STARBORN®

GUIDE TO STRUCTURAL WOOD SCREWS

STRUCTURAL H19
STRUCTURAL H23

STRUCTURAL F19
STRUCTURAL F23

STRUCTURAL F23-E
STRUCTURAL F23-W

STRUCTURAL F23 STAINLESS

Designed For Effortless Installation

Time is of the essence in any construction project. That's why our structural wood screws are engineered with advanced features to increase productivity. All Starborn® Structural wood screws are designed with our unique Tri-Forged® Point that provides quick engagement into wood, minimizes splitting, and reduces driving torque. Additionally, the Speed-Knurl™ and specially formulated black exterior coating with lubricious topcoat, both reduce friction on the unthreaded shank during installation.

STRUCTURAL H19

Multipurpose/ Truss To Top Plate

Comparable to 3/8" Lag

APPLICATION

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

FINISH

Black Exterior Grade Coating

CORROSION

Exterior Use

Approved for use in ACQ, Fire Retardant Treated (FRT) and other pressure treated lumbers.

For salt water or other areas where corrosion is a concern, use Grade 316 Stainless.

DRIVE SYSTEM

5/16" Hex Head

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)

DESIGN FEATURES

5/16" Hex Head
For maximum drivability

Speed-Knurl™
Reduces driving torque

Tri-Forge® Point
Fast start, reduced splitting

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"	300	375	375	440
4"	D19 4	2-1/4"	305	270	435	415
6"	D19 6	2-1/2"				
8"	D19 8					
10"	D19 10					

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

STARBORN® STRUCTURAL PACKAGING H19

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)	—

STRUCTURAL H23
Deck Ledger
Comparable to 1/2" Lag

APPLICATION

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

FINISH

Black Exterior Grade Coating

CORROSION

Exterior Use

Approved for use in ACQ, Fire Retardant Treated (FRT) and other pressure treated lumbers.

For salt water or other areas where corrosion is a concern, use Grade 316 Stainless.

DRIVE SYSTEM

3/8" Hex Head

CODE COMPLIANCE REPORTS

Fastener Properties and Design Values (DrJ TER 1703-05)

Deck Ledger and Ledger to Stud Applications (DrJ TER 1703-01)

DESIGN FEATURES

3/8" Hex Head
For maximum driveability

Speed-Knurl™
Reduces driving torque

Tri-Forge® Point
Fast start, reduced splitting

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"	D19 4	2-3/8"	420	420	560	560
5"	D19 5	3"				

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

STARBORN® STRUCTURAL PACKAGING H23

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

STRUCTURAL F19

Multipurpose

Comparable to 3/8" Lag

APPLICATION

Starborn® Structural F19 screws are designed for heavy duty framing applications that include decking, pergolas, fencing, timber frame, SIP panels, log home construction and other general applications. Available in lengths from 2-7/8" to 16", these multipurpose screws feature a unique Tri-Forge® point for faster installation than traditional lag screws and a low-profile flat head designed to countersink easily. Fully tested and code compliant, they require no pre-drilling and are finished with a high-adhesion exterior grade coating.

FEATURES

- IRC/IBC code compliant
- No pre-drilling
- Comparable to 3/8" lag screws
- 0.19" shank diameter
- T30 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

FINISH

Black exterior coating

CORROSION

Approved for use in ACQ, Fire Retardant Treated (FRT) and other pressure treated lumbers.

Structural F19 screws are not designed for use in or near salt water environments.

For salt water or other areas where corrosion is a concern, use Grade 316 Stainless.

DRIVE SYSTEM

T30 star drive
Flat head

CODE COMPLIANCE REPORTS

Fastener Properties and Design Values (DrJ TER 1703-05)

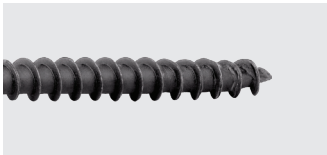
Cladding Attachment Through Foam Sheathing (DrJ TER 1703-04)

Multi-Ply Applications (DrJ TER 1703-03)

DESIGN FEATURES

Low Profile Flat Head
T30 star drive eliminates cam-out

Speed-Knurl™
Reduces driving torque



Tri-Forge® Point
Fast start, reduced splitting

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	2"	290	315	380	335
4-1/2"	D19 4.5					
6"	D19 6		315	350	425	370
8"	D19 8		340	305	425	375
10"	D19 10		370	325	465	365
12"	D19 12					
14"	D19 14					
16"	D19 16					

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

STARBORN® STRUCTURAL PACKAGING F19

LENGTH	20 PC		50 PC		250 PC	500 PC
	ITEM NO	CASE QTY	ITEM NO	CASE QTY	ITEM NO	ITEM NO
2-7/8"	XF19CL0288	6	XF19CT0288	6	XF19CQ0288	XF19CV0288
4-1/2"	XF19CL0450	6	XF19CT0450	6	XF19CQ0450	XF19CV0450
6"	XF19CL0600	6	XF19CT0600	6	XF19CQ0600	XF19CV0600
8"	XF19CL0800	6	XF19CT0800	3	XF19CQ0800	—
10"	XF19CL1000	6	XF19CT1000	3	XF19CQ1000 (200 pc)	—
12"	XF19CL1200	5	—	—	XF19CQ1200 (200 pc)	—
14"	XF19CL1400	5	—	—	XF19CQ1400 (200 pc)	—
16"	XF19CL1600	5	—	—	XF19CQ1600 (150 pc)	—

STRUCTURAL F23

Deck Ledger/ Multipurpose

Comparable to 1/2" Lag

APPLICATION

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

FINISH
Black Exterior Grade Coating
CORROSION
Exterior Use Approved for use in ACQ, Fire Retardant Treated (FRT) and other pressure treated lumbers. For salt water or other areas where corrosion is a concern, use Grade 316 Stainless.
DRIVE SYSTEM
T40 Star Drive
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)

DESIGN FEATURES

Low Profile Flat Head
T40 star drive eliminates cam-out

Speed-Knurl™
Reduces driving torque

Tri-Forge® Point
Fast start, reduced splitting

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"	365	415	405	540
4"	D23 4	2-3/8"	420	420	560	560
5"	D23 5	3"				
6"	D23 6	2-3/4"				
8"	D23 8					
10"	D23 10					

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

STARBORN® STRUCTURAL PACKAGING F23

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)	—

STRUCTURAL F23-E & F23-W

Multi-Ply Beam

2-, 3-, 4-Ply LVL and Dimensional Beam Connections

APPLICATION

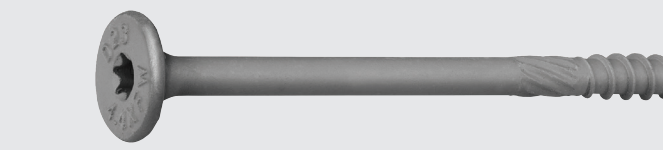
Starborn® Structural F23-E and F23-W screws are specifically designed for interior multi-ply beam connections. They are a fully tested alternative to nails and through-bolts, and can be installed from one side of the beam without pre-drilling. Structural F23-E and F23-W screws feature a unique Tri–Forge® 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

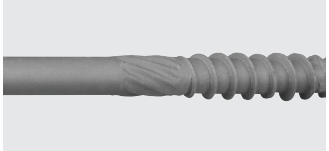
- No pre-drilling
- Alternative to nails and through-bolts
- 0.23" shank diameter
- T40 star drive head eliminates cam-out
- Tri-Forge® Point provides a fast start, minimal splitting, and reduced driving torque
- Speed-Knurl™ reduces friction on the unthreaded shank for faster installation
- Thread design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

FINISH
Gray Interior Grade E-Coat
CORROSION
Interior Use Only
DRIVE SYSTEM
T40 Star Drive
CODE COMPLIANCE REPORTS
Fastener Properties and Design Values (DrJ TER 1703-05)
Multi-Ply Applications (DrJ TER 1703-03)

DESIGN FEATURES



Low Profile Flat Head
T40 star drive eliminates cam-out



Speed-Knurl™
Reduces driving torque

Tri-Forge® Point
Fast start, reduced splitting

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"	—	—	405	540
5"	D23 5 XFE				560	560
6-3/4"	D23 6.8 XFE					
STRUCTURAL F23-W						
2-7/8"	D23 2.9 XFW	1.4"	365	415	405	540
4-3/8"	D23 4.4 XFW		420	420	560	560
5-7/8"	D23 5.9 XFW					

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

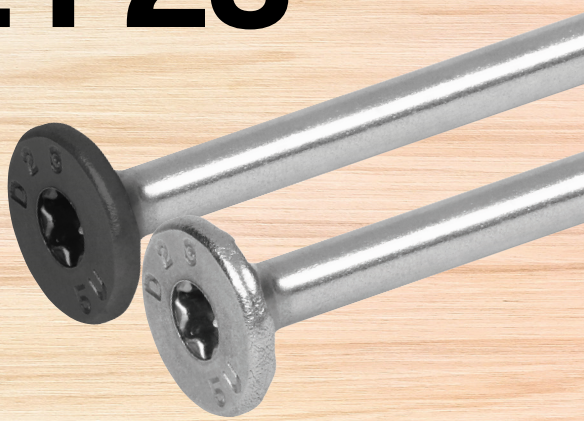
STARBORN® STRUCTURAL PACKAGING F23-E

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

STARBORN® STRUCTURAL PACKAGING 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

STRUCTURAL F23 Stainless Deck Ledger/ Multipurpose



APPLICATION

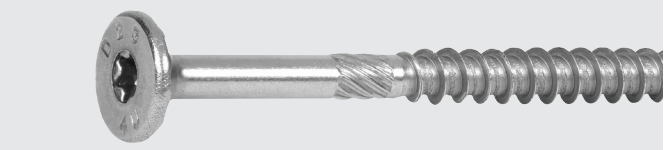
Starborn® Structural F23 Stainless screws are designed for wood-to-wood connections in coastal or severe corrosion environments, ideal for decks, docks, boardwalks, pergolas, fencing, piers, and more. These screws are thoroughly tested and code-compliant alternatives to traditional lag screws and through bolts, requiring no pre-drilling. The 4" and 5" lengths are specifically designed for code compliant deck ledger attachments.

