STARBORN®

Structural

Code Compliant Wood Screws

Structural *H19*
Structural *H23*
Structural *F23*
Structural *F23-E & F23-W*

STARBORN.

Structural Screws

Starborn® Structural screws are designed for professional builders who demand higher levels of performance and enhanced usability. They are fully tested and code compliant alternatives to traditional lag screws and through-bolts, with no pre-drilling required.

Starborn Structural screws include several unique features that increase starting speed and reduce driving torque—all designed to save time and reduce labor on the jobsite.

Code compliance
Starborn Structural screws are fully tested and certified for code compliance.

Superior design values and performance
Starborn Structural screws are engineered to a higher specification for shear, tensile, and wood-to-wood connection strength.

Faster and easier installation
Starborn Structural screws are designed for reduced driving torque, making them faster and easier to install. Key features include a unique Tri-Forge™ Point that cleanly and efficiently bores through sawn lumber and engineered wood products, a Speed-Knurl™ that reduces friction on the unthreaded shank of the screw, and a specially formulated lubricious topcoat.

Corrosion resistance
Structural *H19*, *H23* and *F23* screws feature a black exterior coating that is a code compliant alternative to hot-dip galvanizing. This coating is approved for use in ACQ, Fire Retardant Treated (FRT), and other pressure treated lumbers. Structural *F23-E* and *F23-W* screws feature a gray e-coat finish designed for interior use only.

STARBORN®

Table of Contents

Products

Technical Guides and Merchandising

STARBORN®

Structural *H19*

Multipurpose | **Truss to Top Plate** | HEX

Exterior Grade Code Compliant Wood Screw

Starborn® Structural *H19* screws are designed for wood-to-wood connections in a variety of applications including decking, fencing, pergolas, landscape timbers, timber framing, and more. They are fully tested and code compliant alternatives to traditional lag screws and through-bolts, with no pre-drilling required. Structural *H19* screws feature a hex washer head for maximum drivability, a unique Tri-Forge™ point for reduced driving torque, and a high-adhesion exterior grade coating. The 6" screw is ideal for truss or rafter to top plate connections and is a code compliant alternative to toe-nail connections, metal hurricane ties, and seismic clips.

Features

- IRC/IBC code compliant
- No pre-drilling
- Comparable to 3/8" lag screws
- 0.19" shank diameter
- 5/16" hex head for maximum drivability
- Tri-Forge™ Point provides a fast start, minimal splitting, and reduced driving torque
- Speed-Knurl™ reduces friction on the unthreaded shank for faster installation
- Black exterior grade coating has high-adhesion and is an ACQ approved alternative to hot-dip galvanized coatings

Code Compliance Reports

- Fastener Properties and Design Values (DrJ TER 1703-05)
- Truss or Rafter to Top Plate and Bottom Plate to Rim Board (DrJ TER 1703-02)

Lateral Design Values (lbf)

Length	Head Marking*	Thread Length	HF/SPF (0.42 SG)		DF/SP/SCL (0.50 SG)	
			Z Perp	Z Para	Z Perp	Z Para
2-7/8"	D19 2.9	1.4"	230	230	225	245
4"	D19 4	2-1/4"	305	230	300	345
6"	D19 6	2-1/2"				
8"	D19 8					
10"	D19 10					

*Indicates Diameter and Length.
For complete technical information, visit starbornindustries.com

Packaging

Length	20 pc		50 pc		250 pc	500 pc
	Item no.	Case Qty.	Item no.	Case Qty.	Item no.	Item no.
2-7/8"	XH19CL0288	6	XH19CT0288	6	XH19CQ0288	XH19CV0288
4"	XH19CL0400	6	XH19CT0400	6	XH19CQ0400	XH19CV0400
6"	XH19CL0600	6	XH19CT0600	6	XH19CQ0600	XH19CV0600
8"	XH19CL0800	6	XH19CT0800	3	XH19CQ0800	
10"	XH19CL1000	6	XH19CT1000	3	XH19CQ1000 (200 pc)	

STARBORN®

Structural *H23*

Deck Ledger / Multipurpose

Exterior Grade Code Compliant Wood Screw

HEX

Starborn® Structural *H23* screws are specifically designed to attach deck ledgers to rim joists. They are fully tested and code compliant alternatives to traditional lag screws and through-bolts, with no pre-drilling required. Structural *H23* screws feature a hex washer head for maximum drivability, a unique Tri-Forge™ point for reduced driving torque, and a high-adhesion exterior grade coating. Complete fastening instructions are available in the Deck Ledger to Rim Joist Technical Guide. Structural *H23* screws can also be used in a variety of other code compliant wood-to-wood connections.

Features

- IRC/IBC code compliant
- No pre-drilling
- Comparable to 1/2" lag screws
- 0.23" shank diameter
- 3/8" hex head for maximum drivability
- Tri-Forge™ Point provides a fast start, minimal splitting, and reduced driving torque
- Speed-Knurl™ reduces friction on the unthreaded shank for faster installation
- Black exterior grade coating has high-adhesion and is an ACQ approved alternative to hot-dip galvanized coatings

Code Compliance Reports

- Fastener Properties and Design Values (DrJ TER 1703-05)
- Deck Ledger and Ledger to Stud Applications (DrJ TER 1703-01)

Lateral Design Values (lbf)

Length	Head Marking*	Thread Length	HF/SPF (0.42 SG)		DF/SP/SCL (0.50 SG)	
			Z Perp	Z Para	Z Perp	Z Para
4"	D23 4	2-3/8"	405	280	540	485
5"	D23 5	3"				

*Indicates Diameter and Length.
For a low-profile flat head alternative to attach deck ledgers, use Starborn Structural *F23* 4" and 5" screws.
For complete technical information, visit starbornindustries.com

Packaging

Length	20 pc		50 pc		250 pc	500 pc
	Item no.	Case Qty.	Item no.	Case Qty.	Item no.	Item no.
4"	XH23CL0400	6	XH23CT0400	6	XH23CQ0400	XH23CV0400
5"	XH23CL0500	6	XH23CT0500	6	XH23CQ0500	XH23CV0500

STARBORN®

Structural *F23*

Deck Ledger | **Multipurpose**

Exterior Grade Code Compliant Wood Screw

FLAT

Starborn® Structural *F23* screws are designed for heavy duty framing applications including decking, fencing, pergolas, landscape timbers, timber framing, and more. They are fully tested and code compliant alternatives to traditional lag screws and through-bolts, with no pre-drilling required. These versatile screws feature a low-profile flat head design that minimizes interference with connectors and finish materials, a unique Tri-Forge™ point for reduced driving torque, and a high-adhesion exterior grade coating. The 4" and 5" lengths are specifically designed for code compliant deck ledger attachments.

Features

- IRC/IBC code compliant
- No pre-drilling
- Comparable to 1/2" lag screws
- 0.23" shank diameter
- T40 star drive head eliminates cam-out
- Tri-Forge™ Point provides a fast start, minimal splitting, and reduced driving torque
- Speed-Knurl™ reduces friction on the unthreaded shank for faster installation
- Black exterior grade coating has high-adhesion and is an ACQ approved alternative to hot-dip galvanized coatings

Code Compliance Reports

- Fastener Properties and Design Values (DrJ TER 1703-05)
- Deck Ledger and Ledger to Stud Applications (DrJ TER 1703-01)
- Cladding Attachment Through Foam Sheathing (DrJ TER 1703-04)
- Multi-Ply Applications (DrJ TER 1703-03)

Lateral Design Values (lbf)

Length	Head Marking*	Thread Length	HF/SPF (0.42 SG)		DF/SP/SCL (0.50 SG)	
			Z Perp	Z Para	Z Perp	Z Para
2-7/8"	D23 2.9	1.4"	205	250	220	280
4"	D23 4	2-3/8"	405	280	540	485
5"	D23 5	3"				
6"	D23 6	2-3/4"				
8"	D23 8					
10"	D23 10					

*Indicates Diameter and Length.
For a hex head alternative to attach deck ledgers, use Starborn Structural *H23* 4" and 5" screws.
For complete technical information, visit starbornindustries.com

Packaging

Length	20 pc		50 pc		250 pc	500 pc
	Item no.	Case Qty.	Item no.	Case Qty.	Item no.	Item no.
2-7/8"	XF23CL0288	6	XF23CT0288	6	XF23CQ0288	XF23CV0288
4"	XF23CL0400	6	XF23CT0400	6	XF23CQ0400	XF23CV0400
5"	XF23CL0500	6	XF23CT0500	6	XF23CQ0500	XF23CV0500
6"	XF23CL0600	6	XF23CT0600	6	XF23CQ0600	XF23CV0600
8"	XF23CL0800	6	XF23CT0800	3	XF23CQ0800	
10"	XF23CL1000	6	XF23CT1000	3	XF23CQ1000 (200 pc)	

STARBORN®

Structural *F23-E & F23-W*

Multi-Ply Engineered Wood *F23-E* | **Multi-Ply Dimensional Wood** *F23-W*

FLAT

Interior Grade Code Compliant Wood Screw

Starborn® Structural *F23-E* and *F23-W* screws are specifically designed for interior multi-ply beam connections. They are a fully tested alternative to nails and through-bolts, and can be installed from one side of the beam without pre-drilling. Structural *F23-E* and *F23-W* screws feature a unique Tri-Forge™ point for reduced driving torque and a low-profile flat head that minimizes interference with connectors and finish materials. They are available in specific lengths for 2-, 3-, and 4-ply beams. *F23-E* screws are designed to fasten LVL, LSL, and PSL multi-ply beams. *F23-W* screws are designed to fasten 2x sawn lumber multi-ply beams.

