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Ministry of Housing, Infrastructure and Outlying Districts

EN 1992-1-1 GL NA:2025

National Annex to

Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings

Foreword

This Greenlandic National Annex (GL NA) replaces EN 1992-1-1 GL NA:2024 as well as *Foreskrifter for betonkonstruktioner (Regulations for Concrete Structures)*, Home Rule of Greenland, Bygge- og Anlægsstyrelsen (Agency for Building and Construction works), 1996.

This Annex is based on DS/EN 1992-1-1 DK NA:2024, which is the Danish national annex to EN 1992-1-1, and carries forward a number of provisions from '*Foreskrifter for betonkonstruktioner*' (Regulations for Concrete Structures).

Scope

The Annex is adapted to national, geographical and climatic conditions as well as national legislation and specifies how EN 1992-1-1+AC:2008 and its corrigenda are to be applied in Greenland.

For structures covered by the Danish Building Regulations BR 24, levels of checking are left out and execution classes (EXC1, EXC2, and EXC3) are used to specify the extent of checking and other requirements for execution.

The Annex provides Greenlandic national choices and complementary information. For any complementary information, it is specified whether it is normative or informative. Normative information comprises requirements to be followed.

The numbering in the Annex refers to the numbering in EN 1992-1-1+AC:2008 or DS/EN 1992-1-1 DK NA:2024.



Overview of Greenlandic national choices and complementary information

DS/EN 1992-1-1 DK NA:2024 is applicable with the following national choices and complementary information:

Clause	Subject	Change
DK NA	References in DK NA	National choice
3.1.2	Concrete, Strength	Complementary information, Normative
4.2	Exposure classes	National choice
4.4.1.2(5)	Minimum cover	National choice
7.3.1(5)	Recommended maximum values of calculated crack widths	National choice
9.1	Structural design, General	Complementary information, Normative
E.1(3)	Minimum value of prescribed f_{ck}	Complementary information, Normative



National choices

References in DK NA

References in DS/EN 1992-1-1 DK NA to other Danish National Annexes are replaced by references to corresponding Greenlandic National Annexes. Where these do not exist, the Danish National Annexes apply.

4.2 Environmental conditions

Exposure classes defined in EN 206 GL NA are represented in Table 4.1 GL NA.

NOTE 7: The exposure classes cover normal environmental and climatic actions. If structural members are exposed to particularly aggressive environmental and climatic actions, this may lead to a need for the specification of additional requirements.

NOTE 8: In the informative examples given in Table 4.1 GL NA, a structural member may be covered by several exposure classes. This means that the requirements for all exposure classes shall be met. For example, a foundation pile in fresh water will be subject to exposure class XC2, whereas a foundation pile in seawater or in groundwater with a chloride content corresponding to the adjacent seawater will be subject to both exposure classes XC2 and XS2.

Table 4.1 GL NA – Exposure classes cf. EN 206 GL NA:2025, Table GL NA-1

Class designation	Description of the environment, cf. EN 206	Informative examples of exposure classes related to climatic and environmental actions
1 No risk of corrosion or attack		
X0	For concrete without reinforcement or embedded metal: All exposures except where there is freeze/thaw, abrasion or chemical attack. For concrete with reinforcement or embedded metal: Very dry	Concrete inside buildings with very low air humidity, e.g.: - structures in heated rooms.
2 Corrosion induced by carbonation		
Where concrete containing reinforcement or other embedded metal is exposed to air and moisture, the exposure shall be classified as follows:		
XC1	Dry or permanently wet	Concrete inside buildings with low air humidity, e.g.: - structures in rooms that are unheated - floor slabs on insulation, or concrete permanently submerged in soil without flowing water, e.g.: - buried foundations where the load bearing capacity is verified without the use of reinforcement.
XC2	Wet, rarely dry	Concrete subject to long-term water contact, e.g.: - foundation piles; - lift shafts; - installation ducts; - service corridors; - structures in fresh water (e.g. water tanks); - buried foundations where the load bearing capacity is verified with the use of reinforcement; - base plates.



