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DS/EN 1996-2:2024 DK NA:202x

**National Annex to: Eurocode 6 – Design of masonry structures –
Part 2: Design considerations, selection of materials and execution**

**Nationalt Anneks til: Eurocode 6 – Murværkskonstruktioner –
Del 2: Designbetragtninger, valg af materialer og udførelse af murværk**

Foreword

Published [måned og år].

This National Annex (NA) to EN 1996-2:2024 forms part of the Danish national annexes to the second generation of Eurocodes.

This NA supersedes DS/EN 1996-2:2007 DK NA:2021 upon its implementation in the Building Regulations (Bygningsreglementet 2018 – BR18) as an appendix.

During the transition period stated in the Building Regulations, both the first generation and the second generation of the Eurocodes and NAs may be applied.

This NA cannot be used in conjunction with the first generation of Eurocodes.

This NA lays down the conditions for the Danish implementation of DS/EN 1996-2:2024 for construction works in conformity with the Danish Building Regulations; Bygningsreglementet 2018 (BR 18). Other parties may bring this NA into force by reference.

The Eurocodes establish the principle that certain parameters are left open for national determination. These parameters are referred to as *Nationally Determined Parameters* (NDP) and specify the nationally applicable values, classes or methods. Furthermore, the NA may provide *Non-Contradictory, Complementary Information* (NCCI), i.e. additional guidance and alternative methods or values that support the application of the Eurocode without altering or contradicting its provisions.

Further, this National Annex includes NOTES. Notes have the status of guidance and provide additional information intended to assist the understanding or use of text of the national annex.

In conformity with the Danish Building regulations, the verbal forms used in this Eurocode and NA are to be understood as follows:

- “shall” expresses a requirement to be followed
- “should” expresses a recommendation. Alternative approaches could be used if technically justified
- “may” expresses permission within the limits of the Building Regulations
- “can” expresses a possibility or capability
- “is/are” expresses a statement of certainty or a fact

This NA includes:

- Foreword;
- An overview of clauses with possible Nationally Determined Parameters (NDPs) and of Non-Contradictory Complementary Information (NCCI);
- National choice to national Determined Parameters (NDP), and Non-Contradictory Complementary Information (NCCI)

Valid versions of the NAs as well as previous versions, addenda can be found at www.bygningsreglementet.dk.

Overview of possible Nationally Determined Parameters (NDPs) and Non-Contradictory Complementary Information (NCCI)

The list below identifies the clauses where Nationally Determined Parameters (NDPs) are possible, and whether a national choice has been made, and if an informative annex is applicable or not applicable. Furthermore, clauses providing complementary information (NCCI) are identified in the list below.

Clause	Subject	Nationally Determined Parameters	Non-Contradictory Complementary Information
4.3.4.2(6)	Spacing of movement joints	National choice	
5.3.1.4(1)	Admixtures and additions		Complementary information
Annex A	Classification of micro conditions of exposure of completed masonry	Applicable	Complementary information
Annex B	Acceptable specifications of masonry units and mortar for durable masonry in various exposure conditions	Applicable	
Annex C	Selection of material and corrosion protection specification for ancillary components according to exposure class	Not applicable	
Annex C NA	Selection of material and corrosion protection specification for ancillary components according to exposure class	National choice	
NOTE Unchanged: Recommendations in the Eurocode to be followed. National choice: A National Determined Parameter is chosen and defined. Complementary information: (Non-contradictory) complementary information on how to use the Eurocode. Normative: The Annex shall be used. Informative: The Annex may be used. Not applicable: The Annex cannot be used. No further information: The Eurocode allows further information. No further information is given.			

Nationally Determined Parameters (NDP) and Non-Contradictory Complementary Information (NCCI)

4.3.4.2(6) Spacing of movement joints

(NDP)

Table 4.1 in DS/EN 1996-2:2024 is not detailed enough according to Danish experiences. For unreinforced clay masonry on foundation with bitumen as damp proof course (dpc) instead the following shall be used to determine the maximum horizontal distance between vertical movement joints.