Features

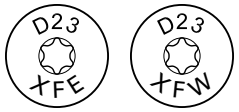
- No pre-drilling
- Alternative to nails and through-bolts
- 0.23" shank diameter
- T40 star drive head eliminates cam-out
- Tri-Forge™ Point provides a fast start, minimal splitting, and reduced driving torque
- Speed-Knurl™ reduces friction on the unthreaded shank for faster installation
- Thread design prevents board jacking
- Gray e-coat finish with lubricated top-coat for interior use only

Code Compliance Reports

- Fastener Properties and Design Values (DrJ TER 1703-05)
- Multi-Ply Applications (DrJ TER 1703-03)

Lateral Design Values (lbf)

Length	Head Marking*	Thread Length	HF/SPF (0.42 SG)		DF/SP/SCL (0.50 SG)	
			Z Perp	Z Para	Z Perp	Z Para
Structural *F23-E*						
3-3/8"	D23 3.4 XFE	1-1/2"	–	–	220	280
5"	D23 5 XFE				540	485
6-3/4"	D23 6.8 XFE					
Structural *F23-W*						
2-7/8"	D23 2.9 XFW	1.4"	205	250	220	280
4-3/8"	D23 4.4 XFW		405	280	540	485
5-7/8"	D23 5.9 XFW					



*Indicates Diameter and Length.
For exterior applications, use Starborn Structural *F23* black coated screws.
For complete technical information, visit starbornindustries.com

Packaging

Structural *F23-E*			
Length	50 pc		250 pc
	Item no.	Case Qty.	Item no.
3-3/8"	XF23ET0338	6	XF23EQ0338
5"	XF23ET0500	6	XF23EQ0500
6-3/4"	XF23ET0675	6	XF23EQ0675

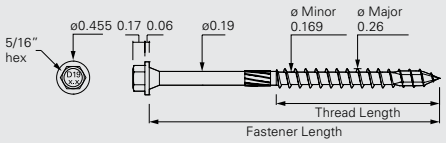
Structural *F23-W*			
Length	50 pc		250 pc
	Item no.	Case Qty.	Item no.
2-7/8"	XF23WT0288	6	XF23WV0288
4-3/8"	XF23WT0438	6	XF23WQ0438
5-7/8"	XF23WT0588	6	XF23WQ0588

STARBORN®

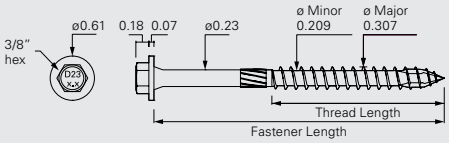
Structural Screws
Screw Properties and Design Values

For more detailed information, refer to the Code Compliance Report:
Fastener Properties and Design Values (DrJ TER 1703-05) available at *starbornindustries.com.*

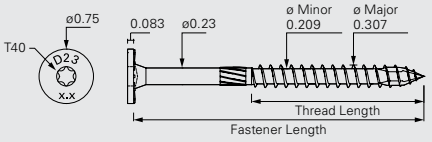
Structural *H19*



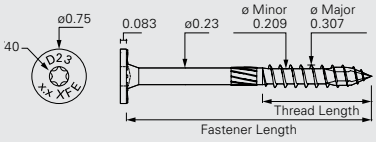
Structural *H23*



Structural *F23*



Structural *F23-E*



Structural *F23-W*

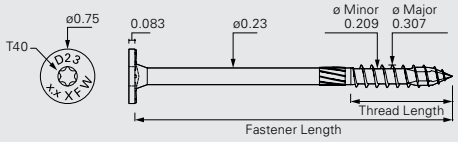


Table 1: Reference Lateral Design Values for Single Shear Connections

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)	Side Member Thickness (in)	Main Member Penetration (in)	Lateral Design Values (lbf) by Species (SG) and Load Orientation			
								HF/SPF (0.42)		DF/SP/SCL (0.50)	
								Z Perp	Z Para	Z Perp	Z Para
Structural *H19*	D19 2.9	0.19	Hex	2-7/8	1.4	1-1/2	1-3/8	230	230	225	245
	D19 4			4	2-1/4		2-1/2	305	230	300	345
	D19 6			6	2-1/2		4-1/2				
	D19 8			8			6-1/2				
	D19 10			10			8-1/2				
Structural *H23*	D23 4	0.23	Hex	4	2-3/8	1-1/2	2-1/2	405	280	540	485
	D23 5			5	3		3-1/2				
Structural *F23*	D23 2.9	0.23	Flat	2-7/8	1.4	1-1/2	1-3/8	205	250	220	280
	D23 4			4	2-3/8		2-1/2	405	280	540	485
	D23 5			5	3		3-1/2				
	D23 6			6	2-3/4		4-1/2				
	D23 8			8			6-1/2				
	D23 10			10			8-1/2				
Structural *F23-E*	D23 3.4 XFE	0.23	Flat	3-3/8	1-1/2	1-3/4	1-5/8	-	-	220	280
	D23 5 XFE			5			3-1/4			540	485
	D23 6.8 XFE			6-3/4			5				
						3-1/2	3-1/4				
Structural *F23-W*	D23 2.9 XFW	0.23	Flat	2-7/8	1.4	1-1/2	1-3/8	205	250	220	280
	D23 4.4 XFW			4-3/8			2-7/8	405	280	540	485
	D23 5.9 XFW			5-7/8			4-1/2				

1. Reference lateral design values apply to two-member single shear connections where both members are of the same specific gravity and the screw is oriented perpendicular to grain. When the wood members have different specific gravities, use the lower of the two.
2. Values shall be adjusted by all applicable adjustment factors per NDS.
3. Z Perp = lateral design value for connection with wood members loaded perpendicular to grain.
4. Z Para = lateral design value for connection with wood members loaded parallel to grain.

Table 2: Reference Withdrawal Design Values in Side Grain Applications and Head Pull-Through Design Values

Product Name	Screw Length (in)	Thread Length (in)	Allowable Withdrawal Design Values (lbf/in)[1]				Allowable Maximum Withdrawal Design Values (lbf)[1,2]		Allowable Head Pull-Through Design Values (lbf/in)[3]	
			Species (SG)				Species (SG)		Species (SG)	
			HF/SPF (0.42)		DF/SP/SCL (0.50)		HF/SPF (0.42)	DF/SP/SCL (0.50)	HF/SPF (0.42)	DF/SP/SCL (0.50)
			Thread Penetration (in)							
			1	2	1	2				
Structural *H19*	2-7/8	1.4	155	-	195	-	160	195	230	255
	4	2-1/4		165		195	170			
	6	2-1/2								
	8									
	10									
Structural *H23*	4	2-3/8	160	225	175	270	250	305	365	575
	5	3					290	365		
Structural *F23*	2-7/8	1.4	160	-	175	-	185	215	520	490
	4	2-3/8		225		270	250	305		
	5	3					290	365		
	6	2-3/4					275	340		
	8									
	10									
Structural *F23-E*	3-3/8	1-1/2	160	-	175	-	195	225	520	490
	5									
	6-3/4									
Structural *F23-W*	2-7/8	1.4	160	-	175	-	185	215	520	490
	4-3/8									
	5-7/8									

1. Values shall be adjusted by all applicable adjustment factors per NDS Section 11.3 for wood screws.
2. Maximum withdrawal design values based on full thread engagement, including the tip.
3. Values based on 1-1/2" thick wood member.

lbf = pound-force
SG = Specific Gravity
HF = Hem-Fir
SPF = Spruce-Pine-Fir
DF = Douglas Fir
SP = Southern Pine
SCL = Structural Composite Lumber

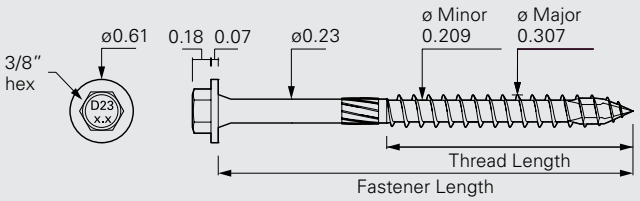
For the most up to date version of this Technical Guide, visit *starbornindustries.com*

STARBORN®

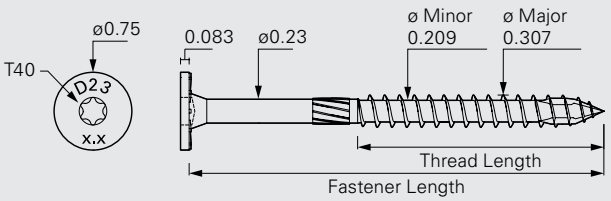
Deck Ledger to Rim Joist
Structural *H23* and *F23*

Starborn® Structural *H23* and *F23* Deck Ledger / Multipurpose screws are specifically designed to attach deck ledgers to rim joists in accordance with IRC Section R507.9 and IBC Section 1604.8.3.

