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# ESR-1742

Reissued 04/2017  
This report is subject to renewal 04/2019.

**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**

**SECTION: 06 17 33—WOOD I-JOISTS**

**REPORT HOLDER:**

## NORDIC ENGINEERED WOOD

1100, AVE DES CANADIENS-DE-MONTRÉAL  
WINDSOR STATION – SUITE 504  
MONTRÉAL, QUEBEC H3B 2S2  
CANADA

**EVALUATION SUBJECT:**

## NI SERIES PREFABRICATED I-JOISTS



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# ICC-ES Evaluation Report

**ESR-1742**

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A Subsidiary of the International Code Council®

**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**

**Section: 06 17 33—Wood I-joists**

**REPORT HOLDER:**

**NORDIC ENGINEERED WOOD  
WINDSOR STATION – SUITE 504  
1100, AVE DES CANADIENS-DE-MONTRÉAL  
MONTRÉAL, QUÉBEC H3B 2S2  
CANADA  
(514) 871-8526  
[www.nordicewp.com](http://www.nordicewp.com)  
[info@nordicewp.com](mailto:info@nordicewp.com)**

**EVALUATION SUBJECT:**

**NI SERIES PREFABRICATED I-JOISTS**

**1.0 EVALUATION SCOPE**

**1.1 Compliance with the following codes:**

- 2012 and 2009 *International Building Code*® (IBC)
- 2012 and 2009 *International Residential Code*® (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

**Properties evaluated:**

- Structural
- Fire resistance

**1.2 Evaluation to the following green code(s) and/or standards:**

- 2016 California Green Building Standards Code (CALGreen), Title 24, Part 11
- 2015, 2012 and 2008 ICC 700 *National Green Building Standard*™ (ICC 700-2015, ICC 700-2012 and ICC 700-2008)

**Attributes verified:**

- See Section 3.1

**2.0 USES**

NI Series Prefabricated Wood I-Joists are used as rafters and floor joists.

**3.0 DESCRIPTION**

**3.1 General:**

The NI series prefabricated I-joists described in this report have solid-sawn or glued laminated lumber flanges

and oriented strand board (OSB) webs. The top and bottom flanges are parallel, creating a constant-depth I-joist. The web-to-web connection of adjacent OSB panels is jointed and glued to form a continuous web. The web-to-flange connection is a proprietary, glued, tongue-and-groove joint. Joist depths vary from 7<sup>1</sup>/<sub>8</sub> inches to 24 inches (200 mm to 610 mm). See Tables 1 and 2 for I-joist descriptions and design properties, respectively.

The attributes of the wood joists have been verified as conforming to the provisions of (i) CALGreen Sections A4.404.3 for efficient framing techniques; (ii) ICC 700-2015 and ICC 700-2012 Section 608.1(2), 11.608.1(2) and 12(A).608.1 for resource-efficient materials; and (iii) ICC 700-2008 Section 607.1(2) for resource-efficient materials. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

**3.2 Materials:**

**3.2.1 Flanges:** Flange material for all I-joist series except the NI-20 and NI-90x is spruce-pine-fir (SPF), machine-stress-rated (MSR), finger-joined lumber. Flange material for the NI-20 series is visually graded lumber, and flange material for the NI-90x series is glued laminated lumber, manufactured in accordance with the manufacturer's (Nordic Engineered Wood) quality control manual.

**3.2.2 Webs:** Webs are 3<sup>3</sup>/<sub>8</sub>-inch-thick (9.5 mm) or 7<sup>1</sup>/<sub>16</sub>-inch-thick (11.1 mm) OSB panels conforming with Structural I, Exposure 1, performance-rated panel requirements as noted in DOC PS2 and the approved manufacturer's quality control manual.

**3.2.3 Adhesive:** Exterior-type adhesives used in I-joist fabrication comply with ASTM D2559 and Section 5.4.3 of ASTM D5055-12.

**4.0 DESIGN AND INSTALLATION**

**4.1 General:**

Drawings and/or specifications for the erection of the Nordic NI series I-joists must be submitted to the code official. These documents and this report must be strictly adhered to, and copies of these documents must be available at all times on the jobsite during installation.

**4.2 Design Properties:**

Design properties for the Nordic NI series I-joists are noted in Table 2. Duration of load adjustments to the tabulated values for allowable shear and moment are applicable in

accordance with the National Design Specification for Wood Construction (NDS).

When joists are used as simple span members, the design shear to be resisted must be taken as equal to the calculated end reaction for the joists. When joists are used as uniformly loaded multiple span members, continuous over one or more interior supports, or in applications involving cantilevers, the design shear must be taken as the maximum shear at the face of the supports, using standard engineering and loading principles.

Midspan deflections for a uniformly loaded simple span condition or a simple span condition with a concentrated load at midspan must be calculated using the equations given in the notes to Table 2.

#### 4.3 Web Hole Size and Location:

Nordic NI series I-joists provide 1<sup>1</sup>/<sub>2</sub>-inch-diameter (38 mm) knockout holes at 15 inches (381 mm) on center along the length of the joists to facilitate the installation of electrical wiring or light plumbing lines. These knockouts can be removed with a hammer as needed.

If the size of the knockout holes is insufficient for the specific end-use application, larger holes may be field-cut in the web in accordance with the limitations set forth in Figure 1 and Table 3. These provisions apply to uniformly loaded, simple or multiple span Nordic NI series I-joists when dead loads do not exceed 10 psf (0.5 kN/m<sup>2</sup>) and live loads do not exceed 40 psf (1.9 kN/m<sup>2</sup>).

