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DS/EN 1995-1-1:2025 DK NA:202x

**National Annex to: Eurocode 5 - Design of timber structures-
Part 1-1: General rules and rules for buildings**

**Nationalt Anneks til: Eurocode 5 - Trækonstruktioner-
Del 1-1: Generelle regler og regler for bygningskonstruktioner**

Foreword

Published [måned og år].

This National Annex (NA) to DS/EN 1995-1-1:2025 and DSF/EN 1995-1-1:2025/prA1 forms part of the Danish national annexes to the second generation of Eurocodes.

This NA supersedes DS/EN 1995-1-1 DK NA:2024 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 1995-1-1:2025 for construction works in conformity with the Danish Building Regulations; Bygningsreglementet 2018 (BR18). 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 specifies 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 provides 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 Danish 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 Parameter	Non-Contradictory Complementary Information
4.3.1.3(1)	Load-duration classes	National choice	
4.3.1.4(1)	Service classes (SC)	National choice	
4.5.1(1)	Design value of a material strength of wood or wood-based products	National choice Awaiting calibration	
4.5.1(2)	Design value of a material strength of wood or wood-based products	Unchanged	
4.5.2(1)	Design value of a resistance of wood and wood-based products	National choice Awaiting calibration	
4.5.2(2)	Design value of a resistance of wood and wood-based products	Unchanged	
5.1.3	Overview of products for structural members		Complementary information
6.2.1(2)	Measures to prevent a biological attack – Service class and use class		Complementary information
6.2.1(3)	Measures to prevent a biological attack - Effect of impregnation		Complementary information
6.2.1(4)	Measures to prevent a biological attack - Ingress of water		Complementary information
6.2.2.1(1)	Basic constructive measures– preferred moisture content	National choice	
6.2.2.1(2)	Basic constructive measures – Hygrothermal simulations		Complementary information
6.2.2.1(3)	Basic constructive measures – Structural protection		Complementary information
6.2.2.2(1)	Special constructive measures	National choice	

Clause	Subject	Nationally Determined Parameter	Non-Contradictory Complementary Information
7.4.1(3)	Equivalent imperfections		Complementary information
7.5.1(1)	Bracing - general		Complementary information
7.5.2(6)	Simplified requirements for the bracing of members – torsional moment		Complementary information
7.6	Analysis of assemblies sensitive for the load cases handling, transport and erection		Complementary information
8.1	Member resistance verification - CLT		Complementary information
8.1.6.1(2)	Compression perpendicular to grain - general	National choice	Complementary information
8.1.11.1(4)	Shear - general		Complementary information
8.3.5.1(5)	Notched members - CLT		Complementary information
8.3.5.1(6)	Notched members – CLT		Complementary information
8.3.5.1(7)	Notched members - CLT		Complementary information
8.5.2(2)	Single members formed by components		Complementary information
8.5.2(3)	Single members		Awaiting
8.5.3(1)	Parallel members within a load-sharing system		Awaiting
9.2.1	Deformations - general		Complementary information
9.3.1.5	Floor configuration		Complementary information
9.3.2.2(6)	Vibration criteria	National choice	Awaiting
10.1(2)	Fatigue - General	No further information	

Clause	Subject	Nationally Determined Parameter	Non-Contradictory Complementary Information
11.1.2(7)	Ductile connections		Complementary information
11.2.2.3(1)	Withdrawal resistance		Complementary information
11.2.3.6(1)	Characteristic yield moment		Complementary information
11.3.4(3)	Laterally-loaded fasteners – splitting		Complementary information
11.3.7(2)	Interaction of axial and lateral forces		Complementary information
11.3.8.2(6)	Initial slip modulus of a dowel-type fastener or shear connector		Complementary information
11.3.9.1(2)	Minimum number of fasteners –CL		Complementary information
11.3.9.1(4)	Minimum number of fasteners		Complementary information
11.3.9.1(5)	Minimum number of fasteners – use of one fastener		Complementary information
11.3.9.2(1)	Overlap of fasteners		Complementary information
11.3.9.4(1)	Execution - Shrinkage		Complementary information
11.3.10	Minimum thickness of members and minimum withdrawal length		Complementary information
11.3.11(1)	Pre-drilling requirements for dowel-type fasteners		Complementary information
11.3.11(3)	Pre-drilling requirements for dowel-type fasteners		Complementary information
11.3.12(1)	Dowel-type fasteners in end grain		Complementary information
11.3.12(3)	Dowel-type fasteners in end grain		Complementary information
11.4.5(1)(2)	Maximum spacings for laterally-loaded staples, nails and screws		Complementary information