Structural *H23*



Structural *F23*



Installation Instructions

- Select either the 4" or 5" screw so the threads fully engage the rim joist and the tip extends beyond its back face.
- Determine spacing pattern utilizing Table 2. Install screws in a staggered "W" pattern along the length of the ledger while maintaining the required edge and end distances (Figure 2).
- Use a high-torque low-speed drill with a 3/8" hex or Torx® T40 driver bit. Pre-drilling is not required, but can be used where lumber is prone to splitting.
- Drive until the washer is drawn firm and flush. Do not overdrive or countersink.

Corrosion Resistance

- Structural *H23* and *F23* screws feature a high-adhesion exterior grade coating and are a code compliant alternative to hot-dip galvanized fasteners. The coating is approved for use in ACQ, Fire Retardant Treated (FRT), and other pressure treated lumbers.
- Structural *H23* and *F23* screws are not designed for use in or near saltwater environments.

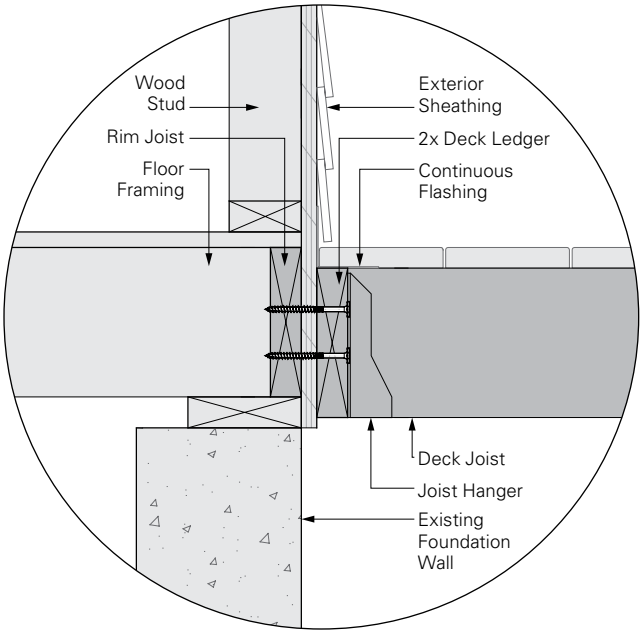


Figure 1—Deck Connection Assembly

Table 1: Screw Properties

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)
Structural *H23*	D23 4	0.23	Hex 3/8"	4	2-3/8
	D23 5			5	3
Structural *F23*	D23 4		Flat T40	4	2-3/8
	D23 5			5	3

For the most up to date version of this Technical Guide and more detailed information contained in the Deck Ledger and Ledger to Stud Applications code compliance report (DrJ TER 1703-01), visit *starbornindustries.com*. For applications outside the scope of this Technical Guide, an engineered design is required.

Figure 2—Minimum Spacing Requirements

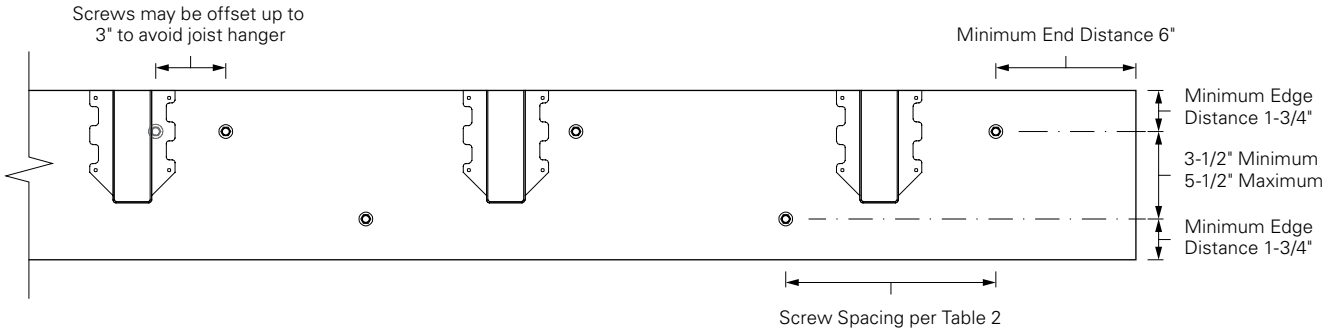


Table 2: IRC Compliant Screw Spacing Pattern for Attaching a Deck Ledger to a Band Joist

Loading Condition (psf): Live Load + Dead Load	Screw Length (in)	Rim Joist Material	2x Ledger Species	Maximum Deck Joist Spans (ft)						
				Up to 6	Up to 8	Up to 10	Up to 12	Up to 14	Up to 16	Up to 18
				Maximum On-Center Fastener Spacing (in)						
40+10	4	2x Sawn Lumber	HF/SPF	22	17	13	11	9	8	7
			DF/SP	30	22	18	15	12	11	10
		EWP	HF/SPF	24	18	14	12	10	9	8
			DF/SP	28	21	17	14	12	10	9
	5	2x Sawn Lumber	HF/SPF	24	18	14	12	10	9	8
			DF/SP	30	23	18	15	13	11	10
		EWP	HF/SPF	26	19	15	13	11	9	8
			DF/SP	30	23	18	15	13	11	10
60+10	4	2x Sawn Lumber	HF/SPF	16	12	9	8	6	6	5
			DF/SP	21	16	12	10	9	8	7
		EWP	HF/SPF	17	13	10	8	7	6	5
			DF/SP	20	15	12	10	8	7	6
	5	2x Sawn Lumber	HF/SPF	17	13	10	8	7	6	5
			DF/SP	23	17	13	11	9	8	7
		EWP	HF/SPF	18	14	11	9	8	7	6
			DF/SP	22	16	13	11	9	8	7

1. Spacing for items in IRC 2018 Table 507.9.1.3(1) or IRC 2015 Table 507.2 and other materials and conditions.
2. 2x solid sawn lumber rim joists and ledger shall be HF/SPF (SG = 0.42) or DF/SP (SG = 0.50).
3. Minimum rim joist: 2x solid sawn lumber SPF (SG = 0.42) 1-1/2" thick and 7-1/4" deep; EWP (SG = 0.50) 1" thick and 7-1/4" deep.
4. Minimum ledger: 1-1/2" thick and 7-1/4" deep.
5. Ledger assumed to be in wet service condition.
6. Design values include a wood load duration (C_D) = 1.0. Spacing may be adjusted by the applicable load duration as specified in NDS.
7. Screw spacing based on tested loads. The design values are the lesser of a 1/8" deflection or a safety factor greater than or equivalent to the code compliant lag screw application.
8. A maximum of 1/2" structural sheathing may be installed between the ledger and rim joist.

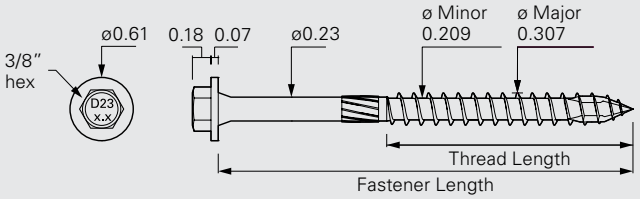
psf = pounds per square foot
EWP = Engineered Wood Product
HF = Hem-Fir
SPF = Spruce-Pine-Fir
DF = Douglas Fir
SP = Southern Pine
SG = Specific Gravity

STARBORN®

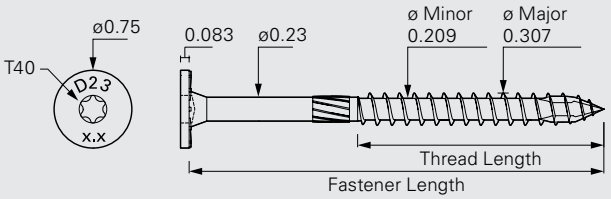
Ledger to Stud with 0, 1, or 2 Layers of 5/8" Gypsum
Structural *H23* and *F23*

Starborn® Structural *F23* and *H23* Deck Ledger / Multipurpose Screws can be used to attach ledgers to wood studs with zero, one, or two layers of gypsum between the ledger and studs.