The distance between movement joints depends on the type of unit or block, the mortar strength, the geometry of the wall, and its restraints of movement. The design should take into account significant cross-sectional variations, e.g. large openings or variations in the wall height.

Unless determined by calculation, the horizontal distance between vertical movement joints shall be taken as 10 m to 20 m for masonry units with a normalized compressive strength, f_b , of at least 15 MPa and 15 m to 30 m for masonry units with a normalized compressive strength, f_b , of at least 20 MPa.

The lower distance values apply when high-strength mortars are used.

For masonry units with a normalized compressive strength, f_b , between 15 MPa and 20 MPa, linear interpolation between the distances shall be applied. Extrapolation for normalized compressive strengths greater than 20 MPa are not permitted.

The values above for the horizontal distance apply to unreinforced clay masonry founded on a foundation with bitumen as damp proof course (dpc). The distances may be increased in the following cases:

- 1) Where a slip plane (e.g. a membrane in accordance with BYG-ERFA (29) 12 12 25 or a steel plate) is provided over the full cross-section of the outer leaf, the distances may be increased by 20 %.
- 2) Where brackets are assessed to possess flexibility with regard to horizontal movement, the distances may be increased by 30 %.
- 3) Where reinforced masonry is used, the distances may be increased by 30 %.

The provisions given in items 1) and 2) above shall not be combined. For item 3, the area of reinforcement shall be at least 0,05 % of the effective cross-sectional area of the masonry, and bed joint reinforcement shall be provided at intervals not exceeding every sixth bed joint or 400 mm.

The distance between movement joints and/or tie-wire free corners shall not exceed 30 m. However, for very low-strength mortars (K100/1200), no practical upper limit applies to the spacing of movement joints.

As an alternative to a movement joint at a masonry corner, the first vertical tie column may be placed at a suitable distance from the corner. The distance to the vertical tie column from the corner can be determined from the movements of the corner and the stiffness of the ties and their anchorage.

A masonry corner where the first vertical tie column is placed at a suitable distance from the corner can be regarded as a movement joint. The distances to the vertical tie column from the corner can be determined from the movements of the corner and the stiffness of the ties and their anchorage.

Masonry extensions shall consider differential movements between new and old masonry and slip planes between masonry and foundation, brackets not maintaining the masonry in the horizontal direction and bed joint reinforcement.

5.3.1.4(1) Admixtures and additions

(NCCI)

Ethanol (denatured alcohol) and blended products of ethanol and isopropanol containing up to 40 % isopropanol may be used as an antifreeze admixture for KC 60/40/850 and KC 50/50/700 produced as prescribed mortar, provided that at least 1 and no more than 4 L are added per 100 L of mortar.

In such cases, a 20% reduction shall be assumed for all strength parameters of the mortar.

Annex A Classification of micro conditions of exposure of completed masonry

Applicable.

(NCCI)

NOTE In Table A.1 the exposure class is only hierarchical from MX1 to MX3.2. MX4 and MX5 can occur in combination with MX1 to MX3.2.

Annex C NA Selection of material and corrosion protection specification for ancillary components according to exposure class

(NDP)

C.1 NA Use of this annex

Annex C in DS/EN 1996-2:2024 is not applicable, the national choice is presented below.

