

# NORDIC

TECHNICAL GUIDE  
NORDIC JOIST

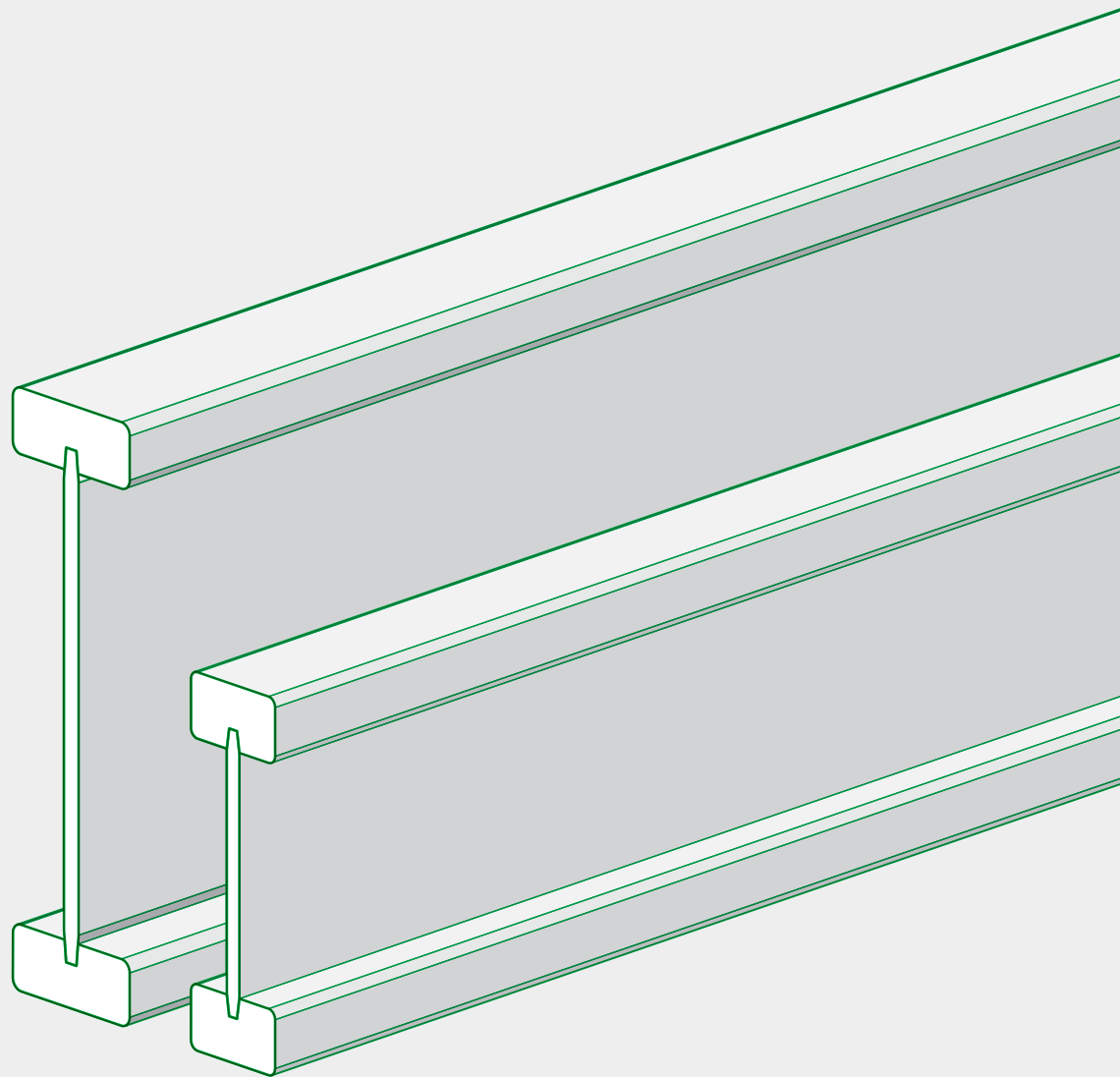
NS-GT3 

ENGLISH

VERSION  
2024-08-01

Engineered Wood Products

## NORDIC JOIST TECHNICAL GUIDE



**NORDIC**  
STRUCTURES

## ABOUT NORDIC

# NORDIC STRUCTURES

Nordic Structures is the leading innovator in engineered wood products. 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

##### Nordic Structures

100-1100 Canadiens-de-Montréal Avenue  
Montréal, Québec H3B 2S2

[www.nordic.ca](http://www.nordic.ca)

---

#### GENERAL INFORMATION

[info@nordic.ca](mailto:info@nordic.ca)

---

#### TECHNICAL SUPPORT

[tech@nordic.ca](mailto:tech@nordic.ca)

---

## TABLE OF CONTENTS

NORDIC JOIST

1

STRUCTURE

2

CONSTRUCTION  
DETAILS

3

BUILDING  
SCIENCE

4

LIGHT-COMMERCIAL  
I-JOISTS

5

ADDITIONAL  
INFORMATION

6

Standard size products available  
from our distributors

## NS-GT3



## 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

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.

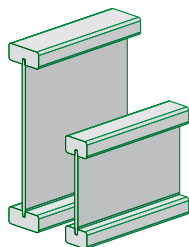
## NI-90

2×4 2400f MSR, 7/16 in. web

## Depths

11-7/8, 14 and 16 in.

## RESIDENTIAL SERIES



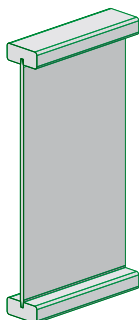
## NI-80x

2×4 2100f MSR, 7/16 in. web

## Depths

18, 20, 22 and 24 in.

## COMMERCIAL SERIES



## NS-GT4


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

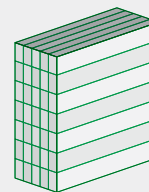
9-1/2, 11-7/8, 14, 16, 18, 20, 22 and 24 in.

## 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

ES12



\* Larger sizes available upon request

Products custom-manufactured  
and machined for major projects

## NS-GT5



### 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\*

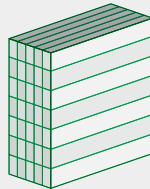
From 67 to 2435 mm  
(2-5/8 to 95-7/8 in.)

##### 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

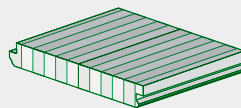
203, 305 and 406 mm  
(8, 12 and 16 in.)

##### 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 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 bonding with structural adhesives.

#### SLABS AND PANELS

##### Layup combinations

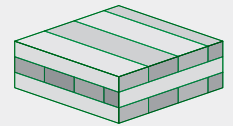
89-3s, 105-3s,  
143-5s, 175-5s,  
197-7s, 213-7l, 245-7s, 245-7l  
and 267-9l

##### Maximum sizes

2.565 × 19.5 m (101 in. × 64 ft)

##### Stress grade

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





# NORDIC

TECHNICAL GUIDE  
NORDIC JOIST

NS-GT3 

ENGLISH  
VERSION  
2024-08-01

NORDIC JOIST

1



## 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

2x3 S-P-F No. 2, 3/8 in. web

**Depths**

9-1/2 and 11-7/8 in.

### NI-40x

2x3 1950f MSR, 3/8 in. web

**Depths**

9-1/2, 11-7/8 and 14 in.

### NI-60

2x3 2100f MSR, 3/8 in. web

**Depths**

9-1/2, 11-7/8, 14 and 16 in.

### NI-80

2x4 2100f MSR, 3/8 in. web

**Depths**

9-1/2, 11-7/8, 14 and 16 in.

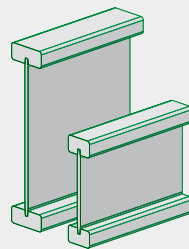
### NI-90

2x4 2400f MSR, 7/16 in. web

**Depths**

11-7/8, 14 and 16 in.

### RESIDENTIAL SERIES



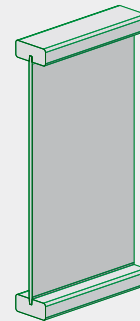
### NI-80x

2x4 2100f MSR, 7/16 in. web

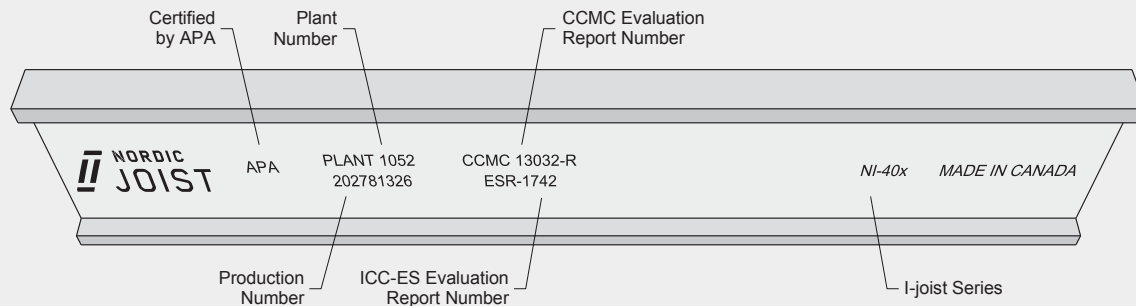
**Depths**

18, 20, 22 and 24 in.

### COMMERCIAL SERIES



Check availability of products with your local distributor.





# Nordic Joist – Specification Guide

## Specifications

Scope – Prefabricated wood I-joists shall be used in dry service conditions, such as in most covered structures, where the average equilibrium moisture content of solid sawn lumber over a year is 15% or less and does not exceed 19%. Prefabricated wood I-joists 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 33.01

## REFERENCE STANDARD

- .1 ASTM D5055, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

## INFORMATION SUBMITTALS

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

## STRUCTURAL ELEMENTS

- .1 I-joists : to ASTM D5055, [FSC certified]

## INSTALLATION

- .1 Install I-joists in accordance with manufacturer's installation guide and applicable building code.

## Short Form

I-joists specification contents:

1. Nordic Joist
2. Depth (9-1/2", 11-7/8", 14" or 16")  
On special order (18", 20", 22" or 24")
3. Series (NI-20, NI-40x, NI-60, NI-80 or NI-90)  
On special order (NI-80x)
4. Addition information – (if necessary)  
Examples: Joist lengths required, quantity, etc.

## Nordic Joist – Advantages

### Nordic I-joists: The Strong and Reliable Type

**Vertical Integration** – Our vision is built on the founding principles of responsible forestry practices, consistent quality and reliable service. The company harvests its own trees, optimizing fibre and ensuring quality throughout the manufacturing process. Each phase, from the forest to the finished product, reflects our commitment to quality. Lastly, Nordic Structures offers a range of technical and engineering services.

**Forestry Operations** – The company has achieved Forest Stewardship Council (FSC) forest management certification, confirming that the forest is being managed in a way that preserves the natural ecosystem and benefits the lives of local people and workers, all while ensuring it sustains economical viability.

**Black Spruce** – Nordic I-joists are made from sawn lumber from the spruce-pine-fir (S-P-F) species combination, but mainly black spruce (scientific name: *Picea mariana*), providing consistent quality and superior strength. Black spruce is known for its narrow growth rings, exceptional density and fibre strength.

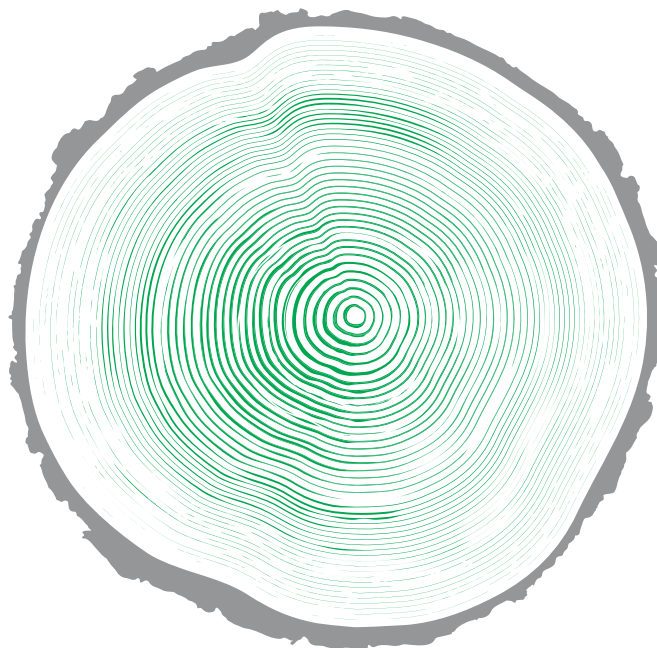
**Sawn Lumber** – The manufacturing process includes scanning lumber to identify species, grade and moisture content, as well as to eliminate defects such as wane, warp and splits, resulting in uniform quality material. The flanges are made from short-length end-jointed lumber, minimizing deviations and ensuring straightness.

**OSB Web** – The web is made of oriented strand board (OSB) conforming to CSA O325, Construction Sheathing. The glue bond characteristics meet the requirements of the Exposure 1 grade, i.e. a bond classification for panels suitable for uses not permanently exposed to the weather.

**Adhesives** – Polyurethane adhesives are in accordance with ASTM D5055, i.e. for use under exterior exposure conditions and that have demonstrated heat durability performance. A tension test on each flange and quality control tests ensure the structural integrity of the joints.

**Quality Control** – Production controls, in-line tests, physical tests as well as rigorous manufacturing and product inspections at specific intervals contribute to the production of the highest quality product. Our compliance with quality control practices is more than a formality.

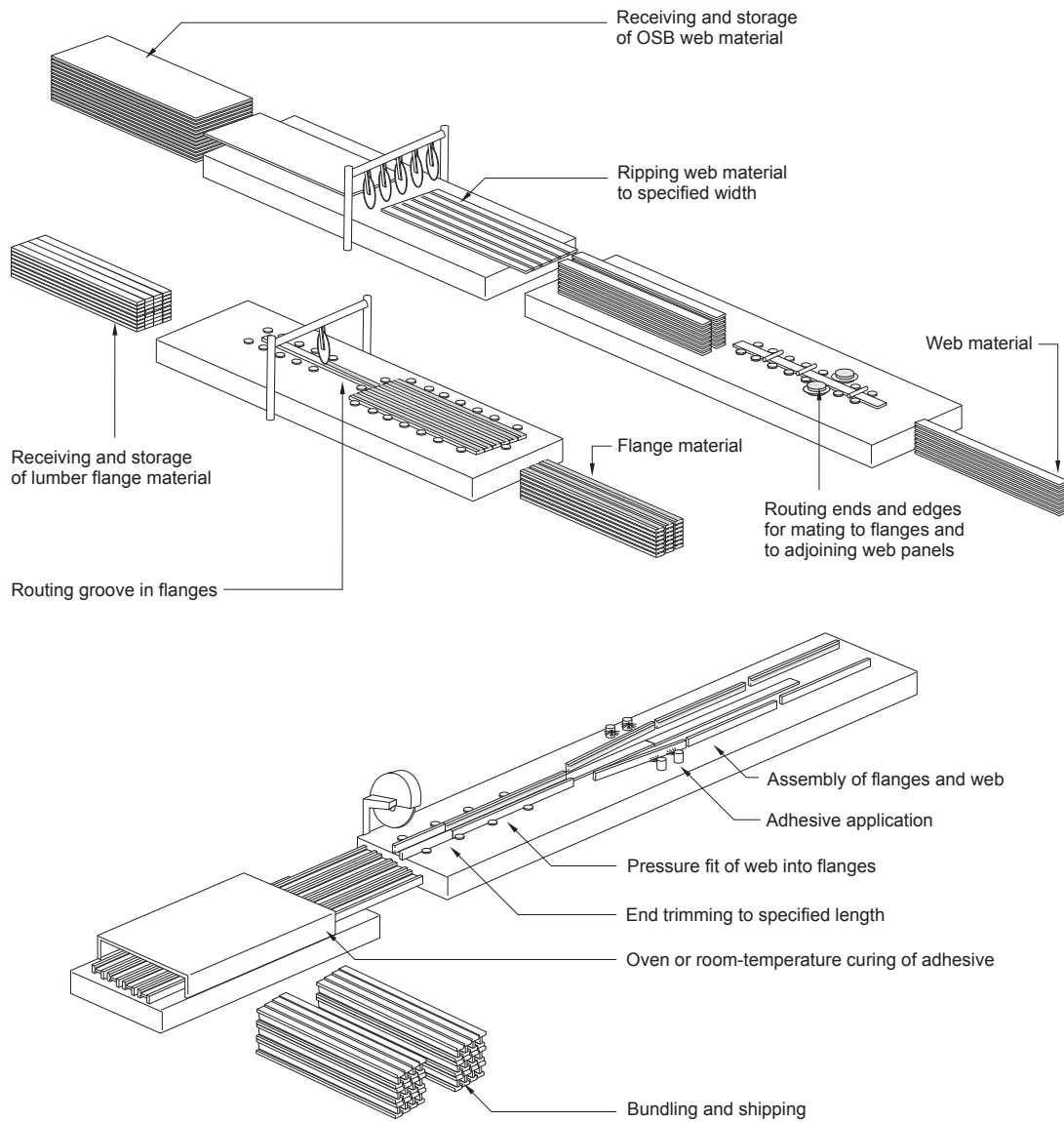
**Certifications** – Nordic products are certified by APA and are subject to regular audits by APA in accordance with the quality assurance program, to verify conformance to industry standards for lumber grade and glue bond quality. In addition, Nordic I-joists have been evaluated by CCMC and ICC-ES, among others.



Black spruce (*Picea mariana*)

## Nordic Joist – Manufacture

Wood I-joists are proprietary products and the method of manufacture varies somewhat from one manufacturer to another. A general representation of the manufacturing process is shown in the figure below.



## Nordic Joist – Flexibility, Stability, Quality

Nordic I-joists are the ideal choice for designers and builders who want to provide their customers with high quality floor systems. They provide consistent performance for the most demanding residential applications.

**Simple to Install** – I-joists save builders time, and therefore money. I-joists are typically pre-cut in two-foot increments of length and shipped to the jobsite ready to install. This minimizes jobsite cutting and material waste. I-joists can be cut and fastened with traditional framing tools and fasteners – no special tools are required. Since I-joists can typically be used at greater joist spacings compared to lumber, fewer pieces must be cut and handled on the job site, making I-joist installation less costly and less wasteful for the builder.

**Design Flexibility** – The availability of long lengths allows multiple span installations thus speeding construction by eliminating the need to lap joists over bearing walls or support beams. This also means fewer pieces to handle. The availability of long lengths and relatively deep joists also gives designers the freedom to create more open spaces and reduces the need for supporting walls, columns, or beams.

**Dimensionally Stable** – I-joists will not warp, twist, or shrink, and are more uniform in their dimensions than sawn lumber joists. The L/480 maximum live load deflection criteria of I-joists combined with their straightness and uniformity provides a stiffer, more uniform floor with fewer squeaks, resulting in higher customer satisfaction.

**Lightweight** – Because I-joists typically weigh less than half of comparable conventional framing lumber, they can be installed quickly and efficiently.

**Web Holes** – The wood structural panel webs in I-joists permit holes or openings to be easily cut on the jobsite to permit the passage of electrical wiring, plumbing and ductwork. With sawn lumber joists, such mechanical systems often must be passed under the joist system.

**APA Quality Assured** – The APA trademark ensures superior I-joist quality and consistent performance. All products are subject to the proven quality assurance program of APA.

**Resource-friendly** – Wood I-joists use up to 50% less wood fibre in their production than conventional lumber joists, allowing more efficient use of our natural resources.



## Nordic Joist – Certifications

### Product Certifications

Nordic Joist wood I-joists, certified by APA – The Engineered Wood Association (apawood.org), are manufactured in accordance with the applicable standards and associated specifications indicated below:

- ASTM D5055, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists
- PRI-400, Performance Standard for APA EWS I-Joists
- CCMC Evaluation Report 13032-R
- APA Product Report PR-L274C

APA is a not-for-profit trade association and is accredited by the Standards Council of Canada (SCC) to operate a production certification system based on ISO/IEC 17065. APA is also accredited by the ANSI National Accreditation Board (ANAB) as an inspection agency under ISO/IEC 17020 and as a testing laboratory under ISO/IEC 17025.

The ASTM D5055 standard is recognized in CSA O86, Engineering design in wood, which is referred to in the National Building Code (NBC).

### System Certifications

Numerous fire-rated assemblies or systems incorporate I-joists, wood structural panels and/or rim board. These assemblies or systems are illustrated in the following documents:

- APA PR-S274, Fire-Rated Assemblies (Nordic Structures)
- APA D350, APA Rim Board in Fire-Rated Assemblies
- National Building Code of Canada 2015, Table 9.10.3.1.-B

### Green Certifications

Wood – efficient and ecological

Overview of environmental certifications:

- Green Verification Report APA GR-L274
- Low Formaldehyde Emissions Products APA PR-E730
- Environmental Product Declaration (EPD) NA I-Joists
- Health Product Declaration (HPD), Nordic Joist
- Declare (ILFI), Nordic Joist
- Home Innovation NGBS Green Certified, Certificate #00198
- USDA Certified Biobased Product, Product 99%
- FSC-certified products available

Note: For independently verified ICC 700 NGBS (National Green Building Standard) and LEED (Leadership in Energy and Environmental Design) points, refer to APA GR-L274.

### Product Warranty

Nordic Structures guarantees that, in accordance with its specifications, Nordic products are free from manufacturing defects in material and workmanship. Furthermore, Nordic Structures warrants that their products, when utilized in accordance with the installation guide, will meet or exceed their specifications for the lifetime of the structure.

See [nordic.ca](http://nordic.ca) for details.

## Nordic Joist – Transparency Brief

The North American wood I-joists 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.

### Product Definition

Wood I-joists are manufactured by first manufacturing lumber that is used as top and bottom flanges, as well as oriented strand board that is used as the web. The wood components are then cut to specified dimensions, a joint is grooved into the flanges, and the components are then glued and pressed.

### Lifecycle Impact Categories

The environmental impacts listed below were assessed throughout the product's lifecycle – including raw material extraction, transportation, manufacturing, packaging, use, and disposal at end of life.

Functional Unit – The declared unit is 10 linear metres of wood I-joist. This is equivalent to 32.81 linear feet. The average density of North American I-joist including resins and excluding moisture content is 36.44 oven dry kg. Results are expressed for a cradle-to-gate analysis and exclude use phase and end of life impacts.

### Environmental impacts

#### Atmosphere

Global warming potential	16.74 kg CO <sub>2</sub> eq.
Ozone depletion potential	0 kg CFC-11 eq.
Photochemical ozone creation potential	0.28 kg O <sub>3</sub> eq.

#### Water

Acidification potential	8.64 H+ moles eq.
Eutrophication potential	0.0071 kg N eq.

#### Earth

Depletion of abiotic resources (Elements)	---
Depletion of abiotic resources (Fossil Fuels)	---

### Material content

Component	Availability	Mass (%)
Wood (on oven dry basis)	Renewable	96.01 %
Resins (phenol formaldehyde)	Fossil resource, limited	2.65 %
Resins (methylene diphenyl diisocyanate (MDI))	Fossil resource, limited	0.43 %
Resins (phenol resorcinol formaldehyde (PRF))	Fossil resource, limited	0.13 %
Resins (polyurethane)	Fossil resource, limited	0.09 %
Wax		0.67 %
Filler		0.02 %
Total		100 %

Source: American Wood Council / Canadian Wood Council, North American Wood I-Joists EPD (Environmental Product Declaration) Transparency Summary

# NORDIC

TECHNICAL GUIDE  
NORDIC JOIST

NS-GT3 

ENGLISH

VERSION  
2024-08-01

STRUCTURE

2

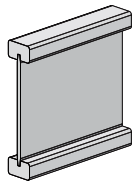
**NORDIC**  
STRUCTURES





## Nordic Joist – Design Properties

### Products



#### NI-20

**2x3** S-P-F No. 2  
3/8 in. web

**Depths**  
9-1/2 and 11-7/8 in.

33 pieces per unit

#### NI-40x

**2x3** 1950f MSR  
3/8 in. web

**Depths**  
9-1/2, 11-7/8  
and 14 in.

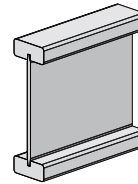
33 pieces per unit

#### NI-60

**2x3** 2100f MSR  
3/8 in. web

**Depths**  
9-1/2, 11-7/8,  
14 and 16 in.

33 pieces per unit



#### NI-80

**2x4** 2100f MSR  
3/8 in. web

**Depths**  
9-1/2, 11-7/8,  
14 and 16 in.

23 pieces per unit

#### NI-90

**2x4** 2400f MSR  
7/16 in. web

**Depths**  
11-7/8, 14  
and 16 in.

23 pieces per unit

Refer to Chapter 5 for I-joists designed for light-commercial applications.

### Design Properties

Joist depth	Joist series	EI <sup>(a)</sup> (10 <sup>6</sup> lbf-in. <sup>2</sup> )	M <sub>r</sub> <sup>(b)</sup> (lbf-ft)	V <sub>r</sub> <sup>(c)</sup> (lbf)	3-1/2" Bearing		5-1/2" Bearing		1-3/4" Bearing		4" Bearing		K <sup>(f)</sup> (10 <sup>6</sup> lbf)	Weight (plf)
					IR <sub>r</sub> <sup>(d)</sup> (lbf)	IR <sub>r</sub> <sup>(d)</sup> w/ BS (lbf)	IR <sub>r</sub> <sup>(d)</sup> (lbf)	IR <sub>r</sub> <sup>(d)</sup> w/ BS (lbf)	ER <sub>r</sub> <sup>(e)</sup> (lbf)	ER <sub>r</sub> <sup>(e)</sup> w/ BS (lbf)	ER <sub>r</sub> <sup>(e)</sup> (lbf)	ER <sub>r</sub> <sup>(e)</sup> w/ BS (lbf)		
9-1/2"	NI-20	145	4,310	1,770	3,800	3,830	4,060	4,060	1,630	1,630	1,770	1,770	4.94	2.63
	NI-40x	218	4,825	1,890	3,800	3,830	4,150	4,170	1,850	1,890	1,890	1,890	4.94	2.65
	NI-60	231	6,335	1,890	3,810	3,850	4,160	4,210	1,850	1,890	1,890	1,890	4.94	2.78
	NI-80	324	8,955	1,890	3,810	4,210	4,240	4,240	1,890	1,890	1,890	1,890	4.94	3.27
11-7/8"	NI-20	253	5,580	2,240	4,740	4,780	5,070	5,070	1,970	1,970	2,240	2,240	6.18	2.71
	NI-40x	371	6,255	2,340	4,740	4,780	5,590	5,640	2,010	2,340	2,340	2,340	6.18	2.85
	NI-60	396	8,210	2,480	4,740	4,850	5,600	5,720	2,010	2,340	2,450	2,480	6.18	2.99
	NI-80	547	11,610	2,510	4,740	5,260	5,790	5,790	2,130	2,510	2,450	2,510	6.18	3.45
	NI-90	601	14,605	3,040	5,300	5,300	5,790	5,790	2,210	2,340	2,980	3,040	6.18	3.75
14"	NI-40x	540	7,535	2,760	4,940	4,990	5,570	5,630	2,090	2,670	2,450	2,760	7.28	3.00
	NI-60	584	9,890	2,760	4,960	5,150	5,590	5,990	2,120	2,670	2,450	2,760	7.28	3.15
	NI-80	802	13,980	2,900	5,260	5,750	6,030	6,430	2,300	2,780	2,530	2,900	7.28	3.75
	NI-90	877	17,580	3,350	5,300	5,750	6,030	6,430	2,300	2,670	2,980	3,350	7.28	4.03
16"	NI-60	799	11,470	3,160	5,150	5,430	5,570	6,240	2,230	2,960	2,450	3,160	8.32	3.46
	NI-80	1,092	16,210	3,270	5,750	6,200	6,250	7,030	2,450	3,020	2,530	3,270	8.32	3.95
	NI-90	1,187	20,390	3,680	5,750	6,200	6,250	7,030	2,450	2,960	2,980	3,680	8.32	4.27

a) Bending stiffness, EI, of the I-joist.

b) Factored bending moment resistance, M<sub>r</sub>, of the I-joist.

c) Factored shear resistance, V<sub>r</sub>, of the I-joist.

d) Factored intermediate reaction resistance, IR<sub>r</sub>, of the I-joist with and without bearing stiffeners (BS). Minimum bearing length shall be 3-1/2 inches for intermediate bearings. Interpolation of the resistance between 3-1/2-inch and 5-1/2-inch bearing is permitted.

e) Factored end reaction resistance, ER<sub>r</sub>, of the I-joist with and without bearing stiffeners (BS). Minimum bearing length shall be 1-3/4 inch for end bearings. Interpolation of the resistance between 1-3/4-inch and 4-inch bearing is permitted.

f) Coefficient of shear deflection, K. For calculating uniform load and centre-point load deflections of the I-joist in a simple-span application, use equations (1) and (2).

(1) Uniform load: 
$$\delta = \frac{5w\ell^4}{384EI} + \frac{w\ell^2}{K}$$

(2) Centre-point load: 
$$\delta = \frac{P\ell^3}{48EI} + \frac{2P\ell}{K}$$

Where:

δ = calculated deflection (in.)

ℓ = design span (in.)

EI = bending stiffness of the I-joist (lbf-in.<sup>2</sup>)

K = coefficient of shear deflection (lbf)

w = specified uniform load (lbf/in.)

P = specified concentrated load (lbf)

### Notes:

- The tabulated design values are for standard-term duration of load (K<sub>D</sub> = 1.0).
- The factored vertical (bearing) linear load resistance is 2,900 lbf/ft without bearing stiffeners.
- Design of I-joists shall be in accordance with CSA O86:19.

## Maximum Floor Spans



### Design Criteria

Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	5/8 in. nailed-glued oriented strand board (OSB) sheathing

### Maximum Floor Spans

#### Bare joist

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
9-1/2"	NI-20	15'-1"	14'-3"	13'-10"	-	15'-8"	14'-10"	14'-4"	-
	NI-40x	16'-2"	15'-3"	14'-8"	-	16'-9"	15'-10"	15'-3"	-
	NI-60	16'-4"	15'-4"	14'-10"	-	16'-11"	16'-0"	15'-5"	-
	NI-80	17'-3"	16'-3"	15'-8"	-	18'-0"	16'-11"	16'-4"	-
11-7/8"	NI-20	17'-0"	16'-0"	15'-6"	-	17'-8"	16'-8"	16'-1"	-
	NI-40x	18'-2"	17'-1"	16'-6"	-	19'-1"	17'-9"	17'-2"	-
	NI-60	18'-5"	17'-3"	16'-8"	-	19'-4"	17'-11"	17'-4"	-
	NI-80	19'-9"	18'-3"	17'-7"	-	20'-10"	19'-3"	18'-4"	-
14"	NI-90	20'-2"	18'-8"	17'-10"	-	21'-3"	19'-8"	18'-9"	-
	NI-40x	20'-1"	18'-8"	17'-10"	-	21'-2"	19'-8"	18'-9"	-
	NI-60	20'-6"	18'-11"	18'-2"	-	21'-7"	19'-11"	19'-1"	-
	NI-80	21'-11"	20'-3"	19'-4"	-	23'-2"	21'-5"	20'-5"	-
16"	NI-90	22'-5"	20'-8"	19'-9"	-	23'-7"	21'-10"	20'-10"	-
	NI-60	22'-4"	20'-8"	19'-9"	-	23'-6"	21'-9"	20'-10"	-
	NI-80	23'-11"	22'-1"	21'-1"	-	25'-3"	23'-4"	22'-3"	-
	NI-90	24'-5"	22'-6"	21'-6"	-	25'-9"	23'-9"	22'-8"	-

#### 1/2 in. gypsum ceiling

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
9-1/2"	NI-20	15'-7"	14'-9"	14'-3"	-	16'-2"	15'-4"	14'-10"	-
	NI-40x	16'-7"	15'-8"	15'-1"	-	17'-3"	16'-3"	15'-8"	-
	NI-60	16'-9"	15'-9"	15'-3"	-	17'-5"	16'-5"	15'-10"	-
	NI-80	17'-8"	16'-7"	16'-0"	-	18'-6"	17'-4"	16'-8"	-
11-7/8"	NI-20	17'-6"	16'-7"	16'-0"	-	18'-4"	17'-3"	16'-8"	-
	NI-40x	18'-9"	17'-6"	16'-11"	-	19'-9"	18'-4"	17'-8"	-
	NI-60	19'-0"	17'-8"	17'-1"	-	20'-0"	18'-7"	17'-10"	-
	NI-80	20'-4"	18'-10"	18'-0"	-	21'-5"	19'-10"	18'-11"	-
14"	NI-90	20'-9"	19'-2"	18'-4"	-	21'-10"	20'-3"	19'-4"	-
	NI-40x	20'-10"	19'-4"	18'-6"	-	21'-11"	20'-5"	19'-6"	-
	NI-60	21'-2"	19'-8"	18'-9"	-	22'-4"	20'-8"	19'-10"	-
	NI-80	22'-7"	20'-11"	20'-0"	-	23'-10"	22'-1"	21'-1"	-
16"	NI-90	23'-0"	21'-4"	20'-4"	-	24'-4"	22'-6"	21'-5"	-
	NI-60	23'-1"	21'-5"	20'-6"	-	24'-4"	22'-7"	21'-7"	-
	NI-80	24'-8"	22'-10"	21'-9"	-	26'-0"	24'-1"	23'-0"	-
	NI-90	25'-1"	23'-2"	22'-2"	-	26'-6"	24'-6"	23'-4"	-

#### Notes:

1. The tabulated clear spans are applicable to residential floor construction meeting the above design criteria.
2. The vibration-controlled span is determined using Clause A.5.4.5.2 b) of CSA O86:19.
3. For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
4. Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings.
5. Bearing stiffeners are not required when I-joists are used in accordance with this table, except as required for hangers.

