

Filing Category: FASTENERS—Wood Hangers and Framing Anchors

USP LUMBER CONNECTORS: JUS JOIST HANGERS AND LSSH LIGHT SLOPEABLE/SKEWABLE HANGERS

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1.0 SUBJECT

USP Lumber Connectors: Joist Hangers and Light Slopeable/Skewable Hangers.

2.0 DESCRIPTION

2.1 General:

The USP Lumber Connectors described in this report are alternative methods of construction to those specified in Section 2318.4 of the 1997 *Uniform Building Code*™ (UBC), Section 2304.9.3 of the 2000 *International Building Code*® (IBC), and Section R602.3 of the 2000 *International Residential Code*® (IRC).

2.2 JUS Joist Hangers:

The JUS Joist Hangers are designed to support nominal 2-inch-by-4-inch (51 mm by 102 mm), -6-inch (152 mm), -8-inch (203 mm), or -10-inch (254 mm) joist lumber. The hangers are fabricated from No. 18 gage [0.044 inch base-metal thickness (1.12 mm)] galvanized steel. The hangers are 1⁹/₁₆ inches (39.4 mm) wide and 1³/₄ inches (44.5 mm) deep, with varying heights. The JUS hanger is prepunched to accept 10d common nails for connections to the joists and headers, as shown in Figure 1. The nails are driven through the joist at 45 degrees horizontally so that the nail penetrates a minimum of 1 inch (25.4 mm) through the corner of the joist into the header. The joist must butt up against the header. See Figure 2 for installation details, and Table 1 for nailing schedules, dimensions and allowable loads.

2.3 LSSH Series Light Slopeable/Skewable Hangers:

The LSSH Series Light Slopeable/Skewable Hangers are designed to attach joists or rafters to headers, sloped up or down, and/or skewed left or right, up to 45 degrees. The hangers are fabricated from No. 18 gage [0.044 inch base-metal thickness (1.12 mm)] and No. 16 gage [0.055 inch (1.4 mm)] galvanized steel. The hangers are prepunched for 10d and 16d common nails. Table 2 specifies nailing schedules, dimensions and allowable loads for LSSH hangers that are sloped a maximum of 45 degrees. Table 3 specifies nailing schedules, dimensions and allowable loads for LSSH hangers that are skewed and sloped a maximum of 45 degrees. Refer to Figure 3 for hanger details, and to Figure 4 for installation details.

2.4 Design:

The connected wood members must be designed for applied loads. The allowable loads for the connectors described in this report are based on the lowest load obtained by comparing the following:

- Test load that causes 0.125 inch (3.2 mm) deflection.
- Lowest ultimate test load with a safety factor of 3.0 applied.
- Allowable fastener and compression perpendicular to grain values in accordance with ANSI/NFoPA National Design Specification for Wood Construction (NDS), 1991 revised edition (under the UBC), and ANSI/AF&PA 1997 edition (under the IBC and IRC), based on wood with a specific gravity of 0.50, such as Douglas fir-larch.

Allowable joist hanger values in this report apply to installations in wood seasoned to a moisture content of 19 percent or less and used under continuously dry conditions. For connections in unseasoned or partially seasoned wood, or when connections are exposed to wet-service conditions, or where the in-service temperature exceeds 100°F (37.8°C), the allowable loads in this report must be multiplied by the adjustment factors specified in the ANSI/NFoPA NDS-91, as referenced in Chapter 23, Division III, of the UBC, and in the ANSI/AF&PA NDS-97, as referenced in the IBC and IRC. The maximum adjusted load shall not exceed the maximum design load shown in the tables.

2.5 Materials:

2.5.1 Steel: All hangers listed in this report are fabricated from steel complying with ASTM A 653 SS Grade 33, having a minimum yield strength of 33,000 psi (228 MPa) and minimum ultimate tensile strength of 45,000 psi (310 MPa). Galvanized coating conforms to ASTM A 924/A 924M and A 653, with a coating designation of G60. Cold-formed thickness for the specified steel is as described in this report. The uncoated minimum steel thickness of cold-formed steel products described in this report shall not, at any location except at bends and corners, be less than 95 percent of the listed base-metal thickness.

