NORDIC

TECHNICAL GUIDE
NORDIC X-LAM

NS-GT6

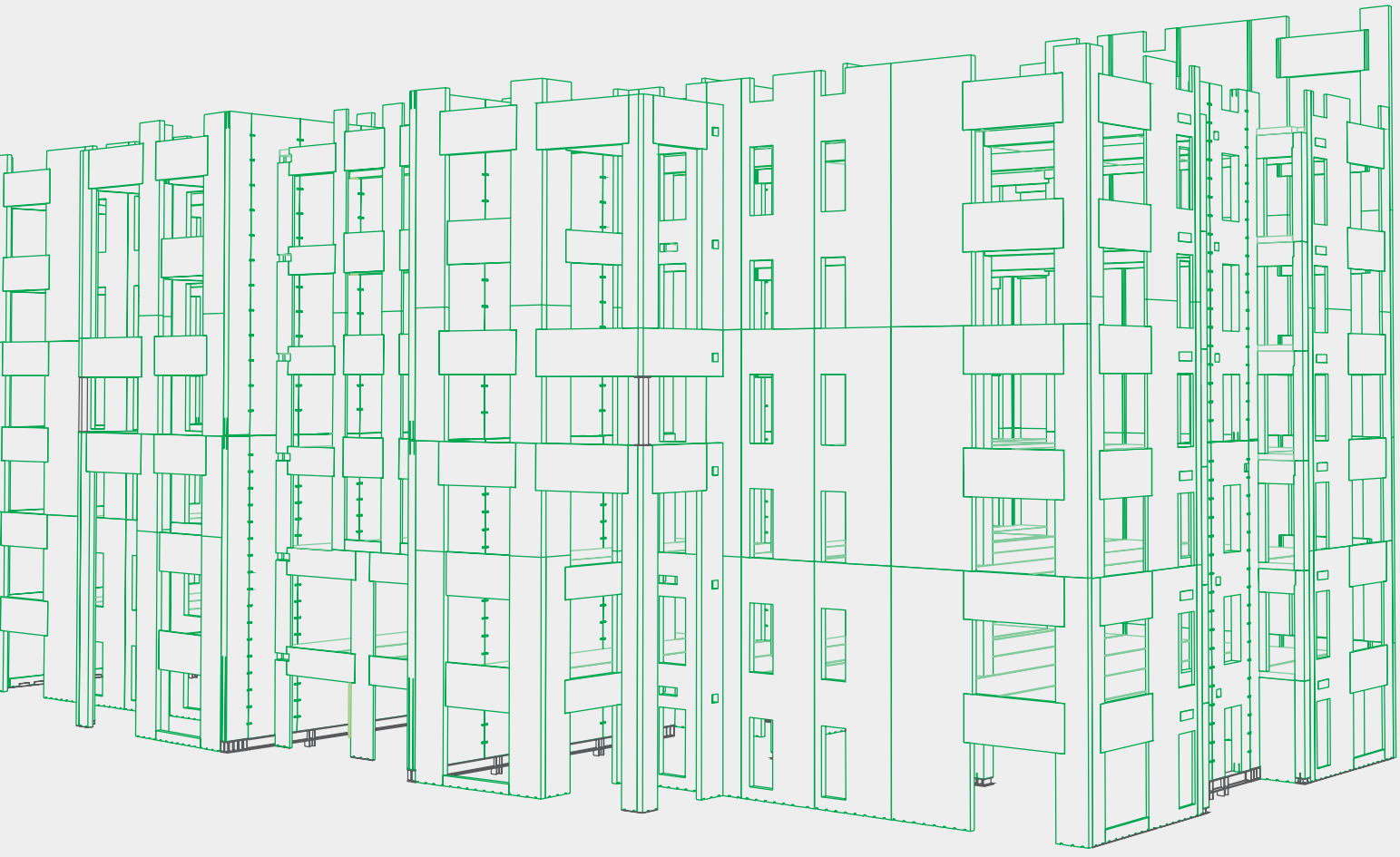
ENGLISH

VERSION
2022-04-21

Mass Timber Construction

NORDIC X-LAM TECHNICAL GUIDE

NORDIC X-LAM



NORDIC STRUCTURES

ABOUT NORDIC

NORDIC STRUCTURES

Nordic Structures is the leading innovator in mass timber construction. Its resource comes from responsibly managed lands within the regional boreal forest. Vertical integration, from forest to structure, bolstered by Nordic's experienced design and development team, ensures consistent quality and unparalleled level of service.

514-871-8526
1 866 817-3418

HEAD OFFICE

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GENERAL INFORMATION

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TABLE OF CONTENTS

NORDIC X-LAM 1

STRUCTURE 2

STRUCTURAL DETAILS 3

ARCHITECTURAL DETAILS 4

ADDITIONAL INFORMATION 5

ENGINEERED WOOD PRODUCTS

Standard size products available
from our distributors

NS-GT3

NORDIC JOIST

NORDIC I-JOISTS

Nordic I-joists are composed of sawn lumber flanges connected by a structural oriented strand board and bonded together with exterior-grade adhesives.

NI-20 — RESIDENTIAL SERIES

2×3 S-P-F No. 2, 3/8 in. web
Depths
9-1/2 and 11-7/8 in.

NI-40x

2×3 1950f MSR, 3/8 in. web
Depths
9-1/2, 11-7/8 and 14 in.

NI-60

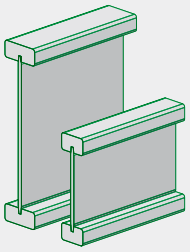
2×3 2100f MSR, 3/8 in. web
Depths
9-1/2, 11-7/8, 14 and 16 in.

NI-80

2×4 2100f MSR, 3/8 in. web
Depths
9-1/2, 11-7/8, 14 and 16 in.

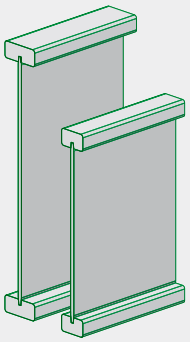
NI-90

2×4 2400f MSR, 7/16 in. web
Depths
11-7/8, 14 and 16 in.



NI-80x — COMMERCIAL SERIES

2×4 2100f MSR, 7/16 in. web
Depths
18, 20, 22 and 24 in.



NS-GT4

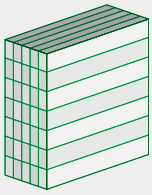
NORDIC LAM

NORDIC LAM
GLUED-LAMINATED TIMBER

Nordic Lam glued-laminated timber of industrial appearance grade consists of small wood laminations bonded together in parallel using structural adhesives.

BEAMS AND HEADERS

Widths
1-3/4, 3-1/2, 5-1/2 and 7 in.
Depths
9-1/2, 11-7/8, 14, 16, 18, 20, 22 and 24 in.
Lengths*
Up to 48 ft
Stress grade
24F-1.9E



COLUMNS

Widths
3-1/2, 5-1/2 and 7 in.
Depths
3-1/2, 5-1/2 and 7 in.
Lengths*
Up to 48 ft
Stress grade
ES12

STUDS

Widths
1-1/2 and 1-3/4 in.
Depths
5-1/2 and 7-1/4 in.
Lengths*
Up to 48 ft
Stress grade
ES11

* Larger sizes available upon request

MASS TIMBER CONSTRUCTION

Products custom-manufactured
and machined for major projects

NS-GT5

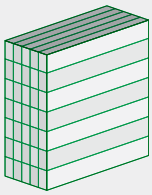
NORDIC LAM+

NORDIC LAM+ GLUED-LAMINATED TIMBER

Nordic Lam+ glued-laminated timber of architectural appearance grade consists of small wood laminations bonded together in parallel using structural adhesives.

BEAMS AND COLUMNS

Widths*
38, 86, 137, 184, 215, 241, 292, 346, 395, 448, 502, 552 and 603 mm
(1-1/2, 3-3/8, 5-3/8, 7-1/4, 8-1/2, 9-1/2, 11-1/2, 13-5/8, 15-1/2, 17-5/8, 19-3/4, 21-3/4 and 23-3/4 in.)



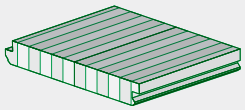
Depths*
From 67 to 2435 mm
(2-5/8 to 95-7/8 in.)

Lengths*
Up to 24.4 m (80 ft)

Stress grade
24F-ES/NPG

DECKING

Thicknesses*
38, 44, 54 and 89 mm
(1-1/2, 1-3/4, 2-1/8 and 3-1/2 in.)



Widths
203, 305 and 406 mm
(8, 12 and 16 in.)

Lengths
Up to 18.9 m (62 ft)

Stress grades
ES11, except 89 mm thickness in 20F-ES/CPG

* Larger sizes available upon request

NS-GT6

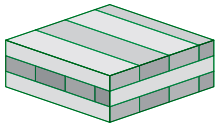
NORDIC X-LAM

NORDIC X-LAM CROSS-LAMINATED TIMBER

Nordic X-Lam cross-laminated timber is made of at least three orthogonal layers of graded sawn lumber that are laminated by gluing with structural adhesives.

SLABS AND PANELS

Layup combinations
89-3s, 105-3s,
143-5s, 175-5s,
197-7s, 213-7l, 245-7s, 245-7l
and 267-9l



Maximum sizes
2.70 × 19.5 m (106-1/4 in. × 64 ft)

Stress grade
E1 (L 1950Fb and T No. 3/Stud)

NORDIC

TECHNICAL GUIDE
NORDIC X-LAM

NS-GT6

ENGLISH

VERSION
2022-04-21

NORDIC X-LAM 1

NORDIC
STRUCTURES

CLT

NORDIC X-LAM

NORDIC X-LAM
CROSS-LAMINATED TIMBER

Nordic X-Lam cross-laminated timber is made of at least three orthogonal layers of graded sawn lumber that are laminated by gluing with structural adhesives.

SLABS AND PANELS

Layup combinations
89-3s, 105-3s,
143-5s, 175-5s,
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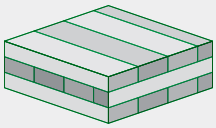
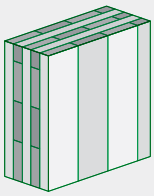
and 267-9l

Maximum sizes
2.70 × 19.5 m (106-1/4 in. × 64 ft)

Stress grade
E1 (L 1950Fb and T No. 3/Stud)

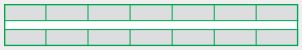




NORDIC X-LAM LAYUP COMBINATIONS

3 LAYERS

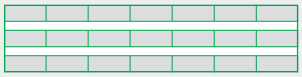
89-3s



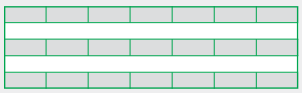
105-3s

5 LAYERS

143-5s

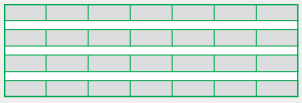


175-5s

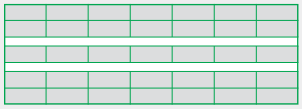


7 LAYERS

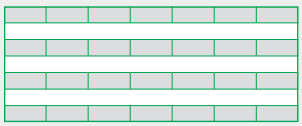
197-7s



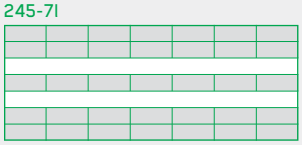
213-7l



245-7s

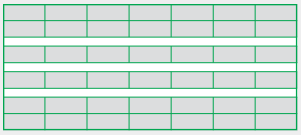


245-7l



9 LAYERS

267-9l



Nordic X-Lam – Specification Guide

Specifications

Cross-laminated timber (CLT) products shall be used in dry service conditions, such as in most covered structures, where the average equilibrium moisture content of solid wood over a year is 15% or less and does not exceed 19%. CLT products are intended to resist the effects of moisture on structural performance as may occur due to construction delays or other conditions of similar severity.

Master format 06 17 19

REFERENCE STANDARD

.1 ANSI/APA PRG 320-[2018], Standard for Performance-Rated Cross-Laminated Timber.

ACTION AND INFORMATION SUBMITTALS

.1 Submit the product report published by a certification agency accredited by the Standards Council of Canada at completion of fabrication.

MATERIALS

.1 Laminating stock: Spruce-Pine-Fir, [FSC certified]
.2 Sealer: Penetrating type, clear sealer (Sansin KP-12UVW) applied only to exposed (architectural-grade) surfaces
.3 Preservative: [Specify as required]
.4 Fire retardant: [Specify as required]

FABRICATION

.1 Stress grade: E1
.2 Service grade: Interior
.3 Appearance grade:

SPEC NOTE: Typically, only the exposed (visible) surfaces are of architectural appearance grade.
Faces: [industrial (U.N.O.)] [one industrial face – one architectural face] [architectural]
Edges: industrial
Note: Laminations are not edge-glued; Panel edges are not meant to be showcased.

.4 Fire resistance: [Specify as required]

ERECTION

.1 Erect cross-laminated timber members in accordance with erection drawings issued for construction.

For the detailed specification guide: https://www.nordic.ca/en/documentation/technical-documents

Nordic X-Lam – Appearance Grades

The following examples of CLT appearance grades are for reference only. These requirements are based on the appearance at the time of manufacturing. The actual CLT product appearance requirements are recommended to be agreed upon between the buyer and the seller.

Industrial Appearance

An appearance grade normally suitable for use in concealed applications where appearance is not of primary concern. Specific characteristics of this grade are as follows:

- Voids appearing on the edges of laminations need not be filled.
- Loose knots and knot holes appearing on the face layers exposed to view are not filled.
- Members are surfaced on face layers only and the appearance requirements apply only to these layers.
- Occasional misses, low laminations or wane (limited to the lumber grade) are permitted on the surface layers and are not limited in length.

Architectural Appearance

An appearance grade normally suitable for applications where appearance is an important but not overriding consideration. Specific characteristics of this grade are as follows:

- In exposed surfaces, all knot holes and voids measuring over 19 mm are filled with a wood-tone filler or clear wood inserts selected for similarity with the grain and color of the adjacent wood.
- The face layers exposed to view are free of loose knots and open knot holes are filled.
- Knot holes do not exceed 19 mm when measured in the direction of the lamination length with the exception that a void may be longer than 19 mm if its area is not greater than 323 mm^2.
- Voids greater than 1.6 mm wide created by edge joints appearing on the face layers exposed to view are filled.
- Exposed surfaces are surfaced smooth with no misses permitted.

Nordic X-Lam – Certifications

Product Certifications

Nordic X-Lam cross-laminated timber (CLT) products, certified by APA – The Engineered Wood Association (apawood.org), are manufactured in accordance with the applicable standards and associated specifications indicated below:

- ANSI/APA PRG 320, Standard for Performance-Rated Cross-Laminated Timber
- CCMC Listing 13654-L
- APA Product Report PR-L306C

APA is a not-for-profit trade association and is accredited by the Standards Council of Canada (SCC) as a Product Certification Body under ISO Guide 65. APA is also an accredited testing organization recognized by SCC under ISO/IEC 17025.

The ANSI/APA PRG 320 standard is recognized in the National Building Code (NBC) and is required for using the design provisions specified in CSA O86, Engineering design in wood.

Green Certifications

Wood – efficient and ecological

Overview of environmental certifications:

- Green Verification Report APA GR-L306
- Low Formaldehyde Emissions Products APA PR-E740
- Environmental Product Declaration (EPD), Nordic X-Lam
- Health Product Declaration (HPD), Nordic X-Lam
- Declare (ILFI), Nordic X-Lam
- USDA Certified Biobased Product, Product 100%
- Cradle to Cradle Certified, Nordic X-Lam
- FSC-certified products available

Note: For independently verified LEED (Leadership in Energy and Environmental Design) points, refer to APA GR-L306.

See nordic.ca for details.

Nordic X-Lam – Transparency Brief

The Nordic X-Lam business-to-business environmental product declaration (EPD) is based on a cradle-to-gate life cycle analysis (LCA). The delivery of the product to the customer, its use and eventual end-of-life processing are excluded from the EPD.

Forest Operations

The assessment of the life cycle impacts of Nordic wood product begins with its origin in managed forests and the energy use and emissions caused by its extraction. Forest management and reforestation that occurs after extraction are also included.

Nordic is committed to sustainable forestry as defined in the Forest Stewardship Council (FSC) forest management certification. Nordic's wood fiber sources fall into the following category:

- Certified sources of wood fiber come from FSC certified forests

CLT Production

The cross-laminated timber (CLT) production phase begins with the transportation of logs to the finished product. These processes consume fossil fuel (65.7%), electricity drawn from regional grids (22.5%), internally generated biomass (9.4%) and nuclear (2.4%).

Environmental Impacts

Atmosphere		
	Global warming potential	121.89 kg CO_2 eq.
	Ozone depletion potential	1.79E-06 kg CFC-11 eq.
	Photochemical ozone creation potential	35.53 kg O_3 eq.
Water		
	Acidification potential	1.19 kg SO_2 eq.
	Eutrophication potential	0.11 kg N eq.
Earth		
	Depletion of abiotic resources (elements)	38.84 kg
	Depletion of abiotic resources (fossil fuels)	1831.88 MJ

Material Content

Component – for 1 m^3 of Nordic X-Lam	**Mass (kg)**	**Mass (%)**
Wood (on oven dry basis); renewable	406 kg	98.9 %
Resins (polyurethane and isocyanate)	4.46 kg	1.1 %
Total	410.46 kg	100 %

Carbon Balance

Impact Category – for 1 m^3 of Nordic X-Lam	**Carbon (kg of CO_2 eq.)**
Forest carbon uptake	-741.36 kg of CO_2 eq.
Life cycle greenhouse gas emissions	121.89 kg of CO_2 eq.
Unaccounted biogenic carbon emissions	28.50 kg of CO_2 eq.
Net global warming potential	-590.97 kg of CO_2 eq.

See nordic.ca for details.

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TECHNICAL GUIDE
NORDIC X-LAM

NS-GT6

ENGLISH

VERSION
2022-04-21

STRUCTURE 2

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STRUCTURES

Nordic X-Lam – Design Properties

Characteristics

Nordic X-Lam cross-laminated timber (CLT) is certified according to E1 CLT stress grade, using 1950 F_b-1.7E Spruce-Pine-Fir (S-P-F) MSR lumber in longitudinal layers and No. 3/Stud S-P-F lumber in the transverse layers. Nordic X-Lam products are certified by APA (Product Report PR-L306C) per the ANSI/APA PRG 320 Standard and shall be used in dry service conditions.

Material Design Properties

CLT stress grade	E1	
	Layers	
Orientation	Longitudinal	Transversal
Species combination	S-P-F	S-P-F
Stress class	1950 F_b-1.7E MSR	No. 3/Stud
Bending at extreme fibre, f_b (MPa)	28.2	7.0
Longitudinal shear, f_v (MPa)	1.5	1.5
Rolling shear, f_s (MPa)	0.5	0.5
Compression parallel to grain, f_c (MPa)	19.3	9.0
Compression perpendicular to grain, f_{cp} (MPa)	5.3	5.3
Tension parallel to grain, f_t (MPa)	15.4	3.2
Modulus of elasticity, E (MPa)	11 700	9 000
Shear modulus, G (MPa)	731	563
Rolling shear modulus, G_s (MPa)	73.1	56.3

Note:

1. Appearance grades as defined in ANSI/APA PRG 320 do not affect the structural performance of CLT panels.

Panel Layups

Layup [a]	Thickness and orientation of layers [b]	Number of layers	Thickness		Weight		
			(mm)	(in.)	(kg/m²)	(kN/m²)	(psf)
89-3s	35L - 19T - 35L	3	89	3-1/2	45.9	0.45	9.40
105-3s	35L - 35T - 35L	3	105	4-1/8	54.1	0.53	11.1
143-5s	35L - 19T - 35L - 19T - 35L	5	143	5-5/8	73.7	0.72	15.1
175-5s	35L - 35T - 35L - 35T - 35L	5	175	6-7/8	90.1	0.88	18.5
197-7s	35L - 19T - 35L - 19T - 35L - 19T - 35L	7	197	7-3/4	102	1.00	20.8
213-7l	35L - 35L - 19T - 35L - 19T - 35L - 35L	7	213	8-3/8	110	1.08	22.5
245-7s	35L - 35T - 35L - 35T - 35L - 35T - 35L	7	245	9-5/8	126	1.24	25.9
245-7l	35L - 35L - 35T - 35L - 35T - 35L - 35L	7	245	9-5/8	126	1.24	25.9
267-9l	35L - 35L - 19T - 35L - 19T - 35L - 19T - 35L - 35L	9	267	10-1/2	138	1.35	28.2

a) The layup designation refers to the panel thickness (in mm), the number of layers, and the layer orientations ("s" for standard perpendicular layers, and "l" for doubled outermost parallel layers).

b) L = longitudinal, T = transversal, 35 = 35 mm, 19 = 19.1 mm

Floor/Roof Slabs – Design Properties

Floor/Roof Slabs – Design Properties

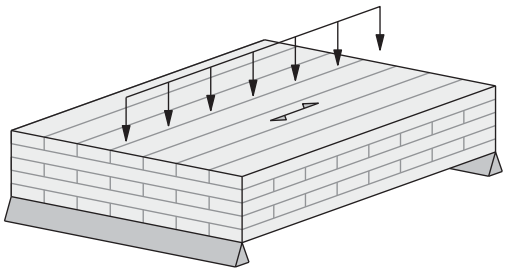
CLT stress grade	E1 (L = 1950 F_b-1.7E S-P-F MSR and T = No. 3/Stud S-P-F)								
Layup	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
Bending in the major strength direction									
Flatwise bending moment resistance, $M_{r,f,0}$ (kN-m/m) [(a)]	28	38	65	88	116	158	155	200	239
Flatwise shear resistance, $V_{r,f,0}$ (kN/m) [(b)]	27	32	43	53	59	64	74	74	80
Effective flatwise bending stiffness, $(EI)_{eff,f,0}$ (10^9 N-mm^2/m)	683	1 088	2 531	4 166	6 194	9 117	10 306	13 279	17 327
Effective shear stiffness in flatwise bending, $(GA)_{eff,f,0}$ (10^6 N/m)	7.6	7.3	15	15	23	25	22	22	32
Bending in the minor strength direction									
Flatwise bending moment resistance, $M_{r,f,90}$ (kN-m/m) [(a)]	0.38	1.3	5.0	11	11	5.0	26	11	11
Flatwise shear resistance, $V_{r,f,90}$ (kN/m) [(b)]	5.7	11	22	32	38	22	53	32	38
Effective flatwise bending stiffness, $(EI)_{eff,f,90}$ (10^9 N-mm^2/m)	5.2	32	263	837	1 045	263	3 220	837	1 045
Effective shear stiffness in flatwise bending, $(GA)_{eff,f,90}$ (10^6 N/m)	5.7	9.1	11	18	17	14	27	20	19

a) The factored flatwise bending moment resistance values, $M_{r,f}$, include the resistance factor, φ, and the adjustment factor K_{rb} as defined in CSA O86:19.

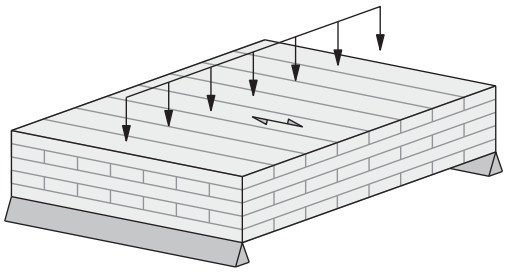
b) The factored flatwise shear resistance values, $V_{r,f}$, include the resistance factor, φ.

Notes:

1. The tabulated design values are for dry service conditions and standard-term duration of load.
2. The compressive resistance perpendicular to grain values shall be based on S-P-F No. 3/Stud lumber (f_{cp} = 5.3 MPa).
3. The specific gravity for dowel-type fastener design, G, is 0.42.
4. The density for member weight is 515 kg/m^3 (5.1 kN/m^3) for a moisture content of 12%.
5. Design of CLT members shall be in accordance with CSA O86:19.



Bending in the major strength direction



Bending in the minor strength direction

Floor Slabs – Sizing

Live load = 1.9 kPa – Simple Span

Layup selection

Dead load [a] (kPa)	L (m) [b, c]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
1.0	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	197-7s	197-7s	213-7l	213-7l	213-7l
1.5						105-3s	105-3s												
2.0					105-3s	105-3s	143-5s				175-5s			197-7s					245-7s
2.5				105-3s	105-3s	143-5s				175-5s		197-7s	197-7s		213-7l	213-7l		245-7s	245-7l
3.0			105-3s	143-5s	143-5s			143-5s	175-5s		197-7s			213-7l			245-7s		
3.5		105-3s						175-5s											
4.0																			
4.5																			
5.0																			

Live load = 1.9 kPa – Double Span

Layup selection

Dead load [a] (kPa)	L (m) [b, d]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
1.0	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	197-7s	197-7s	197-7s
1.5						89-3s													
2.0					89-3s				143-5s		143-5s	143-5s							
2.5			89-3s	89-3s						143-5s			143-5s						
3.0		89-3s					105-3s	143-5s	143-5s										
3.5				89-3s	89-3s	105-3s				143-5s									
4.0			89-3s																
4.5		89-3s											175-5s						197-7s
5.0																			

a) Specified dead load. The panel self weight is considered in the calculation and shall not be included in the specified dead load.

b) Span is measured centre to centre of supports.

c) The maximum spans for vibration control, l_v, are increased by 10% as recommended by Nordic Structures.

d) The maximum spans for vibration control, l_v, are increased by 20% for non-structural elements that are considered to provide enhanced vibration effect.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance.
2. Tables are based on uniform loads and dry service conditions, for bending in the major strength direction of the panel.
3. The ultimate limit states take into account the factored bending moment and shear resistances. The serviceability limit states include the consideration for floor vibration, a live load deflection limit of L/360 and a total load deflection limit of L/180.
4. Fire-resistance rating takes into account the bending moment and the shear resistances of the effective cross-section.
5. Fire-resistance rating:

30 min	60 min	90 min	120 min

Live load = 2.4 kPa – Simple Span

Layup selection

Dead load [a] (kPa)	L (m) [b, c]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
1.0	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	197-7s	197-7s	213-7l	213-7l	213-7l
1.5						105-3s					143-5s								
2.0					105-3s		143-5s				175-5s			197-7s		213-7l		245-7s	245-7l
2.5			105-3s	105-3s		143-5s			143-5s	175-5s		197-7s	197-7s		213-7l		245-7s		
3.0					143-5s			143-5s	175-5s		197-7s			213-7l			245-7l		267-9l
3.5		89-3s		143-5s			143-5s	175-5s											
4.0		105-3s					175-5s												
4.5																			
5.0																			

Live load = 2.4 kPa – Double Span

Layup selection

Dead load [a] (kPa)	L (m) [b, d]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
1.0	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	197-7s	197-7s	197-7s
1.5																			
2.0					89-3s				143-5s		143-5s								
2.5			89-3s	89-3s		89-3s	105-3s			143-5s		143-5s	143-5s						197-7s
3.0								105-3s	143-5s										
3.5		89-3s		89-3s	89-3s		105-3s			143-5s	143-5s								
4.0			89-3s			105-3s		143-5s	143-5s				175-5s			197-7s		197-7s	197-7s
4.5		89-3s																	
5.0					105-3s		143-5s												

a) Specified dead load. The panel self weight is considered in the calculation and shall not be included in the specified dead load.

b) Span is measured centre to centre of supports.

c) The maximum spans for vibration control, l_v, are increased by 10% as recommended by Nordic Structures.

d) The maximum spans for vibration control, l_v, are increased by 20% for non-structural elements that are considered to provide enhanced vibration effect.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance and of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC (if applicable).
2. Tables are based on uniform loads and dry service conditions, for bending in the major strength direction of the panel.
3. The ultimate limit states take into account the factored bending moment and shear resistances. The serviceability limit states include the consideration for floor vibration, a live load deflection limit of L/360 and a total load deflection limit of L/180.
4. Fire-resistance rating takes into account the bending moment and the shear resistances of the effective cross-section.
5. Fire-resistance rating:

30 min	60 min	90 min	120 min

Live load = 4.8 kPa – Simple Span

Layup selection

Dead load [a] (kPa)	L (m) [b, c]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
1.0	89-3s	89-3s	89-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	175-5s	197-7s	197-7s	197-7s	213-7l	213-7l	213-7l
1.5																			245-7s
2.0		89-3s			143-5s			143-5s					197-7s			213-7l		245-7s	
2.5			105-3s				143-5s		175-5s			197-7s			213-7l		245-7s		245-7l
3.0				143-5s		143-5s		175-5s			197-7s		213-7l	213-7l		245-7s		245-7l	
3.5	89-3s	105-3s	143-5s		143-5s		175-5s			197-7s		213-7l			245-7s	245-7l	245-7l		267-9l
4.0																			
4.5																			
5.0			143-5s		143-5s		175-5s				213-7l				245-7s			267-9l	