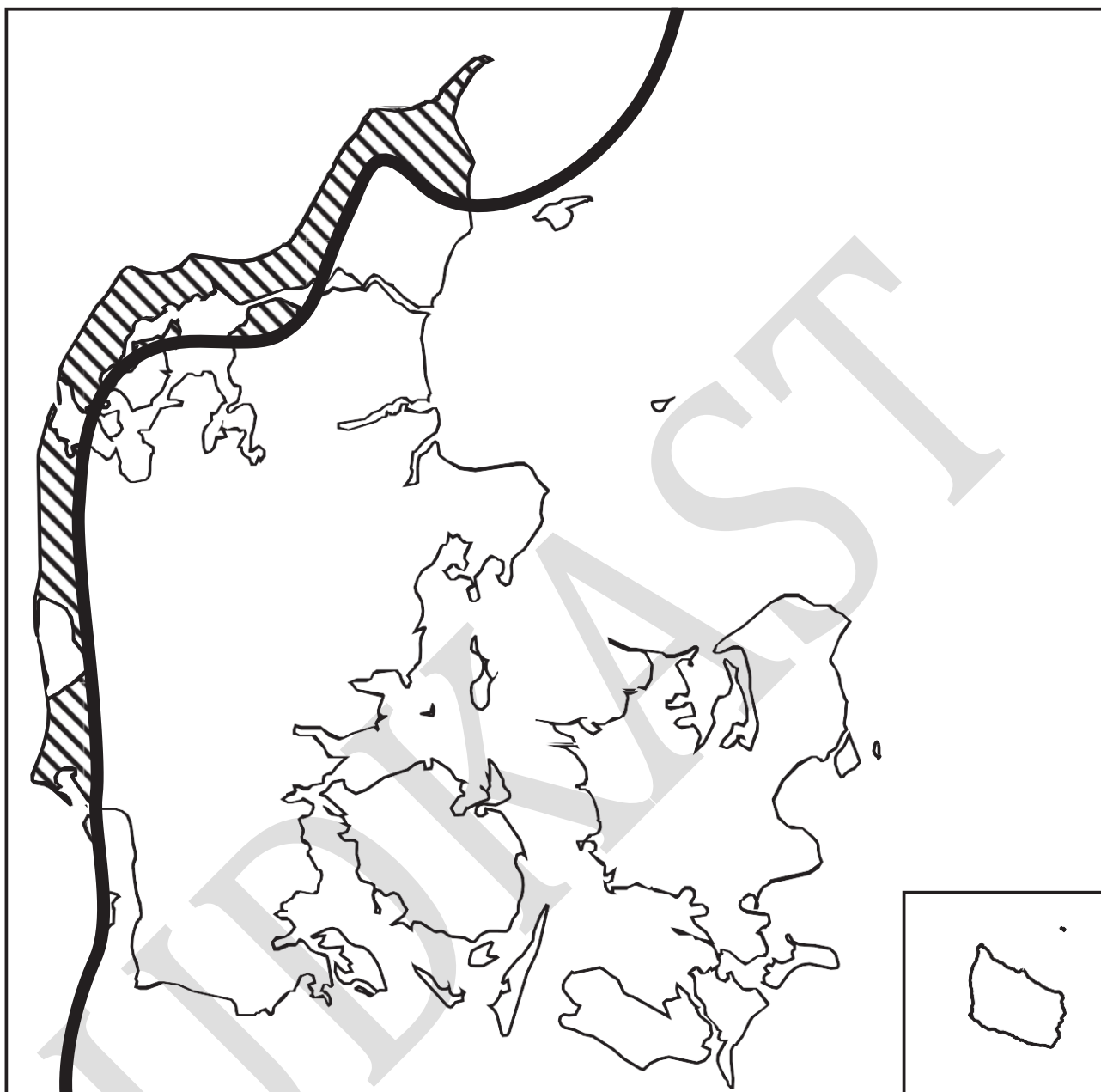
Exposure classes and corrosion categories are stated below in C.2 NA and C.3 NA.