2.5.2 Wood: Lumber must be nominal-dimension, with moisture content not exceeding 19 percent unless the connection has been designed with the appropriate wet-use factor. The lumber must be Douglas fir-larch with a minimum specific gravity of 0.50. Use of the connectors is limited to lumber that has not been treated with fire-retardant chemicals.

2.5.3 Fasteners: Steel wire common nails must conform to nominal sizes specified in ASTM F 1667. The 16d common, 3¹/₂-inch-long (89 mm) nail and the 10d common,

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3-inch-long (76 mm) nail each must have a minimum bending yield strength, F_{yb} , of 90,000 psi (620.1 N/MPa).

Nails for pressure-preservative-treated wood shall be of hot-dipped, zinc-coated, galvanized steel, stainless steel or copper.

2.6 Installation:

Connectors must be installed in accordance with this report and the manufacturer's published installation instructions.

2.7 Identification:

Each device is identified by a label or stamp with the letters "USP," the stock number and the ICBO ES evaluation report number (ICBO ES ER-5356).

3.0 EVIDENCE SUBMITTED

Reports of structural load tests, calculations and details in accordance with the ICBO ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated January 2002; and a quality control manual.

4.0 FINDINGS

That the USP lumber connectors described in this report comply with the 1997 *Uniform Building Code*[™] (UBC), the 2000 *International Building Code*[®] (IBC), and the 2000 *International Residential Code*[®] (IRC), subject to the following conditions:

4.1 The connectors are manufactured, identified and installed in accordance with this report and the manufacturer's installation procedures.

4.2 Maximum allowable loads comply with this report and shall not exceed the capacities indicated in Tables 1, 2 and 3.

4.3 Lumber is nominal-dimension lumber having a specific gravity of 0.50 or greater, with a moisture content of 19 percent or less, used in dry conditions.

4.4 Calculations showing compliance with this report must be submitted to and approved by the building official.

4.5 Fasteners for pressure-preservative-treated wood are of hot-dipped zinc-coated galvanized steel.

4.6 Adjustment factors shall be applied to allowable loads as set forth in this report, where lumber moisture content exceeds 19 percent, where there are wet-service conditions, where the in-service temperature exceeds 100/F (37.8/C), and where preservative-treated wood is used.

4.7 The connectors are manufactured by United Steel Products Company at their facilities located in Montgomery, Minnesota, and Livermore, California.

4.8 The uncoated minimum steel thicknesses of the cold-formed steel products described in this report are not permitted, at any location except at bends and corners, to be less than 95 percent of the listed design thicknesses.

This report is subject to re-examination in two years.

TABLE 1—JUS HANGER

| STOCK NO. | STEEL GA. | DIMENSIONS (inches) | | | FASTENER SCHEDULE ¹ | | | | ALLOWABLE LOADS (lbs) | | | | | | | |
|-----------|-----------|--------------------------------|---------------------------------|-------------------------------|--------------------------------|------|--------------------|------|----------------------------|------|------|----------------------------|------|------|---------------------|------|
| | | W | H | D | Header | | Joist ² | | F _{c,⊥} = 460 psi | | | F _{c,⊥} = 625 psi | | | Uplift ³ | |
| | | | | | Face | Type | Quality | Type | 100% | 115% | 125% | 100% | 115% | 125% | 133% | 160% |
| JUS 24 | 18 | 1 ⁹ / ₁₆ | 3 ⁷ / ₈ | 1 ³ / ₄ | 4 | 10d | 2 | 10d | 645 | 740 | 805 | 645 | 740 | 805 | 510 | 510 |
| JUS 26 | 18 | 1 ⁹ / ₁₆ | 4 ¹³ / ₁₆ | 1 ³ / ₄ | 4 | 10d | 4 | 10d | 840 | 970 | 1050 | 840 | 970 | 1050 | 1115 | 1115 |
| JUS 28 | 18 | 1 ⁹ / ₁₆ | 6 ⁵ / ₈ | 1 ³ / ₄ | 6 | 10d | 4 | 10d | 1065 | 1225 | 1330 | 1065 | 1225 | 1330 | 1115 | 1115 |
| JUS 210 | 18 | 1 ⁹ / ₁₆ | 7 ³ / ₄ | 1 ³ / ₄ | 8 | 10d | 4 | 10d | 1290 | 1485 | 1610 | 1290 | 1485 | 1610 | 1115 | 1115 |

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

¹A 10d common nail is 3 inches long and 0.148 inch in diameter.