Clause	Subject	Nationally Determined Parameter	Non-Contradictory Complementary Information
11.5.1(3)	Brittle failure modes of connections with dowel-type fasteners loaded parallel to grain – general – combined cross sections		Complementary information
12.2.3(10)	Framed diaphragms - Ultimate limit states		Complementary information
12.2.4(1)-(3)	Framed diaphragms - Verification of a sheathing panel resistance		Complementary information
12.3.1(1)	Framed wall diaphragms - General		Complementary information
12.3.2(5)	Framed wall diaphragms - Ultimate limit state		Complementary information
12.4.3(3)	Floor diaphragms - Type 1		Complementary information
12.4.4(2)	Floor diaphragms - Type 2		Complementary information
Annex A	Additional guidance to Basis of design	Informative	
A.3	Additional guidance for increasing the robustness of timber structures	Normative	
Annex B	Additional information to Structural Analysis	Informative	
B.3.3 NA	Stability and bracing of members and structural systems		Complementary information Awaiting
B.4	Buckling of beam columns – non-linear method	Informative	
B.5	Mechanical jointed members	Normative	
Annex C	Additional provisions to Ultimate Limit States	Normative	
C.3.1	Additional design provisions for cross laminated timber (CLT)- Field of application		Complementary information
C.3.6 NA	Effective bending stiffness of CLT		Complementary information
C.4.2(1)	Laminated timber decks - Basis of design (partial factor)	Awaiting calibration	

Clause	Subject	Nationally Determined Parameter	Non-Contradictory Complementary Information
C.4.2(2)	Laminated timber decks - Basis of design (partial factor)	Awaiting calibration	
Annex D	Additional information to Ultimate Limit States	Informative	
D.3	Build-up columns	Normative	
Annex E	Additional information to Serviceability Limit States	Informative	
Annex F	Additional provisions to Connections	Normative	
F.3.2(1)	Connections with punched metal plate fasteners - Design resistances (partial factor)	Awaiting	
F.3.2(2)	Connections with punched metal plate fasteners - Design resistances (partial factor)	Awaiting	
F.3.9(3)	Connection strength verification out of plane of timber assembly	National choice	
Annex G	Additional information to Connections	Informative	
G.3	Connection with three-dimensional connectors	National choice	Complementary information
Annex H	Additional information to Diaphragms	Informative	
H.4	Framed walls with combined anchorage	Informative	Complementary information
H.5 NA	Alternative design method for diaphragms		Complementary information
Annex I	Information on timber foundation piles	Informative	
Annex M	Material and product properties for design	Normative	
M.6.1(1)	Structural parameters determined by testing	Unchanged	
M.6.2(1)	Connectors, punched metal plate fasteners, metal plate connectors and metal 3D-connectors	Unchanged	
M.6.5	Characteristic withdrawal strength of screws and rods with wood screw thread		Complementary information
M.7(1)	Timber foundation piles	Unchanged	

Clause	Subject	Nationally Determined Parameter	Non-Contradictory Complementary Information
Annex N	Additional information on material and product properties for design	Informative	
N.1(1)	Use of this annex		Complementary information
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.			

National Determined Parameter (NDP) and Non-contradictory complementary Information (NCCI)

4.3.1.3(1) Load-duration classes

(NDP)

Actions shall be assigned to load-duration classes given in Table 4.1 NA.

Table 4.1 NA — Load-duration classes and examples of load-duration assignment

Load-duration class	Accumulated duration of characteristic load	Examples of loading
Permanent	more than 10 years	self-weight, prestress, differential settlements
Long-term	6 months – 10 years	storage, load category E
Medium-term	1 week – 6 months	imposed floor load, moisture variations, loads not mentioned otherwise
Short-term	less than one week	snow load, traffic load, temperature effect, ice load, load on scaffolding and temporary structures
Instantaneous	usually less than one minute	wind load, impact load ^a , seismic action, acceleration and breaking force, load on inaccessible structures ^b
NOTE	The load-duration classes are characterised by the effect of a constant load acting for a certain period during the design service life of the structure.	
a	including loads from ships and waves	
b	e.g. point load on roof structures	

4.3.1.4(1) Service classes (SC)

(NDP)

The following assignments may be used:

- SC 1: members inside insulated and heated spaces with low relative humidity;
- SC 2: members in unheated spaces which are not exposed to rain, including temporarily heated spaces and ventilated roof spaces;
- SC 3: members exposed to weather where rain will run off or spaces with a higher relative humidity than permitted in SC2;
- SC 4: members submerged in soil or water, (e.g. foundation piles and marine structures).

4.5.1(1) Design value of a material strength of wood or wood-based products

(NDP)

Awaiting calibration of partial factors.

4.5.2(1) Design value of a resistance of wood and wood-based products

(NDP)

Awaiting calibration of partial factors.

5.1.3 Overview of products for structural members

(NCCI)

(2) NA The declared strength parameters according to EN 14080 (including density) for both GLh and GLc can be used for any purpose.

(3) NA Glulam lamellas that are strength graded according to DS/INSTA 142 as LT20 and LT30, can be assumed to meet the requirements for strength class T15 and T22 respectively as defined in EN338, when producing glued laminated timber according to EN 14080.