FEATURES

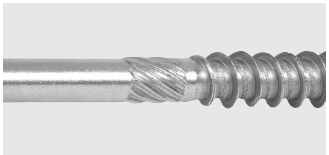
- IRC/IBC code compliant
- No pre-drilling required
- Comparable to 1/2" lag screws
- 0.23" shank diameter
- T40 star drive head eliminates cam-out
- Low Profile Flat Head minimizes interference
- Speed-Knurl™ reduces driving torque
- Type 17 cut-point for fast start and reduced splitting
- ACQ-approved, suitable for coastal environments

FINISH
316 Stainless Steel
CORROSION
Exterior Use Approved for use in ACQ and pressure treated lumbers. For salt water or other areas where corrosion is a concern, use Grade 316 Stainless.
DRIVE SYSTEM
T40 Star Drive
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)

DESIGN FEATURES



Low Profile Flat Head
T40 star drive eliminates cam-out



Speed-Knurl™
Reduces driving torque

Type 17 Point
Fast start, reduced splitting

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"	330	370	425	350
4"	D23 4	2-3/8"	390	450	470	600
5"	D23 5	3"				
6"	D23 6	2-3/4"				

*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

STARBORN® STRUCTURAL PACKAGING F23 STAINLESS

LENGTH	20 PC		250 PC	500 PC
	ITEM NO	CASE QTY	ITEM NO	ITEM NO
2-7/8"	XF23U01L0288	6	XF23U01Q0288	XF23U01V0288
4"	XF23U01L0400	6	XF23U01Q0400	XF23U01V0400
5"	XF23U01L0500	6	XF23U01Q0500	XF23U01V0500
6"	XF23U01L0600	6	XF23U01Q0600	XF23U01V0600

STARBORN® STRUCTURAL PACKAGING F23 #38 BLACK STAINLESS

LENGTH	20 PC		250 PC	500 PC
	ITEM NO	CASE QTY	ITEM NO	ITEM NO
2-7/8"	XF23U38L0288	6	XF23U38Q0288	XF23U38V0288
4"	XF23U38L0400	6	XF23U38Q0400	XF23U38V0400
5"	XF23U38L0500	6	XF23U38Q0500	XF23U38V0500
6"	XF23U38L0600	6	XF23U38Q0600	XF23U38V0600

Structural Screws
Screw Properties and Design Values

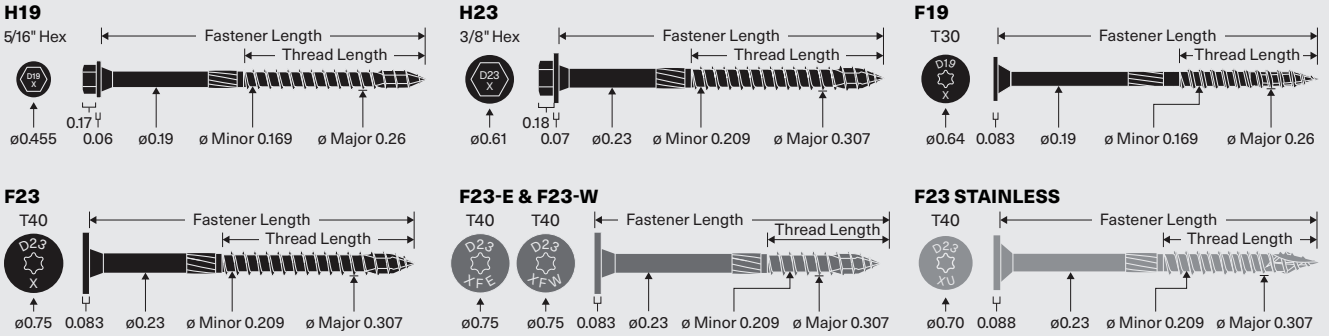


TABLE 1: Reference Lateral Design Values For Single Shear Connections

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	300	375	375	440
	D19 4			4	2-1/4		2-1/2	305	270	435	415
	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	420	420	560	560
	D23 5			5	3		3-1/2				
Structural F19	D19 2.9	0.19	Flat	2-7/8	2	1-1/2	1-3/8	290	315	380	335
	D19 4.5			4-1/2			2-1/2				
	D19 6			6			4-1/2	315	350	425	370
	D19 8			8			6-1/2	340	305	425	375
	D19 10			10			8-1/2	370	325	465	365
	D19 12			12			10-1/2				
	D19 14			14			12-1/2				
	D19 16			16			14-1/2				
Structural F23	D23 2.9	0.23	Flat	2-7/8	1.4	1-1/2	1-3/8	365	415	405	540
	D23 4			4	2-3/8		2-1/2	420	420	560	560
	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	—	—	405	540
	D23 5 XFE			5			3-1/4			560	560
	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	365	415	405	540
	D23 4.4 XFW			4-3/8			2-7/8	420	420	560	560
	D23 5.9 XFW			5-7/8			4-1/2				
Structural F23 Stainless	D23 2.9 XU	0.23	Flat	2 7/8	1.4	1-1/2	1-3/8	330	370	425	350
	D23 4 XU			4	2-3/8		2-1/2	390	450	470	600
	D23 5 XU			5	3		3-1/2				
	D23 6 XU			6	2-3/4		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

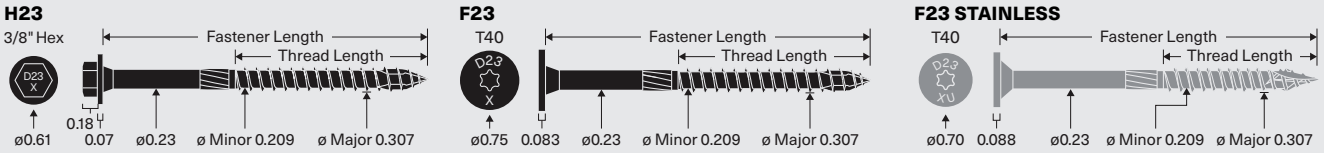
PRODUCT NAME	SCREW LENGTH (IN)	THREAD LENGTH (IN)	ALLOWABLE WITHDRAWAL DESIGN VALUES (LBF/IN)[1]				ALLOWABLE MAXIMUM WITHDRAWAL DESIGN VALUES (LBF)		ALLOWABLE HEAD PULL-THROUGH DESIGN VALUES (LBF/IN)[2]	
			SPECIES (SG)				SPECIES (SG)		SPECIES (SG)	
			HF/SPF (0.42)		DF/SP/SCL (0.50)		HF/SPF (0.42)	DF/SP/SCL (0.50)	HF/SPF (0.42)	DF/SP/SCL (0.50)
			THREAD PENETRATION (IN)[3]							
			1	2	1	2				
Structural H19	2-7/8	1.4	255	—	340	—	395	520	405	600
	4	2-1/4		300		395	685	905		
	6	2-1/2					775	1015		
	8									
	10									
Structural H23	4	2-3/8	280	380	360	445	940	1090	775	1075
	5	3					1240	1420		
Structural F19	2-7/8	2	255	—	340	—	395	520	855	975
	4-1/2			300		395	685	905		
	6						775	1015		
	8									
	10									
	12									
	14									
	16									
Structural F23	2-7/8	1.4	280	—	360	—	470	570	970	1210
	4	2-3/8		380		445	940	1090		
	5	3					1240	1420		
	6	2-3/4					1120	1290		
	8									
	10									
Structural F23-E	3-3/8	1-1/2	280	—	360	—	520	625	970	1210
	5									
	6-3/4									
Structural F23-W	2-7/8	1.4	280	—	360	—	470	570	970	1210
	4-3/8									
	5-7/8									
Structural F23 Stainless	2-7/8	1.4	190	285	225	335	265	315	445	630
	4	2-3/8					450	535		
	5	3					570	675		
	6	2-3/4					525	620		

Values shall be adjusted by all applicable adjustment factors per NDS Section 11.3 for wood screws.
Maximum withdrawal design values based on full thread engagement, including the tip. 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

Deck Ledger to Rim Joist
Structural H23, F23, F23 Stainless

Starborn® Structural H23, F23, and F23 Stainless 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.



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.
- Structural F23 Stainless screws are exterior grade and approved for use in ACQ and pressure treated lumber. For salt water or other areas where corrosion is a concern, use Grade 316 Stainless.
- All metal fasteners have the potential to corrode including stainless steel. For more information visit *starbornindustries.com/corrosion*

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.