²The 10d common nails driven into the joist shall be installed at 30 to 45 degrees horizontally toward the header.

³Uplift loads include a 33¹/₃% or 60% increase for wind or seismic load conditions. The 160% values are prohibited under the UBC. No further increase is permitted.

⁴Header must be of sufficient thickness to provide a minimum of 1.78 inches of nail penetration.

TABLE 2—LSSH SERIES SLOPED

| STOCK NUMBER | STEEL GAGE | HANGER DIMENSIONS | | | | FASTENER SCHEDULE ^{1,2,3} | | | | ALLOWABLE LOADS (lbs) | | | | | | | |
|--------------|------------|---------------------------------|---------------------------------|---------------------------------|------------|------------------------------------|------|----------|-------------------------------------|----------------------------|------|------|----------------------------|------|------|---------------------|------|
| | | Joist (W) (inches) | L (inches) | H inches | D (inches) | Header | | Joist | | F _{c,⊥} = 460 psi | | | F _{c,⊥} = 625 psi | | | Uplift ⁴ | |
| | | | | | | Quantity | Type | Quantity | Type | 100% | 115% | 125% | 100% | 115% | 125% | 133% | 160% |
| LSSH 210 | 18 | 1 ⁹ / ₁₆ | 5 ⁷ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 1030 |
| LSSH 179 | 18 | 1 ¹³ / ₁₆ | 5 ⁷ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 1030 |
| LSSH 20 | 18 | 2 ¹ / ₁₆ | 7 ¹ / ₈ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 980 |
| LSSH 23 | 18 | 2 ³ / ₁₆ | 7 ¹ / ₈ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 980 |
| LSSH 25 | 16 | 2 ¹ / ₁₆ | 8 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 18 | 16d | 12 | 10d × 1 ¹ / ₂ | 2420 | 2600 | 2600 | 2420 | 2600 | 2600 | 1195 | 1195 |
| LSSH 26 | 16 | 2 ¹ / ₁₆ | 8 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 18 | 16d | 12 | 10d × 1 ¹ / ₂ | 2420 | 2600 | 2600 | 2420 | 2600 | 2600 | 1195 | 1195 |
| LSSH 31 | 16 | 3 ¹ / ₈ | 10 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 18 | 16d | 12 | 10d × 1 ¹ / ₂ | 2420 | 2785 | 3025 | 2420 | 2785 | 3025 | 1465 | 1585 |
| LSSH 35 | 16 | 3 ³ / ₁₆ | 10 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 18 | 16d | 12 | 10d × 1 ¹ / ₂ | 2420 | 2785 | 3025 | 2420 | 2785 | 3025 | 1465 | 1585 |

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 6.89 kPa.

¹A 16d common nail is 3¹/₂ inches long and 0.162 inch in diameter.

²A 10d common nail is 3 inches long and 0.148 inch in diameter.

³A 10d × 1¹/₂ common nail is 1¹/₂ inches long and 0.148 inch in diameter.

⁴Uplift loads include a 33¹/₃% or 60% increase for wind or seismic load conditions. The 160% values are prohibited under the UBC. No further increase is permitted.

