



CERTIFICATION



Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 2204-02

Multi-Ply Beam Connections with
GripRite Structural Screws

**PrimeSource Building Products,
Inc.**

Products:

**1/4", 5/16", and 3/8" GripRite
Structural Screws**

Issue Date:

July 22, 2022

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July 22, 2022

Subject to Renewal:

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INFORMATION:

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

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

1 PRODUCTS EVALUATED¹

- 1.1 1/4", 5/16", and 3/8" GripRite Structural Screws

2 APPLICABLE CODES AND STANDARDS^{2,3}

2.1 Codes

- 2.1.1 *IBC—15, 18, 21: International Building Code®*
2.1.2 *IRC—15, 18, 21: International Residential Code®*

2.2 Standards and Referenced Documents

- 2.2.1 *AISI S904: Standard Test Methods for Determining the Tensile and Shear of Screws*
2.2.2 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*
2.2.3 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
2.2.4 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
2.2.5 *ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus*
2.2.6 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*
2.2.7 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
2.2.8 *ASTM G85: Standard Practice for Modified Salt Spray (Fog) Testing*

¹ For more information, visit drjcertification.org or call us at 608-310-6748.

² Unless otherwise noted, all references in this TER are from the 2021 version of the codes and the standards referenced therein. This material, design, or method of construction also complies with the 2000-2018 versions of the referenced codes and the standards referenced therein.

³ All terms defined in the applicable building codes are italicized.

3 PERFORMANCE EVALUATION

- 3.1 1/4", 5/16", and 3/8" GripRite Structural Screws were evaluated for their ability to provide multi-ply attachment in trusses, sawn lumber, and structural composite lumber (SCL) applications.
- 3.2 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this TER.
- 3.3 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.4 Any engineering evaluation conducted for this TER was performed within DrJ's ANAB accredited ICS code scope and/or the defined professional engineering scope of work on the dates provided herein.

4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 The products evaluated in this TER is shown in Figure 1.

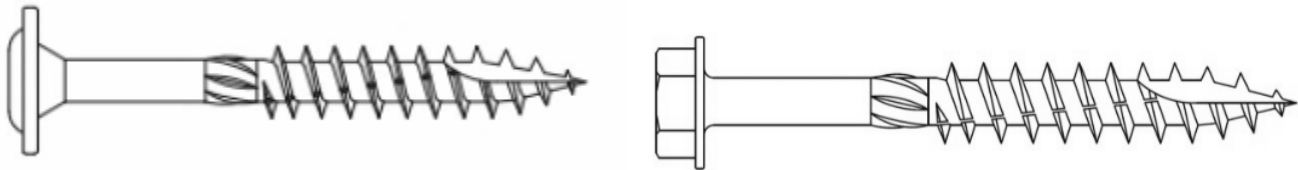


FIGURE 1. GRIPRITE STRUCTURAL SCREW WITH FLAT HEAD (LEFT) AND HEX HEAD (RIGHT)

- 4.2 GripRite Structural Screws are partially-threaded, self-drilling screws with flat heads with a star shaped driving recess or hex-washer heads. The screws have a Type 17 point. The screws have a reamer knurl between the screw thread and the smooth portion of the shank.
- 4.3 GripRite Structural Screws are formed from carbon steel wire, hardened after forming and then coated with a proprietary coating.
 - 4.3.1 The coating consists of a layer of zinc and a proprietary black outer coating.
- 4.4 *Treated Wood Applications*
 - 4.4.1 GripRite Structural Screws may be used in preservative-treated and fire-resistant-treated lumber as alternatives to hot-dip galvanized fasteners prescribed in IBC Section 2304.10.6⁴. GripRite Structural Screws have been evaluated for use in wood treated with ACQ-D preservatives with a maximum retention of 0.40 pcf.
 - 4.4.2 Corrosion resistance applications are limited to the following:
 - 4.4.2.1 Where equilibrium moisture content of the chemically treated wood meets the dry service conditions as described in *NDS*.
 - 4.4.2.2 Exposure is freshwater and chemically treated wood (no saltwater exposure).
 - 4.4.3 Fastener design values for preservative-treated and fire-resistant-treated lumber must be reduced as stated by the manufacturer of the lumber treatment.
- 4.5 *Wood Material*
 - 4.5.1 Wood main and side members must be solid-sawn lumber or boards having an assigned specific gravity as given in the respective tables of this TER.
- 4.6 The GripRite Structural Screws evaluated in this TER are set forth in Table 1.