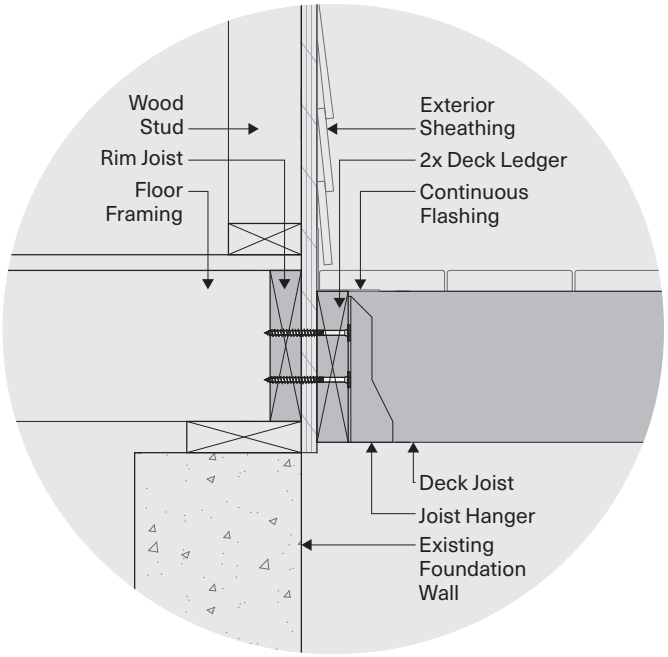


Figure 1—Deck Connection Assembly

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
Structural F23 Stainless	D23 4		Flat T40	4	2-3/8
	D23 5			5	3

Figure 2—Minimum Spacing Requirements: Wood Rim Joist

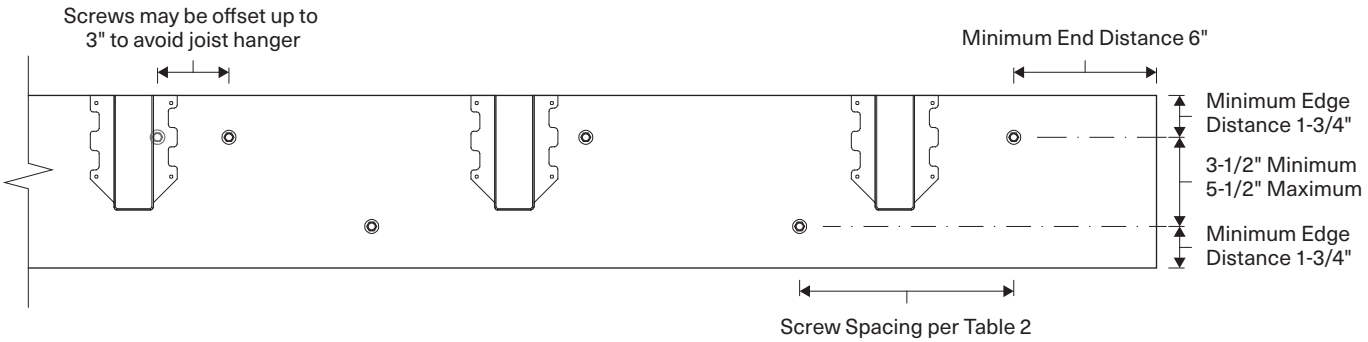


TABLE 2: Structural H23 and F23 Screw Spacing for Items in IRC Table 507.9.1.3(1) & Other Materials & Loading Conditions

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
		SCL	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
		SCL	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
		SCL	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
		SCL	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

TABLE 3: Structural F23 Stainless Screw Spacing for Items in IRC Table 507.9.1.3(1) & Other Materials & Loading Conditions

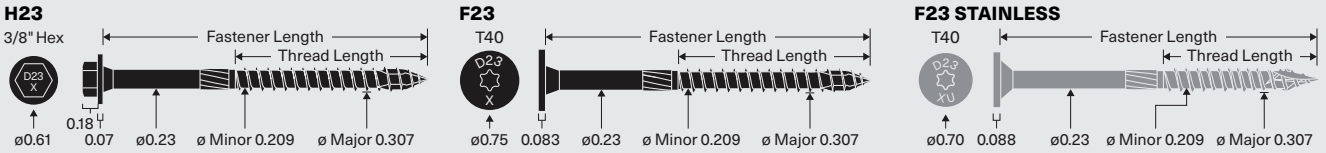
LOADING CONDITION (PSF): LIVE LOAD + DEAD LOAD	SCREW LENGTH (IN)	RIM JOIST MATERIAL	2X LEDGER SPECIES	MAXIMUM DECK JOIST SPANS (FT)						
				UP TO 6	UP TO 8	UP TO 10	UP TO 12	UP TO 14	UP TO 16	UP TO 18
				MAXIMUM ON-CENTER FASTENER SPACING (IN)						
40+10	4	2x Sawn Lumber	HF/SPF	20	15	12	10	8	7	6
			DF/SP	21	15	12	10	9	7	7
		SCL	HF/SPF	20	15	12	10	8	7	6
			DF/SP	23	17	13	11	9	8	7
	5	2x Sawn Lumber	HF/SPF	20	15	12	10	8	7	6
			DF/SP	21	15	12	10	9	7	7
		SCL	HF/SPF	20	15	12	10	8	7	6
			DF/SP	23	17	13	11	9	8	7
60+10	4	2x Sawn Lumber	HF/SPF	14	11	8	7	6	5	4
			DF/SP	15	11	9	7	6	5	5
		SCL	HF/SPF	14	10	8	7	6	5	4
			DF/SP	16	12	9	8	7	6	5
	5	2x Sawn Lumber	HF/SPF	14	11	8	7	6	5	4
			DF/SP	15	11	9	7	6	5	5
		SCL	HF/SPF	14	10	8	7	6	5	4
			DF/SP	16	12	9	8	7	6	5

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

Cold Formed Steel (CFS) Ledger to Rim Joist
Structural H23, F23, F23 Stainless

Starborn® Structural H23 and F23, and F23 Stainless 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.



INSTALLATION INSTRUCTIONS

- Minimum fastener length to be used is 2-7/8". Fasteners are required to have full thread penetration into the main member.
- 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).
- Using a step bit predrill holes in steel ledger.
- 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 washer is drawn firm to steel ledger and there are not air gaps between the steel ledger and wood sheathing or rim plate.

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.

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.

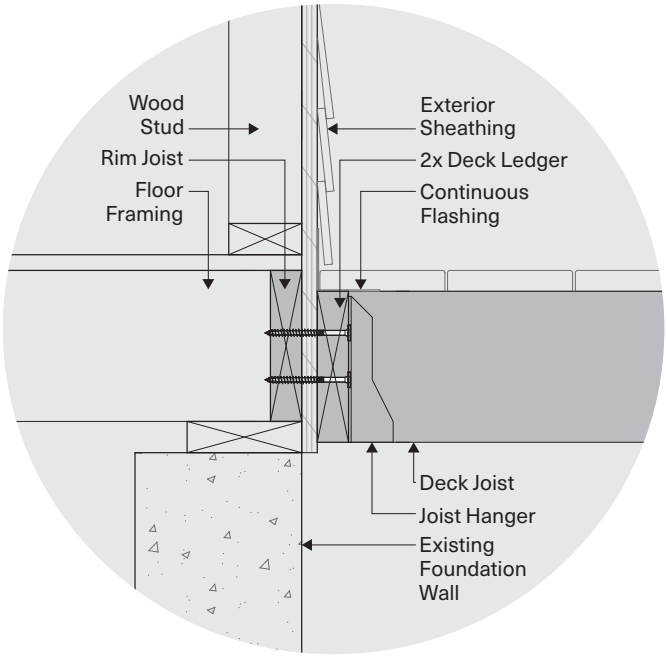


Figure 1—Deck Connection Assembly

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 2.9		Flat T40	2-7/8	1-2/5
	D23 4			4	2-3/8
	D23 5			5	3
Structural F23 Stainless	D23 2.9		Flat T40	2-7/8	1-2/5
	D23 4			4	2-3/8
	D23 5			5	3

Figure 2—Minimum Spacing Requirements: Cold Formed Steel (CFS)

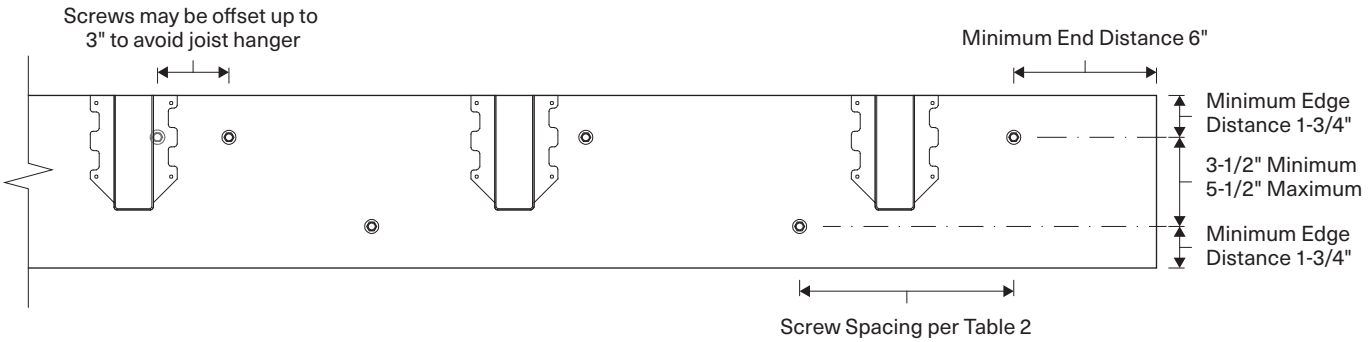


TABLE 2: Structural H23 and F23 Screw Spacing for Listed CFS Ledgers & Loading Conditions[1,2,4]