Live load = 4.8 kPa – Double Span

Layup selection

Dead load [a] (kPa)	L (m) [b, d]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
1.0	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	197-7s	197-7s	197-7s	197-7s
1.5																			197-7s
2.0		89-3s					143-5s											197-7s	197-7s
2.5								143-5s									197-7s		
3.0			89-3s		105-3s				143-5s	143-5s		175-5s		175-5s	197-7s	197-7s		197-7s	213-7l
3.5	89-3s	89-3s		89-3s		105-3s	143-5s	143-5s			143-5s		175-5s				197-7s		
4.0												175-5s		197-7s	197-7s	197-7s		197-7s	
4.5				105-3s		143-5s					175-5s						197-7s	213-7l	
5.0																	213-7l		245-7s

a) Specified dead load. The panel self weight is considered in the calculation and shall not be included in the specified dead load.

b) Span is measured centre to centre of supports.

c) The maximum spans for vibration control, l_v, are increased by 10% as recommended by Nordic Structures.

d) The maximum spans for vibration control, l_v, are increased by 20% for non-structural elements that are considered to provide enhanced vibration effect.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance and of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC (if applicable).
2. Tables are based on uniform loads and dry service conditions, for bending in the major strength direction of the panel.
3. The ultimate limit states take into account the factored bending moment and shear resistances. The serviceability limit states include the consideration for floor vibration, a live load deflection limit of L/360 and a total load deflection limit of L/180.
4. Fire-resistance rating takes into account the bending moment and the shear resistances of the effective cross-section.
5. Fire-resistance rating:

30 min	60 min	90 min	120 min

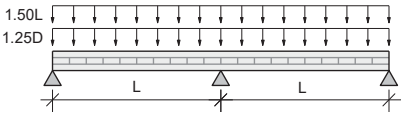
Floor Slabs – Selection Tables

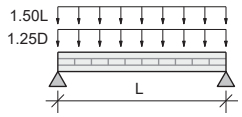
Ultimate Limit States – Factored Bending Moment and Shear Resistances

Maximum factored uniform load (kPa)

L [(a)] (m)	Layup								
	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0									
3.2	14.13								
3.4	13.26								
3.6	12.49	14.92							
3.8	11.81	14.10							
4.0	11.20	13.36							
4.2	10.65	12.70							
4.4	10.15	12.10							
4.6	9.69	11.55							
4.8	9.28	11.05							
5.0	8.89	10.60	14.42						
5.2	8.28	10.17	13.84						
5.4	7.68	9.79	13.31						
5.6	7.14	9.43	12.81						
5.8	6.66	9.04	12.35						
6.0	6.22	8.44	11.92	14.83					
6.2	5.83	7.91	11.52	14.32					
6.4	5.47	7.42	11.15	13.86					
6.6	5.14	6.98	10.80	13.42					
6.8	4.84	6.57	10.47	13.01	14.56				
7.0	4.57	6.20	10.16	12.62	14.12				
7.2	4.32	5.86	9.87	12.25	13.71	14.93			
7.4	4.09	5.55	9.50	11.91	13.33	14.51			
7.6	3.88	5.26	9.00	11.58	12.96	14.11			
7.8	3.68	5.00	8.55	11.28	12.61	13.73			
8.0	3.50	4.75	8.13	10.98	12.28	13.37			
8.2		4.52	7.73	10.47	11.97	13.03			
8.4		4.31	7.37	9.98	11.68	12.71	14.79	14.79	
8.6		4.11	7.03	9.52	11.40	12.40	14.42	14.42	
8.8		3.93	6.71	9.09	11.13	12.11	14.08	14.08	
9.0		3.75	6.42	8.69	10.87	11.83	13.75	13.75	14.93
9.2		3.59	6.14	8.32	10.63	11.56	13.44	13.44	14.59
9.4			5.89	7.97	10.39	11.30	13.14	13.14	14.27
9.6			5.64	7.64	10.07	11.06	12.86	12.86	13.96
9.8			5.41	7.33	9.66	10.83	12.59	12.59	13.66

Ultimate limit states
- $M_r \geq M_f$
- $V_r \geq V_f$





a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for live load and total load deflections. If applicable, the final design shall include a consideration for floor vibration, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, standard-term duration of load, and the most restrictive of simple span or double span, for bending in the major strength direction of the panel.
3. The above values apply to slabs with a specified dead load less or equal to the specified live load. If the specified dead load is greater than the specified live load, multiply the maximum factored uniform load by the corresponding adjustment factor:

Adjustment factor based on specified dead load / specified live load ratio (D/L)

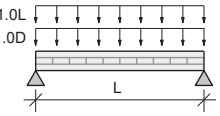
D/L	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.952	0.912	0.878	0.849	0.824	0.801	0.780	0.761

Serviceability Limit States – L/180, Simple Span

Maximum specified uniform total load (kPa)

L [(a)] (m)	Layup								
	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0	6.56	9.88							
3.2	5.46	8.28							
3.4	4.59	7.00							
3.6	3.90	5.97							
3.8		5.13	11.79						
4.0		4.43	10.21						
4.2		3.86	8.89						
4.4			7.79						
4.6			6.87	10.81					
4.8			6.08	9.60					
5.0			5.40	8.56					
5.2			4.83	7.67	11.43				
5.4			4.33	6.89	10.27				
5.6			3.89	6.21	9.26				
5.8			3.52	5.62	8.38				
6.0				5.10	7.61	10.94			
6.2				4.64	6.92	9.97	11.01		
6.4				4.24	6.32	9.11	10.07		
6.6				3.88	5.78	8.34	9.24	11.59	
6.8				3.56	5.30	7.66	8.49	10.67	
7.0					4.87	7.05	7.82	9.84	
7.2					4.49	6.50	7.22	9.10	12.00
7.4					4.15	6.01	6.68	8.42	11.10
7.6					3.84	5.56	6.19	7.81	10.30
7.8					3.56	5.16	5.75	7.26	9.56
8.0						4.80	5.34	6.76	8.90
8.2						4.47	4.98	6.30	8.29
8.4						4.16	4.64	5.88	7.74
8.6						3.89	4.34	5.50	7.23
8.8						3.64	4.06	5.15	6.77
9.0							3.80	4.83	6.35
9.2							3.57	4.53	5.96
9.4								4.26	5.60
9.6								4.01	5.27
9.8								3.78	4.96

Serviceability limit states
- $\Delta_{ST} + \Delta_{LT} K_{creep} \leq L/180$



a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for live load and total load deflections. If applicable, the final design shall include a consideration for floor vibration, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.
3. The above values apply to slabs with a specified dead load less or equal to the specified live load. If the specified dead load is greater than the specified live load, multiply the maximum specified uniform total load by the corresponding adjustment factor:

Adjustment factor based on specified dead load / specified live load ratio (D/L)

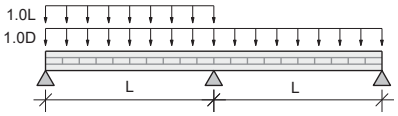
D/L	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.964	0.938	0.917	0.900	0.886	0.875	0.865	0.857

Serviceability Limit States – L/180, Double Span

Maximum specified uniform total load (kPa)

L [(a)] (m)	Layup								
	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0	11.90								
3.2	9.99								
3.4	8.47								
3.6	7.23	10.71							
3.8	6.22	9.28							
4.0	5.39	8.08							
4.2	4.69	7.08							
4.4	4.11	6.23							
4.6	3.62	5.51							
4.8		4.90	11.24						
5.0		4.37	10.03						
5.2		3.91	9.00						
5.4		3.52	8.09						
5.6			7.31	11.36					
5.8			6.62	10.32					
6.0			6.01	9.41					
6.2			5.47	8.59					
6.4			5.00	7.87	11.74				
6.6			4.58	7.22	10.78				
6.8			4.20	6.65	9.91				
7.0			3.87	6.13	9.14				
7.2			3.56	5.66	8.44				
7.4				5.24	7.81	11.17			
7.6				4.86	7.24	10.37	11.38		
7.8				4.51	6.73	9.64	10.60		
8.0				4.20	6.26	8.98	9.88		
8.2				3.91	5.83	8.38	9.23	11.51	
8.4				3.65	5.44	7.83	8.63	10.78	
8.6					5.08	7.32	8.08	10.11	
8.8					4.76	6.86	7.58	9.49	
9.0					4.46	6.44	7.12	8.92	11.79
9.2					4.19	6.04	6.69	8.40	11.09
9.4					3.93	5.68	6.30	7.91	10.45
9.6					3.70	5.35	5.93	7.46	9.85
9.8						5.04	5.60	7.04	9.29

Serviceability limit states
- $\Delta_{ST} + \Delta_{LT} K_{creep} \leq L/180$



a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for live load and total load deflections. If applicable, the final design shall include a consideration for floor vibration, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.
3. The above values apply to slabs with a specified dead load less or equal to the specified live load. If the specified dead load is greater than the specified live load, multiply the maximum specified uniform total load by the corresponding adjustment factor:

Adjustment factor based on specified dead load / specified live load ratio (D/L)

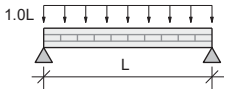
D/L	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.964	0.938	0.917	0.900	0.886	0.875	0.865	0.857

Serviceability Limit States – L/360, Simple Span

Maximum specified uniform live load (kPa)

L [(a)]	Layup								
(m)	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0	4.92	7.42							
3.2	4.10	6.21							
3.4	3.45	5.26							
3.6	2.93	4.48							
3.8	2.51	3.85							
4.0	2.16	3.33	7.66						
4.2		2.90	6.67						
4.4		2.54	5.85						
4.6		2.23	5.15	8.11					
4.8		1.98	4.56	7.20					
5.0			4.06	6.42					
5.2			3.62	5.75					
5.4			3.25	5.17	7.71				
5.6			2.92	4.66	6.95				
5.8			2.64	4.22	6.29				
6.0			2.39	3.83	5.71	8.21			
6.2			2.17	3.49	5.20	7.48	8.26		
6.4			1.98	3.18	4.74	6.84	7.56		
6.6				2.91	4.34	6.26	6.93		
6.8				2.67	3.98	5.75	6.37	8.01	
7.0				2.46	3.66	5.29	5.87	7.39	
7.2				2.26	3.37	4.88	5.42	6.83	
7.4				2.09	3.11	4.51	5.01	6.32	8.33
7.6				1.94	2.88	4.18	4.65	5.86	7.73
7.8					2.67	3.88	4.31	5.45	7.18
8.0					2.48	3.60	4.01	5.07	6.68
8.2					2.31	3.35	3.74	4.73	6.22
8.4					2.15	3.13	3.49	4.42	5.81
8.6					2.01	2.92	3.26	4.13	5.43
8.8						2.73	3.05	3.87	5.08
9.0						2.56	2.86	3.63	4.76
9.2						2.40	2.68	3.40	4.47
9.4						2.25	2.52	3.20	4.20
9.6						2.12	2.37	3.01	3.95
9.8						1.99	2.23	2.84	3.73

Serviceability limit states
- $\Delta_L \leq L/360$



a) Span is measured centre to centre of supports.

Notes:

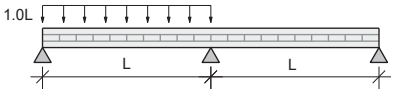
1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for live load and total load deflections. If applicable, the final design shall include a consideration for floor vibration, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.

Serviceability Limit States – L/360, Double Span

Maximum specified uniform live load (kPa)

L [(a)]	Layup								
(m)	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0	6.76								
3.2	5.65	8.41							
3.4	4.77	7.15							
3.6	4.06	6.12							
3.8	3.48	5.28							
4.0	3.01	4.58							
4.2	2.62	4.00							
4.4	2.29	3.51	8.06						
4.6	2.01	3.10	7.12						
4.8		2.74	6.32						
5.0		2.44	5.63						
5.2		2.18	5.04	7.89					
5.4		1.96	4.52	7.11					
5.6			4.08	6.43					
5.8			3.69	5.83					
6.0			3.34	5.30	7.90				
6.2			3.04	4.83	7.20				
6.4			2.78	4.42	6.58				
6.6			2.54	4.05	6.03				
6.8			2.33	3.72	5.54	7.95			
7.0			2.14	3.42	5.10	7.33	8.07		
7.2			1.97	3.16	4.70	6.77	7.46		
7.4				2.92	4.35	6.26	6.91		
7.6				2.70	4.03	5.81	6.42	8.04	
7.8				2.51	3.74	5.39	5.97	7.48	
8.0				2.33	3.47	5.02	5.56	6.98	
8.2				2.17	3.23	4.67	5.18	6.51	
8.4				2.03	3.02	4.36	4.84	6.09	8.03
8.6					2.82	4.08	4.53	5.70	7.52
8.8					2.63	3.82	4.24	5.35	7.05
9.0					2.47	3.58	3.98	5.02	6.61
9.2					2.31	3.36	3.74	4.72	6.21
9.4					2.17	3.15	3.51	4.44	5.84
9.6					2.04	2.97	3.31	4.18	5.50
9.8					1.92	2.80	3.12	3.95	5.19

Serviceability limit states
- $\Delta_L \leq L/360$



a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for live load and total load deflections. If applicable, the final design shall include a consideration for floor vibration, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.

Serviceability Limit States – Vibration, Simple Span

Maximum span, l_v (m)

Span	Layup								
	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
Simple	3.76	4.22	5.20	5.86	6.48	7.18	7.32	7.88	8.42

Notes:

1. The maximum spans for vibration control, l_v, are increased by 10% as recommended by Nordic Structures.
2. The tabulated values apply to simply supported floor slabs.

Serviceability Limit States – Vibration, Double Span

Maximum span, l_v (m)

Span	Layup								
	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
Double	4.10	4.61	5.67	6.39	7.07	7.84	7.98	8.00	8.42

Notes:

1. The maximum spans for vibration control, l_v, are increased by 20% for non-structural elements that are considered to provide enhanced vibration effect.
2. If applicable, the concrete topping area density shall not be greater than twice the bare CLT floor area density.
3. The tabulated values apply to simply supported floor slabs.

Roof Slabs – Sizing

Snow load = 1.5 kPa – Simple Span

Layup selection

Dead load [a] (kPa)	L (m) [b]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
0.5	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s
1.0								105-3s	105-3s						175-5s	175-5s			197-7s
1.5						105-3s	105-3s	105-3s		143-5s	143-5s			175-5s			197-7s	197-7s	
2.0						105-3s			143-5s				175-5s		197-7s	197-7s			213-7l
2.5					105-3s		143-5s	143-5s				175-5s		197-7s			213-7l	213-7l	
3.0				105-3s	105-3s	143-5s				175-5s	175-5s		197-7s		213-7l	213-7l			245-7l
3.5				105-3s	143-5s							197-7s							
4.0			105-3s						175-5s										
4.5			105-3s																

Snow load = 1.5 kPa – Double Span

Layup selection

Dead load [a] (kPa)	L (m) [b]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
0.5	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	105-3s	143-5s	143-5s	143-5s
1.0															143-5s	143-5s			
1.5									89-3s			105-3s	105-3s	143-5s			143-5s	143-5s	
2.0								89-3s		105-3s	105-3s				143-5s	143-5s			175-5s
2.5							89-3s		105-3s			143-5s	143-5s	143-5s			143-5s	175-5s	
3.0						89-3s		105-3s		143-5s	143-5s				175-5s	175-5s			197-7s
3.5				89-3s	89-3s		105-3s		143-5s								175-5s	197-7s	
4.0			89-3s			105-3s													
4.5																			

a) Specified dead load. The panel self weight is considered in the calculation and shall not be included in the specified dead load.

b) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance. If applicable, the final design shall include a consideration for vibration control and the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC.
2. Tables are based on uniform loads and dry service conditions, for bending in the major strength direction of the panel. Tables also consider a normal importance category for buildings as defined in Table 4.1.2.1. of the 2015 NBC.
3. The ultimate limit states take into account the factored bending moment and shear resistances. The serviceability limit states include a snow load deflection limit of L/240 and a total load deflection limit of L/180.
4. Fire-resistance rating takes into account the bending moment and shear resistances of the effective cross-section.
5. Fire-resistance rating:

30 min	60 min	90 min	120 min

Snow load = 2.5 kPa – Simple Span

Layup selection

Dead load [a] (kPa)	L (m) [b]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
0.5	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	197-7s
1.0						89-3s	105-3s		143-5s			143-5s	143-5s	175-5s	175-5s	197-7s	197-7s	197-7s	
1.5					89-3s	105-3s		143-5s			143-5s	175-5s	175-5s		197-7s			213-7l	213-7l
2.0					105-3s		143-5s			143-5s	175-5s			197-7s		213-7l	213-7l		
2.5			89-3s	105-3s		143-5s		143-5s	143-5s	175-5s		197-7s	197-7s		213-7l			245-7s	245-7s
3.0			105-3s		143-5s				175-5s		197-7s			213-7l		245-7s	245-7s		
3.5				143-5s				143-5s		197-7s		197-7s	213-7l		245-7s				
4.0		89-3s												245-7s					
4.5																			

Snow load = 2.5 kPa – Double Span

Layup selection

Dead load [a] (kPa)	L (m) [b]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
0.5	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	143-5s
1.0						89-3s					105-3s			143-5s				175-5s	175-5s
1.5					89-3s				105-3s	105-3s		143-5s	143-5s		175-5s	175-5s	175-5s		
2.0							89-3s	105-3s			143-5s								197-7s
2.5			89-3s	89-3s	89-3s				143-5s	143-5s				175-5s	175-5s			197-7s	
3.0						105-3s	105-3s	143-5s								175-5s	197-7s		197-7s
3.5																			
4.0		89-3s																	
4.5																			

a) Specified dead load. The panel self weight is considered in the calculation and shall not be included in the specified dead load.

b) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance. If applicable, the final design shall include a consideration for vibration control and the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC.
2. Tables are based on uniform loads and dry service conditions, for bending in the major strength direction of the panel. Tables also consider a normal importance category for buildings as defined in Table 4.1.2.1. of the 2015 NBC.
3. The ultimate limit states take into account the factored bending moment and shear resistances. The serviceability limit states include a snow load deflection limit of L/240 and a total load deflection limit of L/180.
4. Fire-resistance rating takes into account the bending moment and shear resistances of the effective cross-section.
5. Fire-resistance rating:

30 min	60 min	90 min	120 min

Snow load = 3.5 kPa – Simple Span

Layup selection

Dead load [a] (kPa)	L (m) [b]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
0.5	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	143-5s	175-5s	175-5s	175-5s	175-5s	197-7s	197-7s
1.0						105-3s					143-5s		175-5s			197-7s	197-7s		
1.5				89-3s			143-5s	143-5s		143-5s		175-5s			197-7s			213-7l	213-7l
2.0			89-3s		105-3s	143-5s			143-5s		175-5s		197-7s	197-7s			213-7l		
2.5				105-3s						175-5s									245-7s
3.0			105-3s		143-5s			143-5s	175-5s			197-7s	197-7s		213-7l	213-7l		245-7s	245-7l
3.5		89-3s		143-5s			143-5s	175-5s			197-7s			213-7l			245-7s	245-7l	
4.0		105-3s															245-7s		
4.5																			

Snow load = 3.5 kPa – Double Span

Layup selection

Dead load [a] (kPa)	L (m) [b]																		
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
0.5	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	89-3s	105-3s	105-3s	105-3s	143-5s	143-5s	143-5s	143-5s	143-5s	143-5s	143-5s
1.0									105-3s										175-5s
1.5				89-3s						143-5s	143-5s	143-5s					175-5s	175-5s	
2.0			89-3s		89-3s	89-3s		105-3s							175-5s	175-5s			
2.5				89-3s			105-3s		143-5s					175-5s					197-7s
3.0													175-5s				197-7s	197-7s	
3.5		89-3s				105-3s		143-5s											197-7s
4.0																			
4.5																			

a) Specified dead load. The panel self weight is considered in the calculation and shall not be included in the specified dead load.

b) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance. If applicable, the final design shall include a consideration for vibration control and the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC.
2. Tables are based on uniform loads and dry service conditions, for bending in the major strength direction of the panel. Tables also consider a normal importance category for buildings as defined in Table 4.1.2.1. of the 2015 NBC.
3. The ultimate limit states take into account the factored bending moment and shear resistances. The serviceability limit states include a snow load deflection limit of L/240 and a total load deflection limit of L/180.
4. Fire-resistance rating takes into account the bending moment and shear resistances of the effective cross-section.
5. Fire-resistance rating:

30 min	60 min	90 min	120 min

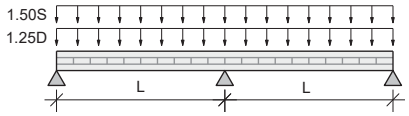
Roof Slabs – Selection Tables

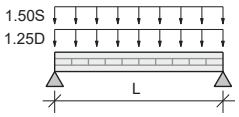
Ultimate Limit States – Factored Bending Moment and Shear Resistances

Maximum factored uniform load (kPa)

L [(a)]	Layup								
(m)	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0									
3.2	14.13								
3.4	13.26								
3.6	12.49	14.92							
3.8	11.81	14.10							
4.0	11.20	13.36							
4.2	10.65	12.70							
4.4	10.15	12.10							
4.6	9.69	11.55							
4.8	9.28	11.05							
5.0	8.89	10.60	14.42						
5.2	8.28	10.17	13.84						
5.4	7.68	9.79	13.31						
5.6	7.14	9.43	12.81						
5.8	6.66	9.04	12.35						
6.0	6.22	8.44	11.92	14.83					
6.2	5.83	7.91	11.52	14.32					
6.4	5.47	7.42	11.15	13.86					
6.6	5.14	6.98	10.80	13.42					
6.8	4.84	6.57	10.47	13.01	14.56				
7.0	4.57	6.20	10.16	12.62	14.12				
7.2	4.32	5.86	9.87	12.25	13.71	14.93			
7.4	4.09	5.55	9.50	11.91	13.33	14.51			
7.6	3.88	5.26	9.00	11.58	12.96	14.11			
7.8	3.68	5.00	8.55	11.28	12.61	13.73			
8.0	3.50	4.75	8.13	10.98	12.28	13.37			
8.2		4.52	7.73	10.47	11.97	13.03			
8.4		4.31	7.37	9.98	11.68	12.71	14.79	14.79	
8.6		4.11	7.03	9.52	11.40	12.40	14.42	14.42	
8.8		3.93	6.71	9.09	11.13	12.11	14.08	14.08	
9.0		3.75	6.42	8.69	10.87	11.83	13.75	13.75	14.93
9.2		3.59	6.14	8.32	10.63	11.56	13.44	13.44	14.59
9.4			5.89	7.97	10.39	11.30	13.14	13.14	14.27
9.6			5.64	7.64	10.07	11.06	12.86	12.86	13.96
9.8			5.41	7.33	9.66	10.83	12.59	12.59	13.66

Ultimate limit states
- $M_r \geq M_f$
- $V_r \geq V_f$





a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for snow load and total load deflections. If applicable, the final design shall include a consideration for vibration control, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, standard-term duration of load, and the most restrictive of simple span or double span, for bending in the major strength direction of the panel.
3. The above values apply to slabs with a specified dead load less or equal to the specified snow load. If the specified dead load is greater than the specified snow load, multiply the maximum factored uniform load by the corresponding adjustment factor:

Adjustment factor based on specified dead load / specified snow load ratio (D/S)

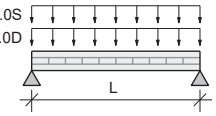
D/S	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.952	0.912	0.878	0.849	0.824	0.801	0.780	0.761

Serviceability Limit States – Simple Span, L/180

Maximum specified uniform total load (kPa)

L [(a)] (m)	Layup								
	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0	6.56	9.88							
3.2	5.46	8.28							
3.4	4.59	7.00							
3.6	3.90	5.97							
3.8		5.13	11.79						
4.0		4.43	10.21						
4.2		3.86	8.89						
4.4			7.79						
4.6			6.87	10.81					
4.8			6.08	9.60					
5.0			5.40	8.56					
5.2			4.83	7.67	11.43				
5.4			4.33	6.89	10.27				
5.6			3.89	6.21	9.26				
5.8			3.52	5.62	8.38				
6.0				5.10	7.61	10.94			
6.2				4.64	6.92	9.97	11.01		
6.4				4.24	6.32	9.11	10.07		
6.6				3.88	5.78	8.34	9.24	11.59	
6.8				3.56	5.30	7.66	8.49	10.67	
7.0					4.87	7.05	7.82	9.84	
7.2					4.49	6.50	7.22	9.10	12.00
7.4					4.15	6.01	6.68	8.42	11.10
7.6					3.84	5.56	6.19	7.81	10.30
7.8					3.56	5.16	5.75	7.26	9.56
8.0						4.80	5.34	6.76	8.90
8.2						4.47	4.98	6.30	8.29
8.4						4.16	4.64	5.88	7.74
8.6						3.89	4.34	5.50	7.23
8.8						3.64	4.06	5.15	6.77
9.0							3.80	4.83	6.35
9.2							3.57	4.53	5.96
9.4								4.26	5.60
9.6								4.01	5.27
9.8								3.78	4.96

Serviceability limit states
- $\Delta_{ST} + \Delta_{LT} K_{creep} \leq L/180$



a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for snow load and total load deflections. If applicable, the final design shall include a consideration for vibration control, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.
3. The above values apply to slabs with a specified dead load less or equal to the specified snow load. If the specified dead load is greater than the specified snow load, multiply the maximum specified uniform total load by the corresponding adjustment factor:

Adjustment factor based on specified dead load / specified snow load ratio (D/S)

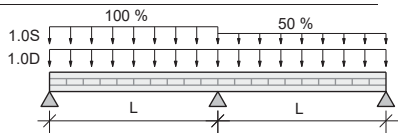
D/S	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.964	0.938	0.917	0.900	0.886	0.875	0.865	0.857

Serviceability Limit States – L/180, Double Span

Maximum specified uniform total load (kPa)

L [(a)]	Layup								
(m)	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0									
3.2	10.87								
3.4	9.22								
3.6	7.88	11.61							
3.8	6.79	10.07							
4.0	5.88	8.78							
4.2	5.13	7.70							
4.4	4.50	6.78							
4.6	3.97	6.01							
4.8	3.51	5.34							
5.0		4.77	10.94						
5.2		4.27	9.81						
5.4		3.84	8.84						
5.6			7.98						
5.8			7.23	11.23					
6.0			6.57	10.24					
6.2			5.99	9.36					
6.4			5.47	8.58					
6.6			5.01	7.88	11.76				
6.8			4.60	7.25	10.82				
7.0			4.24	6.69	9.98				
7.2			3.91	6.18	9.22				
7.4			3.61	5.72	8.54				
7.6				5.31	7.92	11.31			
7.8				4.93	7.36	10.52	11.54		
8.0				4.59	6.85	9.81	10.76		
8.2				4.28	6.38	9.15	10.06		
8.4				4.00	5.96	8.55	9.41	11.72	
8.6				3.74	5.57	8.00	8.82	11.00	
8.8				3.50	5.21	7.50	8.27	10.33	
9.0					4.89	7.04	7.77	9.72	
9.2					4.59	6.61	7.31	9.15	
9.4					4.31	6.22	6.88	8.62	11.40
9.6					4.06	5.86	6.49	8.14	10.75
9.8					3.82	5.52	6.12	7.69	10.15

Serviceability limit states
- $\Delta_{ST} + \Delta_{LT} K_{creep} \leq L/180$



a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for snow load and total load deflections. If applicable, the final design shall include a consideration for vibration control, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.
3. The above values apply to slabs with a specified dead load less or equal to the specified snow load. If the specified dead load is greater than the specified snow load, multiply the maximum specified uniform total load by the corresponding adjustment factor:

Adjustment factor based on specified dead load / specified snow load ratio (D/S)

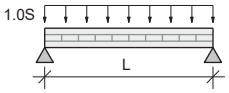
D/S	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.964	0.938	0.917	0.900	0.886	0.875	0.865	0.857

Serviceability Limit States – L/240, Simple Span

Maximum specified uniform snow load (kPa)

L [(a)]	Layup								
(m)	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0	7.39								
3.2	6.15	9.32							
3.4	5.17	7.88							
3.6	4.39	6.72							
3.8	3.76	5.77							
4.0	3.24	4.99							
4.2	2.81	4.35							
4.4	2.46	3.81	8.77						
4.6	2.16	3.35	7.73						
4.8	1.90	2.96	6.84						
5.0		2.63	6.09	9.64					
5.2		2.35	5.43	8.63					
5.4		2.11	4.87	7.76					
5.6			4.39	7.00					
5.8			3.96	6.33	9.43				
6.0			3.59	5.75	8.56				
6.2			3.26	5.23	7.79				
6.4			2.97	4.77	7.11				
6.6			2.72	4.37	6.51	9.39			
6.8			2.49	4.01	5.97	8.63	9.56		
7.0			2.29	3.69	5.49	7.94	8.81		
7.2			2.10	3.40	5.06	7.32	8.13		
7.4			1.94	3.14	4.67	6.77	7.52	9.48	
7.6				2.90	4.32	6.27	6.97	8.80	
7.8				2.69	4.01	5.81	6.47	8.18	
8.0				2.50	3.72	5.40	6.02	7.61	
8.2				2.33	3.46	5.03	5.61	7.10	9.33
8.4				2.17	3.23	4.69	5.23	6.63	8.71
8.6				2.02	3.01	4.38	4.89	6.20	8.14
8.8					2.81	4.10	4.57	5.80	7.62
9.0					2.63	3.84	4.29	5.44	7.15
9.2					2.47	3.60	4.02	5.11	6.71
9.4					2.32	3.38	3.78	4.80	6.30
9.6					2.18	3.18	3.55	4.52	5.93
9.8					2.05	2.99	3.35	4.26	5.59

Serviceability limit states
- $\Delta_S \leq L/240$



a) Span is measured centre to centre of supports.