⁴ 2018 IBC Section 2304.10.5



TABLE 1. GRIPRITE STRUCTURAL SCREW PROPERTIES

Fastener Designation	Head			Length (in)		Diameter (in)			Bending Yield Strength ³ , f_{yb} , (psi)	Allowable Steel Strength (lbs)	
	Style	Drive System	Diameter (in)	Fastener ¹	Thread ²	Shank	Minor	Major		Tensile	Shear
1/4" x 2 1/2"	Flat	T-25	0.533	2 1/2	1 1/2	0.166	0.148	0.234	220,000	1,155	645
1/4" x 3"	Hex Washer	T-20	0.415	3	1 1/2						
1/4" x 4"				4	2						
1/4" x 4 1/2"				4 1/2	2 1/4						
1/4" x 5"				5	2 1/4						
1/4" x 6"				6	3 1/4						
1/4" x 3"	Flat	T-25	0.533	3	1 1/2	0.166	0.148	0.234	220,000	1,155	645
1/4" x 4"				4	2						
1/4" x 4 1/2"				4 1/2	2 1/4						
1/4" x 5"				5	2 1/4						
1/4" x 6"				6	3 1/4						
5/16" x 3"	Hex Washer	T-25	0.571	3	1 1/2	0.202	0.179	0.281	230,000	1,970	1,070
5/16" x 3 1/8"				3 1/8	1 1/2						
5/16" x 4"				4	2						
5/16" x 5"				5	2 1/4						
5/16" x 6"				6	3 1/4						
5/16" x 3"	Flat	T-30	0.610	3	1 1/2	0.202	0.179	0.281	230,000	1,970	1,070
5/16" x 3 1/8"				3 1/8	1 1/2						
5/16" x 4"				4	2						
5/16" x 5"				5	2 1/4						
5/16" x 6"				6	3 1/4						
3/8" x 3"	Hex	T-25	0.571	3	1 1/2	0.220	0.196	0.311	230,000	2,105	1,085
3/8" x 3 1/2"				3 1/2	2						
3/8" x 4"				4	2						
3/8" x 6"				4 1/2	3 1/4						
3/8" x 3"	Flat	T-40	0.728	3	1 1/2	0.220	0.196	0.311	230,000	2,105	1,085
3/8" x 3 1/2"				3 1/2	2						
3/8" x 4"				4	2						
3/8" x 6"				4 1/2	3 1/4						

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

1. Fastener length is measured from the underside of the head to the tip.
2. Thread length includes tapered tip.
3. Bending yield strength, F_{yb} , is determined in accordance with *ASTM F1575* using minor thread diameter.

5 APPLICATIONS

5.1 General

5.1.1 GripRite Structural Screws are used for attaching multi-ply wood members including trusses, sawn lumber, and SCL products.

5.2 Design

5.2.1 GripRite Structural Screws is governed by the applicable code and the provisions for dowel type fasteners in NDS.
 5.2.2 Unless otherwise noted, adjustment of the design stresses for duration of load shall be in accordance with the applicable code.

5.3 Multi-Ply Connection Design Values

5.3.1 Sawn lumber design values are provided for assemblies with two, three, or four plies. Sawn lumber assemblies are detailed in Figure 2.

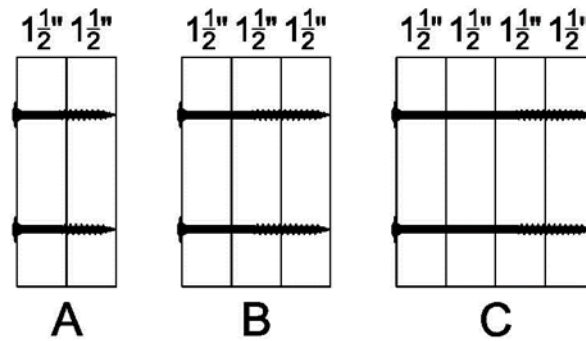


FIGURE 2. SAWN LUMBER ASSEMBLY CONFIGURATION

5.3.2 SCL design values are provided for assemblies with two, three, or four plies. SCL assemblies are detailed in Figure 3.