LOADING CONDITION (PSF): LIVE LOAD + DEAD LOAD	LEDGER[3]		RIM JOIST MATERIAL	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	F_y = 33ksi	12 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	14	11	8	7	6	5	4
		14 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	14	10	8	7	6	5	4
		16 gauge	HF/SPF	10	7	6	5	4	3	3
			DF/SP	14	10	8	7	6	5	4
	F_y = 50ksi	12 gauge	HF/SPF	11	8	6	5	4	4	3
			DF/SP	15	11	9	7	6	5	5
		14 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	14	11	8	7	6	5	4
		16 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	14	11	8	7	6	5	4
60+10	F_y = 33ksi	12 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	12	9	7	6	5	4	4
		14 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	11	8	7	5	5	4	3
		16 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	11	8	7	5	5	4	3
	F_y = 50ksi	12 gauge	HF/SPF	9	6	5	4	3	3	3
			DF/SP	12	9	7	6	5	4	4
		14 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	12	9	7	6	5	4	4
		16 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	12	9	7	6	5	4	4

1. Based on load duration, Cd, of 1.00 for live load conditions, and 1.15 for snow load conditions. Spacing may be adjusted by the applicable load duration for other conditions as specified in the NDS.
2. Fasteners are required to have full thread penetration into the main member. Minimum fastener length to be used is 2-7/8".
3. Solid sawn band joists shall be HF/SPF or SP/DF species (Specific gravity of 0.42 and 0.50 respectively). Sawn lumber band joist 1.5" thick and 7.25" depth; SCL band joist 1.0" thick and 7.25 depth.
4. Similar to the wood-ledger application, fasteners shall be staggered from the top to the bottom along the length of the ledger while maintaining the required edge and end distances.
5. A maximum 1/2" structural sheathing may be installed between the ledger and the band joist.
6. Minimum CFS ledger board requirements: 1.5" flange thickness and 8" depth.

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

TABLE 3: Structural F23 Stainless Screw Spacing for Listed CFS Ledgers & Loading Conditions[1,2,4]

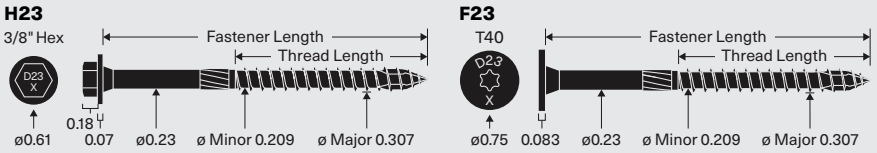
LOADING CONDITION (PSF): LIVE LOAD + DEAD LOAD	LEDGER[3]		RIM JOIST MATERIAL	MAXIMUM DECK JOIST SPANS (FT)						
				UP TO 6	UP TO 8	UP TO 10	UP TO 12	UP TO 14	UP TO 16	UP TO 18
				MAXIMUM ON-CENTER FASTENER SPACING (IN)						
40+10	F_y = 33ksi	12 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	13	10	8	6	5	5	4
		14 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	13	10	8	6	5	5	4
		16 gauge	HF/SPF	10	7	6	5	4	3	3
			DF/SP	13	10	8	6	5	5	4
	F_y = 50ksi	12 gauge	HF/SPF	11	8	6	5	4	4	3
			DF/SP	14	10	8	7	6	5	4
		14 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	13	10	8	6	5	5	4
		16 gauge	HF/SPF	10	8	6	5	4	4	3
			DF/SP	13	10	8	6	5	5	4
60+10	F_y = 33ksi	12 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	11	8	6	5	4	4	3
		14 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	11	8	6	5	4	4	3
		16 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	11	8	6	5	4	4	3
	F_y = 50ksi	12 gauge	HF/SPF	9	6	5	4	3	3	3
			DF/SP	11	8	7	5	5	4	3
		14 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	11	8	6	5	4	4	3
		16 gauge	HF/SPF	8	6	5	4	3	3	2
			DF/SP	11	8	6	5	4	4	3

1. Based on load duration, Cd, of 1.00 for live load conditions, and 1.15 for snow load conditions. Spacing may be adjusted by the applicable load duration for other conditions as specified in the NDS.
2. Fasteners are required to have full thread penetration into the main member. Minimum fastener length to be used is 2-7/8".
3. Solid sawn band joists shall be HF/SPF or SP/DF species (Specific gravity of 0.42 and 0.50 respectively). Sawn lumber band joist 1.5" thick and 7.25" depth; SCL band joist 1.0" thick and 7.25 depth.
4. Similar to the wood-ledger application, fasteners shall be staggered from the top to the bottom along the length of the ledger while maintaining the required edge and end distances.
5. A maximum 1/2" structural sheathing may be installed between the ledger and the band joist.
6. Minimum CFS ledger board requirements: 1.5" flange thickness and 8" depth.

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

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

Starborn® Structural H23 and F23 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.



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.

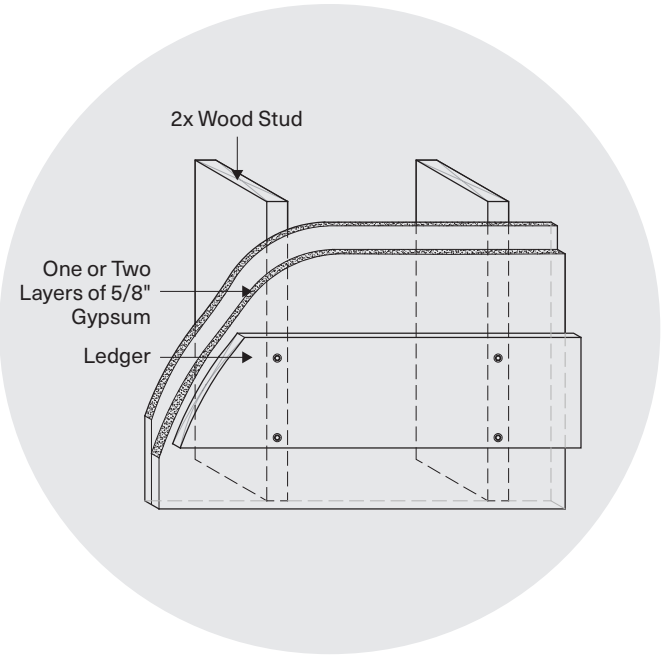


Figure 1

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.

Figure 2—2x6 and 2x8 Ledger Configuration

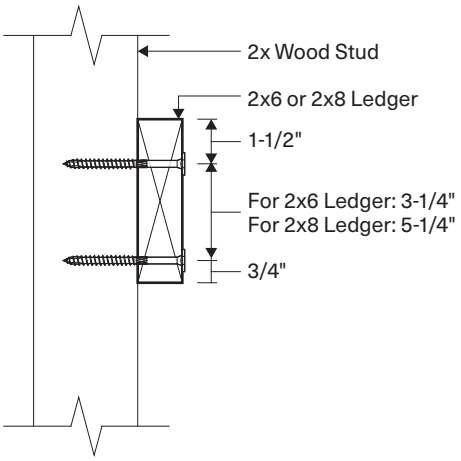


Figure 3—2x10 Ledger Configuration

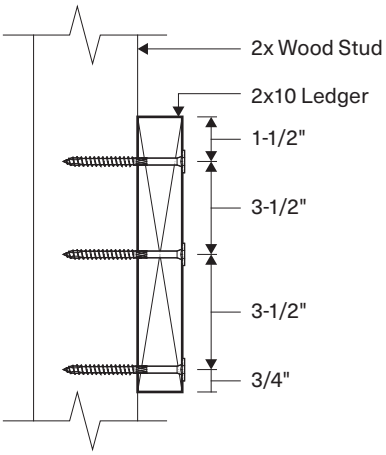


Figure 4—2x6 and 2x8 Ledger Configuration with 1 or 2 Gypsum Interlayers

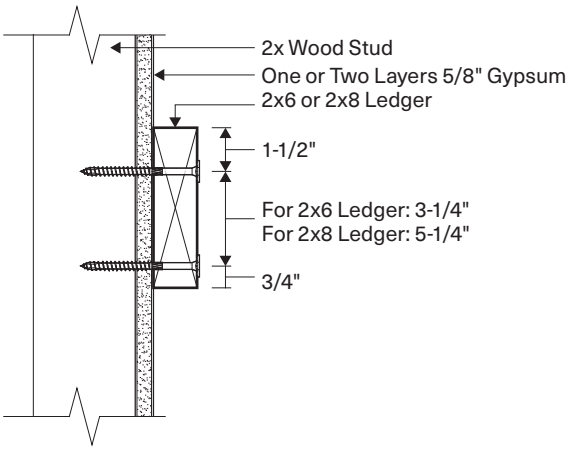


Figure 5—2x10 Ledger Configuration with 1 or 2 Gypsum Interlayers

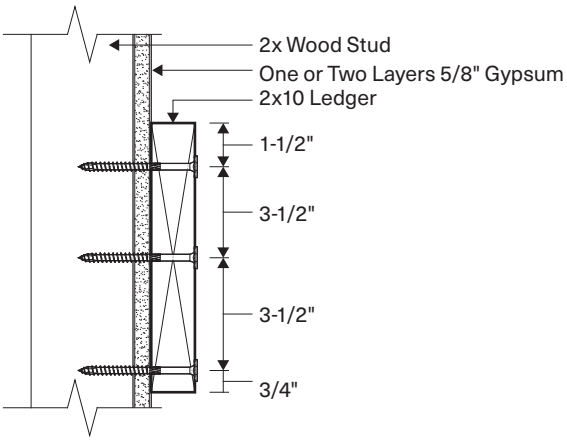


TABLE 2: Reference Lateral Design Values for Ledger to Stud Connections With and Without Gypsum

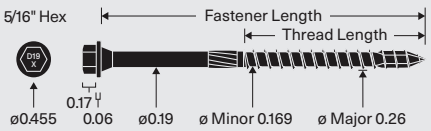
ALLOWABLE LOAD PER STUD CONNECTION (LBF)[1]						
SCREW LENGTH (IN)	MINIMUM PENETRATION INTO MAIN MEMBER (IN)	LAYERS OF 5/8" GYPSUM	NUMBER OF FASTENERS PER STUD	LEDGER SIZE		
				2X6	2X8	2X10
4	2-1/2	0	2	915		1190
	1-7/8	1		815		1070
5	2-1/4	2	3	845		1095

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 (CD) = 1.0. Loads may be increased for load duration as permitted by the building code up to CD = 1.6. All adjustment factors shall be applied per NDS. For in-service moisture content greater than 19%, use Wet Service Factor (CM) = 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.