Class designation	Description of the environment, cf. EN 206	Informative examples of exposure classes related to climatic and environmental actions
XC3	Moderate humidity	Concrete inside buildings with moderate or high humidity, e.g.: <ul style="list-style-type: none"> – installation ducts; – service corridors; or external concrete sheltered from rain, e.g.: <ul style="list-style-type: none"> – beams with structurally protected surfaces at the top side.
XC4	Cyclic wet and dry	Concrete subject to water contact, but not within exposure class XC2, e.g.: <ul style="list-style-type: none"> – external walls, facades, columns, staircases, slabs and beams; – balcony parapets, balcony slabs, access balconies and balcony corbels; – foundations partly above ground; – retaining walls; – external basement walls partly above ground; – concrete exposed to industrial waters; – car washes; – parking floors; – bridge piers and edge beams on bridges; – marine structures near the water line.
3 Corrosion induced by chlorides other than from sea water		
Where concrete containing reinforcement or other embedded metal is subject to contact with water containing chlorides, including de-icing salts, from sources other than from sea water, the exposure shall be classified as follows:		
XD1	Moderate humidity	Concrete exposed to airborne chlorides from de-icing salts, limited de-icing salts, or adjacent to de-icing areas, e.g.: <ul style="list-style-type: none"> – balcony slabs of restricted access; – retaining walls; – external staircases; – external basement walls partly above ground; – vertical parts of car parks; – columns, end supports, retaining walls, foundations, etc., for bridges and tunnels not assigned to XD3; – moisture insulated bridge decks.
XD2	Wet, rarely dry	Concrete subject to long-term water and chloride contact, e.g.: <ul style="list-style-type: none"> – swimming pools; – concrete exposed to industrial waters containing chlorides. NOTE – For swimming pools, reference is made to DS 477:2013, 6.2.2 and 2.7.
XD3	Cyclic wet and dry	Concrete exposed to water spray containing chlorides or exposed to de-icing salts, e.g.: <ul style="list-style-type: none"> – access balconies and balcony corbels; – external staircases; – parking floors; – edge beams on bridges;



Class designation	Description of the environment, cf. EN 206	Informative examples of exposure classes related to climatic and environmental actions
		<ul style="list-style-type: none"> – bridge piers. <p>NOTE – Reference is made to DS/EN 1992-2 DK NA for specific rules regarding bridges and tunnels.</p>
4 Corrosion induced by chlorides from sea water		
Where concrete containing reinforcement or other embedded metal is subject to contact with chlorides from sea water or airborne salt originating from sea water, the exposure shall be classified as follows:		
XS1	Exposed to airborne salt but not in direct contact with sea water	<p>Concrete exposed to airborne salt from sea water, e.g.:</p> <ul style="list-style-type: none"> – structures in harbour and coastal areas. <p>NOTE - If the condition is not investigated, "coastal areas" can normally be considered locations with less than 1 000 m to the coastline.</p>
XS2	Permanently submerged	<p>Concrete exposed to permanent contact with seawater, e.g.:</p> <ul style="list-style-type: none"> – submerged marine structures; – buried structures in harbour or coastal areas with groundwater having a chloride content corresponding to the adjacent sea water.
XS3	Tidal, splash and spray zones	<p>Concrete exposed to water spray from seawater, e.g.:</p> <ul style="list-style-type: none"> - marine structures near the water line.
5 Freeze/thaw attack with or without de-icing agents		
Where concrete is exposed to significant attack by freeze/thaw cycles while wet, the exposure shall be classified as follows:		
XF1	Moderate water saturation, without de-icing agent	<p>Vertical concrete surfaces exposed to rain and freeze, e.g.</p> <ul style="list-style-type: none"> – foundations partly above ground; – retaining walls; – external basement walls partly above ground; – external walls and facades; – external columns; – external beams with structural protection; – balcony parapets.
XF2	Moderate water saturation, with de-icing agent	<p>Vertical concrete surfaces exposed to freezing and airborne de-icing agents, e.g.</p> <ul style="list-style-type: none"> – retaining walls; – external staircases with limited traffic; – external basement walls partly above ground; – structures in harbour and coastal areas.
XF3	High water saturation, without de-icing agent	<p>Horizontal concrete surfaces exposed to rain and freeze, e.g.</p> <ul style="list-style-type: none"> – balcony slabs of restricted access; – external slabs; – external beams; – light shafts; – ducts, outdoor swimming pools and pits.
XF4	High water saturation, with de-icing agent or seawater	<p>Concrete exposed to water, freeze, and chlorides, e.g.:</p> <ul style="list-style-type: none"> – access balconies and balcony corbels; – parking floors; – bridge piers; – edge beams on bridges; – marine structures in the splash zone., e.g. ramps.