Notes:

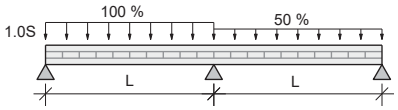
1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for snow load and total load deflections. If applicable, the final design shall include a consideration for vibration control, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.

Serviceability Limit States – L/240, Double Span

Maximum specified uniform snow load (kPa)

L [(a)] (m)	Layup								
	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
3.0									
3.2									
3.4	8.81								
3.6	7.51								
3.8	6.46	9.68							
4.0	5.59	8.42							
4.2	4.87	7.37							
4.4	4.27	6.48							
4.6	3.76	5.73							
4.8	3.32	5.09							
5.0	2.96	4.54							
5.2	2.64	4.06	9.34						
5.4	2.37	3.65	8.40						
5.6	2.13	3.29	7.58						
5.8	1.92	2.98	6.86						
6.0		2.70	6.23	9.78					
6.2		2.46	5.67	8.93					
6.4		2.24	5.18	8.18					
6.6		2.05	4.74	7.50					
6.8			4.35	6.90					
7.0			4.00	6.36	9.48				
7.2			3.69	5.87	8.75				
7.4			3.41	5.43	8.10				
7.6			3.15	5.04	7.50				
7.8			2.92	4.68	6.97				
8.0			2.72	4.35	6.48	9.32			
8.2			2.53	4.05	6.04	8.69	9.59		
8.4			2.36	3.78	5.63	8.12	8.97		
8.6			2.20	3.53	5.26	7.59	8.39		
8.8			2.06	3.31	4.93	7.11	7.87	9.87	
9.0			1.92	3.10	4.62	6.67	7.39	9.28	
9.2				2.91	4.33	6.26	6.94	8.73	
9.4				2.73	4.07	5.89	6.53	8.22	
9.6				2.57	3.83	5.54	6.15	7.75	
9.8				2.42	3.61	5.22	5.80	7.32	9.64

Serviceability limit states
- $\Delta_S \leq L/240$



a) Span is measured centre to centre of supports.

Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bending moment, shear, and bearing resistances and a consideration for snow load and total load deflections. If applicable, the final design shall include a consideration for vibration control, the verification of a concentrated live load as defined in Article 4.1.5.9. of the 2015 NBC, and fire-resistance requirements.
2. The tabulated values are based on dry service conditions, for bending in the major strength direction of the panel.

Walls – Design Properties

Walls – Design Properties

CLT stress grade	E1 (L = 1950 F_b-1.7E S-P-F MSR and T = No. 3/Stud S-P-F)								
Layup	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
Loading parallel to outermost layers									
Compression in the major strength direction									
Compressive resistance, $P_{r,0}$ (kN/m) [a]	1 081	1 081	1 621	1 621	2 162	2 702	2 162	2 702	3 242
Effective cross-sectional area, $A_{eff,0}$ (10^3 mm^2/m)	70	70	105	105	140	175	140	175	210
Effective out-of-plane moment of inertia, $I_{eff,0}$ (10^6 mm^4/m)	58	93	216	354	526	778	872	1 133	1 478
Effective out-of-plane radius of gyration, $r_{eff,0}$ (mm/m)	29	36	45	58	61	67	79	80	84
Bending in the major strength direction									
Flatwise bending moment resistance, $M_{r,f,0}$ (kN-m/m) [b]	28	38	65	88	116	158	155	200	239
Flatwise shear resistance, $V_{r,f,0}$ (kN/m) [c]	27	32	43	53	59	64	74	74	80
Effective flatwise bending stiffness, $(EI)_{eff,f,0}$ (10^9 N-mm^2/m)	683	1 088	2 531	4 166	6 194	9 117	10 306	13 279	17 327
Effective shear stiffness in flatwise bending, $(GA)_{eff,f,0}$ (10^6 N/m)	7.6	7.3	15	15	23	25	22	22	32
Loading perpendicular to outermost layers									
Compression in the minor strength direction									
Compressive resistance, $P_{r,90}$ (kN/m) [a]	138	252	275	504	413	275	756	504	413
Effective cross-sectional area, $A_{eff,90}$ (10^3 mm^2/m)	19	35	38	70	57	38	105	70	57
Effective out-of-plane moment of inertia, $I_{eff,90}$ (10^6 mm^4/m)	0.58	3.6	29	93	114	29	354	93	114
Effective out-of-plane radius of gyration, $r_{eff,90}$ (mm/m)	5.5	10	28	36	45	28	58	36	45
Bending in the minor strength direction									
Flatwise bending moment resistance, $M_{r,f,90}$ (kN-m/m) [b]	0.38	1.3	5.0	11	11	5.0	26	11	11
Flatwise shear resistance, $V_{r,f,90}$ (kN/m) [c]	5.7	11	22	32	38	22	53	32	38
Effective flatwise bending stiffness, $(EI)_{eff,f,90}$ (10^9 N-mm^2/m)	5.2	32	263	837	1 045	263	3 220	837	1 045
Effective shear stiffness in flatwise bending, $(GA)_{eff,f,90}$ (10^6 N/m)	5.7	9.1	11	18	17	14	27	20	19

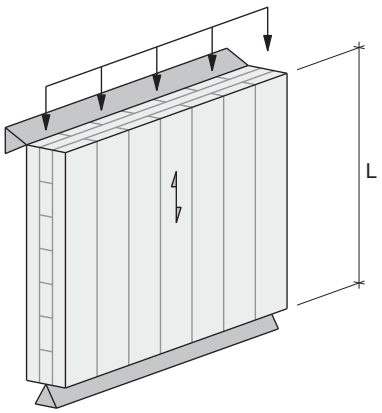
a) The factored compressive resistance under axial load, P_r, include the resistance factor, φ. Furthermore, these values shall be adjusted by the size and slenderness factors, K_{Zc} and K_C, respectively, as defined in CSA O86:19.

b) The factored flatwise bending moment resistance values, $M_{r,f}$, include the resistance factor, φ, and the adjustment factor K_{rb} as defined in CSA O86:19.

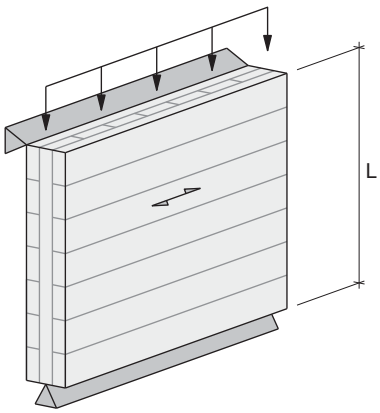
c) The factored flatwise shear resistance values, $V_{r,f}$, include the resistance factor, φ.

Notes:

1. The tabulated design values are for dry service conditions and standard-term duration of load.
2. The compressive resistance perpendicular to grain values shall be based on S-P-F No. 3/Stud lumber (f_{cp} = 5.3 MPa).
3. The specific gravity for dowel-type fastener design, G, is 0.42.
4. The density for member weight is 515 kg/m^3 (5.1 kN/m^3) for a moisture content of 12%.
5. Design of CLT members shall be in accordance with CSA O86:19.



Loading parallel to outermost layers



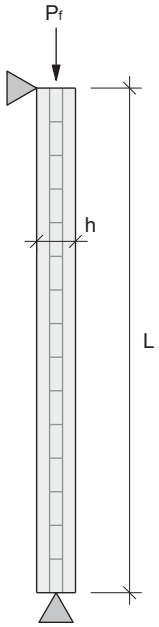
Loading perpendicular to outermost layers

Walls – Selection Tables

Ultimate Limit States – Concentric End Loads

Maximum factored uniform load, P_f (kN/m)

L	Fire-resistance rating	Layup								
(m)	(min)	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
2.5	0	636	849	1 500	1 643	2 215	2 801	2 261	2 828	3 394
	30	347	636	1 500	1 643	2 215	2 801	2 261	2 828	3 394
	60	46	50	1 361	1 643	2 215	2 801	2 261	2 828	3 394
	90			402	1 505	2 093	2 801	2 261	2 828	3 394
	120			50	182	1 374	2 138	2 033	2 828	3 394
3.0	0	455	667	1 275	1 489	2 028	2 600	2 140	2 681	3 228
	30	215	422	1 275	1 489	2 028	2 600	2 140	2 681	3 228
	60	26	28	957	1 475	2 028	2 600	2 140	2 681	3 228
	90			252	1 131	1 606	2 334	2 140	2 681	3 228
	120			28	109	974	1 593	1 622	2 681	3 228
3.5	0	326	516	1 062	1 328	1 832	2 386	2 012	2 526	3 056
	30	140	286	1 062	1 328	1 832	2 386	2 012	2 526	3 056
	60	15	17	678	1 128	1 832	2 386	2 012	2 526	3 056
	90			165	843	1 217	1 814	2 012	2 309	3 056
	120			16	68	694	1 178	1 271	2 309	3 056
4.0	0	237	397	872	1 168	1 632	2 165	1 877	2 364	2 875
	30	94	200	866	1 168	1 632	2 165	1 877	2 364	2 875
	60			488	861	1 632	2 165	1 877	2 364	2 875
	90			112	630	922	1 402	1 877	1 874	2 875
	120				45	502	876	989	1 874	2 624
4.5	0		306	711	1 016	1 438	1 943	1 738	2 195	2 686
	30		144	656	1 016	1 438	1 943	1 738	2 195	2 686
	60			359	660	1 438	1 893	1 738	2 195	2 686
	90			79	475	702	1 087	1 738	1 513	2 686
	120				30	369	659	770	1 513	2 174
5.0	0		238	578	875	1 255	1 729	1 596	2 023	2 492
	30		106	503	875	1 255	1 729	1 596	2 023	2 492
	60			269	511	1 236	1 538	1 596	2 023	2 492
	90			56	363	542	848	1 596	1 219	2 406
	120				20	277	502	603	1 219	1 793
5.5	0			470	750	1 088	1 526	1 455	1 851	2 297
	30			392	741	1 088	1 526	1 455	1 851	2 297
	60			205	399	999	1 252	1 455	1 851	2 297
	90			41	281	422	669	1 359	986	2 026
	120				13	211	388	476	986	1 478



Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance and a consideration for live load and total load deflections.
2. The tabulated values are based on dry service conditions, standard-term duration of load, and on simply axially loaded walls subjected to concentric end loads parallel to outermost layers.
3. For L ≤ 2.5 m, use P_f for L = 2.5 m.
4. L = unsupported length.
5. Provided that surfaces are protected from fire exposure by fire-rated Type X gypsum board, the assigned fire-resistance duration can be increased as per Clause B.8.1 of CSA O86:19.
6. The above values apply to wall panels with a specified dead load less or equal to the specified live load. If the specified dead load is greater than the specified live load, multiply the maximum factored uniform load, P_f, by the corresponding adjustment factor:

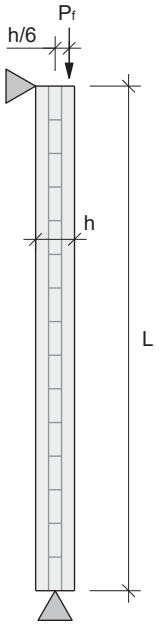
Adjustment factor based on specified dead load / specified live load ratio (D/L)

D/L	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.952	0.912	0.878	0.849	0.824	0.801	0.780	0.761

Ultimate Limit States – Eccentricity of 1/6

Maximum factored uniform load, P_f (kN/m)

L	Fire-resistance rating	Layup								
(m)	(min)	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
2.5	0	384	504	833	955	1 234	1 570	1 322	1 664	1 947
	30	210	318	833	955	1 234	1 570	1 322	1 664	1 947
	60	39	42	646	878	1 234	1 570	1 322	1 664	1 947
	90			210	667	830	1 186	1 322	1 329	1 947
	120			40	87	596	814	679	1 329	1 643
3.0	0	300	417	730	875	1 143	1 469	1 257	1 586	1 862
	30	151	244	730	875	1 143	1 469	1 257	1 586	1 862
	60	24	26	512	730	1 143	1 441	1 257	1 586	1 862
	90			156	550	699	1 012	1 257	1 173	1 862
	120			24	64	479	680	592	1 173	1 479
3.5	0	234	343	633	794	1 048	1 364	1 189	1 503	1 773
	30	110	188	611	794	1 048	1 364	1 189	1 503	1 773
	60	15	16	407	604	1 048	1 264	1 189	1 494	1 773
	90			117	451	585	857	1 189	1 024	1 718
	120			15	47	385	565	512	1 024	1 319
4.0	0	184	281	544	713	953	1 257	1 118	1 416	1 679
	30	81	146	503	713	953	1 257	1 118	1 416	1 679
	60			324	500	953	1 103	1 118	1 347	1 679
	90			88	371	489	724	1 096	890	1 538
	120				34	311	469	441	890	1 167
4.5	0		230	467	637	861	1 150	1 045	1 327	1 583
	30		114	416	617	861	1 150	1 045	1 327	1 583
	60			260	416	846	960	1 045	1 208	1 583
	90			66	306	410	612	971	771	1 371
	120				25	251	390	378	771	1 030
5.0	0		189	399	566	774	1 048	972	1 237	1 484
	30		89	346	531	774	1 048	972	1 237	1 484
	60			210	346	727	835	972	1 080	1 484
	90			49	253	344	518	858	668	1 218
	120				17	204	326	325	668	906
5.5	0			342	502	693	950	900	1 149	1 386
	30			288	458	693	950	900	1 149	1 386
	60			170	290	626	727	900	964	1 386
	90			38	210	289	440	758	580	1 082
	120				12	166	272	279	580	798



Notes:

1. For preliminary design use only. Final design shall include a complete analysis including the verification of the factored bearing resistance and a consideration for live load and total load deflections.
2. The tabulated values are based on dry service conditions, standard-term duration of load, loading parallel to outermost layers, and on simply axially loaded walls subjected to an eccentricity of 1/6 wall thickness.
3. For L ≤ 2.5 m, use P_f for L = 2.5 m.
4. L = unsupported length.
5. Provided that surfaces are protected from fire exposure by fire-rated Type X gypsum board, the assigned fire-resistance duration can be increased as per Clause B.8.1 of CSA O86:19.
6. The above values apply to wall panels with a specified dead load less or equal to the specified live load. If the specified dead load is greater than the specified live load, multiply the maximum factored uniform load, P_f, by the corresponding adjustment factor:

Adjustment factor based on specified dead load / specified live load ratio (D/L)

D/L	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Factor	1.000	0.952	0.912	0.878	0.849	0.824	0.801	0.780	0.761

Shear Walls, Lintels, and Diaphragms – Design Properties

Shear Walls, Lintels, and Diaphragms – Design Properties

CLT stress grade	E1 (L = 1950 F_b-1.7E S-P-F MSR and T = No. 3/Stud S-P-F)								
Layup	89-3s	105-3s	143-5s	175-5s	197-7s	213-7l	245-7s	245-7l	267-9l
Loading parallel to outermost layers									
Edgewise bending in the minor strength direction									
Effective width in edgewise bending, $b_{eff,e,90}$ (mm) [(a)]	19	35	38	70	57	38	105	70	57
Specified edgewise shear strength, $f_{v,e,90}$ (MPa) [(b)]	2.4	2.4	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Shear stiffness in edgewise bending, $G_{e,90}t_p$ (10^6 N/m) [(c)]	22	26	36	44	49	53	61	61	67
Loading perpendicular to outermost layers									
Edgewise bending in the major strength direction									
Effective width in edgewise bending, $b_{eff,e,0}$ (mm) [(a)]	70	70	105	105	140	175	140	175	210
Specified edgewise shear strength, $f_{v,e,0}$ (MPa) [(b)]	2.0	2.0	2.4	2.4	2.0	2.4	2.4	2.4	2.0
Shear stiffness in edgewise bending, $G_{e,0}t_p$ (10^6 N/m) [(c)]	22	26	36	44	49	53	61	61	67

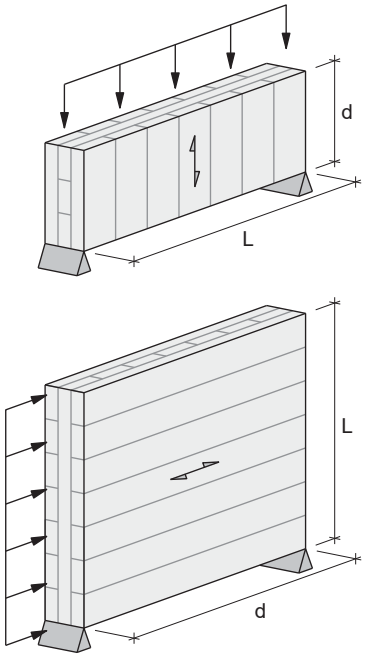
a) The factored edgewise bending moment resistance, $M_{r,e}$, and the effective edgewise bending stiffness, $(EI)_{eff,e}$, values shall be based on the effective width in edgewise bending and depth of the panel, $b_{eff,e}$ and d (see table above and figures below), respectively, and Clause 7.5.6.5 of CSA O86:19. Calculations shall be based on S-P-F No. 3/Stud lumber (f_b = 7.0 MPa, E = 9 000 MPa) for loading parallel to outermost layers, or on S-P-F MSR 1950 F_b-1.7E lumber (f_b = 28.2 MPa, E = 11 700 MPa) for loading perpendicular to outermost layers.

b) The factored edgewise shear resistance values, $V_{r,e}$, shall be based on Clause 7.5.7.3b) of CSA O86:19, taking into account the gross cross-sectional area of the panel and using the specified edgewise shear strength, $f_{v,e}$.

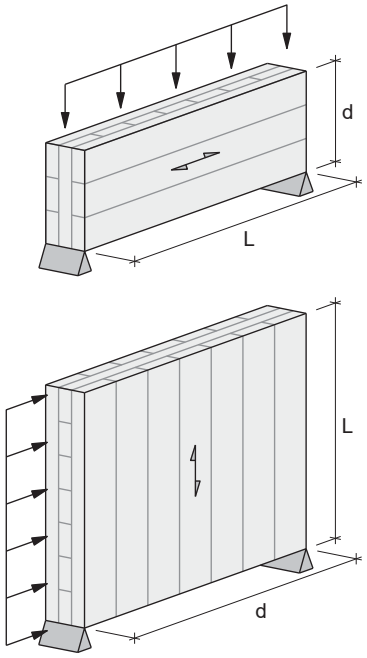
c) $G_{e,0}$ and $G_{e,90}$ = 250 MPa based on product performance testing. Shear stiffness in edgewise bending, $(GA)_{eff,e}$, shall be calculated by multiplying $G_e t_p$ by the member depth, d (see figures below).

Notes:

1. The tabulated design values are for dry service conditions and standard-term duration of load.
2. The compressive resistance perpendicular to grain values shall be based on S-P-F No. 3/Stud lumber (f_{cp} = 5.3 MPa).
3. The specific gravity for dowel-type fastener design, G, is 0.42.
4. The density for member weight is 515 kg/m^3 (5.1 kN/m^3) for a moisture content of 12%.
5. Design of CLT members shall be in accordance with CSA O86:19.



Loading parallel to outermost layers



Loading perpendicular to outermost layers

NORDIC

TECHNICAL GUIDE
NORDIC X-LAM

NS-GT6

ENGLISH

VERSION
2022-04-21

STRUCTURAL DETAILS 3

NORDIC STRUCTURES

GENERAL NOTES

1.0 General

1.1 This document supersedes all previous versions. For the latest version, consult nordic.ca or contact Nordic Structures.

1.2 The information contained in this document is provided for information purposes only. This information should not be used for any application without examination and verification of its accuracy, suitability and applicability by a licensed engineer, architect or other professional. Nordic Structures does not guarantee that the information is suitable for any general or particular use, and assumes no responsibility for the use, application of and/or reference to the information.

1.3 All dimensions are in millimetres (mm), unless otherwise noted.

1.4 For more information, consult nordic.ca or contact Nordic Structures.

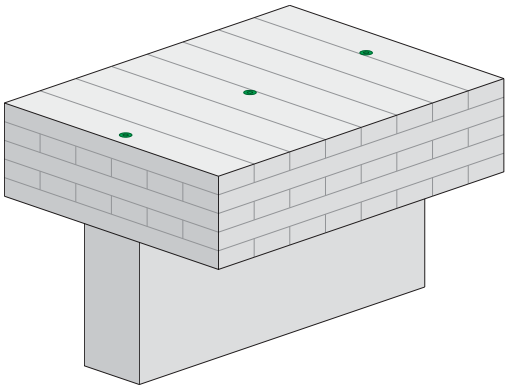
2.0 Design of connections

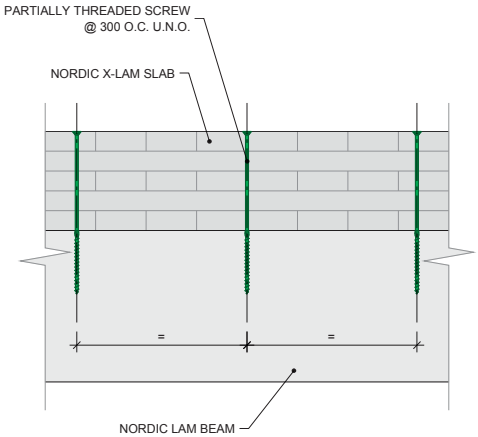
2.1 The design of connections, including fire resistance if required, shall be in accordance with CSA O86-14, Engineering design in wood.

2.2 The design of connections should include considerations for structural and service performance, such as resistance, minimum distances, dimensional changes, durability, erection and fire safety, among others, as well as taking into account architectural requirements.

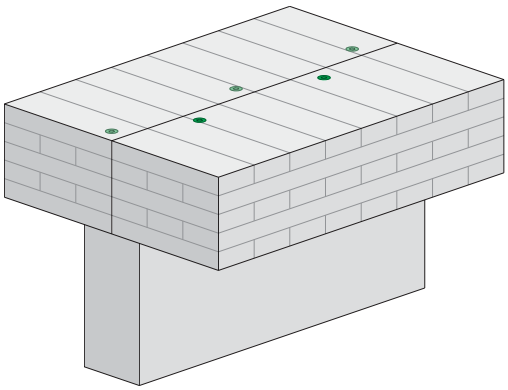
2.3 The connections shown in this document are provided for information purposes only, and conceptually. Note that many possibilities and variants are possible.

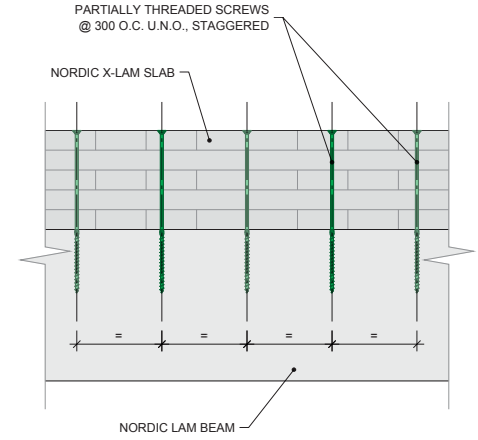
Structure, GL-CLT | Continuous Floor Slab on Beam | NS-DS2001



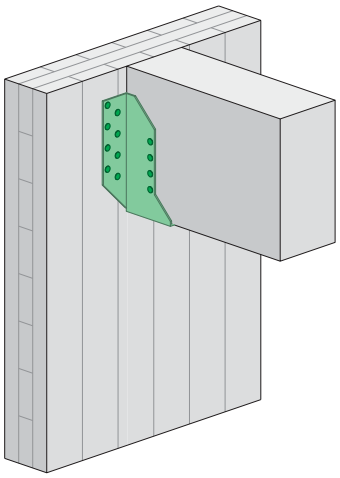


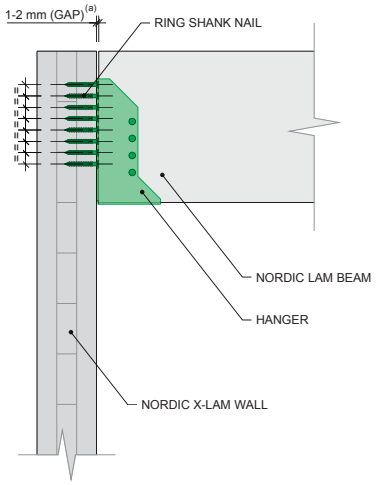
Structure, GL-CLT | Single Floor Slab on Beam | NS-DS2002





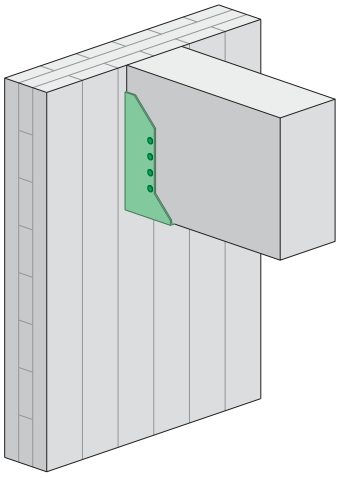
Structure, GL-CLT | Face-mount Hanger | NS-DS2003

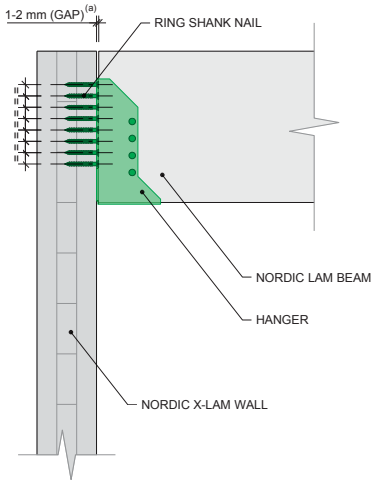




a) The 1-2 mm gap may not be required depending on the detail on the other side of the beam.

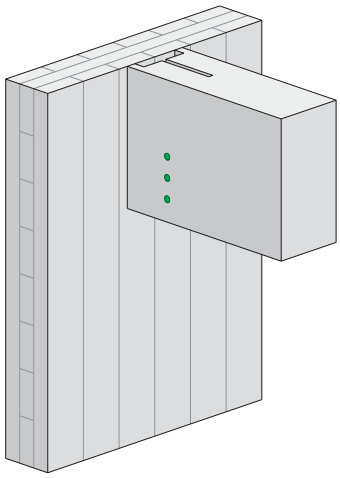
Structure, GL-CLT | Face-mount Hanger with Concealed Flanges | NS-DS2067

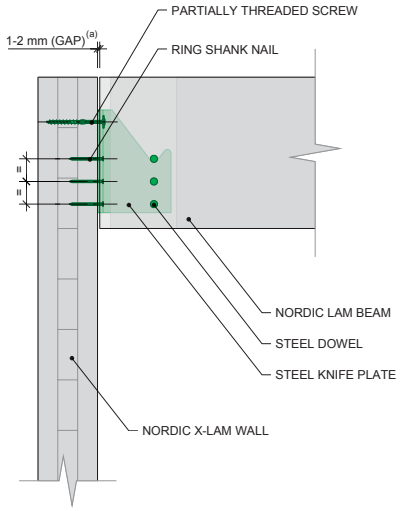




a) The 1-2 mm gap may not be required depending on the detail on the other side of the beam.