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.

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.

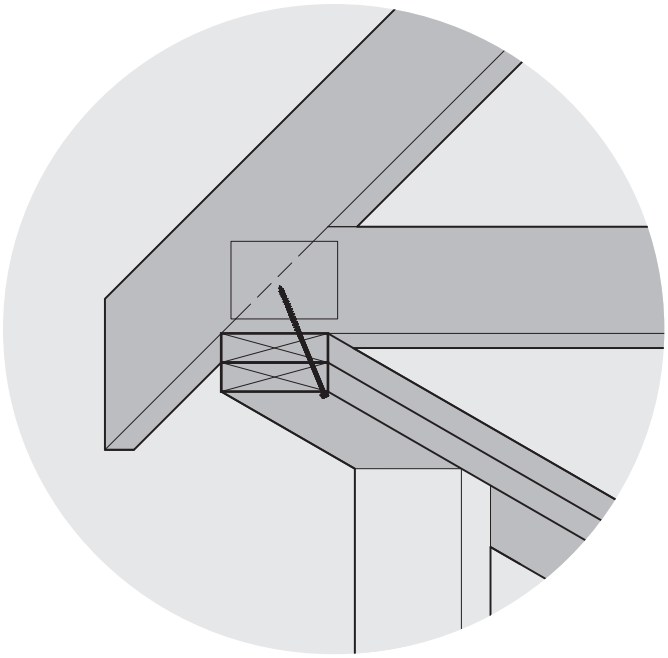


Figure 1

TABLE 1: Screw Properties

PRODUCT NAME	HEAD MARKING	UNTHREADED SHANK DIAMETER (IN)	HEAD TYPE	SCREW LENGTH (IN)	THREAD LENGTH (IN)
Structural H19	D19 4 D19 6	0.19	Hex 5/16"	4	2-1/4
				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

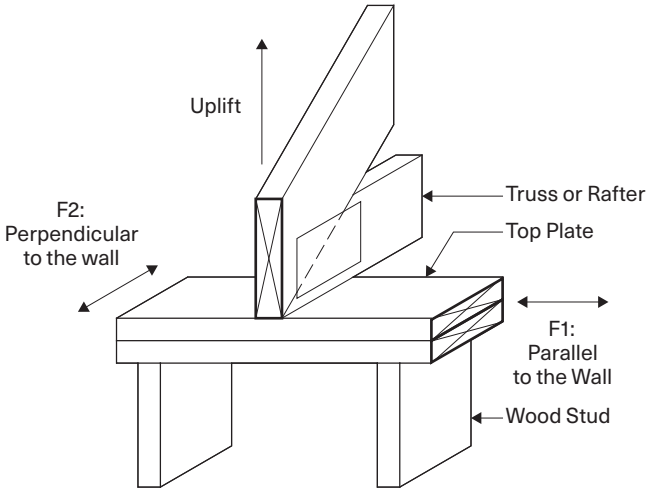


Figure 3—Installation at 20–30°

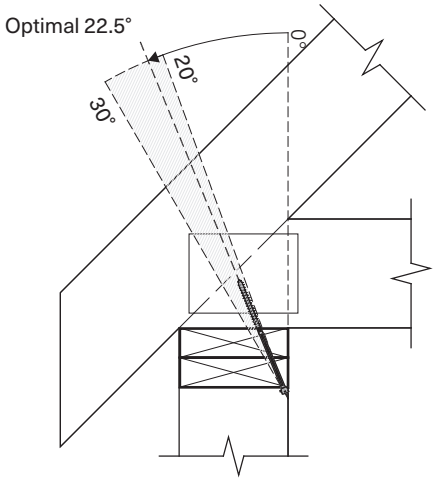


Figure 4—Installation at 90°

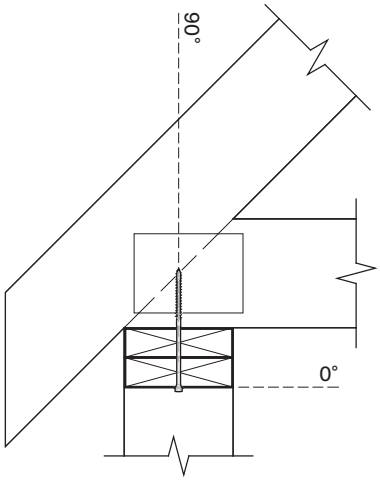


TABLE 2: Allowable Loads for Uplift and Lateral Resistance

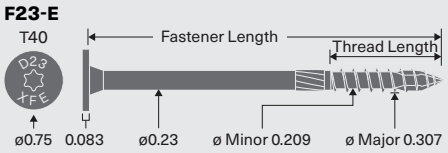
SCREW LENGTH (IN)	TOP PLATE	SCREW ANGLE TO TRUSS	UPLIFT (LBF)	LATERAL (LBF)	
				F1: PARALLEL TO WALL	F2: PERPENDICULAR TO WALL
4	Single	20–30°	445	315	500
		90°	470	360	600
6	Double	20–30°	515	365	570
		90°	465	445	635

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 (CD) = 1.6. No further increases permitted.
4. Minimum 2" penetration.

lbf = pound-force

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.



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.

FINISH AND COATING

Structural F23-E screws have a gray e-coat finish and are designed for interior use only.

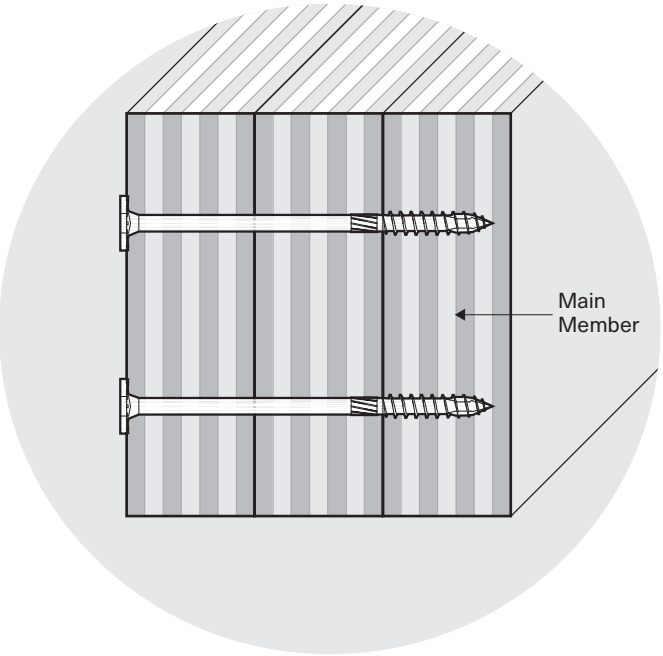


Figure 1

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

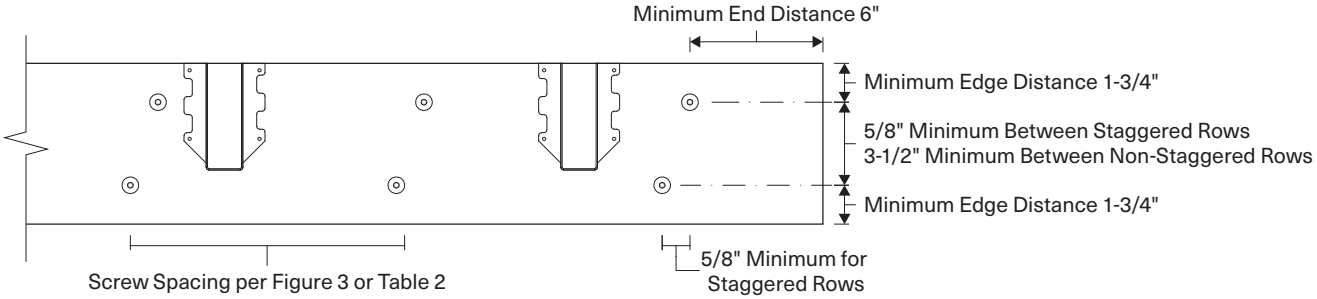
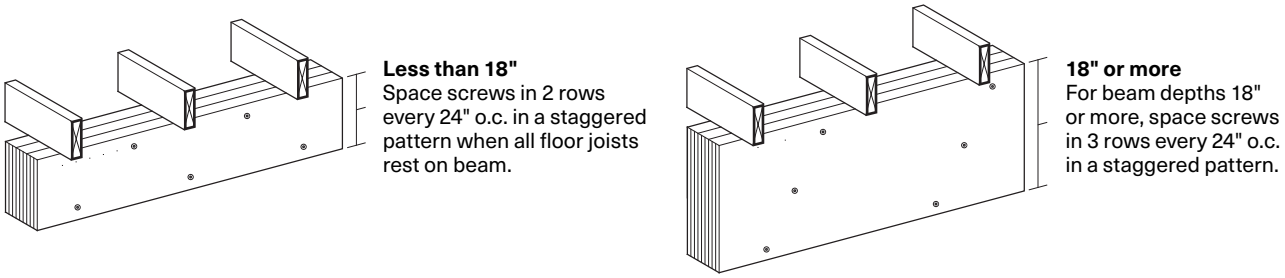


