

# Listing and Technical Evaluation Report™

Report No: 1910-02



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## Use of SPAX® PowerLag® #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" Screws in Wall Connections: Truss/Rafter/Joist to Wall, Stud to Plate, and Plate to Rim Board

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### CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 00 90 - Wood and Plastic Fastenings

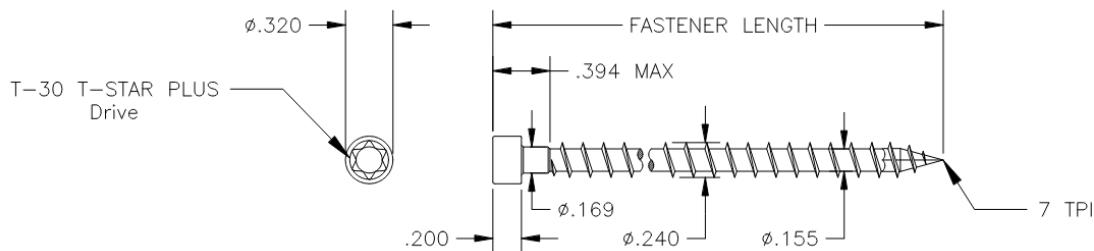
Section: 06 05 23 - Wood, Plastic, and Composite Fastenings

## 1 Innovative Products Evaluated<sup>1</sup>

1.1 SPAX® PowerLag® Screws (#14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" )

## 2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1**.



**Figure 1.** #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" Fastener

2.2 The #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners are made of hardened carbon steel grade 10B18 wire conforming to ASTM A510, or grade 17MnB3 or 19MnB4 wire conforming to DIN 1654.

2.3 The #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners are manufactured using a standard cold-formed process followed by heat treating and coating processes.



2.4 The specifications for the fastener evaluated in this report are set forth in **Table 1**.

**Table 1.** Fastener Specifications

Fastener Name	Head (in)				Length (in)		Diameters (in)			Bending Yield Strength, <sup>3</sup> f <sub>yb</sub> (psi)	Allowable Steel Strength (lb)	
	Style	Marking	Diameter	Height	Fastener <sup>1</sup>	Thread <sup>2</sup>	Shank	Minor	Major		Tensile	Shear <sup>4</sup>
#14 x 4 <sup>3</sup> / <sub>4</sub> "	T-Star Plus Cylindric Head	None	0.320	0.200	4.750	4.356	0.169	0.155	0.240	160,000	990	750
#14 x 6 <sup>1</sup> / <sub>4</sub> "					6.250	5.856						

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N, 1 psi = 0.00689 MPa

1. Fastener length is measured from the topside of the head to the tip.
2. Thread length includes tapered tip (see Figure 1).
3. Bending yield strength, F<sub>yb</sub>, is determined in accordance with ASTM F1575 using minor thread diameter when fastener is tested in threaded section.
4. Shear strength is determined in accordance with AISI S904 using minor thread diameter when fastener is tested in threaded section.
5. Tabulated fastener dimensions are measured on uncoated fasteners. Finished dimensions are larger due to the proprietary coatings added.

2.5 The #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners are available with a proprietary coating.

2.5.1 Interior Grade: Proprietary zinc plate coating that is equivalent to the protection provided by code-approved hot-dipped galvanized coatings meeting ASTM A153, Class D (IBC Section 2304.10.6<sup>ii</sup> and IRC Section R317.3).

2.5.1.1 Zinc plate coating is tested and recognized for use in above ground contact pressure-treated lumber (ACQ-D), interior, dry/damp general construction applications (i.e., Above Ground AWWA UC1-UC2 ACQ-D).

2.5.1.2 Zinc plate-coated fasteners are approved for use in fire-retardant-treated (FRT) lumber, provided the conditions set forth by the FRT lumber manufacturer are met, including appropriate strength reductions.

2.6 As needed, review material properties for design in Section 6 and to regulatory evaluation in Section 8.

### 3 Definitions

3.1 New Materials<sup>iii</sup> are defined as building materials, equipment, appliances, systems, or methods of construction not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.<sup>iv</sup> The design strengths and permissible stresses shall be established by tests<sup>v</sup> and/or engineering analysis.<sup>vi</sup>

3.2 Duly Authenticated Reports<sup>vii</sup> and Research Reports<sup>viii</sup> are test reports and related engineering evaluations, which are written by an approved agency<sup>ix</sup> and/or an approved source<sup>x</sup>.

3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).<sup>xi</sup>

3.3 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory.

3.4 An approved source is "approved" when a professional engineer (i.e., Registered Design Professional [RDP]) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.<sup>xii</sup>

3.5 Testing and/or inspections conducted for this Duly Authenticated Report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.

3.5.1 The Center for Building Innovation (CBI) is ANAB<sup>xiii</sup> ISO/IEC 17025 and ISO/IEC 17020 accredited.



- 3.6 The regulatory authority shall enforce<sup>xiv</sup> the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing<sup>xv</sup> stating the nonconformance and the path to its cure.
- 3.7 The regulatory authority shall accept Duly Authenticated Reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.<sup>xvi</sup>
- 3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory where recognition of certificates, validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope, shall be approved.<sup>xvii</sup> Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.<sup>xviii</sup>
- 3.9 Approval equity is a fundamental commercial and legal principle.<sup>xix</sup>

#### 4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation<sup>xx</sup>

##### 4.1 Standards

- 4.1.1 *AISI S904: Standard Test Methods for Determining the Tensile and Shear Strengths of Screws*
- 4.1.2 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*
- 4.1.3 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- 4.1.4 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
- 4.1.5 *ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus*
- 4.1.6 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
- 4.1.7 *ASTM G85: Standard Practice for Modified Salt Spray (Fog) Testing*

##### 4.2 Regulations

- 4.2.1 *IBC – 15, 18, 21: International Building Code®*
- 4.2.2 *IRC – 15, 18, 21: International Residential Code®*
- 4.2.3 *IECC – 15, 18, 21: International Energy Conservation Code®*

#### 5 Listed<sup>xxi</sup>

- 5.1 A nationally recognized testing laboratory such as CBI, states that the materials, designs, methods of construction, and/or equipment have met nationally recognized standards and/or have been tested and found suitable for use in a specified manner.