#### 4.4 One-hour Fire-resistive Floor-ceiling or Roof-Ceiling Assemblies:

I-joists may be used as wood structural framing members in one-hour fire-resistive floor-ceiling assemblies when the assemblies are constructed in accordance with Sections 4.4.1 through 4.4.4 of this report.

**4.4.1 Assembly 1:** The I-joists are permitted to be used in the one-hour fire-resistive floor-ceiling assemblies described in ICC-ES evaluation report [ESR-1405](#), Section 4.2.2.1.

**4.4.2 Assembly 2:** The I-joists are permitted to be used in lieu of the wood joists or trusses in the one-hour floor-ceiling assembly (Section 4.2.2.4) described in ICC-ES evaluation report [ESR-1338](#).

**4.4.3 Assembly 3:** The I-joists are permitted to be used in the one-hour fire-resistive floor-ceiling assemblies described in ICC-ES evaluation report [ESR-1405](#), Section 4.2.2.3.

**4.4.4 Other Fire-resistive Assemblies:** The I-joists described in this report may be used in the assemblies described in 2012 IBC Table 721.1(3) and 2009 IBC Table 720.1(3), Item Numbers 23-1.1 through 28-1.1, provided the I-joists used meet the criteria described in the table's "Floor or Roof Construction" column.

**4.5 I-Joist Flanges:** Flanges must not be cut.

#### 4.6 Bearing Stiffeners:

Field-installed bearing stiffeners must be provided at points of end bearing when reactions exceed those permitted by Table 2 for unstiffened webs. Such stiffeners must be installed, when required, and must be of the type shown in Figure 2.

Bearing stiffeners must be provided at interior supports when required by Table 2. Such stiffeners must be installed, when required, and must be of the type shown in Figure 2.

#### 4.7 Web Stiffeners:

Field-installed web stiffeners are required at points of concentrated loads when required by Figure 2. Such stiffeners, when required, must be of the type shown in Figure 2 and Table 4, and must be installed in accordance with Figure 2.

#### 4.8 Bearing Sizes:

Ends of joists must be provided with a minimum of 1<sup>3</sup>/<sub>4</sub> inches (45 mm) of bearing length.

Interior supports must be provided with a minimum of 3<sup>1</sup>/<sub>2</sub> inches (89 mm) of bearing length.

#### 4.9 Blocking Panels:

The Nordic NI Proprietary series I-joists must be restrained against lateral movement and rotation at their supports. This may be accomplished by using blocking panels or rim joists at the ends of the joists. The band joist, no matter what its composition, must be placed under the load from above so that it transmits such load to the foundation or supporting structure below.

#### 4.10 Bracing:

Wood panel sheathing complying with the requirements of the code must be nailed or glue-nailed to the top flange of the Nordic NI Proprietary series I-joists to prevent lateral movement in service. Additionally, the top flange must be braced to prevent toppling of the beam or buckling of the top flange during construction.

### 5.0 CONDITIONS OF USE

The NI Series Prefabricated Wood I-Joists described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** For applications based on Tables 1 through 3, design calculations and details for specific applications must be furnished to the code official. Calculations and drawings must be prepared, signed and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.2** No cutting of the flanges is permitted, and holes in the webs must conform to the requirements given in Figure 1.
- 5.3** I-joists are permitted in dry-use service conditions only.
- 5.4** I-joists are manufactured at the Chantiers Chibougamau Ltd. facility in Chibougamau, Quebec, Canada, with quality control inspections by ICC-ES.

### 6.0 EVIDENCE SUBMITTED

Data in accordance with ICC-ES Acceptance Criteria for Prefabricated Wood I-joists (AC14), dated June 2013.

### 7.0 IDENTIFICATION

Each I-joist must be marked with the product trade name; the joist series; the production date; the evaluation report number (ESR-1742); the name of the manufacturer (Nordic Engineered Wood); and the plant location or number.

TABLE 1—NI SERIES PREFABRICATED WOOD I-JOISTS

| SERIES | JOIST DEPTH (inches)   | FLANGE MATERIAL                      | FLANGE DIMENSIONS Width x Depth (inches) | WEB MATERIAL                       |
|--------|--|--------------------------------------|--|------------------------------------|
| NI-20  | 9 <sup>1</sup> / <sub>4</sub> - 11 <sup>7</sup> / <sub>8</sub> | Visually Graded No. 2                | 2.5 x 1.5                                | <sup>3</sup> / <sub>8</sub> " OSB  |
| NI-40  | 9 <sup>1</sup> / <sub>2</sub> - 16                             | MSR 1650f-1.5E                       | 2.5 x 1.5                                | <sup>3</sup> / <sub>8</sub> " OSB  |
| NI-40x | 7 <sup>7</sup> / <sub>8</sub> - 16                             | Enhanced <sup>1</sup> MSR 1650f-1.5E | 2.5 x 1.5                                | <sup>3</sup> / <sub>8</sub> " OSB  |
| NI-60  | 7 <sup>7</sup> / <sub>8</sub> - 18                             | MSR 2100f-1.8E                       | 2.5 x 1.5                                | <sup>3</sup> / <sub>8</sub> " OSB  |
| NI-70  | 9 <sup>1</sup> / <sub>2</sub> - 16                             | MSR 1950f-1.7E                       | 3.5 x 1.5                                | <sup>3</sup> / <sub>8</sub> " OSB  |
| NI-80  | 7 <sup>7</sup> / <sub>8</sub> to 16                            | MSR 2100f-1.8E                       | 3.5 x 1.5                                | <sup>3</sup> / <sub>8</sub> " OSB  |
| NI-80x | 18 - 24  | MSR 2100f-1.8E                       | 3.5 x 1.5                                | <sup>7</sup> / <sub>16</sub> " OSB |
| NI-90x | 11 <sup>7</sup> / <sub>8</sub> - 16                            | Glued Laminated Lumber               | 3.5 x 2.0                                | <sup>7</sup> / <sub>16</sub> " OSB |

For SI: 1 inch = 25.4 mm.