Structural *H23*



Structural *F23*



Installation Instructions

- Select the proper length screw according to Table 2.
- Install screws while maintaining the required edge and end distances (Figures 2–5).
- Use a high-torque low-speed drill with a 3/8" hex or Torx® T40 driver bit. Pre-drilling is not required, but can be used where lumber is prone to splitting. For ledger end distances between 2" and 4", pre-drilling is recommended.
- Drive until the washer is drawn firm and flush. Do not overdrive or countersink.

Corrosion Resistance

- Structural *H23* and *F23* screws feature a high-adhesion exterior grade coating and are a code compliant alternative to hot-dip galvanized fasteners. The coating is approved for use in ACQ, Fire Retardant Treated (FRT), and other pressure treated lumbers.
- Structural *H23* and *F23* screws are not designed for use in or near saltwater environments.

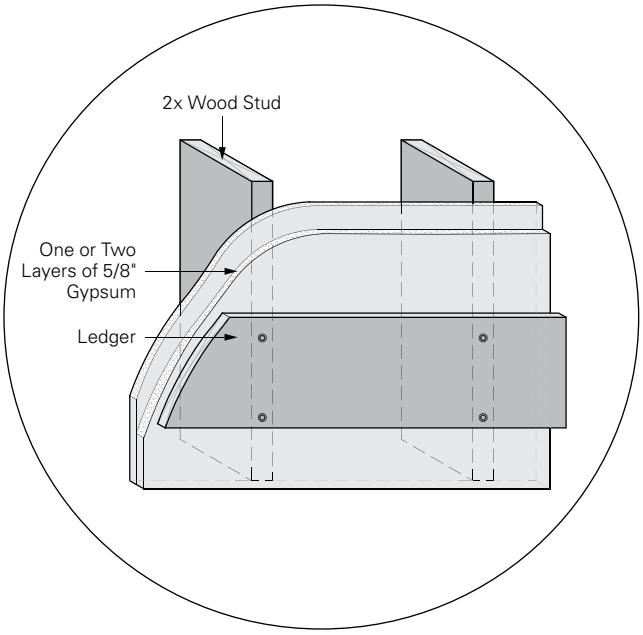


Figure 1

Table 1: Screw Properties

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)
Structural *H23*	D23 4	0.23	Hex 3/8"	4	2-3/8
	D23 5			5	3
Structural *F23*	D23 4		Flat T40	4	2-3/8
	D23 5			5	3

For the most up to date version of this Technical Guide and more detailed information contained in the Deck Ledger and Ledger to Stud Applications code compliance report (DrJ TER 1703-01), visit *starbornindustries.com*. For applications outside the scope of this Technical Guide, an engineered design is required.

Ledger to Stud with 0, 1, or 2 Layers of 5/8" Gypsum Structural *H23* and *F23*

Figure 2—2x6 and 2x8 Ledger Configuration with No Gypsum Interlayer

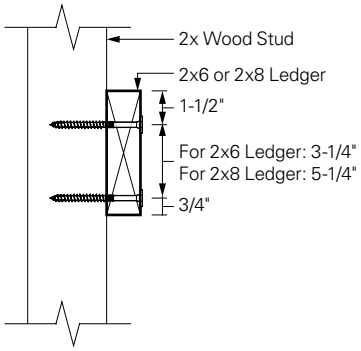


Figure 3—2x10 Ledger Configuration with No Gypsum Interlayer

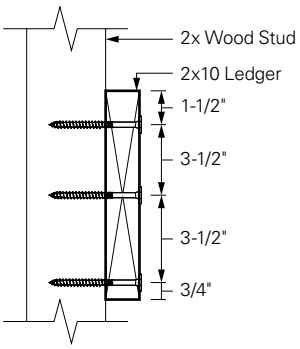


Figure 4—2x6 and 2x8 Ledger Configuration with 1 or 2 Gypsum Interlayers

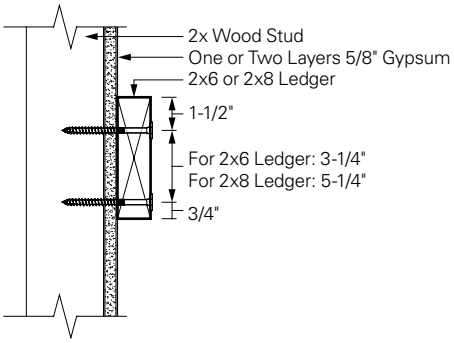


Figure 5—2x10 Ledger Configuration with 1 or 2 Gypsum Interlayers

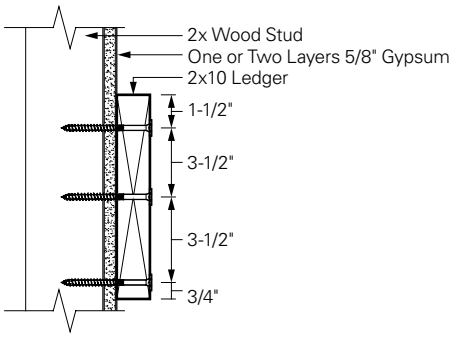


Table 2: Reference Lateral Design Values for Ledger to Stud Connections With and Without Gypsum

Allowable Load per Stud Connection (lbf)[1]						
Screw Length (in)	Minimum Penetration Into Main Member (in)	Layers of 5/8" Gypsum	Number of Fasteners Per Stud	Ledger Size		
				2x6	2x8	2x10
4	2-1/2	0	2	640		710
	1-7/8	1				895
5	2-1/4	2	3	740		1045

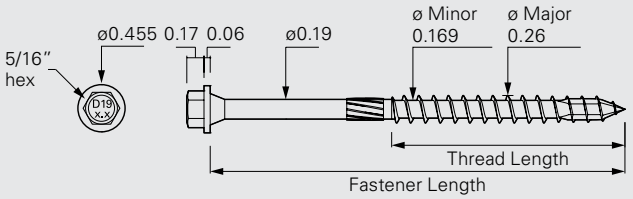
1. The minimum ledger end distance is 6" for full values. For ledger end distances between 2" and 6" use 50% of the table loads. For end distances between 2" and 4", predrill using a 5/32" bit to prevent splitting.
2. Additional screws prohibited.
3. Ledger shall be Spruce-Pine-Fir (SPF) or any species with a specific gravity of 0.42 or greater.
4. Values apply to minimum 2x solid sawn lumber studs (parallel-to-grain loaded) and ledgers (perpendicular-to-grain loaded).
5. Allowable loads include a wood load duration (C_D) = 1.0. Loads may be increased for load duration as permitted by the building code up to C_D = 1.6. All adjustment factors shall be applied per NDS. For in-service moisture content greater than 19%, use Wet Service Factor (C_M) = 0.7.
6. Screws shall be centered in the stud and spaced as shown in Figures 2–5. Stud minimum end distance is 6-3/4" when loaded toward the end and 4" when loaded away from the end.
7. For Load Resistance Factor Design (LRFD) values, the reference connection design values shall be adjusted in accordance with NDS, Section 11.3.
8. Gypsum must be attached as required per the applicable building code.

STARBORN®

Truss or Rafter to Top Plate
Structural *H19*

Starborn® Structural *H19* Truss to Top Plate / Multipurpose screws can be used to attach wood trusses and rafters to wall top plates in accordance with IRC Section R602 or IBC Section 2308. They are an alternative to toe-nail connections, metal hurricane ties and seismic clips.

Structural *H19*



Installation Instructions

- Select the proper length screw according to Table 2.
- Install using a high-torque low-speed drill with a 5/16" hex driver bit. Pre-drilling is not required, but can be used where lumber is prone to splitting.
- Drive screw upward through the top plate/s into the center of the truss or rafter at the proper angle noted below within 1/4" of the centerline.

Between Studs Install at an angle between 20–30° with an optimal angle of 22.5° (Figure 2). Option: Install at a 90° angle (Figure 3).

At Studs Install at an angle between 20–30° with an optimal angle of 22.5°.

With Top Plate Splice If the truss or rafter is located directly over a top plate splice, install with an offset of 1/4" to one side of splice. Install at an angle between 20–30° with an optimal angle of 22.5°.

- Adjust the installation angle to ensure the screw does not protrude out of the wood truss or rafter. Screw head may be countersunk to avoid interfering with interior finishes.

Corrosion Resistance

- Structural H19 screws feature a high-adhesion exterior grade coating and are a code compliant alternative to hot-dip galvanized fasteners. The coating is approved for use in ACQ, Fire Retardant Treated (FRT), and other pressure treated lumbers.
- Structural *H19* screws are not designed for use in or near saltwater environments.