6.2.1(2) Measures to prevent a biological attack – Service class and use class

(NCCI)

NOTE 3 NA The relation between Service Classes and Use Classes according to DS/EN 335 is that UC 1, 2, 3-1 and 4 corresponds to SC1, 2, 3 and 4. UC 3-2 cannot be referred to a Service Class.

6.2.1(3) Measures to prevent a biological attack – Effect of impregnation

(NCCI)

The effect of pressure impregnation may be disregarded. Heat treated timber is not suitable for structural purposes.

6.2.1(4) Measures to prevent a biological attack – Ingress of water

(NCCI)

Exposure to weather causing ingress of water should be avoided unless special measures are taken to ensure durability. Exposed heads of fasteners are normally acceptable.

6.2.2.1(1) Basic constructive measures – preferred moisture content

(NDP)

The ideal moisture content for each product at the time of installation is the expected yearly average moisture content in use. Higher or lower values can be permitted by the building owner. A moisture protection plan should ensure that the moisture content stays within an acceptable range during the entire construction phase. Expected movements can be determined using Table 5.8.

For structural timber the maximum moisture content at the time of installation in SC2 is generally 18 %, for unheated roof structures 20 %. For GL and CLT the maximum in SC2 is generally 14 %. For wood-based panels in SC1 and SC2 the minimum moisture content is generally the equilibrium moisture content at 40 % relative humidity. If conditioned at 60 % relative humidity wood-based panels in SC1 might be installed without gaps between the panel edges.

6.2.2.1(2) Basic constructive measures – Hygrothermal simulations

(NCCI)

Numerical simulations should be used with great care and take into account the variability of the material properties, of the outdoor climate and the 2D and 3D effects on the flow of moisture and heat.

6.2.2.1(3) Basic constructive measures – Structural protection

(NCCI)

The protection needed against precipitation should be evaluated based on the actual exposure, which is highly affected by the wind climate. Exposed members should be referred to SC3 and exposed connections should be protected in accordance with NCCI to 6.2.1(4). No general recommendation is given for the angle α in Figure 6.1.

6.2.2.2(1) Special constructive measures

(NDP)

Clause 6.2.2.2 should not be used.

7.4.1(3) Equivalent imperfections

(NCCI)

NOTE 2 NA The eccentricity e is the maximum eccentricity due to the equivalent bow imperfection.

7.5.1(1) Bracing - general

(NCCI)

In accordance with NOTE to 7.5.1(1) the supplementary guidance given in (coming) B.3.3 NA should be used because the approach in 7.5.2 is conservative, there are errors in Figure 7.5, and Formula (7.12) is wrong.

7.5.2(6) Simplified requirements for the bracing of members – torsional moment

(NCCI)

The torsional moment at the fork supports can be taken as $T_d = \frac{M_d}{80}$ for ST, and $T_d = \frac{M_d}{100}$ for GL, if the deformation of the bracing system is limited to $L/500$.

7.6 Analysis of assemblies sensitive for the load cases handling, transport and erection

(NCCI)

(7) NA As an alternative to (3), (4), (5) and (6), the manufacturer should provide instructions for handling, transport and execution of the products which by experience ensure that the product is not damaged in the process.

(8) NA During erection of trussed rafters, the tolerances a_{bow} , a_{dis} and a_{dev} as defined in Figure 7.6 NA should be limited to the following values

$$a_{\text{bow}} \leq \max \begin{cases} 10 \text{ mm} \\ \frac{l}{500} \leq 45 \text{ mm} \end{cases} \quad \begin{array}{l} \text{over 3 m straight edge:} \\ a_{\text{bow}} \leq 15 \text{ mm} \end{array} \quad (7.22 \text{ NA})$$

$$a_{dis} \leq \max \begin{cases} 10 \text{ mm} \\ \frac{h}{100} \leq 45 \text{ mm} \end{cases} \quad (7.23 \text{ NA})$$

$$a_{dev} \leq \max \begin{cases} 10 \text{ mm} \\ \frac{h}{100} \leq 45 \text{ mm} \end{cases} \quad \text{for } l > 14 \text{ m} \quad (7.24 \text{ NA})$$