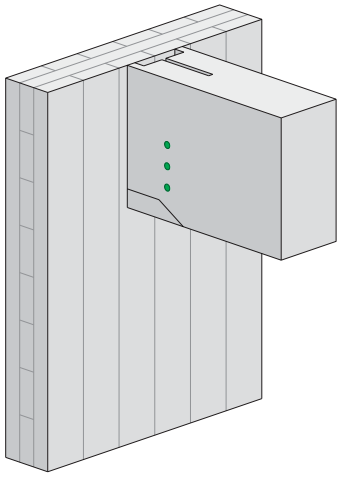
Structure, GL-CLT | Knife Plate | NS-DS2004

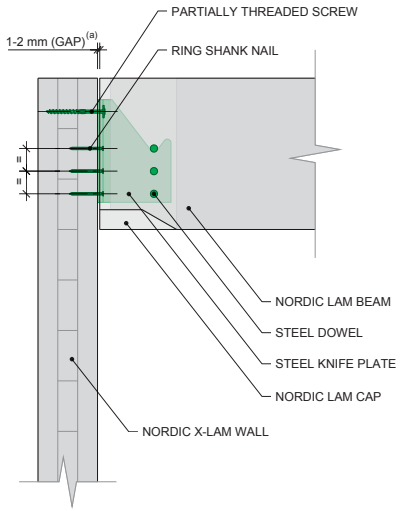




a) The 1-2 mm gap may not be required depending on the detail on the other side of the beam.

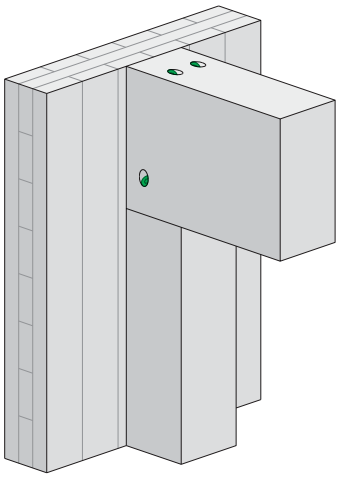
Structure, GL-CLT | Knife Plate with Cap | NS-DS2005

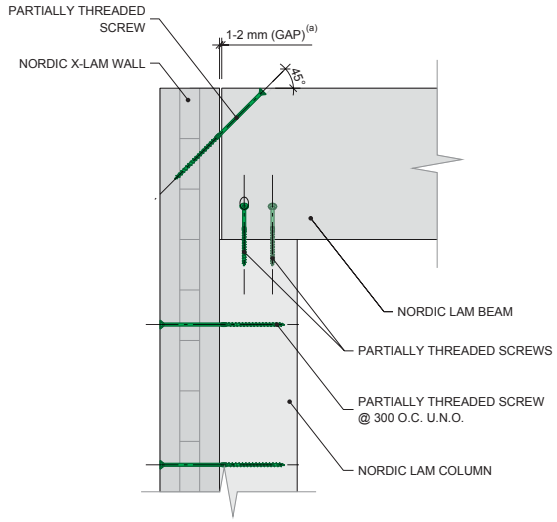




a) The 1-2 mm gap may not be required depending on the detail on the other side of the beam.

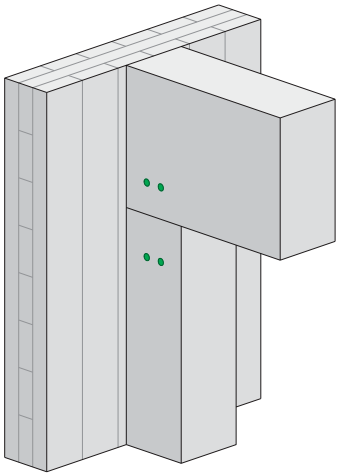
Structure, GL-CLT | Screwed Beam to Column | NS-DS2006

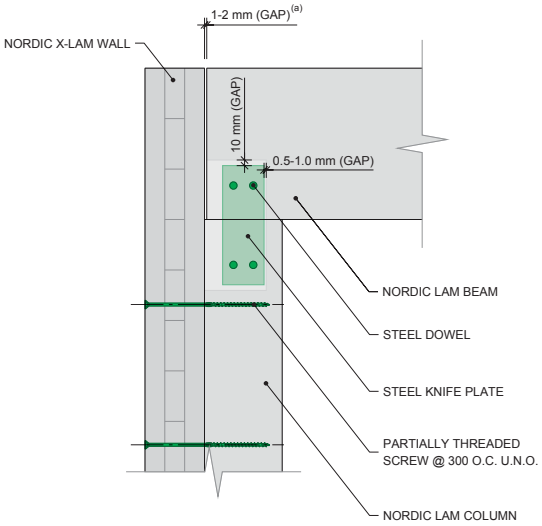




a) The 1-2 mm gap may not be required depending on the detail on the other side of the beam.

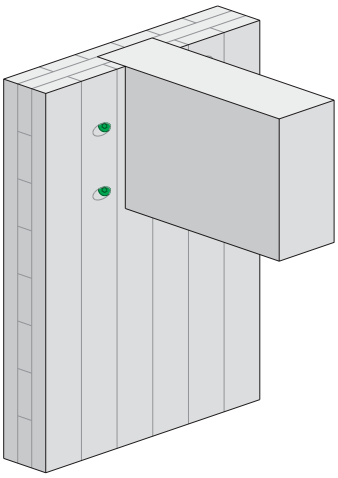
Structure, GL-CLT | Beam to Column with Knife Plate | NS-DS2007

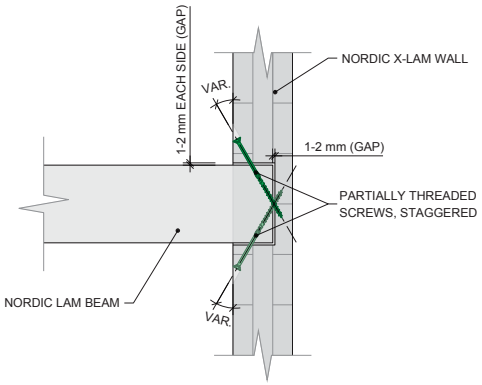




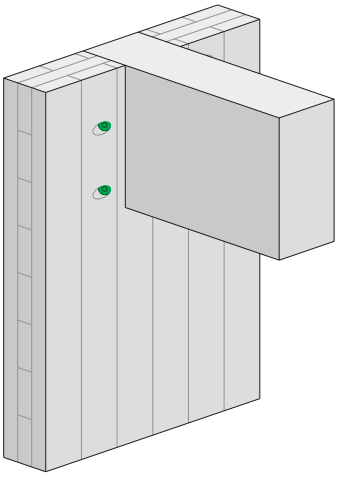
a) The 1-2 mm gap may not be required depending on the detail on the other side of the beam.

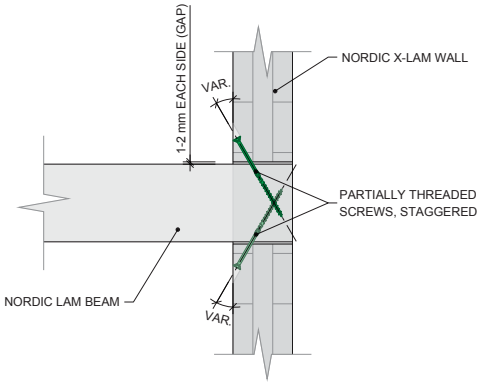
Structure, GL-CLT | Pocket for Beam | NS-DS2008



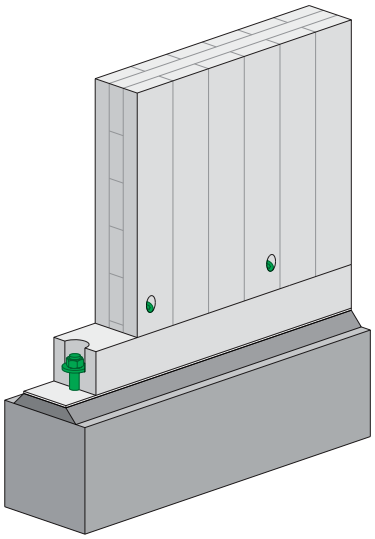


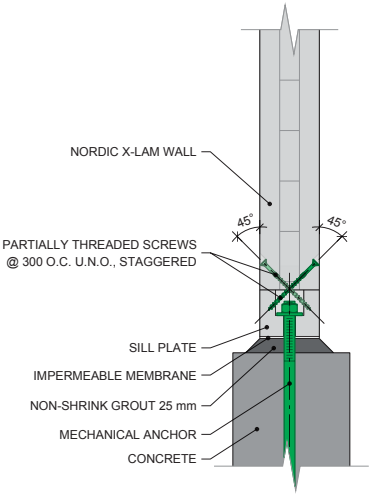
Structure, GL-CLT | Through Pocket for Beam | NS-DS2009



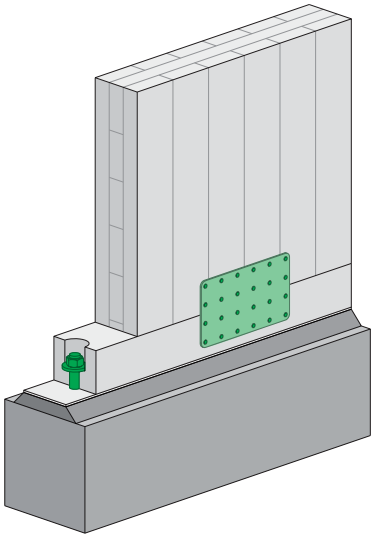


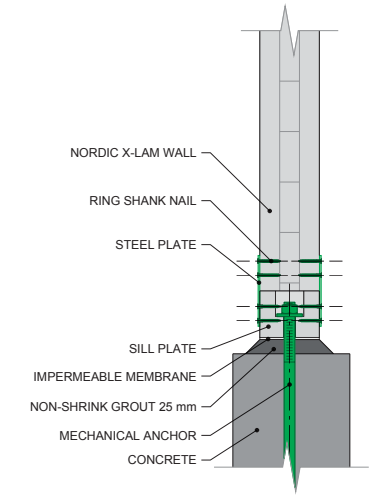
Structure, Wall-Foundation | Wall to Sill Plate, Screws | NS-DS2010



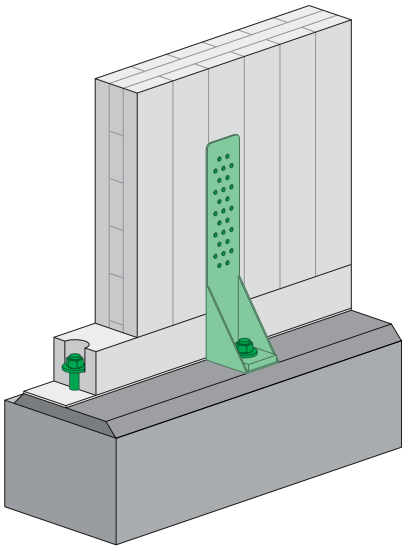


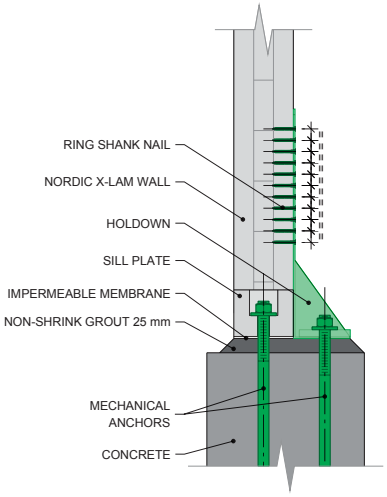
Structure, Wall-Foundation | Wall to Sill Plate, Nailed Steel Plate | NS-DS2011



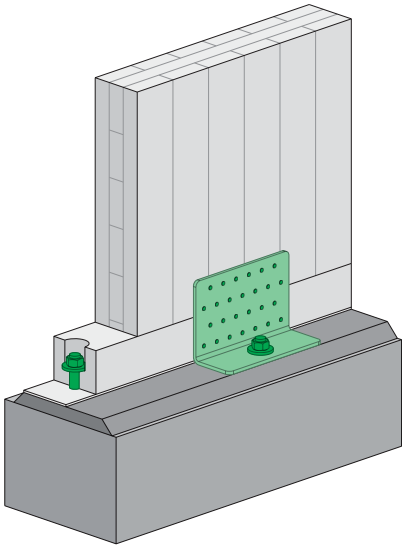


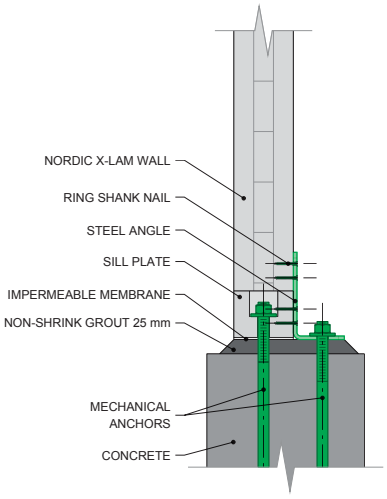
Structure, Wall-Foundation | Wall to Sill Plate, Holdown | NS-DS2012



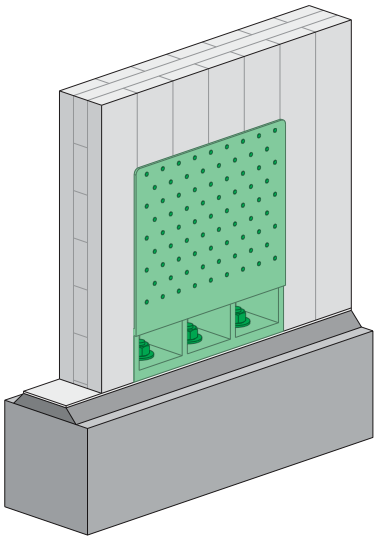


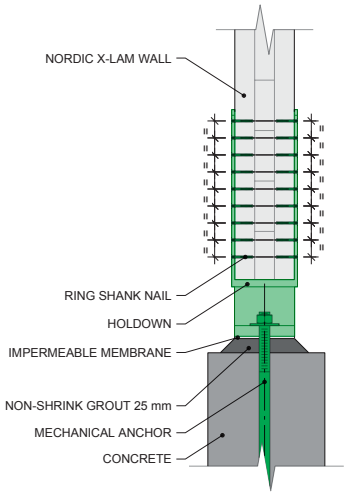
Structure, Wall-Foundation | Wall to Sill Plate, Steel Angle | NS-DS2013



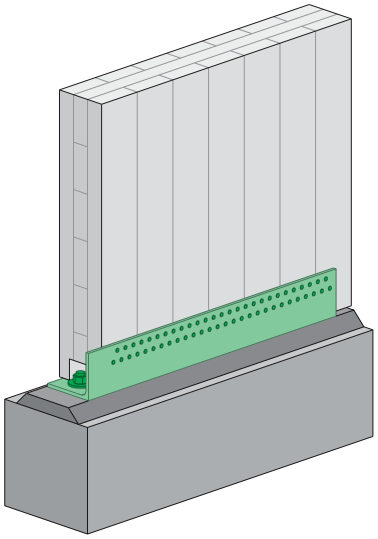


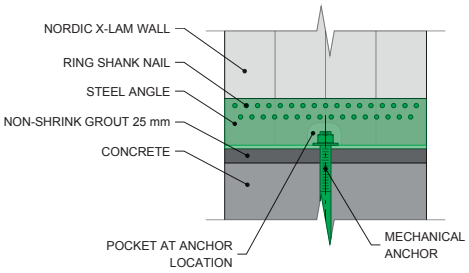
Structure, Wall-Foundation | Wall to Foundation, Holdown | NS-DS2014

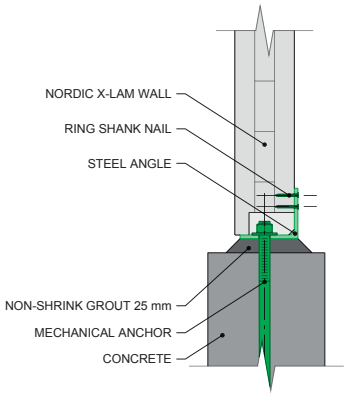




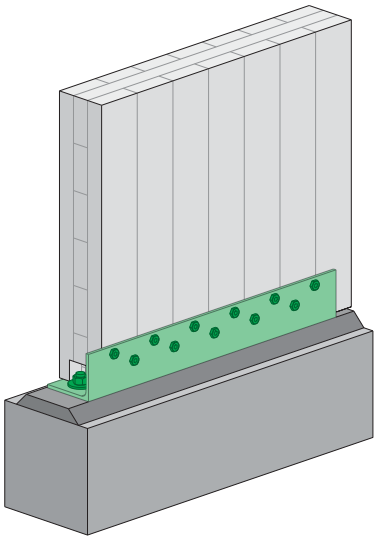
Structure, Wall-Foundation | Wall to Foundation, Nailed Steel Angle | NS-DS2015

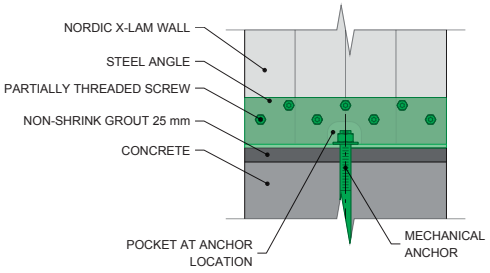


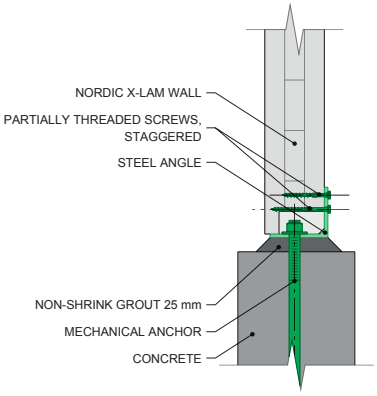




Structure, Wall-Foundation | Wall to Foundation, Screwed Steel Angle | NS-DS2016

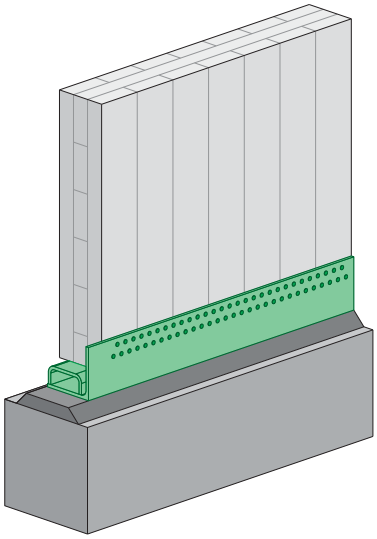


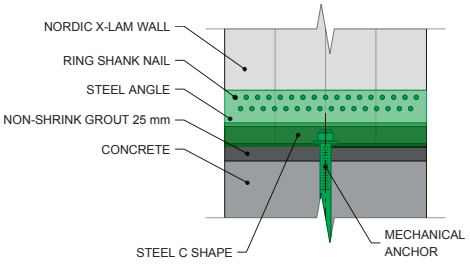


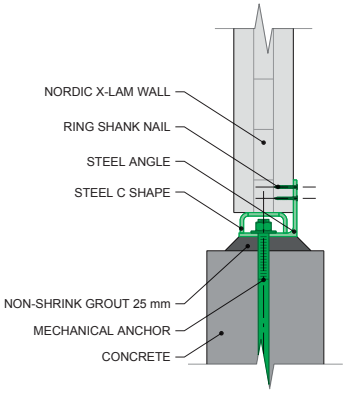


Note:
1. This assembly detail offers a resistance to forces acting perpendicularlry to the foundation wall.

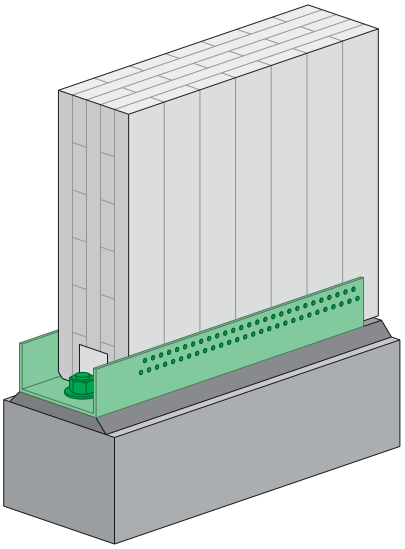
Structure, Wall-Foundation | Wall to Foundation, Nailed Steel Angle and Steel C Shape | NS-DS2068

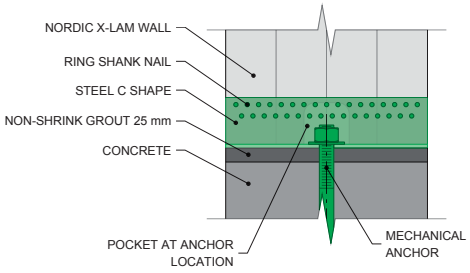


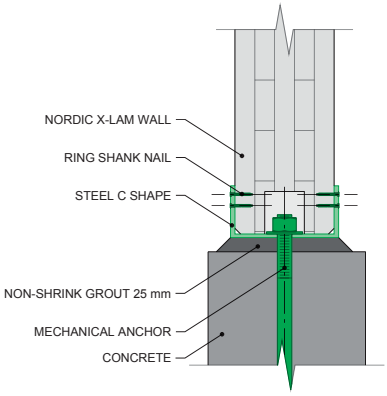




Structure, Wall-Foundation | Wall to Foundation, Nailed C Shape | NS-DS2017

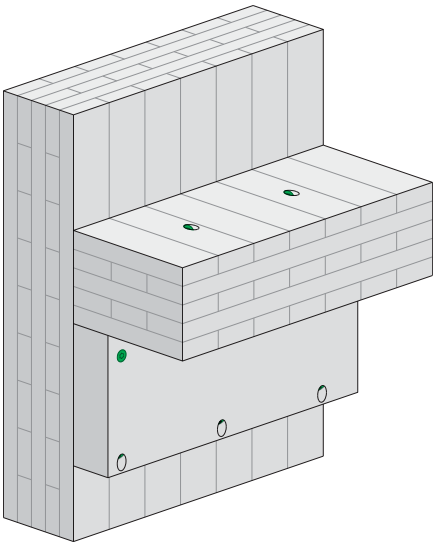


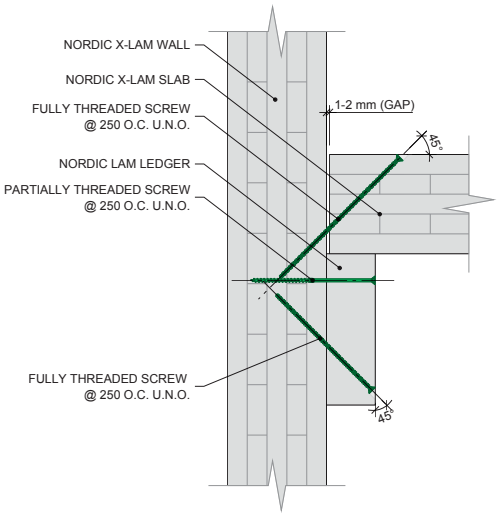




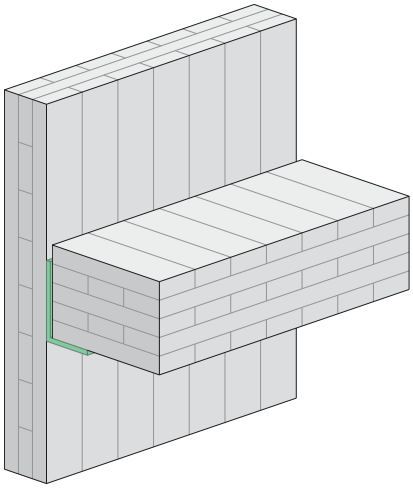
Note:
1. For an exterior wall on foundation, careful consideration should be given to waterproofing and drainage at the junction between wall and steel C shape.

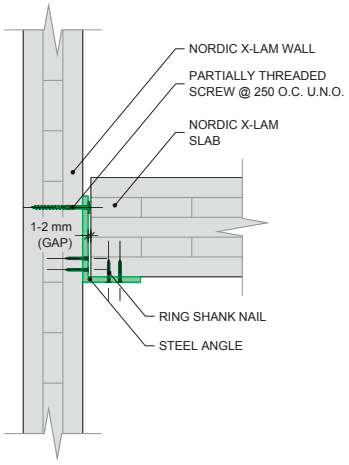
Structure, Floor/Roof-Wall | Ledger | NS-DS2018



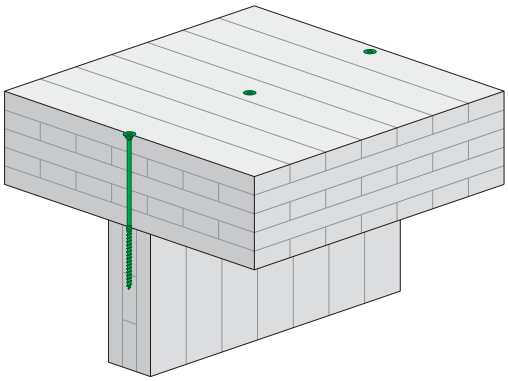


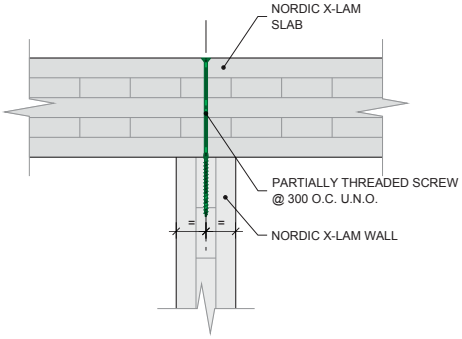
Structure, Floor/Roof-Wall | Steel Angle | NS-DS2019



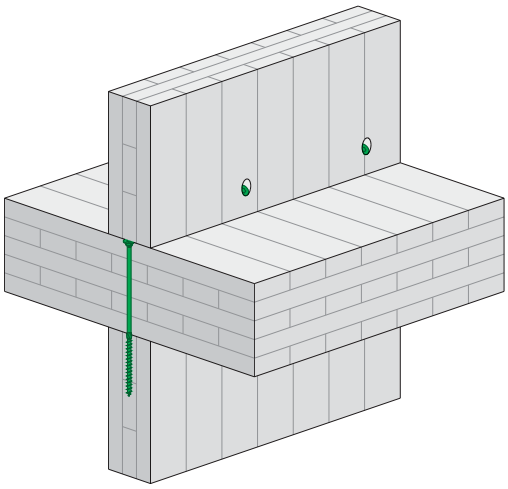


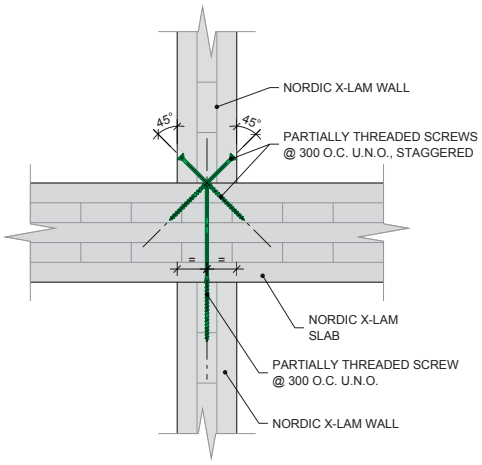
Structure, Floor/Roof-Wall | Screwed Floor/Roof Slab to Wall | NS-DS2020



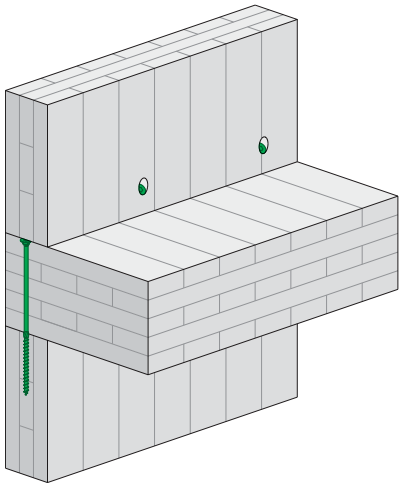


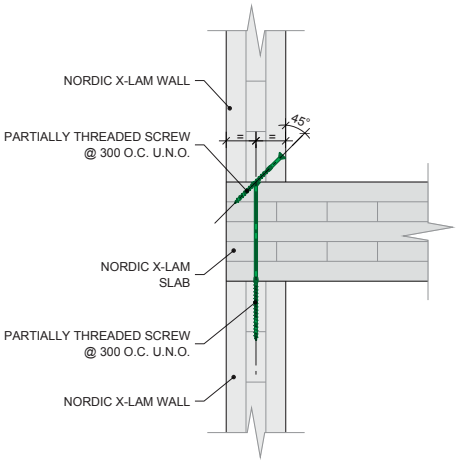
Structure, Floor/Roof-Wall | Screwed Wall to Continuous Floor Slab to Wall | NS-DS2021



