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ESR-1768

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

SECTION: 06 05 23.13—NAILS

REPORT HOLDER:

TREE ISLAND INDUSTRIES, LTD.

**3933 BOUNDARY ROAD
RICHMOND, BRITISH COLUMBIA V6V 1T8
CANADA**

EVALUATION SUBJECT:

**PNEUMATICALLY, MECHANICALLY AND MANUALLY DRIVEN ROUND-HEAD NAILS
AND ROOFING NAILS**



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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 05 23.13—Nails

REPORT HOLDER:

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EVALUATION SUBJECT:

PNEUMATICALLY, MECHANICALLY AND MANUALLY DRIVEN ROUND-HEAD NAILS AND ROOFING NAILS

ADDITIONAL LISTEE:

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1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code*® (IBC)
- 2015, 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:

- Bending yield strength.
- Compliance with material requirements and tolerances of ASTM F1667.
- Compliance with prescriptive requirements of the IBC and IRC.
- Use in diaphragms, shear walls and braced walls.
- Compliance with ASTM C514.

2.0 USES

The nails described in this report are used for engineered and prescriptive structural connections between wood members and for attachment of roofing materials to wood sheathing.

3.0 DESCRIPTION

3.1 General:

The nails are formed from plain steel wire of Grades 1006 through 1030; or stainless steel Type 304 or 316. The nails have smooth, ring (annularly threaded) or screw (helicly threaded) shanks and concentric round heads.

3.2 Structural Nails:

See Table 1 for dimensions and additional information for hand-driven nails recognized for use in structural applications, including specified bending yield strength and available finishes. See Table 2 for dimensions and additional information for collated, gun-driven nails recognized for use in structural applications. Dimensional tolerances conform to ASTM F1667.

Some of the sizes of the nails listed in Tables 1 and 2 are available as True Spec brand nails. The True Spec system is intended to allow the shank size and length of a nail to be determined after it is driven, by referring to the nail color and/or the code stamped on the head of the nail. For non-galvanized nails, the length is identified by the paint color on the nail head and the shank diameter is defined by a number. For galvanized nails, the length is identified by a letter and the shank diameter is defined by a number or letter. Non-galvanized nails intended for use with framing connectors (hardware) also have an 'H' on the head. Ring and screw shank nails are identified by an 'r' stamped on the head. See Table 3 for applicable colors and codes.

3.3 Roofing Nails:

Roofing nails have a nominal shank diameter of 11 gage [0.124 inch (3.1 mm)] and a flat round head with a nominal diameter of 0.437 inch (11.1 mm). The nails are available in lengths ranging from ⁵/₈ inch to 3 inches (15.9 to 76 mm) and are either hot-dipped galvanized or electro-galvanized. Nail length must comply with the applicable requirements in Section 1507 of the IBC or Section R905 of the IRC. Dimensional tolerances conform to ASTM F1667.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 Engineered Structural Connections: The structural nails listed in Tables 1 and 2 comply with the requirements of IBC Section 2303.6 and may be used in connections designed in accordance with the ANSI/AWC National Design Specification (NDS) for Wood Construction, using the specified bending yield strengths and nominal nail diameters shown in the tables. Reference lateral and withdrawal values for select connections are

shown in Table 4. These reference design values must be adjusted by all applicable factors in the NDS.

4.1.2 Engineered Diaphragms and Shear Walls: The structural nails listed in Table 5 comply with the requirements of IBC Section 2303.6 and head area requirements defined in the ICC-ES Acceptance Criteria for Nails (AC116) and are equivalent to the code-prescribed nails listed in Table 5 for use in engineered diaphragms and shear walls in accordance with the AWC Special Design Provisions for Wind and Seismic (SDPWS), which is referenced in the IBC.

4.1.3 Prescriptive Framing Connections: The structural nails listed in Tables 1 and 2 comply with the requirements of IBC Section 2303.6 and may be used in framing connections where the applicable nail type and size is prescribed in 2015 IBC Table 2304.10.1 (2012 and 2009 IBC Table 2304.9.1) or IRC Table R602.3(1), as applicable.