#### 6 Tabulated Properties Generated from Nationally Recognized Standards

- 6.1 #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners are used in the construction of walls that meet the requirements of IBC Section 2308 or IRC Section R602 for the following applications:
  - 6.1.1 To attach minimum 1<sup>1</sup>/<sub>2</sub> inch-thick wood trusses, rafters, or floor joists to wood walls.
  - 6.1.2 To attach wall bottom plates to rim boards in the construction of walls.
  - 6.1.3 To attach minimum 1<sup>1</sup>/<sub>2</sub> inch-thick wood studs to wall top and bottom plates.
- 6.2 See Section 6.8, Section 6.9, and Section 6.10 for allowable design loads.
- 6.3 Allowable design loads are applicable to fasteners installed in accordance with Section 9.
- 6.4 Walls shall consist, at a minimum, of a single or double top plate installed in accordance with IBC Section 2308.5.3.2 or IRC Section R602.3.2.
- 6.5 #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners are used in buildings requiring design in accordance with IBC Section 1609 or wind analysis in accordance with IRC Section R301.2.1.



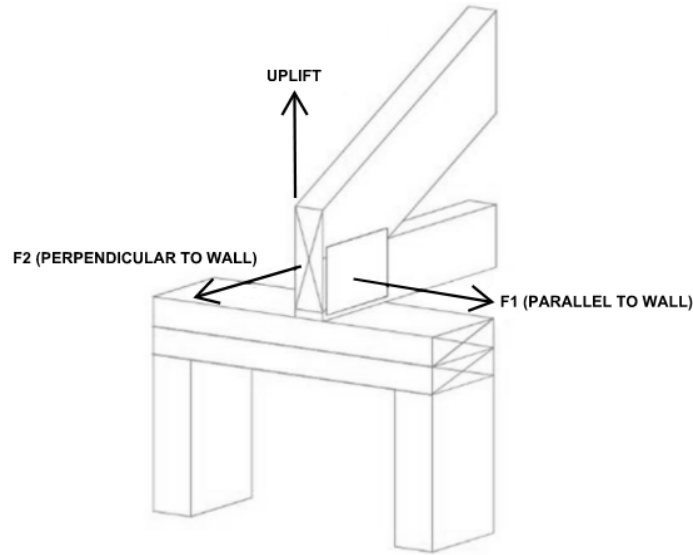
- 6.6 #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners are used in buildings requiring design in accordance with IBC Section 1613 or seismic analysis in accordance with IRC Section R301.2.2.
- 6.7 To maintain a continuous uplift load path, connections in the same area must be stacked on the same side of the wall (i.e., rafter to top plate connection and top plate to stud connection).
- 6.8 *Allowable Design Loads – Truss/Rafter/Joist to Top Plate Connection*
  - 6.8.1 Allowable design loads for uplift and lateral resistance for truss, rafter, and joist to top plate connections are provided in **Table 2**.
  - 6.8.2 Loads parallel to the wall are labeled F1 and loads perpendicular to the wall are labeled F2. See **Figure 2** for load directions.
  - 6.8.3 Allowable design loads are applicable to fasteners installed in accordance with Section 9.7 in single or double top plate applications.

**Table 2.** Allowable Uplift and Lateral Loads for Fasteners in Truss/Rafter/Joist to Top Plate Connections

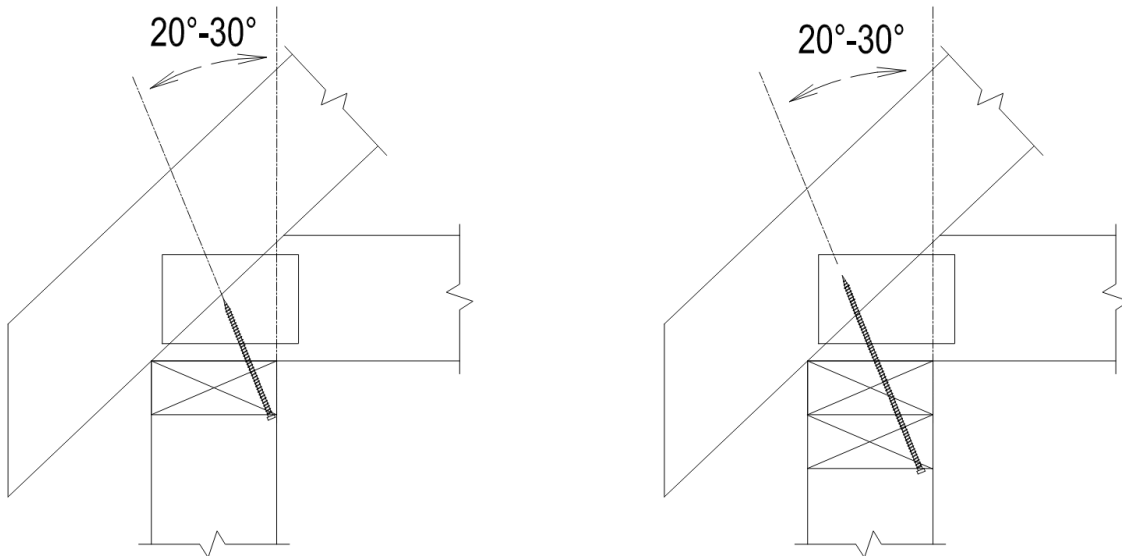
Fastener Length	Min. Penetration into Truss/Rafter/Joist <sup>1</sup> (in)	Top Plate(s)	Fastener Angle to Vertical <sup>7</sup>	Allowable Loads <sup>2,3,4,5,6</sup> (lb)					
				DF-L/SP (0.50)			SPF/HF (0.42)		
				Uplift	F1	F2	Uplift	F1	F2
4.75	2 <sup>1</sup> / <sub>2</sub>	Single	22.5°	550	285	285	510	240	240
			90°	580			540		
6.25		Double	22.5°	880	285	515	650	240	435
			90°	990	355	350	990	315	275

