site measured values in assessment or specified limits of execution tolerances in design

Condition for adjusted material factors	Persistent and transient design situations			Accidental design situations			Statistical data used for deriving partial factors
	γ_S	γ_C	γ_V	γ_S	γ_C	γ_V	
a) if the execution ensures that geometrical deviations of Tolerance Class 2 according to BS EN 13670 are fulfilled.	1,08	1,48	1,33	1,00*	1,15	1,11	BS EN 1992-1-1:2023 Table A.3 and (4)
b) if the calculation of design resistance is based on the value of the dominant geometrical data measured in the finished structure and the COV of the measurement is not larger than the value given in BS EN1992-1-1:2023 A.3(5).	1,04	1,48	1,29	1,00*	1,15	1,08	BS EN 1992-1-1:2023 Table A.3 and (5)
NOTE 1 If the in-situ strength in the finished structure is assessed according to BS EN 13791: 2019, Clause 8, the partial factors γ_C and γ_V may be further adjusted in accordance with BS EN 1992-1-1:2023, A.3.(7). NOTE 2 Where BS EN 1992-1-1:2023 A.3.(7) is used to determine partial factors, the values should not be taken as less than the following: i) Persistent and transient situations 1,3 for γ_C and 1,25 for γ_V. ii) Accidental situations 1.0 for γ_C and γ_V NOTE 3 The partial factors γ_S may be further adjusted in accordance with BS EN 1992-1-1:2023 A.3.(3) with the statistical values as indicated in BS EN 1992-1-1, A.3.(8), if the yield strength of the reinforcement is assessed from tests on samples taken from the existing structure; NOTE 4 The partial factors γ_C and γ_V may also be further adjusted in accordance with BS EN1992-1-1:2023 A.3(3) with the statistical values given in BS EN 1992-1-1:2023, Table A.5 if the target value of the reliability index β_{tgt} given in BS EN 1992-1-1:2023 Table A.4 is modified in accordance with the relevant authority. * Denotes a UK modification to proposed values							