Figure 3—Top Loaded Beams



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

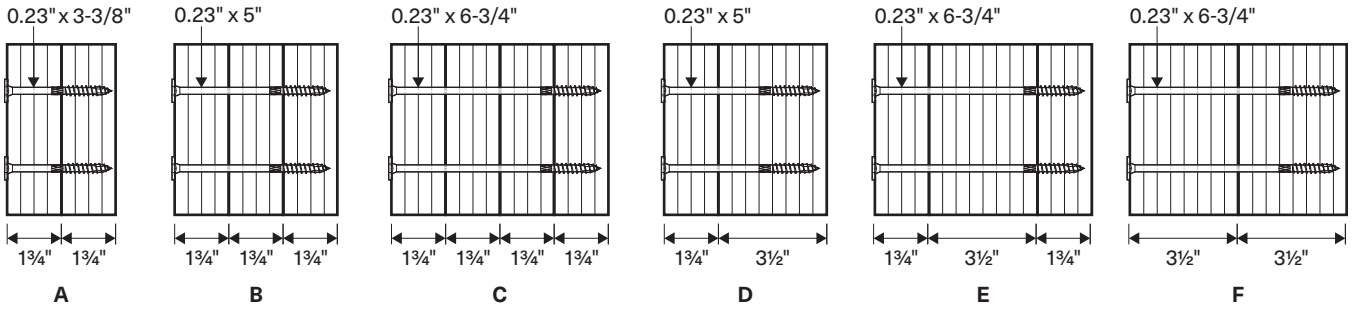


TABLE 2: Allowable Side Load Capacity (plf)

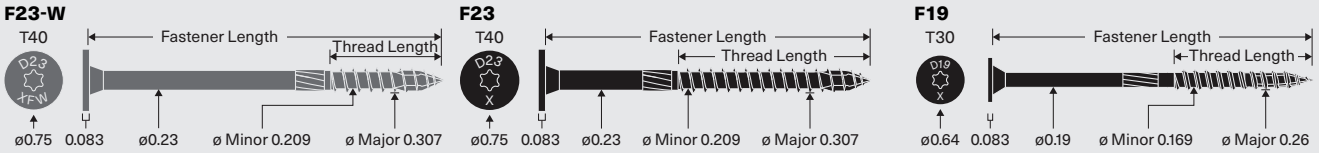
ASSEMBLY	COMPONENTS	SCREW LENGTH (IN)	12" O.C.		16" O.C.		24" O.C.	
			2 ROWS	3 ROWS	2 ROWS	3 ROWS	2 ROWS	3 ROWS
A	2-ply 1-3/4"	3-3/8	1660	2490	1250	1875	830	1245
B	3-ply 1-3/4"	5	1495	2245	1125	1690	750	1125
C	4-ply 1-3/4"	6-3/4	1680	2520	1265	1900	840	1260
D	2-ply 1-3/4" & 3-1/2"	5	1495	2245	1125	1690	750	1125
E	3-ply 1-3/4" & 3-1/2"	6-3/4	1660	2490	1250	1875	830	1245
F	2-ply 3-1/2"	6-3/4	1660	2490	1250	1875	830	1245

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 (CD) = 1.0. Values may be multiplied by all applicable adjustment factors per NDS.

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

Multi-Ply Dimensional Wood Connections
Structural F23-W, F23, F19

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 F19 or F23 Multipurpose screws with IRC Section R507.9 and IBC Section 1604.8.3.



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® T30 or 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.
- **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.

FINISH AND COATING

- Structural F23-W screws have a gray e-coat finish and are designed for interior use only.
- Structural F19 and 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.
- Structural F19, F23, and F23-W screws are not designed for use in or near saltwater environments.

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.

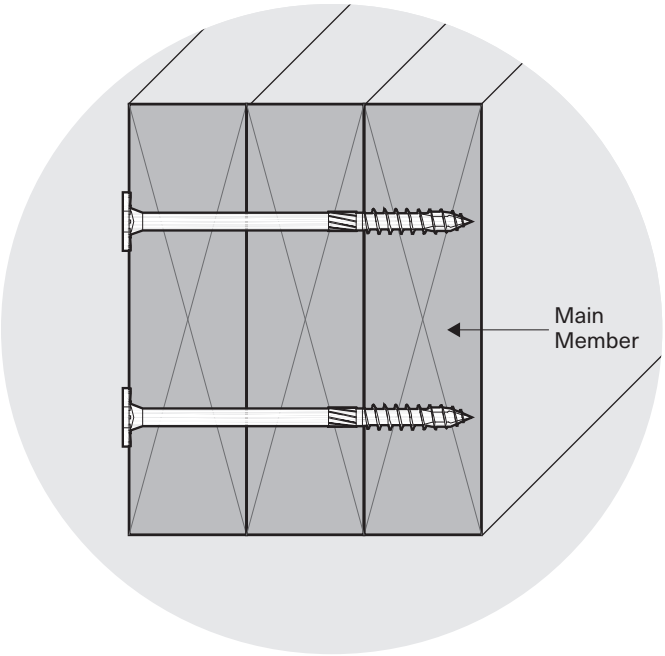


Figure 1

TABLE 1: Screw Properties

PRODUCT NAME	HEAD MARKING	UNTHREADED SHANK DIAMETER (IN)	HEAD TYPE	SCREW LENGTH (IN)	THREAD LENGTH (IN)
Structural F19 (exterior)	D19 2.9	0.19	Flat T30	2-7/8	2
	D19 4.5			4-1/2	
	D19 6			6	
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 5			5	3
	D23 6			6	2-3/4

Figure 2—Minimum Spacing Requirements

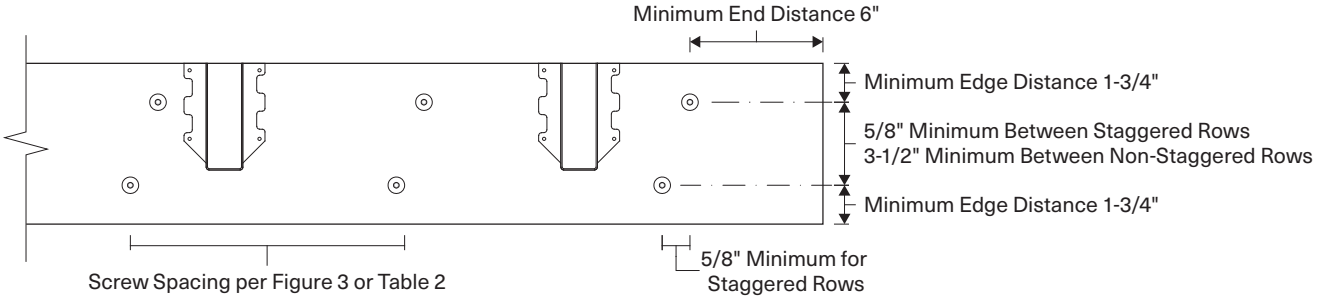


Figure 3—Top Loaded Beams

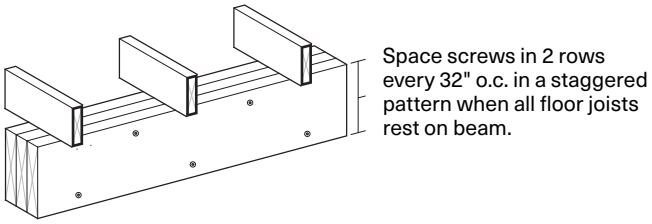


Figure 4—Dimensional Wood Assemblies

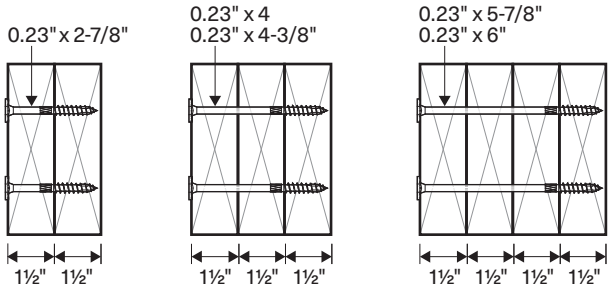


TABLE 2: Allowable Side Load Capacity (plf)

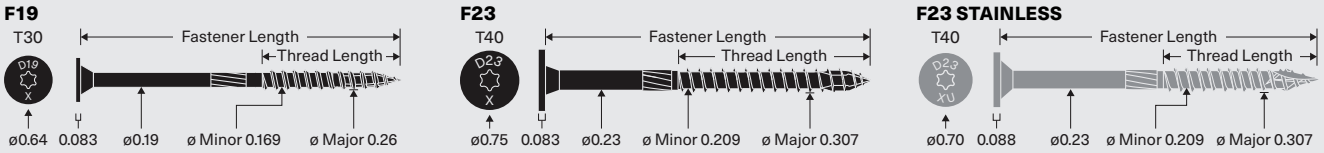
WOOD SPECIES (SPECIFIC GRAVITY)			HF/SPF (0.42)						DF/SP (0.50)					
ASSEMBLY	COMPONENTS	PRODUCT: SCREW LENGTH (IN)	12" O.C.		16" O.C.		24" O.C.		12" O.C.		16" O.C.		24" O.C.	
			2 ROWS	3 ROWS	2 ROWS	3 ROWS	2 ROWS	3 ROWS	2 ROWS	3 ROWS	2 ROWS	3 ROWS	2 ROWS	3 ROWS
A	2-ply 1-1/2"	F19: 2-7/8	1160	1740	870	1305	580	870	1520	2280	1145	1720	760	1140
		F23-W: 2-7/8	1460	2190	1100	1650	730	1095	1660	2490	1250	1875	830	1245
		F23: 2-7/8												
B	3-ply 1-1/2"	F19: 4-1/2	1140	1710	855	1285	570	855	870	1305	655	985	435	655
		F23-W: 4-3/8	1260	1890	945	1420	630	945	1680	2520	1265	1900	840	1260
		F23: 4												
C	4-ply 1-1/2"	F19: 6	870	1305	655	985	435	655	1140	1710	855	1285	570	855
		F23-W: 5-7/8	1120	1680	840	1260	560	840	1495	2245	1125	1690	750	1125
		F23: 6												

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
SP = Southern Pine
HF = Hem-Fir
o.c. = on-center
SPF = Spruce-Pine-Fir
DF = Douglas Fir

Cladding Over Foam Sheathing
Structural H19, F19, F23, F23 Stainless

Starborn® Structural 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.