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N

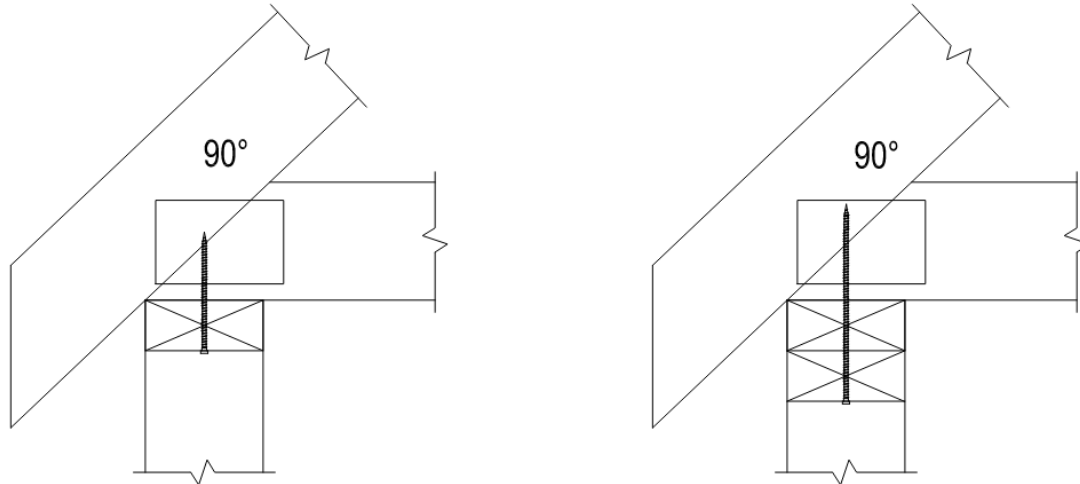
1. Wood truss, rafter, or floor joist members shall be a minimum of 2" nominal thickness. Design of truss, rafter, or floor joist is by others.
2. Includes 1.6 duration of load increase for wind and seismic. No further duration of load increases permitted. Reduce design values for other load durations as applicable.
3. Equivalent specific gravity of Structural Composite Lumber (SCL) shall be equal to or greater than the specific gravities provided in this table. Refer to product information from SCL manufacturer.
4. For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for a specific gravity of 0.42. For wood species with an assigned specific gravity greater than or equal to 0.50, use the tabulated value for specific gravity of 0.50.
5. For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
6. See **Figure 2** for load directions. See **Figure 3** and **Figure 4** installation details.
7. Install fastener at an upward angle from the vertical of 20° to 30° (22.5° is optimal) as shown in **Figure 3**, or at 90° as shown in **Figure 4**. For installation between 20° and 30°, design values for 22.5° may be used.



**Figure 2.** Uplift and Lateral Load (F1 and F2) Directions (Single or Double Top Plate Applications)



**Figure 3.** Installation of Fasteners at an Angle in Single and Double Top Plate to Truss/Rafter/Joist Applications



**Figure 4.** Installation of Fasteners Perpendicular in Single or Double Top Plate to Truss/Rafter/Joist Applications

**6.9 Allowable Design Loads – Bottom Plate to Rim Board Connection**

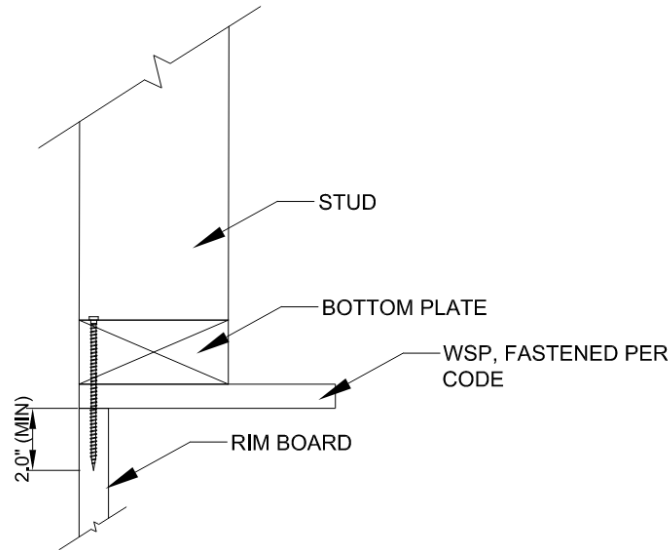
- 6.9.1 Allowable design loads for lateral resistance parallel to grain in bottom plate to rim board connections are provided in **Table 3**. The connection configuration is shown in **Figure 5**.
  - 6.9.1.1 A wood structural panel (WSP) up to 1 1/8" thick is permitted between the rim board and the bottom plate, so long as it is independently fastened to the rim board per the building code and the minimum 2" screw penetration for the #14 x 4 3/4" and #14 x 6 1/4" is met.
  - 6.9.1.2 Double bottom plates are permitted so long as they are independently fastened per the building code and the minimum 2" screw penetration for the #14 x 4 3/4" and #14 x 6 1/4" is met.
- 6.9.2 Allowable design loads are applicable to fasteners installed in accordance with Section **9.8**.