TABLE 3—LSSH SERIES SKEWED AND SLOPED

| STOCK NUMBER | STEEL GAGE | HANGER DIMENSIONS | | | | FASTENER SCHEDULE ^{1,2,3} | | | | ALLOWABLE LOADS (lbs) | | | | | | | |
|--------------|------------|---------------------------------|---------------------------------|---------------------------------|------------|------------------------------------|------|----------|-------------------------------------|----------------------------|------|------|----------------------------|------|------|---------------------|------|
| | | Joist (W) (inches) | L (inches) | H inches | D (inches) | Header | | Joist | | F _{c,⊥} = 460 psi | | | F _{c,⊥} = 625 psi | | | Uplift ⁴ | |
| | | | | | | Quantity | Type | Quantity | Type | 100% | 115% | 125% | 100% | 115% | 125% | 133% | 160% |
| LSSH 210 | 18 | 1 ⁹ / ₁₆ | 5 ⁷ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 1030 |
| LSSH 179 | 18 | 1 ¹³ / ₁₆ | 5 ⁷ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 1030 |
| LSSH 20 | 18 | 2 ¹ / ₁₆ | 7 ¹ / ₈ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 980 |
| LSSH 23 | 18 | 2 ³ / ₁₆ | 7 ¹ / ₈ | 8 ¹³ / ₁₆ | 3 | 10 | 10d | 7 | 10d × 1 ¹ / ₂ | 1120 | 1290 | 1400 | 1120 | 1290 | 1400 | 855 | 980 |
| LSSH 25 | 16 | 2 ³ / ₁₆ | 8 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 14 | 16d | 12 | 10d × 1 ¹ / ₂ | 1825 | 1825 | 1825 | 1825 | 1825 | 1825 | 1195 | 1195 |
| LSSH 26 | 16 | 2 ¹ / ₁₆ | 8 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 14 | 16d | 12 | 10d × 1 ¹ / ₂ | 1825 | 1825 | 1825 | 1825 | 1825 | 1825 | 1195 | 1195 |
| LSSH 31 | 16 | 3 ¹ / ₈ | 10 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 14 | 16d | 12 | 10d × 1 ¹ / ₂ | 1885 | 1920 | 1920 | 1885 | 1920 | 1920 | 1465 | 1585 |
| LSSH 35 | 16 | 3 ³ / ₁₆ | 10 ¹ / ₁₆ | 8 ¹³ / ₁₆ | 3 | 14 | 16d | 12 | 10d × 1 ¹ / ₂ | 1885 | 1920 | 1920 | 1885 | 1920 | 1920 | 1465 | 1585 |

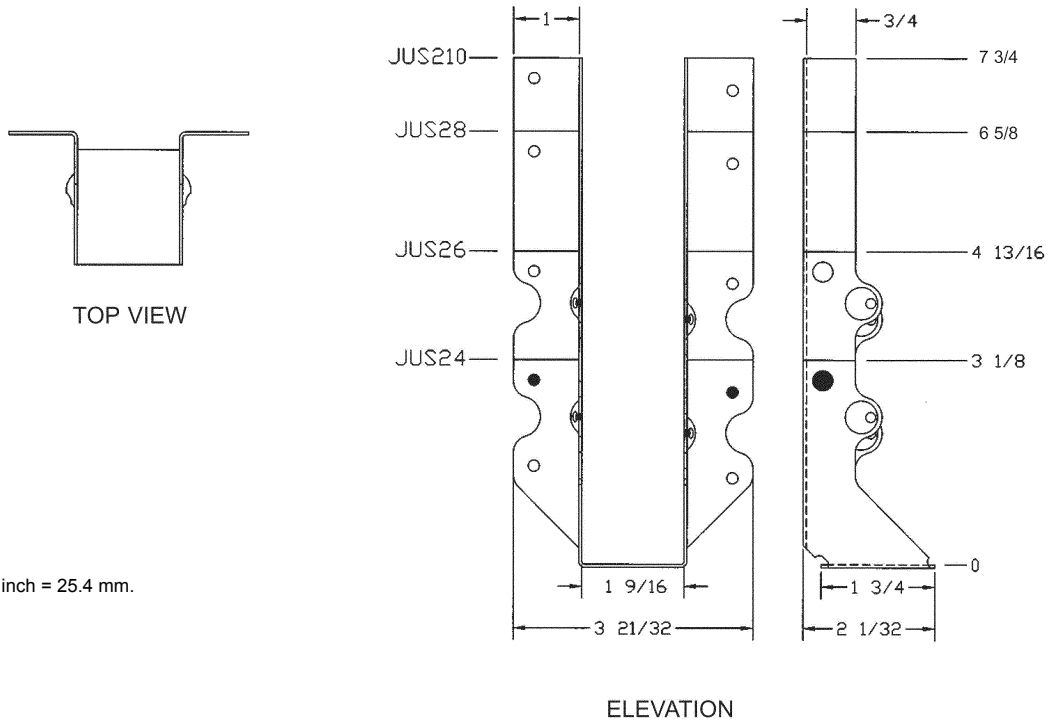
For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 6.89 kPa.