where l is the span length

h is the truss height at the considered section

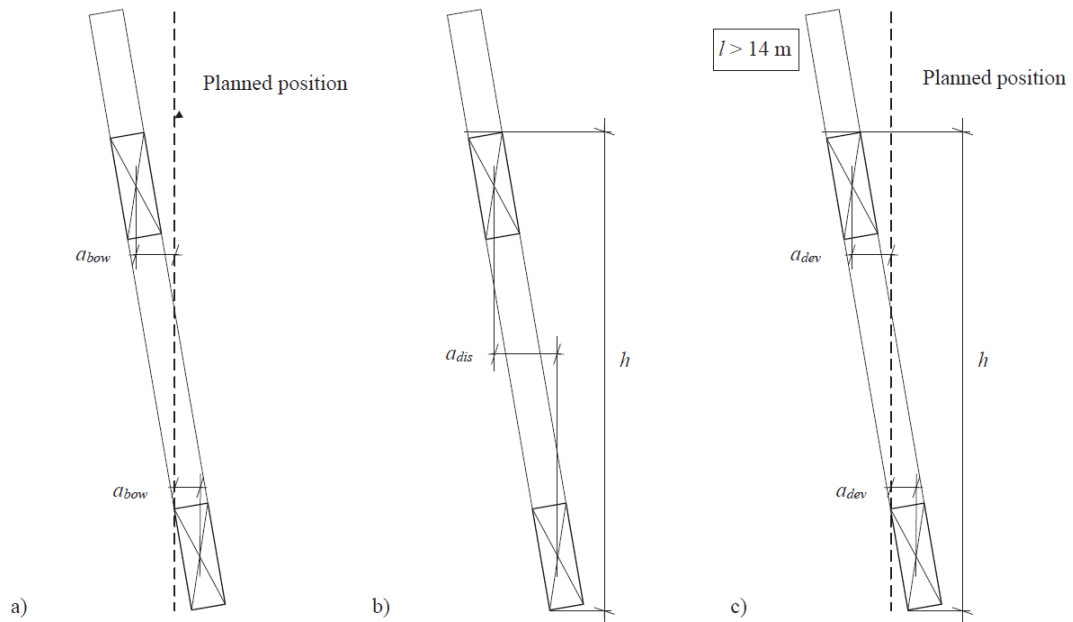


Figure 7.6 NA - Tolerances for erection of trussed rafters

For larger tolerances the additional load effects should be taken into account in the design, especially for the bracing system.

8.1.1 Member resistance verification - CLT

(NCCI)

Clause in accordance with pr. A1, where a clause (4) is added.

(5)NA For CLT elements subjected to in-plane normal stresses, each principal direction should be considered separately, and for the determination of stresses the cross-layers may be disregarded. The shear stiffness of the cross-layers may be assumed infinitely large with respect to bending effects. For column action, the shear stiffness of the cross-layers should be taken into account.

NOTE See Annex C.3.1(2) NA and C.3.6 NA

8.1.6.1(2) Compression perpendicular to grain - general

(NDP – NOTE 4)

Table 8.1, footnote a): Case A should only be used if it is necessary to limit deformations.

In multi-storey buildings it is generally needed to limit deformations that accumulate over height.

8.1.11.1(4) Shear - general

(NCCI)

For members in SC1 and SC2 which are not exposed to direct sunlight or subjected to large variation in the moisture content the value $k_{var} = 1,25$ may be used. Then $k_v f_{v,k}$ may be taken as 2,9 MPa for ST and 3,1 MPa for GL. For GL with $h \leq 600$ mm $k_v f_{v,k}$ may be taken as $f_{v,k}$.

8.3.5.1(5) Notched members - CLT

(NCCI)

For CLT the shear strength should be taken as the rolling shear strength, using $k_v = 1,0$.

8.3.5.1(6) Notched members - CLT

(NCCI)

For CLT k_n in (8.80) may be taken as 5.

8.3.5.1(7) Notched members - CLT

(NCCI)

For CLT the effective height h_{ef} should be taken as the depth to the lower side of the lowest longitudinal lamella not affected by the notch.

8.5.2(2) Single members formed by components - GL

(NCCI)

NOTE 1 applies to both combined and homogeneous glulam.

8.5.2(3) System strength - Single members

(NCCI)

Awaiting - Limitations on the use of k_{sys} might be necessary.

8.5.3(1) System strength - Parallel members within a load-sharing system

(NCCI)

Awaiting - NCCI needed on requirement to load-sharing system.

9.2.1 Deformations - simplification

(NCCI)

(3) NA The vertical deformation of roof and floor structures is normally satisfying in SC1, SC2 and SC3 when the deformation is within the limits shown in Table 9.1.a NA.

NOTE The limits only apply directly if the materials have the same value of k_{def} .

The horizontal deformation of a frame or a column is normally satisfying when the deformation is within the limits given in Table 9.1.b NA.

Table 9.1.a NA — Limits for vertical deformation for each load component

Load component	Limit
Self-weight, no prechamber	$w_{\text{inst}}(1+k_{\text{def}}) \leq l/400$
Self-weight, with prechamber $w_c \geq 0,8 w_{\text{inst}}(1+k_{\text{def}})$	$w_{\text{inst}}(1+k_{\text{def}}) \leq l/250$
Characteristic snow load	$w_{\text{inst}} \leq l/400$
Characteristic wind load	$w_{\text{inst}} \leq l/250$
Characteristic imposed load	$w_{\text{inst}}(1+\psi_2 k_{\text{def}}) \leq l/350$
w_{inst} is the instantaneous deformation of the structure for the characteristic value of each load component. It is equivalent to the deformation when the load determined from (9.3) using only one load at a time. l is the span	

Table 9.1.b NA — Limits for horizontal deformation for wind-load

Structure	Limit
Frame without a crane system	$w_{\text{inst}} \leq h/150$
Column in a one-story building	$w_{\text{inst}} \leq h/300$
Column in a multistory building, per story	$w_{\text{inst}} \leq h/300$
Top of the building	$w_{\text{inst}} \leq h_e/500$
w_{inst} is the instantaneous deformation of the structure for the characteristic value of the wind load. h is the height of the single column h_e is the height of the building	

9.3.1.5 Floor configuration

(NCCI)

Clause in accordance with pr. A1.