**Table 3.** Allowable Shear Loads Parallel to Grain for Bottom Plate to Rim Board Connections

Fastener Length	Nominal Sole Plate Thickness	Min. Penetration into Rim Board (in)	Allowable Shear Loads, Parallel to Grain (lb) <sup>1,2,3</sup>							
			Rim Board Species (Specific Gravity)							
			2x DF-L/SP (0.50)		2x SPF/HF (0.42)		1 1/4" LVL (0.50)		1 1/4" LSL (0.50)	
			Sole Plate Species (Specific Gravity)							
			DF-L/SP (0.50)	SPF/HF (0.42)	DF-L/SP (0.50)	SPF/HF (0.42)	DF-L/SP (0.50)	SPF/HF (0.42)	DF-L/SP (0.50)	SPF/HF (0.42)
4.75	2x	2	170	155	155	145	170	155	170	155
6.25	2x or 3x									

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N

1. For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for a specific gravity of 0.42. For wood species with an assigned specific gravity greater than or equal to 0.50, use the tabulated value for specific gravity of 0.50.
2. For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
3. Tabulated loads are based on a load duration factor of CD = 1.00. Loads may be increased for load duration per NDS.



**Figure 5.** Fastener in Bottom Plate to Rim Board Connection

6.10 *Allowable Design Loads – Stud to Top or Bottom Plate Connection*

- 6.10.1 Allowable design loads for uplift and lateral resistance in stud to plate connections for fasteners installed in the wide face and narrow face are provided in **Table 4** and **Table 5**, respectively.
  - 6.10.1.1 Double bottom plates are permitted so long as they are independently fastened per the building code and the minimum 2" screw penetration for the #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" is met.
- 6.10.2 Installation details for stud to plate connections for fasteners installed in the wide face and narrow face are provided in **Figure 6** and **Figure 7**, respectively.

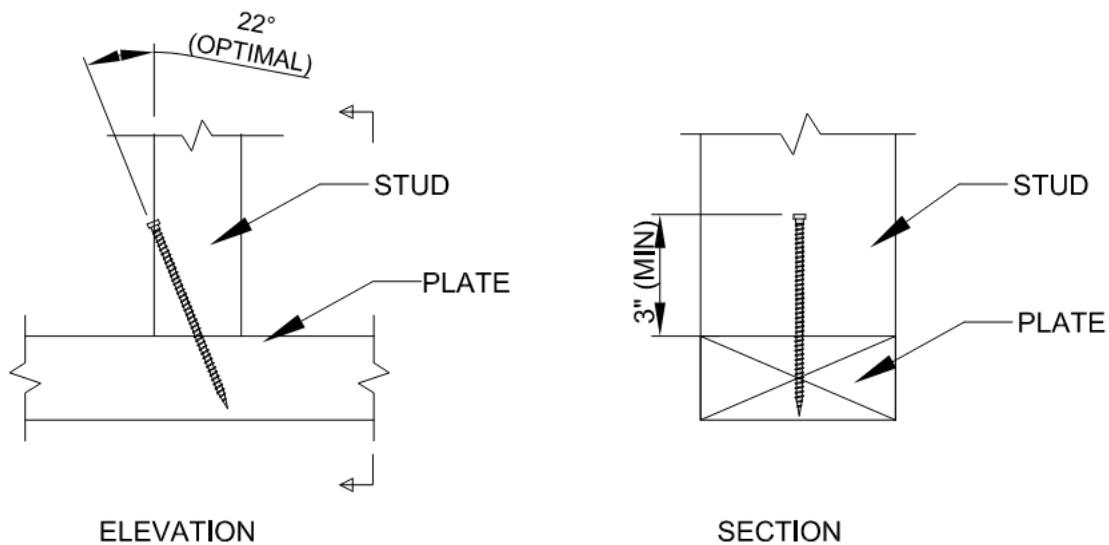
6.10.3 Allowable design loads are applicable to fasteners installed in accordance with Section 9.9 in single or double top plate applications.

**Table 4.** Allowable Design Values for Stud to Plate Connections, Fasteners Installed in Wide Face

Fastener Length	Number of Fasteners Installed	Nominal Plate Thickness	Allowable Loads <sup>1,2,3,4</sup> (lbs)			
			DF-L/SP (0.50)		SPF/HF (0.42)	
			Uplift	Lateral (F2) <sup>5,6</sup>	Uplift	Lateral (F2) <sup>5,6</sup>
4.75	1	2x	260	270	260	210
	2		520	540	520	420
	3		780	810	780	630
6.25	1	2x <sup>7</sup>	675	285	505	240
	2		1345	570	1015	480
	3		2020	860	1520	720
	1	Double 2x <sup>8</sup>	775	285	720	245
	2		1545	570	1435	485
	3		2320	860	2150	730

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N

1. Dimensional lumber members shall be a minimum of 2" nominal thickness.
2. Fastener shall be installed at an angle between 20 - 30°. 22° is optimal (see Figure 6).
3. For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for a specific gravity of 0.42. For wood species with an assigned specific gravity greater than or equal to 0.50, use the tabulated value for specific gravity of 0.50.
4. For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
5. Includes 1.6 duration of load increase for wind and seismic. No further duration of load increases permitted. Reduce design values for other load durations as applicable.
6. The lateral load direction (F2) is perpendicular to the wall.
7. Fasteners installed at a 15° angle, maximum 4.5" from end of stud (see Figure 6).
8. Fasteners installed at a 22° angle, maximum 3" from end of stud (see Figure 6).