Class designation	Description of the environment, cf. EN 206	Informative examples of exposure classes related to climatic and environmental actions
		NOTE – Freeze/thaw attack on parking floors may vary depending on the design of the car park.
6 Chemical attack		
Where concrete is exposed to chemical attack from natural soils and groundwater, the exposure shall be classified as follows:		
XA1	Slightly aggressive chemical environment	Concrete exposed to natural soil and groundwater according to Table 2 of EN 206, XA1, e.g.: <ul style="list-style-type: none"> – ducts and pits; – foundation piles; – tunnels; – external basement walls.
XA2	Moderately aggressive chemical environment	Concrete exposed to natural soil and groundwater according to Table 2 of EN 206, XA2, e.g.: <ul style="list-style-type: none"> - examples as shown in XA1 NOTE – Concrete in sea water should comply with XA2 as sea water contains SO_4^{2-} .
XA3	Highly aggressive chemical environment	Concrete exposed to natural soil and groundwater according to Table 2 of EN 206, XA3, e.g.: <ul style="list-style-type: none"> - examples as shown in XA1

4.4.1.2(5) Minimum cover, c_{min}

The concrete cover shall apply concrete types according to EN 206 GL NA as specified in Table 4.4Na GL NA for non-prestressed reinforcement in conformity with EN 10080, and as specified in Table 4.5Na GL NA and Table 4.5Nb GL NA, respectively, for prestressing steels in conformity with EN 10138.

Where the Tables do not provide a minimum cover, the concerned concretes cannot be applied.

NOTE 1: The values given are based on a design working life of at least 50 years with regular maintenance.

NOTE 2: For concrete permanently submerged in soil without flowing water, and where the load bearing capacity is verified without the use of reinforcement (XC1), the minimum cover given in Table 4.4Na GL NA and Table 4.6N GL NA may be applied to reinforcement to ensure integrity (coherence).

Table 4.4Na GL NA – Requirements for minimum cover, $c_{min,dur}$, with respect to the durability of non-prestressing steel in accordance with EN 10080 when applying concrete types according to EN 206 GL NA:2026.

Exposure classes	Minimum cover [mm]		
	Outdoor, salt/freeze Concrete type 1:2:2	Outdoor, freeze Concrete type 1:2:3	Indoor Concrete type 1:3:5
XD2, XD3, XS3, XF4, XA3 ¹⁾	40	-	-



XD1, XS1, XS2, XF2, XF3, XA2	30	-	-
XC2, XC3, XC4, XF1, XA1	20	20	- 2)
X0, XC1	10	10	10

NOTE 1 to Table: Requires that the w/c ratio is less than 0,40

NOTE 2 to Table: For strip foundations in consequence classes XC2, XC3, XC4, XF1, and XA1 for structures in a low consequences class (CC1) as well as structures in a medium consequences class (CC2) in 1 and 2-storey buildings with moderate spans, including dwellings in 2 two storeys without horizontal apartment separations: 30 mm.

Table 4.5Na GL NA – Requirements for minimum cover, $c_{min,dur}$, with respect to the durability of prestressing tendons (not bundled) in accordance with EN 10138 when applying concrete types according to EN 206 GL NA.

Exposure classes	Minimum cover [mm]		
	Outdoor, salt/freeze Concrete type 1:2:2	Outdoor, freeze Concrete type 1:2:3	Indoor Concrete type 1:3:5
XD2, XD3, XS3, XF4, XA3 *1)	40	-	-
XD1, XS1, XS2, XF2, XF3, XA2	30	-	-
XC2, XC3, XC4, XF1, XA1	20	20	-
X0, XC1	10	10	10

NOTE 1 to Table: Requires that the w/c ratio is less than 0,40

Table 4.5Nb GL NA – Requirements for minimum cover, $c_{min,dur}$ (mm), with respect to the durability of post-tensioned tendons in ducts in accordance with EN 10138 when applying concrete types according to EN 206 GL NA.

Exposure classes	Minimum cover [mm]		
	Outdoor, salt/freeze Concrete type 1:2:2	Outdoor, freeze Concrete type 1:2:3	Indoor Concrete type 1:3:5
XD2, XD3, XS3, XF4, XA3*1)	50	-	-
XD1, XS1, XS2, XF2, XF3, XA2	40	-	-
XC2, XC3, XC4, XF1, XA1	35	35	-
X0, XC1	30	30	30

NOTE 1 to Table: Requires that the w/c ratio is less than 0,40



4.4.1.2(6) Addition to minimum cover, $\Delta c_{min,dur,y}$

Concrete covers according to 4.4.1.2(5) are increased by an addition to the minimum cover in accordance with Table 4.6N GL NA.