C.2 NA Ancillary materials in contact with the mortar

Table C.a NA Recommended stainless steel grades for installation in masonry in contact with mortar ^a

Exposure class ^b	Minimum requirements for corrosion resistance or corrosion protection of masonry accessories (for example wall ties and brackets), reinforced steel and steel lintels.
MX1	"Black" steel, hot-dip galvanised with a minimum zinc coating thickness of 70 µm. ^c
MX2.1	Austenitic stainless steel ^d
MX3.1	Tin bronze, CuSn6 (ISO 427)
MX2.2	Austenitic stainless steel ^d
MX3.2	Tin bronze. CuSn6 (ISO 427)
MX4 ^b	Austenitic stainless steel ^e
MX5	Austenitic stainless steel ^{e,f}

- a Mortar containing active lime and/or air-entraining admixtures shall be regarded as corrosive. Only dense concrete and pure cement mortars (e.g. C100/400) may be considered as providing corrosion protection. The required concrete cover in mm. shall be documented if the concrete layer is to be used as corrosion protection.
- b See EN 1996-2, as well as additional guidance on the delimitation of exposure class MX4 in Denmark below (Figure C.a NA).
- c Minimum local thickness of the zinc coating in accordance with DS/EN ISO 1461:2009.
- d Chrome nickel alloys in accordance with EN 10088:2014, Table 9.
- e Molybdenum-containing chrome–nickel alloys or duplex stainless steels, in accordance with EN 10088:2014, Table 9.
- f Austenitic stainless steel cannot be assumed to be suitable in all aggressive environments. The suitability of the steel shall be assessed for the specific project.

Figure C.a NA – Delineation of exposure class MX4 in Denmark

Masonry located within the hatched area in Figure C.a NA shall be classified as exposure class MX4. For masonry outside this zone, an assessment shall be made as to whether specific conditions may result in increased salt exposure, such as:

- de-icing of pedestrian areas
- a particularly exposed location directly at the coast or harbor
- salts originating from the use of the building (e.g. a swimming pool)

If such conditions are present, the masonry shall be classified as exposure class MX4.

Table C.b NA –Steel grades according to EN 10088:2014

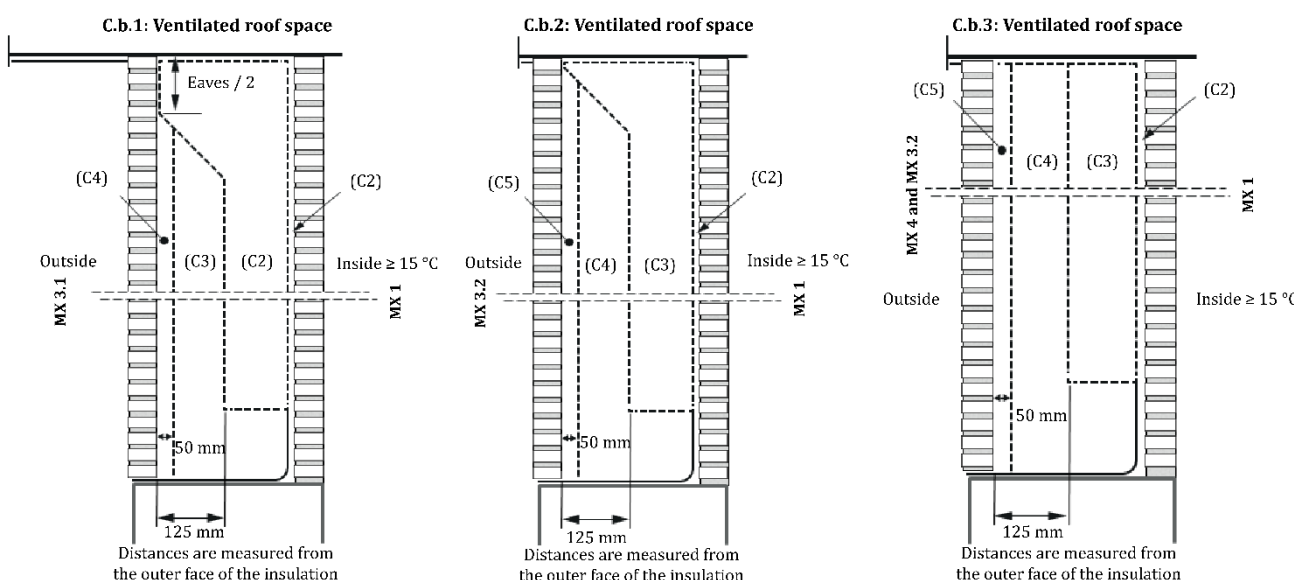
Number	Description	Type	Exposure class
1.4301	X5CrNi18-10	Austenitic	MX3.2
1.4306	X2CrNi19-11	Austenitic	MX3.2
1.4541	X6CrNiTi 18-10	Austenitic	MX3.2
1.4311	X2CrNiN 18-10	Austenitic	MX3.2
1.4482	X2CrMnNiMoN 21-5-3	Austenitic–ferritic (Duplex)	MX3.2
1.4401	X5CrNiMo 17-12-2	Austenitic	MX3.2, MX4, MX5
1.4404	X2CrNiMo 17-12-2	Austenitic	MX3.2, MX4, MX5
1.4571	X6CrNiMoTi 17-12-2	Austenitic	MX3.2, MX4, MX5
1.4429	X2CrNiMoN 17-13-3	Austenitic	MX3.2, MX4, MX5
1.4432	X2CrNiMo 17-12-3	Austenitic	MX3.2, MX4, MX5
1.4435	X2CrNiMo 18-14-3	Austenitic	MX3.2, MX4, MX5
1.4362	X2CrNiN 23-4	Austenitic–ferritic (Duplex)	MX3.2, MX4, MX5
1.4062	X2CrNiN 22-2	Austenitic–ferritic (Duplex)	MX3.2, MX4, MX5
1.4162	X2CrMnNiN 21-5-1	Austenitic–ferritic (Duplex)	MX3.2, MX4, MX5
1.4662	X2CrNiMnMoCuN 24-4-3-2	Austenitic–ferritic (Duplex)	MX3.2, MX4, MX5