**Figure 6.** Elevation and Section Views for Fastener Installed in Wide Face of Stud

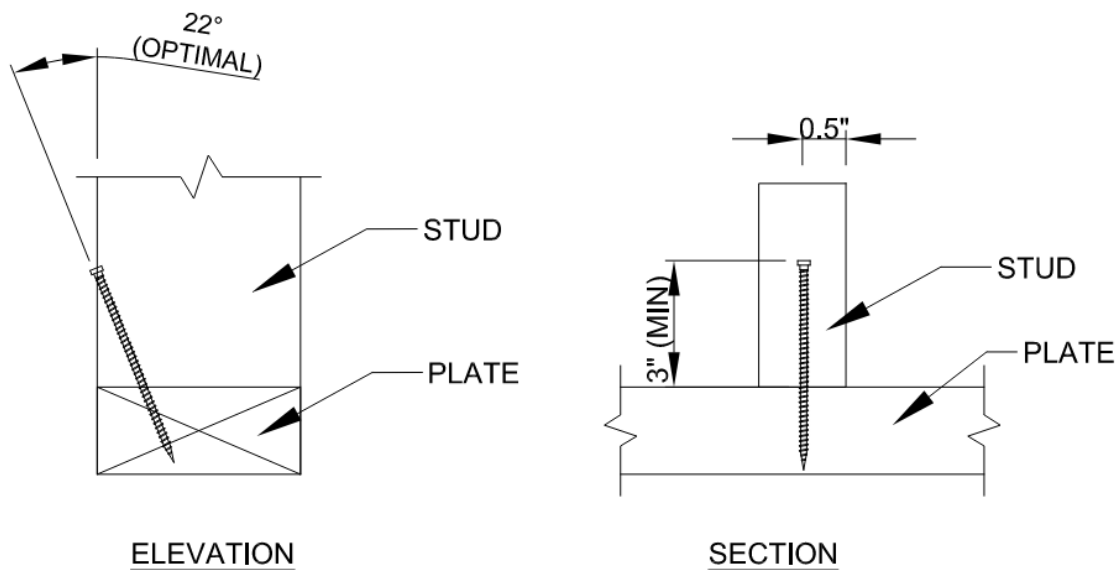


**Table 5.** Allowable Design Values for Stud to Plate Connections, Fasteners Installed in Narrow Face

Fastener Length	Nominal Plate Thickness	Allowable Loads <sup>1,2,3,4,5</sup> (lb)			
		DF-L/SP (0.50)		SPF/HF (0.42)	
		Uplift	Lateral (F2) <sup>6,7</sup>	Uplift	Lateral (F2) <sup>6,7</sup>
4.75	2x	260	270	260	210
6.25	2x	260	285	260	240
	Double 2x	350	285	290	245

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N

1. Dimensional lumber members shall be a minimum of 2" nominal thickness.
2. Fastener shall be installed at an angle between 20 - 30°. 22° is optimal (see **Figure 7**).
3. For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for a specific gravity of 0.42. For wood species with an assigned specific gravity greater than or equal to 0.50, use the tabulated value for specific gravity of 0.50.
4. For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
5. Includes 1.6 duration of load increase for wind and seismic. No further duration of load increases permitted. Reduce design values for other load durations as applicable.
6. Limit: one fastener installed in the narrow face of each stud.
7. The lateral load direction (F2) is perpendicular to the wall.



**Figure 7.** Elevation and Section Views for Fastener Installed in Narrow Face of Stud

- 6.11 Where it is anticipated that loads will be applied to a single fastener in more than one direction simultaneously, additional evaluation is required to account for the combined effect of the loads using accepted engineering practice.
  - 6.11.1 Consult a professional engineer, as needed, for complex design conditions.
- 6.12 Where the application falls outside of the performance evaluation, conditions of use, and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.



## 7 Certified Performance<sup>xxii</sup>

- 7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.<sup>xxiii</sup>
- 7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.<sup>xxiv</sup>

## 8 Regulatory Evaluation and Accepted Engineering Practice

- 8.1 SPAX® PowerLag® Screws comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:
  - 8.1.1 #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners were evaluated as an alternate means of attaching metal plate connected wood trusses, rafters, or floor joists to the tops of walls to provide uplift and lateral load resistance. The fasteners were evaluated under the following conditions:
    - 8.1.1.1 Shear strength for use as an alternative to toenail connections, hurricane and seismic clips/straps, or nails in shear (lateral) load applications either parallel or perpendicular to wood grain.
    - 8.1.1.2 Withdrawal strength for use as an alternative to toenail connections, metal hurricane and seismic clips/straps, or nails in tension (uplift) load applications.
    - 8.1.1.3 Head pull-through strength for use as an alternative to toenail connections, hurricane and seismic clips/straps, or nails in tension (uplift) load applications.
  - 8.1.2 #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners were evaluated as an alternative means of attaching wall bottom plates to the rim board. The fasteners were evaluated under the following conditions:
    - 8.1.2.1 Shear strength to resist shear (lateral) loads applied parallel to the bottom plate and rim board.
  - 8.1.3 #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners were evaluated as an alternative means of attaching wall studs to top and bottom plates. The fasteners were evaluated under the following conditions:
    - 8.1.3.1 Shear strength for use as an alternative to toenail connections to resist shear (lateral) loads applied perpendicular to the wall.
    - 8.1.3.2 Withdrawal strength for use as an alternative to toenail connections to resist tension (uplift) loads.
    - 8.1.3.3 Head pull-through strength of #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners for use as an alternative to toenail connections to resist tension (uplift) loads.
  - 8.1.4 Connections other than those addressed in Section 9 are outside the scope of this report.
- 8.2 Any building code, regulation, and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this report were performed by DrJ Engineering, LLC (DrJ), an [ISO/IEC 17065 accredited certification body](#) and a professional engineering company operated by [RDP/approved sources](#). DrJ is qualified<sup>xxv</sup> to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.
- 8.3 Engineering evaluations are conducted with DrJ's ANAB [accredited ICS code scope](#) of expertise, which are also its areas of professional engineering competence.
- 8.4 Any regulation specific issues not addressed in this section are outside the scope of this report.