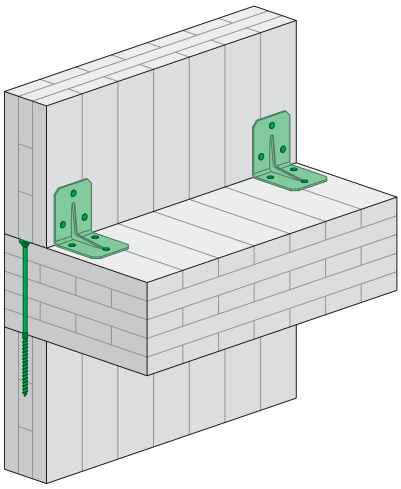


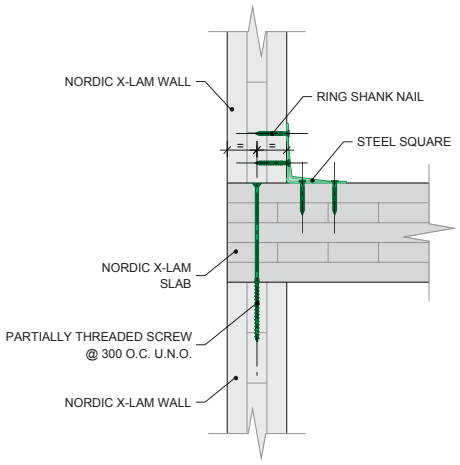
Structure, Floor/Roof-Wall | Screwed Wall to Single Floor Slab to Wall | NS-DS2022



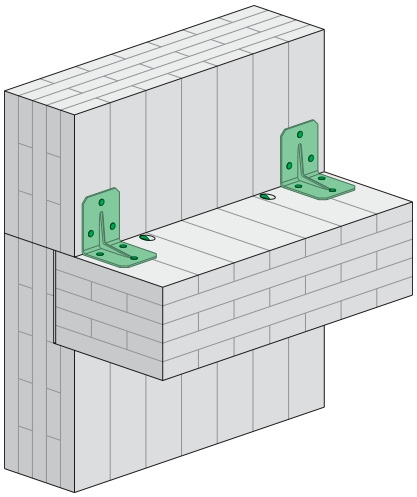


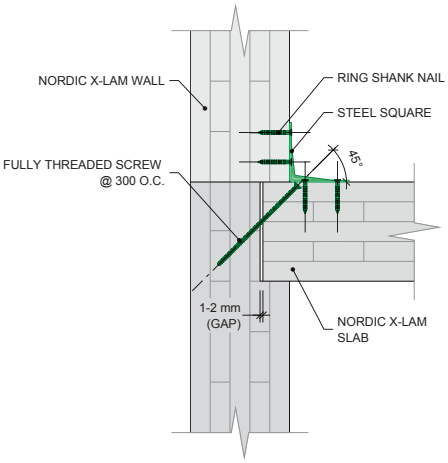
Structure, Floor/Roof-Wall | Wall to Floor Slab with Steel Square to Wall | NS-DS2023



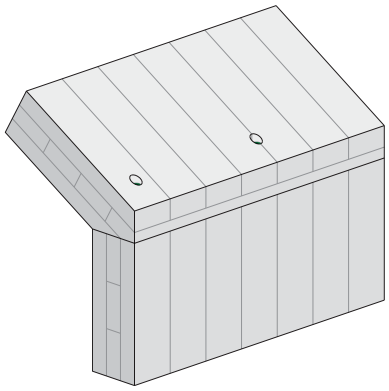


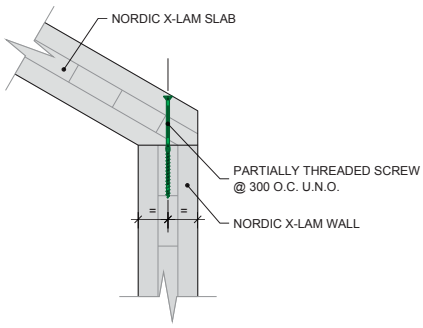
Structure, Floor/Roof-Wall | Wall to Floor Slab with Steel Square to Notched Wall | NS-DS2024



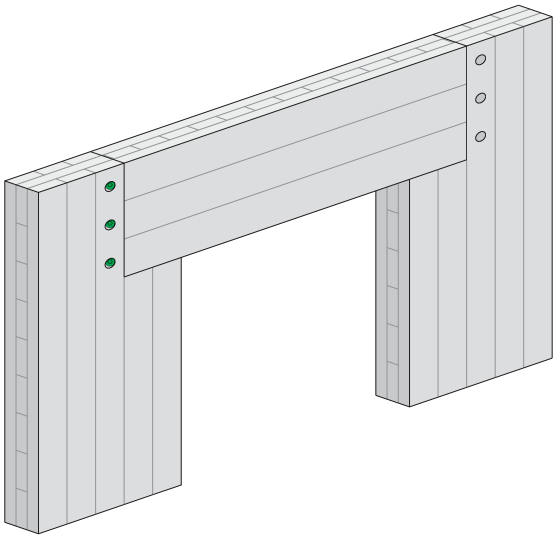


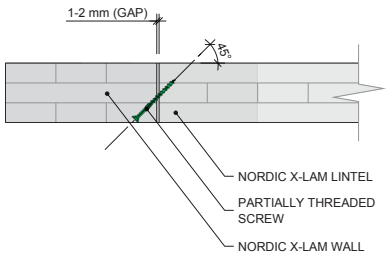
Structure, Floor/Roof-Wall | Sloped Roof Slab to Wall | NS-DS2025



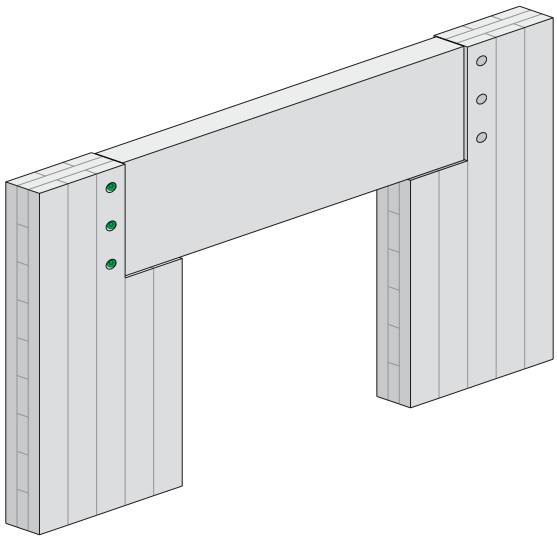


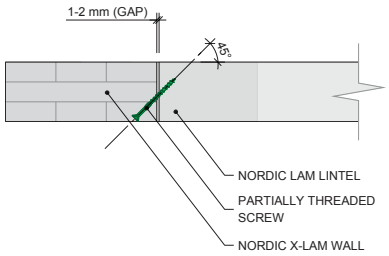
Structure, Lintel | CLT Lintel | NS-DS2026



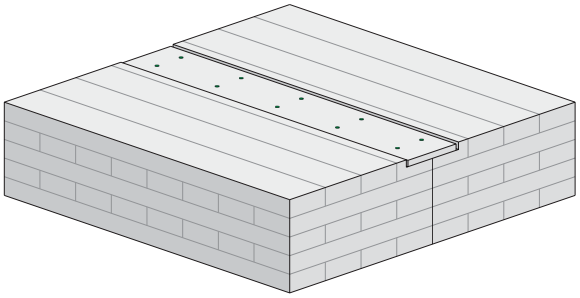


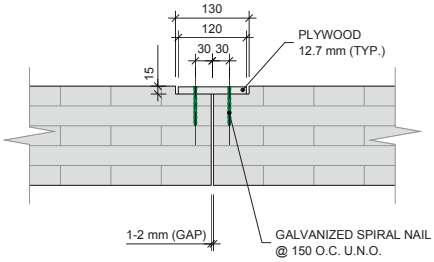
Structure, Lintel | Glulam Lintel | NS-DS2027



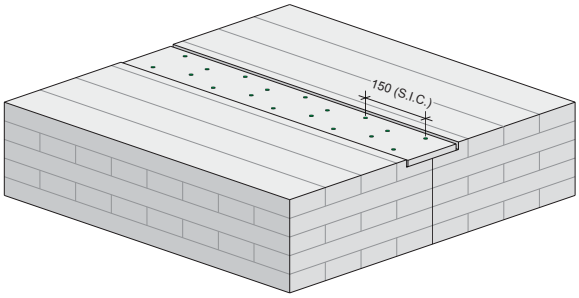


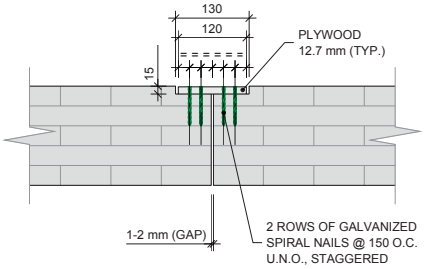
Structure, Panel-Panel | Butt Joint, One Row of Nails | NS-DS2029



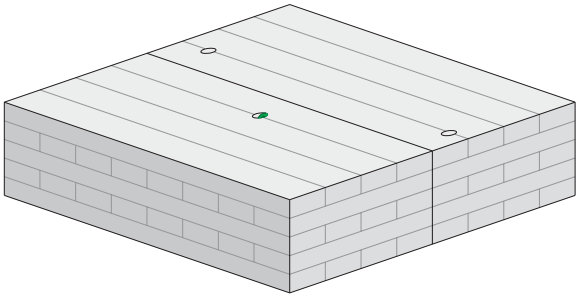


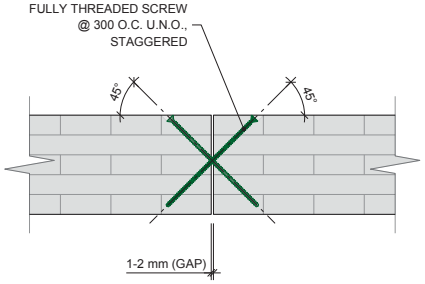
Structure, Panel-Panel | Butt Joint, Two Rows of Nails | NS-DS2030



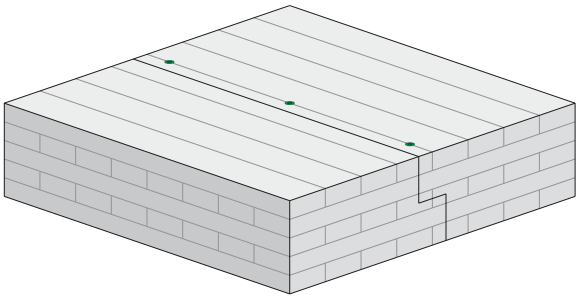


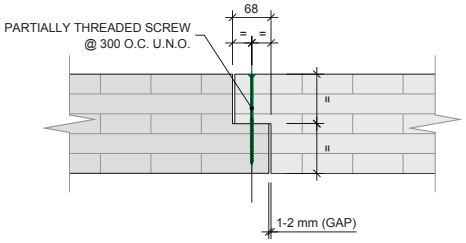
Structure, Panel-Panel | Butt Joint, 45° Screws | NS-DS2069



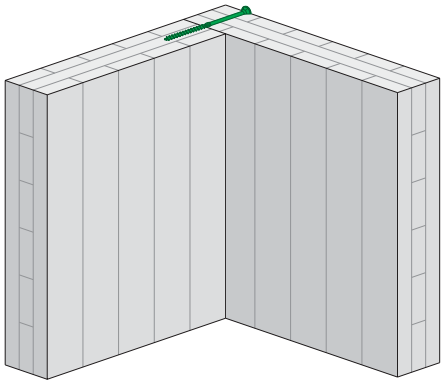


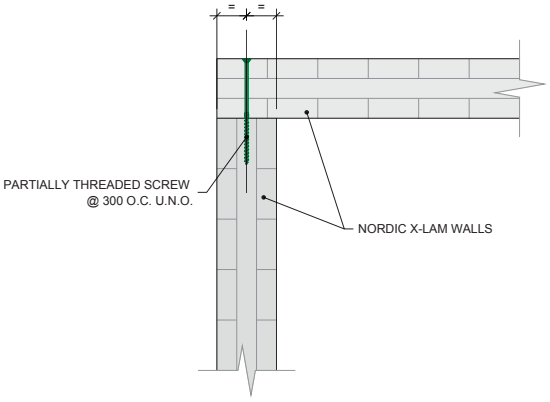
Structure, Panel-Panel | Half-lap Joint | NS-DS2031



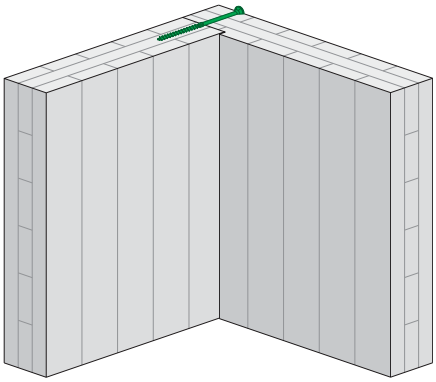


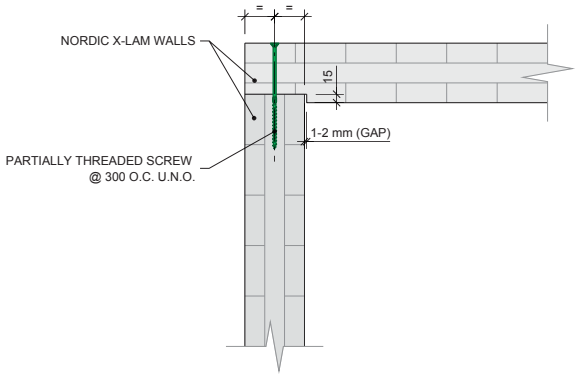
Structure, Wall-Wall | Corner Joint with 90° Screws | NS-DS2032



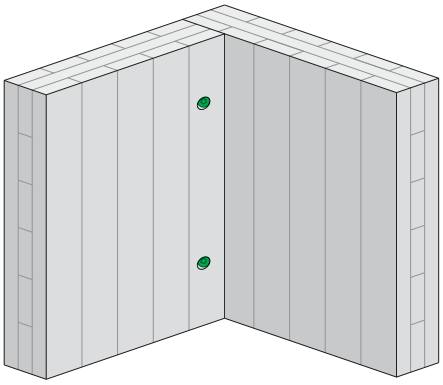


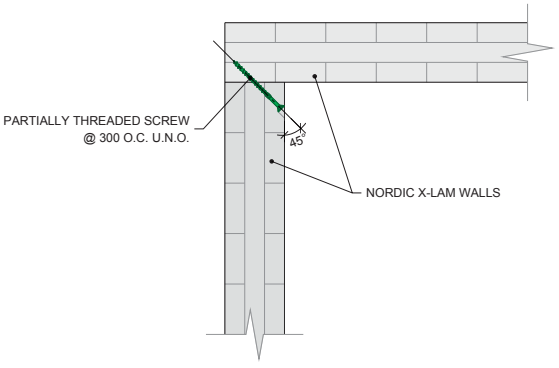
Structure, Wall-Wall | Notched Corner Joint with 90° Screws | NS-DS2033



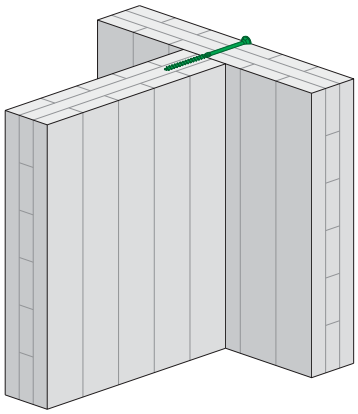


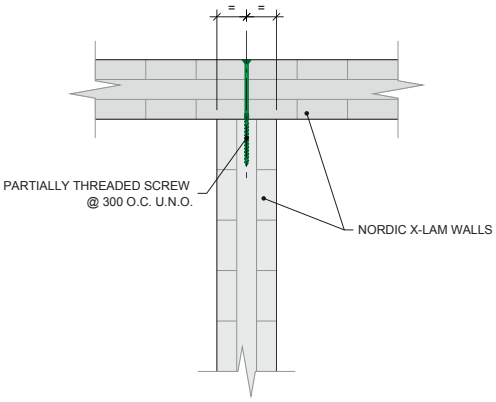
Structure, Wall-Wall | Corner Joint with 45° Screws | NS-DS2034



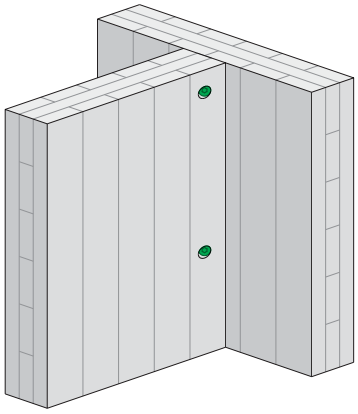


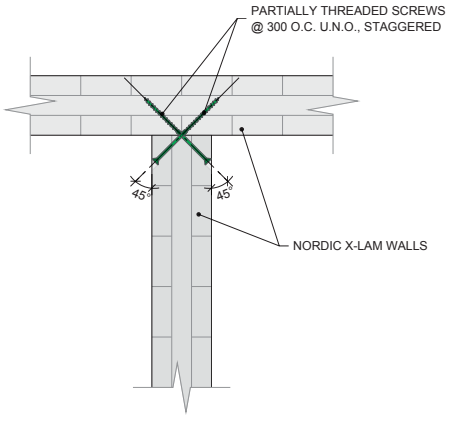
Structure, Wall-Wall | T-joint with 90° Screws | NS-DS2035



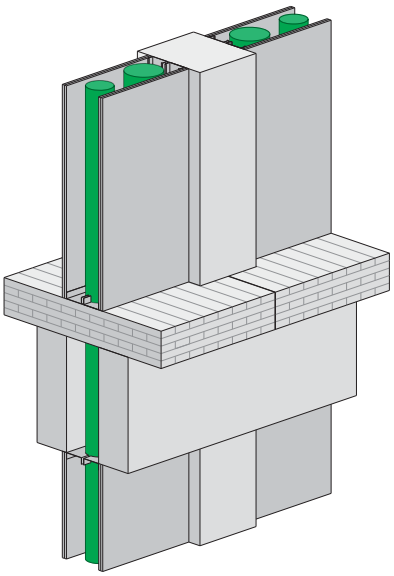


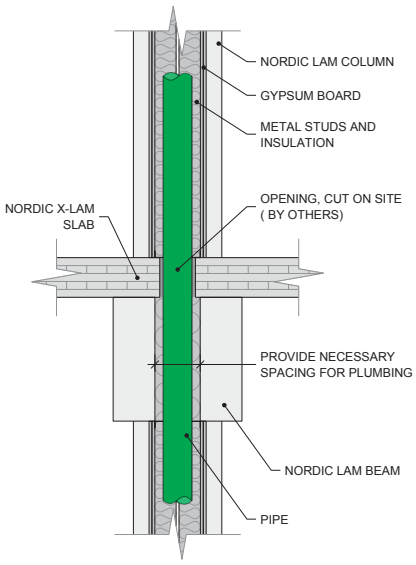
Structure, Wall-Wall | T-joint with 45° Screws | NS-DS2036



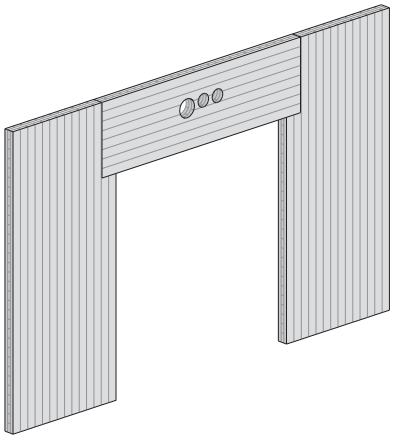


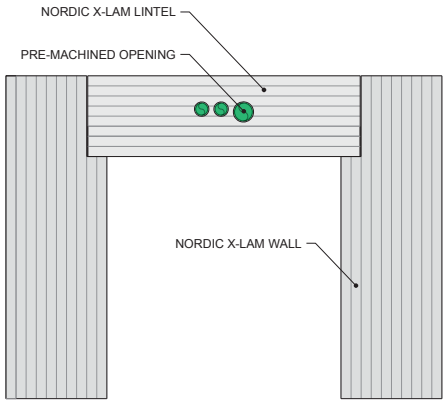
Mechanical, Electrical, and Plumbing | Vertical, Double-member Beam | NS-DS2501



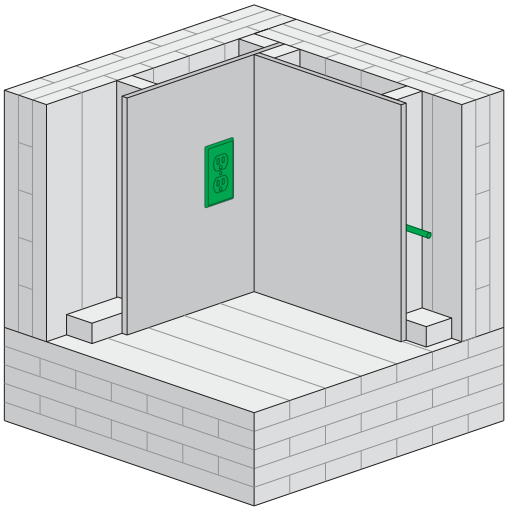


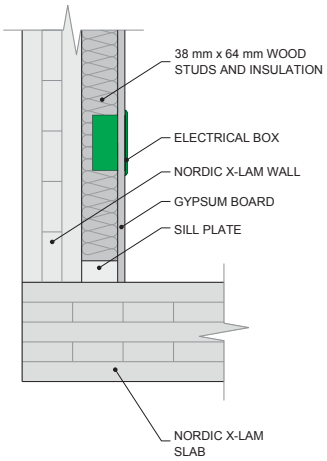
Mechanical, Electrical, and Plumbing | Horizontal, Pre-machined Opening | NS-DS2502



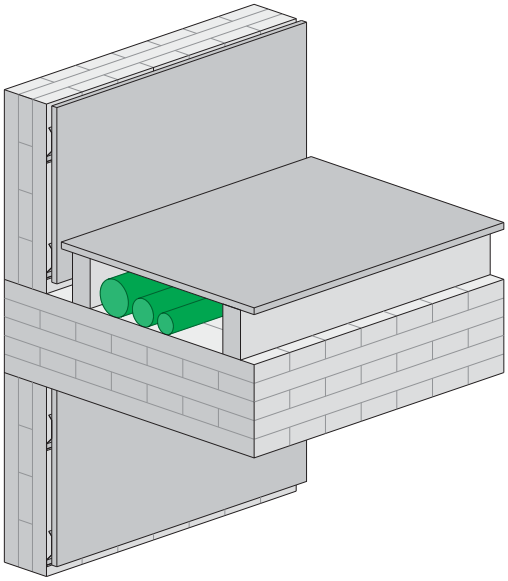


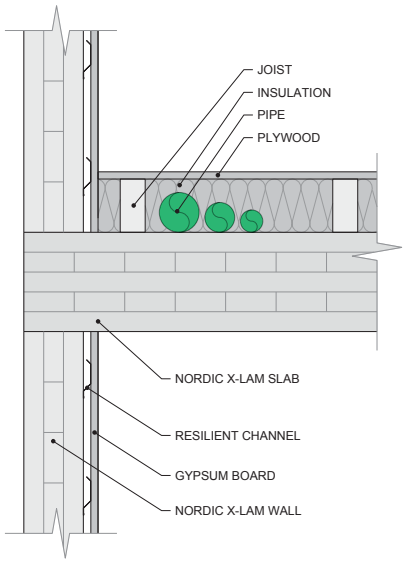
Mechanical, Electrical, and Plumbing | Horizontal, Electrical Box with 38 mm x 64 mm Wood Studs | NS-DS2503



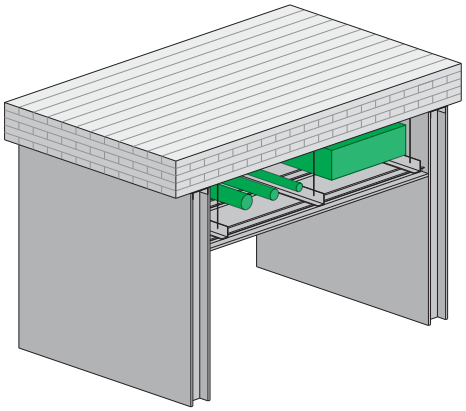


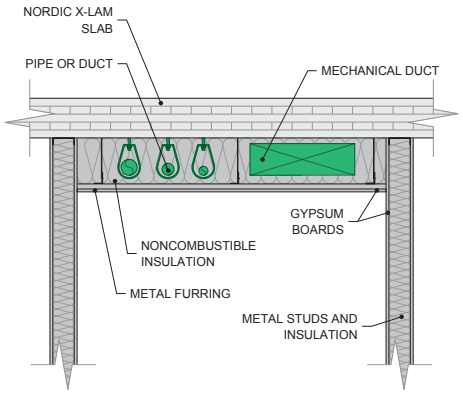
Mechanical, Electrical, and Plumbing | Horizontal, Raised Floor | NS-DS2504



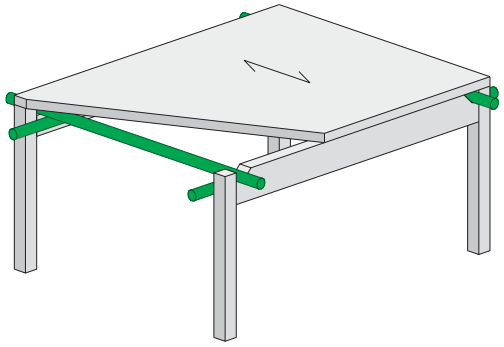


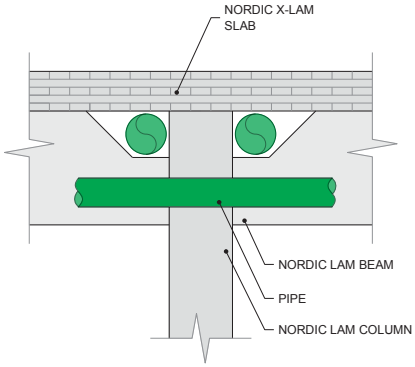
Mechanical, Electrical, and Plumbing | Horizontal, Suspended Ceiling | NS-DS2505



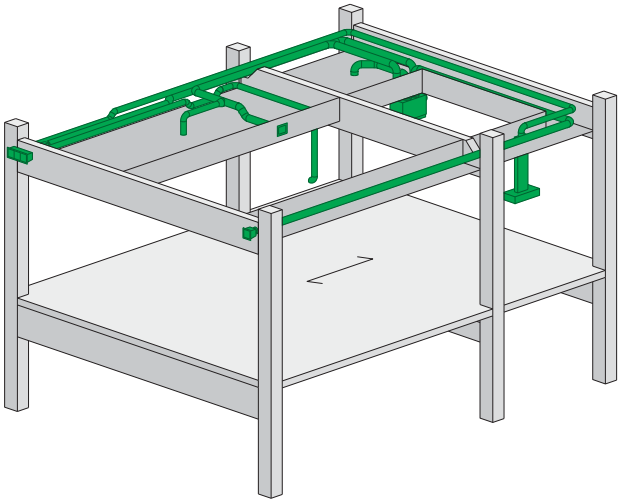


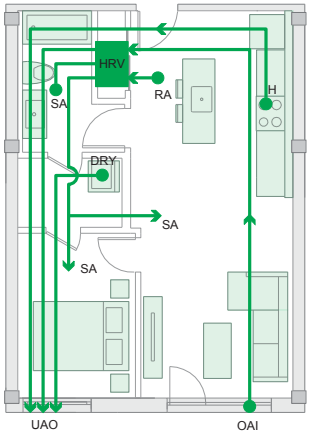
Mechanical, Electrical, and Plumbing | Horizontal, Bevelled Beam | NS-DS2507





Mechanical, Electrical, and Plumbing | Multi-residential Unit Diagram – Option 1 | NS-DS2508

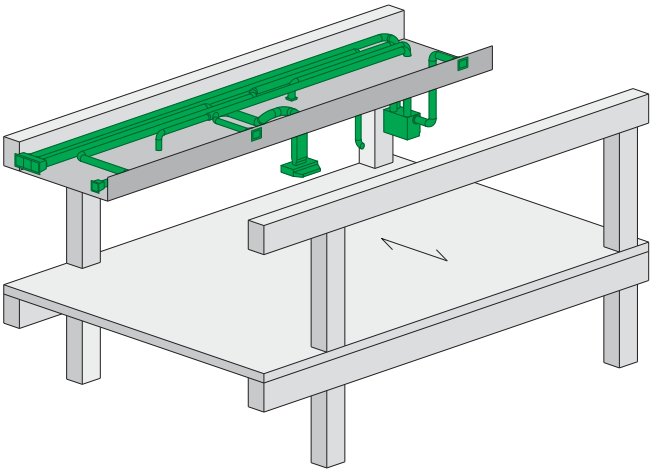


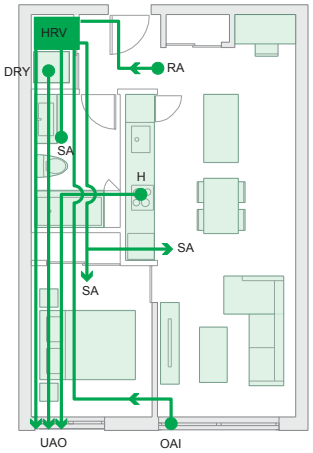


Legend

SA	Supply Air
H	Hood
OAI	Outdoor Air Intake
RA	Return Air
UAO	Used Air Outlet
SEC	Dryer
HRV	Heat Recovery Ventilator

Mechanical, Electrical, and Plumbing | Multi-residential Unit Diagram – Option 2 | NS-DS2509





Legend

SA	Supply Air
H	Hood
OAI	Outdoor Air Intake
RA	Return Air
UAO	Used Air Outlet
SEC	Dryer
HRV	Heat Recovery Ventilator

NORDIC

TECHNICAL GUIDE
NORDIC X-LAM

NS-GT6

ENGLISH

VERSION
2022-04-21

ARCHITECTURAL DETAILS 4

NORDIC STRUCTURES

GENERAL NOTES

1.0 General

1.1 This document supersedes all previous versions. For the latest version, consult nordic.ca or contact Nordic Structures.