¹A 16d common nail is 3¹/₂ inches long and 0.162 inch in diameter.

²A 10d common nail is 3 inches long and 0.148 inch in diameter.

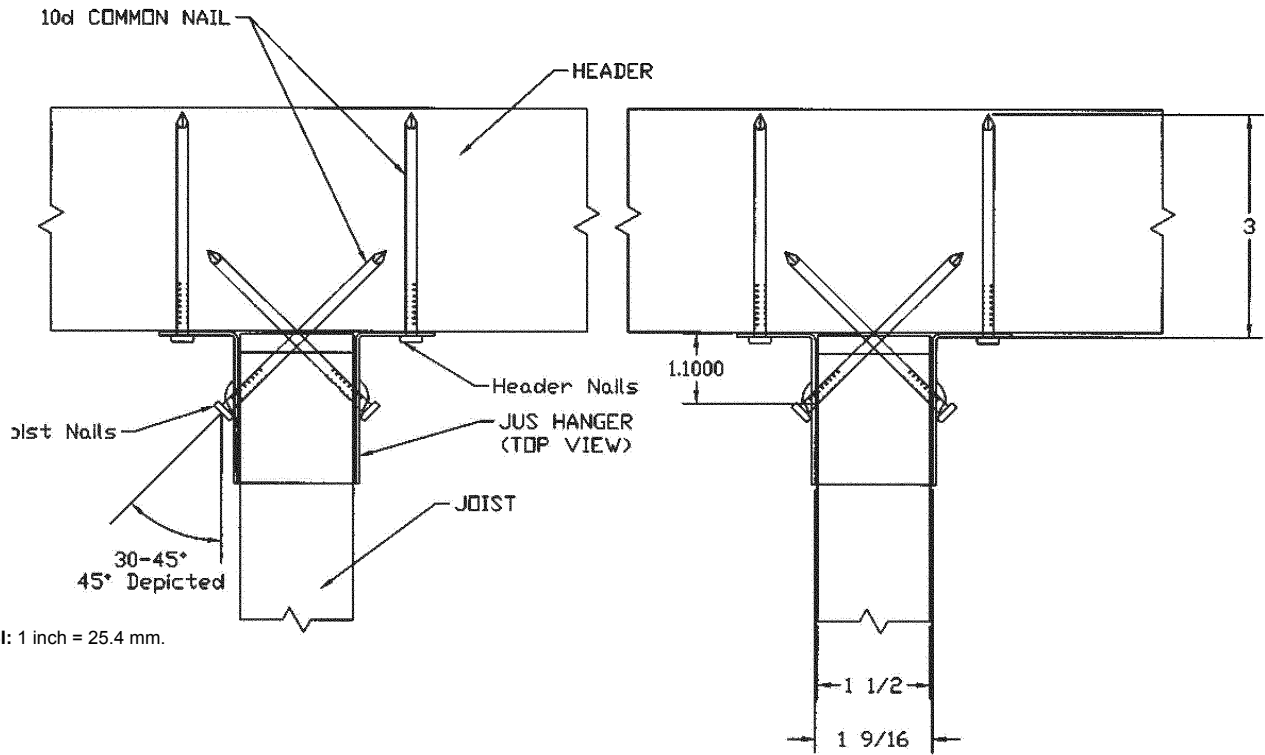
³A 10d × 1¹/₂ common nail is 1¹/₂ inches long and 0.148 inch in diameter.