## 9 Installation

- 9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report and the applicable building code.
- 9.2 In the event of a conflict between the manufacturer installation instructions and this report, the more restrictive shall govern.
- 9.3 #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners shall be installed using a T-30 or SPAX® T-30 Plus driver bit.
- 9.4 Fasteners shall not be struck with a hammer during installation.
- 9.5 Lead holes are not required.
- 9.6 The fastener head must be installed flush to the surface of the wood member being connected. The fastener must not be overdriven.

### 9.7 Truss/Rafter/Joist to Top Plate Connection

- 9.7.1 Install #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners upward through the wall top plates or wood structural framing member at the bottom corner of the top plate(s) and into the center of the wood truss or rafter. The fastener should be installed at an upward angle from the vertical of 20° to 30° (**Figure 3**) and should penetrate the wood truss, rafter, or joist within 1/4" of the centerline. Fasteners located between studs may be installed at a 90° angle (**Figure 4**).
  - 9.7.1.1 If the wood truss, rafter, or floor joist is located directly over a top plate splice, offset the fastener 1/4" to one side of the splice. Note that the splice may be in either top plate.
- 9.7.2 Minimum penetration for truss/rafter/joist to top plate connections is 2.5".
- 9.7.3 Minimum requirements for fastener spacing, edge distance, and end distance shall be in accordance with **Table 6**.

**Table 6.** Minimum Spacing, Edge Distance, and End Distance Requirements

Connection Geometry	Minimum Spacing (in)
Edge Distance – Load in any direction	1/2
End Distance – Load parallel to grain, towards end	2 <sup>5</sup> / <sub>8</sub>
End Distance – Load parallel to grain, away from end	1 <sup>3</sup> / <sub>4</sub>
End Distance – Load perpendicular to grain	1 <sup>3</sup> / <sub>4</sub>
Spacing between Fasteners in a Row – Parallel to grain	2 <sup>5</sup> / <sub>8</sub>
Spacing between Fasteners in a Row – Perpendicular to grain	1 <sup>3</sup> / <sub>4</sub>
Spacing between Rows of Fasteners – In-line	7/8
Spacing between Rows of Fasteners – Staggered	1/2

SI: 1 in. = 25.4 mm

- Edge distances, end distances, and spacing of fasteners shall be sufficient to prevent splitting of the wood or as shown in this table, whichever is the more restrictive.
- Values for "Spacing between Rows of Fasteners – Staggered" apply where the fasteners in adjacent rows are offset by one half of the "Spacing between Fasteners in a Row."
- For required end distance in stud to plate connections, see Section 9.9.3.1.

### 9.8 Bottom Plate to Rim Board Connection

- 9.8.1 Install #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners downward at a 90° angle, a minimum of 1/2" from outside face of wall, through the plate and into the rim board (see **Figure 5**).
- 9.8.2 Minimum penetration for bottom plate to rim board connections is 2.0".
- 9.8.3 Minimum requirements for fastener spacing, edge distance, and end distance shall be in accordance with **Table 6**.



## 9.9 Stud to Plate Connection

- 9.9.1 Install #14 x 4<sup>3</sup>/<sub>4</sub>" and #14 x 6<sup>1</sup>/<sub>4</sub>" fasteners through the stud and into the wall top or bottom plate. The fastener should be installed at an angle from the vertical of 20° to 30° (see **Figure 6** and **Figure 7**).
- 9.9.2 Where three fasteners are installed in the wide face of the stud, two fasteners are driven into the same face with a minimum 1<sup>3</sup>/<sub>4</sub>" spacing between them, and the third fastener is driven into the center of the stud (+/- 1/8") on the opposite face.
- 9.9.3 Minimum requirements for fastener spacing, edge distance, and end distance shall be in accordance with **Table 6**, with the following exception:
  - 9.9.3.1 Fasteners shall be located a minimum of 3" from the end of the stud (see **Figure 6** and **Figure 7**).

## 10 Substantiating Data

- 10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:
  - 10.1.1 Connection design value calculations by DrJ Engineering, LLC in accordance with NDS and accepted engineering practice.
  - 10.1.2 Material properties and design values in accordance with Report Number 1912-07.
- 10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or RDPs. Accuracy of external test data and resulting analysis is relied upon.
- 10.3 Where pertinent, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.
- 10.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.
- 10.5 Testing and engineering analysis: The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.<sup>xxvi</sup>
- 10.6 Where additional condition of use and/or regulatory compliance information is required, please search for SPAX® PowerLag® Screws on the DrJ Certification website.