**Design Criteria**

Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	3/4 in. nailed-glued oriented strand board (OSB) sheathing

**Maximum Floor Spans**

Bare joist

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
9'-1/2"	NI-20	15'-11"	15'-0"	14'-6"	13'-5"	16'-7"	15'-7"	15'-1"	14'-6"
	NI-40x	17'-0"	16'-0"	15'-5"	14'-10"	17'-8"	16'-8"	16'-1"	15'-5"
	NI-60	17'-2"	16'-2"	15'-7"	14'-11"	17'-10"	16'-10"	16'-2"	15'-6"
	NI-80	18'-3"	17'-1"	16'-5"	15'-9"	19'-2"	17'-9"	17'-1"	16'-5"
11'-7/8"	NI-20	17'-11"	16'-11"	16'-3"	15'-8"	18'-10"	17'-7"	16'-11"	16'-3"
	NI-40x	19'-4"	17'-11"	17'-3"	16'-7"	20'-4"	18'-11"	18'-0"	17'-3"
	NI-60	19'-7"	18'-2"	17'-6"	16'-9"	20'-8"	19'-2"	18'-3"	17'-5"
	NI-80	21'-1"	19'-6"	18'-6"	17'-7"	22'-2"	20'-6"	19'-6"	18'-6"
14"	NI-90	21'-6"	19'-10"	18'-11"	17'-11"	22'-8"	20'-11"	19'-11"	18'-10"
	NI-40x	21'-5"	19'-11"	18'-11"	18'-0"	22'-7"	20'-11"	19'-11"	18'-11"
	NI-60	21'-10"	20'-2"	19'-3"	18'-3"	23'-0"	21'-3"	20'-3"	19'-2"
	NI-80	23'-5"	21'-7"	20'-7"	19'-5"	24'-8"	22'-9"	21'-8"	20'-6"
16"	NI-90	23'-10"	22'-1"	21'-0"	19'-10"	25'-2"	23'-3"	22'-1"	20'-11"
	NI-60	23'-9"	22'-0"	21'-0"	19'-10"	25'-0"	23'-2"	22'-1"	20'-11"
	NI-80	25'-6"	23'-7"	22'-5"	21'-2"	26'-10"	24'-10"	23'-7"	22'-4"
NI-90	26'-0"	24'-0"	22'-10"	21'-6"	27'-5"	25'-3"	24'-0"	22'-8"	

1/2 in. gypsum ceiling

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
9'-1/2"	NI-20	16'-5"	15'-5"	14'-6"	13'-5"	17'-0"	16'-1"	15'-7"	14'-7"
	NI-40x	17'-5"	16'-5"	15'-10"	15'-2"	18'-2"	17'-1"	16'-6"	15'-5"
	NI-60	17'-7"	16'-7"	16'-0"	15'-4"	18'-4"	17'-3"	16'-7"	15'-11"
	NI-80	18'-8"	17'-5"	16'-9"	16'-1"	19'-8"	18'-3"	17'-6"	16'-9"
11'-7/8"	NI-20	18'-7"	17'-5"	16'-10"	16'-2"	19'-6"	18'-2"	17'-6"	16'-7"
	NI-40x	19'-11"	18'-6"	17'-9"	17'-0"	21'-0"	19'-6"	18'-8"	17'-7"
	NI-60	20'-2"	18'-9"	17'-11"	17'-2"	21'-3"	19'-9"	18'-10"	17'-11"
	NI-80	21'-7"	20'-0"	19'-0"	18'-0"	22'-9"	21'-1"	20'-1"	19'-0"
14"	NI-90	22'-0"	20'-4"	19'-5"	18'-4"	23'-2"	21'-6"	20'-5"	19'-4"
	NI-40x	22'-1"	20'-7"	19'-7"	18'-7"	23'-4"	21'-8"	20'-8"	19'-4"
	NI-60	22'-6"	20'-10"	19'-11"	18'-10"	23'-8"	22'-0"	21'-0"	19'-11"
	NI-80	24'-0"	22'-3"	21'-2"	20'-0"	25'-3"	23'-5"	22'-4"	21'-1"
16"	NI-90	24'-5"	22'-7"	21'-6"	20'-4"	25'-9"	23'-10"	22'-9"	21'-6"
	NI-60	24'-6"	22'-9"	21'-8"	20'-7"	25'-10"	24'-0"	22'-11"	21'-8"
	NI-80	26'-2"	24'-3"	23'-1"	21'-10"	27'-7"	25'-6"	24'-4"	23'-0"
NI-90	26'-7"	24'-8"	23'-5"	22'-2"	28'-1"	26'-0"	24'-9"	23'-5"	

Notes:

1. The tabulated clear spans are applicable to residential floor construction meeting the above design criteria.
2. The vibration-controlled span is determined using Clause A.5.4.5.2 b) of CSA O86:19.
3. For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
4. Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings.
5. Bearing stiffeners are not required when I-joists are used in accordance with this table, except as required for hangers.

## Maximum Roof Spans

### Design Criteria

Span:	Simple
Load:	Dead load = 15 psf
Deflection limits:	L/360 under snow load and L/240 under total load

### Maximum Roof Spans

Snow load = 20 psf

Joist depth	Joist series	Slope of 1/4:12 to 4:12			Slope of >4:12 to 8:12			Slope of >8:12 to 12:12		
		On centre spacing			On centre spacing			On centre spacing		
		12"	16"	24"	12"	16"	24"	12"	16"	24"
9-1/2"	NI-20	20'-5"	18'-6"	16'-1"	19'-2"	17'-5"	15'-1"	17'-8"	16'-0"	13'-11"
	NI-40x	23'-5"	21'-3"	18'-5"	22'-0"	19'-11"	17'-4"	20'-3"	18'-4"	16'-0"
	NI-60	23'-11"	21'-7"	18'-9"	22'-5"	20'-4"	17'-8"	20'-8"	18'-9"	16'-3"
	NI-80	26'-8"	24'-2"	21'-0"	25'-1"	22'-8"	19'-9"	23'-1"	20'-11"	18'-2"
11-7/8"	NI-20	24'-8"	22'-4"	19'-5"	23'-2"	21'-0"	18'-3"	21'-4"	19'-4"	16'-10"
	NI-40x	28'-0"	25'-4"	22'-1"	26'-3"	23'-10"	20'-8"	24'-3"	21'-11"	19'-1"
	NI-60	28'-7"	25'-11"	22'-6"	26'-10"	24'-4"	21'-2"	24'-9"	22'-5"	19'-6"
	NI-80	31'-10"	28'-10"	25'-1"	29'-11"	27'-1"	23'-7"	27'-7"	25'-0"	21'-9"
14"	NI-90	32'-10"	29'-9"	25'-10"	30'-10"	27'-11"	24'-3"	28'-5"	25'-9"	22'-5"
	NI-40x	31'-9"	28'-9"	24'-6"	29'-10"	27'-0"	23'-6"	27'-6"	24'-11"	21'-8"
	NI-60	32'-7"	29'-6"	25'-8"	30'-7"	27'-9"	24'-1"	28'-2"	25'-7"	22'-3"
	NI-80	36'-3"	32'-10"	28'-6"	34'-0"	30'-10"	26'-9"	31'-4"	28'-5"	24'-8"
16"	NI-90	37'-4"	33'-9"	29'-4"	35'-0"	31'-9"	27'-7"	32'-3"	29'-3"	25'-5"
	NI-60	36'-3"	32'-10"	28'-6"	34'-0"	30'-10"	26'-9"	31'-4"	28'-5"	24'-9"
	NI-80	40'-2"	36'-5"	31'-7"	37'-8"	34'-2"	29'-8"	34'-9"	31'-6"	27'-5"
NI-90	41'-4"	37'-5"	32'-6"	38'-9"	35'-1"	30'-6"	35'-9"	32'-5"	28'-2"	

Snow load = 30 psf

Joist depth	Joist series	Slope of 1/4:12 to 4:12			Slope of >4:12 to 8:12			Slope of >8:12 to 12:12		
		On centre spacing			On centre spacing			On centre spacing		
		12"	16"	24"	12"	16"	24"	12"	16"	24"
9-1/2"	NI-20	18'-10"	17'-1"	14'-10"	17'-9"	16'-1"	14'-0"	16'-6"	14'-11"	13'-0"
	NI-40x	21'-7"	19'-7"	17'-0"	20'-4"	18'-5"	16'-0"	18'-11"	17'-1"	14'-10"
	NI-60	22'-0"	19'-11"	17'-3"	20'-9"	18'-9"	16'-4"	19'-3"	17'-5"	15'-2"
	NI-80	24'-7"	22'-3"	19'-4"	23'-3"	21'-0"	18'-3"	21'-6"	19'-6"	16'-11"
11-7/8"	NI-20	22'-9"	20'-7"	17'-11"	21'-5"	19'-5"	16'-11"	19'-10"	18'-0"	15'-8"
	NI-40x	25'-10"	23'-5"	19'-6"	24'-4"	22'-1"	19'-1"	22'-7"	20'-5"	17'-9"
	NI-60	26'-5"	23'-11"	20'-9"	24'-10"	22'-6"	19'-7"	23'-1"	20'-11"	18'-2"
	NI-80	29'-4"	26'-7"	23'-1"	27'-8"	25'-1"	21'-9"	25'-8"	23'-3"	20'-3"
14"	NI-90	30'-3"	27'-5"	23'-9"	28'-7"	25'-10"	22'-5"	26'-6"	24'-0"	20'-10"
	NI-40x	29'-4"	26'-3"	21'-5"	27'-7"	25'-0"	21'-0"	25'-7"	23'-2"	20'-2"
	NI-60	30'-1"	27'-3"	23'-8"	28'-4"	25'-8"	22'-4"	26'-3"	23'-10"	20'-8"
	NI-80	33'-5"	30'-3"	26'-3"	31'-6"	28'-6"	24'-9"	29'-2"	26'-5"	23'-0"
16"	NI-90	34'-5"	31'-2"	27'-0"	32'-5"	29'-4"	25'-6"	30'-1"	27'-3"	23'-8"
	NI-60	33'-5"	30'-3"	26'-3"	31'-6"	28'-6"	24'-10"	29'-2"	26'-6"	23'-0"
	NI-80	37'-1"	33'-6"	29'-1"	34'-11"	31'-8"	27'-6"	32'-5"	29'-4"	25'-6"
NI-90	38'-1"	34'-6"	29'-11"	35'-11"	32'-6"	28'-3"	33'-4"	30'-2"	26'-3"	

### Notes:

- The tabulated spans are based on the horizontal distance between inside face of supports and are applicable to residential roof construction meeting the above design criteria.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except as required for hangers.

**Design Criteria**

Span:	Simple
Load:	Dead load = 15 psf
Deflection limits:	L/360 under snow load and L/240 under total load

**Maximum Roof Spans**

Snow load = 40 psf

Joist depth	Joist series	Slope of 1/4:12 to 4:12			Slope of >4:12 to 8:12			Slope of >8:12 to 12:12		
		On centre spacing			On centre spacing			On centre spacing		
		12"	16"	24"	12"	16"	24"	12"	16"	24"
9-1/2"	NI-20	17'-5"	15'-9"	13'-8"	16'-8"	15'-1"	13'-1"	15'-6"	14'-1"	12'-3"
	NI-40x	19'-11"	18'-0"	15'-5"	19'-1"	17'-4"	15'-0"	17'-10"	16'-1"	14'-0"
	NI-60	20'-4"	18'-4"	15'-11"	19'-6"	17'-8"	15'-4"	18'-2"	16'-5"	14'-3"
	NI-80	22'-8"	20'-6"	17'-9"	21'-9"	19'-9"	17'-1"	20'-4"	18'-4"	15'-11"
11-7/8"	NI-20	21'-0"	19'-0"	16'-6"	20'-2"	18'-3"	15'-10"	18'-9"	17'-0"	14'-9"
	NI-40x	23'-10"	21'-7"	17'-7"	22'-10"	20'-8"	17'-3"	21'-3"	19'-3"	16'-9"
	NI-60	24'-4"	22'-0"	19'-1"	23'-4"	21'-2"	18'-4"	21'-9"	19'-8"	17'-1"
	NI-80	27'-1"	24'-6"	21'-3"	26'-0"	23'-6"	20'-5"	24'-3"	21'-11"	19'-0"
14"	NI-90	27'-11"	25'-3"	21'-11"	26'-10"	24'-3"	21'-1"	25'-0"	22'-7"	19'-8"
	NI-40x	27'-1"	23'-8"	19'-3"	25'-11"	23'-3"	19'-0"	24'-2"	21'-11"	18'-6"
	NI-60	27'-9"	25'-1"	21'-9"	26'-8"	24'-1"	20'-11"	24'-9"	22'-5"	19'-6"
	NI-80	30'-10"	27'-11"	24'-2"	29'-7"	26'-9"	23'-3"	27'-6"	24'-11"	21'-8"
16"	NI-90	31'-9"	28'-8"	24'-11"	30'-5"	27'-7"	23'-11"	28'-4"	25'-8"	22'-4"
	NI-60	30'-10"	27'-11"	23'-10"	29'-7"	26'-10"	23'-3"	27'-7"	24'-11"	21'-8"
	NI-80	34'-2"	30'-11"	26'-10"	32'-10"	29'-8"	25'-9"	30'-7"	27'-8"	24'-0"
	NI-90	35'-2"	31'-9"	27'-7"	33'-9"	30'-6"	26'-6"	31'-5"	28'-5"	24'-8"

Snow load = 50 psf

Joist depth	Joist series	Slope of 1/4:12 to 4:12			Slope of >4:12 to 8:12			Slope of >8:12 to 12:12		
		On centre spacing			On centre spacing			On centre spacing		
		12"	16"	24"	12"	16"	24"	12"	16"	24"
9-1/2"	NI-20	16'-1"	14'-7"	12'-8"	15'-6"	14'-0"	12'-2"	14'-8"	13'-3"	11'-6"
	NI-40x	18'-5"	16'-8"	14'-1"	17'-8"	16'-0"	13'-11"	16'-10"	15'-3"	13'-2"
	NI-60	18'-9"	17'-0"	14'-8"	18'-0"	16'-4"	14'-2"	17'-2"	15'-6"	13'-6"
	NI-80	21'-0"	19'-0"	16'-5"	20'-2"	18'-3"	15'-10"	19'-2"	17'-4"	15'-1"
11-7/8"	NI-20	19'-5"	17'-7"	15'-2"	18'-8"	16'-11"	14'-8"	17'-9"	16'-0"	13'-11"
	NI-40x	22'-1"	19'-9"	16'-1"	21'-2"	19'-2"	15'-10"	20'-1"	18'-3"	15'-7"
	NI-60	22'-6"	20'-4"	17'-8"	21'-8"	19'-7"	17'-0"	20'-7"	18'-7"	16'-2"
	NI-80	25'-1"	22'-8"	19'-7"	24'-1"	21'-9"	18'-10"	22'-10"	20'-8"	18'-0"
14"	NI-90	25'-10"	23'-4"	20'-3"	24'-10"	22'-5"	19'-5"	23'-7"	21'-4"	18'-6"
	NI-40x	25'-0"	21'-8"	17'-8"	24'-0"	21'-5"	17'-5"	22'-10"	20'-8"	17'-1"
	NI-60	25'-8"	23'-3"	20'-2"	24'-8"	22'-4"	19'-4"	23'-5"	21'-3"	18'-5"
	NI-80	28'-6"	25'-9"	22'-4"	27'-5"	24'-9"	21'-6"	26'-0"	23'-7"	20'-5"
16"	NI-90	29'-4"	26'-6"	23'-0"	28'-2"	25'-6"	22'-1"	26'-10"	24'-3"	21'-1"
	NI-60	28'-7"	25'-10"	21'-10"	27'-5"	24'-10"	21'-6"	26'-0"	23'-7"	20'-6"
	NI-80	31'-8"	28'-7"	24'-9"	30'-5"	27'-6"	23'-10"	28'-10"	26'-2"	22'-8"
	NI-90	32'-6"	29'-5"	25'-5"	31'-3"	28'-3"	24'-6"	29'-8"	26'-10"	23'-4"

**Notes:**

- The tabulated spans are based on the horizontal distance between inside face of supports and are applicable to residential roof construction meeting the above design criteria.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except as required for hangers.

## Maximum Uniform Loads

### Maximum Uniform Loads (plf)

Joist depth	Joist series	Criteria	Clear span (ft)											
			8	10	12	14	16	18	20	22	24	26	28	30
9-1/2"	NI-20	Live or snow load (L/480)		133	81	52	36	25	-	-	-	-	-	-
		Total load (L/240)			162	105	72	51	37	28	22	17	14	11
		Factored load	344	277	230	170	131	103	84	69	58	50	43	37
	NI-40x	Live or snow load (L/480)		188	116	76	52	37	28	-	-	-	-	-
		Total load (L/240)					105	75	56	42	33	26	-	-
		Factored load	367	295	247	190	146	116	94	78	65	56	48	42
	NI-60	Live or snow load (L/480)			122	80	55	39	29	-	-	-	-	-
		Total load (L/240)					111	79	59	44	34	27	-	-
		Factored load	367	295	247	212	186	152	123	102	86	73	63	55
	NI-80	Live or snow load (L/480)			162	108	75	54	40	30	24	-	-	-
		Total load (L/240)						108	81	61	48	38	30	25
		Factored load	367	295	247	212	186	165	149	136	122	104	89	78
11-7/8"	NI-20	Live or snow load (L/480)		222	136	89	61	44	32	24	-	-	-	
		Total load (L/240)						88	65	49	38	30	24	
		Factored load	436	350	293	220	169	134	109	90	76	64	56	48
	NI-40x	Live or snow load (L/480)			189	125	87	62	46	35	27	-	-	-
		Total load (L/240)							71	55	44	35	29	
		Factored load	455	366	306	247	190	150	122	101	85	72	62	54
	NI-60	Live or snow load (L/480)			199	132	92	66	49	37	29	23	-	-
		Total load (L/240)						133	99	75	59	46	37	30
		Factored load	455	366	306	263	230	197	160	133	111	95	82	71
	NI-80	Live or snow load (L/480)				173	122	88	66	51	39	31	25	-
		Total load (L/240)							133	102	79	63	51	42
		Factored load	455	366	306	263	230	205	185	168	154	135	116	101
NI-90	Live or snow load (L/480)				187	132	96	72	55	43	34	28	23	
	Total load (L/240)							144	111	87	69	56	46	
	Factored load	515	414	347	298	261	232	209	190	175	161	146	127	

#### Notes:

- The tabulated values may be used for simple or multiple spans.
- For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
- I-joist shall satisfy the specified live or snow load, the specified total load, and the factored load. Where the live or snow load is blank, the factored load governs the design.
- I-joist shall be laterally supported at points of bearing and along all compression edges.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except as required for hangers.
- The ultimate limit states take into account the factored bending moment, shear, and reaction resistances. The serviceability limit states are based on a live or snow load deflection limit of L/480 and a total deflection limit of L/240. If applicable, the final design shall include a consideration for floor vibration.
- For a live or snow load deflection limit of L/360, multiply live or snow load values by 1.33.
- For double joists, double the table values and nail joists together per detail 1p.
- For sloped roofs, the horizontal clear span must be multiplied by the corresponding slope adjustment factor:

#### Roof slope adjustment factor

Slope	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
Adjustment factor	1.003	1.014	1.031	1.054	1.083	1.118	1.158	1.202	1.250	1.302	1.357	1.414

**Maximum Uniform Loads (plf)**

Joist depth	Joist series	Criteria	Clear span (ft)													
			8	10	12	14	16	18	20	22	24	26	28	30		
14"	NI-40x	Live or snow load (L/480)					176	123	89	66	51	39	31	25	-	
		Total load (L/240)											63	51	41	
		Factored load	480	386	323	277	229	181	147	122	102	87	75	66		
	NI-60	Live or snow load (L/480)						132	96	71	54	42	34	27	-	
		Total load (L/240)									143	109	85	68	55	45
		Factored load	482	388	324	279	244	217	193	160	134	115	99	86		
	NI-80	Live or snow load (L/480)						172	126	95	73	57	45	37	30	
		Total load (L/240)										115	91	74	61	
		Factored load	512	411	344	295	259	230	208	189	173	160	140	122		
	NI-90	Live or snow load (L/480)							136	102	79	62	49	40	33	
		Total load (L/240)										124	99	80	66	
		Factored load	515	414	347	298	261	232	209	190	175	161	150	140		
16"	NI-60	Live or snow load (L/480)							128	96	74	57	46	37	30	
		Total load (L/240)										115	92	74	61	
		Factored load	501	403	337	289	254	226	203	185	156	133	115	100		
	NI-80	Live or snow load (L/480)							167	126	97	76	61	49	41	
		Total load (L/240)											123	99	82	
		Factored load	559	450	376	323	283	252	227	207	189	175	162	142		
	NI-90	Live or snow load (L/480)								135	105	82	66	53	44	
		Total load (L/240)												107	88	
		Factored load	559	450	376	323	283	252	227	207	189	175	163	152		

Notes:

1. The tabulated values may be used for simple or multiple spans.
2. For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
3. I-joist shall satisfy the specified live or snow load, the specified total load, and the factored load. Where the live or snow load is blank, the factored load govern the design.
4. I-joist shall be laterally supported at points of bearing and along all compression edges.
5. Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings.
6. Bearing stiffeners are not required when I-joists are used in accordance with this table, except as required for hangers.
7. The ultimate limit states take into account the factored bending moment, shear, and reaction resistances. The serviceability limit states are based on a live or snow load deflection limit of L/480 and a total deflection limit of L/240. If applicable, the final design shall include a consideration for floor vibration.
8. For a live or snow load deflection limit of L/360, multiply live or snow load values by 1.33.
9. For double joists, double the table values and nail joists together per detail 1p.

*Roof slope adjustment factor*

Slope	1:12	2:12	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
Adjustment factor	1.003	1.014	1.031	1.054	1.083	1.118	1.158	1.202	1.250	1.302	1.357	1.414

## Hangers – Simpson Strong-Tie

### Hangers – Simpson Strong-Tie

Factored resistances (lbf) – Single joist

Joist		Single joist – Face mount				Single joist – Top mount			
		Fastener		Factored resist. (lbf)	Fastener		Factored resist. (lbf)		
Series	Depth	Hanger	Header		Joist	Hanger		Header	Joist
NI-20 NI-40x NI-60	9-1/2"	IUS2.56/9.5	10d	-	1,645	LT259	10d	WS	1,645
	11-7/8"	IUS2.56/11.88	10d	-	1,820	LT251188	10d	WS	1,725
	14"	IUS2.56/14	10d	-	1,820	LT2514	10d	WS	1,725
	16"	IUS2.56/16	10d	-	1,935	LT2516	10d	WS	1,725
NI-80 NI-90	9-1/2"	IUS3.56/9.5	10d	-	1,685	LT359	10d	WS	1,725
	11-7/8"	IUS3.56/11.88	10d	-	1,685	LT351188	10d	WS	1,725
	14"	IUS3.56/14	10d	-	1,685	LT3514	10d	WS	1,725
	16"	IUS3.56/16	10d	-	1,685	LT3516	10d	WS	1,725
Joist		Single joist – Slopeable & skewable				Single joist – 45° skew			
		Fastener		Factored resist. (lbf)	Fastener		Factored resist. (lbf)		
Series	Depth	Hanger	Header		Joist	Hanger		Header	Joist
NI-20 NI-40x NI-60	9-1/2"	LSSR2.56Z <sup>(a, b)</sup>	10d	10d x 1-1/2	1,200	SUR/L2.56/9	16d	10d x 1-1/2	1,720
	11-7/8"	LSSR2.56Z <sup>(a, b)</sup>	10d	10d x 1-1/2	1,200	SUR/L2.56/11	16d	10d x 1-1/2	2,145
	14"	LSSR2.56Z <sup>(a, b)</sup>	10d	10d x 1-1/2	1,200	SUR/L2.56/14	16d	10d x 1-1/2	2,710
	16"	Refer to Simpson Strong-Tie's literature					SUR/L2.56/14	16d	10d x 1-1/2
NI-80 NI-90	9-1/2"	LSSR410Z <sup>(a, b)</sup>	16d	16d x 2-1/2	1,835	SUR/L410	16d	16d	1,890
	11-7/8"	LSSR410Z <sup>(a, b)</sup>	16d	16d x 2-1/2	1,835	SUR/L410	16d	16d	2,340
	14"	LSSR410Z <sup>(a, b)</sup>	16d	16d x 2-1/2	1,835	SUR/L414	16d	16d	2,695
	16"	Refer to Simpson Strong-Tie's literature					SUR/L414	16d	16d

a) The LSSR requires web stiffeners that are 4-inch wide and attached with four nails each side.

b) LSSR nails and loads shown are for skewed rafter condition. Refer to Simpson Strong-Tie's literature for nailing options with higher loads.

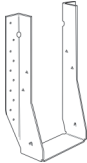

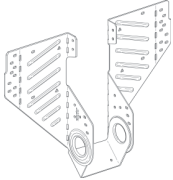

#### Notes:

- Shaded hangers require web stiffeners at joist ends.
- The factored resistance values are for Nordic Lam or S-P-F sawn lumber headers, downward loads, and standard-term duration of load.
- Fill all round, dimple, and positive-angle nail holes.
- Leave 1/16 inch (1/8 inch maximum) clearance between the end of the supported joist and the header or hanger.
- WS = #8 x 1-1/4 wood screw.
- To verify hanger suitability for a specific application and for additional information, refer to Simpson Strong-Tie's literature.



**Hangers – Simpson Strong-Tie**

Factored resistances (lbf) – Double joist

		Double joist – Face mount				Double joist – Top mount				
Joist										
Series	Depth	Hanger	Fastener		Factored resist. (lbf)	Hanger	Fastener		Factored resist. (lbf)	
			Header	Joist			Header	Joist		
NI-20 NI-40x NI-60	9-1/2"	MIU5.12/9	16d	10d x 1-1/2	3,230	MIT39.5-2	16d	10d x 1-1/2	2,420	
	11-7/8"	MIU5.12/11	16d	10d x 1-1/2	3,230	MIT311.88-2	16d	10d x 1-1/2	2,420	
	14"	MIU5.12/14	16d	10d x 1-1/2	3,485	MIT314-2	16d	10d x 1-1/2	2,420	
	16"	MIU5.12/16	16d	10d x 1-1/2	3,485	MIT5.12/16	16d	10d x 1-1/2	2,420	
NI-80 NI-90	9-1/2"	HU410-2	16d	16d	3,780	BA7.12/9.5	16d	10d x 1-1/2	3,780	
	11-7/8"	HU412-2	16d	16d	4,680	BA7.12/11.88	16d	10d x 1-1/2	4,030	
	14"	HU414-2	16d	16d	5,380	BA7.12/14	16d	10d x 1-1/2	4,030	
	16"	HU414-2	16d	16d	6,020	BA7.12/16	16d	10d x 1-1/2	4,030	
		Double joist – Slopeable & skewable				Double joist – 45° skew				
Joist										
Series	Depth	Hanger	Fastener		Factored resist. (lbf)	Hanger	Fastener		Factored resist. (lbf)	
			Header	Joist			Header	Joist		
NI-20 NI-40x NI-60	9-1/2"	LSU5.12 <sup>(a)</sup>	16d	10d x 1-1/2	1,845	HSUR/L5.12/9	16d	10d x 1-1/2	2,350	
	11-7/8"	LSU5.12 <sup>(a)</sup>	16d	10d x 1-1/2	1,845	HSUR/L5.12/11	16d	10d x 1-1/2	2,965	
	14"	LSU5.12 <sup>(a)</sup>	16d	10d x 1-1/2	1,845	HSUR/L5.12/14	16d	10d x 1-1/2	2,965	
	16"	Refer to Simpson Strong-Tie's literature					HSUR/L5.12/16	16d	10d x 1-1/2	2,965
NI-80 NI-90	9-1/2"	Refer to Simpson Strong-Tie's literature					HU410-2X <sup>(a)</sup>	16d	16d	3,050
	11-7/8"						HU412-2X <sup>(a)</sup>	16d	16d	3,050
	14"						HU414-2X <sup>(a)</sup>	16d	16d	4,020
	16"						HU414-2X <sup>(a)</sup>	16d	16d	4,020

a) Hanger is special order.





Notes:

1. Shaded hangers require web stiffeners at joist ends.
2. The factored resistance values are for Nordic Lam or S-P-F sawn lumber headers, downward loads, and standard-term duration of load.
3. Fill all round, dimple, and positive-angle nail holes.
4. Leave 1/16 inch (1/8 inch maximum) clearance between the end of the supported joist and the header or hanger.
5. To verify hanger suitability for a specific application and for additional information, refer to Simpson Strong-Tie's literature.