1.2 The information contained in this document is provided for information purposes only. This information should not be used for any application without examination and verification of its accuracy, suitability and applicability by a licensed engineer, architect or other professional. Nordic Structures does not guarantee that the information is suitable for any general or particular use, and assumes no responsibility for the use, application of and/or reference to the information.

1.3 Certain commercial products are identified in this document in order to properly represent the test procedure. In no case does such identification imply recommendations or endorsement by Nordic Structures, nor does it imply that the product or material identified is the best available for the purpose.

1.4 For more information, consult nordic.ca or contact Nordic Structures.

2.0 Fire Safety

2.1 The fire resistance rating (FRR) is determined using the design methodology specified in Annex B of CSA O86-14, Engineering design in wood. The fire resistance rating may also be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101, Fire Endurance Tests of Building Construction and Materials.

2.2 To determine the fire resistance of an element or assembly according to other assumptions than those specified in this document, consult the Nordic X-Lam technical guide or use Nordic Sizer software.

2.3 The fire performance criteria for evaluating the separating function of building elements shall be considered when required by the applicable building code.

2.4 For this purpose, among other requirements, many firestop systems suitable for mass timber are available. For more details, consult the product suppliers.

2.5 Additional references: Fire-Resistance-Tested Mass Timber Assemblies and Penetrations.

3.0 Envelope

3.1 Good thermal insulation is never arbitrary and must always be chosen according to location, area and climate.

3.2 The total thermal resistance of an assembly is calculated according to the values of thermal conductivity, λ, and thermal resistance, RSI, indicated in the following table.

3.3 To convert the thermal resistance of the International System (RSI) [m²K/W] to the R-value [ft²Fh/BTU], divide the RSI value by 0.1761.

3.4 As stated in technical note NS-NT602-CA-en, Nordic X-Lam cross-laminated timber acts as a vapor barrier.

3.5 The use of closed cell spray polyurethane is not recommended for exterior wall assemblies made of cross-laminated timber because of its low permeability.

3.6 The study of the building envelope, including the control of condensation, the transfers of heat, air, moisture and sound, as well as the details of joining and fixing of the coverings, shall be carried out in accordance with the applicable building code.

GENERAL NOTES (CONTINUED)

Thermal Resistance of Materials

Product	t (mm)	λ (W/mK)	RSI (m²K/W)
Nordic Lam	25	0.13	0.19
Nordic X-Lam	25	0.13	0.19
Sawn lumber	25	0.12	0.21
Spray polyurethane (BASF)	50	0.02	2.50
Stone wool (Rockwool ComfortBatt R24)	139.7	0.033	4.23
Gypsum board	12.7	0.159	0.08
Polyisocyanurate (SOPRA-ISO)	-	0.025	-
Air cavity – Wall	13-20	-	0.16
Air cavity – Ceiling	13-40	-	0.15
	40-90	-	0.16
Interior air film – Wall	-	-	0.12
Interior air film – Ceiling	-	-	0.11
Exterior air film	-	-	0.03

References: Test Report AT-00205 (AIR-INS inc.), Wood Handbook (FPL, 2010), Evaluation Listing CCMC 13588-L (2011), Technical Data Sheet (Rockwool, 2017), Technical Data Sheet 190304SCANE (Soprema, 2019) and Table A-9.36.2.4.1.1)-D of NBC 2015.

4.0 Acoustics

4.1 The Sound Transmission Class (STC) rating describes the performance of the separating wall or floor/ceiling assembly, whereas the Apparent Sound Transmission Class (ASTC) takes into consideration the performance of the separating element as well as the flanking transmission paths. Moreover, building professionals should ensure that floors are designed to minimize impact transmission. For more details, see Appendix Note A-9.11. of the NBC 2015.

4.2 The following pages present separating assemblies that may comply with the applicable building code. However, selecting an appropriate separating assembly is only one part of the solution for reducing airborne sound transmission between adjoining spaces: to fully address the sound performance of the whole system, flanking assemblies must be connected to the separating assembly. For more details, see Appendix Note A-9.11.1.4. of the NBC 2015.

4.3 Unless otherwise noted, concrete topping and prefabricated concrete topping used in assemblies have a density of 2 710 kg/m³.

4.4 The use of prefabricated concrete topping in floor assemblies is only required by the acoustical testing procedure.

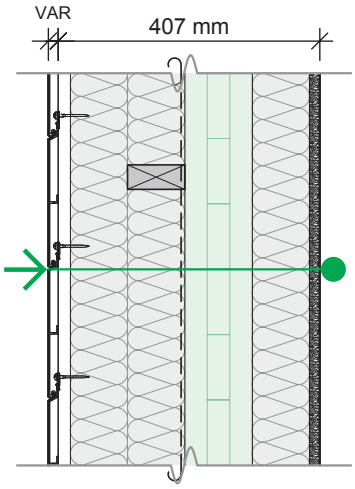
4.5 The use of an acoustic membrane under a floor covering is recommended, especially when it is a hard surface coating (e.g. ceramic).

4.6 Unless otherwise noted, the acoustic performance values are derived from test results from a certified laboratory. Test reports are available upon request.

4.7 Additional references:

- WoodWorks – Acoustics and Mass Timber: Room-to-Room Noise Control
- WoodWorks – Acoustically-Tested Mass Timber Assemblies
- University of Oregon – Acoustic Lab Testing of Typical Multi-Family Residential Wall and Floor Assemblies

Architecture, Assembly | Exterior Wall | NS-DA2000



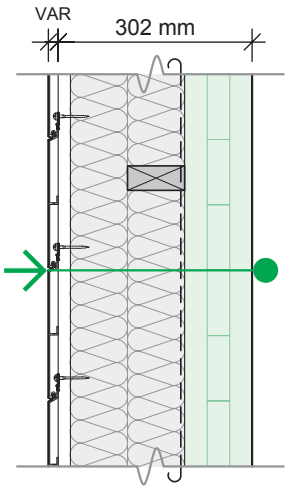
E1

Fire-resistance rating	FRR [a]	1 h	
Thermal resistance	RSI / R	6.7	/ 38
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- WOOD FURRING 38 mm X 89 mm @ 610 mm O.C.
- 2 ROWS OF STONE WOOL INSULATION 89 mm EA.
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- 1 ROW OF STONE WOOL INSULATION 89 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Exterior Wall | NS-DA2001



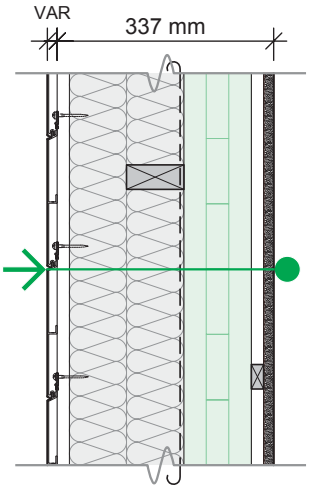
E2

Fire-resistance rating	FRR [a]	30 min	
Thermal resistance	RSI / R	4.8	/ 27
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- WOOD FURRING 38 mm X 89 mm @ 610 mm O.C.
- 2 ROWS OF STONE WOOL INSULATION 89 mm EA.
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm

Architecture, Assembly | Exterior Wall | NS-DA2002



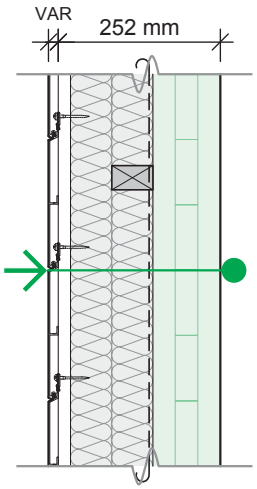
E3

Fire-resistance rating	FRR [a]	1 h	
Thermal resistance	RSI / R	5.0	/ 28
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- WOOD FURRING 38 mm X 89 mm @ 610 mm O.C.
- 2 ROWS OF STONE WOOL INSULATION 89 mm EA.
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- WOOD FURRING 19 mm @ 610 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Exterior Wall | NS-DA2003



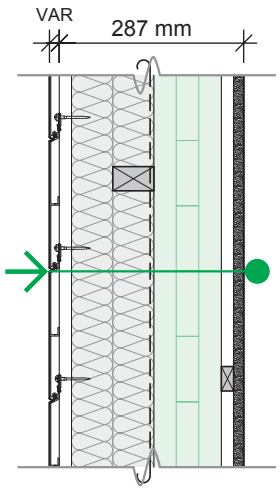
E4

Fire-resistance rating	FRR [a]	30 min	
Thermal resistance	RSI / R	3.7	/ 21
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 64 mm @ 610 mm O.C.
- WOOD FURRING 38 mm X 64 mm @ 610 mm O.C.
- 2 ROWS OF STONE WOOL INSULATION 64 mm EA.
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm

Architecture, Assembly | Exterior Wall | NS-DA2004



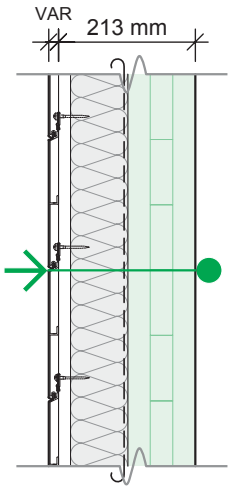
E5

Fire-resistance rating	FRR [a]	1 h	
Thermal resistance	RSI / R	4.0	/ 22
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 64 mm @ 610 mm O.C.
- WOOD FURRING 38 mm X 64 mm @ 610 mm O.C.
- 2 ROWS OF STONE WOOL INSULATION 64 mm EA.
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- WOOD FURRING 19 mm @ 610 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Exterior Wall | NS-DA2005



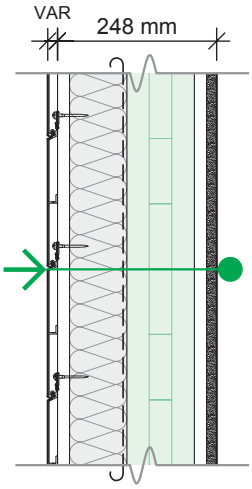
E6

Fire-resistance rating	FRR [a]	30 min	
Thermal resistance	RSI / R	2.9	/ 16
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- 1 ROW OF STONE WOOL INSULATION 89 mm
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm

Architecture, Assembly | Exterior Wall | NS-DA2006



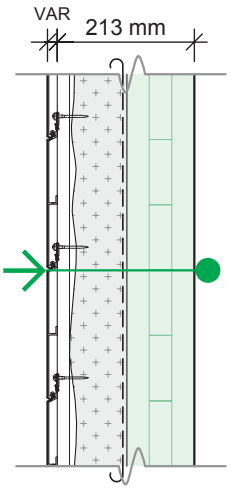
E7

Fire-resistance rating	FRR [a]	1 h	
Thermal resistance	RSI / R	3.1	/ 18
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- 1 ROW OF STONE WOOL INSULATION 89 mm
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- WOOD FURRING 19 mm @ 610 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Exterior Wall | NS-DA2007



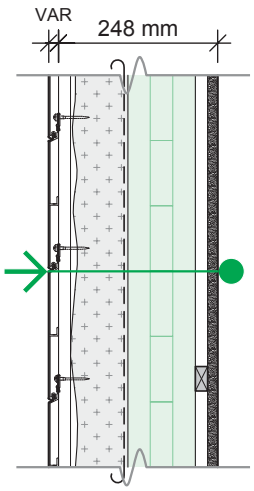
E8

Fire-resistance rating	FRR [a]	30 min	
Thermal resistance	RSI / R	3.4	/ 20
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- SPRAYED POLYURETHANE FOAM 89 mm
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm

Architecture, Assembly | Exterior Wall | NS-DA2008



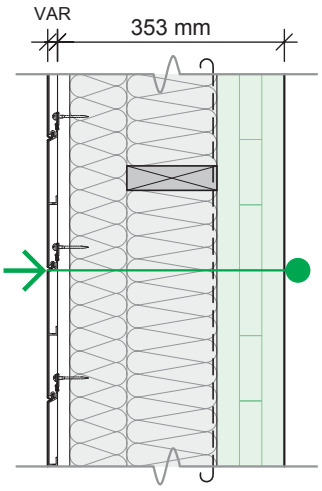
E9

Fire-resistance rating	FRR [a]	1 h	
Thermal resistance	RSI / R	3.7	/ 21
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- SPRAYED POLYURETHANE FOAM 89 mm
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- WOOD FURRING 19 mm @ 610 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Exterior Wall | NS-DA2009



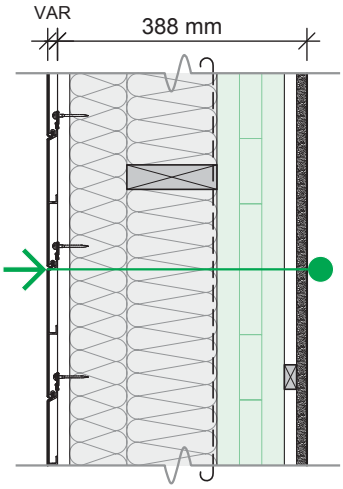
E10

Fire-resistance rating	FRR [a]	30 min	
Thermal resistance	RSI / R	5.8	/ 33
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- WOOD FURRING 38 mm X 140 mm @ 610 mm O.C.
- 1 ROW OF STONE WOOL INSULATION 89 mm
- 1 ROW OF STONE WOOL INSULATION 140 mm
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm

Architecture, Assembly | Exterior Wall | NS-DA2010



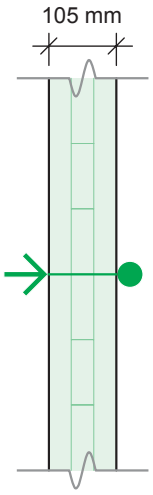
E11

Fire-resistance rating	FRR [a]	1 h	
Thermal resistance	RSI / R	6.1	/ 35
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- CLADDING (UP TO THE DESIGNER)
- AIR GAP 19 mm
- WOOD STUDS 38 mm X 89 mm @ 610 mm O.C.
- WOOD FURRING 38 mm X 140 mm @ 610 mm O.C.
- 1 ROW OF STONE WOOL INSULATION 89 mm
- 1 ROW OF STONE WOOL INSULATION 140 mm
- AIR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- WOOD FURRING 19 mm @ 610 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2100



P1

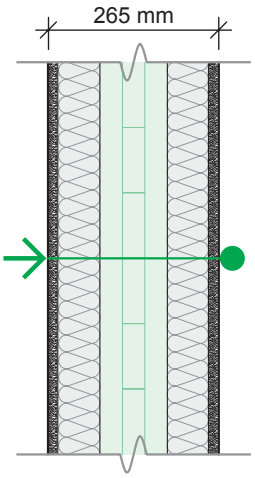
Fire-resistance rating	FRR [a]	30 min	/ 30 min
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	33	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

b) Composition and acoustic performance taken from the CLT Handbook – Canadian Edition (FPInnovations, 2011). Acoustic performance based on a CLT thickness of 95-115 mm.

- NORDIC X-LAM 105 mm

Architecture, Assembly | Partition | NS-DA2101



P2

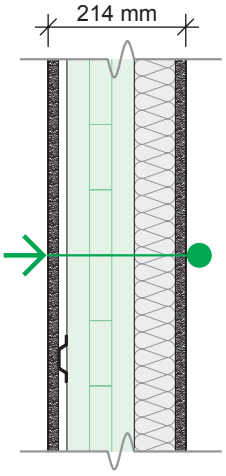
Fire-resistance rating	FRR [a]	1 h	/ 1 h
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	58	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

b) Composition and acoustic performance taken from the CLT Handbook – Canadian Edition (FPInnovations, 2011). Acoustic performance based on a CLT thickness of 95-115 mm.

- 1 TYPE X GYPSUM BOARD 15.9 mm
- 1 ROW OF MINERAL WOOL INSULATION 64 mm
- WOOD STUDS 38 mm X 64 mm @ 610 mm O.C.
- NORDIC X-LAM 105 mm
- WOOD STUDS 38 mm X 64 mm @ 610 mm O.C. OFF-CENTERED FROM THE OTHER ROW OF WOOD STUDS
- 1 ROW OF MINERAL WOOL INSULATION 64 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2102



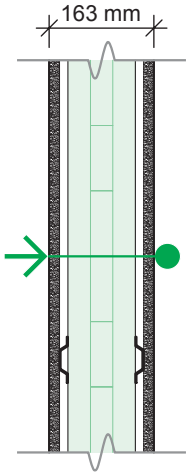
P3

Fire-resistance rating	FRR [a]	1 h	/ 1 h
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	53	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- 1 TYPE X GYPSUM BOARD 15.9 mm
- RESILIENT CHANNELS 12.7 mm @ 406 mm O.C. INSTALLED HORIZONTALLY
- NORDIC X-LAM 105 mm
- WOOD STUDS 38 mm X 64 mm @ 610 mm O.C.
- 1 ROW OF MINERAL WOOL INSULATION 64 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2103



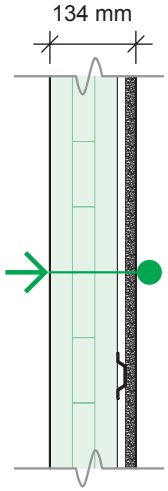
P4

Fire-resistance rating	FRR [a]	1 h	/	1 h
Thermal resistance	RSI / R	n.a.	/	n.a.
	STC [b] / ASTC	37	/	n.a.
Acoustic ratings	IIC / AIIC	n.a.	/	n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.
b) Composition and acoustic performance taken from the CLT Handbook – Canadian Edition (FPInnovations, 2011). Acoustic performance based on a CLT thickness of 95-115 mm.

– 1 TYPE X GYPSUM BOARD 15.9 mm
– RESILIENT CHANNELS 12.7 mm @ 406 mm O.C. INSTALLED HORIZONTALLY
– NORDIC X-LAM 105 mm
– RESILIENT CHANNELS 12.7 mm @ 406 mm O.C. INSTALLED HORIZONTALLY
– 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2104



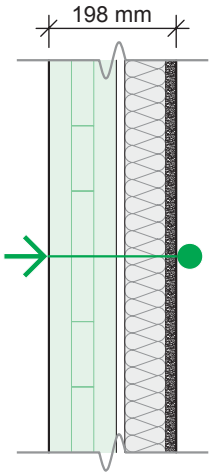
P5

Fire-resistance rating	FRR [a]	30 min	/	1 h
Thermal resistance	RSI / R	n.a.	/	n.a.
	STC [b] / ASTC	37	/	n.a.
Acoustic ratings	IIC / AIIC	n.a.	/	n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.
b) Composition and acoustic performance taken from the CLT Handbook – Canadian Edition (FPInnovations, 2011). Acoustic performance based on a CLT thickness of 95-115 mm.

– NORDIC X-LAM 105 mm
– RESILIENT CHANNELS 12.7 mm @ 406 mm O.C. INSTALLED HORIZONTALLY
– 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2105



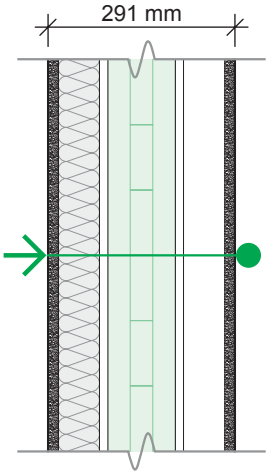
P6

Fire-resistance rating	FRR [a]	30 min	/ 1 h
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	n.a.	/ 47
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- NORDIC X-LAM 105 mm
- AIR GAP 12.7 mm
- WOOD STUDS 38 mm X 64 mm @ 406 mm O.C.
- 1 ROW OF MINERAL WOOL INSULATION 64 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2106



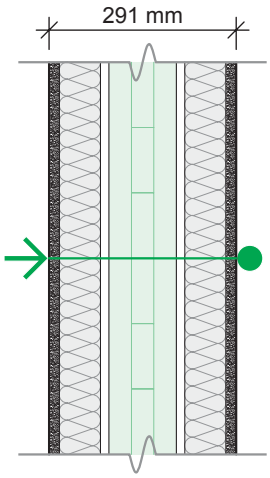
P7

Fire-resistance rating	FRR [a]	1 h	/ 1 h
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	n.a.	/ 50
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- 1 TYPE X GYPSUM BOARD 15.9 mm
- 1 ROW OF MINERAL WOOL INSULATION 64 mm
- WOOD STUDS 38 mm X 64 mm @ 406 mm O.C.
- AIR GAP 12.7 mm
- NORDIC X-LAM 105 mm
- AIR GAP 12.7 mm
- WOOD STUDS 38 mm X 64 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2107



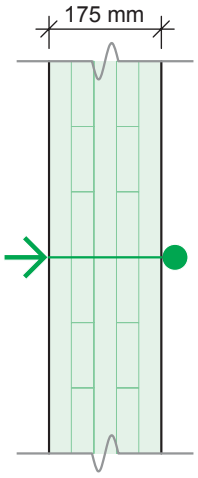
P8

Fire-resistance rating	FRR [(a)]	1 h	/	1 h
Thermal resistance	RSI / R	n.a.	/	n.a.
Acoustic ratings	STC / ASTC	n.a.	/	54
	IIC / AIIC	n.a.	/	n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 300 kN/m.

- 1 TYPE X GYPSUM BOARD 15.9 mm
- 1 ROW OF MINERAL WOOL INSULATION 64 mm
- WOOD STUDS 38 mm X 64 mm @ 406 mm O.C.
- AIR GAP 12.7 mm
- NORDIC X-LAM 105 mm
- AIR GAP 12.7 mm
- WOOD STUDS 38 mm X 64 mm @ 406 mm O.C.
- 1 ROW OF MINERAL WOOL INSULATION 64 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Partition | NS-DA2108



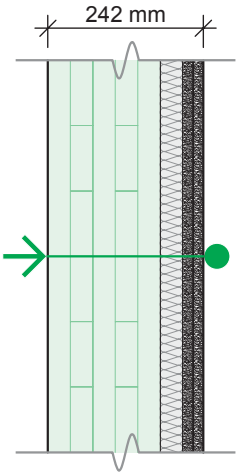
P9

Fire-resistance rating	FRR [(a)]	1.5 h	/	1.5 h
Thermal resistance	RSI / R	n.a.	/	n.a.
Acoustic ratings	STC / ASTC	37	/	n.a.
	IIC / AIIC	n.a.	/	n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- NORDIC X-LAM 175 mm

Architecture, Assembly | Partition | NS-DA2109



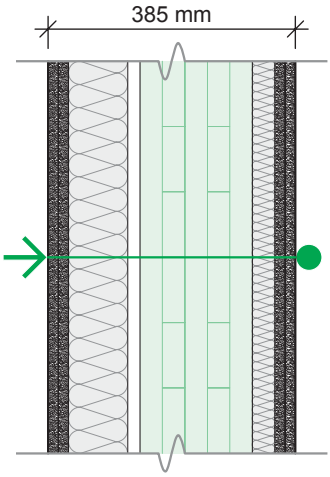
P10

Fire-resistance rating	FRR [a]	1.5 h	/ 2.5 h
Thermal resistance	RSI / R	n.a.	/ n.a.
	STC / ASTC	53	/ n.a.
Acoustic ratings	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 35 mm @ 406 mm O.C. INSTALLED VERTICALLY
- 1 ROW OF FIBREGLASS INSULATION OF TYPE "ROSE FIBERGLAS ECOTOUCH" 38 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.

Architecture, Assembly | Partition | NS-DA2110



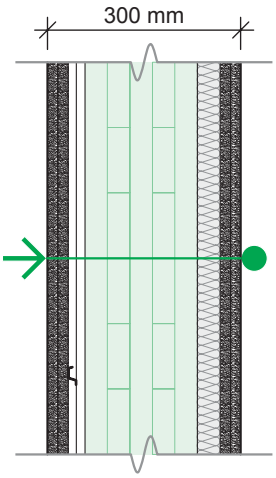
P11

Fire-resistance rating	FRR [a]	2.5 h	/ 2.5 h
Thermal resistance	RSI / R	n.a.	/ n.a.
	STC / ASTC	71	/ n.a.
Acoustic ratings	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.
- METAL STUDS (26 GAUGE) 31 mm X 92 mm @ 406 mm O.C.
- 1 ROW OF FIBREGLASS INSULATION OF TYPE "ROSE FIBERGLAS ECOTOUCH" 92 mm
- AIR GAP 19 mm
- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 35 mm @ 406 mm O.C. INSTALLED VERTICALLY
- 1 ROW OF FIBREGLASS INSULATION OF TYPE "ROSE FIBERGLAS ECOTOUCH" 38 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.

Architecture, Assembly | Partition | NS-DA2111



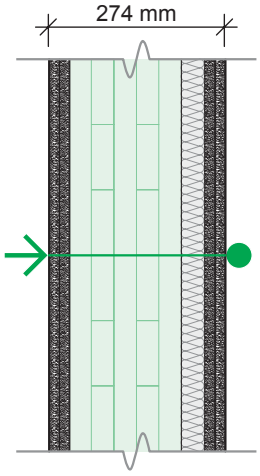
P12

Fire-resistance rating	FRR [a]	2.5 h	/ 2.5 h
Thermal resistance	RSI / R	n.a.	/ n.a.
	STC / ASTC	53	/ n.a.
Acoustic ratings	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.
- RESILIENT CHANNELS 12.7 mm @ 406 mm O.C. INSTALLED HORIZONTALLY
- PLYWOOD STRIPS 12.7 mm @ 406 mm O.C.
- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 35 mm @ 406 mm O.C. INSTALLED VERTICALLY
- 1 ROW OF FIBREGLASS INSULATION OF TYPE "ROSE FIBERGLAS ECOTOUCH" 38 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.