<sup>1</sup>"Enhanced" flange material refers to a proprietary grade conforming to additional grading rules specified in the approved quality control manual.

TABLE 2—DESIGN PROPERTIES FOR NORDIC I-JOISTS <sup>1,2</sup>

| DEPTH (inches)                 | JOIST SERIES | EI <sup>3</sup> (10 <sup>6</sup> lb-in <sup>2</sup> ) | M <sub>r</sub> <sup>4</sup> (lb-ft) | V <sub>r</sub> <sup>5</sup> (lb) | REFERENCE DESIGN REACTION, R <sub>r</sub> (lb) |       |                                     |       |                                     |       |        |       | K <sup>a</sup> (10 <sup>6</sup> lb) |
|--------------------------------|--------------|---|-------------------------------------|----------------------------------|--|-------|-------------------------------------|-------|-------------------------------------|-------|--------|-------|-------------------------------------|
|                                |              |   |                                     |                                  | Intermediate Reaction (lb) <sup>6</sup>        |       |                                     |       | End Reaction (lb) <sup>7,8</sup>    |       |        |       |                                     |
|                                |              |   |                                     |                                  | 3 <sup>1</sup> / <sub>2</sub> -inch            |       | 5 <sup>1</sup> / <sub>2</sub> -inch |       | 1 <sup>3</sup> / <sub>4</sub> -inch |       | 4-inch |       |                                     |
|                                |              |   |                                     |                                  | w/o WS   | w/ WS | w/o WS                              | w/ WS | w/o WS                              | w/ WS | w/o WS | w/ WS |                                     |
| 7 <sup>7</sup> / <sub>8</sub>  | NI-40x       | 138   | 2310                                | 880                              | 2,010  | 2,010 | 2,010                               | 2,010 | 880                                 | 880   | 880    | 880   | 4.10                                |
|                                | NI-60        | 147   | 3030                                | 880                              | 2,010  | 2,010 | 2,010                               | 2,010 | 880                                 | 880   | 880    | 880   | 4.10                                |
|                                | NI-80        | 204   | 4285                                | 880                              | 2,010  | 2,010 | 2,010                               | 2,010 | 880                                 | 880   | 880    | 880   | 4.10                                |
| 9 <sup>1</sup> / <sub>4</sub>  | NI-20        | 138   | 2510                                | 1080                             | 2,350  | 2,360 | 2,510                               | 2,510 | 1,015                               | 1,015 | 1,080  | 1,080 | 4.81                                |
|                                | NI-40x       | 198   | 2810                                | 1170                             | 2,350  | 2,360 | 2,535                               | 2,550 | 1,135                               | 1,135 | 1,170  | 1,170 | 4.81                                |
|                                | NI-60        | 217   | 3680                                | 1170                             | 2,350  | 2,375 | 2,540                               | 2,550 | 1,135                               | 1,135 | 1,170  | 1,170 | 4.81                                |
|                                | NI-80        | 304   | 5215                                | 1170                             | 2,350  | 2,570 | 2,580                               | 2,580 | 1,170                               | 1,170 | 1,170  | 1,170 | 4.81                                |
| 9 <sup>1</sup> / <sub>2</sub>  | NI-20        | 145   | 2590                                | 1120                             | 2,410  | 2,425 | 2,575                               | 2,575 | 1,035                               | 1,035 | 1,120  | 1,120 | 4.94                                |
|                                | NI-40        | 193   | 2735                                | 1200                             | 2,410  | 2,425 | 2,630                               | 2,645 | 1,175                               | 1,200 | 1,200  | 1,200 | 4.94                                |
|                                | NI-40x       | 218   | 2900                                | 1200                             | 2,410  | 2,425 | 2,630                               | 2,645 | 1,175                               | 1,200 | 1,200  | 1,200 | 4.94                                |
|                                | NI-60        | 231   | 3810                                | 1200                             | 2,415  | 2,440 | 2,635                               | 2,665 | 1,175                               | 1,200 | 1,200  | 1,200 | 4.94                                |
|                                | NI-70        | 304   | 5120                                | 1200                             | 2,415  | 2,670 | 2,685                               | 2,685 | 1,200                               | 1,200 | 1,200  | 1,200 | 4.94                                |
|                                | NI-80        | 324   | 5385                                | 1200                             | 2,415  | 2,670 | 2,685                               | 2,685 | 1,200                               | 1,200 | 1,200  | 1,200 | 4.94                                |
| 11 <sup>1</sup> / <sub>4</sub> | NI-20        | 222   | 3155                                | 1340                             | 2,845  | 2,870 | 3,045                               | 3,045 | 1,190                               | 1,190 | 1,340  | 1,340 | 5.85                                |
|                                | NI-40x       | 313   | 3535                                | 1410                             | 2,845  | 2,870 | 3,300                               | 3,330 | 1,250                               | 1,410 | 1,410  | 1,410 | 5.85                                |
|                                | NI-60        | 347   | 4630                                | 1410                             | 2,850  | 2,905 | 3,310                               | 3,375 | 1,250                               | 1,410 | 1,410  | 1,410 | 5.85                                |
|                                | NI-80        | 484   | 6560                                | 1410                             | 2,850  | 3,155 | 3,410                               | 3,410 | 1,330                               | 1,410 | 1,410  | 1,410 | 5.85                                |
| 11 <sup>7</sup> / <sub>8</sub> | NI-20        | 253   | 3355                                | 1420                             | 3,000  | 3,030 | 3,215                               | 3,215 | 1,245                               | 1,245 | 1,420  | 1,420 | 6.18                                |
|                                | NI-40        | 330   | 3545                                | 1480                             | 3,000  | 3,030 | 3,540                               | 3,575 | 1,275                               | 1,480 | 1,480  | 1,480 | 6.18                                |
|                                | NI-40x       | 371   | 3760                                | 1480                             | 3,000  | 3,030 | 3,540                               | 3,575 | 1,275                               | 1,480 | 1,480  | 1,480 | 6.18                                |
|                                | NI-60        | 396   | 4935                                | 1480                             | 3,005  | 3,070 | 3,550                               | 3,625 | 1,275                               | 1,480 | 1,480  | 1,480 | 6.18                                |
|                                | NI-70        | 515   | 6635                                | 1480                             | 3,005  | 3,330 | 3,670                               | 3,670 | 1,350                               | 1,480 | 1,480  | 1,480 | 6.18                                |
|                                | NI-80        | 547   | 6980                                | 1480                             | 3,005  | 3,330 | 3,670                               | 3,670 | 1,350                               | 1,480 | 1,480  | 1,480 | 6.18                                |
|                                | NI90x        | 615   | 9465                                | 2055                             | 4,170  | 4,170 | 4,170                               | 4,170 | 1,765                               | 2,055 | 1,885  | 2,055 | 6.18                                |
| 14                             | NI-40        | 482   | 4270                                | 1730                             | 3,130  | 3,160 | 3,530                               | 3,565 | 1,325                               | 1,690 | 1,550  | 1,730 | 7.28                                |
|                                | NI-40x       | 540   | 4530                                | 1730                             | 3,130  | 3,160 | 3,530                               | 3,565 | 1,325                               | 1,690 | 1,550  | 1,730 | 7.28                                |
|                                | NI-60        | 584   | 5945                                | 1730                             | 3,140  | 3,260 | 3,540                               | 3,795 | 1,345                               | 1,690 | 1,550  | 1,730 | 7.28                                |
|                                | NI-70        | 749   | 7990                                | 1730                             | 3,330  | 3,640 | 3,820                               | 4,075 | 1,455                               | 1,690 | 1,550  | 1,730 | 7.28                                |
|                                | NI-80        | 802   | 8405                                | 1730                             | 3,330  | 3,640 | 3,820                               | 4,075 | 1,455                               | 1,690 | 1,550  | 1,730 | 7.28                                |
|                                | NI-90x       | 910   | 11415                               | 2210                             | 4,170  | 4,170 | 4,170                               | 4,170 | 1,800                               | 2,210 | 1,885  | 2,210 | 7.28                                |
| 16                             | NI-40        | 657   | 4950                                | 1970                             | 3,255  | 3,285 | 3,520                               | 3,555 | 1,370                               | 1,875 | 1,550  | 1,970 | 8.32                                |
|                                | NI-40x       | 734   | 5250                                | 1970                             | 3,255  | 3,285 | 3,520                               | 3,555 | 1,370                               | 1,875 | 1,550  | 1,970 | 8.32                                |
|                                | NI-60        | 799   | 6895                                | 1970                             | 3,265  | 3,440 | 3,530                               | 3,955 | 1,410                               | 1,875 | 1,550  | 1,970 | 8.32                                |
|                                | NI-70        | 1015  | 9265                                | 1970                             | 3,640  | 3,930 | 3,960                               | 4,455 | 1,550                               | 1,875 | 1,550  | 1,970 | 8.32                                |
|                                | NI-80        | 1092  | 9745                                | 1970                             | 3,640  | 3,930 | 3,960                               | 4,455 | 1,550                               | 1,875 | 1,550  | 1,970 | 8.32                                |
|                                | NI-90x       | 1245  | 13100                               | 2325                             | 4,170  | 4,170 | 4,170                               | 4,170 | 1,830                               | 2,325 | 1,885  | 2,325 | 8.32                                |