## Hangers – MiTek

### Hangers – MiTek

Factored resistances (lbf) – Single joist

		Single joist – Face mount				Single joist – Top mount			
Joist									
Series	Depth	Hanger	Fastener		Factored resist. (lbf)	Hanger	Fastener		Factored resist. (lbf)
			Header	Joist			Header	Joist	
NI-20 NI-40x NI-60	9-1/2"	THFI2595	10d	-	1,700	TFL2595	10d	10d x 1-1/2	1,960
	11-7/8"	THFI25118	10d	-	1,700	TFL25118	10d	10d x 1-1/2	1,960
	14"	THFI2514	10d	-	2,910	TFL2514	10d	10d x 1-1/2	1,960
	16"	IHFL2516	10d	10d x 1-1/2	3,310	TFL2516	10d	10d x 1-1/2	1,960
NI-80 NI-90	9-1/2"	IHFL35925	10d	10d x 1-1/2	3,310	THO35950	10d	10d x 1-1/2	2,620
	11-7/8"	IHFL35112	10d	10d x 1-1/2	3,310	THO35118	10d	10d x 1-1/2	2,620
	14"	IHFL3514	10d	10d x 1-1/2	3,310	THO35140	10d	10d x 1-1/2	3,385
	16"	IHFL3516	10d	10d x 1-1/2	3,310	THO35160	10d	10d x 1-1/2	3,385
Joist		Single joist – Slopeable & skewable				Single joist – 45° skew			
									
Series	Depth	Hanger	Fastener		Factored resist. (lbf)	Hanger	Fastener		Factored resist. (lbf)
			Header	Joist			Header	Joist	
NI-20 NI-40x NI-60	9-1/2"	LSSH25-TZ	16d	10d x 1-1/2	1,830	SKH2520L/R	10d	10d x 1-1/2	2,700
	11-7/8"	LSSH25-TZ	16d	10d x 1-1/2	1,830	SKH2520L/R	10d	10d x 1-1/2	2,700
	14"	LSSH25-TZ	16d	10d x 1-1/2	1,830	SKH2524L/R	10d	10d x 1-1/2	3,645
	16"	LSSH25-TZ	16d	10d x 1-1/2	1,830	SKH2524L/R	10d	10d x 1-1/2	3,645
NI-80 NI-90	9-1/2"	LSSH35-TZ	16d	10d x 1-1/2	2,195	HD410_SK45L/R_BV <sup>(b)</sup>	16d	10d	4,180 <sup>(a)</sup>
	11-7/8"	LSSH35-TZ	16d	10d x 1-1/2	2,195	HD410_SK45L/R_BV <sup>(b)</sup>	16d	10d	4,180 <sup>(a)</sup>
	14"	LSSH35-TZ	16d	10d x 1-1/2	2,195	HD414_SK45L/R_BV <sup>(b)</sup>	16d	10d	4,180 <sup>(a)</sup>
	16"	LSSH35-TZ	16d	10d x 1-1/2	2,195	HD414_SK45L/R_BV <sup>(b)</sup>	16d	10d	4,180 <sup>(a)</sup>

a) Bevel cut required on end of joist to achieve design loads.



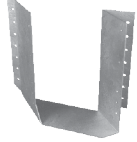
b) Hanger is special order.

#### Notes:

1. Shaded hangers require web stiffeners at joist ends.
2. The factored resistance values are for Nordic Lam or S-P-F sawn lumber headers, downward loads, and standard-term duration of load.
3. Fill all round, dimple, and positive-angle nail holes.
4. Leave 1/16 inch (1/8 inch maximum) clearance between the end of the supported joist and the header or hanger.
5. To verify hanger suitability for a specific application and for additional information, refer to MiTek's literature.

**Hangers – MiTek**

Factored resistances (lbf) – Double joist

Joist		Double joist – Face mount				Double joist – Top mount			
									
Series	Depth	Hanger	Fastener		Factored resist. (lbf)	Hanger	Fastener		Factored resist. (lbf)
			Header	Joist			Header	Joist	
NI-20 NI-40x NI-60	9-1/2"	IHF25925-2	10d	-	2,900	THO25950-2	16d	10d	4,570
	11-7/8"	IHF25112-2	10d	-	2,900	THO25118-2	16d	10d	4,570
	14"	THF25140-2	10d	10d	5,245	THO25140-2	16d	10d	5,545
	16"	THF25160-2	10d	10d	5,245	THO25160-2	16d	10d	5,545
NI-80 NI-90	9-1/2"	HD7100	16d	16d	4,180	BPH7195	16d	10d	4,340
	11-7/8"	HD7120	16d	16d	4,180	BPH71118	16d	10d	4,305
	14"	HD7140	16d	16d	4,180	BPH7114	16d	10d	4,305
	16"	HD7160	16d	10d	4,710	BPH7116	16d	10d	4,305
Joist		Double joist – Slopeable & skewable				Double joist – 45° skew			
		Refer to MiTek's literature							
Series	Depth	Hanger	Fastener		Factored resist. (lbf)	Hanger	Fastener		Factored resist. (lbf)
			Header	Joist			Header	Joist	
NI-20 NI-40x NI-60	9-1/2"	Refer to MiTek's literature				SKH2520L/R-2	10d	10d	4,175 <sup>(a)</sup>
	11-7/8"					SKH2520L/R-2	10d	10d	4,175 <sup>(a)</sup>
	14"					SKH2524L/R-2	10d	10d	3,885 <sup>(a)</sup>
	16"					SKH2524L/R-2	10d	10d	3,885 <sup>(a)</sup>
NI-80 NI-90	9-1/2"	Refer to MiTek's literature				HD7100_SK45L/R_BV <sup>(b)</sup>	16d	16d	4,180 <sup>(a)</sup>
	11-7/8"					HD7120_SK45L/R_BV <sup>(b)</sup>	16d	16d	4,180 <sup>(a)</sup>
	14"					HD7140_SK45L/R_BV <sup>(b)</sup>	16d	16d	4,180 <sup>(a)</sup>
	16"					HD7160_SK45L/R_BV <sup>(b)</sup>	16d	10d	4,710 <sup>(a)</sup>

a) Bevel cut required on end of joist to achieve design loads.

b) Hanger is special order.

Notes:

1. Shaded hangers require web stiffeners at joist ends.
2. The factored resistance values are for Nordic Lam or S-P-F sawn lumber headers, downward loads, and standard-term duration of load.
3. Fill all round, dimple, and positive-angle nail holes.
4. Leave 1/16 inch (1/8 inch maximum) clearance between the end of the supported joist and the header or hanger.
5. To verify hanger suitability for a specific application and for additional information, refer to MiTek's literature.



# NORDIC

TECHNICAL GUIDE  
NORDIC JOIST

NS-GT3 

ENGLISH  
VERSION  
2024-08-01

CONSTRUCTION  
DETAILS

3

## GENERAL NOTES

### 1.0 General

- 1.1 This document supersedes all previous versions. For the latest version, consult [nordic.ca](https://nordic.ca) or contact Nordic Structures.
- 1.2 While this guide emphasizes residential construction, much of the basic design information can be used for other construction applications. Review by a design professional is required for applications beyond the scope of this document.
- 1.3 For more information, consult [nordic.ca](https://nordic.ca) or contact Nordic Structures.

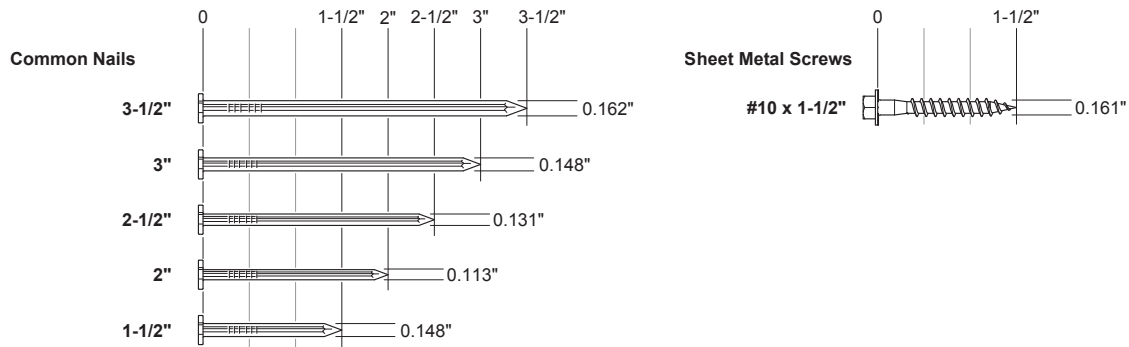
### 2.0 Structure

- 2.1 All nails shown in the details are assumed to be common nails unless otherwise noted. Refer to page 3.3 for diameters. Individual components not shown to scale for clarity.
- 2.2 For APA Rim Board Plus specifications, see [ANSI/APA PRR 410, Standard for Performance-rated Engineered Wood Rim Boards](#).

### 3.0 Fire Safety

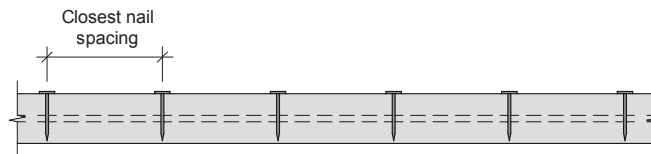
- 3.1 For fire-rated assemblies and fire protection of floor assemblies, refer to Chapter 4.
- 3.2 I-joists are often used in conjunction with both steel and chlorinated polyvinyl chloride (CPVC) sprinkler systems. Details 9 provide some basic guidance on appropriate methods of attachment of steel and CPVC sprinkler systems to I-joists. All designs should be checked by a design professional to assure the adequacy of not only the hangers and fasteners used but the capacity of the I-joists themselves. For more information, refer to [APA J745, Sprinkler Pipe Installation for APA Performance Rated I-Joists](#).

## FASTENERS

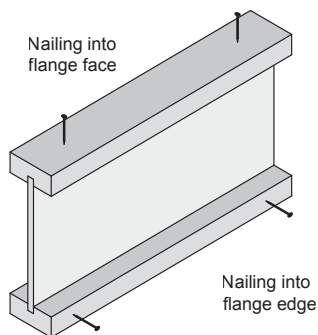
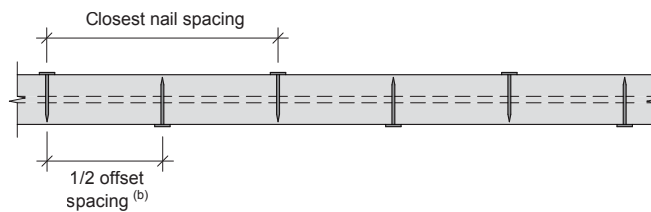


## NAIL SPACING

### Nailed to Only One Flange Edge (Top View)



### Nailed to Both Flange Edges (Top View)



### Recommended Closest Nail Spacing for Fastening Sheathing to I-joist Flanges to Minimize Splitting

Fastener size (diameter x length)	Flange face nailing <sup>(a)</sup>		Flange edge nailing <sup>(b)</sup>		
	End distance (in.)	Nail spacing (in.)	End distance (in.)	Nail spacing (in.)	
				Nailed to only one flange edge	Nailed to both flange edges
0.128" or smaller in diameter, and 3-1/4" or shorter in length	2	2	2	2	4
Greater than 0.128" up to 0.148" in diameter, and 3-1/4" or shorter in length	2	3	2	3	6

<sup>(a)</sup> If more than one row is required, offset rows a minimum of 1/2 inch and stagger.

<sup>(b)</sup> Closest nail spacing measured from one flange edge. Nails on opposite flange edge must be offset one-half the minimum spacing.

## INSTALLATION NOTES

### Floor Systems

1. Installation of Nordic I-joists shall be as shown in details 1.
2. Except for cutting to length, I-joist flanges should never be cut, drilled or notched.
3. Install I-joists so that top and bottom flanges are within 1/2 inch of true vertical alignment.
4. Concentrated loads should only be applied to the top surface of the top flange. Concentrated loads should not be suspended from the bottom flange with the exception of light loads, such as ceiling fans or light fixtures.
5. I-joists must be protected from the weather prior to installation.
6. I-joists must not be used in applications where they will be permanently exposed to weather, or will reach a moisture content of 15 percent or greater, such as in swimming pool or hot tub areas. They must not be installed where they will remain in direct contact with concrete or masonry.
7. End bearing length must be at least 1-3/4 inch. For multiple-span joists, intermediate bearing length must be at least 3-1/2 inches.
8. Ends of floor joists shall be restrained to prevent rollover. Use rim board or I-joist blocking panels.
9. I-joists installed beneath bearing walls perpendicular to the joists shall have full-depth blocking panels, rim board, or squash blocks (cripple blocks) to transfer gravity loads from above the floor system to the wall or foundation below.
10. For I-joists installed directly beneath bearing walls parallel to the joists or used as rim board or blocking panels, the maximum vertical load using a single I-joist is 2,900 plf, and 5,800 plf if double I-joists are used.
11. Continuous lateral support of the I-joist's compression flange is required to prevent rotation and buckling. In simple span uses, lateral support of the top flange is normally supplied by the floor sheathing. In multiple-span or cantilever applications, bracing of the I-joist's bottom flange is also required at interior supports of multiple-span joists, and at the end support next to the cantilever extension. The ends of all cantilever extensions must be laterally braced as shown in details 3, 4, or 5.
12. Nails installed in flange face or edge shall be spaced in accordance with the applicable building code requirements or approved building plans, but should not be closer than those specified on page 3.3.
13. Details 1 on the following pages show only I-joist-specific fastener requirements. For other fastener requirements, see the applicable building code.
14. For proper temporary bracing of wood I-joists and placement of temporary construction loads, see [APA Technical Note: Temporary Construction Loads over I-Joist Roofs and Floors, Form J735](#).

### Floor Performance

Researchers have proposed several methods that can be used to reduce floor vibration. These methods include:

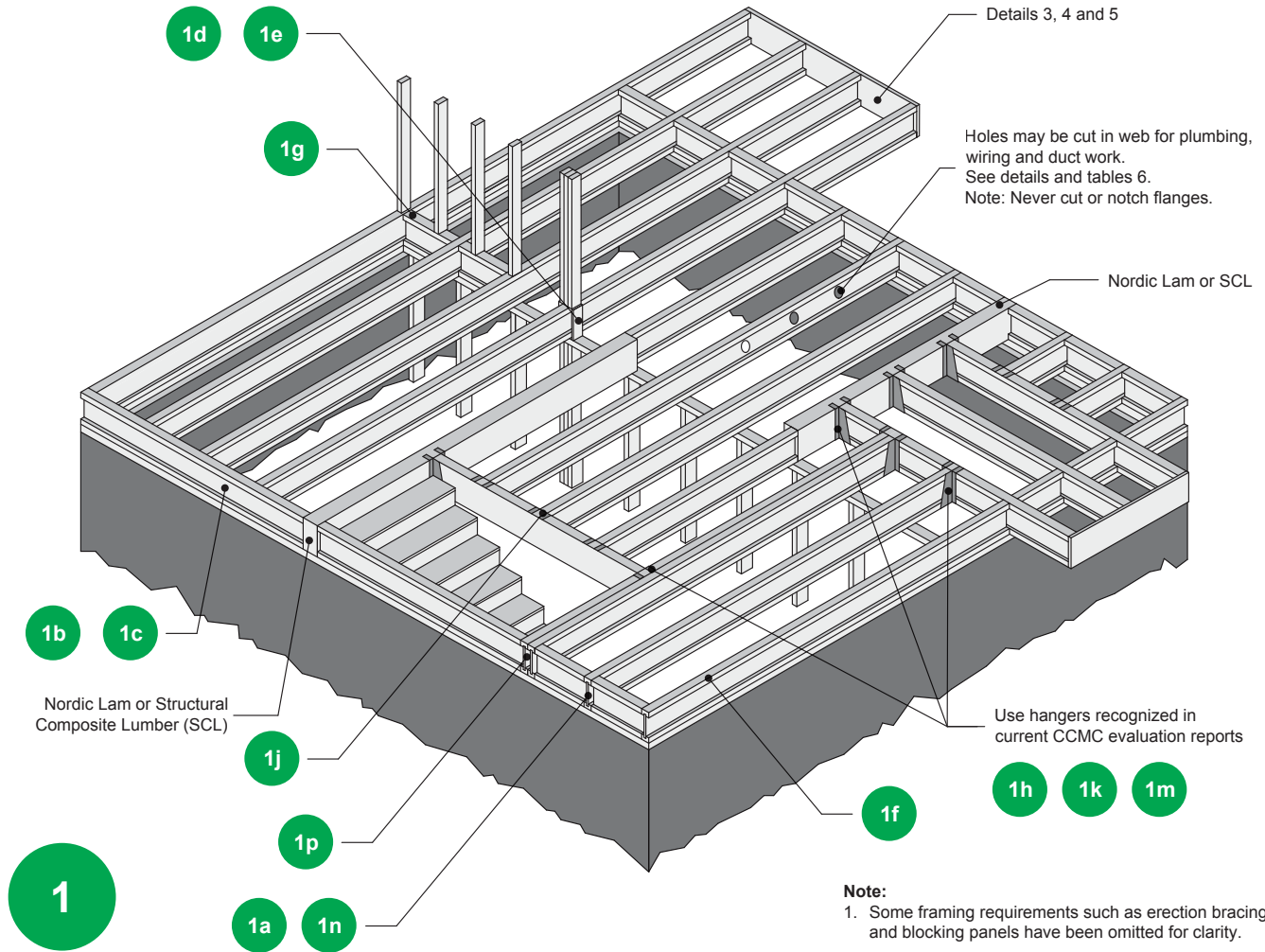
- Gluing the wood structural panel floor to the joists.
- Attaching wood structural panels or gypsum board to the bottom of the floor joists.
- Decreasing the floor-joist spacing by one increment based on maximum floor span.
- Using full-depth blocking at regular intervals between all of the floor joists over the entire floor (detail 1r-1).

By far the most practical and most economical way to further increase the stiffness of your floor when using Nordic I joists is to select the most economical I-joist from our maximum span tables and then maintain the same joist designation but upgrade to the next depth.

For example: If a 9-1/2" NI-40x is selected for a given application, specifying an 11-7/8" NI-40x will provide an increase in stiffness of over 70%, resulting in an increased performance.

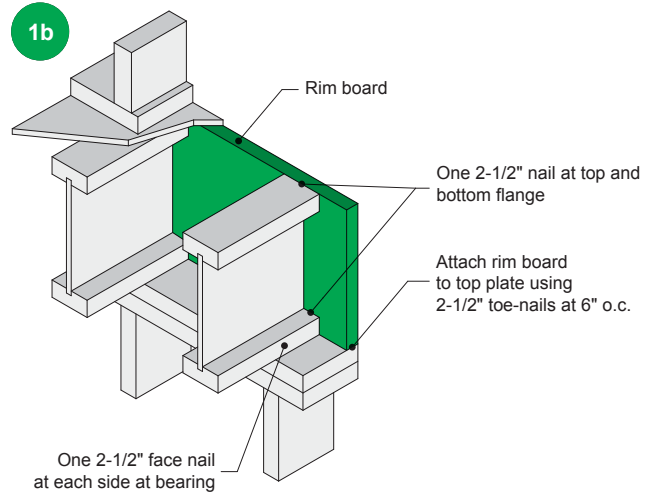
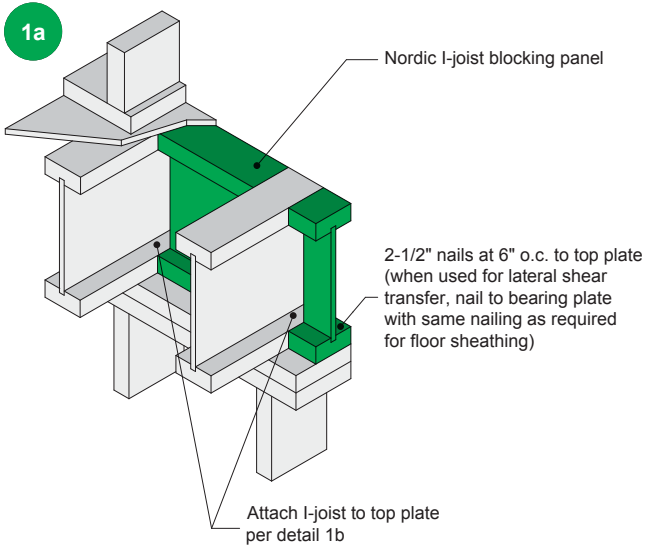


**TYPICAL FLOOR FRAMING AND CONSTRUCTION DETAILS**



 FOR ALL  
[construction details → DC3](#)

 [installation guide → GI31](#)



Blocking panel and/or rim joist	Maximum uniform vertical load transfer (plf) <sup>(a)</sup>
Nordic I-joists	2,900

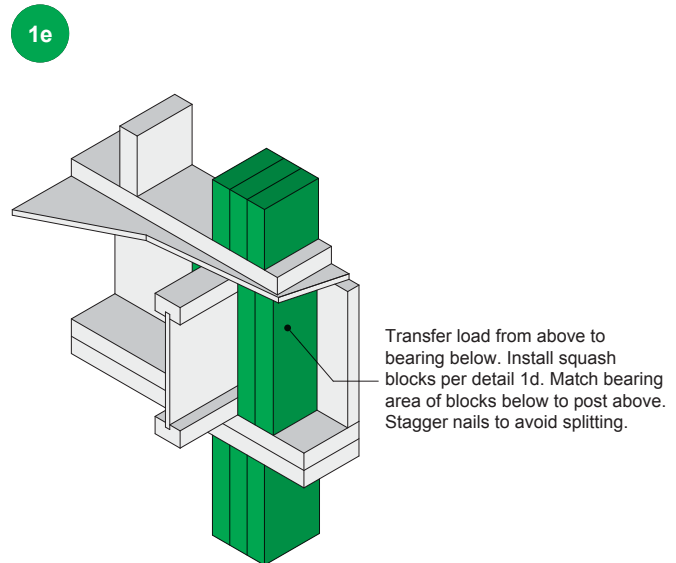
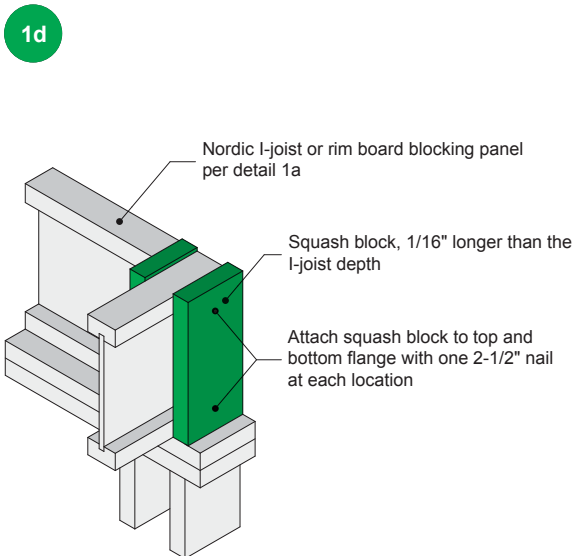
<sup>(a)</sup> The uniform vertical load transfer resistance is limited to a depth of 16 inches or less and is based on standard term load duration. It shall not be used in the design of a bending member, such as joist, header, or rafter. For concentrated vertical load transfer resistance, see detail 1d.

Blocking panel and/or rim joist	Maximum uniform vertical load transfer (plf) <sup>(a)</sup>
1-1/8" APA Rim Board Plus	7,030

<sup>(a)</sup> The uniform vertical load transfer resistance is limited to a depth of 16 inches or less and is based on standard term load duration. It shall not be used in the design of a bending member, such as joist, header, or rafter. For concentrated vertical load transfer resistance, see detail 1d.

**Note:**

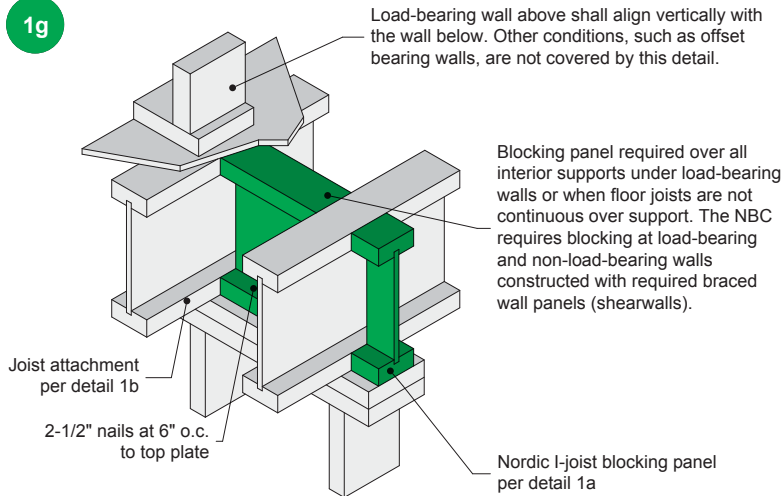
- To avoid splitting flange, start nails at least 1-1/2 inch from end of I-joist. Nails may be driven at an angle to avoid splitting of bearing plate.



Pair of squash blocks <sup>(a)</sup>	Maximum vertical load transfer (lbf)	
	3-1/2" wide	5-1/2" wide
2x lumber	5,800	9,500
1-1/8" APA Rim Board Plus	4,100	6,400

<sup>(a)</sup> The squash blocks are assumed to be in full bearing on the plate below.

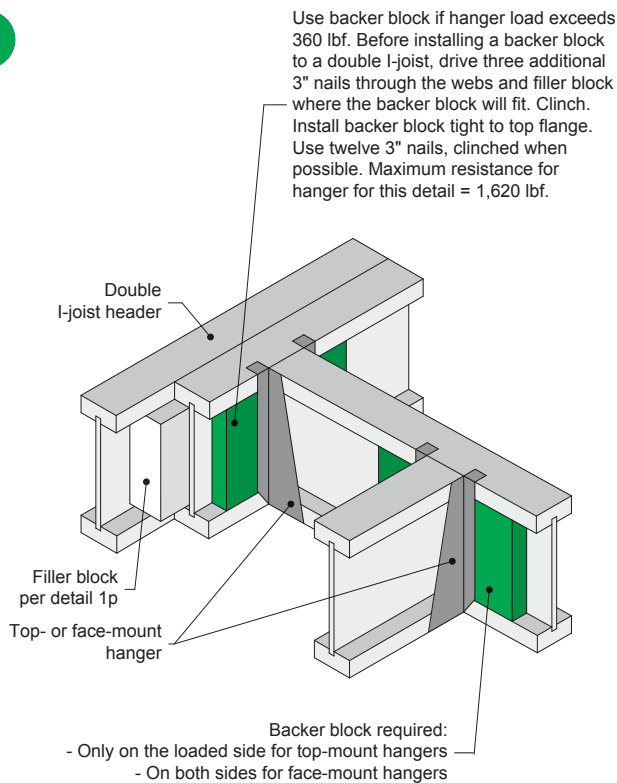
**1g**



**Notes:**

1. An occasional blocking panel (one per line of blocking) may be left out for the passage of plumbing or ventilation ducts. For other applications, contact Nordic Structures.
2. For other options, see details 1g-1 to 1g-7.

**1h**



Flange width (in.)	Material thickness required (in.) <sup>(a)</sup>	Minimum depth (in.) <sup>(b)</sup>
2-1/2	1	5-1/2
3-1/2	1-1/2	7-1/4

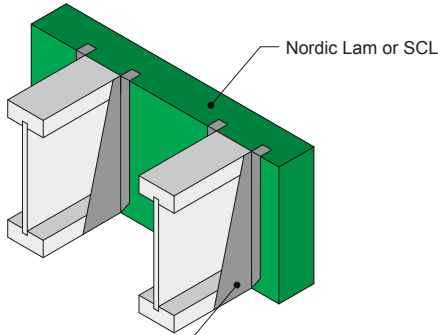
<sup>(a)</sup> Minimum grade for backer block material shall be S-P-F No. 2 or better for solid sawn lumber and wood structural panels conforming to CAN/CSA-O325 Standard.

<sup>(b)</sup> For face-mount hangers use net joist depth minus 3-1/4 inches.

**Notes:**

1. Unless hanger sides laterally support the top flange, bearing stiffeners shall be used.
2. For hanger resistance, see manufacturer's recommendations.
3. Verify double I-joist resistance to support concentrated loads.
4. Backer blocks must be long enough to permit required nailing without splitting.
5. For other options, see details 1h-1 and 1h-2.

1j

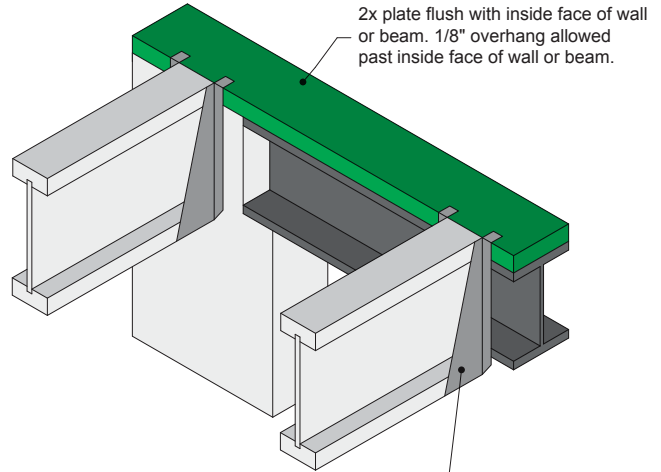


Top- or face-mount hanger installed per manufacturer's recommendations

**Notes:**

1. Unless hanger sides laterally support the top flange, bearing stiffeners shall be used.
2. For nailing schedules for multiple Nordic Lam or SCL beams, see the manufacturer's recommendations.

1k

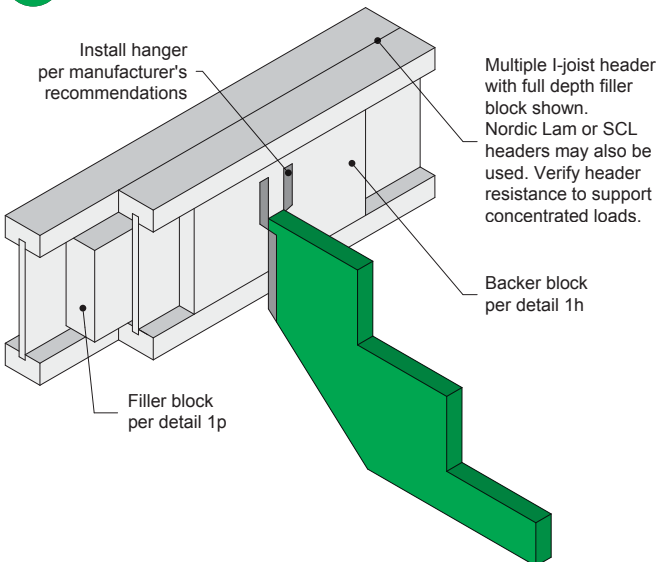


Top-mount hanger installed per manufacturer's recommendations

**Note:**

1. Unless hanger sides laterally support the top flange, bearing stiffeners shall be used.

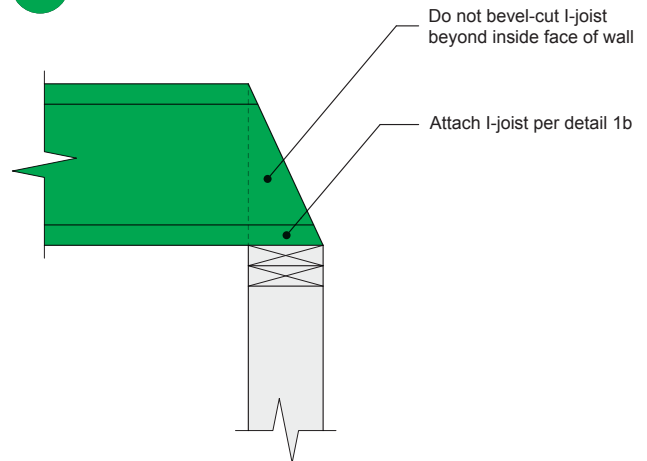
1m



**Note:**

1. See detail 1h for maximum support resistance.

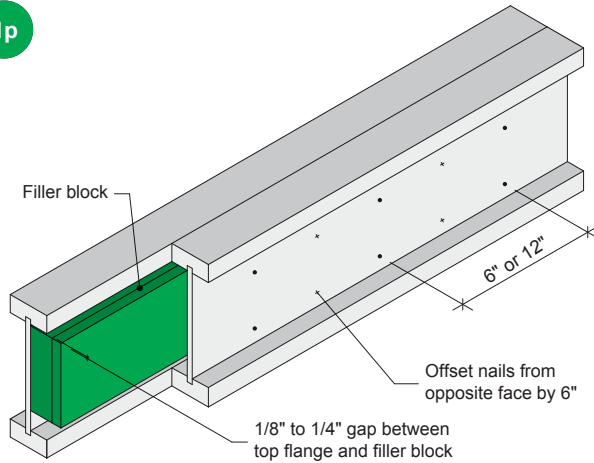
1n



**Note:**

1. Blocking required at bearing for lateral support, not shown for clarity.

1p



**Filler Block Requirements for Double I-joist Construction**

Flange width (in.)	Net depth (in.)	Filler block size (in.)	Example
2-1/2	9-1/2	2-1/8 to 2-1/4 x 6	2x6 + 5/8" or 3/4" sheathing
	11-7/8	2-1/8 to 2-1/4 x 8	2x8 + 5/8" or 3/4" sheathing
	14	2-1/8 to 2-1/4 x 10	2x10 + 5/8" or 3/4" sheathing
	16	2-1/8 to 2-1/4 x 12	2x12 + 5/8" or 3/4" sheathing
3-1/2	9-1/2	3 x 6	2 x 2x6
	11-7/8	3 x 8	2 x 2x8
	14	3 x 10	2 x 2x10
	16	3 x 12	2 x 2x12

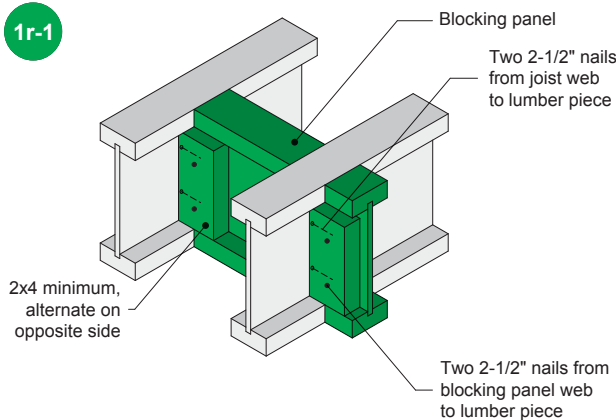
**Note:**

1. The height of the filler block may be different from that specified in the table, as long as it allows nailing and respects the required gap.