Architecture, Assembly | Partition | NS-DA2112



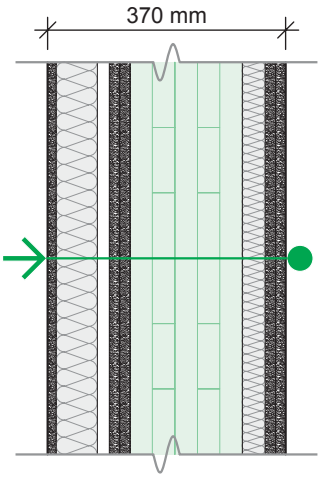
P13

Fire-resistance rating	FRR [a]	2.5 h	/ 2.5 h
Thermal resistance	RSI / R	n.a.	/ n.a.
	STC / ASTC	53	/ n.a.
Acoustic ratings	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.
- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 35 mm @ 406 mm O.C. INSTALLED VERTICALLY
- 1 ROW OF FIBREGLASS INSULATION OF TYPE "ROSE FIBERGLAS ECOTOUCH" 38 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.

Architecture, Assembly | Partition | NS-DA2113



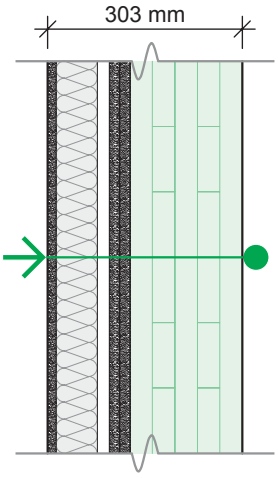
P14

Fire-resistance rating	FRR [a]	2.5 h	/ 2.5 h
Thermal resistance	RSI / R	n.a.	/ n.a.
	STC / ASTC	65	/ n.a.
Acoustic ratings	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- 1 TYPE C GYPSUM BOARD 12.7 mm
- METAL STUDS (26 GAUGE) 31 mm X 64 mm @ 406 mm O.C.
- 1 ROW OF STONE WOOL INSULATION OF TYPE “ROXUL AFB” 64 mm
- AIR GAP 19 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.
- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 35 mm @ 406 mm O.C. INSTALLED VERTICALLY
- 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 38 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.

Architecture, Assembly | Partition | NS-DA2114



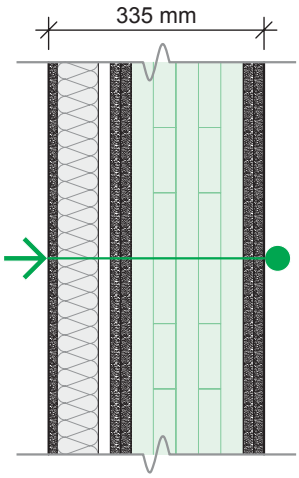
P15

Fire-resistance rating	FRR [a]	2.5 h	/ 1.5 h
Thermal resistance	RSI / R	n.a.	/ n.a.
	STC / ASTC	62	/ n.a.
Acoustic ratings	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- 1 TYPE C GYPSUM BOARD 12.7 mm
- METAL STUDS (26 GAUGE) 31 mm X 64 mm @ 406 mm O.C.
- 1 ROW OF STONE WOOL INSULATION OF TYPE “ROXUL AFB” 64 mm
- AIR GAP 19 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.
- NORDIC X-LAM 175 mm

Architecture, Assembly | Partition | NS-DA2115



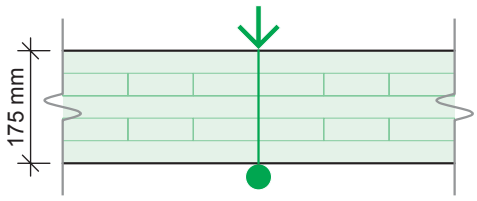
P16

Fire-resistance rating	FRR [a]	2.5 h	/ 2.5 h
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	61	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance ratings on each side of the partition are based on an effective length of 3 m and on a concentric specified uniform load of 800 kN/m.

- 1 TYPE C GYPSUM BOARD 12.7 mm
- METAL STUDS (26 GAUGE) 31 mm X 64 mm @ 406 mm O.C.
- 1 ROW OF STONE WOOL INSULATION OF TYPE “ROXUL AFB” 64 mm
- AIR GAP 19 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.
- NORDIC X-LAM 175 mm
- 2 TYPE X GYPSUM BOARDS 15.9 mm EA.

Architecture, Assembly | Floor | NS-DA2200



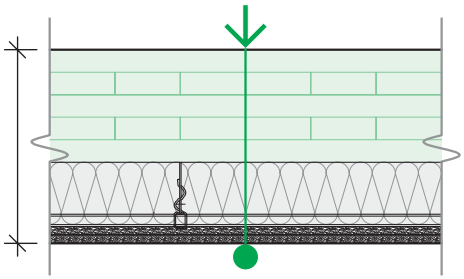
F1

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	39	/ n.a.
	IIC / AIIC	27	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2201



F2

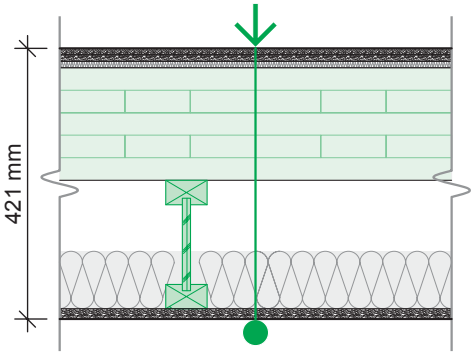
Fire-resistance rating	FRR [a]	2.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	64	/ n.a.
	IIC [b] / AIIC	59	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Composition and acoustic performance taken from the CLT Handbook – Canadian Edition (FPInnovations, 2011). Acoustic performance based on a CLT thickness of 146 mm.

- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - RESILIENT METALLIC HANGERS 100 mm
  - METAL TRACKS @ 406 mm O.C. MIN
  - SOUNDPROOFING MATERIAL 100 mm
- 2 TYPE X GYPSUM BOARDS 12.7 mm EA.

Architecture, Assembly | Floor | NS-DA2202



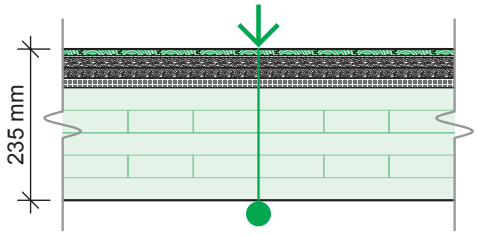
F3

Fire-resistance rating	FRR [a]	2 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- UNDERLAY OF TYPE “FERMACELL 2E32” 30 mm OR “PERMABASE” WITH “SONOPAN”
- NORDIC X-LAM 175 mm
- NORDIC JOIST 200 mm @ 610 mm O.C.
- SOUNDPROOFING MATERIAL 89 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2203



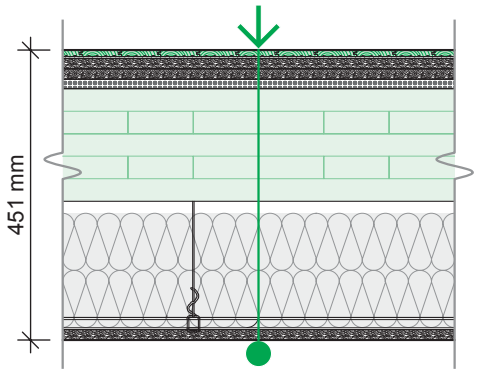
F4

Fire-resistance rating	FRR [a]	1.5 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	n.a. / 47
	IIC / AIIC	n.a. / 46

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- FLOATING FLOOR 10 mm
- UNDERLAY OF TYPE “INSONOBOIS” 3 mm
- 2 UNDERLAYS OF TYPE “FIBEROCK” 15.9 mm EA.
- UNDERLAY OF TYPE “INSONOMAT” 15 mm
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2204



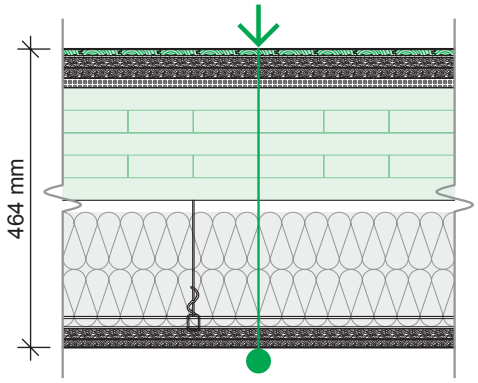
F5

Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	n.a. / 59
	IIC / AIIC	n.a. / 61

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- FLOATING FLOOR 10 mm
- UNDERLAY OF TYPE “INSONOBOIS” 3 mm
- 2 UNDERLAYS OF TYPE “FIBEROCK” 15.9 mm EA.
- UNDERLAY OF TYPE “INSONOMAT” 15 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - RESILIENT METALLIC HANGERS 200 mm @ 1200 mm O.C.
  - METAL TRACKS @ 600 mm O.C.
  - 2 ROWS OF STONE WOOL INSULATION OF TYPE “ROXUL” (40 kg/m³) 89 mm EA.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2205



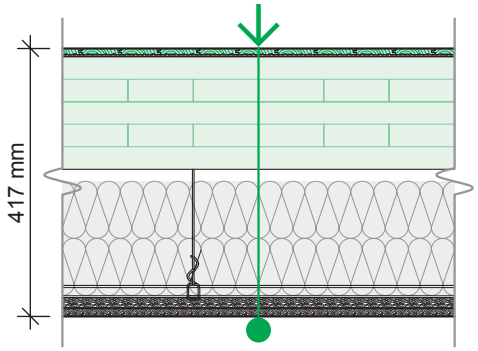
F6

Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	n.a. / 58
	IIC / AIIC	n.a. / 60

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- FLOATING FLOOR 10 mm
- UNDERLAY OF TYPE “INSONOBOIS” 3 mm
- 2 UNDERLAYS OF TYPE “FIBEROCK” 15.9 mm EA.
- UNDERLAY OF TYPE “INSONOMAT” 15 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - RESILIENT METALLIC HANGERS 200 mm @ 1200 mm O.C.
  - METAL TRACKS @ 600 mm O.C.
  - 2 ROWS OF STONE WOOL INSULATION OF TYPE “ROXUL” (40 kg/m³) 89 mm EA.
- 1 TYPE X GYPSUM BOARD 15.9 mm
- 1 REGULAR GYPSUM BOARD 12.7 mm

Architecture, Assembly | Floor | NS-DA2206



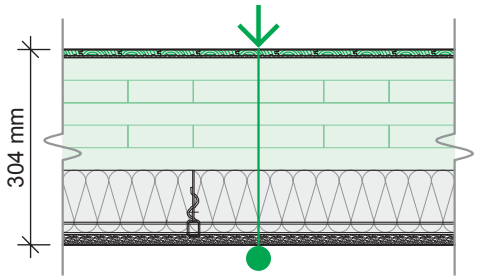
F7

Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	n.a. / 54
	IIC / AIIC	n.a. / 56

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- FLOATING FLOOR 10 mm
- UNDERLAY OF TYPE “INSONOBOIS” 3 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - RESILIENT METALLIC HANGERS 200 mm @ 1200 mm O.C.
  - METAL TRACKS @ 600 mm O.C.
  - 2 ROWS OF STONE WOOL INSULATION OF TYPE “ROXUL” (40 kg/m³) 89 mm EA.
- 1 TYPE X GYPSUM BOARD 15.9 mm
- 1 REGULAR GYPSUM BOARD 12.7 mm

Architecture, Assembly | Floor | NS-DA2207



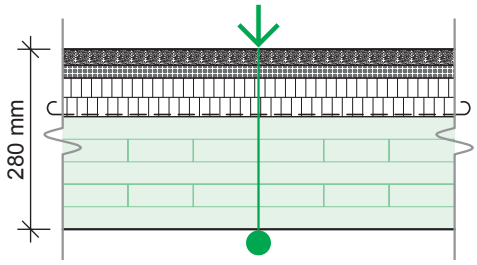
F8

Fire-resistance rating	FRR [a]	2 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	n.a.	/ 53
	IIC / AIIC	n.a.	/ 52

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- FLOATING FLOOR 10 mm
- UNDERLAY OF TYPE “INSONOBOIS” 3 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - RESILIENT METALLIC HANGERS 100 mm @ 1200 mm O.C.
  - METAL TRACKS @ 600 mm O.C.
  - 1 ROW OF STONE WOOL INSULATION OF TYPE “ROXUL” (40 kg/m³) 89 mm EA.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2208



F9

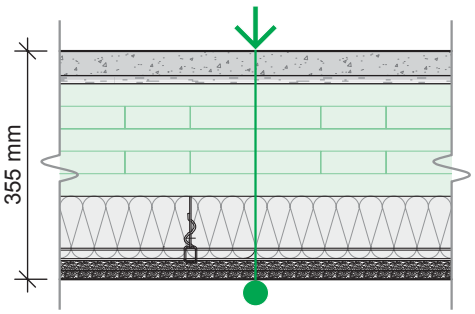
Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	62	/ n.a.
	IIC [b] / AIIC	59	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Composition and acoustic performance taken from the CLT Handbook – U.S. Edition (FPInnovations, 2013). Acoustic performance based on a CLT thickness of 135 mm.

- GYPSUM FIBREBOARD OF TYPE “FERMACELL” 25 mm
- UNDERLAY OF TYPE “ISOVER EP3” 20 mm
- 2 LAYERS OF PELLETS AND HONEYCOMB CORE OF TYPE “FERMACELL” 30 mm EA.
- KRAFT PAPER UNDERLAY
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2209



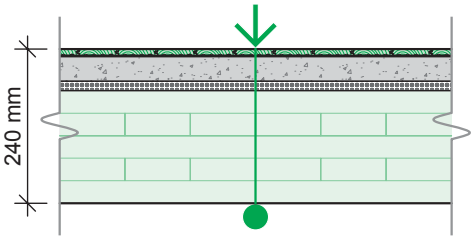
F10

Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	n.a. / 61
	IIC / AIIC	n.a. / 50

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- CONCRETE TOPPING (2000 kg/m³) 38 mm
- WOOD FIBRE ACOUSTIC PANEL OF TYPE "BP ECO-LOGICAL" 12.7 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - RESILIENT METALLIC HANGERS 100 mm @ 1200 mm O.C.
  - METAL TRACKS @ 600 mm O.C.
  - 1 ROW OF STONE WOOL INSULATION OF TYPE "ROXUL" (40 kg/m³) 89 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm
- 1 REGULAR GYPSUM BOARD 12.7 mm

Architecture, Assembly | Floor | NS-DA2210



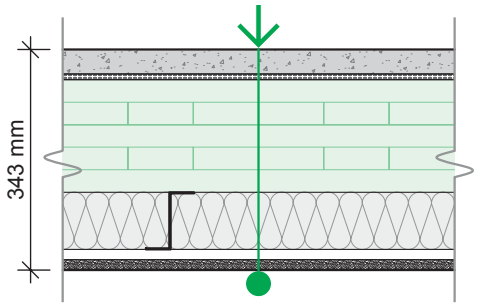
F11

Fire-resistance rating	FRR [a]	1.5 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	55 / n.a.
	IIC / AIIC	51 / n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- ENGINEERED WOOD FLOOR 10 mm
- UNDERLAY OF TYPE "ROBERTS SOFT STRIDE" 2 mm
- CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE "INSONOMAT" 15 mm
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2211



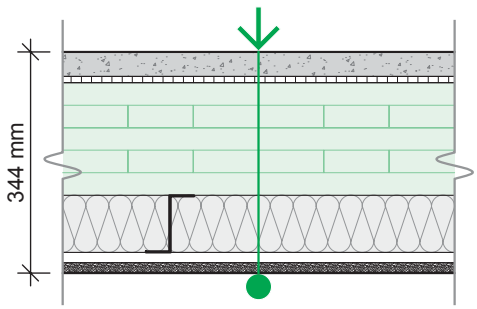
F12

Fire-resistance rating	FRR [a]	2 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	70	/ n.a.
	IIC / AIIC	56	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “OWENS CORNING QUIÉTUDE” 9 mm
- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 90 mm @ 610 mm O.C.
- 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 92 mm
- FURRING CHANNELS 16 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2212



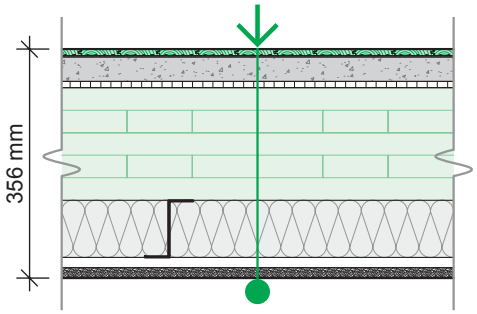
F13

Fire-resistance rating	FRR [a]	2 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	69	/ n.a.
	IIC / AIIC	54	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- CONCRETE TOPPING 38 mm
- TAR FIBREBOARD 10 mm
- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 90 mm @ 610 mm O.C.
- 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 92 mm
- FURRING CHANNELS 16 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2213



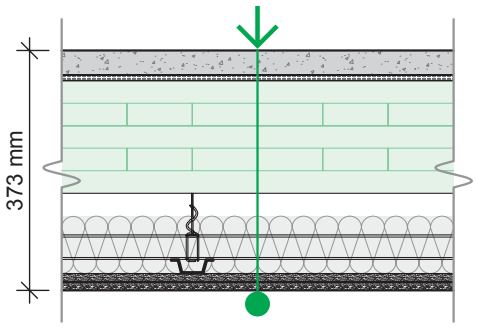
F14

Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	69 / n.a.
	IIC / AIIC	58 / n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- ENGINEERED WOOD FLOOR 10 mm
- UNDERLAY OF TYPE “ROBERTS SOFT STRIDE” 2 mm
- CONCRETE TOPPING 38 mm
- TAR FIBREBOARD 10 mm
- NORDIC X-LAM 175 mm
- Z-CHANNELS (26 GAUGE) 90 mm @ 610 mm O.C.
- 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 92 mm
- FURRING CHANNELS 16 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2214



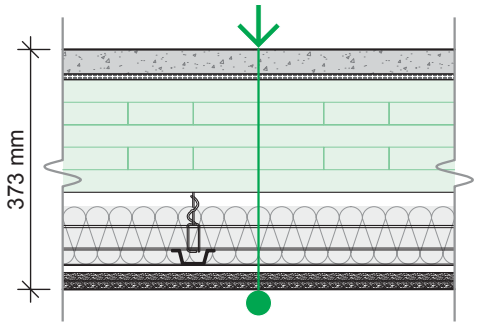
F15

Fire-resistance rating	FRR [a]	1.5 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	72 / n.a.
	IIC / AIIC	65 / n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “OWENS CORNING QUIÉTUDE” 9 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - METALLIC HANGERS 65 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C.
  - FURRING CHANNELS 22 mm @ 406 mm O.C.
  - 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 92 mm
- 2 TYPE C GYPSUM BOARDS 12.7 mm EA.

Architecture, Assembly | Floor | NS-DA2215



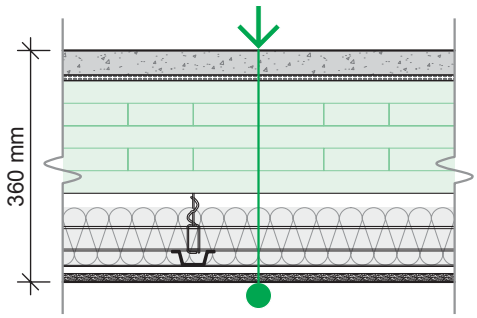
F16

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	73	/ n.a.
	IIC / AIIC	66	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “OWENS CORNING QUIÉTUDE” 9 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - METALLIC HANGERS 52 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C.
  - FURRING CHANNELS 22 mm @ 406 mm O.C.
  - 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 92 mm
- RESILIENT CHANNELS 13 mm @ 610 mm O.C.
- 2 TYPE C GYPSUM BOARDS 12.7 mm EA.

Architecture, Assembly | Floor | NS-DA2216



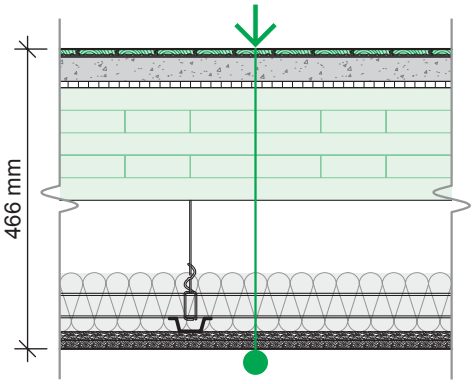
F17

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	72	/ n.a.
	IIC / AIIC	62	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “OWENS CORNING QUIÉTUDE” 9 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - METALLIC HANGERS 52 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C.
  - FURRING CHANNELS 22 mm @ 406 mm O.C.
  - 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 92 mm
- RESILIENT CHANNELS 13 mm @ 610 mm O.C.
- 1 TYPE C GYPSUM BOARD 12.7 mm

Architecture, Assembly | Floor | NS-DA2217



F18

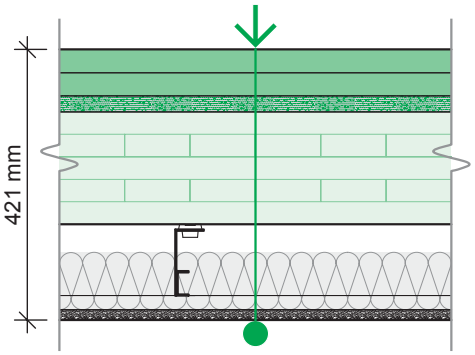
Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	75	/ n.a.
	IIC [b] / AIIC	66	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Acoustic performance based on a CLT thickness of 131 mm.

- FLOATING FLOOR 9 mm
- UNDERLAY OF TYPE “ACOUSTITECH PREMIUM” 3 mm
- PREFABRICATED CONCRETE TOPPING 38 mm
- TAR FIBREBOARD 10 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - METALLIC HANGERS 145 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C.
  - FURRING CHANNELS 22 mm @ 406 mm O.C.
  - 1 ROW OF FIBREGLASS INSULATION OF TYPE “ROSE FIBERGLAS ECOTOUCH” 92 mm
- 2 TYPE C GYPSUM BOARDS 12.7 mm EA.

Architecture, Assembly | Floor | NS-DA2219



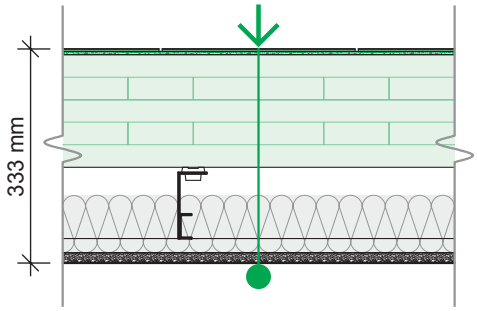
F20

Fire-resistance rating	FRR [a]	2 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	61	/ n.a.
	IIC / AIIC	55	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- 2 ROWS OF PANELS OF TYPE “HUBER ENGINEERED WOOD ADVANTECH” 36 mm EA.
- UNDERLAY OF TYPE “GENIEMAT FF” 25 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - BRACKETS OF TYPE “GENIECLIP LB” 111 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C. FIXED AT THE BOTTOM OF THE BRACKETS
  - FURRING CHANNELS 22 mm @ 610 mm O.C.
  - 1 ROW FIBREGLASS INSULATION OF TYPE “JOHNS MANVILLE UNFACED BATTS R13” 89 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2220



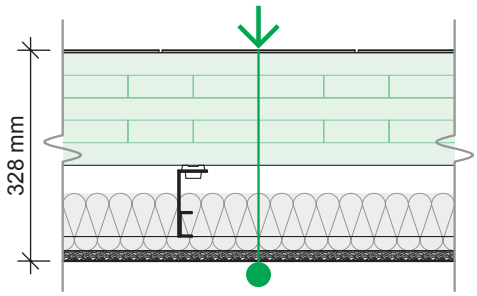
F21

Fire-resistance rating	FRR [a]	2 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	58	/ n.a.
	IIC / AIIC	58	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- VINYL TILES FLOORING 4 mm
- UNDERLAY OF TYPE “GENIEMAT RST05” 5 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - BRACKETS OF TYPE “GENIECLIP LB” 111 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C. FIXED AT THE BOTTOM OF THE BRACKETS
  - FURRING CHANNELS 22 mm @ 610 mm O.C.
  - 1 ROW OF FIBREGLASS INSULATION OF TYPE “JOHNS MANVILLE UNFACED BATTS R13” 89 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2221



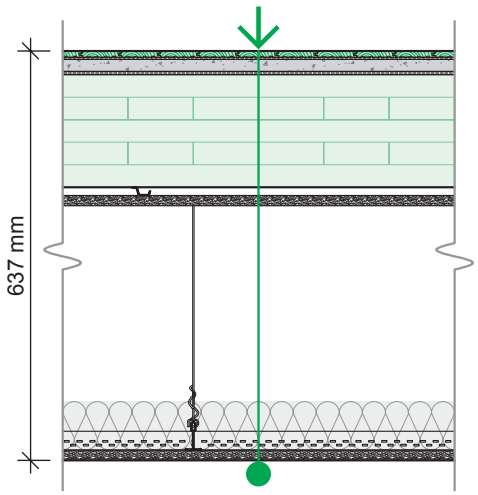
F22

Fire-resistance rating	FRR [a]	2 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC / ASTC	57	/ n.a.
	IIC / AIIC	54	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- VINYL TILES FLOORING 4 mm
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - BRACKETS OF TYPE “GENIECLIP LB” 111 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C. FIXED AT THE BOTTOM OF THE BRACKETS
  - FURRING CHANNELS 22 mm @ 610 mm O.C.
  - 1 ROW OF FIBREGLASS INSULATION OF TYPE “JOHNS MANVILLE UNFACED BATTS R13” 89 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2222



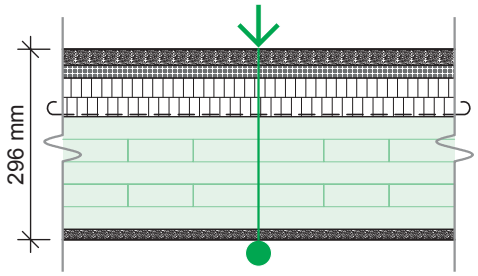
F23

Fire-resistance rating	FRR [a]	2.5 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC	n.a. / 54
	IIC / AIIC	n.a. / 53

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- FLOATING FLOOR 10 mm
- UNDERLAY OF TYPE “INSONOBOIS” 3.5 mm
- TOPPING OF TYPE “MAXXON GYP-CRETE” (2050 kg/m³) 19 mm
- ENTANGLED FILAMENT MAT OF TYPE “MAXXON ACOUSTI-MAT 1” 5 mm
- NORDIC X-LAM 175 mm
- RESILIENT CHANNELS 13 mm @ 610 mm O.C.
- 1 TYPE X GYPSUM BOARD OF TYPE “QUIETROCK” 15.9 mm
- SUSPENDED DRYWALL GRID SYSTEM OF TYPE “ARMSTRONG”:
  - METALLIC HANGERS 380 mm
  - T-CHANNELS 43 mm @ 1220 mm O.C.
  - 1 ROW OF STONE WOOL INSULATION OF TYPE “ROXUL” (40 kg/m³) 75 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2223



F24

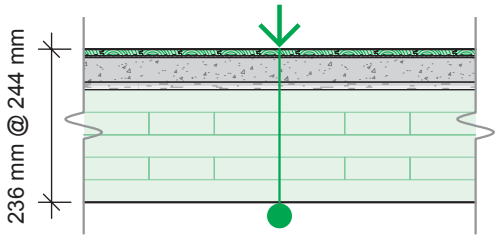
Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC [b] / ASTC	62 / n.a.
	IIC [b] / AIIC	59 / n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Composition and acoustic performance taken from the CLT Handbook – U.S. Edition (FPInnovations, 2013). Acoustic performance based on a CLT thickness of 135 mm.

- GYPSUM FIBERBOARD OF TYPE “FERMACELL” 25 mm
- UNDERLAY OF TYPE “ISOVER EP3” 20 mm
- 2 LAYERS OF PELLETS AND HONEYCOMB CORE OF TYPE “FERMACELL” 30 mm EA.
- KRAFT PAPER UNDERLAY
- NORDIC X-LAM 175 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2224



F25

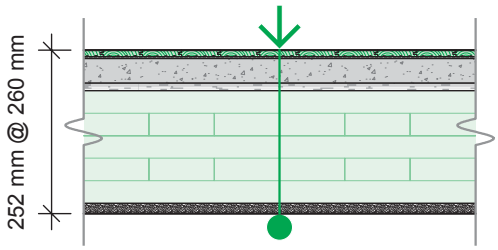
Fire-resistance rating	FRR [a]	1.5 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC [b]	n.a. / > 50
	IIC / AIIC [b]	n.a. / > 50

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Composition and acoustic performance taken from the CLT Handbook – U.S. Edition (FPInnovations, 2013). Acoustic performance based on a CLT thickness of 135 mm.