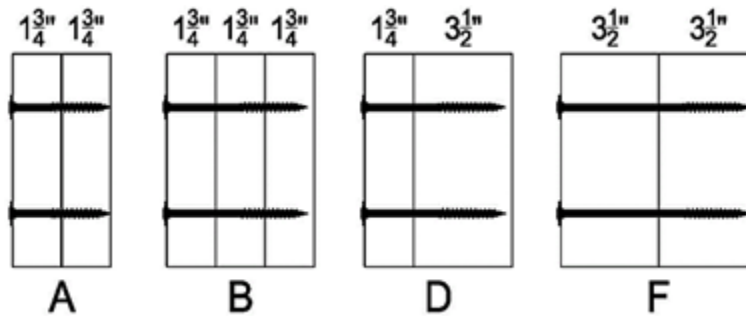


FIGURE 3. SCL ASSEMBLY CONFIGURATIONS



5.3.3 GripRite Structural Screws used in sawn lumber assemblies, with the tabulated fastener spacing along the length of the beam, have the lateral design values set forth in Table 2.

5.3.3.1 See Figure 2 for sawn lumber assemblies A through C.

TABLE 2. ALLOWABLE LATERAL DESIGN VALUES (PLF) IN SAWN LUMBER ASSEMBLIES^{1,2,3,4}

Fastener	Assembly	Members	Fastener Length(s) ⁵ (in)	SPF/HF (0.42)						SP (0.55)					
				12" o.c.		16" o.c.		24" o.c.		12" o.c.		16" o.c.		24" o.c.	
				Number of Fasteners per Row											
				2	3	2	3	2	3	2	3	2	3	2	3
1/4" GripRite	A	2-ply 1 1/2"	2 1/2	460	690	345	520	230	345	625	940	470	705	315	475
	A	2-ply 1 1/2"	3	520	780	390	585	260	390	790	1185	595	895	395	595
	B	3-ply 1 1/2"	4 or 4 1/2	420	630	315	475	210	315	600	900	450	675	300	450
	C	4-ply 1 1/2"	6	375	565	280	420	190	285	535	805	400	600	270	405
5/16" GripRite	A	2-ply 1 1/2"	3	480	720	360	540	240	360	785	1180	590	885	395	595
	C	4-ply 1 1/2"	6	350	525	265	400	175	265	570	855	430	645	285	430
3/8" GripRite	A	2-ply 1 1/2"	3	690	1035	520	780	345	520	880	1320	660	990	440	660
	C	4-ply 1 1/2"	6	460	690	345	520	230	345	585	880	440	660	295	445

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Wood framing shall be any species with specific gravity, SG, of 0.42 or greater. For wood species with an assigned specific gravity between 0.42 and 0.55, use the tabulated values for specific gravity of 0.42. For wood species with an assigned specific gravity greater than 0.55, use the tabulated values for specific gravity of 0.55.
2. Allowable design values are based on a load duration factor $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the NDS.
3. The tabulated allowable design loads may be applied to either side of the beam (head or point side of the fastener). Where loads are applied to both sides of the beam simultaneously, the total load applied to the beam shall not exceed the tabulated load.
4. For top-loaded members with even loading across the width of the entire assembly, fasteners shall be installed in two (2) rows with a maximum distance of 32" o.c. (on-center) between fasteners in the same row.
5. Fastener length is measured from the underside of the head to the tip.

5.3.4 GripRite Structural Screws used for SCL assemblies, with the tabulated fastener spacing along the length of the beam, have the design values set forth in Table 3.