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® T30 or 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 F19 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 F19 and F23 screws are not designed for use in or near saltwater environments.
- Structural F23 Stainless screws are exterior grade and approved for use in ACQ and pressure treated lumber. For salt water or other areas where corrosion is a concern, use Grade 316 Stainless.
- All metal fasteners have the potential to corrode including stainless steel. For more information visit *starbornindustries.com/corrosion*

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.

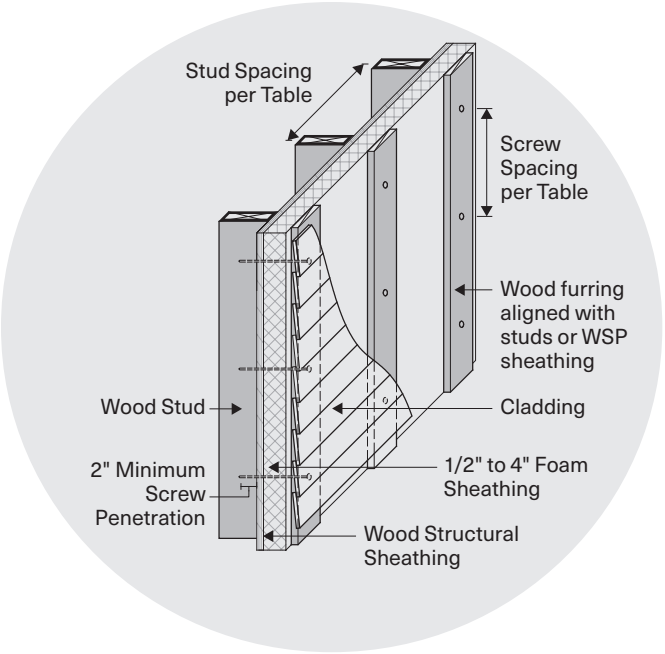


Figure 1—Cladding Over Foam Sheathing

TABLE 1: Screw Properties

PRODUCT NAME	HEAD MARKING	UNTHREADED SHANK DIAMETER (IN)	HEAD TYPE	SCREW LENGTH (IN)	THREAD LENGTH (IN)
Structural H19	D19 2.9	0.19	Hex 5/16"	2-7/8	1.4
	D19 4.5			4	2-1/4
	D19 6			6	2-1/2
	D19 8			8	
Structural F19	D19 2.9	0.19	Flat T30	2-7/8	2
	D19 4.5			4-1/2	
	D19 6			6	
	D19 8			8	
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	
Structural F23 Stainless	D23 2.9 XU	0.23	Flat T40	2-7/8	1.4
	D23 4 XU			4	2-3/4
	D23 5 XU			5	3
	D23 6 XU			6	2-3/4

TABLE 2: Recommended Screw Spacing to Support Cladding Over Foam Sheathing With Wood Furring

STUD SPACING (IN O.C.)	MINIMUM SCREW LENGTH (IN)	FOAM THICKNESS (IN)	MAXIMUM VERTICAL OR HORIZONTAL ON-CENTER SPACING (IN) OF SCREWS ALONG EACH STUD															
			3/8" WSP SHEATHING[1]						3/4" X 3-1/2" WOOD FURRING[1]						1-1/2" X 1-1/2" WOOD FURRING[1]					
			MAXIMUM CLADDING WEIGHT (PSF)[2]						MAXIMUM CLADDING WEIGHT (PSF)[2]						MAXIMUM CLADDING WEIGHT (PSF)[2]					
			5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30
STRUCTURAL F19																				
16	2-7/8	0.5																		
	4-1/2	0.5																		
		1.0																		
		1.5					20	16						20						
		2.0		24		20	16	12		24			16							
	6	1.5					20	16						20						
		2.0				20	16													
		2.5				16	12					20	16	12		24				20
		3.0			20			8			20	16	12	8				20	16	
	8	4.0		20	12	8		7			16	12					20	16	12	
24	2-7/8	0.5						20						20						
	4-1/2	0.5																		
		1					16						20	16		24				
		1.5				16	12					20	16	12					20	16
		2.0		24	16	12	8			24	20	16	12	8						
	6	1.5				16	12					20	16	12						20
		2			16	12					20	16	12			24			20	16
		2.5					8				16	12					20	16		12
		3		20	12			6		20			8	7			20	16	12	
	8	4		12	8	7	6	5		16	12	7	6				16	12		8
STRUCTURAL F23																				
16	2-7/8	0.5																		
	4	0.5																		
		1.0														24				
		1.5												20						
	5	1.5				24						24								
		2.0						20						20		24				
		2.5					20	16					20	16						
	6	2.5																		
		3.0				20	12						16			24				
	8	4.0			20	16	8				16	12						20	16	
24	2-7/8	0.5												20						
	4	0.5																		
		1.0						20						20		24				20
		1.5					20	16				20	16	12						
	5	1.5		24						24			20	16						20
		2.0				20	16	12				20	16	12		24			16	
		2.5			20	16	12				20	16		8						
	6	2.5											12						20	16
		3.0			16	12					20					24				
	8	4.0		20	12		8	7			16			8			16	12		
STRUCTURAL F23 STAINLESS																				
16	2-7/8	0.5																		
	4	0.5																		
		1.0						20						20		24				
		1.5					16						20	16						
	5	1.5		24						24										
		2.0				16						20	16			24				20
		2.5																		
	6	2.5			20	12		8				16	12						20	16
		3.0			16									8		24		20	16	12
24	2-7/8	0.5						20						20						
	4	0.5																		
		1.0						20						20		24				20
		1.5					16						20	16						
	5	1.5			20	16	12			24			16	12					20	16
		2.0		24	16	12						16	12			24		20	16	12
		2.5									16	12	8							
	6	2.5		20	12	8		7										16	12	
		3.0		16			7	5		20	12			7		24	20			8

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

TABLE 3: Recommended Screw Spacing to Support Cladding Over Foam Sheathing With 2-Layers of Wood Furring

STUD SPACING (IN O.C.)	MINIMUM SCREW LENGTH (IN)	FOAM THICKNESS (IN)	MAXIMUM VERTICAL OR HORIZONTAL ON-CENTER SPACING (IN) OF SCREWS ALONG EACH STUD					
			2-LAYER 1-1/2"X 1-1/2" WOOD FURRING[1]					
			MAXIMUM CLADDING WEIGHT (PSF)[2]					
			5	10	15	20	25	30
STRUCTURAL F19								
	6	0.5	24					
		1.0						
		1.5						
	8	2.0						
		2.5						20
		3.0					20	16
	10	4.0				20	16	12
	6	0.5	24					
		1.0						
		1.5					20	16
	8	2.0						
		2.5				20	16	
		3.0				16	12	
	10	4.0			16	12	8	
STRUCTURAL F23								
16	5	0.5	24					
	6	1.0						
		1.5						
	8	2.0						
		2.5						
		3.0						
	10	4.0						20
24	5	0.5	24					
	6	1						
		1.5						20
	8	2						
		2.5						
		3					20	16
	10	4				20	16	12
STRUCTURAL F23 STAINLESS								
16	5	0.5	24					
	6	1						
		1.5						
24	5	0.5	24					
	6	1						20
		1.5					20	16

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. The first furring layer may be installed vertically or horizontally. Furring shall be installed at the same on-center spacing as the studs. All fasteners shall be installed through the double furring layers and into the studs with a minimum of 1.25" fastener penetration. Wood structural panel sheathing attached directly to the studs may be included in the fastener depth. Alternately, where the second furring layer is installed horizontally, and where the required fasteners spacing is 8" o.c. or 12" o.c., the furring may be installed at 16" o.c. or 24" o.c., respectively, provided two (2) fasteners are installed at stud location. Likewise, where fastener spacing is 6"o.c., the furring may be installed horizontally at 12"o.c. and two (2) fasteners used at each stud. Where multiple fasteners are used, furring or sheathing (substrate) shall be of adequate size to provide proper edge, end, and fastener spacing distances.
7. Minimum fastener lengths shown in this table are based on using one fastener to connect both furring layers through FPIS and into the stud. Furring is permitted to be connected separately. When choosing the length of fastener for the second layer of furring, ensure a minimum penetration into the first layer of furring for 1.00" for H19 and F19 fasteners, or 1.25" for F23 fasteners.
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

TABLE 4: Recommended Screw Spacing to Support Cladding Over Foam Sheathing With Cold Formed Steel (CFS)