4.1.4 Prescriptive Sheathing Attachment: The structural nails listed in Table 5 comply with the requirements of IBC Section 2303.6 and head area requirements of AC116, and are equivalent to the code-prescribed nails listed in Table 5 for attachment of sheathing to wood framing in accordance with 2015 IBC Table 2304.10.1 (2012 and 2009 IBC Table 2304.9.1) or IRC Table R602.3(1), as applicable.

4.2 Installation:

4.2.1 Structural Nails: Edge distances, end distances, and spacings must be sufficient to prevent splitting of the wood, and must be in accordance with 2015 NDS Section 12.1.5 (2012 NDS Section 11.1.6 for the 2012 IBC; 2009 NDS Section 11.1.5 for the 2009 IBC).

4.2.2 Roofing Nail: Roofing nails must be installed in accordance with IBC Chapter 15 or IRC Chapter 9. When used in roofing applications, the roofing nails must be hot-dipped galvanized in accordance with ASTM A153, Class D.

5.0 CONDITIONS OF USE

The nails described in this report comply with the codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Use of the nails must comply with this report and the applicable code.

5.2 When required by the code official, calculations demonstrating that the applied loads are less than the design values specified by this report must be submitted for approval. Calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 Use of roofing nails must be limited to installation of roof covering materials and other non-structural materials in accordance with IBC Chapter 15 or IRC Chapter 9.

5.4 Tree Island stainless steel nails and nails with a hot-dip galvanized coating may be used with pressure-preservative-treated wood and fire-retardant-treated wood in accordance with 2015 IBC Section 2304.10.5 (2012 and 2009 IBC Section 2304.9.5) and IRC Section 317.3.

5.5 Use of the nails with a bright finish in chemically-treated wood, such as pressure-, preservative-, or fire-retardant-treated wood; or in exterior or exposed conditions, is not permitted.

5.6 Use of the electro-galvanized zinc or zinc-phosphate coated nails in chemically-treated wood, such as pressure-, preservative-, or fire-retardant-treated wood; or in exterior or exposed conditions is outside the scope of this report.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Nails (AC116), dated June 2014 (editorially revised April 2015).

6.2 Reports of tests in accordance with ASTM C514.

7.0 IDENTIFICATION

Containers of nails must be identified with the company name (Tree Island Industries, Ltd., or Halsteel) and address; nail type and pennyweight and/or nail size [length and diameter (or gage for roofing and gypsum nails)]; the finish or coating, and the evaluation report number (ESR-1768). True Spec nails must also be identified as described in Section 3.2 and Table 3.