TABLE 2—DESIGN PROPERTIES FOR NORDIC I-JOISTS <sup>1,2</sup> (CONTINUED)

| DEPTH<br>(inches) | JOIST<br>SERIES | EI <sup>3</sup><br>(10 <sup>6</sup> lb-in <sup>2</sup> ) | M <sub>r</sub> <sup>4</sup><br>(lb-ft) | V <sub>r</sub> <sup>5</sup><br>(lb) | REFERENCE DESIGN REACTION, R <sub>r</sub> (lb) |       |                                     |       |                                     |       |        |       | K <sup>9</sup><br>(10 <sup>6</sup> lb) |
|-------------------|-----------------|--|--|-------------------------------------|--|-------|-------------------------------------|-------|-------------------------------------|-------|--------|-------|--|
|                   |                 |  |  |                                     | Intermediate Reaction (lb) <sup>6</sup>        |       |                                     |       | End Reaction (lb) <sup>7,8</sup>    |       |        |       |  |
|                   |                 |  |  |                                     | 3 <sup>1</sup> / <sub>2</sub> -inch            |       | 5 <sup>1</sup> / <sub>2</sub> -inch |       | 1 <sup>3</sup> / <sub>4</sub> -inch |       | 4-inch |       |  |
|                   |                 |  |  |                                     | w/o WS   | w/ WS | w/o WS                              | w/ WS | w/o WS                              | w/ WS | w/o WS | w/ WS |  |
| 18                | NI-60           | 1019   | 7800                                   | 2000                                | 2,800  | 3,620 | 3,260                               | 4,115 | 1,475                               | 2,000 | 1,850  | 2,000 | 9.36                                   |
|                   | NI-80x          | 1399   | 10,990                                 | 2360                                | 3,115  | 3,820 | 3,280                               | 4,420 | 1,300                               | 1,900 | 1,850  | 2,360 | 9.36                                   |
| 20                | NI-80x          | 1771   | 12,315                                 | 2450                                | 3,190  | 4,120 | 3,410                               | 4,575 | 1,320                               | 2,045 | 1,900  | 2,450 | 10.40                                  |
| 22                | NI-80x          | 2191   | 13,645                                 | 2530                                | 3,265  | 4,425 | 3,535                               | 4,730 | 1,340                               | 2,195 | 1,950  | 2,530 | 11.44                                  |
| 24                | NI-80x          | 2660   | 14,975                                 | 2600                                | 3,340  | 4,725 | 3,665                               | 4,885 | 1,360                               | 2,340 | 2,000  | 2,600 | 12.48                                  |