- CARPET OR FLOATING FLOOR 10 mm
- RESILIENT UNDERLAY (RUBBER OR FELT) 3 mm
- TOPPING, AT LEAST 76 kg/m² (I.E. CONCRETE OR OF TYPE "MAXXON GYP-CRETE")
- RESILIENT UNDERLAY (RUBBER 10 mm, FELT 18 mm, OR WOOD FIBERBOARD 12 mm)
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2225



F26

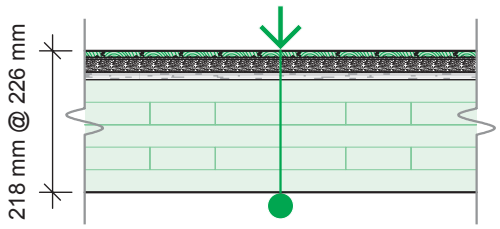
Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC [b]	n.a. / > 50
	IIC / AIIC [b]	n.a. / > 50

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Composition and acoustic performance taken from the CLT Handbook – U.S. Edition (FPInnovations, 2013). Acoustic performance based on a CLT thickness of 135 mm.

- CARPET OR FLOATING FLOOR 10 mm
- RESILIENT UNDERLAY (RUBBER OR FELT) 3 mm
- TOPPING, AT LEAST 76 kg/m² (I.E. CONCRETE OR OF TYPE "MAXXON GYP-CRETE")
- RESILIENT UNDERLAY (RUBBER 10 mm, FELT 18 mm, OR WOOD FIBERBOARD 12 mm)
- NORDIC X-LAM 175 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2226



F27

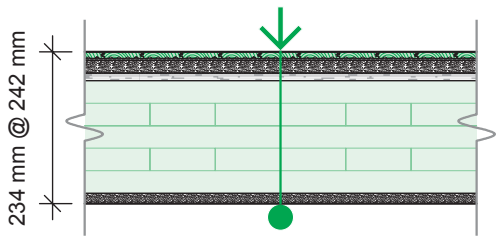
Fire-resistance rating	FRR [a]	1.5 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC [b]	n.a. / > 45
	IIC / AIIC [b]	n.a. / > 45

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Composition and acoustic performance taken from the CLT Handbook – U.S. Edition (FPInnovations, 2013). Acoustic performance based on a CLT thickness of 135 mm.

- CARPET OR FLOATING FLOOR 10 mm
- RESILIENT UNDERLAY (RUBBER OR FELT) 3 mm
- PREFABRICATED TOPPING, AT LEAST 25 kg/m² (20 mm OF TYPE "FERMACELL" OR OF TYPE "FIBREROCK")
- RESILIENT UNDERLAY (RUBBER 10 mm, FELT 18 mm, OR WOOD FIBERBOARD 12 mm)
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2227



F28

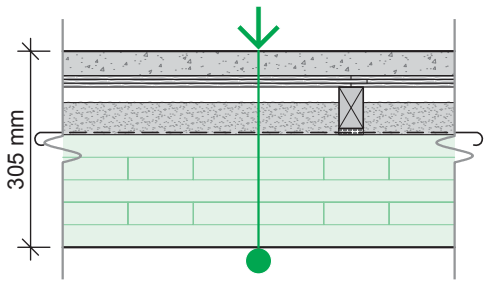
Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	n.a. / n.a.
Acoustic ratings	STC / ASTC [b]	n.a. / > 45
	IIC / AIIC [b]	n.a. / > 45

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Composition and acoustic performance taken from the CLT Handbook – U.S. Edition (FPInnovations, 2013). Acoustic performance based on a CLT thickness of 135 mm.

- CARPET OR FLOATING FLOOR 10 mm
- RESILIENT UNDERLAY (RUBBER OR FELT) 3 mm
- PREFABRICATED TOPPING, AT LEAST 25 kg/m² (20 mm OF TYPE "FERMACELL" OR OF TYPE "FIBREROCK")
- RESILIENT UNDERLAY (RUBBER 10 mm, FELT 18 mm, OR WOOD FIBERBOARD 12 mm)
- NORDIC X-LAM 175 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Floor | NS-DA2228



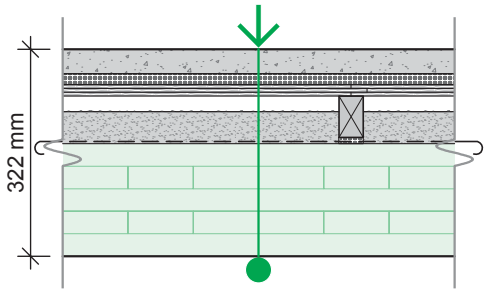
F29

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	64	/ n.a.
	IIC [b] / AIIC	53	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

- PREFABRICATED CONCRETE TOPPING 38 mm
- TONGUE AND GROOVE OSB SHEATHING 18 mm
- WOOD RAFTERS 38 mm X 64 mm @ 610 mm O.C.
- SILICA SAND (#71) 50 mm
- RUBBER MEMBRANE BANDS 10 mm UNDER RAFTERS
- POLYETHYLENE SHEETING 6 mil
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2229



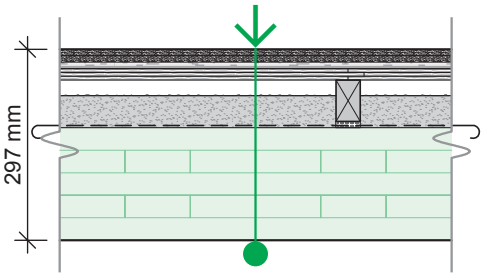
F30

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	66	/ n.a.
	IIC [b] / AIIC	60	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

- PREFABRICATED CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “REGUPOL SONUS WAVE” 17 mm
- TONGUE AND GROOVE OSB SHEATHING 18 mm
- WOOD RAFTERS 38 mm X 64 mm @ 610 mm O.C.
- SILICA SAND (#71) 50 mm
- RUBBER MEMBRANE BANDS 10 mm UNDER RAFTERS
- POLYETHYLENE SHEETING 6 mil
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2230



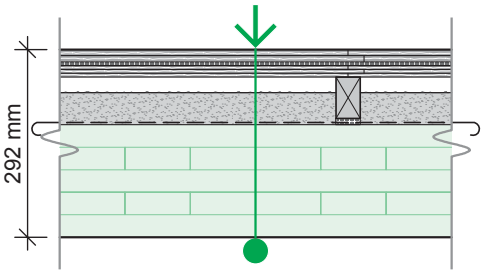
F31

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	59	/ n.a.
	IIC [b] / AIIC	53	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

- UNDERLAY OF TYPE “FERMACELL 2E31” 30 mm
- TONGUE AND GROOVE OSB SHEATHING 18 mm
- WOOD RAFTERS 38 mm X 64 mm @ 610 mm O.C.
- SILICA SAND (#71) 50 mm
- RUBBER MEMBRANE BANDS 10 mm UNDER RAFTERS
- POLYETHYLENE SHEETING 6 mil
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2231



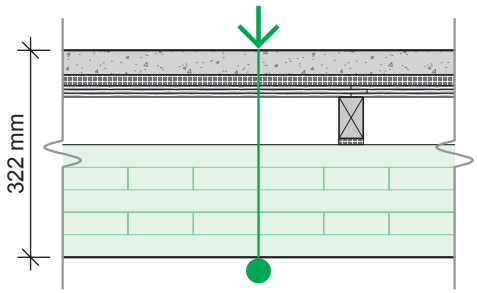
F32

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	56	/ n.a.
	IIC [b] / AIIC	50	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

- UNDERLAY OF TYPE “SONODECK INSULFLOOR” 25 mm
- TONGUE AND GROOVE OSB SHEATHING 18 mm
- WOOD RAFTERS 38 mm X 64 mm @ 610 mm O.C.
- SILICA SAND (#71) 50 mm
- RUBBER MEMBRANE BANDS 10 mm UNDER RAFTERS
- POLYETHYLENE SHEETING 6 mil
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2232



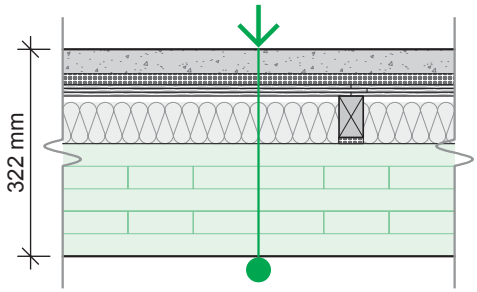
F33

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	59	/ n.a.
	IIC [b] / AIIC	54	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

- PREFABRICATED CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “REGUPOL SONUS WAVE” 17 mm
- TONGUE AND GROOVE OSB SHEATHING 18 mm
- WOOD RAFTERS 38 mm X 64 mm @ 610 mm O.C.
- RUBBER MEMBRANE BANDS 10 mm UNDER RAFTERS
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2233



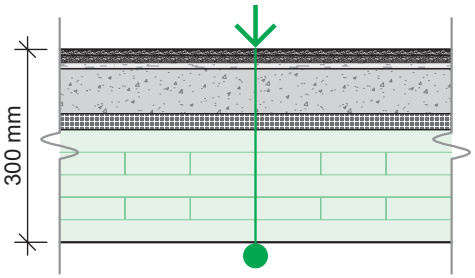
F34

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	60	/ n.a.
	IIC [b] / AIIC	54	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

- PREFABRICATED CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “REGUPOL SONUS WAVE” 17 mm
- TONGUE AND GROOVE OSB SHEATHING 18 mm
- WOOD RAFTERS 38 mm X 64 mm @ 610 mm O.C.
- 1 ROW OF FIBERGLASS INSULATION 65 mm
- RUBBER MEMBRANE BANDS 10 mm UNDER RAFTERS
- NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2235



F36

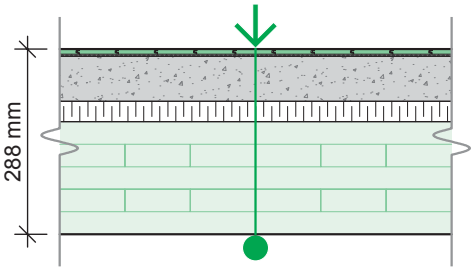
Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	56	/ n.a.
	IIC [b] / AIIC	52	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Acoustic performance based on a CLT thickness of 131 mm.

– UNDERLAY OF TYPE “FERMACELL 2E31” 30 mm
– PREFABRICATED CONCRETE TOPPING (2350 kg/m³) 70 mm
– UNDERLAY OF TYPE “REGUPOL SONUS WAVE” 25 mm
– NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2236



F37

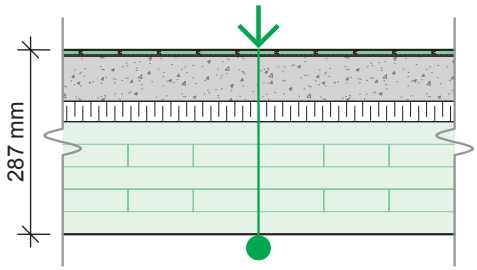
Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	57	/ n.a.
	IIC [b] / AIIC	51	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Acoustic performance based on a CLT thickness of 131 mm.

– LAMINATED FLOORING 8 mm
– UNDERLAY OF TYPE “ACOUSTITECH PREMIUM” 3 mm
– PREFABRICATED CONCRETE TOPPING (2350 kg/m³) 70 mm
– RIGID SHEATHING BOARD OF TYPE “ROXUL COMFORTBOARD IS” 32 mm
– NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2237



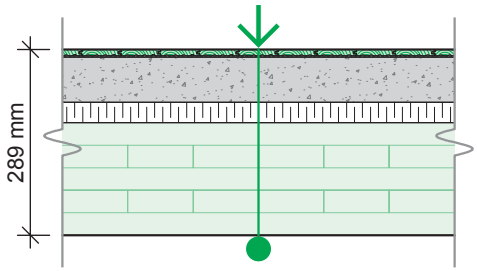
F38

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	57	/ n.a.
	IIC [b] / AIIC	51	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

– LAMINATED FLOORING 8 mm
– UNDERLAY OF TYPE “ROBERTS SOFT STRIDE” 2 mm
– PREFABRICATED CONCRETE TOPPING (2350 kg/m³) 70 mm
– RIGID SHEATHING BOARD OF TYPE “ROXUL COMFORTBOARD IS” 32 mm
– NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2238



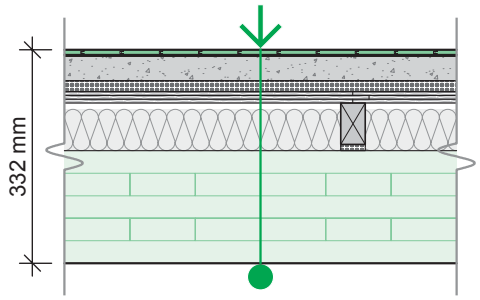
F39

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	57	/ n.a.
	IIC [b] / AIIC	51	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.
b) Acoustic performance based on a CLT thickness of 131 mm.

– HARDWOOD FLOORING OF TYPE “TORLYS EVEREST PREMIER” 10 mm
– UNDERLAY OF TYPE “ROBERTS SOFT STRIDE” 2 mm
– PREFABRICATED CONCRETE TOPPING (2350 kg/m³) 70 mm
– RIGID SHEATHING BOARD OF TYPE “ROXUL COMFORTBOARD IS” 32 mm
– NORDIC X-LAM 175 mm

Architecture, Assembly | Floor | NS-DA2239



F40

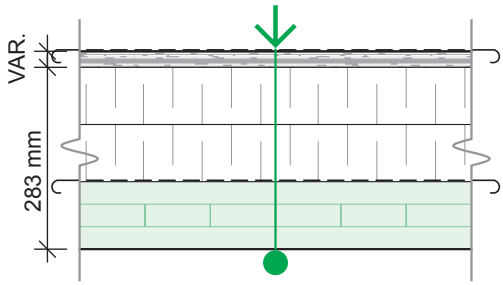
Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	n.a.	/ n.a.
Acoustic ratings	STC [b] / ASTC	60	/ n.a.
	IIC [b] / AIIC	58	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

b) Acoustic performance based on a CLT thickness of 131 mm.

- LAMINATED FLOORING 8 mm
- UNDERLAY OF TYPE “ROBERTS SOFT STRIDE” 2 mm
- PREFABRICATED CONCRETE TOPPING 38 mm
- UNDERLAY OF TYPE “REGUPOL SONUS WAVE” 17 mm
- TONGUE AND GROOVE OSB SHEATHING 18 mm
- WOOD RAFTERS 38 mm X 64 mm @ 610 mm O.C.
- 1 ROW OF FIBERGLASS INSULATION 65 mm
- RUBBER MEMBRANE BANDS 10 mm UNDER RAFTERS
- NORDIC X-LAM 175 mm

Architecture, Assembly | Roof | NS-DA2300



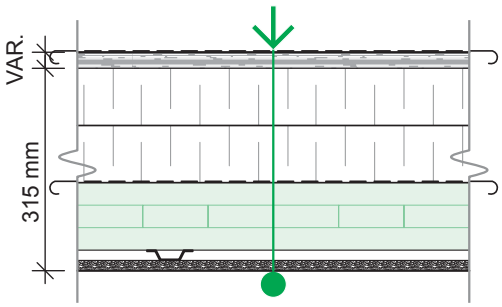
R1

Fire-resistance rating	FRR [a]	1 h	
Thermal resistance	RSI / R	7.9	/ 45
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 3.5 m and on a specified uniform load of 4.5 kPa.

- TWO-LAYER ELASTOMERIC MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 89 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm

Architecture, Assembly | Roof | NS-DA2301



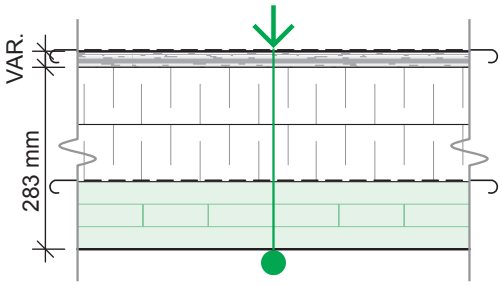
R2

Fire-resistance rating	FRR [(a)]	1.5 h	
Thermal resistance	RSI / R	8.2	/ 47
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 3.5 m and on a specified uniform load of 4.5 kPa.

- TWO-LAYER ELASTOMERIC MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 89 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- FURRING CHANNELS 16 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Roof | NS-DA2302



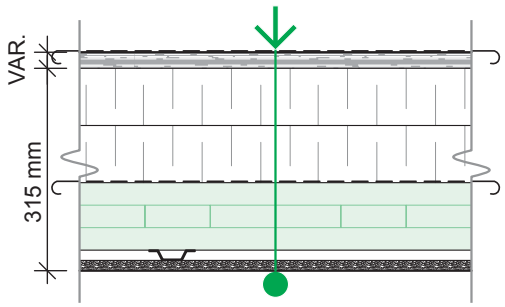
R3

Fire-resistance rating	FRR [(a)]	1 h	
Thermal resistance	RSI / R	7.9	/ 45
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 3.5 m and on a specified uniform load of 4.5 kPa.

- THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 89 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm

Architecture, Assembly | Roof | NS-DA2303



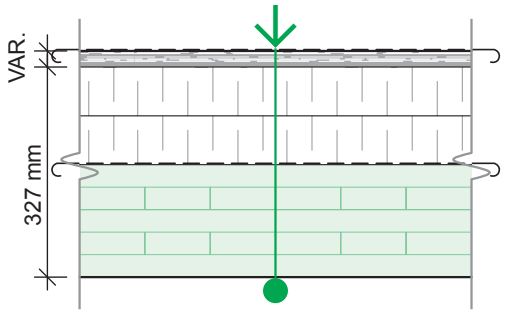
R4

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	8.2	/ 47
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 3.5 m and on a specified uniform load of 4.5 kPa.

- THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 89 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 105 mm
- FURRING CHANNELS 16 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Roof | NS-DA2304



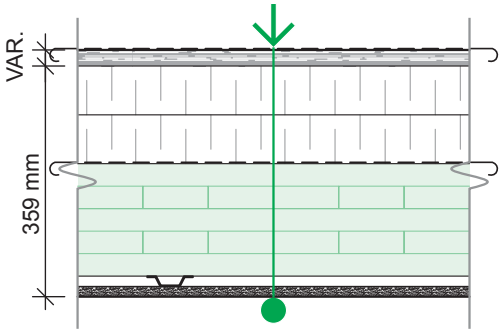
R5

Fire-resistance rating	FRR [a]	1.5 h	
Thermal resistance	RSI / R	7.5	/ 43
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- TWO-LAYER ELASTOMERIC MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 76 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 175 mm

Architecture, Assembly | Roof | NS-DA2305



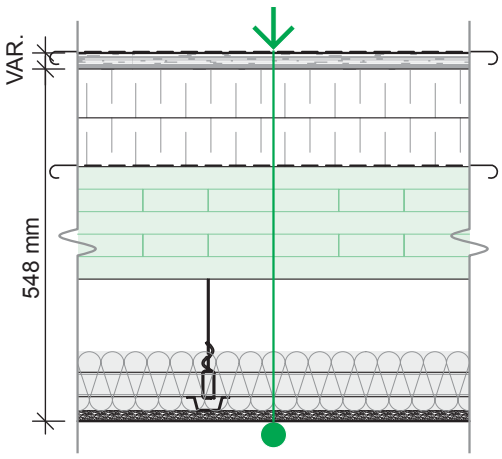
R6

Fire-resistance rating	FRR [(a)]	2 h	
Thermal resistance	RSI / R	7.7	/ 44
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- TWO-LAYER ELASTOMERIC MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 76 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 175 mm
- FURRING CHANNELS 16 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Roof | NS-DA2306



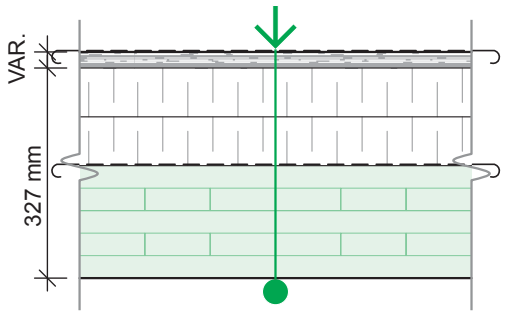
R7

Fire-resistance rating	FRR [(a)]	2 h	
Thermal resistance	RSI / R	7.7	/ 44
Acoustic ratings	STC / ASTC	n.a.	/ n.a.
	IIC / AIIC	n.a.	/ n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- TWO-LAYER ELASTOMERIC MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 76 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 175 mm
- SUSPENDED CEILING:
  - METALLIC HANGERS 145 mm
  - CHANNEL IRONS 38 mm @ 1220 mm O.C.
  - FURRING CHANNELS 22 mm @ 406 mm O.C.
  - SOUNDPROOFING MATERIAL 92 mm
- 1 TYPE X GYPSUM BOARD 15.9 mm

Architecture, Assembly | Roof | NS-DA2307



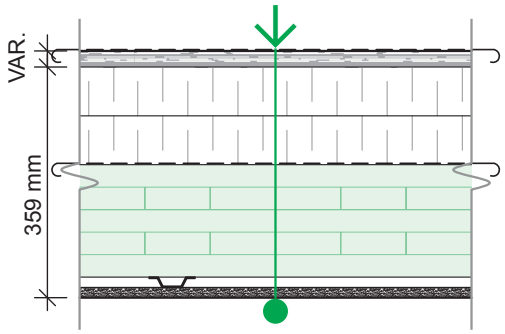
R8

Fire-resistance rating	FRR [a]	1.5 h
Thermal resistance	RSI / R	7.5 / 43
Acoustic ratings	STC / ASTC	n.a. / n.a.
	IIC / AIIC	n.a. / n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 76 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 175 mm

Architecture, Assembly | Roof | NS-DA2308



R9

Fire-resistance rating	FRR [a]	2 h
Thermal resistance	RSI / R	7.7 / 44
Acoustic ratings	STC / ASTC	n.a. / n.a.
	IIC / AIIC	n.a. / n.a.

a) The fire-resistance rating is based on a span of 5.75 m and on a specified uniform load of 4.75 kPa.

- THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING
- ROOFING UNDERLAY (UP TO THE DESIGNER)
- 2 ROWS OF POLYISOCYANURATE INSULATION 76 mm EA.
- VAPOUR BARRIER MEMBRANE
- NORDIC X-LAM 175 mm
- FURRING CHANNELS 16 mm @ 406 mm O.C.
- 1 TYPE X GYPSUM BOARD 15.9 mm

NORDIC

TECHNICAL GUIDE
NORDIC X-LAM

NS-GT6

ENGLISH

VERSION
2022-04-21

ADDITIONAL INFORMATION 5

NORDIC
STRUCTURES

Software

Nordic Sizer

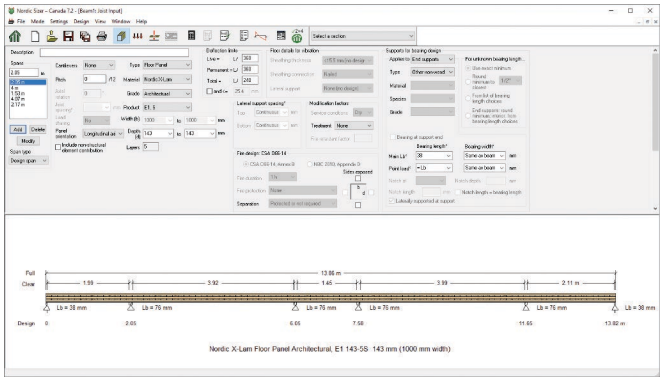
Nordic Sizer is a software program built to design individual structural elements (joists, beams, columns, studs, slabs, and panels) using the full range of Nordic engineered wood products.

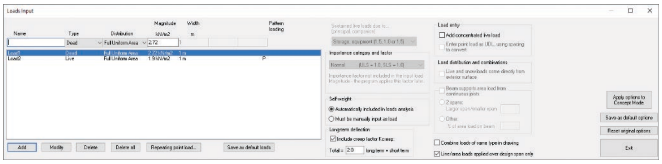
Nordic Sizer software application analyzes and designs members for specified loads in accordance with CSA O86 (Canada) or NDS (United States) standard, and automatically checks load cases and load combinations in accordance with NBC (Canada) or IBC (United States). Features include floor vibration checks and fire resistance calculations.

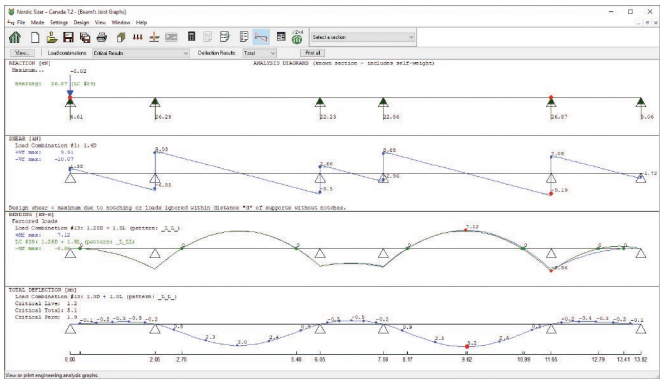
For more information: http://woodworks-software.com

DOWNLOAD & INSTALL
Fill in the form (contact.nordic.ca/en/nordic-sizer-software-request/) to receive instructions by email within the next business day.
For assistance, please contact the technical support at 514-871-8526, ext. 2 or tech@nordic.ca.

WOODWORKS SOFTWARE TUTORIALS
Canadian Training Videos and User Guide
woodworks-software.com/support/support-canadian-edition/







NORDIC STRUCTURES

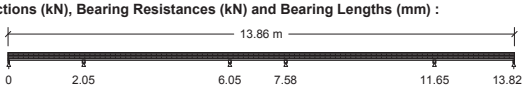
COMPANY	PROJECT
Aug. 12, 2020 15:47	Beam1

Design Check Calculation Sheet
Nordic Sizer – Canada 7.2

Loads:

Load	Type	Distribution	Pat-tern	Location [m] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full Area	No			2.72(1.00m)		kN/m2
Load2	Live	Full Area	Yes			1.90(1.00m)		kN/m2
Self-weight	Dead	Full UDL	No			0.72		kN/m

Maximum Reactions (kN), Bearing Resistances (kN) and Bearing Lengths (mm) :



Unfactored:								
Dead	1.54	12.59		9.22	9.56		12.87	1.79
Live	1.79	7.04		7.14	7.28		7.19	1.88
Factored:								
Uplift	0.02							
Total	4.61	26.29		22.23	22.86		26.87	5.06
Bearing:								
Capacity								
Beam	161.54	282.46		305.35	304.13		282.38	161.54
Des ratio								
Beam	0.03	0.08		0.06	0.07		0.08	0.03
Load case	#24	#14		#25	#16		#29	#24
Length	38*	76		76	76		76	38*
Min req'd	38*	76*		76*	76*		76*	38*
KB	1.00	1.00		1.00	1.00		1.00	1.00
KB min	1.00	1.00		1.00	1.00		1.00	1.00
KD	1.00	0.87		0.94	0.94		0.87	1.00

*Minimum bearing length for panels is 38 mm for exterior supports and 76 mm for intermediate supports

Nordic X-Lam Floor Panel Architectural, E1 143-5S 143 mm (1000 mm width)
Supports: All - Non-wood
Total length: 13.858 m; Clear span: 2, 3.9, 1.5, 4, 2.1 m; Volume = 1.982 m^3; Panel orientation: Longitudinal axis
This section PASSES the design code check.

Limit States Design using CSA O86-14:

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	Vf @d = 9.19	Vr = 27.95	kN	Vf/Vr = 0.33
Moment(+)	Mf = 7.12	Mr = 58.05	kN-m	Mf/Mr = 0.12
Moment(-)	Mf = 8.86	Mr = 56.95	kN-m	Mf/Mr = 0.16
Perm. Defl'n	1.9 = < L/999	11.3 = L/360	mm	0.17
Live Defl'n	1.2 = < L/999	11.3 = L/360	mm	0.11
Total Defl'n	5.1 = L/798	17.0 = L/240	mm	0.30
Vibration	Lmax = 4.070	Lv = 5.186	m	Lmax/Lv = 0.78

+ architectural details →**DA2**

+ structural details →**DS2**

+ installation guide →**GI2**

+ maintenance guide →**GE2**

+ product warranty →**N-X601**

nordic.ca