**Notes:**

1. Support back of I-joist web during nailing to prevent damage to web/flange connection.
2. Leave a 1/8-inch to 1/4-inch gap between top of filler block and bottom of top I-joist flange.
3. Filler block is required between joists for full length of span.
4. For flange width of 2-1/2 inches, nail joists together with two rows of 3-inch nails at 12 inches o.c. (clinched when possible) on each side of the double I-joist (total of four nails per foot). For flange width of 3-1/2 inches, use two rows of 3-inch nails at 6 inches o.c. on each side of the double I-joist (total of eight nails per foot).
5. The maximum factored load that may be applied to one side of the double I-joist using this detail is 860 lbf/ft.

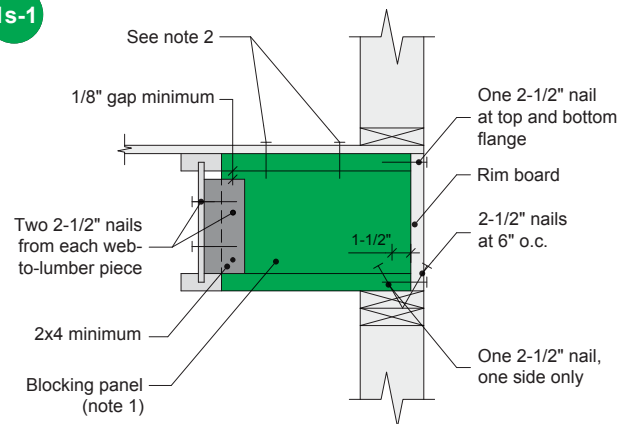
1r-1



**Notes:**

1. This detail may be used to reduce floor vibration.
2. Blocking panels may be of any I-joist series. Nails attaching lumber piece to I-joist web should be driven from the web side and clinched on the lumber side.
3. One occasional blocking panel may be left out for the passage of plumbing or ventilation ducts. Otherwise, a hole of not more than 2/3 of the lesser dimension of the blocking depth or length may be drilled in the blocking panel.

1s-1



**Notes:**

1. In some local codes, blocking panels are prescriptively required in the first joist space (or first and second joist spaces) next to the starter joist. Where required, see local code requirements for spacing of the blocking panels. As a minimum, it is recommended to use blocking panels spaced at 4 feet on centre.
2. Details shown are for minimum blocking attachment. Transfer of lateral loads may require additional fasteners. In such cases, nail size, spacing and specific design detailing shall be provided by the building designer.
3. Where blocking panels are required between adjacent joists, the blocking panels can be staggered by approximately 3 inches, and end-nailed as shown.
4. Nails attaching lumber piece to I-joist web should be driven from the web side and clinched on the lumber side.

## Installing the Nailed-glued Floor System

1. Wipe any mud, dirt, water, or ice from I-joist flanges before gluing.
2. Snap a chalk line across the I-joists four feet in from the wall for panel edge alignment and as a boundary for spreading glue.
3. Spread only enough glue to lay one or two panels at a time, or follow specific recommendations from the glue manufacturer.
4. Lay the first panel with tongue side to the wall, and nail in place. This protects the tongue of the next panel from damage when tapped into place with a block and sledgehammer.
5. Apply a continuous line of glue (about 1/4-inch diameter) to the top flange of a single I-joist. Apply glue in a winding pattern on wide areas, such as with double I-joists.
6. Apply two lines of glue on I-joists where panel ends butt to assure proper gluing of each end.
7. After the first row of panels is in place, spread glue in the groove of one or two panels at a time before laying the next row. Glue line may be continuous or spaced, but avoid squeeze-out by applying a thinner line (1/8 inch) than used on I-joist flanges.
8. Tap the second row of panels into place, using a block to protect groove edges.
9. Stagger end joints in each succeeding row of panels. A 1/8-inch space between all end joints and 1/8-inch at all edges, including T&G edges, is recommended. (Use a spacer tool or an 2-1/2-inch common nail to assure accurate and consistent spacing.)
10. Complete all nailing of each panel before glue sets. Check the manufacturer's recommendations for cure time. (Warm weather accelerates glue setting.) Use 2-inch ring- or screw-shank nails for panels 3/4-inch thick or less, and 2-1/2-inch ring- or screw-shank nails for thicker panels. Space nails per the table below. Closer nail spacing may be required by some codes, or for diaphragm construction. The finished deck can be walked on right away and will carry construction loads without damage to the glue bond.

### Fasteners for Sheathing and Subflooring

Maximum joist spacing	Minimum panel thickness	Fastener size and type			Maximum spacing of fasteners	
		Common wire or spiral nails	Ring thread nails or screws	Staples	Edges	Intermediate supports
16"	5/8"	2"	1-3/4"	2"	6"	12"
19.2"	5/8"	2"	1-3/4"	2"	6"	12"
24"	3/4"	2"	1-3/4"	2"	6"	12"

#### Notes:

1. Fasteners of sheathing and subflooring shall conform to the above table.
2. Staples shall not be less than 1/16-inch in diameter or thickness, with not less than a 3/8-inch crown driven with the crown parallel to framing.
3. Flooring screws shall not be less than 1/8-inch in diameter.
4. Special conditions may impose heavy traffic and concentrated loads that require construction in excess of the minimums shown.
5. Use only adhesives conforming to CAN/CGSB-71.26 Standard, Adhesives for Field-Gluing Plywood to Lumber Framing for Floor System, applied in accordance with the manufacturer's recommendations. If OSB panels with sealed surfaces and edges are to be used, use only solvent-based glues; check with panel manufacturer.

Reference: NRC-CNRC, National Building Code of Canada, Table 9.23.3.5.

## I-joist Web Stiffeners

A web stiffener is a wood block that is used to reinforce the web of an I-joist at locations where:

- The webs of the I-joist are in jeopardy of buckling out of plane. This usually occurs in deeper I-joists.
- The webs of the I-joist are in jeopardy of “knifing” through the I-joist flanges. This can occur at any I-joist depth when the design reaction loads exceed a specific level.
- The I-joist is supported in a hanger and the sides of the hanger do not extend up to the top flange. The web stiffener supports the I-joist along a vertical axis as designed.

There are two kinds of web stiffeners: **bearing stiffeners** and **load stiffeners**. They are differentiated by the applied load and the location of the gap between the slightly undersized stiffener and the top or bottom flange. See detail 2.

**Bearing stiffeners** are located at the supports, both interior and end, when required. Nordic I-joists do not need bearing stiffeners at any support when subjected to the normal residential uniform loads and installed in accordance with the allowable spans printed in this document.

**Load stiffeners** are located between supports where significant point loads are applied to the top flange of an I-joist.

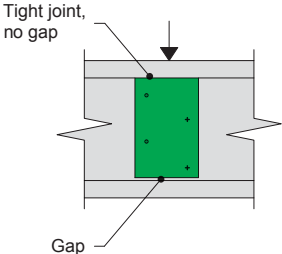
Web stiffener blocks may be comprised of lumber, rim board, or wood structural panels. The minimum grade of wood structural panels shall conform to CSA O325 Standard; minimum lumber grade shall be S-P-F No. 2 or better. The depth of the web stiffener should equal the distance between the flanges of the joist minus 1/8 inch – 1/4 inch.

### Recommendations:

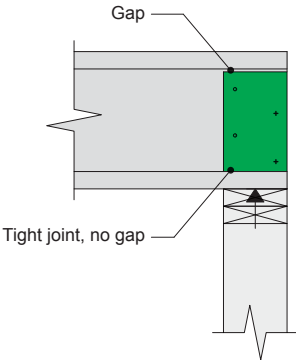
1. A **bearing stiffener** is required in all engineered applications with factored reactions greater than shown in the I-joist properties table on page 2.3. The gap between the stiffener and the flange is at the top.
2. A **bearing stiffener** is required when the I-joist is supported in a hanger and the sides of the hanger do not extend up to, and support, the top flange. The gap between the stiffener and flange is at the top.
3. A **load stiffener** is required at locations where a factored concentrated load greater than 2,370 lbf is applied to the top flange between supports, or in the case of a cantilever, anywhere between the cantilever tip and the support. These values are for standard-term duration of load, and may be adjusted for other load durations as permitted by the code. The gap between the stiffener and the flange is at the bottom.

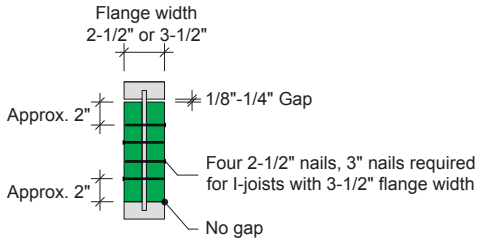
**2**

**Concentrated Load**  
(Load Stiffener)



**End Bearing**  
(Bearing Stiffener)





**Stiffener Size Requirements**

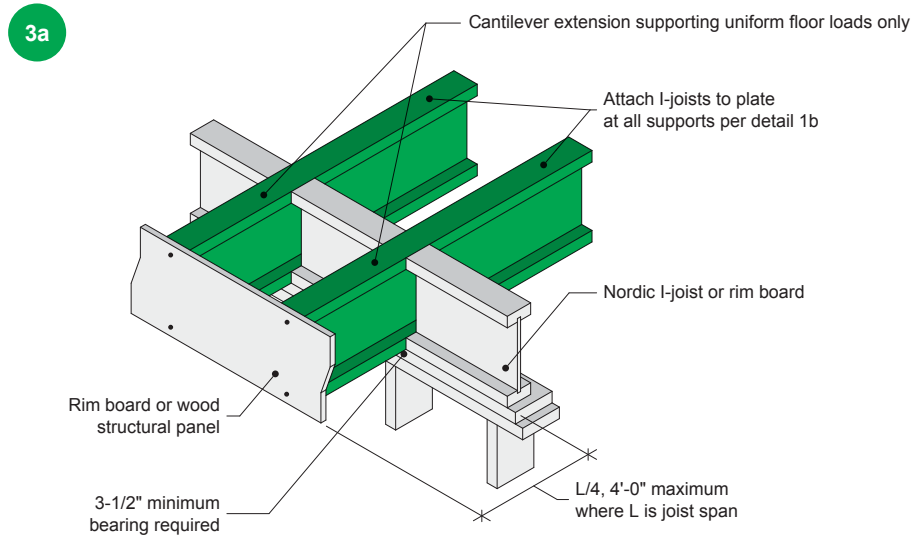
Flange width (in.)	Web stiffener size each side of web (in.)
2-1/2	1 x 2-5/16 Minimum width
3-1/2	1-1/2 x 2-5/16 Minimum width

## Cantilever Details for Balconies

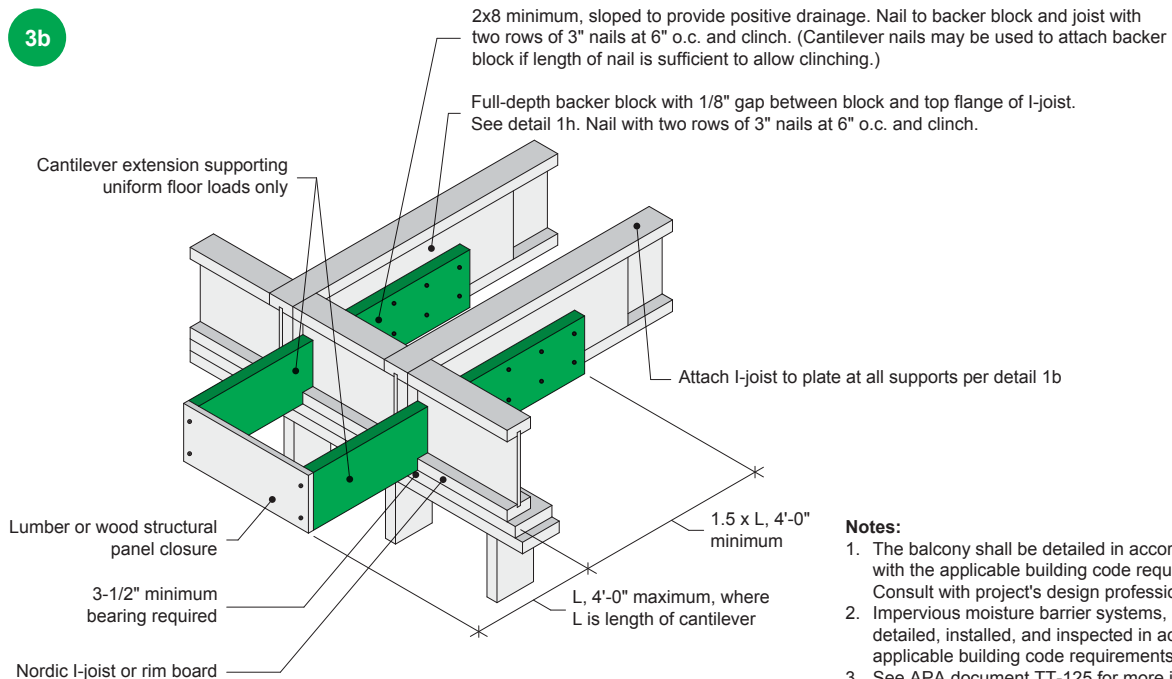
Balconies may be constructed using either continuous Nordic I-joists (detail 3a) or by adding lumber extensions to the I-joist (detail 3b). Continuous I-joist cantilevers are limited to one-fourth the adjacent span when supporting uniform loads only. For applications supporting concentrated loads at the end of the cantilever, such as a wall, see details 4 and 5.

Unless otherwise engineered, cantilevers are limited to a maximum of 4 feet when supporting uniform loads only. Blocking panel is required at the cantilever support, as shown. Uniform floor loads shall not exceed 40 psf live load and 15 psf dead load. The balcony uniform load shall not exceed 60 psf live load and 10 psf dead load.

**Caution:** *Cantilevered balcony details address structural considerations only. Cantilevered balcony details for moisture control, weathering and durability are beyond the scope of this publication.*



**Caution**  
Cantilevers formed this way are limited to interior balconies.



**Notes:**

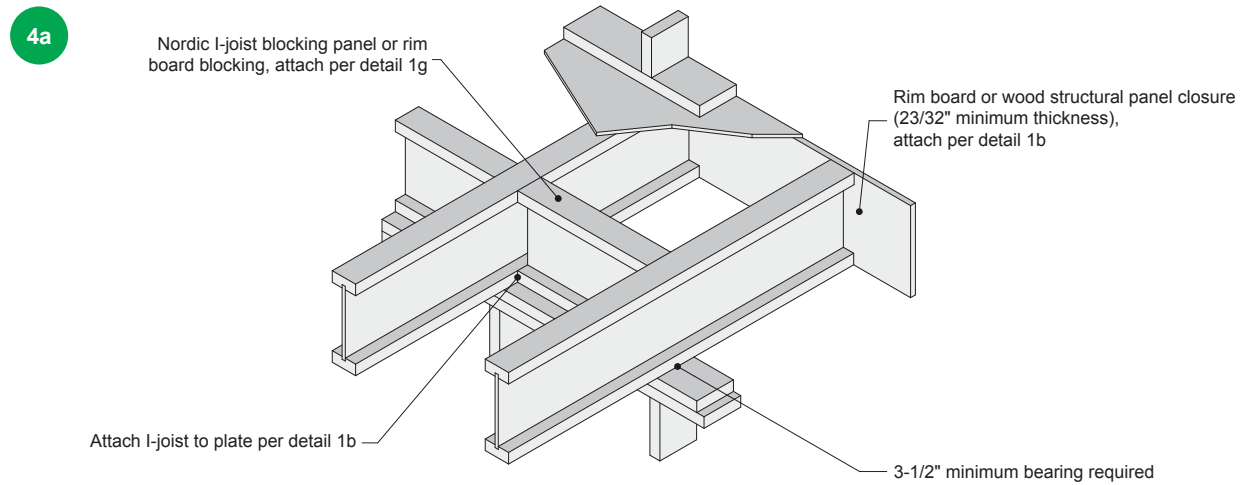
1. The balcony shall be detailed in accordance with the applicable building code requirements. Consult with project's design professional of record.
2. Impervious moisture barrier systems, if required, shall be detailed, installed, and inspected in accordance with the applicable building code requirements.
3. See APA document TT-125 for more information.



## Cantilever Details for Vertical Building Offset

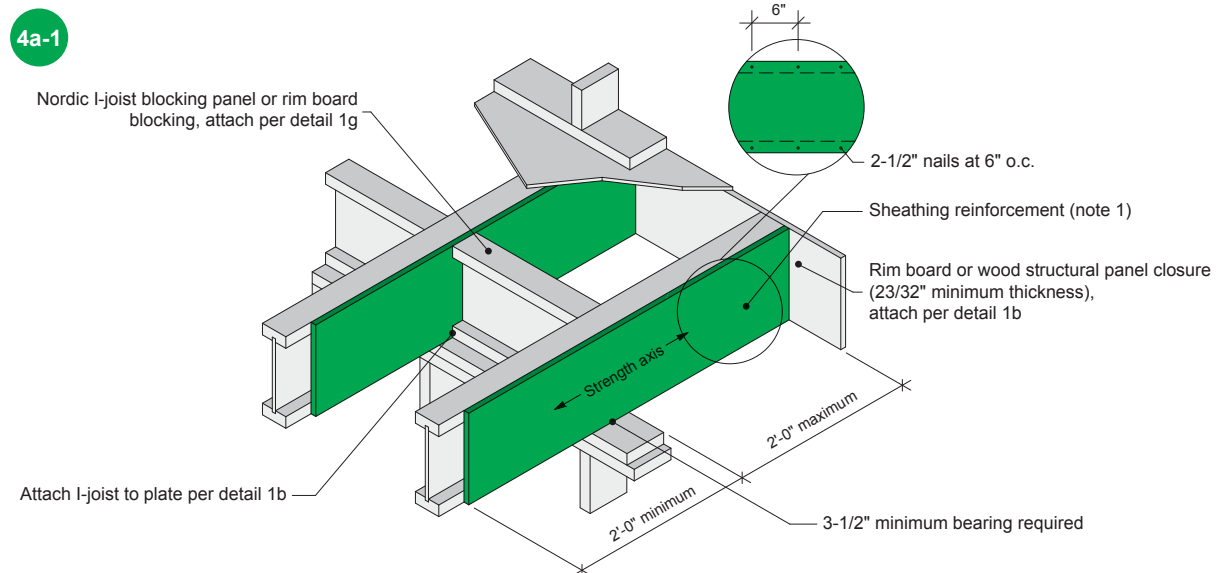
Nordic I-joists may also be used in cantilever applications supporting a uniform wall load applied to the end of the cantilever, such as with a vertical building offset. For cantilever-end load applications that require reinforcing based on table 4.1, the cantilever is limited to 2 feet maximum. In addition, blocking panel is required along the cantilever support.

Subject to the roof loads and layout (see table 4.1), three methods of reinforcing are allowed: sheathing reinforcement applied to one side of the I-joist (detail 4a-1), sheathing reinforcement applied to both sides of the I-joist (detail 4a-2), or double I-joists (detail 4b).



**Notes:**

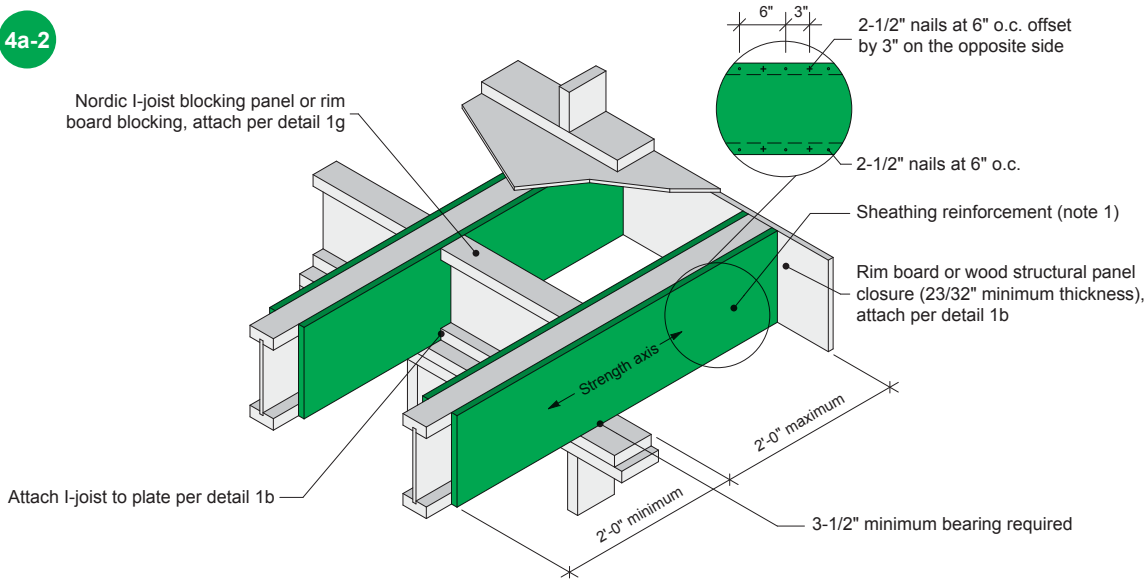
1. Cantilevered joists must be properly sized to support all design loads. Refer to table 4.1.
2. Blocking is required along the cantilever support.
3. Refer to detail 6c for holes in lateral-restraint-only blocking panels.



**Notes:**

1. Wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) required on one side of joist. Depth shall match the full height of the joist. Nail with 2-1/2-inch nails at 6 inches o.c., top and bottom flange. Install with face grain horizontal. Attach I-joist to plate at all supports per detail 1b.
2. Cantilevered joists must be properly sized to support all design loads. Refer to table 4.1.
3. Blocking is required along the cantilever support.
4. Refer to detail 6c for holes in lateral-restraint-only blocking panels.

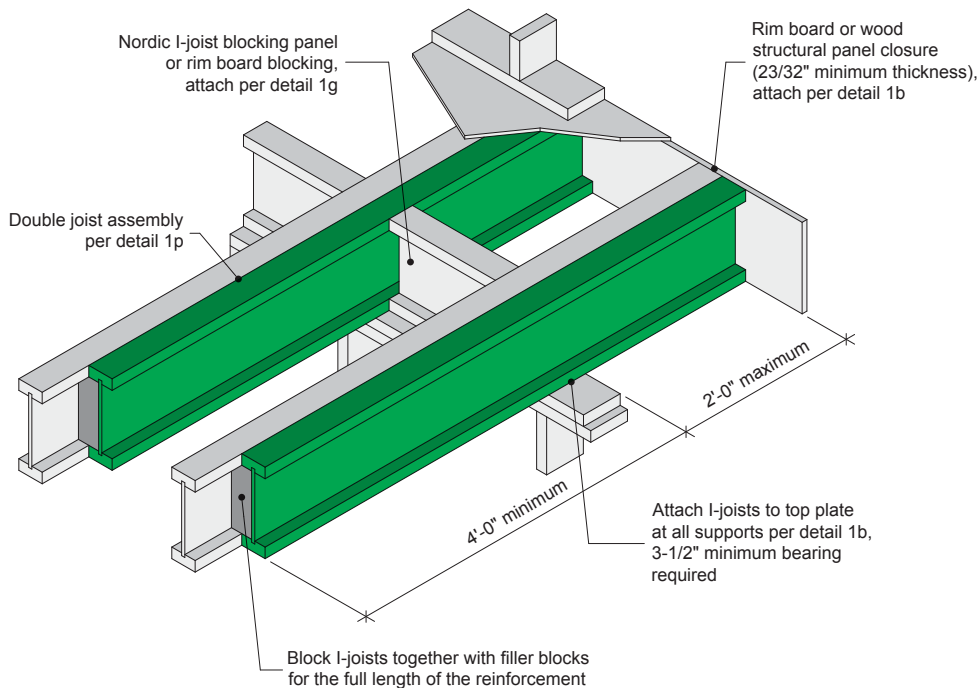
**4a-2**



**Notes:**

1. Wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) required on both sides of joist. Depth shall match the full height of the joist. Nail with 2-1/2-inch nails at 6 inches o.c., top and bottom flange, offset on opposite side. Install with face grain horizontal. Attach I-joist to plate at all supports per detail 1b.
2. Cantilevered joists must be properly sized to support all design loads. Refer to table 4.1.
3. Blocking is required along the cantilever support.
4. Refer to detail 6c for holes in lateral-restraint-only blocking panels.

**4b**



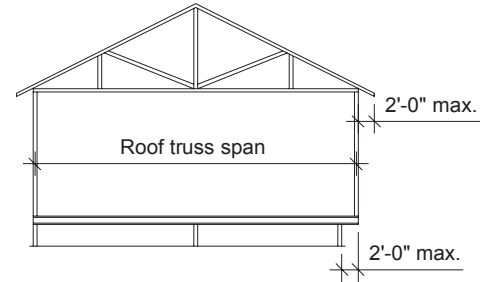
**Notes:**

1. Cantilevered joists must be properly sized to support all design loads. Refer to table 4.1.
2. Blocking is required along the cantilever support.
3. Refer to detail 6c for holes in lateral-restraint-only blocking panels.

**Table 4.1 – Cantilever Reinforcements for Vertical Building Offset**

**Design Criteria**

<b>Roof</b>	
Load:	Dead load = 15 psf
Soffit:	Roof truss soffit up to 24 inches
<b>Wall</b>	
Load:	Dead load = 80 plf
Openings:	Maximum 3 feet wide, spaced at least 6 feet on centre
<b>Floor</b>	
Span:	Simple or multiple
Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	Nailed-glued oriented strand board (OSB) sheathing. 5/8-inch thick for joist spacing up to 19.2 in. 3/4-inch thick for joist spacing of 24 in.

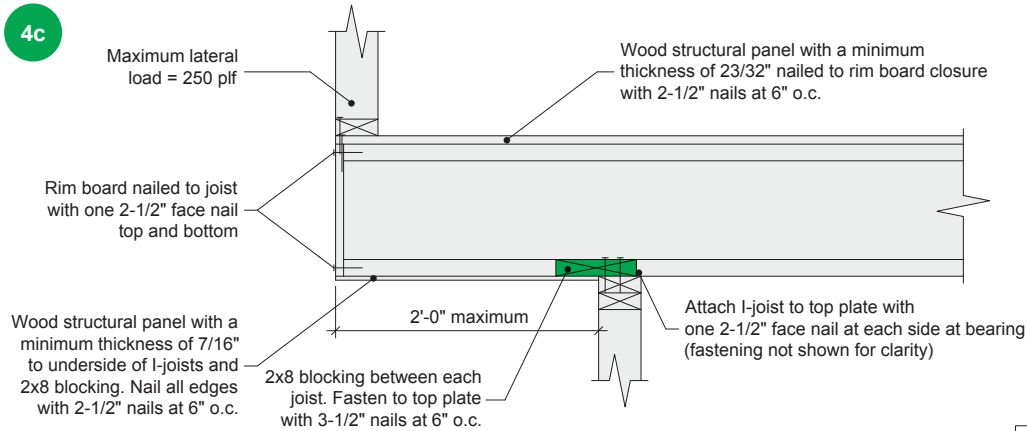


**Cantilever Reinforcements for Vertical Building Offset**

Joist depth	Roof truss span (ft)	Specified roof loading											
		Snow load = 30 psf				Snow load = 40 psf				Snow load = 50 psf			
		Joist spacing				Joist spacing				Joist spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"	12"	16"	19.2"	24"
9-1/2"	26	n	n	1	2	n	1	2	x	n	2	x	x
	28	n	n	1	x	n	1	2	x	n	2	x	x
	30	n	n	1	x	n	1	x	x	1	x	x	x
	32	n	1	2	x	n	2	x	x	1	x	x	x
	34	n	1	2	x	n	2	x	x	1	x	x	x
	36	n	1	2	x	1	2	x	x	2	x	x	x
11-7/8"	26	n	n	n	1	n	n	n	2	n	n	1	x
	28	n	n	n	1	n	n	1	2	n	1	2	x
	30	n	n	n	1	n	n	1	2	n	1	2	x
	32	n	n	n	2	n	n	1	x	n	1	2	x
	34	n	n	1	2	n	1	2	x	n	1	2	x
	36	n	n	1	2	n	1	2	x	n	2	x	x
14"	26	n	n	n	n	n	n	n	1	n	n	n	1
	28	n	n	n	n	n	n	n	1	n	n	n	1
	30	n	n	n	n	n	n	n	1	n	n	1	2
	32	n	n	n	1	n	n	n	1	n	n	1	2
	34	n	n	n	1	n	n	n	1	n	n	1	2
	36	n	n	n	1	n	n	1	2	n	1	1	x
16"	26	n	n	n	n	n	n	n	1	n	n	n	1
	28	n	n	n	n	n	n	n	1	n	n	1	1
	30	n	n	n	1	n	n	n	1	n	n	1	2
	32	n	n	n	1	n	n	n	1	n	n	1	2
	34	n	n	n	1	n	n	1	1	n	n	1	2
	36	n	n	n	1	n	n	1	2	n	1	1	2

**Notes:**

- n = No reinforcement required (detail 4a);  
1 = I-joist reinforced with wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) on one side (detail 4a-1);  
2 = I-joist reinforced with wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) on both sides,  
or double I-joist (detail 4a-2 or detail 4b);  
x = Try a deeper joist or closer spacing.
- The reinforcements are applicable to residential roof construction meeting the above design criteria.
- Cantilever I-joists supporting girder trusses may require additional reinforcement. A beam is usually required.

**Caution**

Cantilevers formed this way must be carefully detailed to prevent moisture intrusion into the structure and potential decay of untreated I-joist extensions.

**Notes:**

1. The above detail is applicable only to single family residential construction, and when the cantilever is loaded by uniform floor loads only (i.e. wall is not load-bearing).
2. Cantilevered joists must be properly sized to support design loads.
3. Blocking over bearing wall must be provided at all areas of wall bracing (at end of walls and at least every 25'-0" of wall length).
4. This detail is adequate for I-joist lateral stability. Additional lateral resistance may be required in high wind and/or seismic load areas. In such cases, specific design detailing shall be provided by the building designer.
5. During erection, provide temporary blocking over bearing wall in order to prevent rollover of floor joists.