## 11 Findings

- 11.1 As outlined in Section 6, SPAX® PowerLag® Screws have performance characteristics that were tested and/or meet applicable regulations and are suitable for use pursuant to its specified purpose.
- 11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, SPAX® PowerLag® Screws shall be approved for the following applications:
- 11.2.1 An acceptable alternative means of attaching metal plate connected wood trusses, or floor joists to the tops of walls to provide uplift and lateral load resistance due to wind and seismic forces as provided in **Table 2**.
  - 11.2.2 An acceptable alternative means of attaching wall bottom plate to rim board to provide lateral load resistance parallel to the bottom plate as provided in **Table 3**.
  - 11.2.3 An acceptable alternative means of attaching wall studs to top and bottom plates, for fasteners installed in the wide face or narrow face of the stud, to provide uplift and lateral load resistance due to wind and seismic forces as provided in **Table 4** and **Table 5**.
- 11.3 Unless exempt by state statute, when SPAX® PowerLag® Screws are to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.
- 11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Altenloh, Brinck & Company U.S., Inc.
- 11.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10<sup>xxvii</sup> are similar) in pertinent part states:
- 104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.
- 11.6 **Approved:**<sup>xxviii</sup> Building regulations require that the building official shall accept duly authenticated reports.<sup>xxix</sup>
- 11.6.1 An approved agency is “approved” when it is ANAB ISO/IEC 17065 accredited.
  - 11.6.2 An approved source is “approved” when an RDP is properly licensed to transact engineering commerce.
  - 11.6.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.
- 11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB-Accredited Product Certification Body – Accreditation #1131.
- 11.8 Through the IAF Multilateral Agreements (MLA), this Duly Authenticated Report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 Duly Authenticated Reports are equivalent.<sup>xxx</sup>

## 12 Conditions of Use

- 12.1 Material properties shall not fall outside the boundaries defined in Section 6.
- 12.2 As defined in Section 6, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.
- 12.3 For conditions not covered in this report, connections shall be designed in accordance with accepted engineering practice.
- 12.4 Connected wood members must have a moisture content of less than or equal to nineteen percent (19%).
- 12.5 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this report.



- 12.6 When required by adopted legislation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:
- 12.6.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.
  - 12.6.2 This report and the installation instructions shall be submitted at the time of permit application.
  - 12.6.3 These innovative products have an internal quality control program and a third-party quality assurance program.
  - 12.6.4 At a minimum, these innovative products shall be installed per Section **9** of this report.
  - 12.6.5 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.
  - 12.6.6 These innovative products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4, and IRC Section R109.2.
  - 12.6.7 The application of these innovative products in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.
- 12.7 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, *"the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new material or assemblies as provided for in Section 104.11,"* all of IBC Section 104, and IBC Section 105.4.
- 12.8 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).
- 12.9 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

### 13 Identification

- 13.1 The innovative products listed in Section **1.1** are identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number and other information to confirm code compliance.
- 13.2 Additional technical information can be found at [www.spax.us](http://www.spax.us).

### 14 Review Schedule

- 14.1 This report is subject to periodic review and revision. For the latest version, visit [drjcertification.org](http://drjcertification.org).
- 14.2 For information on the status of this report, please contact [DrJ Certification](#).

### 15 Approved for Use Pursuant to U.S. and International Legislation Defined in Appendix A

- 15.1 SPAX® PowerLag® Screws are included in this report published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services. This report states either that the material, product, or service meets recognized standards or has been tested and found suitable for a specified purpose. This report meets the legislative intent and definition of being acceptable to the AHJ.





## Appendix A

### 1 Legislation that Authorizes AHJ Approval

- 1.1 **Fair Competition:** State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:
  - 1.1.1 Advance Innovation,
  - 1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and
  - 1.1.3 Benefit consumers through lower prices, better quality and greater choice.
- 1.2 **Adopted Legislation:** The following local, state and federal regulations affirmatively authorize these innovative products to be approved by AHJs, delegates of building departments and/or delegates of an agency of the federal government:
  - 1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies and/or methods of construction. The goal is to “protect economic freedom and opportunity by promoting free and fair competition in the marketplace.”
  - 1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.
  - 1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA),<sup>xxxix</sup> where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than ten years<sup>xxxix</sup> and/or a \$5,000,000 fine or 3 times the value of<sup>xxxix</sup> the Intellectual Property (IP) and Trade Secrets (TS).
    - 1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of Listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.
  - 1.2.4 For new materials<sup>xxxix</sup> that are not specifically provided for in any regulation, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.
  - 1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.<sup>xxxix</sup>
  - 1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence provided in writing, that specific legislation has been violated by an individual registered PE.
  - 1.2.7 The AHJ shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11.<sup>xxxix</sup>



- 1.3 **Approved<sup>xxxvii</sup> by Los Angeles:** The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards that apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.<sup>xxxviii</sup> The Superintendent of Building Approved Testing Agency Roster is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a DrJ Listing are LAMC approved. In addition, the Superintendent of Building shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code (CBC) Section 1707.1.<sup>xxxix</sup>
- 1.4 **Approved by Chicago:** The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).
- 1.5 **Approved by New York City:** The 2022 NYC Building Code (NYCBC) states in part that an approved agency shall be deemed<sup>xl</sup> an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement<sup>xli</sup> (i.e., ANAB, International Accreditation Forum (IAF), etc.).
- 1.6 **Approved by Florida:** Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation by:
- 1.6.1 A certification mark or listing of an approved certification agency,
  - 1.6.2 A test report from an approved testing laboratory,
  - 1.6.3 A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity, or
  - 1.6.4 A product evaluation report based upon testing, comparative or rational analysis, or a combination thereof, developed, signed and sealed by a professional engineer or architect, licensed in Florida.
- 1.7 For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods;
- 1.7.1 A certification mark, listing or label from a commission-approved certification agency indicating that the product complies with the code,
  - 1.7.2 A test report from a commission-approved testing laboratory indicating that the product tested complies with the code,
  - 1.7.3 A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code,