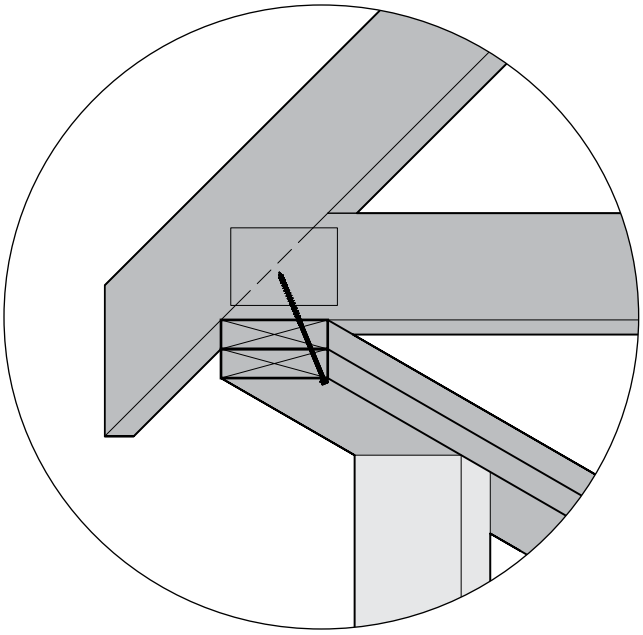


Figure 1

Table 1: Screw Properties

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)
Structural *H19*	D19 4	0.19	Hex 5/16"	4	2-1/4
	D19 6			6	2-1/2

For the most up to date version of this Technical Guide and more detailed information contained in the Truss or Rafter to Top Plate and Bottom Plate to Rim Board code compliance report (DrJ TER 1703-02), visit *starbornindustries.com*. For applications outside the scope of this Technical Guide, an engineered design is required.

Figure 2—Uplift and Lateral Load Orientations

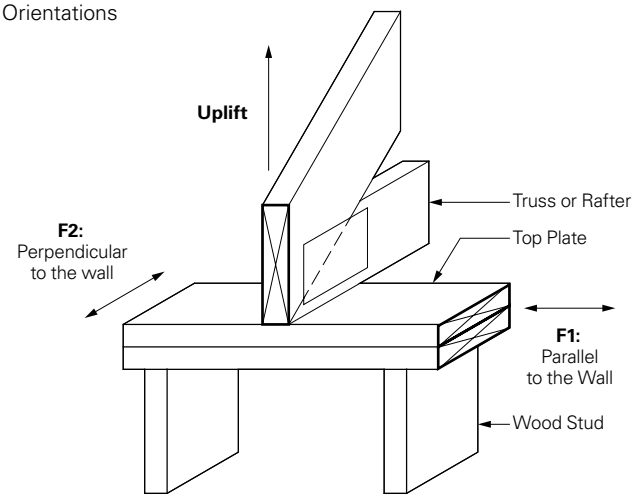


Figure 3—Installation at 20–30°

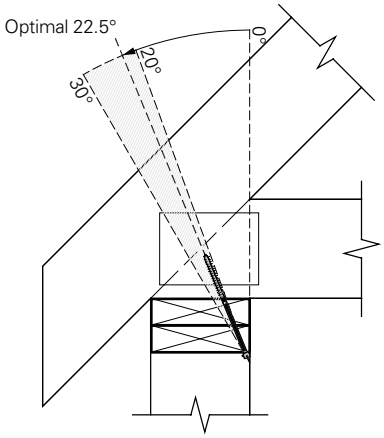


Figure 4—Installation at 90°

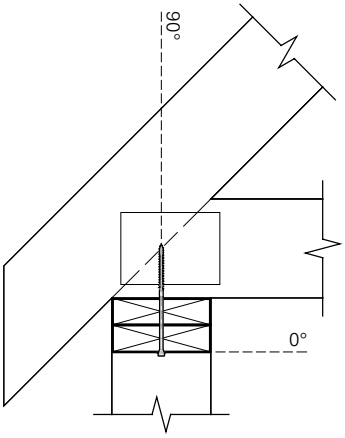


Table 2: Allowable Loads for Uplift and Lateral Resistance

Screw Length (in)	Top Plate	Screw Angle to Truss	Uplift (lbf)	Lateral (lbf)	
				F1: Parallel to Wall	F2: Perpendicular to Wall
4	Single	20-30°	340	230	270
		90°	325	195	375
6	Double	20-30°	415	170	335
		90°	295	280	395

1. Wood truss or rafter minimum of 2x nominal thickness.
2. Wood framing members shall be Spruce-Pine-Fir (SPF) or any species, including engineered wood, with a specific gravity of 0.42 or greater.
3. Design values include an increase of wood load duration (C_D) = 1.6. No further increases permitted.
4. Minimum 2" penetration.

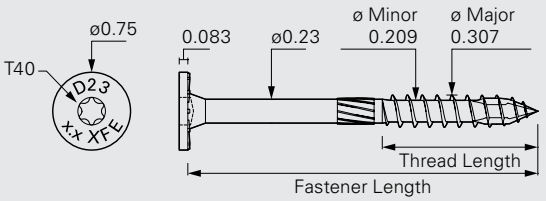
lbf = pound-force

STARBORN®

Multi-Ply Engineered Wood Connections
Structural *F23-E*

Starborn® Structural *F23-E* Multi-Ply Engineered Wood screws are designed for single-sided joining of multi-ply engineered wood beams in interior applications. For use in LVL, LSL, and PSL.

Structural *F23-E*



Installation Instructions

- Select the proper length screw according to Table 2, ensuring a minimum 1" penetration into the main member (final member in the multi-ply assembly).
- Install using a high-torque low-speed drill with a Torx® T40 driver bit. For best results, use a ½" corded drill. Pre-drilling is not required, but can be used where lumber is prone to splitting.
- Drive until the washer is drawn firm and flush. Do not overdrive or countersink.
- Caution: Do not connect warped or curved wood members. Forcing alignment with clamps, screws or bolts may decrease the carrying load of the beam or split the wood.

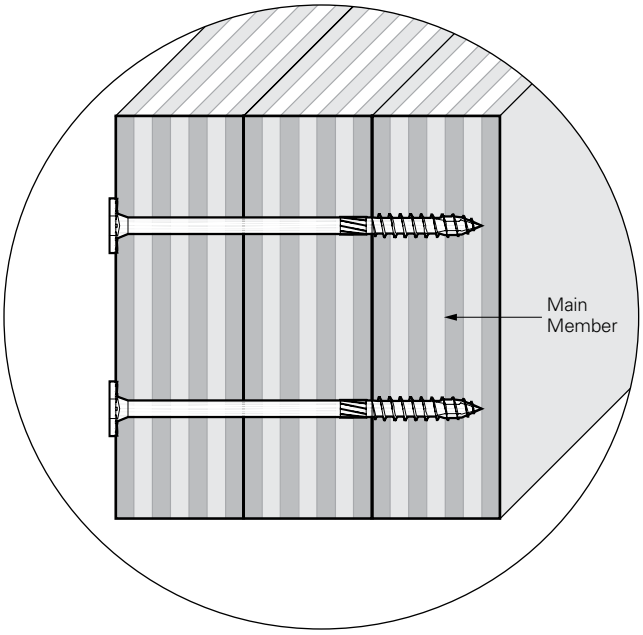


Figure 1

Finish and Coating

- Structural *F23-E* screws have a gray e-coat finish and are designed for interior use only.
- For exterior applications use Structural *F23* black coated screws.

Table 1: Screw Properties

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)
Structural *F23-E*	D23 3.4 XFE	0.23	Flat T40	3-3/8	1-1/2
	D23 5 XFE			5	
	D23 6.8 XFE			6-3/4	

For the most up to date version of this Technical Guide and more detailed information contained in the Multi-Ply Applications code compliance report (DrJ TER 1703-03), visit *starbornindustries.com.* For applications outside the scope of this Technical Guide, an engineered design is required.

Figure 2—Minimum Spacing Requirements

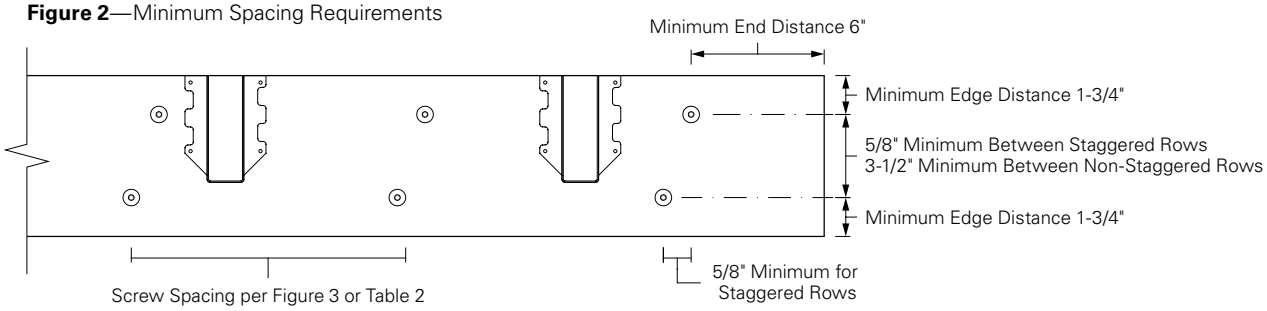
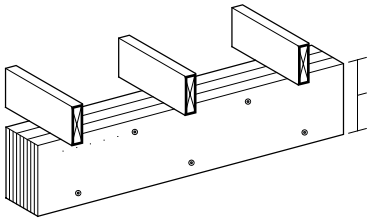
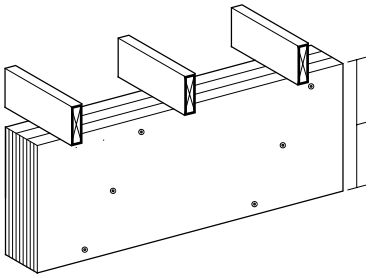


Figure 3—Top Loaded Beams



Less than 18"
Space screws in 2 rows every 24" o.c. in a staggered pattern when all floor joists rest on beam.