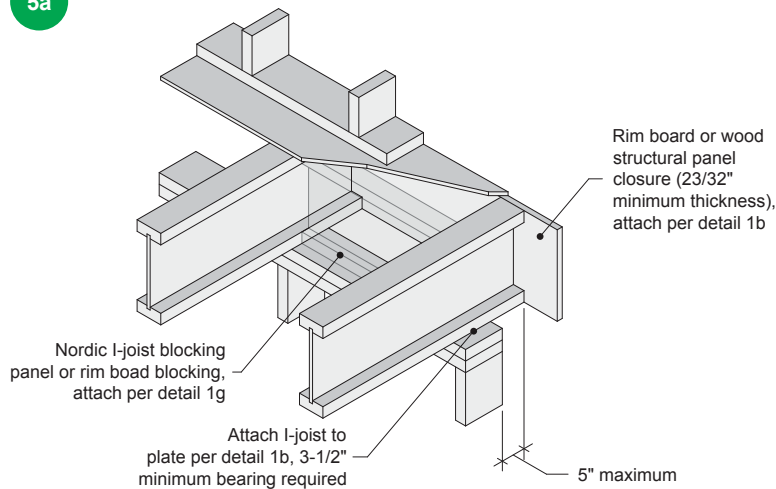
## Short Cantilever Details for Vertical Building Offset

Nordic I-joists may be used in cantilever applications supporting a uniform wall load applied to the end of the cantilever, such as with a vertical building offset for the brick. For cantilever-end load applications that require reinforcing based on table 5.1, the cantilever is limited to 5 inches maximum. In addition, blocking panel is required along the cantilever support.

Subject to the roof loads and layout (see table 5.1), three methods of reinforcing are allowed: sheathing reinforcement applied to one side of the I-joist (detail 5a-1), sheathing reinforcement applied to both sides of the I-joist (detail 5a-2), or double I-joists (detail 5b).

Otherwise, detail 5c (without blocking panel) can only be used when no I-joist reinforcement is required.

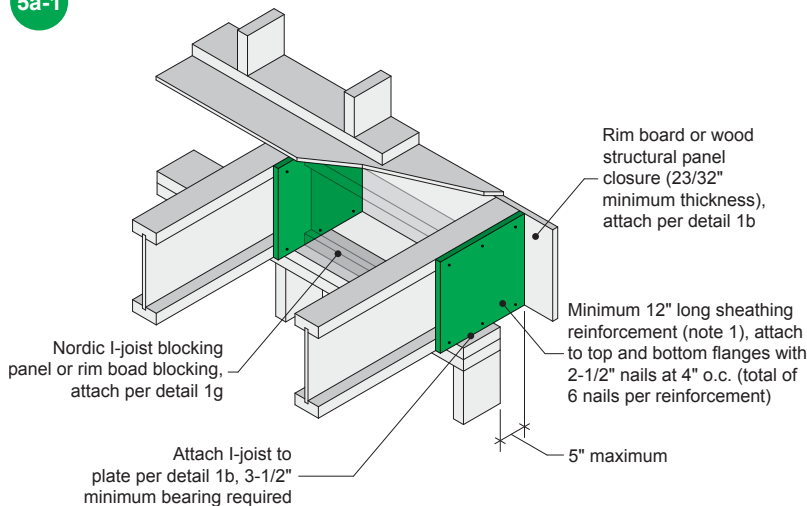
5a



**Notes:**

1. Cantilevered joists must be properly sized to support all design loads. Refer to table 5.1.
2. Blocking is required along the cantilever support.
3. Refer to detail 6c for holes in lateral-restraint-only blocking panels.

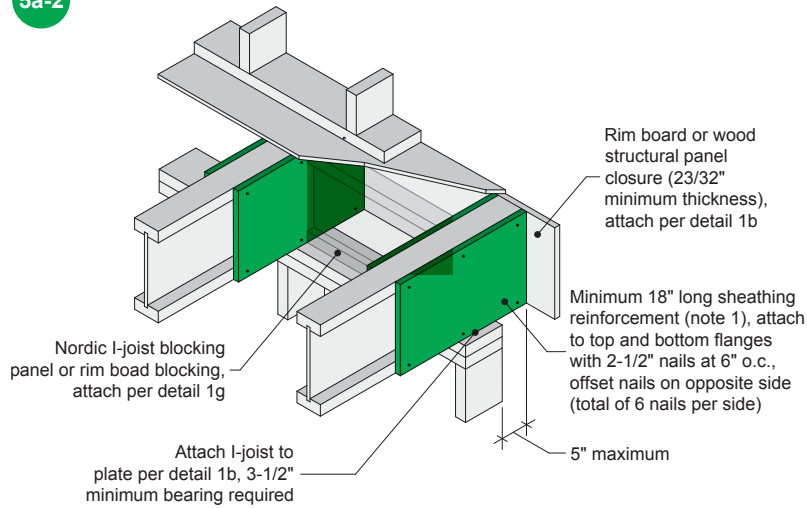
5a-1



**Notes:**

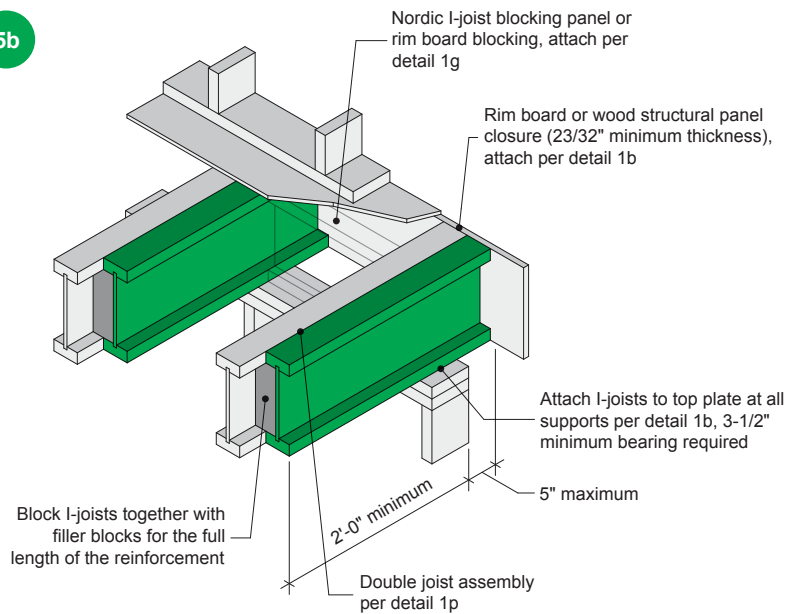
1. Wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) required on one side of joist. Depth shall match the full height of the joist. Install with face grain horizontal. Attach I-joist to plate at all supports per detail 1b.
2. Cantilevered joists must be properly sized to support all design loads. Refer to table 5.1.
3. Blocking is required along the cantilever support.
4. Refer to detail 6c for holes in lateral-restraint-only blocking panels.

5a-2

**Notes:**

1. Wood structural panel with a minimum thickness of  $23/32$  inch (for OSB, panel mark 48/24) required on both sides of joist. Depth shall match the full height of the joist. Install with face grain horizontal. Attach I-joist to plate at all supports per detail 1b.
2. Cantilevered joists must be properly sized to support all design loads. Refer to table 5.1.
3. Blocking is required along the cantilever support.
4. Refer to detail 6c for holes in lateral-restraint-only blocking panels.

5b

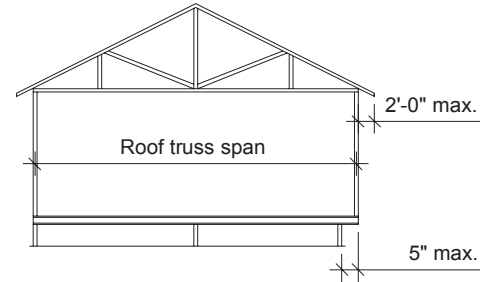
**Notes:**

1. Cantilevered joists must be properly sized to support all design loads. Refer to table 5.1.
2. Blocking is required along the cantilever support.
3. Refer to detail 6c for holes in lateral-restraint-only blocking panels.

**Table 5.1 – Short Cantilever Reinforcements for Vertical Building Offset**

**Design Criteria**

<b>Roof</b>	
Load:	Dead load = 15 psf
Soffit:	Roof truss soffit up to 24 inches
<b>Wall</b>	
Load:	Dead load = 80 plf
Openings:	Maximum 3 feet wide, spaced at least 6 feet on centre
<b>Floor</b>	
Span:	Simple or multiple
Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	Nailed-glued oriented strand board (OSB) sheathing. 5/8-inch thick for joist spacing up to 19.2 in. 3/4-inch thick for joist spacing of 24 in.



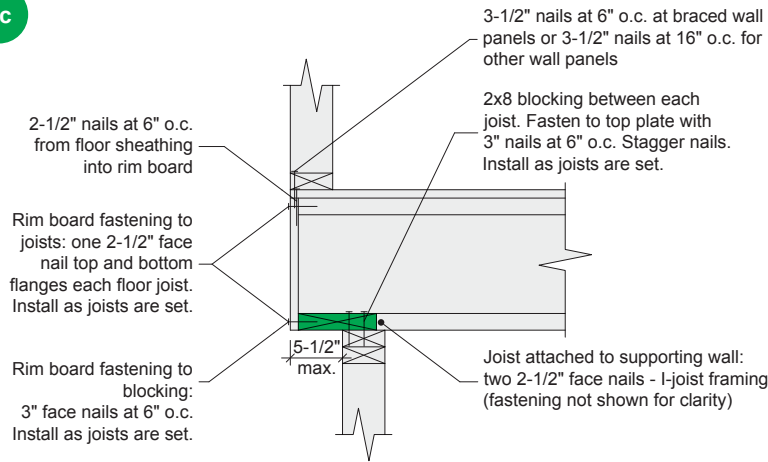
**Short Cantilever Reinforcements for Vertical Building Offset**

Joist depth	Roof truss span (ft)	Specified roof loading											
		Snow load = 30 psf				Snow load = 40 psf				Snow load = 50 psf			
		Joist spacing				Joist spacing				Joist spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"	12"	16"	19.2"	24"
9-1/2"	26	n	1	x	x	1	2	x	x	1	x	x	x
	28	n	2	x	x	1	x	x	x	2	x	x	x
	30	n	2	x	x	1	x	x	x	2	x	x	x
	32	1	2	x	x	1	x	x	x	2	x	x	x
	34	1	2	x	x	2	x	x	x	2	x	x	x
	36	1	x	x	x	2	x	x	x	x	x	x	x
11-7/8"	26	n	1	1	x	n	1	2	x	n	2	x	x
	28	n	1	2	x	n	1	2	x	1	2	x	x
	30	n	1	2	x	n	2	x	x	1	2	x	x
	32	n	1	2	x	n	2	x	x	1	x	x	x
	34	n	1	2	x	1	2	x	x	1	x	x	x
	36	n	1	x	x	1	2	x	x	1	x	x	x
14"	26	n	1	1	x	n	1	2	x	n	2	x	x
	28	n	1	2	x	n	1	x	x	1	2	x	x
	30	n	1	2	x	n	2	x	x	1	2	x	x
	32	n	1	2	x	n	2	x	x	1	x	x	x
	34	n	1	2	x	1	2	x	x	1	x	x	x
	36	n	1	x	x	1	2	x	x	1	x	x	x
16"	26	n	1	2	x	n	1	2	x	1	2	x	x
	28	n	1	2	x	n	2	x	x	1	2	x	x
	30	n	1	2	x	n	2	x	x	1	x	x	x
	32	n	1	2	x	1	2	x	x	1	x	x	x
	34	n	1	x	x	1	2	x	x	1	x	x	x
	36	n	2	x	x	1	2	x	x	1	x	x	x

**Notes:**

- n = No reinforcement required (detail 5a);  
1 = I-joist reinforced with wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) on one side (detail 5a-1);  
2 = I-joist reinforced with wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) on both sides, or double I-joist (detail 5a-2 or detail 5b);  
x = Try a deeper joist or closer spacing.
- The reinforcements are applicable to residential roof construction meeting the above design criteria.
- Cantilever I-joists supporting girder trusses may require additional reinforcement. A beam is usually required.

**5c**



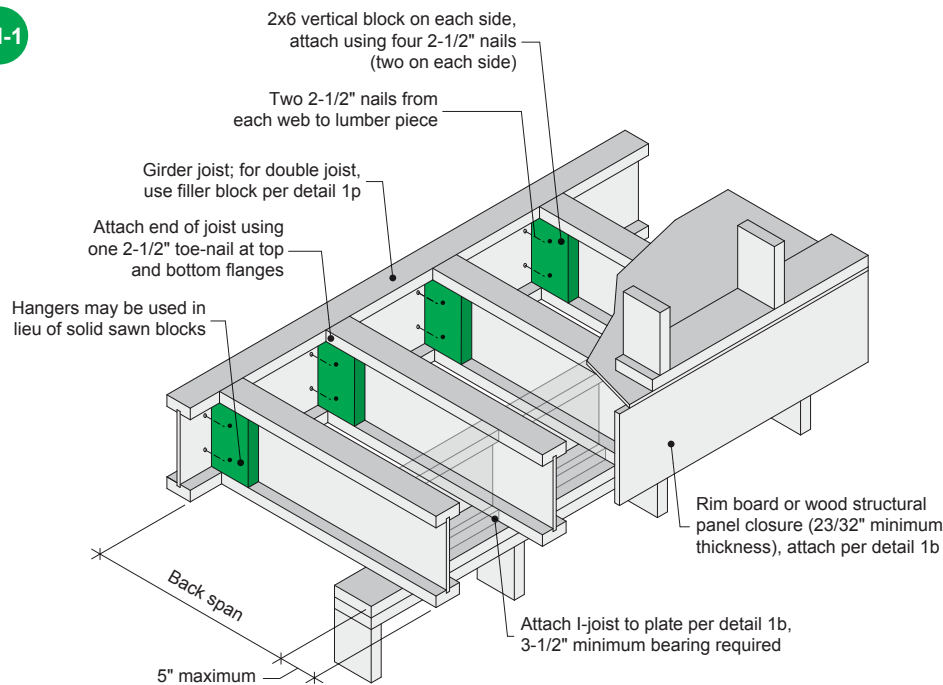
**Caution**

Cantilevers formed this way must be carefully detailed to prevent moisture intrusion into the structure and potential decay of untreated I-joist extensions.

**Notes:**

1. Additional lateral resistance may be required in high wind and/or seismic load areas. In such cases, specific design detailing shall be provided by the building designer.
2. Cantilevered joists must be properly sized and spaced, and may require reinforcements to support vertical wall loads. Note that this detail can only be used when no I-joist reinforcement is required.

**5d-1**

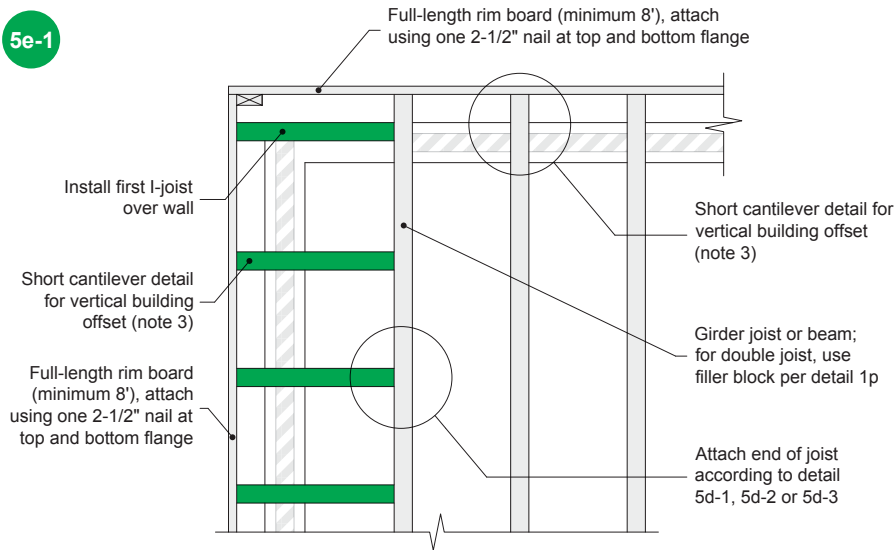


**Notes:**

1. Verify girder joist resistance if the back span exceeds the joist spacing. Limit the differential deflection between adjacent I-joists.
2. Cantilevered joists must be properly sized to support all design loads.
3. Blocking is required along the cantilever support.
4. Maximum resistance for pair of 2x6 blocks for this detail is 650 lbf (total of four nails). For higher resistances, use hangers in lieu of solid sawn blocks.



5e-1



**Notes:**

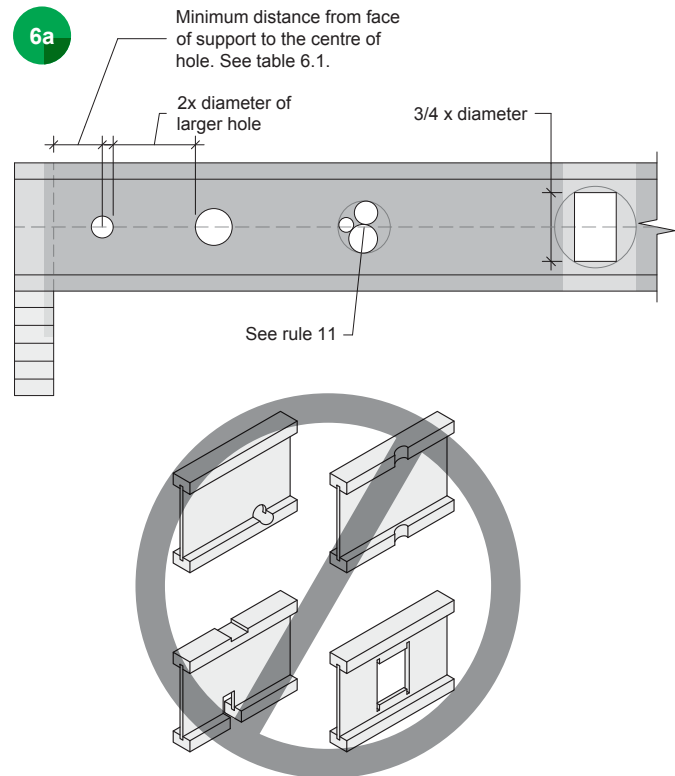
1. This detail is limited to a 5-inch brick cantilever on two adjacent sides of the building. Use in conjunction with the short cantilever details for vertical building offset.
2. Verify girder joist resistance if the back span exceeds the joist spacing. Limit the differential deflection between adjacent I-joists.
3. Cantilevered joists must be properly sized to support all design loads.
4. Blocking is required along the cantilever support.

## Web Hole Specifications

One of the benefits of using I-joists in residential floor construction is that holes may be cut in the joist webs to accommodate electrical wiring, plumbing lines and other mechanical systems, therefore minimizing the depth of the floor system.

### Rules for Cutting Holes in I-joists

1. The distance between the inside edge of the support and the centreline of any hole shall be in compliance with the requirements of table 6.1.
2. I-joist top and bottom flanges must never be cut, notched or otherwise modified.
3. Whenever possible, field-cut holes should be centred on the middle of the web.
4. The maximum size hole that can be cut into an I-joist web shall equal the clear distance between the flanges of the I-joist minus 1/4 inch. A minimum of 1/8 inch should always be maintained between the top or bottom of the hole and the adjacent I-joist flange.
5. The sides of square holes or longest sides of rectangular holes should not exceed 3/4 of the diameter of the maximum round hole permitted at that location.
6. Where more than one hole is necessary, the distance between adjacent hole edges shall exceed twice the diameter of the largest round hole or twice the size of the largest square hole - or twice the length of the longest side of the longest rectangular hole -, and each hole must be sized and located in compliance with the requirements of table 6.1.
7. Holes measuring 1-1/2 inch or smaller shall be permitted anywhere in a cantilevered section of a joist. Holes of greater size may be permitted subject to verification.
8. A 1-1/2 inch hole or smaller can be placed anywhere in the web provided that it meets the requirements of rule number 6 above. For more than three holes per span, refer to rule 11, space holes at minimum 15 inches on centre, or contact Nordic Structures.
9. All holes shall be cut in accordance with the restrictions listed above and as illustrated in detail 6a.
10. Limit three maximum-size holes per span.
11. A group of round holes at approximately the same location shall be permitted if it meets the requirements for a single round hole circumscribed around them.



### Notes:

1. Never drill, cut or notch the flange, or over-cut the web.
2. Holes in web should be cut with a sharp saw.
3. For rectangular holes, avoid over-cutting the corners, as this can cause unnecessary stress concentrations. Slightly rounding the corners is recommended. Starting the rectangular hole by drilling a 1-inch-diameter hole in each of the four corners and then making the cuts between the holes is another good method to minimize damage to the I-joist.

**Table 6.1 – Location of Web Holes**

**Design Criteria**

Span:	Simple or multiple
Joist spacing:	Up to 24 inches
Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load

**Minimum distance from inside face of any support to centre of hole (ft.-in.)**

Joist depth	Joist series	Round hole diameter (in.)														L <sub>ref</sub>	
		2	3	4	5	6	6-1/4	7	8	8-5/8	9	10	10-3/4	11	12		12-3/4
9-1/2"	NI-20	0'-7"	1'-6"	2'-10"	4'-3"	5'-8"	6'-0"	-	-	-	-	-	-	-	-	-	13'-5"
	NI-40x	0'-7"	1'-6"	3'-0"	4'-4"	6'-0"	6'-4"	-	-	-	-	-	-	-	-	-	14'-10"
	NI-60	1'-3"	2'-6"	4'-0"	5'-4"	7'-0"	7'-5"	-	-	-	-	-	-	-	-	-	14'-11"
	NI-80	2'-3"	3'-6"	5'-0"	6'-6"	8'-2"	8'-8"	-	-	-	-	-	-	-	-	-	15'-9"
11-7/8"	NI-20	0'-7"	0'-8"	1'-0"	2'-4"	3'-8"	4'-0"	5'-0"	6'-6"	7'-9"	-	-	-	-	-	-	15'-8"
	NI-40x	0'-7"	0'-8"	1'-3"	2'-8"	4'-0"	4'-4"	5'-5"	7'-0"	8'-4"	-	-	-	-	-	-	16'-7"
	NI-60	0'-7"	1'-8"	3'-0"	4'-3"	5'-9"	6'-0"	7'-3"	8'-10"	10'-0"	-	-	-	-	-	-	16'-9"
	NI-80	1'-6"	2'-10"	4'-2"	5'-6"	7'-0"	7'-5"	8'-6"	10'-3"	11'-4"	-	-	-	-	-	-	17'-7"
	NI-90	0'-7"	0'-8"	1'-5"	3'-2"	4'-10"	5'-4"	6'-9"	8'-9"	10'-2"	-	-	-	-	-	-	17'-11"
14"	NI-40x	0'-7"	0'-8"	0'-8"	1'-0"	2'-4"	2'-9"	3'-9"	5'-2"	6'-0"	6'-6"	8'-3"	10'-2"	-	-	-	18'-0"
	NI-60	0'-7"	0'-8"	1'-8"	3'-0"	4'-3"	4'-8"	5'-8"	7'-2"	8'-0"	8'-8"	10'-4"	11'-9"	-	-	-	18'-3"
	NI-80	0'-10"	2'-0"	3'-4"	4'-9"	6'-2"	6'-5"	7'-6"	9'-0"	10'-0"	10'-8"	12'-4"	13'-9"	-	-	-	19'-5"
	NI-90	0'-7"	0'-8"	0'-10"	2'-5"	4'-0"	4'-5"	5'-9"	7'-5"	8'-8"	9'-4"	11'-4"	12'-11"	-	-	-	19'-10"
16"	NI-60	0'-7"	0'-8"	0'-8"	1'-6"	2'-10"	3'-2"	4'-2"	5'-6"	6'-4"	7'-0"	8'-5"	9'-8"	10'-2"	12'-2"	13'-9"	19'-10"
	NI-80	0'-7"	1'-3"	2'-6"	3'-10"	5'-3"	5'-6"	6'-6"	8'-0"	9'-0"	9'-5"	11'-0"	12'-3"	12'-9"	14'-5"	16'-0"	21'-2"
	NI-90	0'-7"	0'-8"	0'-8"	1'-9"	3'-3"	3'-8"	4'-9"	6'-5"	7'-5"	8'-0"	9'-10"	11'-3"	11'-9"	13'-9"	15'-4"	21'-6"

**Notes:**

1. Tabulated values are applicable to residential floor construction meeting the above design criteria.
2. If the actual measured span is less than the reference span, L<sub>ref</sub>, the minimum distance from inside face of any support to centre of hole may be reduced as follows:

$$D_{\text{reduced}} = (L_{\text{actual}} / L_{\text{ref}}) \times D$$

**Where:**

- D<sub>reduced</sub> = Reduced distance from inside face of any support to centre of hole (ft). The reduced distance shall not be less than 6 inches from the face of the support to edge of the hole.
- L<sub>actual</sub> = Actual measured span distance between the inside face of supports (ft).
- L<sub>ref</sub> = Reference span given in this table (ft).
- D = Minimum distance from the inside face of any support to centre of hole from this table (ft).

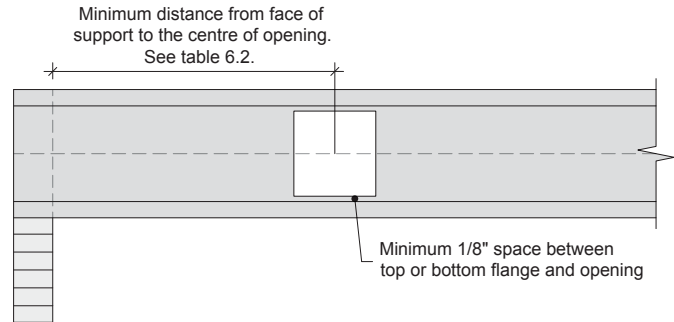
## Duct Chase Opening Specifications

One of the benefits of using I-joists in residential floor construction is that openings may be cut in the joist webs to accommodate a duct chase (supply duct for heating, ventilation or air-conditioning), therefore minimizing the depth of the floor system.

### Rules for Cutting Duct Chase Openings in I-joists

1. The distance between the inside edge of the support and the centreline of a duct chase opening shall be in compliance with the requirements of table 6.2.
2. I-joist top and bottom flanges must never be cut, notched or otherwise modified.
3. The maximum depth of a duct chase opening that can be cut into an I-joist web shall equal the clear distance between the flanges of the I-joist minus 1/4 inch. A minimum of 1/8 inch should always be maintained between the top or bottom of the opening and the adjacent I-joist flange.
4. All openings shall be cut in accordance with the restrictions listed above and as illustrated in detail 6b.
5. Limit one maximum-size duct chase opening per span.

6b



### Notes:

1. Never drill, cut or notch the flange, or over-cut the web.
2. Holes in web should be cut with a sharp saw.
3. Avoid over-cutting the corners, as this can cause unnecessary stress concentrations. Slightly rounding the corners is recommended. Starting the rectangular hole by drilling a 1-inch-diameter hole in each of the four corners and then making the cuts between the holes is another good method to minimize damage to the I-joist.

I-joist depth (in.)	Maximum depth of the opening (in.)
9-1/2	6-1/4
11-7/8	8-5/8
14	10-3/4
16	12-3/4

**Table 6.2 – Location of Duct Chase Openings**

**Design Criteria**

Span:	Simple
Joist spacing:	Up to 24 inches
Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load

**Minimum distance from inside face of any support to centre of opening (ft-in.)**

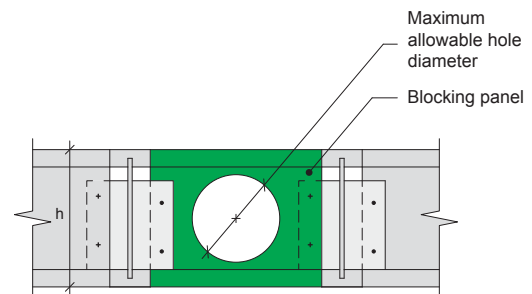
Joist depth	Joist series	Duct chase length (in.)								
		8	10	12	14	16	18	20	22	24
9-1/2"	NI-20	5'-6"	5'-10"	6'-2"	-	-	-	-	-	-
	NI-40x	5'-3"	5'-8"	6'-0"	6'-5"	6'-10"	7'-3"	7'-8"	-	-
	NI-60	5'-4"	5'-9"	6'-2"	6'-7"	7'-1"	7'-5"	8'-0"	-	-
	NI-80	5'-3"	5'-8"	6'-0"	6'-5"	6'-10"	7'-3"	7'-8"	8'-2"	8'-6"
11-7/8"	NI-20	7'-3"	7'-7"	7'-11"	-	-	-	-	-	-
	NI-40x	6'-8"	7'-2"	7'-6"	8'-1"	8'-6"	9'-1"	9'-6"	-	-
	NI-60	7'-3"	7'-8"	8'-0"	8'-6"	9'-0"	9'-3"	9'-9"	-	-
	NI-80	7'-2"	7'-7"	8'-0"	8'-5"	8'-10"	9'-3"	9'-8"	10'-2"	10'-8"
	NI-90	7'-6"	7'-11"	8'-4"	8'-9"	9'-2"	9'-7"	10'-1"	10'-7"	10'-11"
14"	NI-40x	8'-1"	8'-7"	9'-0"	9'-6"	10'-1"	10'-7"	11'-2"	-	-
	NI-60	8'-9"	9'-3"	9'-8"	10'-1"	10'-6"	11'-1"	11'-6"	-	-
	NI-80	9'-0"	9'-3"	9'-9"	10'-1"	10'-7"	11'-1"	11'-6"	12'-1"	12'-6"
	NI-90	9'-2"	9'-8"	10'-0"	10'-6"	10'-11"	11'-5"	11'-9"	12'-4"	12'-11"
16"	NI-60	10'-3"	10'-8"	11'-2"	11'-6"	12'-1"	12'-6"	13'-2"	-	-
	NI-80	10'-4"	10'-9"	11'-3"	11'-9"	12'-1"	12'-7"	13'-1"	13'-8"	14'-4"
	NI-90	10'-9"	11'-2"	11'-8"	12'-0"	12'-6"	13'-0"	13'-6"	14'-2"	14'-10"

**Note:**

1. Tabulated values are applicable to residential floor construction meeting the above design criteria.

**Holes in Lateral-restraint-only Blocking Panels**

This detail concerns the placement of holes in the web of I-joists or rim board used as blocking for lateral restraint of floor and roof joists. Blocking for lateral restraint are those members used between floor joists, ceiling joists or rafters to prevent them from rolling over. As a rule of thumb, any blocking that is not supporting a load-bearing wall (vertical or lateral load) or part of an engineered diaphragm perimeter load path can be considered a lateral-restraint-only blocking panel.



**Maximum Allowable Hole Size**

1. The maximum allowable hole size for a lateral-restraint-only blocking panel is 2/3 of the lesser dimension of the blocking's depth or length. Assuming the blocking panel is longer than its height (or depth), the table aside applies. For other applications, contact Nordic Structures.
2. Holes cut into the blocking panels are subject to the following limitations:
  - The top and bottom flanges of an I-joist blocking panel must never be cut, notched or otherwise modified.
  - Field-cut holes must be centred in the blocking horizontally.
  - While round holes are preferred, rectangle holes may be used provided the corners are not over cut. Slightly rounding corners or pre-drilling corners with a 1-inch-diameter bit is recommended.
  - All holes must be cut in a workman-like manner in accordance with the limitations listed above.

I-joist or rim board blocking depth (in.)	Maximum allowable hole diameter (in.) <sup>(a)</sup>
9-1/2	6-1/4
11-7/8	7-3/4
14	9-1/4
16	10-1/2

<sup>(a)</sup> Maximum allowable hole diameter in blocking panel, where the blocking panel is longer than its height.