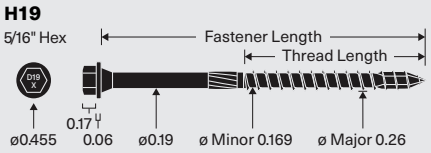
STUD SPACING (IN O.C.)	MINIMUM SCREW LENGTH (IN)	FOAM THICKNESS (IN)	MAXIMUM VERTICAL OR HORIZONTAL ON-CENTER SPACING (IN) OF SCREWS ALONG EACH STUD																	
			USING 20-GAUGE CFS FURRING[1]						USING 18-GAUGE CFS FURRING[1]						USING 16-GAUGE CFS FURRING[1]					
			MAXIMUM CLADDING WEIGHT (PSF)[2]						MAXIMUM CLADDING WEIGHT (PSF)[2]						MAXIMUM CLADDING WEIGHT (PSF)[2]					
			5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30
STRUCTURAL H19 & F19																				
16	2-7/8	0.5	24				20	16	24				20	16	24				20	16
	4 (H19 only)	0.5																		
		1.0																		
		1.5																		
	4-1/2 (F19 only)	0.5																		
		1.0																		
		1.5					20	16					20	16					20	16
		2.0				20	16	12				20	16	12				20	16	12
	6	1.5					20	16					20	16					20	16
		2.0				20	16	12				20	16	12				20	16	12
		2.5			20	16	12				20	16	12				20	16	12	
		3.0			16	12	8				16	12	8				16	12	8	
	8	4.0		20	12			7		20	12			7		20	12			7
24	2-7/8	0.5																		
	4 (H19 only)	0.5																		
		1.0					20	16					20	16					20	16
		1.5				16	12					16	12					16	12	
	4-1/2	0.5																		
		1.0	24				20	16	24				20	16	24				20	16
		1.5				16	12					16	12					16	12	
		2.0			16	12	8				16	12	8				16	12	8	
	6	1.5				16	12					16	12					16	12	
		2.0			16	12	8				16	12	8				16	12	8	
		2.5	20	12			8	7	20	12			8	7					8	7
		3.0	16				7	6	16				7	6	20	12			7	6
	8	4.0	12	8	7	5	4		12	8	7	5	4		12	8	7	6	5	
STRUCTURAL F23																				
16	2-7/8	0.5																		
	4	0.5																		
		1.0																		
		1.5																		
	5	1.5				24						24						24		
		2.0						20						20						20
		2.5					16						16						16	
	6	2.5																		
		3.0				20		12				20		12				20		12
	8	4.0			20	16	12	8			20	16	12	8			20	16	12	8
24	2-7/8	0.5																		
	4	0.5																		
		1.0						20						20						20
		1.5					20	16					20	16					20	16
	5	1.5				24						24						24		
		2.0				20	16	12				20	16	12				20	16	12
		2.5																		
	6	2.5			20	16	12				20	16	12				20	16	12	
		3.0			16	12	8				16	12	8				16	12	8	
	8	4.0	20	12				7	20	12				7	20	12				7
STRUCTURAL F23 STAINLESS																				
16	2-7/8	0.5																		
	4	0.5																		
		1.0				24						24						24		
		1.5						20						20						20
	5	1.5					20	16					20	16					20	16
		2.0				20	16	12				20	16	12				20	16	12
		2.5	24						24						24					
	6	2.5			16	12	8				16	12	8				16	12	8	
		3.0																		
24	2-7/8	0.5						20						20						20
	4	0.5	24						24						24					
		1.0				20	16	12				20	16	12				20	16	12
		1.5			20	12		8			20	12		8			20	16	12	8
	5	1.5	24		20	12		8	24		20	12		8	24		20	16	12	
		2.0			16						16						16	12		
		2.5		16	12	8	7	6		16	12	8	7	6		20	12	8		6
	6	2.5					7	6					7	6						
		3.0					6	5					6	5		16			6	5

1. Wood stud, CFS 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

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.



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.

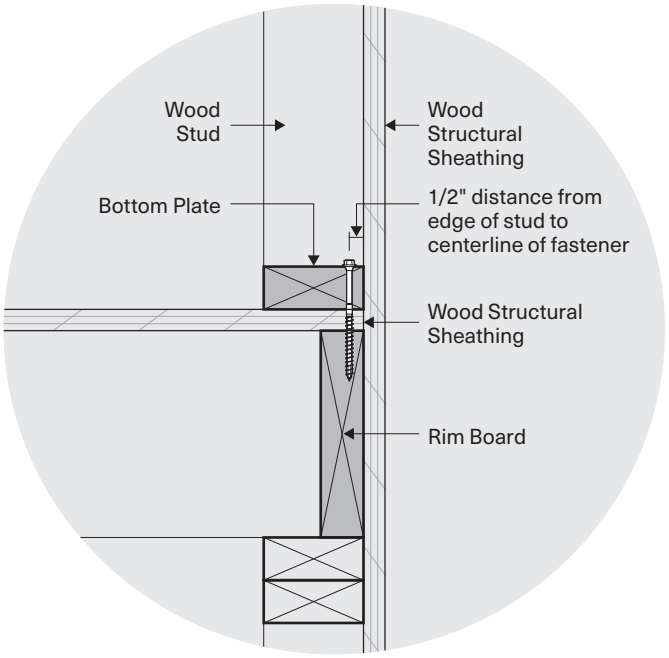


Figure 1—Single Bottom Plate to Rim Board Installation

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	

TABLE 2: Allowable Design Values (lbf)

LOAD DIRECTION	RIM BOARD SPECIES (SPECIFIC GRAVITY)	
	HF/SPF (0.42)	DF/SP (0.50)
Uplift	505	750
Lateral—Parallel to Grain	600	705
Lateral—Perpendicular to Grain	365	395

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.

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.

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

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

3′ END OF AISLE DISPLAY

A complete display offers a more comprehensive offering of fastener lengths for all major applications.

- Lag replacement
- Ledger board attachment
- Deck substructure
- Carrying beams
- Timber framing
- Pergolas
- Fencing
- Log home construction

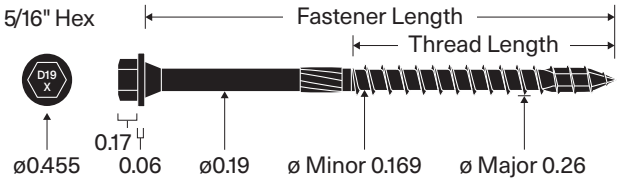
FEATURES

- Fully customizable product selection
- Free 3′ gondola with shelves

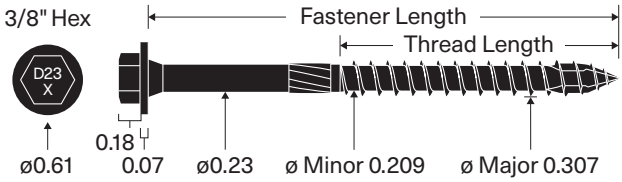
RACK DIMENSIONS

- 36" w x 22" d x 84" h
- Sign: 36" w x 12-1/8" h

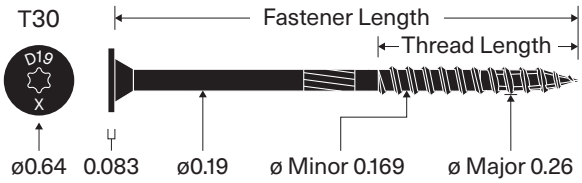
Guide To Structural Wood Screws



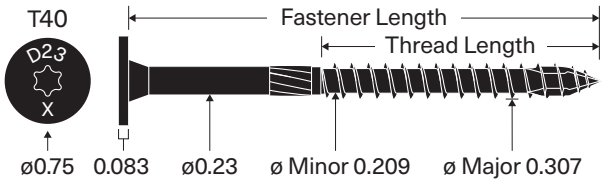
STRUCTURAL H19
Multipurpose/Truss To Top Plate



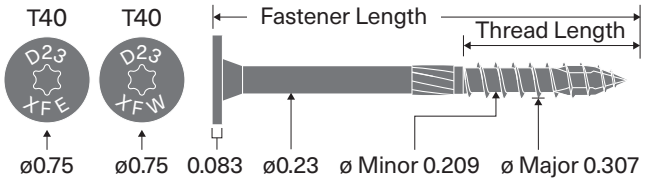
STRUCTURAL H23
Deck Ledger



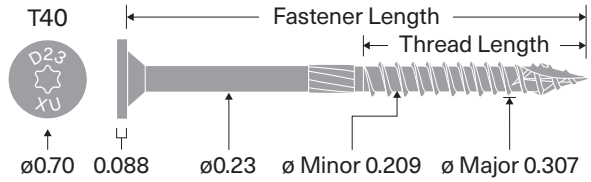
STRUCTURAL F19
Multipurpose



STRUCTURAL F23
Deck Ledger/Multipurpose



STRUCTURAL F23-E & F23-W
Multi-Ply Beam Connections



STRUCTURAL F23 STAINLESS
Deck Ledger/Multipurpose

SOLUTIONS	H19	H23	F19	F23	F23-E	F23-W	F23 STAINLESS	CODE COMPLIANCE REPORT: DRJ TER NO.
	HEX	HEX	FLAT	FLAT	FLAT	FLAT	FLAT	
Screw Properties and Design Values	●	●	●	●	●	●	●	1703-05
Deck Ledger to Rim Joist		●		●			●	1703-01
Ledger to Stud with 0, 1, or 2 Layers of 5/8" Gypsum		●		●				1703-01
Truss or Rafter to Top Plate	●							1703-02
Multi-Ply Engineered Wood Connections					●			1703-03
Multi-Ply Dimensional Wood Connections			●	●		●		1703-03
Cladding Over Foam Sheathing	●		●	●			●	1703-04
Bottom Plate to Rim Board	●							1703-02