18" or more
For beam depths 18" or more, space screws in 3 rows every 24" o.c. in a staggered pattern.

Figure 4—Engineered Wood Assemblies

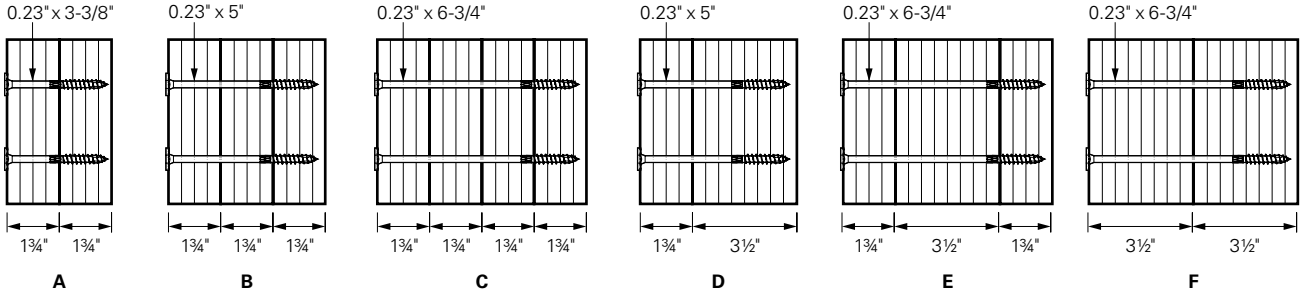


Table 2: Allowable Side Load Capacity (plf)

Assembly	Components	Screw Length (in)	12" o.c.		16" o.c.		24" o.c.	
			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-ply 1-3/4"	3-3/8	1760	2640	1325	1990	880	1320
B	3-ply 1-3/4"	5	1320	1980	990	1485	660	990
C	4-ply 1-3/4"	6-3/4	1175	1765	885	1330	590	885
D	2-ply 1-3/4" & 3-1/2"	5	1320	1980	990	1485	660	990
E	3-ply 1-3/4" & 3-1/2"	6-3/4	1175	1765	885	1330	590	885
F	2-ply 3-1/2"	6-3/4	1760	2640	1325	1990	880	1320

1. May be loaded from either the head or point side.
2. Engineered Wood Product (EWP) minimum specific gravity of 0.50 or greater.
3. Design values include a duration load (C_D) = 1.0. Values may be multiplied by all applicable adjustment factors per NDS.

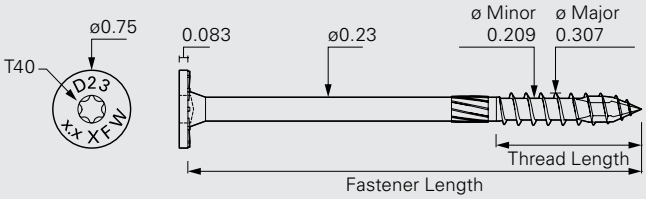
plf = pounds per linear foot LVL = Laminated Veneer Lumber LSL = Laminated Strand Lumber PSL = Parallel Strand Lumber
o.c. = on-center

STARBORN®

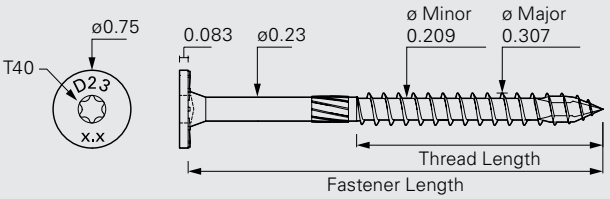
Multi-Ply Dimensional Wood Connections
Structural *F23-W* and *F23*

Starborn® Structural *F23-W* Multi-Ply Dimensional Wood screws are designed for single-sided joining of multi-ply 2x wood beams in interior applications. For exterior applications use *F23* Multipurpose screws.

Structural *F23-W* (Interior Use)



Structural *F23* (Exterior Use)



Installation Instructions

- Select the proper length screw according to Table 2, ensuring a minimum 1" penetration into the main member (final member in the multi-ply assembly).
- Install using a high-torque low-speed drill with a Torx® T40 star driver bit. Pre-drilling is not required, but can be used where lumber is prone to splitting.
- Drive until the washer is drawn firm and flush. Do not overdrive or countersink.
- Caution: Do not connect warped or curved wood members. Forcing alignment with clamps, screws or bolts may decrease the carrying load of the beam or split the wood.

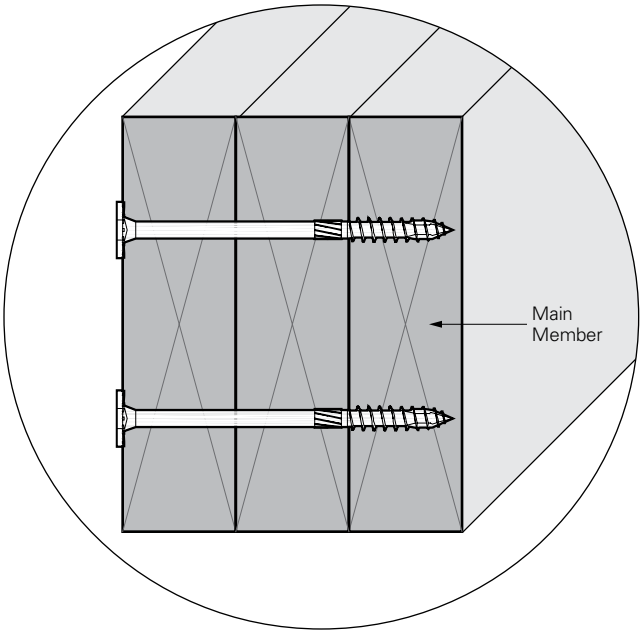


Figure 1

Finish and Coating

- Structural *F23-W* screws have a gray e-coat finish and are designed for interior use only.
- Structural *F23* screws have a black, high-adhesion exterior grade coating and are a code compliant alternative to hot-dip galvanized fasteners. This coating is approved for use in ACQ, Fire Retardant Treated (FRT), and other pressure treated lumbers. *F23* screws are not designed for use in or near saltwater environments.

Table 1: Screw Properties

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)
Structural *F23-W* (interior)	D23 2.9 XFW	0.23	Flat T40	2-7/8	1.4
	D23 4.4 XFW			4-3/8	
	D23 5.9 XFW			5-7/8	
Structural *F23* (exterior)	D23 2.9	0.23	Flat T40	2-7/8	1.4
	D23 4			4	2-3/8
	D23 6			6	2-3/4

For the most up to date version of this Technical Guide and more detailed information contained in the Multi-Ply Applications code compliance report (DrJ TER 1703-03), visit *starbornindustries.com.* For applications outside the scope of this Technical Guide, an engineered design is required.