## Stairwell Openings in I-joist Floors

When designing a floor for a residential structure, the designer is often faced with detailing an unsupported stairwell opening in the floor. The following information simplifies the selection of trimmers and headers, provides guidance on the appropriate detailing for their use, and quantifies hanger capacity requirements for I-joist-to-header and header-to-trimmer intersections.

These recommendations are based on the use of Nordic I-joists used in either simple or multiple maximum spans for residential applications, and on a live load of 40 psf plus dead load of 15 psf for the floor and stair areas. The information provided is appropriate for stairwell openings from 10.5 feet to 12 feet in length and 48 inches in width, whose long dimension is either running parallel or perpendicular to the joist span, as shown in details 7a-1 and 7a-2. It is also assumed that there is a non-load-bearing partition with a specified load of 64 plf along the stairwell opening perimeter.

The stair stringers may be attached to the header/trimmer at either end of the stairwell opening. For stairwells parallel or perpendicular to the I-joist spans, the opening may be placed anywhere in the floor without regard to the support of the floor framing.

### Stairwells Parallel to I-joist Span

The most common method for placing a stairwell in a wood-framed floor is to run the long axis of the opening parallel to the span of the I-joist. This generally requires smaller headers and trimmers than the perpendicular orientation.

Table shown on the following page is a guide for determining the I-joist requirement or the minimum sections of other engineered wood members required to frame the headers and trimmers seen in detail 7a-1.

**Caution:** *In situations where the stairwell runs parallel to the floor joists and the floor joists are installed over two or more spans, the header supporting the continuous floor joists may be subjected to uplift loads caused by the floor joists it supports. Cutting the interrupted joists at the centre support will eliminate this uplift load. If this method is selected, the designer will have to insure that the maximum simple span for the I-joist is not exceeded. An alternative method would be to leave the floor joists continuous over the interior support and design the header and hangers for the resulting uplift loads.*

### Stairwells Perpendicular to I-joist Span

Often the floor plan or architectural details of the building are such that it is not possible to orient the stairwell axis parallel to the I-joist span.

In such cases, the trimmers are placed parallel to the I-joist span and support the headers by way of metal hangers. The headers, in turn, support the cut ends of the floor joists also via metal hangers. This relationship can be seen in detail 7a-2. In addition to the header load, the trimmers are designed to carry the concentrated loads of the stair stringers.

**Caution:** *Because the headers intersect the span of the floor joists over a large length (up to 12 feet), in cases where the floor joists are used continuous over multiple spans, special design consideration must be given to the adjacent clear span to ensure adequate floor performance. To eliminate design problems and allow maximum flexibility in locating the stairwell, consider limiting the maximum spans for continuous floors containing stairwells perpendicular to I-joist spans to those given for simple span floors.*

*Upward thrust acting on the header adjacent to a centre support can be eliminated by cutting the I-joists at the centre of the support, thus providing two simple spans where the I-joists are interrupted by the headers. An alternative method would be to leave the floor joists continuous over the interior support and design the header and hangers for the resulting uplift loads.*

**Design Criteria**

Floor loads:	Live load = 40 psf and dead load = 15 psf
Wall load:	Dead load = 64 plf (along stairwell opening perimeter)
Stairwell length:	Not to exceed 12 feet
Stairwell width:	Not to exceed 48 inches

**Stairwells Parallel to I-joint Span**

I-joint clear span (ft)	Suggested I-joint	Header		Hanger – Factored resistance
		SCL <sup>(b)</sup>	Alternative Nordic Lam 24F-1.9E	
14	(1 ea.) 9-1/2" NI-20	1-3/4" x 9-1/2"	1-3/4" x 9-1/2"	3,045 lbf
16	(1 ea.) 9-1/2" NI-40x	1-3/4" x 9-1/2"	1-3/4" x 9-1/2"	3,045 lbf
18	(1 ea.) 11-7/8" NI-20	1-3/4" x 11-7/8"	1-3/4" x 11-7/8"	3,045 lbf
20	(1 ea.) 11-7/8" NI-40x	1-3/4" x 11-7/8"	1-3/4" x 11-7/8"	3,045 lbf
22	(1 ea.) 11-7/8" NI-80	1-3/4" x 11-7/8"	1-3/4" x 11-7/8"	3,045 lbf

I-joint clear span (ft)	Suggested I-joint <sup>(a)</sup>	Trimmer		Hanger – Factored resistance
		SCL <sup>(b)</sup>	Alternative Nordic Lam 24F-1.9E	
14	(2 ea.) 9-1/2" NI-60	3-1/2" x 9-1/2"	2-1/2" x 9-1/2"	3,045 lbf
16	(2 ea.) 9-1/2" NI-60	3-1/2" x 9-1/2"	3-1/2" x 9-1/2"	3,045 lbf
18	(2 ea.) 11-7/8" NI-60	3-1/2" x 11-7/8"	2-1/2" x 11-7/8"	3,045 lbf
20	(2 ea.) 11-7/8" NI-80	3-1/2" x 11-7/8"	3-1/2" x 11-7/8"	3,045 lbf
22	(2 ea.) 11-7/8" NI-80	3-1/2" x 11-7/8"	5-1/2" x 11-7/8"	3,045 lbf

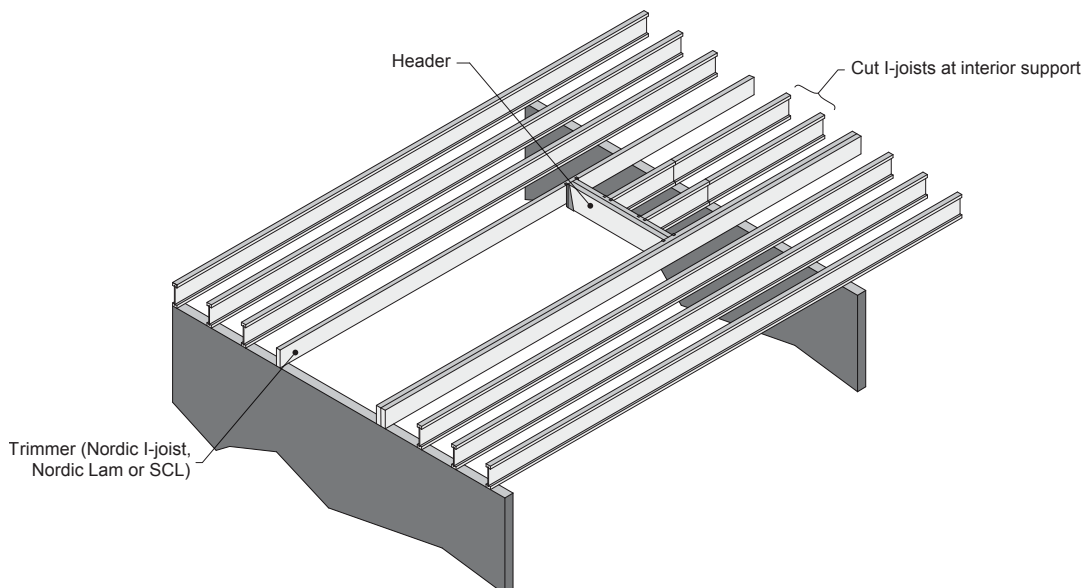
a) Refer to detail 1p for double I-joint construction.

b) SCL sizes are based on the following design properties: E = 2,000,000 psi (apparent), F<sub>b</sub> = 5,360 psi et F<sub>v</sub> = 530 psi.

**Notes:**

1. This table is applicable to trimmers and headers meeting the above design criteria.
2. Minimum bearing length shall be 1-3/4 inch for end bearings, except for shaded areas, which shall be 3-1/2 inches.

**7a-1**



**Design Criteria**

Floor loads:	Live load = 40 psf and dead load = 15 psf
Wall load:	Dead load = 64 plf (along stairwell opening perimeter)
Stairwell length:	Not to exceed 12 feet
Stairwell width:	Not to exceed 48 inches

**Stairwells Perpendicular to I-joist Span**

I-joist clear span (ft)	Suggested I-joist	Header		Hanger – Factored resistance
		SCL <sup>(b)</sup>	Alternative Nordic Lam 24F-1.9E	
14	(1 ea.) 9-1/2" NI-20	1-3/4" x 9-1/2"	2-1/2" x 9-1/2"	3,045 lbf
16	(1 ea.) 9-1/2" NI-60	3-1/2" x 9-1/2"	2-1/2" x 9-1/2"	3,045 lbf
18	(1 ea.) 11-7/8" NI-40x	1-3/4" x 11-7/8"	2-1/2" x 11-7/8"	3,045 lbf
20	(1 ea.) 11-7/8" NI-60	1-3/4" x 11-7/8"	2-1/2" x 11-7/8"	3,045 lbf
22	(1 ea.) 14" NI-40x	1-3/4" x 14"	2-1/2" x 14"	3,045 lbf

I-joist clear span (ft)	Suggested I-joist	Trimmer		Hanger – Factored resistance
		SCL <sup>(b)</sup>	Alternative Nordic Lam 24F-1.9E	
14		5-1/4" x 9-1/2"	5-1/4" x 9-1/2"	5,220 lbf
16		7" x 9-1/2"	7" x 9-1/2"	5,220 lbf
18	Use alternative	5-1/4" x 11-7/8"	5-1/4" x 11-7/8"	5,220 lbf
20		7" x 11-7/8"	7" x 11-7/8"	3,915 lbf
22		5-1/4" x 14"	5-1/2" x 14"	4,350 lbf

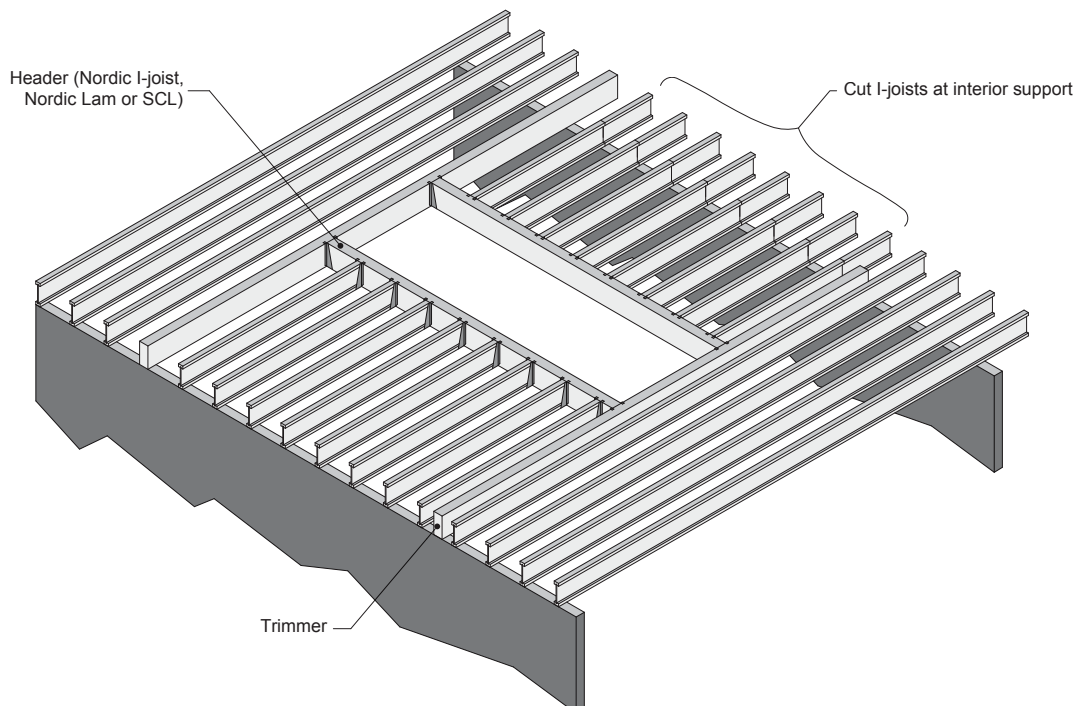
a) Refer to detail 1p for double I-joist construction.

b) SCL sizes are based on the following design properties:  $E = 2,000,000$  psi (apparent),  $F_b = 5,360$  psi et  $F_v = 530$  psi.

## Notes:

- This table is applicable to trimmers and headers meeting the above design criteria.
- Minimum bearing length shall be 1-3/4 inch for end bearings, except for shaded areas, which shall be 3-1/2 inches.

7a-2

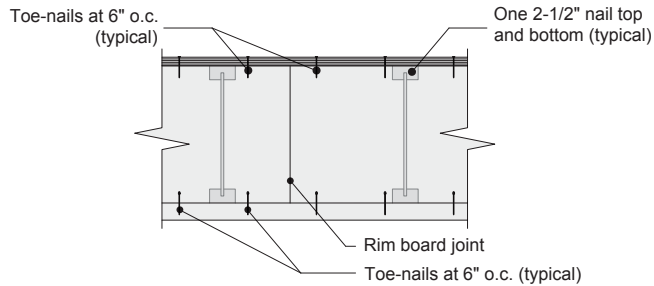




## Details for Rim Boards

8a

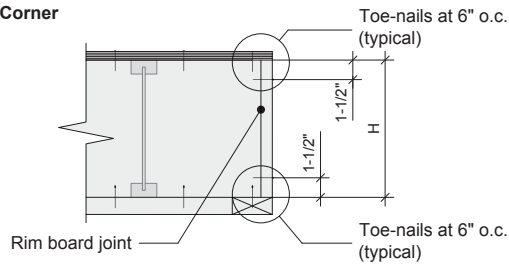
### Rim Board Joint Between Floor Joists



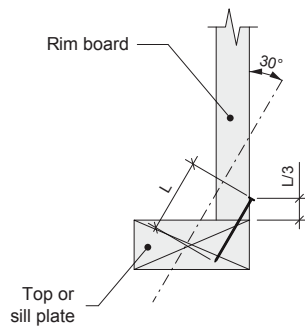
#### Notes:

1. Floor sheathing to rim board - Use 2-1/2-inch common nails at 6 inches o.c. **Caution:** The horizontal load resistance is not necessarily increased with a decreased nail spacing. Under no circumstances should the nail spacing be less than 3 inches. The 3-1/2-inch common nails used to connect the bottom plate of a wall to the rim board through the sheathing do not reduce the horizontal load resistance of the rim board provided that the 2-1/2-inch nail spacing (sheathing-rim board) is 6 inches o.c. and the 3-1/2-inch nail spacing (bottom plate-sheathing-rim board) is in accordance with the prescriptive requirements of the applicable code. APA recommends a minimum 3/8-inch panel edge distance be maintained when nailing. Calculations show that the tongue does not need to be removed for floor sheathing 7/8-inch thick or less when used in conjunction with rim boards of 1-1/8 inch. Some local code jurisdictions, however, may require removal of the tongue at the edge of floor framing when nailing it to rim board.
2. Rim board to I-joist - Use two 2-1/2-inch common nails, one each into the top and bottom flanges.

### Rim Board Joint at Corner



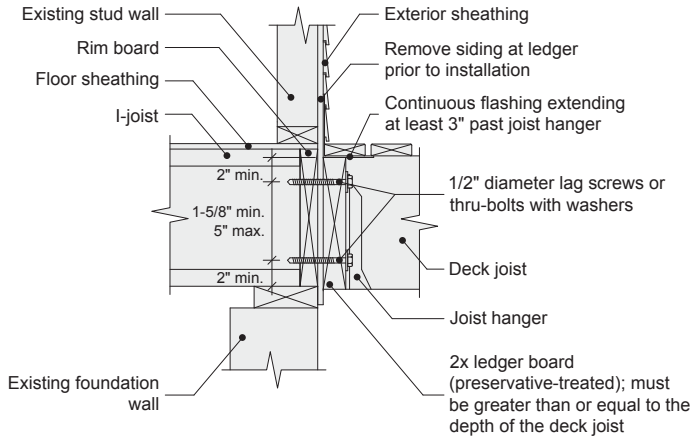
8b



#### Note:

1. Rim board to sill plate - Toe-nail using 3-1/2-inch common nails at 6 inches o.c.

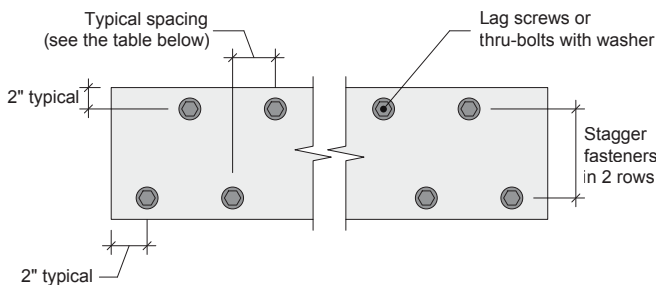
**8c**



**Notes:**

- Attachment of 2x lumber ledgers to rim board - Use 1/2-inch-diameter lag screws (minimum nominal length of 4 inches) or 1/2-inch-diameter through-bolts with washers and nuts. In both cases, use a design value of 585 lbf per fastener (see detail 8d). **Caution:** The lag screw should be inserted in a lead hole by turning with a wrench, not by driving with a hammer. Over-torquing can significantly reduce the lateral resistance of the lag screw and should therefore be avoided. See CSA O86:19, Design in wood, for the appropriate size of clearance and lead holes.
- Positively anchoring decks to the primary structure is advised and may be required by the applicable building code. The lateral connection may be in accordance with detail 8e-1 or 8e-2, as appropriate.

**8d**



**Notes:**

- See notes in detail 8c.
- Lateral resistance of nails applied to the faces of rim board – Calculate the lateral nail resistance based on the procedures given in CSA O86:19, using the dowel bearing strength equivalent to Douglas-fir-Larch.

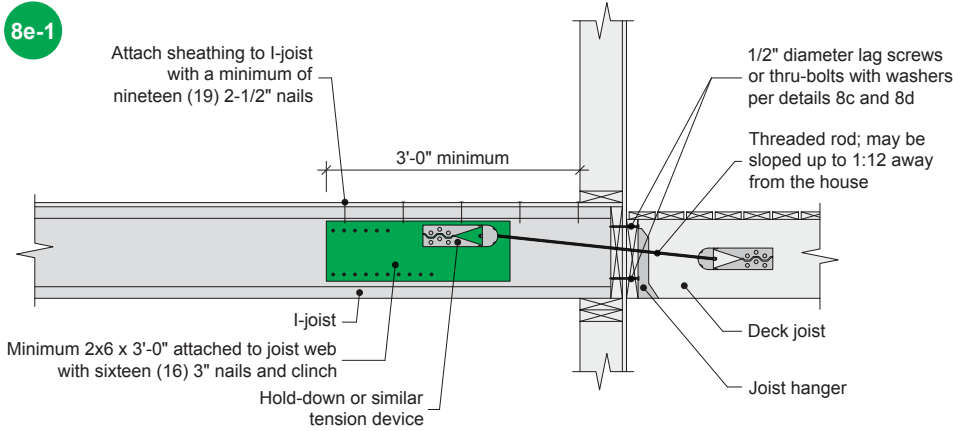
**Fastener Spacing for Deck Ledger and Rim Boards using 1/2-inch-diameter Lag Screws or Thru-bolts with 15/32-inch Maximum Sheathing<sup>(a)</sup>**

Deck live load of 40 psf, deck dead load of 10 psf

Rim boards	Joist span (L)			
	10' < L ≤ 12'	12' < L ≤ 14'	14' < L ≤ 16'	16' < L ≤ 18'
	On-centre spacing of fasteners <sup>(b)</sup>			
1-1/8" or thicker	16"	13"	12"	10"

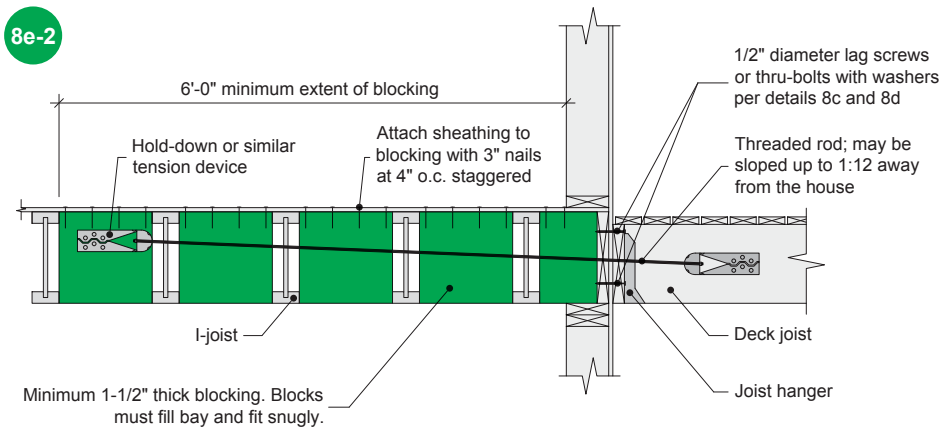
<sup>(a)</sup> See detail 8c for attachment details. Ledger shall be S-P-F or other wood species with a specific gravity of 0.42 or greater.

<sup>(b)</sup> Lag screws and thru-bolts shall be staggered in accordance with the above detail.



**Notes:**

1. Positively anchoring decks to the primary structure is advised and may be required by the applicable building code. This detail is based on U.S. code requirements; check the validity. For more details, refer to the AWC Prescriptive Residential Wood Deck Construction Guide.
2. Hold-down tension devices shall be provided in not less than two locations within two feet of the edge of the deck. Specific design detailing shall be provided by the building designer.



**Notes:**

1. Positively anchoring decks to the primary structure is advised and may be required by the applicable building code. This detail is based on U.S. code requirements; check the validity. For more details, refer to the AWC Prescriptive Residential Wood Deck Construction Guide.
2. Hold-down tension devices shall be provided in not less than two locations within two feet of the edge of the deck. Specific design detailing shall be provided by the building designer.

## Rim Board Hole Specifications

The maximum allowable hole size for a rim board shall be 2/3 of the rim board depth, as shown in the table aside. The length of the rim board segment containing a hole shall be at least eight times the hole size.

### Application Notes

- Do not cut holes in rim board installed over openings, such as doors or windows, where the rim board is not fully supported, except that holes of 1-1/2 inch or less in size are permitted provided they are positioned at the mid-depth and in the middle one-third of the span (see note 5 for minimum hole spacing).
- Field-cut holes should be vertically centred in the rim board and at least one hole diameter or 6 inches, whichever is less, clear distance away from the end of the wall line. Holes should never be placed such that they interfere with the attachment of the rim board to the ends of the floor joist, or any other code-required nailing.
- While round holes are preferred, rectangle holes may be used providing the corners are not over-cut. Slightly rounding corners by pre-drilling with a 1-inch-diameter bit is recommended.
- When concentrated loads are present on the rim board (loads not supported by any other vertical-load-carrying members such as squash blocks), holes should not be placed in the rim board within a distance equal to the depth of the rim board from the area of loading.
- For multiple holes, the clear spacing between holes shall be at least two times the diameter of the larger hole, or twice the length of the longest side of the longest rectangular hole. This minimum hole spacing does not apply to holes of 1-1/2 inch or less in diameter, which can be placed anywhere in the rim board (see note 1 for holes over opening) except that the clear distance to the adjacent hole shall be 3 inches minimum.
- All holes shall be cut in accordance with the limitations listed above. See the information for cutting holes under details 6a and 6b.

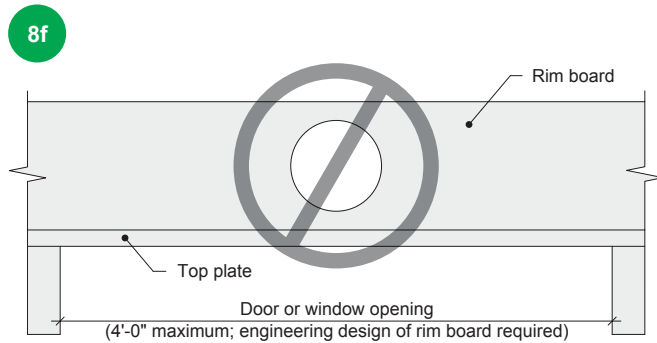
**Rim Board Hole Sizes and Minimum Lengths** <sup>(a)</sup>

Rim board depth (in.)	Maximum allowable hole size (in.) <sup>(b)</sup>	Minimum length of rim board segment for the maximum allowable hole size (in.) <sup>(c)</sup>
9-1/2	6-1/4	50
11-7/8	7-3/4	62
14	9-1/4	74
16	10-1/2	84

<sup>(a)</sup> These hole provisions do not apply to rim board installed over openings, such as doors or windows.

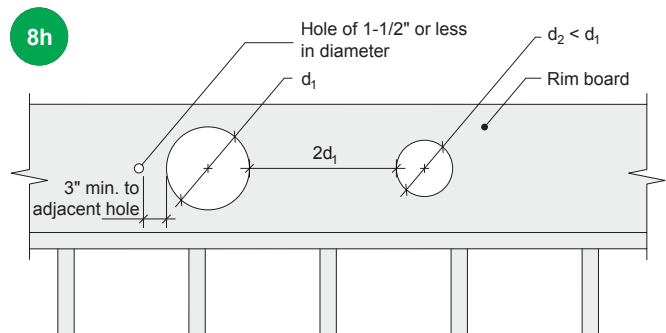
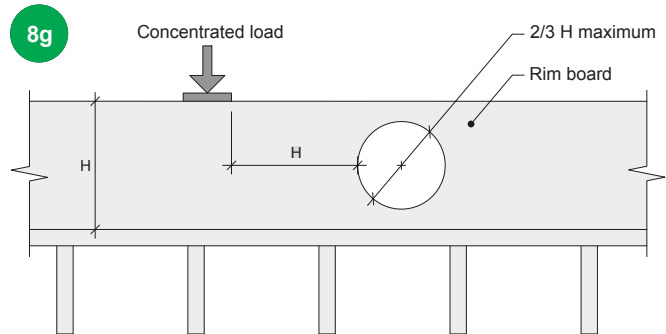
<sup>(b)</sup> The diameter of a round hole or the longer dimension of a rectangular hole.

<sup>(c)</sup> The length of rim board segment per wall line. For multiple holes, the minimum length of rim board segment shall be eight times the sum of all hole sizes.

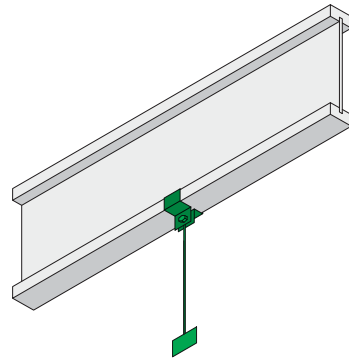
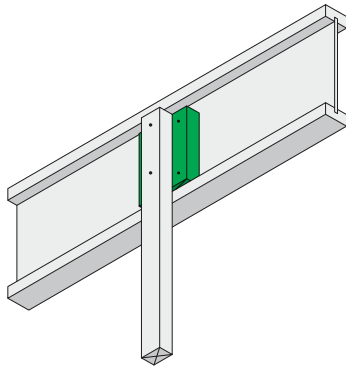
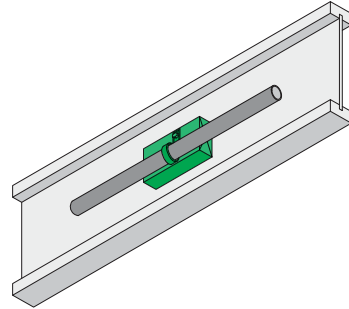
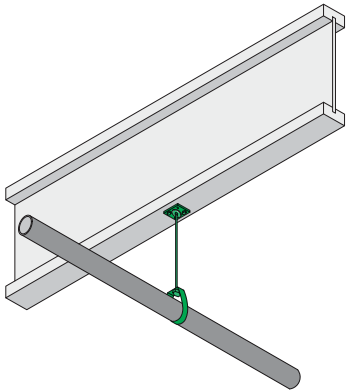


**Note:**

- Do not cut holes in rim board over opening except for holes of 1-1/2" or less in size (see application note 1).



## VARIOUS INSTALLATION DETAILS



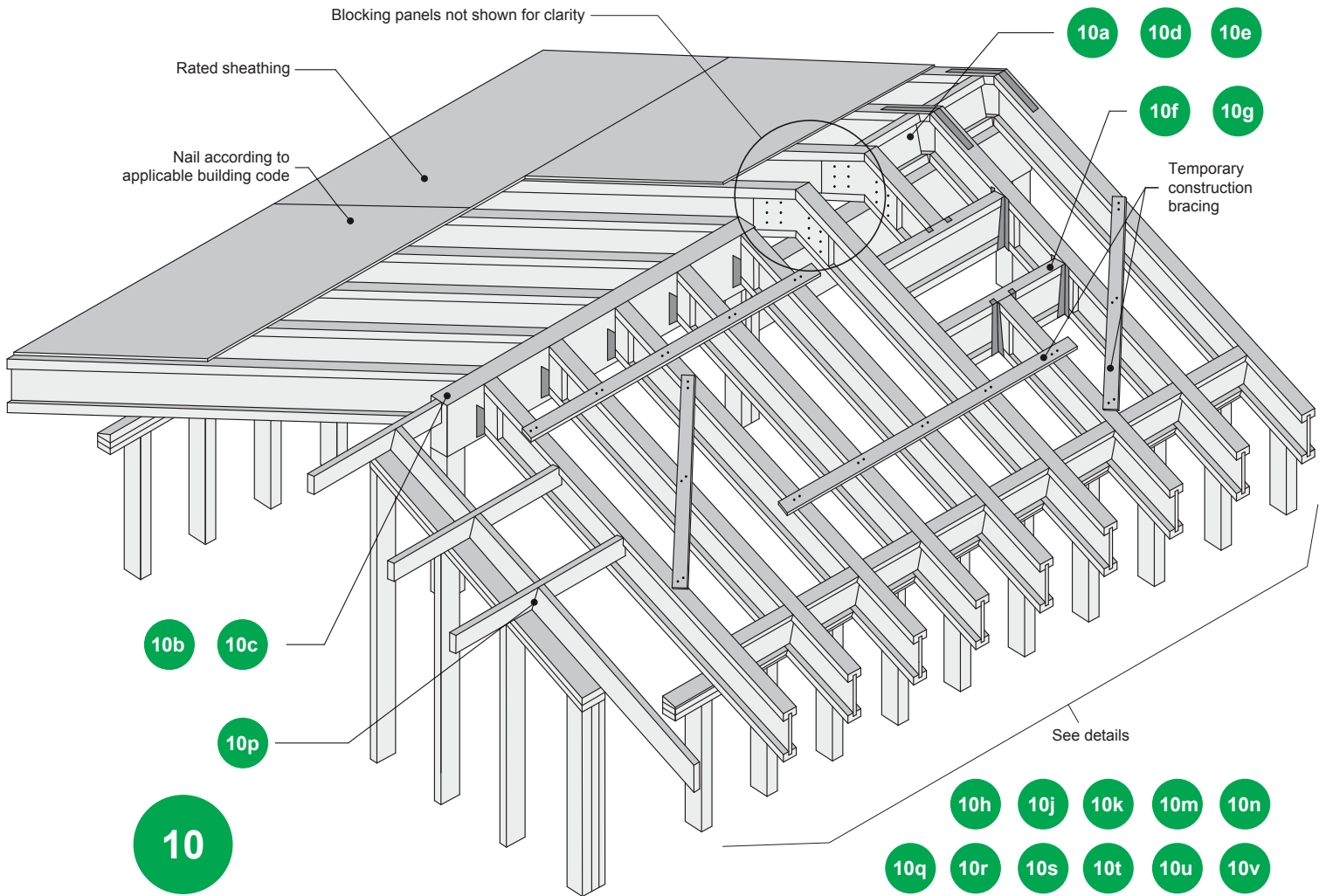
9

## INSTALLATION NOTES

### Roof Systems

1. Installation of Nordic I-joists shall be as shown in details 10.
2. Except for cutting to length, or for providing birdsmouth bearings, I-joist flanges should never be cut, drilled, or notched.
3. I-joists are permitted to be birdsmouth cut at the lower end of the joist only. The birdsmouth cut must have full bearing and not overhang the inside face of the plate. Bearing stiffeners are required at the birdsmouth cut on both sides of the web.
4. When beveled bearing plates are used at I-joists supports, I-joist attachment to the bevel plate must be designed to transfer lateral thrust.
5. End bearing length must be at least 1-3/4 inch. For continuous framing and roof framing with cantilevers, the intermediate support and end bearing adjacent to the cantilever must be at least 3-1/2 inches.
6. Ends of roof joists must be restrained at the bearing to prevent rollover. Rim board or I-joist blocking panels are preferred. Cantilever-end blocking must be placed at the support adjacent to the cantilever, and ends of all cantilever extensions must be laterally braced by a fascia board or other similar methods.
7. Continuous lateral support of the I-joist's compression flange is required to prevent rotation and buckling. In simple span roof applications, lateral support of the top flange is normally supplied by the roof sheathing. Bracing of the I-joist's bottom flange is also required at interior supports of multiple-span joists and at the end support next to an overhang. Lateral support of the entire bottom flange may be required in cases of load reversal such as those caused by high wind.
8. Details 10 show only I-joist specific fastener requirements. For other fastener requirements, such as wind uplift requirements or other member attachment details, see the applicable building code.
9. All roof details are valid up to a 12:12 slope unless otherwise noted.
10. Provide adequate ventilation at each joist bay as per detail 10v. Verify roof ventilation and insulation requirements with applicable building code.
11. Refer to typical floor framing installation notes and safety and construction precautions for additional information.