TABLE 1—HAND DRIVEN STRUCTURAL NAILS

| NAIL TYPE | PENNYWEIGHT | NOMINAL SHANK DIAMETER (inch) | SPECIFIED BENDING YIELD STRENGTH Fyb (psi) | LENGTH (inches) | HEAD STYLE | NOMINAL HEAD DIAMETER (inch) | SHANK TYPE | FINISH ¹ |
|-----------|-------------|-------------------------------|--|--|---------------------|------------------------------|-------------------|---------------------------|
| Box | 6d / 7d | 0.099 | 100,000 | 2 / 2 ¹ / ₄ | Flat Round | 0.265 | Smooth | Bright, VC, EG, Phos, HDG |
| | 8d / 9d | 0.113 | | 2 ¹ / ₂ / 2 ³ / ₄ | | 0.297 | | |
| | 10d / 12d | 0.128 | | 3 to 3 ³ / ₄ | | 0.312 | | |
| | 16d | 0.135 | 3 ¹ / ₂ | 0.344 | | | | |
| | 20d / 30d | 0.148 | 90,000 | 4 to 4 ¹ / ₂ | | 0.375 | | |
| | 40d | 0.162 | | 5 | | 0.406 | | |
| Casing | 6d / 7d | 0.099 | 100,000 | 2 / 2 ¹ / ₄ | Countersunk, cupped | 0.142 | Smooth | HDG |
| | 8d | 0.113 | | 2 ¹ / ₂ | | 0.155 | | |
| | 10d / 12d | 0.131 | | 3 / 3 ¹ / ₄ | | 0.170 | | |
| | 16d | 0.135 | | 3 ¹ / ₂ | | 0.177 | | |
| Common | 4d / 5d | 0.099 | 100,000 | 1 ¹ / ₂ / 1 ³ / ₄ | Flat Round | 0.250 | Smooth Ring | Bright, VC, HDG |
| | 6d / 7d | 0.113 | | 2 / 2 ¹ / ₄ | | 0.265 | | |
| | 8d / 9d | 0.131 | | 2 ¹ / ₂ / 2 ³ / ₄ | | 0.281 | | |
| | 10d / 12d | 0.148 | 90,000 | 3 / 3 ¹ / ₄ | | 0.312 | | |
| | 16d | 0.162 | | 3 ¹ / ₂ | | 0.344 | | |
| | 20d | 0.192 | 80,000 | 4 | | 0.406 | | |
| Hardware | n/a | 0.120 | 100,000 | 1 ¹ / ₄ to 1 ¹ / ₂ | Round | 0.297 | Smooth Ring Screw | Bright, EG, HDG |
| | | 0.120 | | 1 ¹ / ₂ , 2 ¹ / ₂ | | 0.281 | | Bright, HDG |
| | | 0.131 | | | | 0.312 | | Bright, EG, HDG |
| | | 0.148 | 90,000 | 1 ¹ / ₄ to 1 ¹ / ₂ | | 0.344 | | HDG |
| | | 0.162 | | 2 ¹ / ₂ | | 0.375 | | |
| | | 0.192 | 80,000 | 2 ¹ / ₂ | | | | |
| Finishing | 8d | 0.099 | 100,000 | 2 ¹ / ₂ | Brad | 0.142 | Smooth | Bright, HDG |
| | 10d / 12d | 0.113 | | 3 / 3 ¹ / ₄ | | 0.155 | | |
| | 16d | 0.120 | | 3 ¹ / ₂ | | 0.162 | | |
| | 20d | 0.135 | | 4 | | 0.177 | | |
| Sinker | 7d | 0.099 | 100,000 | 2 ¹ / ₈ | Flat countersunk | 0.250 | Smooth | VC, Phos, HDG |
| | 8d | 0.113 | | 2 ³ / ₈ | | 0.266 | | |
| | 10d | 0.120 | | 2 ⁷ / ₈ | | 0.281 | | |
| | 12d | 0.135 | | 3 ¹ / ₈ | | 0.312 | | |
| | 16d | 0.148 | 90,000 | 3 ¹ / ₄ | | 0.344 | | |

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa.

¹Finish types:

- Bright = Non-galvanized
- VC = Vinyl-coated
- EG = Zinc-coated (Electro-galvanized)
- Phos = Zinc-phosphate coated
- HDG = Zinc-coated (Hot-dipped galvanized) complying with ASTM A153 Class D

TABLE 2—GUN DRIVEN STRUCTURAL NAILS

| NOMINAL SHANK DIAMETER (inch) | SPECIFIED BENDING YIELD STRENGTH Fyb (psi) | RANGE OF LENGTHS (inch) | HEAD STYLE | NOMINAL HEAD DIAMETER (inch) | SHANK TYPE ¹ | FINISH ² |
|-------------------------------|--|-------------------------|------------|------------------------------|-------------------------|---------------------|
| 0.113 | 100,000 | 1½ to 2½ | Flat Round | 0.275 | S, R, Sc | Bright, EG, HDG |
| | | | | | S | SS |
| 0.120 | | 2 to 3¼ | | 0.275 | S, R, Sc | Bright, EG, HDG, HT |
| | | | | | S | SS |
| 0.131 | | 1½ to 3½ | | 0.285 | S, R, Sc | Bright, EG, HDG, HT |
| | | | | | S | SS |
| 0.135 | | 2¼ to 3½ | | 0.285 | S, R, Sc | Bright, EG, HDG, HT |
| 0.148 | | | | | S, R, Sc | Bright, EG, HDG, HT |
| 0.162 | 90,000 | 1½ to 4 | 0.285 | S | SS | |
| | | | | S, R, Sc | Bright, EG, HDG, HT | |
| 0.162 | 90,000 | 2½ to 5⅛ | 0.290 | S, R, Sc | Bright, EG, HDG, HT | |
| | | | | S | SS | |

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa.