Figure 2—Minimum Spacing Requirements

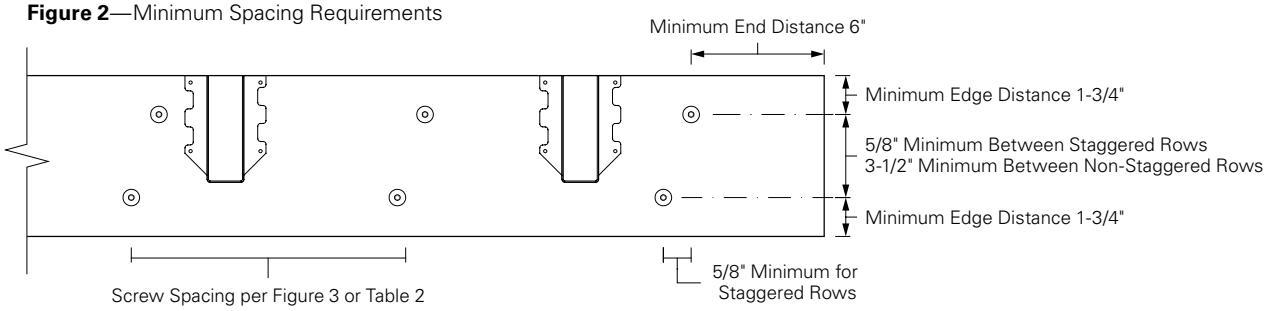


Figure 3—Top Loaded Beams

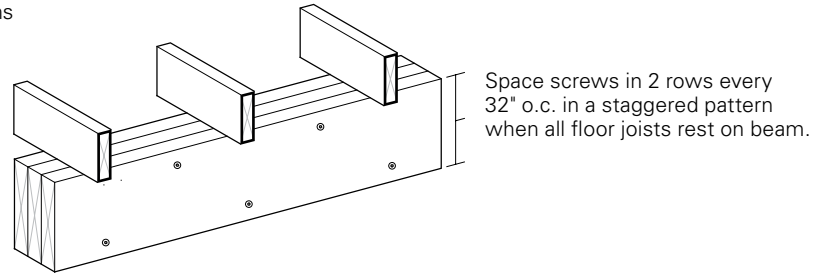


Figure 4—Dimensional Wood Assemblies

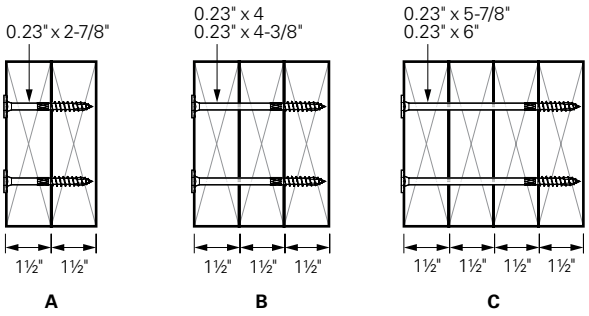


Table 2: Allowable Side Load Capacity (plf)

Wood Species (Specific Gravity)			HF/SPF (0.42)						DF/SP (0.50)					
Assembly	Components	Product: Screw Length (in)	12" o.c.		16" o.c.		24" o.c.		12" o.c.		16" o.c.		24" o.c.	
			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-ply 1-1/2"	F23-W: 2-7/8 F23: 2-7/8	1640	2460	1235	1855	820	1230	1760	2460	1325	1990	880	1320
B	3-ply 1-1/2"	F23-W: 4-3/8 F23: 4	1230	1845	925	1390	615	925	1320	1980	990	1485	660	990
C	4-ply 1-1/2"	F23-W: 5-7/8 F23: 6	1175	1765	885	1330	590	885	1175	1765	885	1330	590	885

1. May be loaded from either the head or point side.
2. Design values include a duration load (C_D) = 1.0. Values may be multiplied by all applicable adjustment factors per NDS.

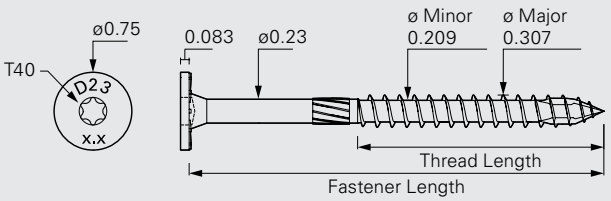
plf = pounds per linear foot HF = Hem-Fir SPF = Spruce-Pine-Fir DF = Douglas Fir
SP = Southern Pine o.c. = on-center

STARBORN®

Cladding Over Foam Sheathing
Structural *F23*

Starborn® Structural *F23* Multipurpose screws can be used to attach rigid foam insulation to wood structural framing. This connection, with the use of either furring strips or WSP sheathing, is rated to support a wide range of exterior cladding materials.

Structural *F23*



Installation Instructions

- Calculate screw spacing using Table 2: (1) Determine stud spacing. (2) Choose foam thickness and screw length to obtain required insulation effect/R-value. (3) Select WSP sheathing or wood furring. (4) Determine cladding weight per manufacturer's specifications.
- Select the proper length screw ensuring it does not penetrate through the backside of the stud.
- Install using a high-torque low-speed drill with a Torx® T40 driver bit. Pre-drilling is not required, but can be used where lumber is prone to splitting.
- Drive until the washer is drawn firm and flush with no gaps between the layers of materials. Do not overdrive or countersink.
- Best practice: Cover and seal screw heads with foam where possible to prevent thermal bridging.
- Caution: Map out mechanical systems in the exterior wall prior to installing screws to avoid penetrating wiring, plumbing, and other mechanical systems.

Corrosion Resistance

- Structural *F23* screws feature a high-adhesion exterior grade coating and are a code compliant alternative to hot-dip galvanized fasteners. The coating is approved for use in ACQ, Fire Retardant Treated (FRT), and other pressure treated lumbers.
- Structural *F23* screws are not designed for use in or near saltwater environments.

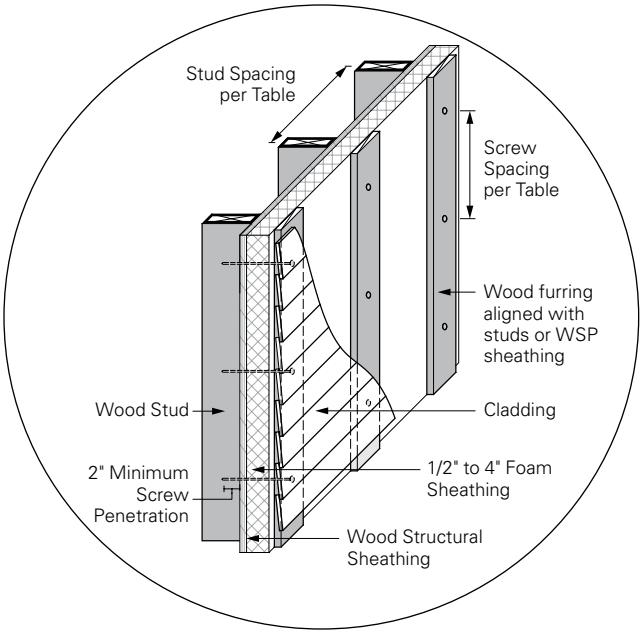


Figure 1—Cladding Over Foam Sheathing

Table 1: Screw Properties

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)
Structural *F23*	D23 2.9	0.23	Flat T40	2-7/8	1.4
	D23 4			4	2-3/8
	D23 5			5	3
	D23 6			6	2-3/4
	D23 8			8	

For the most up to date version of this Technical Guide and more detailed information contained in the Cladding Through Foam Sheathing code compliance report (DrJ TER 1703-04)), visit *starbornindustries.com.*
For applications outside the scope of this Technical Guide, an engineered design is required.

Table 2: Recommended Screw Spacing to Support Cladding Over Foam Sheathing

<table>
<tr><th rowspan="4">Stud Spacing (in o.c.)</th><th rowspan="4">Minimum Screw Length (in)</th><th rowspan="4">Foam Thickness (in)</th><th colspan="12">Maximum Vertical or Horizontal On-Center Spacing (in) of Screws Along Each Stud</th></tr>
<tr><th colspan="6">3/8" WSP Sheathing[1]</th><th colspan="6">3/4" x 3-1/2" Wood Furring[1]</th></tr>
<tr><th colspan="6">Maximum Cladding Weight (psf)[2]</th><th colspan="6">Maximum Cladding Weight (psf)[2]</th></tr>
<tr><th>5</th><th>10</th><th>15</th><th>20</th><th>25</th><th>30</th><th>5</th><th>10</th><th>15</th><th>20</th><th>25</th><th>30</th></tr>
<tr><td rowspan="10">16</td><td>2-7/8</td><td>0.5</td><td colspan="6" rowspan="10">24</td><td colspan="6">-</td></tr>
<tr><td rowspan="3">4</td><td>0.5</td><td colspan="6" rowspan="2">24</td></tr>
<tr><td>1.0</td></tr>
<tr><td>1.5</td><td rowspan="2">20</td><td colspan="6">-</td></tr>
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</table>

1. Wood stud, furring, and sheathing shall be designed by others and be adequate size, species, and grade to resist design loads and requirements in accordance with the applicable building code.
2. Select furring type and thickness per cladding manufacturer's installation requirements (e.g., required screw penetration into furring).
3. Maximum allowable cladding weight includes weight of furring, sheathing, cladding, and other supported materials.
4. Stud minimum of 2x nominal thickness.
5. Stud and furring shall be SPF or any species with specific gravity of 0.42 or greater.
6. Furring may be installed vertically or horizontally and installed at the same on-center (o.c.) spacing as the studs. Install screws through furring and into studs with a minimum 2" screw penetration.
7. Furring may be installed horizontally. When the required screw spacing is 6" o.c., install furring at 12" o.c. using 2 screws at each stud. For 8" o.c. screw spacing, install furring at 16" o.c. using 2 screws at each stud. For 12" o.c. screw spacing, install furring at 24" o.c. using 2 screws at each stud.
8. Where multiple screws are used, furring or sheathing shall be of adequate size to provide proper spacing, edge and end distances, as determined in NDS, Section 12.5.
9. Best practice: Consider using preservative treated wood for horizontal furring or where moisture between the cladding and sheathing is a concern.