NOTE 3 NA Along the edge parallel to the (primary) spanning direction floors may be unsupported, non-rigid supported or rigid supported. Most floors should be regarded as support along all four edges, see also NOTE to (2).

9.3.2.2(6) Vibration criteria

(NDP)

Table 9.2 NA – Recommended selection of floor performance levels for transient floors where $f_1 \geq 8$ Hz

Use category	Recommended level
For multistorey buildings for residential or office use	Level IV or V ^a
For floors within a single-family houses and single-dwelling units	Level VI
a	The recommendation do not apply to cases where the vibrations originate from a neighbouring unit.

9.3.2.2(6) Vibration criteria

(NCCI)

Awaiting.

11.1.2(7) Ductile connections

(NCCI)

Connections with dowel-type fasteners under lateral load are ductile independent of which of the failure modes in Figure 11.5 occurs. This ductility is due to the embedment strength being plastic, even when the dowel does not yield.

For bonded-in-rods yielding of the rod will not be governing in practice.

11.2.2.3(1) Withdrawal resistance

(NCCI)

Corrections to Table 11.2, withdrawal strength:

- A: For profiled nails, the upper limit for d without predrilling is given by 11.3.11.
- A.1: For profiled nails, the parameter 2 in (1) may be replaced a higher declared value in N/mm² for reference conditions as specified in 11.2.1.(4).
- A.1. Profiled nails should not be used in the edge face of CL. For the wide face $d \geq 4$ mm .
- B.1: For screws in CL, $d \geq 8$ mm applies only to the edge face. For the wide face $d \geq 6$ mm.
- E: For smooth nails, the upper limit for d without predrilling is given by 11.3.11.

When a manufacturer declares a value of $f_{w,350,k}$ for reference density $\rho_k = 350$ kg/m³, an alternative to Formula (5) in Table 11.2 is

$$f_{w,k} = f_{w,350,k} k_w k_{mat} \left(\frac{\rho_k}{350} \right)^{k_p} \quad (5A \text{ NA})$$

NOTE NA If a declared value of $f_{ax,k}$ determined in accordance with EN 14358 is given, then see M.6.5(9)NA for $f_{w,k}$.

11.2.3.6(1) Characteristic yield moment

(NCCI)

Clause in accordance with pr. A1, from 11.2.4.6(1).

Table 11.7, yield moment for screws:

- Using the inner diameter d_1 in (3) in Table 11.7 is very conservative. For $d \geq 12$ mm only declared values should be used for design.
- The approximate inner diameters in (4) in Table 11.7 should not be used for design.

11.3.4(3) Laterally-loaded fasteners – splitting

(NCCI)

Clause in accordance with pr. A1.

In Figure 11.11 the distance a_1 should be doubled in accordance with the clause.**11.3.7(2) Interaction of axial and lateral forces**

(NCCI)

Table 11.11, bolts, screws etc.:

NOTE NA The differentiation of p for screws dependent on the failure mode is a disadvantage for screws in relation to comparable nails.

11.3.8.2(6) Initial slip modulus of a dowel-type fastener or shear connector

(NCCI)

To Table 11.12:

NOTE 1 NA For screws K_{SLs} in (5) is much smaller than for otherwise comparable nails.

NOTE 2 NA For gypsum board to timber connections the mean density in (12) is determined from Formula (11.27) taking the gypsum density as $\rho_{mean,1}$.

11.3.9.1(2) Minimum number of fasteners – CL

(NCCI)

Table 11.14 is replaced by:

Table 11.14 NA – Minimum number of fasteners in CL

Type	n_{min}
Nails	6
Screws	4 ^a
NOTE	The minimum withdrawal lengths l_w in Table 11.2 should be observed.
a	If screws penetrate at least three layers then $n_{min} = 2$ may be used.

11.3.9.1(4) Minimum number of fasteners

(NCCI)

The meaning of the clause is:

A one shear-plane connection with bolts should comprise at least four bolts. A two shear-plane connection should comprise at least two bolts or dowels.

11.3.9.1(5) Minimum number of fasteners – use of one fastener

(NCCI)

Bracing members may be fixed with only one fastener.

11.3.9.2(1) Overlap of fasteners

(NCCI)

Clause in accordance with pr. A1, Figure 11.18 is changed to Figure 11.17.