5.3.4.1 See Figure 3 for SCL assemblies.

TABLE 3. ALLOWABLE LATERAL DESIGN VALUES (PLF) IN SCL ASSEMBLIES^{1,2,3,4,5}

Fastener	Assembly	Members	Fastener Length(s) ⁶ (in)	12" o.c.		16" o.c.		24" o.c.	
				Number of Fasteners per Row					
				2	3	2	3	2	3
1/4" GripRite	A	2-ply 1 3/4"	3	615	925	460	690	310	465
	B	3-ply 1 3/4"	4 1/2 or 5	550	825	415	625	275	415
	D	2-ply 1 3/4" & 3 1/2"	3	460	690	345	520	230	345
			4, 4 1/2, or 5	550	825	415	625	275	415
	F	2-ply 3 1/2"	4 1/2	555	835	415	625	280	420
			5	685	1030	515	775	345	520
6	735	1105	555	835	370	555			
5/16" GripRite	A	2-ply 1 3/4"	3	645	970	485	730	325	490
		2-ply 1 3/4"	3 1/8	670	1005	505	760	335	505
	B	3-ply 1 3/4"	5	630	945	475	715	315	475
	D	2-ply 1 3/4" & 3 1/2"	3	485	730	365	550	245	370
			3 1/8	500	750	375	565	250	375
			4 or 5	630	945	475	715	315	475
	F	2-ply 3 1/2"	5	695	1045	525	790	350	525
6			845	1270	635	955	425	640	
3/8" GripRite	A	2-ply 1 3/4"	3	695	1045	525	790	350	525
		2-ply 1 3/4" & 3 1/2"	3 1/2	785	1180	590	885	395	595
	D	2-ply 1 3/4" & 3 1/2"	3	525	790	395	595	265	400
			3 1/2	590	885	445	670	295	445
			4	665	1000	500	750	335	505
	F	2-ply 3 1/2"	6	940	1410	705	1060	470	705

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

- SCL shall have an equivalent specific gravity of 0.50 or greater. Thicknesses listed in Figure 3 are a minimum.
- In Assembly D, the fastener shall be installed with the head in contact with the 1.75" thick member, in order to achieve required penetration, as shown in Figure 3.
- Allowable design values are based on a load duration factor of $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the *NDS*.
- The tabulated allowable design loads may be applied to either side of the beam (head or point side of the fastener). Where loads are applied to both sides of the beam simultaneously, the total load applied to the beam shall not exceed the tabulated load.
- For top-loaded members with even loading across the width of the entire assembly, and a depth of 18" or less, fasteners shall be installed in two (2) rows with a maximum distance of 24" o.c. between fasteners in the same row. Use three (3) rows for members deeper than 18".
- Fastener length is measured from the underside of the head to the tip.

5.4 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

6 INSTALLATION

- 6.1 Installation shall comply with the manufacturer’s installation instructions and this TER. In the event of a conflict between the manufacturer’s installation instructions and this TER, the more restrictive shall govern.
- 6.2 Install fasteners with the underside of the head flush to the surface of the wood member. Do not overdrive.
- 6.3 Lead holes are not required but may be used where lumber is prone to splitting.
- 6.4 Screws shall be installed with the appropriate rotating powered driver.
- 6.5 Fasteners shall not be struck with a hammer during installation.
- 6.6 Minimum requirements for screw spacing edge distance, and end distance shall be in accordance with Table 4.

TABLE 4. SCREW SPACING, EDGE DISTANCE, AND END DISTANCE REQUIREMENTS^{1,2,3}

Connection Geometry		Minimum Spacing (in)						
		3/8"		5/16"		1/4"		
		0.42	0.50	0.42	0.50	0.42	0.50	
End Distance	Tension loading parallel to grain (bearing toward member end)		4 3/4	6 1/4	4 1/4	5 5/8	3 5/8	4 3/4
	Compression loading parallel to grain (bearing away from member end)		3 1/8	4 3/4	2 7/8	4 1/4	2 3/8	3 5/8
	Loading perpendicular to grain		3 1/8	4 3/4	2 7/8	4 1/4	2 3/8	3 5/8
	Axial Loading (withdrawal or pull-through)		3 1/8	3 1/8	2 7/8	2 7/8	2 3/8	2 3/8
Edge Distance	Loading Parallel to Grain		1 5/8	2 1/4	1 1/2	2	1 1/4	1 3/4
	Loading Perpendicular to Grain	Load toward edge	3 1/8	3 3/4	2 7/8	3 3/8	2 3/8	2 7/8
		Load away from edge	1 5/8	2 1/4	1 1/2	2	1 1/4	1 3/4
	Axial Loading		1 1/4	1 1/4	1 1/8	1 1/8	1	1
Spacing Between Fasteners in a Row (Parallel to Grain Spacing)	Loading Parallel to Grain		4 3/4	4 3/4	4 1/4	4 1/4	3 5/8	3 5/8
	Loading Perpendicular to Grain		3 3/4	4 3/4	3 3/8	4 1/4	2 7/8	3 5/8
	Axial Loading		2 1/4	2 1/4	2	2	1 3/4	1 3/4
Spacing Between Rows (Perpendicular to Grain Spacing)	Lateral Loading	In-line rows	1 5/8	2 1/4	1 1/2	2	1 1/4	1 3/4
		Staggered rows ⁴	7/8	1	3/4	7/8	5/8	3/4
	Axial Loading		1 1/4	1 1/4	1 1/8	1 1/8	1	1