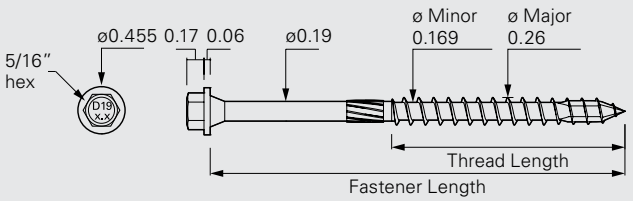
WSP = Wood Structural Panels SPF = Spruce-Pine-Fir psf = pounds per square foot

STARBORN®

Bottom Plate to Rim Board
Structural *H19*

Starborn® Structural *H19* Truss to Top Plate / Multipurpose screws can be used to attach wall bottom plates to rim boards in accordance with IRC Section R602 or IBC Section 2308.

Structural *H19*



Installation Instructions

- Select the proper length screw ensuring a minimum thread penetration of 1-3/4".
- Install using a high-torque low-speed drill with a 5/16" hex driver bit. Pre-drilling is not required, but can be used where lumber is prone to splitting.
- Drive screw downward at a 90° angle, a minimum of 1/2" from outside face of wall, through the bottom plate into the rim board (Figure 1). Drive until the washer is drawn firm and flush. Do not overdrive or countersink.

Corrosion Resistance

- Structural *H19* screws feature a high-adhesion exterior grade coating and are a code compliant alternative to hot-dip galvanized fasteners. The coating is approved for use in ACQ, Fire Retardant Treated (FRT), and other pressure treated lumbers.
- Structural *H19* screws are not designed for use in or near saltwater environments.

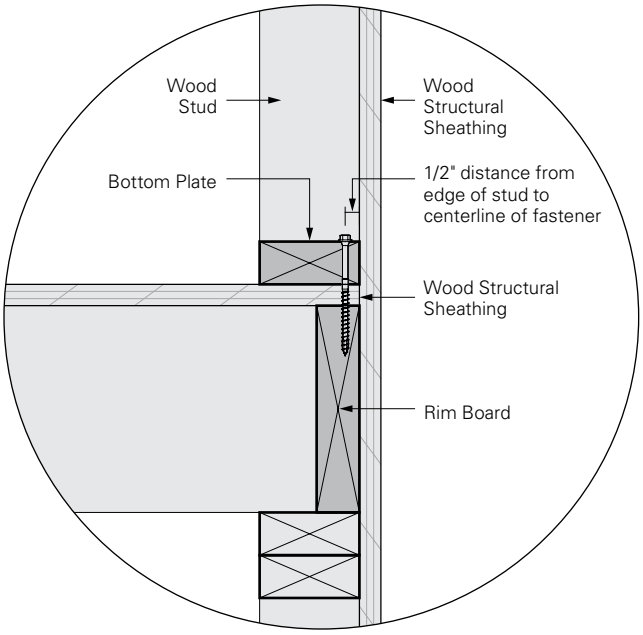


Figure 1—Single Bottom Plate to Rim Board Installation

Table 1: Screw Properties

Product Name	Head Marking	Unthreaded Shank Diameter (in)	Head Type	Screw Length (in)	Thread Length (in)
Structural *H19*	D19 4	0.19	Hex 5/16"	4	2-1/4
	D19 6			6	2-1/2
	D19 8			8	
	D19 10			10	

1. For other specific gravities, use the allowable load corresponding to the lowest specific gravity. For Engineered Wood Product (EWP) rim boards (i.e. OSB, LSL, and LVL), the bottom plates shall be a minimum SPF dimensional lumber. Dimensional lumber minimum of 2x nominal thickness.
2. Design values include a duration load (DOL) = 1.6. No further increases permitted. Reduce design values for other load durations as applicable.

Table 2: Allowable Design Values (lbf)

Load Direction	Rim Board Species (Specific Gravity)	
	HF/SPF (0.42)	DF/SP (0.50)
Uplift	365	405
Lateral—Parallel to Grain	370	360
Lateral—Perpendicular to Grain	365	395

HF = Hem-Fir
SPF = Spruce-Pine-Fir
DF = Douglas Fir
SP = Southern Pine

For the most up to date version of this Technical Guide and more detailed information contained in the Truss or Rafter to Top Plate and Bottom Plate to Rim Board code compliance report (DrJ TER 1703-02), visit *starbornindustries.com*. For applications outside the scope of this Technical Guide, an engineered design is required.

Structural Merchandising Programs

Starborn® Structural screws are available in a variety of merchandising options, including a rolling rack display and pre-set or customizable 3 and 4 foot planograms.

Rolling Rack Display

A complete display rack offers an assortment of screws for a variety applications including:

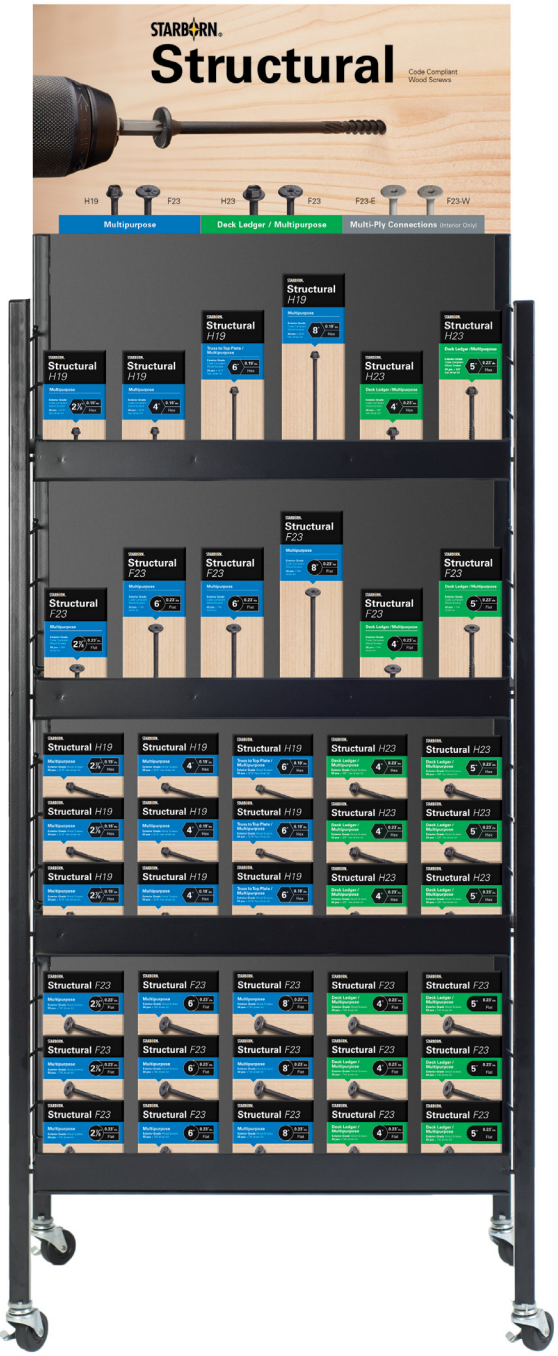
- Lag replacement
- Ledger board attachment
- Deck substructure
- Carrying beams
- Fencing
- Pergolas
- Landscape timbers
- Timber framing

Features

- Fully customizable product selection
- Free display and signage

Rolling Rack Dimensions

- Display: 26" w x 19" d x 58-3/4" h
- Sign: 25-1/4" w x 12-1/8" h



From **Frame** To **Finish**

Professional Fastening Solutions

Starborn Industries, founded in 1961, manufactures innovative and high-quality deck fastening systems. Professional builders rely on Starborn products like Headcote, Smart-Bit®, Cap-Tor® xd, Pro Plug® System, Fascia System, and Deckfast® to fasten all types of composite, PVC, hardwood and pressure treated decking. Starborn offers comprehensive fastener material and color options, plugs made from all major deck and trim products, unique fastener geometry and thread design, and patented accessory tools—all designed for a superior, craftsman-level finish.

Now Starborn is bringing that same combination of innovation and quality to a completely new line of structural wood screws: Starborn Structural. Starborn Structural screws are fully tested and code compliant. They are supported with comprehensive code reports and application-specific technical guides including: deck ledger attachment, truss or rafter to top plate, multi-ply beam connections and more. Starborn Structural screws are engineered to provide professional builders with superior solutions for wood-to-wood connections—better ways to build and stronger ways to frame.

Starborn has you covered from Frame to Finish.

STARBORN®

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