1,5 mm steel plates can be fastened by 4,0x35 mm connector nails from both sides of a 45 mm member, even if the $4d$ requirement is not met.

The caption to Figure 11.17 a) should read 'Screws, nails and staples'.

11.3.9.4(1) Execution - Shrinkage

(NCCI)

NOTE The risk of splitting during shrinkage is generally small if the distance between the outermost fasteners in the steel plate does not exceed 400 mm.

11.3.10 Minimum thickness of members and minimum withdrawal length

(NCCI)

The entire clause including Table 11.15 should not be used.

The minimum withdrawal lengths l_w in Table 11.2 and minimum thicknesses in 11.3.11 should be observed.

11.3.11(1) Pre-drilling requirements for dowel-type fasteners

(NCCI)

In the 2nd and 4th pin '≥' should read '>' (four places)

Add a new pin:

- for nails and screws inserted in members of SL PL CL, LVL-P and GLVL-P if the thickness is smaller than $t_{\min}$, where $t_{\min} = \begin{cases} 7d \\ \frac{(13d-30)\rho_k}{400} \end{cases}$ with d in mm and ρ_s in kg/m³.

11.3.11(3) - Pre-drilling requirements for dowel-type fasteners

(NCCI)

In 2nd line delete 'or in edge faces of LVL or GLVL, '

Pre-drilling may be omitted for timber with higher MC than 10 % and $d \leq 5$ mm.

11.3.12(1) Dowel-type fasteners in end grain

(NCCI)

The third pin should read

- the point side embedment depth is at least $t_{h,2} = 20d$ and the point side withdrawal length is at least $l_{w,2} = 10d$;

11.3.12(3) Dowel-type fasteners in end grain

(NCCI)

Delete 'axial', i.e. neither transmitting lateral nor axial load.

11.4.5(1)(2) Maximum spacings for laterally-loaded staples, nails and screws

(NCCI)

Replace (1) and (2) by:

Sheathing-to-framing spacing of fasteners in diaphragms should be in accordance with 12.2.2 and 12.2.3.

11.5.1(3) Brittle failure modes of connections with dowel-type fasteners loaded parallel to grain - general – combined cross sections

(NCCI)

The clause should not be used. See 5.1.3(2)NA.

12.2.3(10) Framed diaphragms - Ultimate limit state

(NCCI)

k_{pl} should be taken as 1,0 also for panels with free edges.

NOTE The shear flow $s_{res,d}$ is defined in (12.13) for walls (called $s_{0,d}$ since $s_{90,d}$ is not needed, see (11)) and in (12.28) for floors.

12.2.4(1)-(3) Framed diaphragms - Verification of a sheathing panel resistance

(NCCI)

As an alternative to 12.2.4(1) – (3) and for fastener spacing $a_1 \geq 70$ mm the sheathing panel resistance may be assumed sufficient when $a_{net,rib} \leq 70 t_p$.

12.3.1(1) Framed wall diaphragms - General

(NCCI)

The trailing stud should be supported for the downward action, see (12.14).

12.3.2(5) Framed wall diaphragms - Ultimate limit state

(NCCI)

Walls with free panel edges can be designed using H.5.2 DK NA.

12.4.3(3) Floor diaphragms - Type 1

(NCCI)

The shear flow determined from (12.28) for panels with free edges cannot be taken lower than the value determined from (12.27).

An alternative design method is given in H.5.3 DK NA.

12.4.4(2) Floor diaphragms - Type 2

(NCCI)

The shear flow determined from (12.31) for panels with free edges cannot be taken lower than the value determined from (12.30).

An alternative design method is given in H.5.3 DK NA.

B.3.3 NA - Stability and bracing of members and structural systems

(NCCI)

Awaiting.

C.3.1 Field of application

(NCCI)

(2) NA C.3.6 NA deals with effective bending stiffness of CLT members.

C.3.6 NA Effective bending stiffness of CLT

(NCCI)

(1) For CLT the effective stiffness taking into account the shear deformation of the cross layers should be used for determining the deflection from loads perpendicular to the element and for determining the relative slenderness ratio.

(2) The formulae in B.5.3 and B.5.4 for mechanically jointed members may be used for CLT with no more than two cross layers when s_i / K_i in (B.85) is taken as

$$\frac{s_i}{K_i} = \frac{t_i}{G_{\text{rul},i} b_{\text{CLT}}} \quad (\text{C.9A NA})$$

where t_i is the thickness of the cross layer

$G_{\text{rul},i}$ is the roiling shear modulus of the cross layer

b_{CLT} is the width of the panel

l is taken as the actual length of the panel

NOTE A modified method known as Schelling's method can be used for any number of cross layers.

(3) The relative slenderness ratio should be determined using the strength, stiffness and area of the lamellas in the x-direction, see Figure 3.1.

(4) As an alternative, the principle of virtual work may be used to take the deformation contribution of the shear-flexible cross layers into account, the effect of which is often referred to as Timoshenko beam theory.