Table 4.6N GL NA – Additional requirements for minimum cover, $\Delta c_{\min, \text{dur}, \gamma}$ with respect to durability when applying concrete types according to EN 206 GL NA, and execution class according to EN 1990 GL NA

Concrete type	Addition to minimum cover [mm]		
	Execution class 1 (EXC 1)	Execution class 2 (EXC 2)	Execution class 3 (EXC 3)
Designed concrete	10	5	0
Prescribed concrete	20	15	10

7.3.1(5) General considerations

The recommended maximum values for calculated crack widths for relevant exposure classes are given in Table 7.1 GL NA.

Table 7.1 GL NA – Recommended maximum values of calculated crack widths, w_{\max} (mm)

Exposure classes	Maximum calculated crack widths, w_{\max} [mm]	
	Non-prestressed reinforcement	Prestressing tendons
XD2, XD3, XS3, XF4, XA3	Concrete type 1:2:2 0,2 mm	Concrete type 1:2:2 0,1 mm
XD1, XS1, XS2, XF2, XF3, XA2	Concrete type 1:2:2 0,3 mm	Concrete type 1:2:2 0,2 mm
XC2, XC3, XC4, XF1, XA1	Concrete type 1:2:3 Concrete type 1:2:2 0,4 mm	Concrete type 1:2:3 Concrete type 1:2:2 0,3 mm



Complementary information, Normative

3.1.2 Strength

(10) For the verification of ultimate limit states by static calculations in accordance with EN 1992-1-1 and DS/EN 1992-1-1 DK NA, using the specified concrete types, a maximum characteristic compressive strength of concrete as specified in Table 3.1 GL NA may be used.

Table 3.1 GL NA – Maximum characteristic compressive strength by calculation

Concrete type	Maximum value of f_{ck} [MPa]	
	Designed concrete	Prescribed concrete
Outdoor, salt/freeze (Concrete type 1:2:2)	30	20
Outdoor, freeze (Concrete type 1:2:3)	20	15
Indoor (concrete type 1:3:5)	10	5
Binding layer (Concrete type 1:4:6)	5	5

NOTE: See DS/EN 206 GL NA for a definition of designed and prescribed concretes.

(11) Where a designed concrete complies with DS/EN 206 DK NA, a higher maximum characteristic compressive strength than determined according to (10) may be applied by verifying ultimate state limits according to EN 1992-1-1 and DS/EN 1992-1-1 DK NA.

(12) Prescribed concretes shall not be used in pre-tensioned and post-tensioned concrete structures.

9.1 General – conditions at the construction site

(4)P The conditions for execution at the construction site shall be examined and assessed before design is initiated. The conditions for execution at the construction site shall be taken into account in the design of the structure, so that it can be constructed with the required properties and durability.

NOTE 1: The conditions for execution at the construction site may, for example, mean that the dimensions of the structure are increased to avoid closely spaced reinforcement, where it may be difficult to place the concrete according to EN 13670 GL NA.

NOTE 2: The types of concrete that can be produced at the construction site may be limited.

NOTE 3: For certain exposure classes, the conditions of execution at the construction site may lead to the fact that requirements for the concrete cannot be met. In the design of the structure this may, for example, result in an increased cover to the reinforcement to ensure durability of the structure.

NOTE 4 For structures by and in sea water, solid concrete structures should be considered, in which sufficiently high temperatures can develop during curing so that the hardening does not come to a standstill under the influence of the cold seawater; see also EN 13670 GL NA, clause 8.5 (17). Massive concrete structures with extra cover by and in sea water (exposure classes XS2 and XS3) may prevent that minor spalling due to tidal action causes deterioration of the structure during its design working life. Note that solid concrete structures may result in significant temperature differences in the structure during curing, which may lead to



unacceptable cracking, just as ambient temperature variations and shrinkage of the hardened concrete may lead to large crack widths, especially for solid concrete structures.

E.1(2) General

(3) For reinforced concrete, the following minimum value of the prescribed, f_{ck} , is required as follows:

Table E.1 GL NA – Minimum characteristic compressive strength

Concrete type	Minimum value of f_{ck} [MPa]	
	Designed concrete	Prescribed concrete
Outdoor, salt/freeze (Concrete type 1:2:2)	30	20
Outdoor, freeze (Concrete type 1:2:3)	20	15
Indoor (concrete type 1:3:5)	10	5
Binding layer (Concrete type 1:4:6)	5	5

NOTE: See EN 206 GL NA for a definition of designed and prescribed concretes.