¹Shank types: S = smooth, R = ring, Sc = screw

²Finish types:

- Bright = Non-galvanized
- EG = Zinc-coated (Electro-galvanized)
- HDG = Zinc-coated (Hot-dipped galvanized) complying with ASTM A153 Class D
- HT = Heat Treated
- SS = Stainless Steel nails

TABLE 3—TRUE SPEC HEAD IDENTIFICATION SYSTEM LEGEND¹

| DIAMETER INDICATOR | | |
|------------------------|--|--|
| Nominal Shank Diameter | Indicator for Smooth Shank and Screw Shank Nails, All Finishes | Indicator for Ring Shank Nails with HDG Finish |
| 0.113 | 1 | T |
| 0.131 | 3 | W |
| 0.135 | 5 | X |
| 0.148 | 4 | Y |
| 0.162 | 6 | Z |
| LENGTH INDICATOR | | |
| Length (Inches) | Indicator for Non-Galvanized Nails | Indicator for HDG Nails |
| 1½ | Purple | A |
| 2⅛ | Pink | B |
| 2¼ | Brown | C |
| 2⅜ | Green | D |
| 2½ | Blue | E |
| 3 | White | F |
| 3¼ | Black | J |
| 3½ | Orange | K |

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa.

¹Non-galvanized nails intended for use with framing connectors (hardware) also have an 'H' on the head. Ring and screw shank nails are identified by an 'r' stamped on the head.

TABLE 4—SINGLE FASTENER CONNECTIONS—REFERENCE DESIGN VALUES (LATERAL AND WITHDRAWAL)^{1,5}

| NOMINAL NAIL SHANK DIAMETER (inch) | LATERAL STRENGTH VALUE (lbf) ² | | | WITHDRAWAL VALUE FOR SMOOTH NAILS (lbf per inch) ³ | | WITHDRAWAL VALUE FOR THREADED NAILS (lbf per inch) ^{3,4} | |
|------------------------------------|---|-------------------------|-----------------------------|---|-----------------------------|---|-----------------------------|
| | Minimum Side Member Thickness (inches) | Southern Pine SG = 0.55 | Douglas Fir–Larch SG = 0.50 | Southern Pine SG = 0.55 | Douglas Fir–Larch SG = 0.50 | Southern Pine SG = 0.55 | Douglas Fir–Larch SG = 0.50 |
| 0.099 | 3/4 | 61 | 55 | 31 | 24 | - | - |
| 0.113 | 3/4 | 79 | 72 | 35 | 28 | - | - |
| 0.120 | 1 | 89 | 81 | 37 | 29 | 41 | 32 |
| 0.128 | 1 | 101 | 93 | 40 | 31 | | |
| 0.131 | 1 | 106 | 97 | 41 | 32 | - | - |
| 0.135 | 1 | 113 | 103 | 42 | 33 | 46 | 36 |
| 0.148 | 1 | 128 | 118 | 46 | 36 | 50 | 40 |
| 0.162 | 1 | 154 | 141 | 50 | 40 | - | - |
| 0.192 | 1 | 183 | 159 | 59 | 47 | - | - |

For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Tabulated nominal values must be multiplied by all applicable adjustment factors in accordance with the NDS.

²Tabulated lateral design values are for nails inserted in side grain with nail axis perpendicular to wood fibers; minimum nail penetration into the main member must equal 10 diameters.

³Tabulated nominal withdrawal values are for nails driven in the side grain of the main member, with the nail axis perpendicular to the wood fibers.

⁴For diameters other than those noted, withdrawal values must be the same as for the smooth nails.

⁵Reference: NDS 2015 edition. Lateral strength—Table 12N. Withdrawal formula—Section 12.2.3.

TABLE 5—STRUCTURAL NAILS RECOGNIZED FOR USE IN ENGINEERED DIAPHRAGMS AND SHEAR WALLS AND PRESCRIPTIVE SHEATHING ATTACHMENTS

| NAIL TYPE AND SIZE PRESCRIBED IN THE CODE | TREE ISLAND NAIL DESCRIPTION (RECOGNIZED EQUIVALENT) | |
|---|--|--------------------------|
| | Hand Driven (See Table 1) | Gun Driven (See Table 2) |
| 6d common (2" x 0.113") | 8d box; 6d and 7d common; 8d sinker | 2 to 2 1/2" x 0.113" |
| 8d common (2 1/2" x 0.131") | 10d box; 8d and 9d common | 2 1/2" to 3" x 0.131" |
| 10d common (3" x 0.148") | 10 and 12d common; 16d sinker | — |

For **SI**: 1 inch = 25.4 mm.