C.4.2(1) Laminated timber decks - Basis of design (partial factor)

(NDP)

Awaiting calibration of partial factors.

C.4.2(2) Laminated timber decks - Basis of design (partial factor)

(NDP)

Awaiting calibration of partial factors.

F.3.2(1) Connections with punched metal plate fasteners - Design resistances (partial factor)

(NDP)

Awaiting calibration of partial factors.

F.3.2(2) Connections with punched metal plate fasteners - Design resistances (partial factor)

(NDP)

Awaiting calibration of partial factors.

F.3.9(3) Connection strength verification out of plane of timber assembly

(NDP)

In (F.40) the value of p should be taken as 2.0.

G.3 Connections with three-dimensional connectors

(NDP)

Annex G.3 is not applicable. The principles in EAD 130186 can be used.

H.4 Framed walls with combined anchorage

(NCCI)

H.4 should be used with care.

H.5 NA Alternative design method for diaphragms

H.5.1 Field of application

H.5.2 gives a method to design wall diaphragms where panels have free edges, see also Figure 12.2. It supplements 12.3 since no method for walls diaphragms with free panel edges are given in 12.

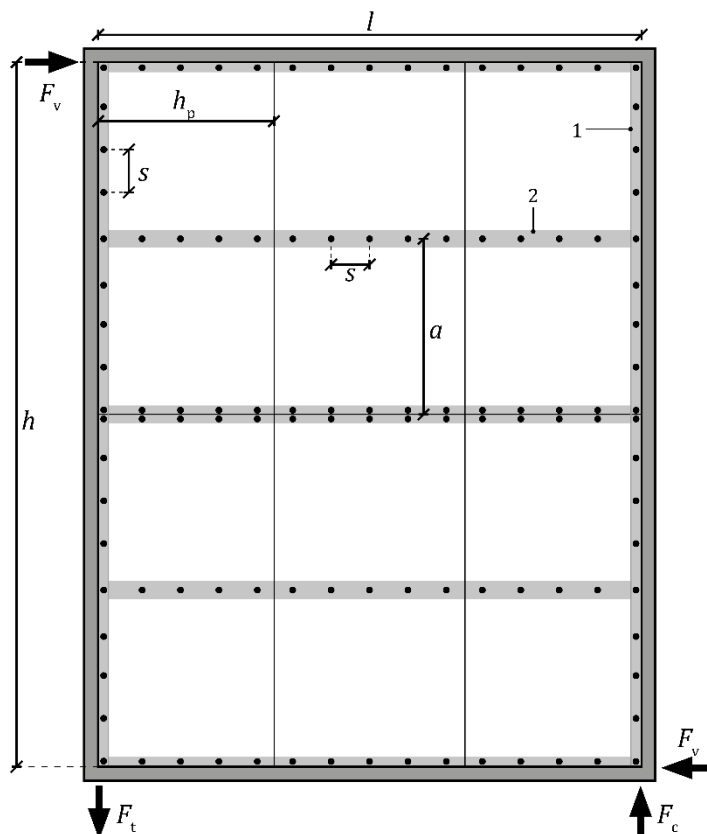
H.5.3 gives examples of how other diaphragm configurations may be designed by analogy to walls.

H.5.2 Walls with free panel edges

(1) The design formulae below give the design resistance $F_{v,Rd}$ of a wall diaphragm as function of geometry, the fastener spacing s and the design resistance $F_{s,d}$ of the fasteners. $F_{s,d}$ is taken as $F_{v,d}$, determined by (11.13).

NOTE This approach is different from the one used in 12, where it is the needed shear flow for a given load $F_{v,Ed}$ that is determined. With the approach used here (12.13) would be $F_{v,Ed} = F_{s,d} l/s$. The shear flow is $s_0 = F_{s,d}/s$.

Figure H.8 NA - Definition of geometry and forces for diaphragms with free (unsupported) internal panel edges



key

l	width of diaphragm in the direction of the load F_v
h	height of the diaphragm
s	spacing of the fasteners
h_p	dimension of sheet along the supports
F_v	horizontal load and reaction
F_t, F_c	vertical reactions

(2) The design load-carrying capacity for a load $F_{v,Rd}$ acting along the top of a diaphragm as in Figure H.8 NA should be taken as

$$F_{v,Rd} = \alpha F_{s,d} \frac{l}{a} \quad (\text{H.46 NA})$$

where

$$\alpha = 0,9 \left(\frac{e}{s} + 1 \right) \left(1 - \frac{e}{h_p} \right)$$

$$e = \min[a - s; 0,35h_p]$$

$$s \leq 150 \text{ mm}$$

and provided that

- the spacing s of fasteners is constant along all supports;
- the panels at the ends of the diaphragm are fastened to a continuous end stud;
- the stiffness of the diaphragm is sufficient to ensure that the compression reaction F_c will act at the end of the diaphragm;
- the load carrying capacity of the timber members is sufficient.