NOTE 1 Any situations deviating from normal soil conditions shall be examined within the context of the specific project

C.3 NA Auxiliary materials/steel columns in cavity walls that are not in contact with mortar

These shall be protected against corrosion in accordance with corrosion category. Figure C.b NA2 provides guidance on corrosion categories for components in typical structures, depending on the relevant exposure classes (external and internal).

Figur C.b NA Corrosion categories for exposure classes MX 3.1 to MX4 (outside the wall)



The corrosion category shall be determined based on the part of the structure that is exposed the most.

When specifying zinc coating thickness and coating systems for the different corrosion categories, the required service life shall be a minimum of 50 years, or the design working life of the structure.

Auxiliary components and steel columns shall be separated from the outer leaf by a damp-proof layer/membrane.

In the cavity wall, the same exposure class as the internal environment may be assumed, typically MX1, for example for tension straps running along the inner leaf and located within (on the warm side of) the raised damp-proof membrane at the base of the wall.

The outside exposure class is assumed to extend up to 50 mm into the insulation, measured from the outer face of the insulation. Further inside the cavity wall (up to 125 mm into the insulation), the corrosion category may be reduced by one level.

Beyond 125 mm into the insulation, the corrosion category may be reduced by an additional level, provided that profiles do not penetrate the damp-proof membrane at the base of the wall.

NOTE 2 Window fittings and similar components that can be routinely replaced are not subject to the requirements of this annex.

At the top of the wall, the corrosion category may be reduced towards the outer leaf for exposure class MX3.2 and lower, where the boundary follows a 45° line (as shown on figure C.b NA, C.b.1 and C.b.2).

For exposure class MX5, the corrosion category within the cavity wall shall be determined specifically for the individual project. For auxiliary components or steel columns in contact with mortar, reference shall be made to Table C.a NA.

At wall terminations, movement joints, and around openings, effective anchoring of the outer leaf shall be provided by installing a row/column of ties with a maximum spacing of 400 mm.