## TYPICAL ROOF FRAMING AND CONSTRUCTION DETAILS



FOR ROOF DETAILS

construction details → DC3





# NORDIC

TECHNICAL GUIDE  
NORDIC JOIST

NS-GT3 

ENGLISH  
VERSION  
2024-08-01

BUILDING  
SCIENCE

4

## GENERAL NOTES

### 1.0 General

- 1.1 This document supersedes all previous versions. For the latest version, consult [nordic.ca](https://nordic.ca) or contact Nordic Structures.
- 1.2 While this guide emphasizes residential construction, much of the basic design information can be used for other construction applications. Review by a design professional is required for applications beyond the scope of this document.
- 1.3 For more information, consult [nordic.ca](https://nordic.ca) or contact Nordic Structures.

### 2.0 Referenced Documents

- 2.1 References to Parts, Table 9.10.3.1.-B and Clauses are to the 2020 edition of the National Building Code of Canada (NBC).

## Fire Safety

---

### Introduction

This section provides information on fire safety and regulations for applications including Nordic I-joists. Topics include an introduction to fire safety as well as fire-resistance rated and unrated assemblies.

For more information:

- [APA, I-Joist Floor Assemblies](#)
- [CWC, Fire Safety](#)
- National Building Code of Canada (NBC)

---

### Wood Construction

Important distinctions exist on different levels between light-frame wood, heavy timber, and mass timber construction, specifically regarding their fire performance behavior.

#### Light-frame Wood Construction

Light-frame wood construction is defined as construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood framing members.

Light-frame wood construction relies on fire-resistant materials that are added as protective layers to the wooden studs and joists. Such layers typically consist of gypsum board, insulation, and structural wood panels.

#### Heavy Timber Construction

Heavy timber construction means that type of combustible construction in which a degree of fire safety is attained by placing limitations on the sizes of wood structural members and on the thickness and composition of wood floors and roofs and by the avoidance of concealed spaces under floors and roofs.

Given the prescriptive minimum dimensions and construction details, heavy timber construction inherently has a certain degree of fire resistance.

#### Encapsulated Mass Timber Construction

Encapsulated mass timber construction means that type of construction in which a degree of fire safety is attained by the use of encapsulated mass timber elements with an encapsulation rating and minimum dimensions for structural members and other building assemblies.

During a fire, exposed mass timber chars on the outside, which forms an insulating layer protecting interior wood from damage. Additionally, when the building code requires protection with gypsum board, mass timber can achieve nearly damage-free performance during a contents-fire burnout event. Mass timber is therefore recognized for its excellent fire performance.

---

### Construction Fire Safety

Although less than 2% of building fires occur during construction, this phase presents unique risk scenarios that make any building more vulnerable regardless of material. The NBC provides extensive safety precautions for this phase, but the fires that do occur are often caused when required elements – such as fire doors, smoke alarms and sprinklers – have not been put in place. For this reason, construction site safety includes some unique challenges that are best addressed through education and increased planning. (Source: Think Wood, AWC and WoodWorks)

For more information:

- [CWC, Construction Sites](#)
- [Construction Fire Safety Coalition](#)

## Fire-safe Construction

### Fire Resistance

Fire resistance is that property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

Buildings and structures are classified in one of the construction types with limitations on building height, number of stories, and building area, as defined in the building code. Depending on the construction type, the building elements are required to have, or not, a fire-resistance rating, referred as fire-resistance-rated or unrated construction, respectively.

Fire resistance is one of the measures that ensure fire-safe construction. Other measures include firewalls, fire separations, fire blocks, shaft enclosures, fire-stop systems, automatic sprinkler systems, fire alarm and detection systems, emergency alarm systems, smoke detection systems, and means of egress. For construction requirements, refer to the applicable building code.

### Fire-resistance Ratings

Fire-resistance rating means the time in minutes or hours that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived therefrom as prescribed in the NBC.

### Test Methods

The fire-resistance rating of a material, assembly of materials or a structural member may be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101. The fire-resistance rating of penetrations and fire-resistant joint systems shall be determined in accordance with the applicable code requirements.

The CAN/ULC-S101 test method prescribes a standard fire exposure, controlled by the time-temperature curve shown in Figure 4.1, for comparing the test results of building construction assemblies.

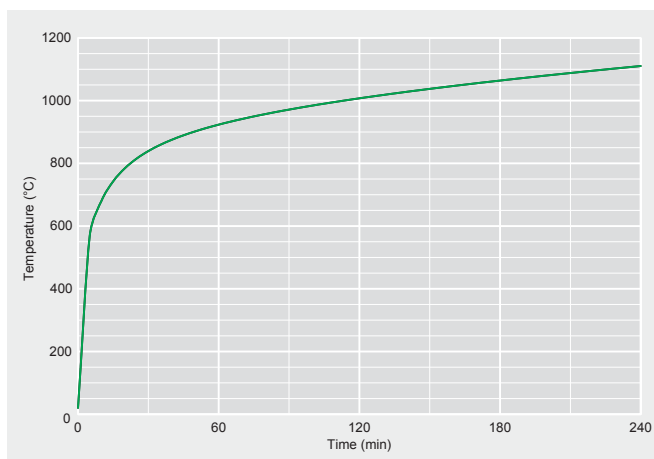
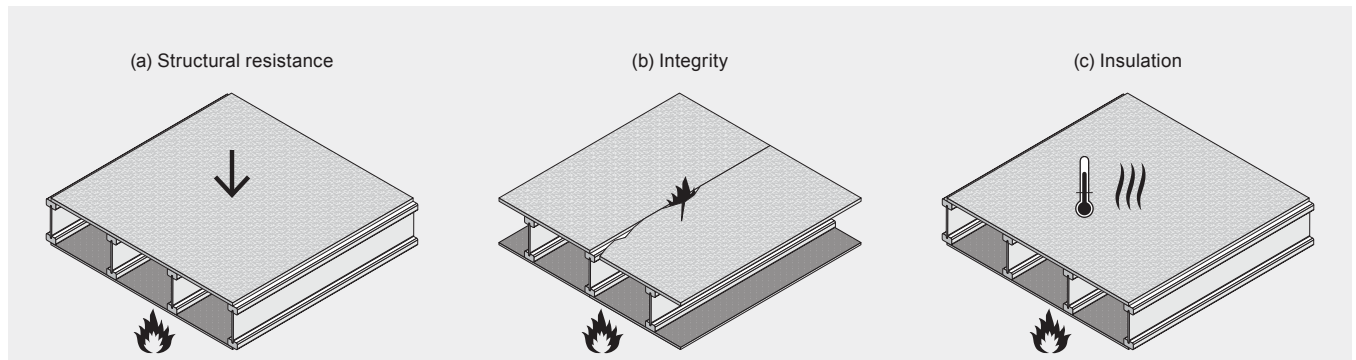


Figure 4.1 Time-temperature curve as per CAN/ULC-S101

In obtaining a fire endurance period, the following conditions shall be met:

1. The test specimen shall have sustained the applied load during the fire endurance period without passage of flames or gases hot enough to ignite cotton pads. [Structural resistance (a) and integrity (b) on Figure 4.2]
2. The transmission of heat through the test specimen throughout the fire endurance test shall not raise the average temperature on its unexposed surface more than 140°C above its initial average temperature; nor shall the temperature rise at any individual point exceed 180°C. [Insulation (c) on Figure 4.2]



**Figure 4.2 Fire resistance criteria per CAN/ULC-S101**

#### Determination of Fire-resistance Ratings

Where a fire-resistance rating is required for an element of a building, such rating shall be determined in conformance with:

- a) the test methods described in Part 3
- b) the calculation methods presented in Appendix D, which include:
  - Component Additive Method (CAM) [Appendix D, Subsection D-2.3.]
  - Method A for Glued-Laminated Timber Beams and Columns [Appendix D, Article D-2.11.3.]
  - Method B for Mass Timber (Annex B of CSA O86) [Appendix D, Article D-2.11.4.]
- c) for Part 9 buildings, the construction specifications presented in Table 9.10.3.1.-B

The following methods or procedures are also generally accepted (to be validated with the building regulatory authorities):

1. Fire-resistance designs documented in approved sources.
2. Engineering analysis based on a comparison of building element, component or assemblies designs having fire-resistance ratings as determined by the test procedures set forth in CAN/ULC-S101.
3. Fire-resistance designs certified by an approved agency.
4. Alternative solutions – using alternative solutions that will achieve at least the minimum level of performance required by Division B, per Clause 1.2.1.1.(1) (b), Division A.

In other words, one method for code-conforming wood design and construction is to adhere to tested or prescriptive floor-ceiling or roof-ceiling assemblies that have been assigned a fire-resistance rating (see Fire Protection for prescriptive designs). Fire resistance may also be calculated using the calculation methods in Appendix D, such as the Component Additive Method (CAM), which adds the time assigned of individual components, or Annex B of CSA O86, which provides design procedures for large cross-section wood members based on the char rate. Lastly, a performance-based fire safety design approach may be considered (alternative solutions).

For more information:

- 2020 NBC, Appendix D, Section D-2, Fire-Resistance Ratings
- CSA O86, Engineering design in wood (Annex B)

## Fire Protection

---

### Introduction

Active fire protection equipment systems perform the functions of detecting a fire, alerting the occupants or fire department of a fire emergency, mass notification, gas detection, controlling smoke and controlling or extinguishing the fire (e.g., Automatic Sprinkler Systems). Generally, the requirements are based on the occupancy, the height, and the area of the building, as these are the factors that most affect fire-fighting capabilities and the relative hazard of a specific building or portion thereof.

Passive fire protection is an integral component of building safety. Components and systems are intended to contain fires or slow the spread of fires through the use of fire-resistant building elements and open space.

---

### Automatic Sprinkler Systems

I-joists are often used in conjunction with both steel and chlorinated polyvinyl chloride (CPVC) sprinkler systems. The documents below provide some basic guidance on appropriate methods of attachment of steel and CPVC sprinkler systems to I-joists. All designs should be checked by a design professional to assure the adequacy of not only the hangers and fasteners used but the capacity of the I-joists themselves.

- [APA J745, Sprinkler Pipe Installation for APA Performance Rated I-Joists](#)
- [APA J745SUP, Sprinkler Pipe Installation Design Details](#)
- [NS-DC3, Construction Details](#) (Details 9)

---

### I-joists in Fire-rated Assemblies

Numerous fire-rated assemblies incorporate I-joists and wood structural panels. The references below contain prescriptive details of fire-resistance-rated building elements, components or assemblies. Nordic floor-ceiling and roof-ceiling fire-rated assemblies are illustrated in the APA Product Report PR-S274.

- 2020 NBC, Table 9.10.3.1.-B., Fire and Sound Resistance of Floors Ceilings and Roofs
- [APA PR-S274, Fire-Rated Assemblies](#) (Nordic Structures)

---

### Rim Board in Fire-rated Assemblies

When fire-rated walls or floor-ceiling assemblies are required, a fire barrier over the walls is typically necessary to prevent flames from escaping the confinement provided by the wall or ceiling assembly. The barrier may be in the form of continuous rim board on top of the wall and parallel with the floor joists or as continuous rim board along the top of the wall and perpendicular to the joists. The references below provide fire-resistant rim board assemblies.

- [APA D350, APA Rim Board in Fire-Rated Assemblies](#)
- [AWC DCA3, Fire-Resistance-Rated Wood-Frame Wall and Floor/Ceiling Assemblies](#)

### Flame-spread Rating and Smoke Developed Classification

The NBC prescribes interior finish requirements based on occupancy, location or element. The flame-spread rating and smoke developed classification of a material, assembly, or structural member is determined on the basis of not less than three tests conducted in conformance with CAN/ULC-S102 (or with CAN/ULC-S102.2 under certain conditions). A material, assembly, or structural member is also permitted to be assigned a flame-spread rating and smoke developed classification on the basis of Appendix D.

Flame-spread rating means an index or classification indicating the extent of spread-of-flame on the surface of a material or an assembly of materials as determined in a standard fire test as prescribed in the NBC.

Table 4.1 shows the relevant flame spread and smoke-developed indices.

**Table 4.1 – Flame-spread Ratings and Smoke Developed Classifications**

Product	Flame-spread rating	Smoke developed classification	Class	Source
OSB 3/8"	125	90	C	APA TT-128
Nordic Lam	26-75	0-450	B	APA PR-L294C

For more information:

- 2020 NBC, Appendix D, Section D-3, Flame-Spread Ratings and Smoke Developed Classifications
- [APA Technical Topics TT-128, Flame-Spread Rating for Oriented Strand Board in Canada](#)
- [APA Product Report PR-L294C, Nordic Lam \(Section 5\)](#)

### Fire Protection of Floors

The CCMC 13032-R Evaluation Report for Nordic Joist provides fire protection options for the proprietary floor system as an alternative solution to the acceptable solution in Part 9 for conventional wood-frame floor construction. These options have demonstrated fire resistance at least equivalent to that of conventional wood-frame floor construction with exposed 2x10 joists.

For more information:

- [APA R425, Fire Protective Options for I-Joist Floor Systems](#)
- [APA System Report SR-405, Fire Protection of Floors Constructed with Prefabricated Wood I-Joists for Compliance with the International Residential Code](#)
- [APA Product Report PR-S274, Fire-rated Assemblies \(Nordic Structures\)](#)
- [CCMC Evaluation Report 13032-R, Nordic Joist](#)

## Fire Facts Qs & As

---

### Can a fire-protective coating be used with Nordic I-joists?

Given the proprietary nature of almost all fire coatings, it is APA's position that the APA trademark is applicable only to the base product and does not apply after the application of the fire protective coating. Certification and inspection of such fire protective coatings are outside the scope of APA. The performance characteristics of the APA-trademarked engineered wood product after application of the proprietary fire protective coatings are the responsibility of the fire protective coating company and its certification agency.

Nordic I-joists are identified with the trademark of APA, in accordance with the APA Quality Assurance Program. APA is a not-for-profit trade association and is accredited by the Standards Council of Canada (SCC) to operate a production certification system based on ISO/IEC 17065.

For more information:

- [APA Technical Topics TT-126. Applicability of APA Trademarks on Engineered Wood Products Surface-Coated with Fire Protective Coating](#)

---

### Do adhesives used in Nordic products increase smoke toxicity?

No; testing shows that the difference in smoke toxicity between natural solid wood and engineered wood products is insignificant. However, smoke produced during the burning of most materials, wood products included, is toxic. Smoke inhalation is the leading cause of death in a fire event. The most important life-saving strategy in a fire is its containment, as well as that of smoke, for as long as possible, and a quick evacuation of the building.



## Acoustics

---

### Requirements

The NBC provides parameters to establish minimum acoustical requirements: apparent sound transmission class (ASTC), sound transmission class (STC), and impact insulation class (IIC). Compliance with these requirements may be demonstrated either through testing or through engineering analysis based on empirical test data from other similar assemblies.

Detailed descriptions for STC and IIC ratings are provided in the following document:

- [APA W460, Design/Construction Guide: Noise-Rated Systems](#)

---

### Floor Assemblies

The construction assemblies presented in the documents below have been tested and evaluated for their acoustic performance according to standard test methods by recognized acoustical laboratories. Some assemblies contain proprietary products, so test sponsors should be contacted for additional construction details.

- [APA T230, Acoustic Performance of All-Wood Floor Systems](#)
- [AWC DCA3, Fire-Resistance-Rated Wood-Frame Wall and Floor/Ceiling Assemblies](#) (Details WIJ-1.1 to WIJ-1.7, and WIJ-2.1)
- NBC, Table 9.10.3.1.-B, Fire and Sound Resistance of Floors, Ceilings and Roofs
- [APA PR-S274, Fire-Rated Assemblies](#) (Nordic Structures)

---

### Analytical Method

AWC TR15 shows how to use an empirical model for compliance, which may be used for analysis of wood-frame floor-ceiling assemblies to estimate the code-regulated STC and IIC sound transmission parameters:

- [AWC TR15, Calculation of Sound Transmission Parameters for Wood-Framed Assemblies](#)

## Weathered I-joists

---

### Intended Use

I-joists are intended for use in dry-service conditions in which the average equilibrium moisture content of wood is 15% or less on average over a year without exceeding 19%.

While the products will withstand normal exposure, excessive exposure during distribution, storage or construction may lead to dimensional changes that affect serviceability. These changes include cupping, bowing or expansion to dimensions beyond the specified tolerance of the product in the as-manufactured condition. Excessive moisture exposure can cause I-joist webs to swell which can split the lumber flanges. Prolonged periods of high moisture may also support the growth of wood decay fungi, another reason for which it is important to follow proper methods of design, handling, installation and maintenance to protect wood building materials from moisture.

---

### I-joist Components

#### Adhesives

Adhesives used in I-joists conform to the requirements of ASTM D2559, meaning the adhesives are suitable for the bonding of wood into structural laminated wood products (I-joists) for general construction where a high-strength, waterproof adhesive bond is required.

#### Flanges

Simple exposure to sun and rain causes wood to change color, usually first darkening or yellowing due to sunlight, then eventually weathering to a silver grey. In all these cases of non-biological staining, the wood has not been harmed and no action is required.

In addition, a study on the effects of limited outdoor exposure on properties of I-joists has shown that exterior exposure has no negative effect on tension properties.

#### Webs

I-joist webs are made from Exposure 1 OSB panels, which refers to a bond classification suitable for uses not permanently exposed to the weather. Panels classified as Exposure 1 are intended to resist the effects of moisture due to construction delays, or other conditions of similar severity.

The effects of exterior exposure on flexural properties of I-joists are significant after a prolonged period of exposure. It has been shown that swelling of the OSB webs caused by wetting is the primary cause of strength loss.

---

### Recommendations

In conclusion, I-joists are intended for dry-use applications because water absorption can lead to swelling, deformation, and losses in material properties. However, when I-joists are exposed to normal jobsite wetting and then dried to long-term moisture conditions, the structural properties are not compromised. Furthermore, the short exposure during normal construction is not sufficient for decay.

In all other cases, such as significant swelling of the OSB, the effects of weathering on I-joists should be assessed by a designer competent in engineered wood products, and the professional will take over the responsibility and warranty for the products being evaluated.

The design and installation of Nordic I-joists should be in accordance with the recommendations and construction details published in Chapter 3. Also, it is important to minimize excessive moisture exposure with proper storage and handling as shown in Chapter 6.

For more information:

- [APA A525, Build A Better Home: Controlling Mold and Mildew](#)
- [ASTM D2559, Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions](#)

# NORDIC

TECHNICAL GUIDE  
NORDIC JOIST

NS-GT3 

ENGLISH

VERSION  
2024-08-01

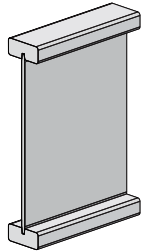
LIGHT-COMMERCIAL  
I-JOISTS

5

**NORDIC**  
STRUCTURES

## Nordic Joist – Design Properties

### Products

**NI-80x****2x4** 2100f MSR

7/16 in. web

**Depths**

18, 20, 22 and 24 in.

23 pieces per unit

Refer to Chapter 2 for I-joists designed for residential applications.

### Design Properties

Joist depth	Joist series	EI <sup>(a)</sup> (10 <sup>6</sup> lbf-in. <sup>2</sup> )	M <sub>r</sub> <sup>(b)</sup> (lbf-ft)	V <sub>r</sub> <sup>(c)</sup> (lbf)	3-1/2" Bearing		5-1/2" Bearing		1-3/4" Bearing		4" Bearing		K <sup>(f)</sup> (10 <sup>6</sup> lbf)	Weight (plf)
					IR <sub>r</sub> <sup>(d)</sup> (lbf)	IR <sub>r</sub> <sup>(d)</sup> w/ BS (lbf)	IR <sub>r</sub> <sup>(d)</sup> (lbf)	IR <sub>r</sub> <sup>(d)</sup> w/ BS (lbf)	ER <sub>r</sub> <sup>(e)</sup> (lbf)	ER <sub>r</sub> <sup>(e)</sup> w/ BS (lbf)	ER <sub>r</sub> <sup>(e)</sup> (lbf)	ER <sub>r</sub> <sup>(e)</sup> w/ BS (lbf)		
18"	NI-80x	1,399	18,280	3,730	4,920	6,030	5,180	6,980	2,050	3,000	2,920	3,730	9.36	4.45
20"	NI-80x	1,771	20,480	3,870	5,040	6,500	5,380	7,220	2,080	3,230	3,000	3,870	10.4	4.75
22"	NI-80x	2,191	22,695	3,990	5,150	6,980	5,580	7,470	2,120	3,460	3,080	3,990	11.44	5.05
24"	NI-80x	2,660	24,905	4,100	5,270	7,460	5,780	7,710	2,150	3,690	3,160	4,100	12.48	5.25

- a) Bending stiffness, EI, of the I-joist.
- b) Factored bending moment resistance, M<sub>r</sub>, of the I-joist.
- c) Factored shear resistance, V<sub>r</sub>, of the I-joist.
- d) Factored intermediate reaction resistance, IR<sub>r</sub>, of the I-joist with and without bearing stiffeners (BS). Minimum bearing length shall be 3-1/2 inches for intermediate bearings. Interpolation of the resistance between 3-1/2-inch and 5-1/2-inch bearing is permitted.
- e) Factored end reaction resistance, ER<sub>r</sub>, of the I-joist with and without bearing stiffeners (BS). Minimum bearing length shall be 1-3/4 inch for end bearings. Interpolation of the resistance between 1-3/4-inch and 4-inch bearing is permitted.
- f) Coefficient of shear deflection, K. For calculating uniform load and centre-point load deflections of the I-joist in a simple-span application, use equations (1) and (2).

(1) Uniform load: 
$$\delta = \frac{5w\ell^4}{384EI} + \frac{w\ell^2}{K}$$

(2) Centre-point load: 
$$\delta = \frac{P\ell^3}{48EI} + \frac{2P\ell}{K}$$

Where:

- δ = calculated deflection (in.)  
 ℓ = design span (in.)  
 EI = bending stiffness of the I-joist (lbf-in.<sup>2</sup>)  
 K = coefficient of shear deflection (lbf)  
 w = specified uniform load (lbf/in.)  
 P = specified concentrated load (lbf)

### Notes:

- The tabulated design values are for standard-term duration of load (K<sub>D</sub> = 1.0).
- The factored vertical (bearing) linear load resistance without bearing stiffeners is 1,850 lbf/ft for NI-80x up to 24 inches.
- Design of I-joists shall be in accordance with CSA O86:19.

## Maximum Floor Spans

### Design Criteria

Load:	Live load = 40 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	Nailed-glued oriented strand board (OSB) sheathing
Ceiling:	Bare joist

### Maximum Floor Spans

Dead load = 15 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	25'-8"	23'-8"	22'-7"	22'-8"	27'-1"	25'-0"	23'-10"	23'-11"
20"	NI-80x	27'-5"	25'-4"	24'-2"	24'-3"	28'-11"	26'-8"	25'-6"	<u>25'-6"</u>
22"	NI-80x	29'-2"	26'-11"	25'-8"	25'-8"	30'-9"	28'-4"	27'-0"	<u>27'-1"</u>
24"	NI-80x	30'-9"	28'-5"	27'-1"	27'-1"	32'-8"	29'-11"	28'-7"	<u>28'-7"</u>

Dead load = 30 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	25'-8"	23'-8"	22'-7"	<u>22'-8"</u>	27'-1"	25'-0"	23'-10"	<u>23'-11"</u>
20"	NI-80x	27'-5"	25'-4"	24'-2"	<u>24'-3"</u>	28'-11"	26'-8"	25'-6"	<u>25'-6"</u>
22"	NI-80x	29'-2"	26'-11"	25'-8"	<u>25'-8"</u>	30'-9"	28'-4"	<u>27'-0"</u>	<u>27'-1"</u>
24"	NI-80x	30'-9"	28'-5"	27'-1"	<u>27'-1"</u>	32'-8"	29'-11"	<u>28'-7"</u>	<u>28'-7"</u>

Dead load = 35 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	25'-8"	23'-8"	22'-7"	<u>22'-8"</u>	27'-1"	25'-0"	<u>23'-10"</u>	<u>23'-9"</u>
20"	NI-80x	27'-5"	25'-4"	24'-2"	<u>24'-3"</u>	28'-11"	26'-8"	<u>25'-6"</u>	<u>25'-5"</u>
22"	NI-80x	29'-2"	26'-11"	<u>25'-8"</u>	<u>25'-8"</u>	30'-9"	28'-4"	<u>27'-0"</u>	<u>26'-11"</u>
24"	NI-80x	30'-9"	28'-5"	<u>27'-1"</u>	<u>27'-1"</u>	32'-8"	29'-11"	<u>28'-7"</u>	<u>28'-5"</u>

### Notes:

- The tabulated clear spans are applicable to floor construction meeting the above design criteria and are based on a sheathing thickness of 5/8 inch for a joist spacing of 19.2 inches or less, or 3/4 inch for a joist spacing of 24 inches.
- The vibration-controlled span is determined using Clause A.5.4.5.2 b) of CSA O86:19.
- For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings, except for shaded areas, which shall be 3-1/2 inches for end bearings and 5-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except for underlined clear spans and as required for hangers.

**Design Criteria**

Load:	Live load = 40 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	Nailed-glued oriented strand board (OSB) sheathing
Ceiling:	1/2 in. gypsum ceiling

**Maximum Floor Spans**

Dead load = 15 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	26'-5"	24'-6"	23'-5"	23'-5"	27'-11"	25'-10"	24'-8"	24'-8"
20"	NI-80x	28'-3"	26'-2"	25'-0"	25'-0"	29'-10"	27'-7"	26'-4"	26'-5"
22"	NI-80x	30'-0"	27'-9"	26'-6"	26'-7"	31'-8"	29'-4"	28'-0"	28'-0"
24"	NI-80x	31'-9"	29'-4"	28'-0"	<u>28'-1"</u>	34'-0"	31'-0"	29'-7"	<u>29'-7"</u>

Dead load = 30 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	26'-5"	24'-6"	23'-5"	<u>23'-5"</u>	27'-11"	25'-10"	24'-8"	<u>24'-7"</u>
20"	NI-80x	28'-3"	26'-2"	25'-0"	<u>25'-0"</u>	29'-10"	27'-7"	<u>26'-4"</u>	<u>26'-5"</u>
22"	NI-80x	30'-0"	27'-9"	26'-6"	<u>26'-7"</u>	31'-8"	29'-4"	<u>28'-0"</u>	<u>28'-0"</u>
24"	NI-80x	31'-9"	29'-4"	<u>28'-0"</u>	<u>28'-1"</u>	34'-0"	31'-0"	<u>29'-7"</u>	<u>29'-7"</u>

Dead load = 35 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	26'-5"	24'-6"	23'-5"	<u>23'-5"</u>	27'-11"	25'-10"	<u>24'-8"</u>	<u>24'-7"</u>
20"	NI-80x	28'-3"	26'-2"	<u>25'-0"</u>	<u>25'-0"</u>	29'-10"	27'-7"	<u>26'-4"</u>	<u>26'-3"</u>
22"	NI-80x	30'-0"	27'-9"	<u>26'-6"</u>	<u>26'-7"</u>	31'-8"	29'-4"	<u>28'-0"</u>	<u>27'-11"</u>
24"	NI-80x	31'-9"	29'-4"	<u>28'-0"</u>	<u>28'-1"</u>	34'-0"	<u>31'-0"</u>	<u>29'-7"</u>	<u>29'-4"</u>

**Notes:**

- The tabulated clear spans are applicable to floor construction meeting the above design criteria and are based on a sheathing thickness of 5/8 inch for a joist spacing of 19.2 inches or less, or 3/4 inch for a joist spacing of 24 inches.
- The vibration-controlled span is determined using Clause A.5.4.5.2 b) of CSA O86:19.
- For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings, except for shaded areas, which shall be 3-1/2 inches for end bearings and 5-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except for underlined clear spans and as required for hangers.

**Design Criteria**

Load:	Live load = 50 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	Nailed-glued oriented strand board (OSB) sheathing
Ceiling:	Bare joist

**Maximum Floor Spans**

Dead load = 15 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	25'-8"	23'-8"	22'-7"	<u>22'-8"</u>	27'-1"	25'-0"	23'-10"	<u>23'-11"</u>
20"	NI-80x	27'-5"	25'-4"	24'-2"	<u>24'-3"</u>	28'-11"	26'-8"	25'-6"	<u>25'-6"</u>
22"	NI-80x	29'-2"	26'-11"	25'-8"	<u>25'-8"</u>	30'-9"	28'-4"	27'-0"	<u>27'-1"</u>
24"	NI-80x	30'-9"	28'-5"	27'-1"	<u>27'-1"</u>	32'-8"	29'-11"	<u>28'-7"</u>	<u>28'-7"</u>

Dead load = 30 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	25'-8"	23'-8"	22'-7"	<u>22'-8"</u>	27'-1"	25'-0"	<u>23'-10"</u>	<u>23'-9"</u>
20"	NI-80x	27'-5"	25'-4"	24'-2"	<u>24'-3"</u>	28'-11"	26'-8"	<u>25'-6"</u>	<u>25'-4"</u>
22"	NI-80x	29'-2"	26'-11"	<u>25'-8"</u>	<u>25'-8"</u>	30'-9"	<u>28'-4"</u>	<u>27'-0"</u>	<u>26'-2"</u>
24"	NI-80x	30'-9"	28'-5"	<u>27'-1"</u>	<u>27'-1"</u>	32'-8"	<u>29'-11"</u>	<u>28'-7"</u>	<u>27'-0"</u>

Dead load = 35 psf

Joist depth	Joist series	Simple span				Multiple spans			
		On centre spacing				On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
18"	NI-80x	25'-8"	23'-8"	22'-7"	<u>22'-8"</u>	27'-1"	25'-0"	<u>23'-10"</u>	<u>23'-2"</u>
20"	NI-80x	27'-5"	25'-4"	24'-2"	<u>24'-3"</u>	28'-11"	26'-8"	<u>25'-6"</u>	<u>23'-11"</u>
22"	NI-80x	29'-2"	<u>26'-11"</u>	<u>25'-8"</u>	<u>25'-8"</u>	30'-9"	<u>28'-4"</u>	<u>27'-0"</u>	<u>24'-9"</u>
24"	NI-80x	30'-9"	<u>28'-5"</u>	<u>27'-1"</u>	<u>27'-1"</u>	32'-8"	<u>29'-11"</u>	<u>28'-7"</u>	<u>25'-7"</u>

**Notes:**

- The tabulated clear spans are applicable to floor construction meeting the above design criteria and are based on a sheathing thickness of 5/8 inch for a joist spacing of 19.2 inches or less, or 3/4 inch for a joist spacing of 24 inches.
- The vibration-controlled span is determined using Clause A.5.4.5.2 b) of CSA O86:19.
- For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings, except for shaded areas, which shall be 3-1/2 inches for end bearings and 5-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except for underlined clear spans and as required for hangers.