For SI: 1 inch = 25.4 mm, 1 lb = 4.448 N, 1 ft-lb = 1.35 N-m, 1 lb-in<sup>2</sup> = 179 N-mm<sup>2</sup>.

<sup>1</sup>The tabulated values are design values for normal duration of load (10 years). All values, except for EI and K, are permitted to be adjusted for other durations of load in accordance with the NDS. Reference design reaction values, R<sub>r</sub>, may be adjusted for other durations of load in accordance with the NDS, provided the adjusted design reaction value, (R<sub>r</sub>), does not exceed the adjusted flange bearing capacity, (P<sub>c</sub>), calculated as follows:

$$P_c = F_{cp} C_b C_{fb} (W_f - 0.15)$$

- where: F<sub>cp</sub> = 425 psi for end reactions, 470 psi for 3<sup>1</sup>/<sub>2</sub>-inch intermediate reactions, and 454 psi for 5<sup>1</sup>/<sub>2</sub>-inch intermediate reactions.
- C<sub>b</sub> = Bearing area factor as defined in Section 3.10.4 of the NDS, if applicable.
- C<sub>fb</sub> = Bearing length of the I-joist in inches.
- W<sub>f</sub> = Bearing width of the flange in inches (see Table 1).
- 0.15 = Allowance for the flange edge easing

<sup>2</sup>The vertical load capacity (VLC), for transfer of vertical uniform loads when I-joists are used as continuously-supported blocking, for NI series I-joists without web stiffeners is 2000 lb/ft for I-joist depths up to 16 inches, 1850 lb/ft for the 18-inch NI-60 series, and 1275 lb/ft for the NI-80x series having depths from 18 inches to 24 inches. The VLC values must be decreased for permanent loads per the NDS, but are not permitted to be increased for shorter durations.

<sup>3</sup>Reference design bending stiffness (EI) of the I-joist.

<sup>4</sup>Reference design moment, (M<sub>r</sub>) of the I-joist. The repetitive-member-use factor, (C<sub>r</sub>) equals 1.0 in all cases.

<sup>5</sup>Reference design shear, (V<sub>r</sub>) of the I-joist.

<sup>6</sup>Intermediate reaction design values require a minimum bearing length of 3<sup>1</sup>/<sub>2</sub> inches or 5<sup>1</sup>/<sub>2</sub> inches, as shown. Values are given for applications with web stiffeners (w/ WS), and without web stiffeners (w/o WS). Where required, web stiffeners must be installed in accordance with Figure 2 and Table 4.

<sup>7</sup>End reaction design values require a minimum bearing length of 1<sup>3</sup>/<sub>4</sub> inches or 4 inches, as shown. Values are given for applications with web stiffeners (w/ WS), and without web stiffeners (w/o WS). Where required, web stiffeners must be installed in accordance with Figure 2 and Table 4.

<sup>8</sup>Reaction capacity shall be permitted to be increased over that tabulated for the minimum bearing length by linear interpolation of the reaction capacity between the minimum and maximum bearing lengths. Extrapolation beyond the minimum and maximum bearing lengths is beyond the scope of this table.

<sup>9</sup>Coefficient of shear deflection (K). For calculating uniform load and center-point load deflections of the I-joists in a simple span application, use equations 1 and 2, respectively. For all other loading and support conditions, deflection must be calculated using standard engineering formulae, accounting for both bending and shear deformation.

Simple span uniformly distributed load:

$$\delta = \frac{5wL^4}{384EI} + \frac{wL^2}{k} \quad (1)$$

Simple span concentrated load at center of span:

$$\delta = \frac{Pl^3}{48EI} + \frac{2Pl}{k} \quad (2)$$

where:

- δ = Deflection (inches)
- EI = Stiffness (moment of inertia times modulus of elasticity) (lb-in<sup>2</sup>)
- k = Shear deflection coefficient (lbs)
- l = Effective span (inches)
- P = Concentrated load (lb)
- w = Uniform load (pounds per lineal inch)