- 1.7.4 A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code, or
- 1.7.5 A statewide product approval issued by the Florida Building Commission.
- 1.8 The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642) and as a Florida Registered Engineer (i.e., ANE13741).
- 1.9 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA]):** A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.
- 1.10 **Approved by New Jersey:** Pursuant to the 2018 Building Code of New Jersey in IBC Section 1707.1 General,<sup>xiii</sup> it states: *“In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)”*.<sup>xiii</sup> Furthermore N.J.A.C 5:23-3.7 states: *“Municipal approvals of alternative materials, equipment, or methods of construction.”*
- 1.10.1 **Approvals:** Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations.
- 1.10.1.1 A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of the above.
- 1.10.1.2 Reports of engineering findings issued by nationally recognized evaluation service programs such as but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC) and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of the above.
- 1.10.2 The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item the previous paragraph, given that the listed entities are no longer in existence and/or do not provide *“reports of engineering findings”*.
- 1.11 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards:** Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14<sup>xliv</sup> and Part 3280,<sup>xlv</sup> the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform to the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow:
- 1.11.1 *“All construction methods shall be in conformance with accepted engineering practices”*
- 1.11.2 *“The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.”*
- 1.11.3 *“The design stresses of all materials shall conform to accepted engineering practice.”*



- 1.12 **Approval by US, Local and State Jurisdictions in General:** In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:
- 1.12.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.<sup>xlvi</sup>
  - 1.12.2 For innovative alternatives and/or methods of construction, the building official shall accept duly authenticated reports from approved agencies with respect to the quality and manner of use of new materials or assemblies.<sup>xlvii</sup>
    - 1.12.2.1 An approved agency is “approved” when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is in the ANAB directory.
    - 1.12.2.2 An approved source is “approved” when an RDP is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.<sup>xlviii</sup>
  - 1.12.3 The design strengths and permissible stresses of any structural material...shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.<sup>xlix</sup>
- 1.13 **Approval by International Jurisdictions:** The USMCA and GATT agreements provide for approval of innovative materials, designs, services and/or methods of construction through the Agreement on Technical Barriers to Trade and the IAF Multilateral Recognition Arrangement (MLA), where these agreements:
- 1.13.1 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.
  - 1.13.2 **Approved:** The purpose of the MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA and subsequently, acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, designs, services and/or methods of construction.
  - 1.13.3 ANAB is an IAF-MLA signatory where recognition of certificates, validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope, shall be approved.<sup>i</sup>
  - 1.13.4 Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.<sup>ii</sup>
- 1.14 Approval equity is a fundamental commercial and legal principle.<sup>iii</sup>



# Notes

- i For more information, visit [drjcertification.org](http://drjcertification.org) or call us at 608-310-6748.
- ii [2018 IBC Section 2304.10.5](#)
- iii <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1702>
- iv Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review <https://www.justice.gov/atr/mission> and <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11>
- v <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706>:-:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests%20as
- vi The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706>:-:text=shall%20conform%20to%20the%20specifications%20and%20methods%20of%20design%20of%20accepted%20engineering%20practice
- vii <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>:-:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies
- viii <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2>
- ix [https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved\\_agency](https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_agency)
- x [https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved\\_source](https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_source)
- xi <https://www.law.cornell.edu/uscode/text/18/1832> (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of \$5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The federal government and each state have a public records act. To follow D TSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: [Intellectual Property and Trade Secrets](#).
- xii <https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional> AND <https://apassociation.org/list-of-engineering-boards-in-each-state-archive/>
- xiii <https://www.cbiteest.com/accreditation/>
- xiv <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104>:-:text=to%20enforce%20the%20provisions%20of%20this%20code
- xv <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11>:-:text=Where%20the%20alternative%20material%20design%20or%20method%20of%20construction%20is%20not%20approved%20the%20building%20official%20shall%20respond%20in%20writing%20stating%20the%20reasons%20why%20the%20alternative%20was%20not%20approved AND <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#105.3.1>:-:text=If%20the%20application%20or%20the%20construction%20documents%20do%20not%20conform%20to%20the%20requirements%20of%20pertinent%20laws%20the%20building%20official%20shall%20reject%20such%20application%20in%20writing%20stating%20the%20reasons%20therefore
- xvi <https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>:-:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.11
- xvii <https://iaf.nu/en/about-iaf-mia/>:-:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%20with%20the%20appropriate%20scope
- xviii True for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- xix <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>
- xx Unless otherwise noted, all references in this report are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.
- xxi <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2>(Listed%20or%20certified); <https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#listed> AND <https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#labeled>
- xxii <https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1703.4>
- xxiii <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#>:-:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%20livable%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades
- xxiv <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#>:-:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur
- xxv Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited [product certification body](#).
- xxvi See Code of Federal Regulations (CFR) [Title 24 Subtitle B Chapter XX Part 3280](#) for definition.
- xxvii [2018 IFC Section 104.9](#)



- xxviii Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC [Section 201.4](#) where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.
- xxix <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>
- xxx Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- xxxi <http://www.drjengineering.org/AppendixC> AND <https://www.drjcertification.org/cornell-2016-protection-trade-secrets>
- xxxii <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years>
- xxxiii <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided>
- xxxiv <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2>
- xxxv [IBC 2021, Section 1706.1 Conformance to Standards](#)
- xxxvi [IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General](#)
- xxxvii **See Section 11.6 for the distilled building code definition of Approved.**
- xxxviii [Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES](#)
- xxxix <https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1>
- xl [New York City, The Rules of the City of New York, § 101-07 Approved Agencies](#)
- xli [New York City, The Rules of the City of New York, § 101-07 Approved Agencies](#)
- xlii [https://up.codes/viewer/new\\_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1](https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1)
- xliii <https://www.nj.gov/dca/divisions/codes/codreg/ucc.html>
- xliv <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14>
- xlv <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>
- xlvi [IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials.](#) Adopted law pursuant to IBC model code language 1706.2.
- xlvii [IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General.](#) Adopted law pursuant to IBC model code language 1707.1.
- xlviii <https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional> AND <https://apassociation.org/list-of-engineering-boards-in-each-state-archive/>
- xlix [IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards](#) Adopted law pursuant to IBC model code language 1706.1.
- i <https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope>
- ii True for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- iii <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>