**Design Criteria**

Load:	Live load = 50 psf
Deflection limits:	L/480 under live load and L/240 under total load
Sheathing:	Nailed-glued oriented strand board (OSB) sheathing
Ceiling:	1/2 in. gypsum ceiling

**Maximum Floor Spans**

Dead load = 15 psf

Joist depth	Joist series	Simple span On centre spacing				Multiple spans On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
		18"	NI-80x	26'-5"	24'-6"	23'-5"	<u>23'-5"</u>	27'-11"	25'-10"
20"	NI-80x	28'-3"	26'-2"	25'-0"	<u>25'-0"</u>	29'-10"	27'-7"	26'-4"	<u>26'-5"</u>
22"	NI-80x	30'-0"	27'-9"	26'-6"	<u>26'-7"</u>	31'-8"	29'-4"	<u>28'-0"</u>	<u>28'-0"</u>
24"	NI-80x	31'-9"	29'-4"	28'-0"	<u>28'-1"</u>	34'-0"	31'-0"	<u>29'-7"</u>	<u>29'-7"</u>

Dead load = 30 psf

Joist depth	Joist series	Simple span On centre spacing				Multiple spans On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
		18"	NI-80x	26'-5"	24'-6"	<u>23'-5"</u>	<u>23'-5"</u>	27'-11"	25'-10"
20"	NI-80x	28'-3"	26'-2"	<u>25'-0"</u>	<u>25'-0"</u>	29'-10"	27'-7"	<u>26'-4"</u>	<u>25'-4"</u>
22"	NI-80x	30'-0"	27'-9"	<u>26'-6"</u>	<u>26'-7"</u>	31'-8"	29'-4"	<u>28'-0"</u>	<u>26'-2"</u>
24"	NI-80x	31'-9"	<u>29'-4"</u>	<u>28'-0"</u>	<u>28'-1"</u>	34'-0"	<u>31'-0"</u>	<u>29'-7"</u>	<u>27'-0"</u>

Dead load = 35 psf

Joist depth	Joist series	Simple span On centre spacing				Multiple spans On centre spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"
		18"	NI-80x	26'-5"	24'-6"	<u>23'-5"</u>	<u>23'-5"</u>	27'-11"	25'-10"
20"	NI-80x	28'-3"	<u>26'-2"</u>	<u>25'-0"</u>	<u>25'-0"</u>	29'-10"	27'-7"	<u>26'-4"</u>	<u>23'-11"</u>
22"	NI-80x	30'-0"	<u>27'-9"</u>	<u>26'-6"</u>	<u>26'-7"</u>	31'-8"	29'-4"	<u>28'-0"</u>	<u>24'-9"</u>
24"	NI-80x	31'-9"	<u>29'-4"</u>	<u>28'-0"</u>	<u>28'-1"</u>	34'-0"	<u>31'-0"</u>	<u>29'-7"</u>	<u>25'-7"</u>

**Notes:**

- The tabulated clear spans are applicable to floor construction meeting the above design criteria and are based on a sheathing thickness of 5/8 inch for a joist spacing of 19.2 inches or less, or 3/4 inch for a joist spacing of 24 inches.
- The vibration-controlled span is determined using Clause A.5.4.5.2 b) of CSA O86:19.
- For multiple-span applications, the end spans shall be 40% or more of the adjacent span.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings, except for shaded areas, which shall be 3-1/2 inches for end bearings and 5-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except for underlined clear spans and as required for hangers.



## Maximum Roof Spans

### Design Criteria

Span:	Simple
Load:	Dead load = 20 psf
Deflection limits:	L/360 under snow load and L/240 under total load
Building:	Normal importance category, NBC 4.1.2.1. 3)

### Maximum Roof Spans

Snow load = 30 psf

Joist depth	Joist series	Slope of 1/4:12 to 4:12			Slope of >4:12 to 8:12			Slope of >8:12 to 12:12		
		On centre spacing			On centre spacing			On centre spacing		
		12"	16"	24"	12"	16"	24"	12"	16"	24"
18"	NI-80x	38'-7"	34'-11"	<u>30'-3"</u>	36'-3"	32'-10"	28'-6"	33'-6"	30'-4"	26'-4"
20"	NI-80x	41'-9"	37'-10"	<u>32'-10"</u>	39'-3"	35'-7"	30'-10"	36'-3"	32'-10"	28'-6"
22"	NI-80x	44'-11"	40'-7"	<u>35'-3"</u>	42'-2"	38'-2"	<u>33'-2"</u>	38'-11"	35'-3"	30'-8"
24"	NI-80x	47'-11"	43'-4"	<u>37'-1"</u>	45'-0"	40'-9"	<u>35'-5"</u>	41'-7"	37'-8"	32'-9"

Snow load = 40 psf

Joist depth	Joist series	Slope of 1/4:12 to 4:12			Slope of >4:12 to 8:12			Slope of >8:12 to 12:12		
		On centre spacing			On centre spacing			On centre spacing		
		12"	16"	24"	12"	16"	24"	12"	16"	24"
18"	NI-80x	36'-4"	32'-11"	<u>28'-6"</u>	34'-3"	31'-0"	26'-11"	31'-10"	28'-9"	25'-0"
20"	NI-80x	39'-4"	35'-7"	<u>30'-7"</u>	37'-1"	33'-7"	<u>29'-2"</u>	34'-5"	31'-2"	27'-1"
22"	NI-80x	42'-4"	<u>38'-3"</u>	<u>32'-2"</u>	39'-11"	36'-1"	<u>31'-4"</u>	37'-0"	33'-6"	29'-1"
24"	NI-80x	45'-2"	<u>40'-10"</u>	<u>33'-9"</u>	42'-7"	38'-7"	<u>33'-0"</u>	39'-6"	35'-9"	<u>31'-1"</u>

Snow load = 50 psf

Joist depth	Joist series	Slope of 1/4:12 to 4:12			Slope of >4:12 to 8:12			Slope of >8:12 to 12:12		
		On centre spacing			On centre spacing			On centre spacing		
		12"	16"	24"	12"	16"	24"	12"	16"	24"
18"	NI-80x	34'-3"	31'-0"	<u>26'-7"</u>	32'-8"	29'-7"	<u>25'-7"</u>	30'-5"	27'-6"	23'-10"
20"	NI-80x	37'-2"	<u>33'-7"</u>	<u>28'-2"</u>	35'-4"	32'-0"	<u>27'-8"</u>	32'-11"	29'-10"	25'-10"
22"	NI-80x	39'-11"	<u>36'-1"</u>	<u>29'-8"</u>	38'-0"	34'-5"	<u>29'-2"</u>	35'-4"	32'-0"	<u>27'-10"</u>
24"	NI-80x	42'-5"	<u>38'-2"</u>	<u>31'-1"</u>	40'-7"	<u>36'-9"</u>	<u>30'-7"</u>	37'-9"	34'-2"	<u>29'-8"</u>

### Notes:

- The tabulated spans are based on the horizontal distance between inside face of supports and are applicable to roof construction meeting the above design criteria.
- Minimum bearing length shall be 1-3/4 inch for end bearings and 3-1/2 inches for intermediate bearings.
- Bearing stiffeners are not required when I-joists are used in accordance with this table, except for underlined clear spans and as required for hangers.

## Web Hole and Duct Chase Opening Specifications

### Location of Web Holes

#### Design Criteria

Span:	Simple or multiple
Joist spacing:	Up to 24 inches
Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load

Minimum distance from inside face of any support to centre of hole (ft-in.)

Joist depth	Joist series	Round hole diameter (in.)														
		2	4	6	8	10	12	14	14-3/4	16	16-3/4	18	18-3/4	20	20-3/4	22
18"	NI-80x	0'-7"	0'-8"	1'-2"	5'-3"	9'-5"	13'-8"	17'-10"	19'-5"	-	-	-	-	-	-	-
20"	NI-80x	0'-7"	0'-8"	0'-9"	3'-9"	7'-8"	11'-6"	15'-6"	17'-0"	19'-6"	21'-0"	-	-	-	-	-
22"	NI-80x	0'-7"	0'-8"	0'-9"	2'-3"	5'-10"	9'-5"	13'-2"	14'-6"	16'-10"	18'-3"	20'-8"	23'-0"	-	-	-
24"	NI-80x	0'-7"	0'-8"	0'-9"	1'-0"	4'-4"	7'-9"	11'-2"	12'-5"	14'-8"	16'-0"	18'-2"	19'-9"	23'-6"	26'-0"	-

#### Notes:

1. Tabulated values are applicable to floor construction meeting the above design criteria.
2. Refer to Chapter 3 for rules related to cutting holes in I-joists.

### Location of Duct Chase Openings

#### Design Criteria

Span:	Simple
Joist spacing:	Up to 24 inches
Loads:	Live load = 40 psf and dead load = 15 psf
Deflection limits:	L/480 under live load and L/240 under total load

Minimum distance from inside face of any support to centre of opening (ft-in.)

Joist depth	Joist series	Duct chase length (in.)				
		8	12	16	20	24
18"	NI-80x	13'-0"	14'-0"	15'-1"	16'-2"	17'-3"
20"	NI-80x	14'-7"	15'-8"	16'-10"	18'-0"	19'-0"
22"	NI-80x	16'-2"	17'-3"	18'-5"	19'-6"	20'-8"
24"	NI-80x	17'-2"	18'-4"	19'-5"	20'-7"	21'-8"

#### Notes:

1. Tabulated values are applicable to floor construction meeting the above design criteria.
2. The maximum depth of a duct chase opening that can be cut into an I-joist web shall equal the clear distance between the flanges of the I-joist minus 1/4 inch (maintain a minimum of 1/8 inch between the top or bottom of the opening and the adjacent I-joist flange).
3. Refer to Chapter 3 for rules related to cutting duct chase openings in I-joists.

# NORDIC

TECHNICAL GUIDE  
NORDIC JOIST

NS-GT3 

ENGLISH

VERSION  
2024-08-01

ADDITIONAL  
INFORMATION

6

## Safety and Construction Precautions

I-joists are not stable until completely installed, and will not carry any load until fully braced and sheathed.

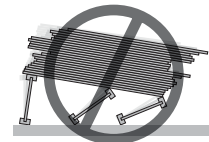
### Avoid Accidents by Following these Important Guidelines:

1. Brace and nail each I-joist as it is installed, using hangers, blocking panels, rim board, and/or cross-bridging at joist ends. When I-joists are applied continuous over interior supports and a load-bearing wall is planned at that location, blocking will be required at the interior support.
2. When the building is completed, the floor sheathing will provide lateral support for the top flanges of the I-joists. Until this sheathing is applied, temporary bracing, often called struts, or temporary sheathing must be applied to prevent I-joist rollover or buckling.
  - Temporary bracing or struts must be 1x4 inch minimum, at least 8 feet long and spaced no more than 8 feet on centre, and must be secured with a minimum of two 2-1/2-inch nails fastened to the top surface of each I-joist. Nail the bracing to a lateral restraint at the end of each bay. Lap ends of adjoining bracing over at least two I-joists.
  - Or, sheathing (temporary or permanent) can be nailed to the top flange of the first 4 feet of I-joists at the end of the bay.
3. For cantilevered I-joists, brace top and bottom flanges, and brace ends with closure panels, rim board, or cross-bridging.
4. Install and fully nail permanent sheathing to each I-joist before placing loads on the floor system. Then, stack building materials over beams or walls only.
5. *Never* install a damaged I-joist.

Improper storage or installation, failure to follow applicable building codes, failure to follow span ratings for Nordic I-joists, failure to follow allowable hole sizes and locations, or failure to use web stiffeners when required can result in serious accidents. Follow these installation guidelines carefully.



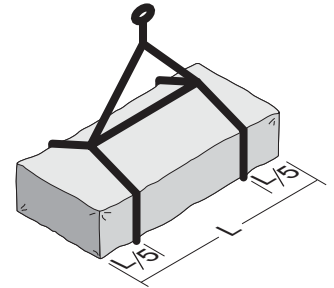
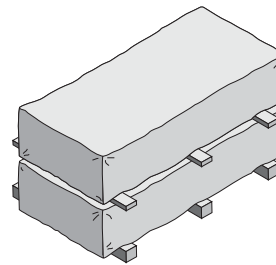
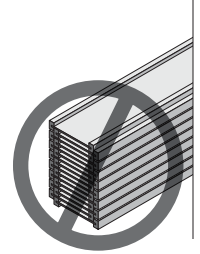
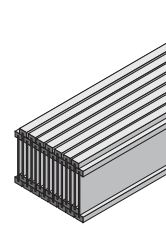
Do not walk on I-joists until fully fastened and braced, or serious injuries can result.



Never stack building materials over unbraced I-joists. Once sheathed, do not overstress I-joist with concentrated loads from building materials.

## Storage and Handling Guidelines

1. Bundle wrap can be slippery when wet. Avoid walking on wrapped bundles.
2. Store, stack, and handle I-joists vertically and level only.
3. Always stack and handle I-joists in the upright position only.
4. Do not store I-joists in direct contact with the ground and/or flatwise.
5. Protect I-joists from weather, and use spacers to separate bundles.
6. Bundled units should be kept intact until time of installation.
7. When handling I-joists with a crane on the job site, take a few simple precautions to prevent damage to the I-joists and injury to your work crew.
  - Pick I-joists in bundles as shipped by the supplier.
  - Orient the bundles so that the webs of the I-joists are vertical.
  - Pick the bundles at the 5th points, using a spreader bar if necessary.
8. Do not handle I-joists in a horizontal orientation.
9. Never use or try to repair a damaged I-joist.



## 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

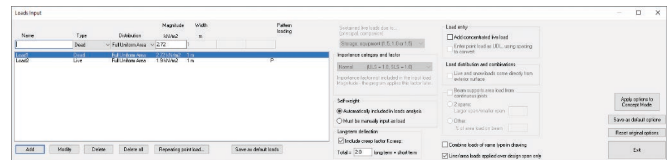
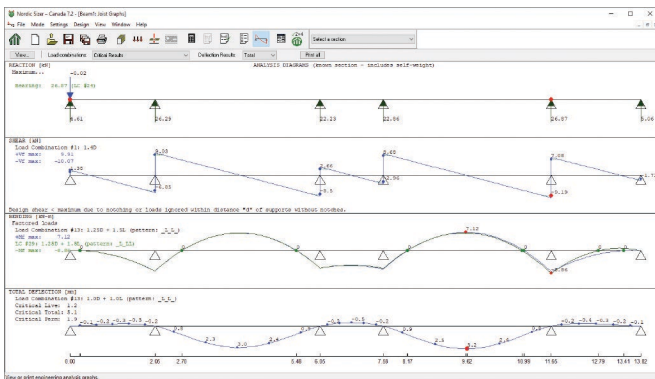
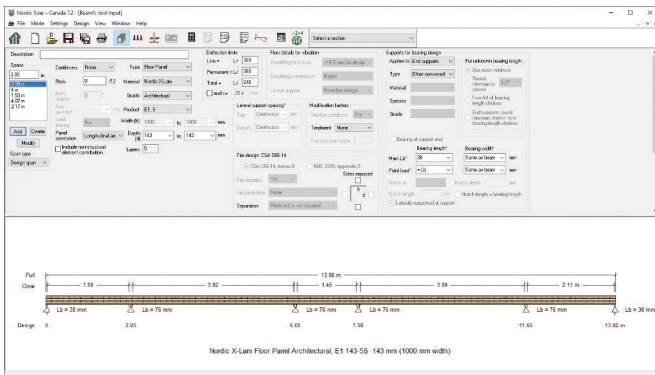
Fill in the [form](http://contact.nordic.ca/en/nordic-sizer-software-request/) (contact.nordic.ca/en/nordic-sizer-software-request/) to receive instructions by email within the next business day.

For assistance, please contact the technical support at 514-871-8526, ext. 2 or [tech@nordic.ca](mailto:tech@nordic.ca).

### WOODWORKS SOFTWARE TUTORIALS

Canadian Training Videos and User Guide

[woodworks-software.com/support/support-canadian-edition/](http://woodworks-software.com/support/support-canadian-edition/)



<b>NORDIC STRUCTURES</b>	<b>COMPANY</b> Aug. 12, 2020 15:47	<b>PROJECT</b> Beam1
--------------------------	---------------------------------------	-------------------------

### Design Check Calculation Sheet

Nordic Sizer – Canada 7.2

#### Loads:

Load	Type	Distribution	Pat-tern	Location [m]	Magnitude	Unit
				Start	End	
Load1	Dead	Full Area	No		2.72(1.00m)	kN/m <sup>2</sup>
Load2	Live	Full Area	Yes		1.90(1.00m)	kN/m <sup>2</sup>
Self-weight	Dead	Full UDL	No		0.72	kN/m

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

	13.86 m					
	0	2.05	6.05	7.58	11.65	13.82 m
Unfactored:						
Dead	1.54	12.59		9.22	9.56	12.87
Live	1.79	7.04		7.14	7.28	7.19
Factored:						
Uplift	0.02					
Total	4.61	26.29		22.23	22.86	26.87
Bearing:						
Capacity						
Des ratio	161.54	282.46		305.35	304.13	282.38
Beam	0.03	0.08		0.06	0.07	0.08
Load case	#24	#14		#25	#16	#29
Length	38*	76		76	76	76
Min req'd	38*	76*		76*	76*	38*
KB	1.00	1.00		1.00	1.00	1.00
KB min	1.00	1.00		1.00	1.00	1.00
KD	1.00	0.87		0.94	0.94	0.87

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

**Nordic X-Lam Floor Panel Architectural, E1 143-58 143 mm (1000 mm width)**  
 Supports: All - Non-wood  
 Total length: 13.858 m; Clear span: 2, 3.9, 1.5, 4.2, 2.1 m; Volume = 1.982 m<sup>3</sup>; 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 Rd = 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

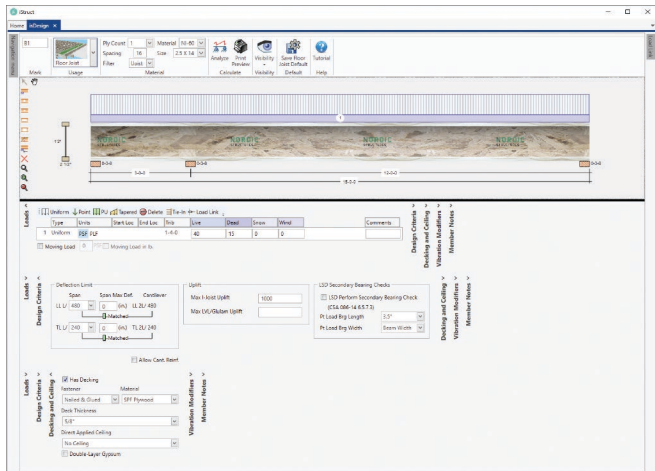


**CSD – iStruct™**

iStruct™ is a state-of-the-art enterprise solution for layout, design, and structural analysis that combines layout/drafting, single member design, reporting, and an incredible real time 3D experience. It supports a selection of products, including I-joists, SCL lumber, solid sawn lumber, walls, rim board, hangers, and more.

isDesign™ is a single member sizing solution that allows users to size floor and roof joists, beams, and posts by inputting span and load information. Innovative tools allow selection of the most cost-effective solution.

isPlan™ is a 3D layout and design solution that allows users to model an entire structure with 2D and 3D views. isPlan™ develops and transfers gravity loads through the entire structure and designs the structural members. Robust import and export of pdf, dxf, and dwg files combined with intuitive modeling and design tools ensure efficient and cost-effective designs.



Client: \_\_\_\_\_ Date: 2020-08-12 Page 1 of 1  
 Project: \_\_\_\_\_ Input by: \_\_\_\_\_  
 Address: \_\_\_\_\_ Job Name: \_\_\_\_\_  
 Project # \_\_\_\_\_ Level: Level

**B1 NI-60 14.000" - PASSED**

Member Information		Unfactored Reactions UNPATTERNED I <sub>b</sub> (Uplift)				
Type: Joist	Application: Floor (Residential)	Big	Live	Dead	Snow	Wind
Spacing: 16" o.c.	Design Method: LSD	1	0 (99)	(37)	0	0
Moisture Condition: Dry	Building Code: NBC 2015	2	617	231	0	0
Deflection LL: 480	Load Sharing: No	3	282	106	0	0
Deflection TL: 240	Deck: 5/8" SPF Plywood Nailed and Glued					
Importance: Normal	Vibration: OK					
General Load	Vibration Span: 20'-9-14 (13%)					
Floor Live: 40 PSF	Vibration Span: 20'-9-14 (57%)					
Diaphragm: 15 PSF						

Bearings and Factored Reactions	
Bearing Length	Cap. React DL, LL, Total, Ld, Cse, Ld, Comb.
1 - SPF 3.500"	4% -36 / 125 89 (319) L, L 0.9D+1.5L (1.25D+1.5L)
2 - SPF 3.500"	25% 294 / 941 1235 LL 1.25D+1.5L
3 - SPF 3.500"	23% 131 / 422 553 L 1.25D+1.5L

Analysis Results	
Analysis	Actual Location Allowed Capacity Comb. Case



**MiTek – SAPHIRE™ Structure**

Built exclusively for component manufacturers, this software delivers the most powerful structural modeling, editing, and estimating functionality available anywhere.

The Formula Builder feature enables designers to create or store customized formulas, group formulas into sets, scheme and apply to jobs or individual objects. Create estimates by applying formulas to modeled objects. For options management, you can create and customize plan options directly from within a job file. You can include all member types in your options, from accessories to walls, and utilize option customization, such as special junction considerations for site-specific creation.

MiTek	JOB#	Job Name	1 Ply Member	Status
	CUSTOMER: _____	nordic	11 7/8" NI-40x	Design Passed
	PROJECT: _____	Label: Non Model-Floor Joist - Floor Joist		

Graphical Illustration Not to Scale. Pitch: 0/12. Designed by: MiTek SAPHIRE™ Supply Version 8.3.0.234 Update17. Report Version: 2019.10.19. 06/10/2020 11:32

DESIGN INFORMATION		ANALYSIS RESULTS	
Building Code: NBC 2015, ABC 2015, CBC 2012 (2019 Amendment)	Design Criteria: Location	Load Combination: 1.25D + 1.5L	LDf Design Limit Result
Design Methodology: LSD	Design Criteria: Location	LDf Design Limit Result	6255 lb ft Passed - 65%
Importance Category: Service Condition: Dry	Design Criteria: Location	LDf Design Limit Result	914 lb Passed - 39%
System Live Load: 40.0 psf	Design Criteria: Location	LDf Design Limit Result	2207 lb 5361 lb Passed - L731
System Dead Load: 15.0 psf	Design Criteria: Location	LDf Design Limit Result	2207 lb 5361 lb Passed - L531
Joist Spacing: 16" o.c.	Design Criteria: Location	LDf Design Limit Result	2207 lb 5361 lb Passed - L612
LL Deflection Limit: L/480, 0.75" (absolute)	Design Criteria: Location	LDf Design Limit Result	17'-5" 18'-7/16" 97%
TL Deflection Limit: L/240, 1.50" (absolute)	Design Criteria: Location	LDf Design Limit Result	

SUPPORT AND REACTION INFORMATION	
Input Bearing Length	Controlling Load Combinations
1 3 1/2"	1.25D + 1.5L 1.00 945 lb
2 3 1/2"	1.25D + 1.5L 1.00 945 lb

SUPPORTED REACTIONS	
Typ	Start Loc. End Loc. Source F. fact. Dead (D) Live (L) Snow (S) Wind (W)
Uniform	0' 16' Smoothed Load Top 20.00 lb/ft 53.00 lb/ft

UNFACTORED REACTIONS	
ID	Start Loc. End Loc. Source F. fact. Dead (D) Live (L) Snow (S) Wind (W)
1	0' 0' 3 1/2" 180.00 lb 450.00 lb - -
2	17'-8 1/2" 18' 180.00 lb 450.00 lb - -

**DESIGN NOTES**

- The dead loads used in the design of this member were applied to the structure as sloped dead loads.
- Analysis and Design has been performed using precision loading from actual modeled conditions. Some loads may have been modified to simplify reporting.

**Required Factored Resistance of Support:**  
 • R16-End. Resasn. (lb-ft): 3-10"

## Dead Load

### Material Weights

Material	(psf)	Material	(psf)
<b>Sheathing and decking</b>		<b>Floor fill</b>	
OSB, 3/8-in.	1.4	Gypsum concrete, 3/4-in.	6.9
OSB, 7/16-in.	1.6	Lightweight concrete, 1-1/2-in.	12
OSB, 1/2-in.	1.9	Stone concrete, 1-1/2-in.	18
OSB, 19/32-in.	2.2		
OSB, 23/32-in.	2.7	<b>Floor finishes</b>	
Plywood, 11/32-in.	1.1	Carpet and pad	2.0
Plywood, 15/32-in.	1.5	Ceramic or quarry tile (3/4-in.) on 1/2-in. mortar bed	16
Plywood, 19/32-in.	1.9	Ceramic or quarry tile (3/4-in.) on 1-in. mortar bed	23
Plywood, 23/32-in.	2.3	Hardwood flooring, nominal 1-in.	4.0
Plywood, 1-1/8-in.	3.6	Linoleum or asphalt tile, 1/4-in.	1.0
Metal deck, 20 gage	2.5	Marble and mortar on stone-concrete fill	33
Metal deck, 18 gage	3.0	Slate (per inch thickness)	15
Wood decking, 1-in.	3.0	Subflooring, 3/4-in.	3.0
Wood decking, 2-in.	5.0		
Wood decking, 3-in.	8.0	<b>Floors (12-in. spacing)</b>	
		2 x 6	2.1
		2 x 8	2.8
		2 x 10	3.6
		2 x 12	4.3
		Nordic I-joists <sup>(a)</sup>	2.55 - 5.25
<b>Ceilings</b>		<b>Partitions</b>	
Gypsum board, 1/2-in.	2.2	Wood or steel studs, 1/2-in. gypsum board each side	8.0
Gypsum board, 5/8-in.	2.8	Wood studs, 2 x 4, unplastered	4.0
Mechanical duct allowance	4.0	Wood studs, 2 x 4, plastered one side	12
Plaster on wood lath	8.0	Wood studs, 2 x 4, plastered two sides	20
Suspended steel channel system	2.0		
Wood furring suspension system	2.5	<b>Walls <sup>(b)</sup></b>	
		<b>Exterior stud walls</b>	
		5/8-in. gypsum, insulated, 3/8-in. siding	
		2 x 4 at 16-in. o.c.	11
		2 x 6 at 16-in. o.c.	12
		With brick veneer	48
		Windows, glass, frame and sash	8.0
<b>Coverings</b>		<b>Insulation (per inch thickness)</b>	
Asbestos-cement shingles	4.0	Cellular glass	0.7
Asphalt shingles	2.0	Fibrous glass	1.1
Wood shingles	3.0	Fibreboard	1.5
Cement tile	16	Perlite	0.8
Clay tile (for mortar add 10 psf)		Polystyrene foam	0.2
Minimum	10	Rigid insulation	1.5
Spanish	19	Urethane foam with skin	0.5
Composition			
Three-ply ready roofing	1.0		
Four-ply felt and gravel	5.5		
Five-ply felt and gravel	6.0		
Gypsum sheathing, 1/2-in.	2.0		
Skylight, metal frame, 3/8-in. wire glass	8.0		
<b>Waterproofing membranes</b>			
Bituminous, gravel-covered	5.5		
Bituminous, smooth surface	1.5		
Liquid applied	1.0		
Single-ply, sheet	0.7		

a) See pages 2.3 and 5.2 for residential and commercial I-joist weight, respectively.

b) Wall weights in pounds per square foot of wall. Multiply weight times wall height for pounds per linear foot (plf).

#### Notes:

- Estimated material weights in pounds per square foot (psf).
- Adding 1.0 to 2.0 psf is recommended for miscellaneous dead loads.
- Wood decking and 2x lumber weight based on Douglas Fir.
- For additional information, refer to *Minimum Design Loads for Buildings and Other Structures*, Standard ASCE 7, Tables C3-1 and C3-2.



## Conversion Factors

### Conversion Factors

Item	Imperial to metric		Metric to imperial	
Length	1 in.	= 25.4 mm	1 mm	= 0.0393701 in.
		= 0.0254 m	1 m	= 39.3701 in.
	1 ft	= 0.3048 m		= 3.28084 ft
	1 yd	= 0.9144 m		= 1.09361 yd
	1 mile	= 1.60934 km	1 km	= 0.621371 mile
Length / time	1 ft/s	= 0.3048 m/s	1 m/s	= 3.28084 ft/s
	1 mph	= 1.60934 km/h	1 km/h	= 0.621371 mph
Area	1 in. <sup>2</sup>	= 645.16 mm <sup>2</sup>	1 mm <sup>2</sup>	= 0.001550 in. <sup>2</sup>
	1 ft <sup>2</sup>	= 0.0929030 m <sup>2</sup>	1 m <sup>2</sup>	= 10.7639 ft <sup>2</sup>
	1 acre	= 0.404686 ha	1 ha	= 2.47105 acres
	1 mi <sup>2</sup>	= 2.58999 km <sup>2</sup>	1 km <sup>2</sup>	= 0.386102 mi <sup>2</sup>
Volume	1 in. <sup>3</sup>	= 16 387.1 mm <sup>3</sup>	1 mm <sup>3</sup>	= 0.0000610237 in. <sup>3</sup>
	1 ft <sup>3</sup>	= 0.0283168 m <sup>3</sup>	1 m <sup>3</sup>	= 35.3147 ft <sup>3</sup>
	1 yd <sup>3</sup>	= 0.764555 m <sup>3</sup>		= 1.30795 yd <sup>3</sup>
	1 fl oz (US)	= 29.5735 mL	1 mL	= 0.0338141 fl oz (US)
	1 gal (US)	= 3.78541 L	1 L	= 0.264172 gal (US)
Mass	1 oz	= 28.3495 g	1 g	= 0.0352740 oz
	1 lb	= 0.453592 kg	1 kg	= 2.20462 lb
	1 short ton (2000 lb)	= 0.907185 tons	1 ton	= 1.10231 short tons
Mass / volume	1 lb/ft <sup>3</sup>	= 16.0185 kg/m <sup>3</sup>	1 kg/m <sup>3</sup>	= 0.0624280 lb/ft <sup>3</sup>
Force	1 lbf	= 4.44822 N	1 N	= 0.224809 lbf
Stress	1 lbf/in. <sup>2</sup> (psi)	= 0.00689476 N/mm <sup>2</sup> (MPa)	1 N/mm <sup>2</sup> (MPa)	= 145.038 lbf/in. <sup>2</sup> (psi)
Loading	1 lbf/ft <sup>2</sup> (psf)	= 0.0478803 kN/m <sup>2</sup> (kPa)	1 kN/m <sup>2</sup> (kPa)	= 20.8854 lbf/ft <sup>2</sup> (psf)
	1 lbf/ft (plf)	= 0.0145939 kN/m	1 kN/m	= 68.5218 lbf/ft (plf)
Bending moment	1 lbf-ft	= 0.00135582 kN-m	1 kN-m	= 737.561 lbf-ft
Temperature	1 °F	= (°F - 32) / 1.8 °C	1 °C	= 32 + 1.8 (°C) °F

Notes:

1. 9.80665 N = 1.0 kg x 9.80665 m/s<sup>2</sup>
2. 1.0 Pa = 1.0 N/m<sup>2</sup>





 construction details → **DC3**

 installation guide → **GI31**

 product warranty → **NS-D1002**