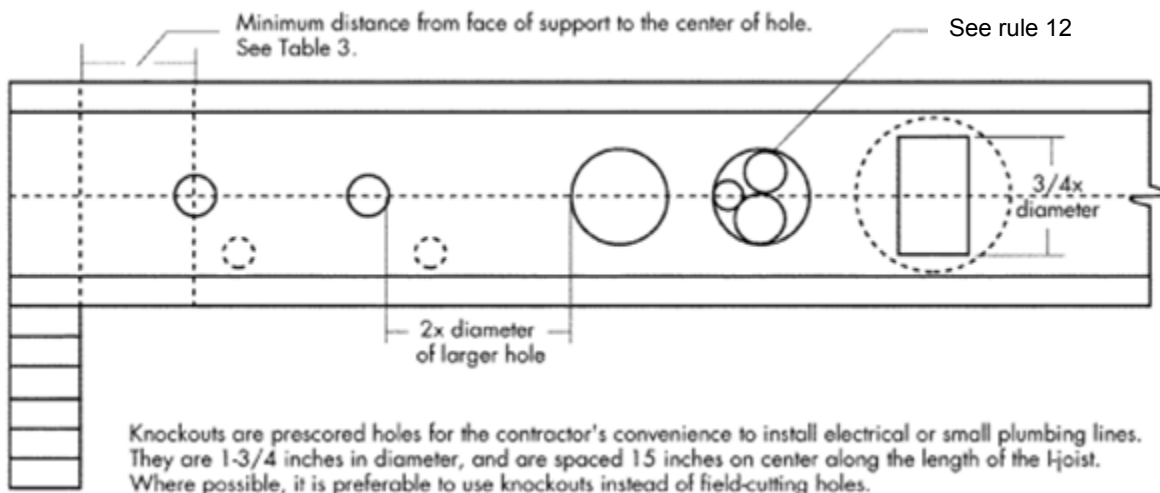


FIGURE 1—TYPICAL HOLES

**Rules for cutting holes in NI Joists**

1. The distance between the inside edge of the support and the centerline of any hole must be in compliance with the requirements of Table 3.
2. I-joist top and bottom flanges must NEVER be cut, notched, or otherwise modified.
3. Whenever possible, field-cut holes should be centered 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 three-fourths 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 3.
7. A knockout is not considered a hole, may be utilized anywhere it occurs and may be ignored for purposes of calculating minimum distances between holes.
8. Holes measuring 1 1/2 inches or smaller shall be permitted anywhere in a cantilevered section of a joist. Holes of greater size may be permitted subject to verification.
9. 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.
10. All holes shall be cut in a workman-like manner in accordance with the restrictions listed above and as illustrated in Figure 1.
11. Limit three maximum-size holes per span.
12. A group of round holes at approximately the same location shall be permitted if they meet the requirements for a single round hole circumscribed around them.

**TABLE 3—LOCATION OF CIRCULAR HOLES IN NI-SERIES I-JOIST WEBS, SIMPLE OR MULTIPLE SPAN, FOR LIVE LOADS UP TO 40 psf AND DEAD LOADS UP TO 10 psf<sup>1,2,3,4</sup>**