(3) The reactions are

$$F_{t,Ed} = F_{c,Ed} = F_{v,Ed} \frac{h}{l} \quad (\text{H.47 NA})$$

where $F_{v,Ed}$ is the actual horizontal design load

(4) The sectional forces in the supports are

$$V_{\max} = \frac{\alpha F_{v,Ed}}{0,9l} \quad (\text{between two panels}) \quad (\text{H.48 NA})$$

$$V_{\text{midspan}} = V_{\max} \frac{e}{h_p - 2} \quad (\text{at midspan of panel}) \quad (\text{H.49 NA})$$

$$M_{\max} = \beta V_{\max} \quad (\text{H.50 NA})$$

where

$$\beta = \frac{e}{2} \left(1 - \frac{e}{h_p} \right) \left(1 - \frac{s}{h_p} \right)$$

H.5.3 Analogies for other diaphragms

(1) A wall diaphragm subjected to a distributed load q along an edge may be regarded as a diaphragm subjected to an equivalent concentrated load F_v acting in the centre of gravity of the distributed load along

the same edge. The height of the panel is then taken as the distance H to the equivalent load, see Figure H.9 NA.

NOTE An example is a double pitched roof sustaining wind load on the gables of the building with no transfer of load over the ridge.

Figure H.9 NA - A diaphragm subjected to distributed load q along one edge may be regarded as a wall diaphragm with dimensions $H \times l$ subjected to an equivalent concentrated load F_v .

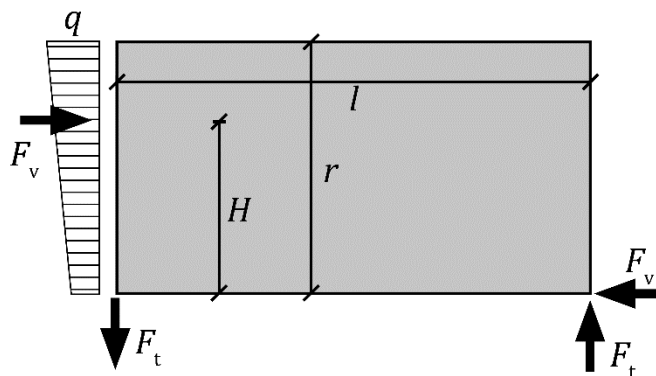
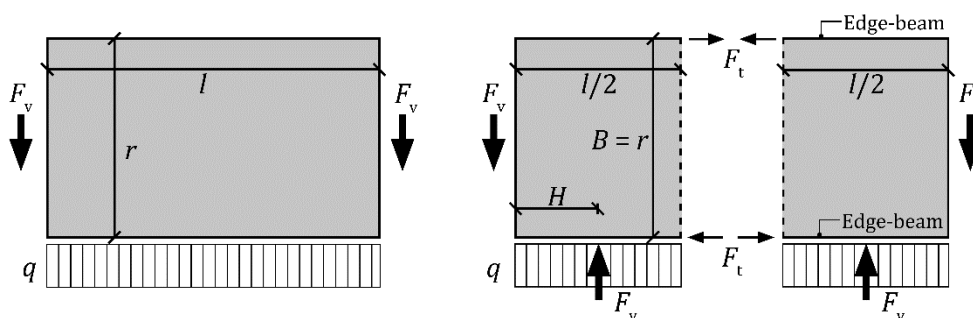


Figure H.10 NA - A diaphragm supported along two opposite sides may be regarded as two wall diaphragms with dimensions $H \times h$ each subjected to an equivalent concentrated load F_v .



(2) A diaphragm supported along two opposite edges, may be regarded as two wall diaphragms subjected to load q along an edge as illustrated in Figure H.10 NA. Each wall is designed according to (1). The edge-beams should be able to sustain the reactions F_t and F_v .

NOTE Examples are floor and roof diaphragms sustaining wind load on the facades.

(3) If the load q acts perpendicular to the supports it shall be ensured that it can be transferred to the panel. This may be ensured by blockings, see Figure 12.13.

M.6.5 Characteristic withdrawal strength of screws and rods with wood screw thread

(NCCI)

Clause in accordance with pr. A1, where M.6.4 is changed.

Clauses (2) to (7) should not be used.

(9) NA $f_{w,350,k}$ may be estimated from declared values of $f_{ax,k}$ for screws when determined in accordance with EN 14358 for reference density $\rho_k = 350 \text{ kg/m}^3$ as $f_{w,350,k} = 0,36 f_{ax,k}$.

N.1(1) Use of this annex

(NCCI)

The strength categories in Table N.1, N.2 and N.3 are only informative and should not be used for design. The strength and stiffnesses for gypsum boards in Table N.4 and N.5 may be used for design.

Awaiting - Embedment strength properties for gypsum panels will be included later.

Categories for screws in Table N.6 and N.7 should not be used. Strength parameters should be taken from the relevant Declaration of performance, or from section 11 where applicable.