⁴Uplift loads include a 33¹/₃% or 60% increase for wind or seismic load conditions. The 160% values are prohibited under the UBC. No further increase is permitted.



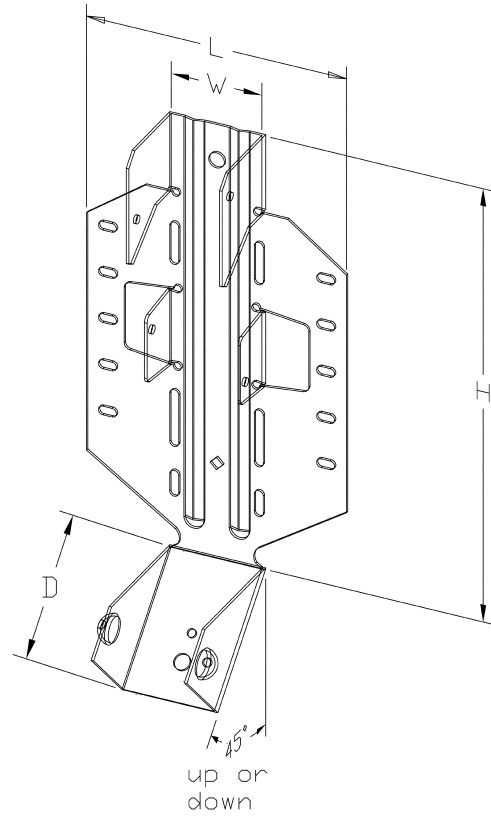
For SI: 1 inch = 25.4 mm.

FIGURE 1



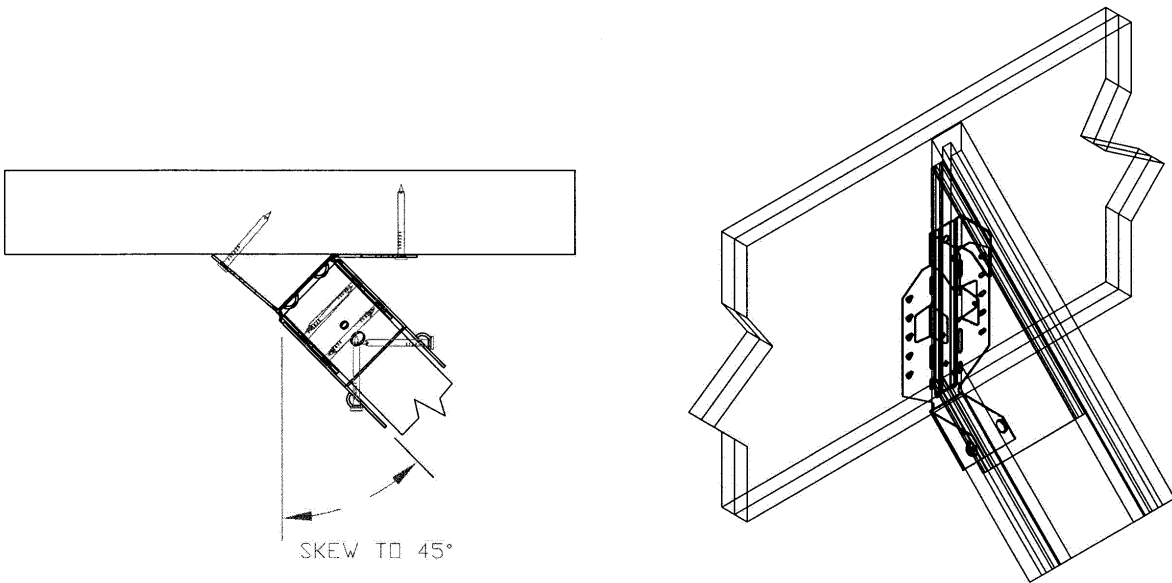
For SI: 1 inch = 25.4 mm.

FIGURE 2



LSSH

FIGURE 3



Typical LSSH Installation

FIGURE 4