| JOIST DEPTH (in.) | JOIST SERIES | SAF <sup>5</sup> (ft-in) | MINIMUM DISTANCE FROM INSIDE FACE OF ANY SUPPORT TO CENTER OF HOLE (ft-in) |      |      |      |      |       |      |      |       |      |       |        |       |      |        |
|-------------------|--------------|--------------------------|--|------|------|------|------|-------|------|------|-------|------|-------|--------|-------|------|--------|
|                   |              |                          | Round Hole Diameter (in.)  |      |      |      |      |       |      |      |       |      |       |        |       |      |        |
|                   |              |                          | 2  | 3    | 4    | 5    | 6    | 6 1/4 | 7    | 8    | 8 5/8 | 9    | 10    | 10 3/4 | 11    | 12   | 12 3/4 |
| 7 7/8             | NI-40x       | 12-11                    | 1-10   | 3-2  | 4-5  |      | ---  | ---   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-60        | 13-2                     | 2-2  | 3-5  | 4-9  |      | ---  | ---   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-80        | 13-10                    | 2-4  | 3-10 | 5-6  |      | ---  | ---   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
| 9 1/4             | NI-20        | 13-3                     | 0-7  | 1-6  | 2-10 | 4-2  | 5-8  | ---   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40x       | 14-7                     | 0-7  | 1-5  | 2-10 | 4-3  | 5-11 | ---   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-60        | 14-11                    | 0-11   | 2-3  | 3-8  | 5-2  | 6-9  | ---   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-80        | 16-5                     | 2-2  | 3-5  | 4-11 | 6-5  | 8-2  | ---   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
| 9 1/2             | NI-20        | 13-6                     | 0-7  | 1-4  | 2-8  | 3-11 | 5-5  | 5-9   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40        | 14-6                     | 0-7  | 1-0  | 2-4  | 3-10 | 5-4  | 5-9   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40x       | 15-0                     | 0-7  | 1-4  | 2-8  | 4-2  | 5-8  | 6-2   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-60        | 15-3                     | 1-0  | 2-4  | 3-9  | 5-3  | 6-10 | 7-3   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-70        | 16-5                     | 1-10   | 3-3  | 4-8  | 6-2  | 7-9  | 8-3   | ---  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
| 11 1/4            | NI-20        | 15-5                     | 0-7  | 0-8  | 1-4  | 2-6  | 3-11 | 4-3   | 5-4  | 7-0  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40x       | 16-7                     | 0-7  | 0-8  | 1-5  | 2-9  | 4-2  | 4-6   | 5-8  | 7-6  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-60        | 17-5                     | 0-7  | 1-6  | 2-10 | 4-3  | 5-8  | 6-0   | 7-3  | 8-11 | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-80        | 19-1                     | 1-6  | 2-10 | 4-3  | 5-8  | 7-2  | 7-6   | 8-9  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
| 11 7/8            | NI-20        | 16-1                     | 0-7  | 0-8  | 0-10 | 2-0  | 3-4  | 3-9   | 4-9  | 6-3  | 7-5   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40        | 16-7                     | 0-7  | 0-8  | 0-8  | 1-2  | 2-8  | 3-2   | 4-5  | 6-3  | 7-6   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40x       | 17-1                     | 0-7  | 0-8  | 1-0  | 2-4  | 3-8  | 4-0   | 5-2  | 6-8  | 7-11  | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-60        | 18-2                     | 0-7  | 1-4  | 2-8  | 4-0  | 5-5  | 5-10  | 7-0  | 8-8  | 9-9   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-70        | 19-7                     | 1-2  | 2-5  | 3-9  | 5-2  | 6-8  | 7-0   | 8-2  | 9-10 | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-80        | 19-11                    | 1-4  | 2-8  | 3-11 | 5-4  | 6-10 | 7-3   | 8-5  | 10-2 | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
| 14                | NI-90x       | 20-7                     | 0-7  | 0-8  | 0-8  | 2-3  | 4-2  | 4-6   | 6-0  | ---  | ---   | ---  | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40        | 18-3                     | 0-7  | 0-8  | 0-8  | 0-9  | 1-8  | 2-0   | 3-0  | 4-4  | 5-3   | 5-10 | 7-5   | 9-2    | ---   | ---  | ---    |
|                   | NI-40x       | 18-10                    | 0-7  | 0-8  | 0-8  | 0-9  | 2-0  | 2-4   | 3-4  | 4-9  | 5-9   | 6-3  | 7-11  | 9-9    | ---   | ---  | ---    |
|                   | NI-60        | 20-8                     | 0-7  | 0-8  | 1-3  | 2-6  | 3-11 | 4-3   | 5-3  | 6-9  | 7-9   | 8-3  | 10-2  | ---    | ---   | ---  | ---    |
|                   | NI-70        | 22-2                     | 0-7  | 1-8  | 2-11 | 4-3  | 5-8  | 5-11  | 7-0  | 8-6  | 9-6   | 10-2 | 11-11 | ---    | ---   | ---  | ---    |
|                   | NI-80        | 22-7                     | 0-8  | 1-10 | 3-2  | 4-6  | 5-11 | 6-3   | 7-4  | 8-10 | 9-10  | 10-6 | 12-3  | ---    | ---   | ---  | ---    |
| 16                | NI-90x       | 23-5                     | 0-7  | 0-8  | 0-8  | 1-10 | 3-6  | 3-11  | 5-3  | 7-0  | 8-3   | 8-11 | ---   | ---    | ---   | ---  | ---    |
|                   | NI-40        | 19-8                     | 0-7  | 0-8  | 0-8  | 0-9  | 0-9  | 0-9   | 1-4  | 2-8  | 3-5   | 4-0  | 5-5   | 6-6    | 6-11  | 8-8  | 10-8   |
|                   | NI-40x       | 20-3                     | 0-7  | 0-8  | 0-8  | 0-9  | 0-9  | 0-10  | 1-9  | 3-0  | 3-10  | 4-5  | 5-10  | 6-11   | 7-4   | 9-3  | ---    |
|                   | NI-60        | 22-10                    | 0-7  | 0-8  | 0-8  | 1-2  | 2-5  | 2-9   | 3-9  | 5-0  | 5-11  | 6-6  | 7-11  | 9-2    | 9-8   | 11-9 | ---    |
|                   | NI-70        | 24-6                     | 0-7  | 0-9  | 2-0  | 3-3  | 4-8  | 4-11  | 5-11 | 7-5  | 8-4   | 8-11 | 10-5  | 11-9   | 12-2  | ---  | ---    |
| 18                | NI-80        | 25-0                     | 0-7  | 1-2  | 2-4  | 3-8  | 5-0  | 5-4   | 6-4  | 7-10 | 8-9   | 9-4  | 10-11 | 12-2   | 12-6  | ---  | ---    |
|                   | NI-90x       | 26-0                     | 0-7  | 0-8  | 0-8  | 1-10 | 3-4  | 3-9   | 4-11 | 6-6  | 7-6   | 8-3  | 10-0  | 11-5   | 11-10 | ---  | ---    |
| 18                | NI-60        | 22-2                     | 0-7  | 0-8  | 0-8  | 0-9  | 0-10 | 1-2   | 2-3  | 3-9  | 4-8   | 5-3  | 6-9   | 7-11   | 8-5   | 10-2 | 11-6   |
| 18                | NI-80x       | 24-8                     | 0-7  | 0-8  | 0-8  | 0-9  | 0-9  | 0-9   | 1-5  | 3-2  | 4-3   | 4-10 | 6-8   | 8-2    | 8-6   | 10-6 | 12-2   |
| 20                | NI-80x       | 25-4                     | 0-7  | 0-8  | 0-8  | 0-9  | 0-9  | 0-9   | 0-10 | 1-6  | 2-6   | 3-2  | 4-9   | 6-2    | 6-8   | 8-9  | 10-4   |
| 22                | NI-80x       | 25-11                    | 0-7  | 0-8  | 0-8  | 0-9  | 0-9  | 0-9   | 0-10 | 0-10 | 1-5   | 2-2  | 3-10  | 5-3    | 5-9   | 7-8  | 9-0    |
| 24                | NI-80x       | 26-6                     | 0-7  | 0-8  | 0-8  | 0-9  | 0-9  | 0-9   | 0-10 | 0-10 | 0-10  | 0-11 | 2-4   | 3-6    | 3-11  | 5-9  | 7-0    |

**Notes for Table 3**

For SI: 1 inch = 25.4 mm, 1 pound = 4.448 N.

<sup>1</sup>Above tables may be used for I-joist spacing of 24 inches on center or less.

<sup>2</sup>Hole location distance is measured from inside face of supports to center of hole.

<sup>3</sup>Distances in this chart are based on uniformly loaded joists.

<sup>4</sup>SAF = Span Adjustment Factor, used as defined below.

**OPTIONAL:**

Table 3 is based on the I-joists being used at their maximum span. If the I-joists are placed at less than their full allowable span, the minimum distance from the centerline of the hole to the face of any support (*D*) as given above may be reduced as follows:

$$D_{reduced} = \frac{L_{actual} D}{SAF}$$

Where: *D<sub>reduced</sub>* = Distance from the inside face of any support to center of hole, reduced for less-than-maximum span applications (ft). The reduced distance must not be less than 6 inches from the face of support to edge of the hole.