SI: 1 in = 25.4 mm

- 1. 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.
- 2. Wood member stresses must be checked in accordance with Section 11.1.2 and Appendix E of the *NDS*, and end distances, edge distances and fastener spacing may need to be increased accordingly.
- 3. Values for “Spacing between Rows or Fasteners-Staggered” apply where the screws in adjacent rows are offset by one-half of the “Spacing between Fasteners in a Row”.

7 SUBSTANTIATING DATA

- 7.1 Connection design value calculations by DrJ Engineering, LLC in accordance with *NDS* and accepted engineering practice.
- 7.2 Information contained herein is the result of testing and/or data analysis by sources which conform to *IBC Section 1703* and/or *professional engineering regulations*. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.

- 7.3 Where appropriate, DrJ's analysis is based on provisions that have been codified into law through state or local adoption of codes and standards. The providers of the codes and standards are legally responsible for their content. DrJ analysis may use code-adopted provisions as a control sample. A control sample versus a test sample establishes a products as being equivalent to that prescribed in this code in quality, strength, effectiveness, fire resistance, durability, and safety. Where the accuracy of the provisions provided herein is reliant upon the published properties of materials, DrJ relies upon the grade mark, grade stamp, mill certificate, and/or test data provided by material suppliers to be minimum properties. DrJ analysis relies upon these properties to be accurate.

8 FINDINGS

- 8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, the product(s) listed in Section 1.1 are approved for the following:
- 8.1.1 To provide multi-ply attachment in trusses, sawn lumber, and SCL assemblies.
- 8.2 Building codes require data from valid research reports be obtained from approved sources (i.e., licensed registered design professionals [RDPs]).
- 8.2.1 Building official approval of a licensed RDP is performed by verifying the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.
- 8.3 Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the building official. DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131 and employs RDPs.
- 8.4 Through ANAB accreditation and the IAF MLA, DrJ certification can be used to obtain products approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – “certified once, accepted everywhere.”
- 8.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10⁵ are similar) 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*.

9 CONDITIONS OF USE

- 9.1 Moisture content shall be less than or equal to 19% for sawn lumber and less than 16% for SCL products.
- 9.2 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this evaluation report.
- 9.3 Where required by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.
- 9.4 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 9.5 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (e.g., owner or RDP).
- 9.6 At a minimum, this products shall be installed per Section 6 of this TER.
- 9.7 This products has an internal quality control program and a third-party quality assurance program in accordance with IBC Section 104.4 and Section 110.4 and IRC Section R104.4 and Section R109.2.
- 9.8 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent.

⁵ 2018 IFC Section 104.9



- 9.9 This TER shall be reviewed for code compliance by the AHJ in concert with IBC Section 104.
- 9.10 The implementation of this TER for this products is dependent on the design, quality control, third-party quality assurance, proper implementation of installation instructions, inspections required by IBC Section 110.3, and any other code or regulatory requirements that may apply.

10 IDENTIFICATION

- 10.1 The products listed in Section 1.1 is identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.
- 10.2 Additional technical information can be found at primesourcebp.com.

11 REVIEW SCHEDULE

- 11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.
- 11.2 For information on the current status of this TER, contact DrJ Certification.