*L<sub>actual</sub>* = The actual measured span distance between the inside faces of supports (ft).

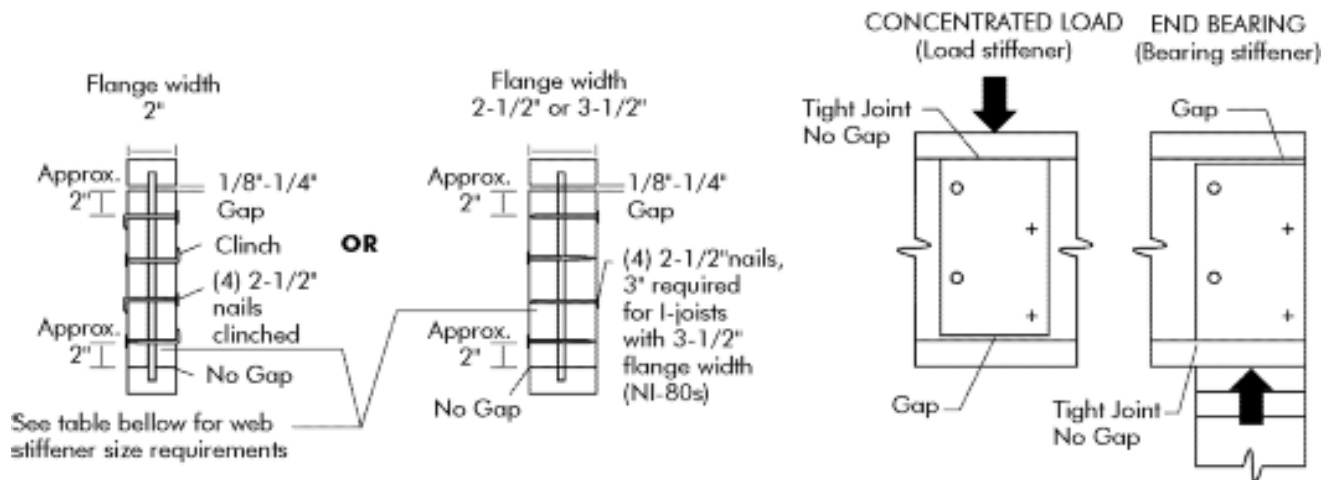
*SAF* = Span Adjustment Factor given in Table 3 (ft).

*D* = The minimum distance from the inside face of any support to center of hole from Table 3 (ft).

If  $\frac{L_{actual}}{SAF}$  is greater than 1, use 1 in the above calculation for  $\frac{L_{actual}}{SAF}$ .

**Requirements for web stiffeners**

1. Web stiffeners must be placed on each side of the I-joist web at:
  - a) Hangers with side nailing.
  - b) Hangers with a side, which do not support top flanges of I-joists.
  - c) Locations where concentrated loads in excess of 1500 pounds are applied to the top flange of the I-joist between supports, or in case of cantilever, any where between the cantilever tip and the support.
  - d) At exterior supports in engineered applications where concentrated loads cause exterior reaction loads to exceed 1550 pounds, with the exception of the NI-80x and NI-90x, which require web stiffeners when end reaction values exceed 1850 and 1885 pounds, respectively.
2. Web stiffeners must be made of Utility grade SPF (south) or better for lumber and/or Sheathing grade or better for wood structural panels.



**FIGURE 2—NI-SERIES I-JOIST WEB STIFFENER CONSTRUCTION DETAILS**

**TABLE 4—WEB STIFFENER SIZE REQUIRED**

| I-JOIST FLANGE WIDTH | WEB STIFFENER SIZE REQUIRED ON EACH SIDE OF WEB      |
|----------------------|--|
| 2 1/2 inches         | 1 × 2 <sup>5</sup> / <sub>16</sub> minimum width     |
| 3 1/2 inches         | 1 1/2 × 2 <sup>5</sup> / <sub>16</sub> minimum width |

For SI: 1 inch=25.4 mm

## ICC-ES Evaluation Report

## ESR-1742 FBC Supplement

Reissued April 2017

This report is subject to renewal April 2019.

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES  
Section: 06 17 33—Wood I-joists

### REPORT HOLDER:

NORDIC ENGINEERED WOOD  
WINDSOR STATION – SUITE 504  
1100, AVE DES CANADIENS-DE-MONTRÉAL  
MONTRÉAL, QUÉBEC H3B 2S2  
CANADA  
(514) 871-8526  
[www.nordicewp.com](http://www.nordicewp.com)  
[info@nordicewp.com](mailto:info@nordicewp.com)

### EVALUATION SUBJECT:

#### NI SERIES PREFABRICATED I-JOISTS

#### 1.0 REPORT PURPOSE AND SCOPE

##### Purpose:

The purpose of this evaluation report supplement is to indicate that NI Series Prefabricated I-Joists, recognized in ICC-ES master report ESR-1742, have also been evaluated for compliance with the codes noted below.

##### Applicable code editions:

- 2010 *Florida Building Code—Building*
- 2010 *Florida Building Code—Residential*

#### 2.0 CONCLUSIONS

The NI Series Prefabricated I-Joists, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1742, comply with the 2010 *Florida Building Code—Building* and the 2010 *Florida Building Code—Residential*, provided the design and installation are in accordance with the *International Building Code*® provisions noted in the master report.

Use of the NI Series Prefabricated I-Joists for compliance with the High-Velocity Hurricane Zone provisions of the 2010 *Florida Building Code—Building* and the 2010 *Florida Building Code—Residential* has not been evaluated, and is outside the scope of this evaluation report.

For products falling under Florida Rule 9N-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the master report, reissued April 2017.