

# Get Retro-“FIT”

## with Triangle Fastener Corporation



### Retrofit Fastening Systems Guide

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**1-800-486-1832**

**TRIANGLE FASTENER CORPORATION**

*Specialty Fasteners for the Construction Industry*

# Why TFC For Retrofit Fastening?

Triangle Fastener Corporations' retrofit fastening systems program is designed specifically for servicing the needs of the metal building manufacturer, dealer, and contractor. We specialize in end-user assistance, providing the finest products, services, and job-site support assuring the job is done right!

## Count On Experience!

### Markets Served

#### Full line of fasteners and accessories that support

- ▽ Metal building and custom construction
- ▽ Flat (BUR) roofing

### Job-Site Support

#### Trained sales team is focused on the needs of the end-user

- ▽ 16 branch locations for immediate service
- ▽ Pullout tests
- ▽ Fastening recommendations

### Products

#### Fasteners and accessories available for numerous applications

- ▽ Fasteners for metal, wood & masonry
- ▽ Complete line of drill bits, sockets and installation tools



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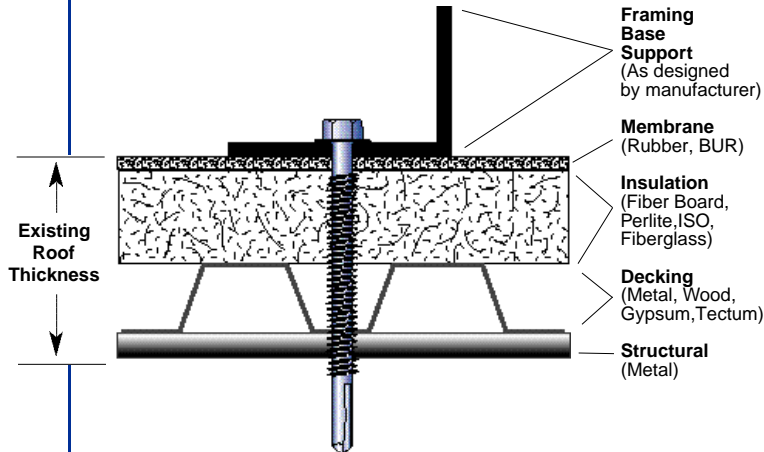
# Retrofit Fastening Systems Guide

Structural Material Type

# METAL

STEP

## 1 Examine Existing Roof and Structural Condition

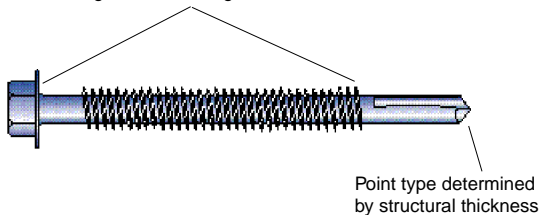


1. Pull out tests should be performed to help determine roof condition and fastener type. Contact TFC for assistance.
2. Analyze existing roof to assure that pullout, deflection and dead loads associated with the new roof can be met. Refer to roof system manufacturer for design load criteria.
3. New roofing system should be attached to existing structural.
4. It is recommended that existing structural be a minimum of 16 gauge to accept new roof load requirements.
5. Penetrations caused by pullout tests must be sealed to help prevent leaks prior to installation of new roofing system.

STEP

## 2 Determine Fastener Length and Point Type

Thread length must be a minimum of 5/8" longer than existing roof thickness



STEP

## 3 Select Fastener

Expected Pullout Results in Steel

STRUCTURAL THICKNESS	1/4-14 Driller	1/4-28 Driller	1/4-14 Tapper	#15-13 Tapper
14 (.075)	1148	918	1230	892
12 (.105)	1861	1507	1681	1567
1/8" (.125)	2409	3300	1812	1271
3/16" (.187)	*4553	N/A	2660	N/A
1/4" (.250)	*5036	*5059	3179	2693
1/2" (.500)	N/A	N/A	*3850	N/A
Available Lengths	8" Max	8" Max	12" Max	16" Max

Average Lbs. Ultimate to Failure  
\*Exceeds Tensile Strength

Choose Length Based on Roof Thickness

SELF DRILLING FASTENER LENGTH				
Roofing Thickness	1-1/4" to 2-3/8"	2-3/8" to 3-3/8"	3-3/8" to 4-3/8"	4-3/8" to 6-3/8"
Recommended Fastener	4" long	5" long	6" long	8" long

SELF TAPPING FASTENER LENGTH							
Roofing Thickness	1-1/4" to 3-3/8"	2-3/8" to 4-3/8"	3-3/8" to 5-3/8"	4-3/8" to 7-1/2"	7" to 9-1/2"	9" to 11-1/2"	11" to 13-3/8"
Recommended Fastener	4" long	5" long	6" long	8" long	*10" long	*12" long	*14" long

\*Available in 15 Diameter Only

## HELPFUL HINTS

- ▽ Fastener strength should meet or exceed load requirements specified by the roofing system manufacturer.
- ▽ It is recommended that a minimum of a 1/4" diameter fastener be used due to higher tensile and shear strength compared to smaller diameters.
- ▽ Fasteners should be supplied with long-life coating or be of stainless steel material for added corrosion protection.
- ▽ Actual job site results will vary. TFC assumes no liability for the use of these published test results.
- ▽ Contact TFC for job site assistance.

Refer to page 4 for Products and Installation Information



1-800-486-1832

# TRIANGLE FASTENER CORPORATION

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## Metal Application Product And Installation Information

The following information is designed to assist in determining the appropriate fastener for retrofit base framing attachment and provide tips for installation into structural steel members. Care should be taken to examine existing roof to be sure that all design loads are achieved. Contact TFC for job site assistance and product support.

### Fastener Mechanical Properties

DIAMETER	TORSIONAL (Inch lbs.)	TENSILE (lbs)	SHEAR (lbs)
#12-14	92	2778	2000
#12-24	92	3188	2100
1/4-14	150	3850	2600
1/4-20	150	4275	2700
1/4-28	234	5577	3310
#15-13	162	4297	2327

### Fastener Physical Properties

DIAMETER	THREAD MAJOR DIA.	THREAD MINOR DIA.	TENSILE STRESS AREA
#12-14	.210	.160	.0134 sq in
#12-24	.210	.187	.0242 sq in
1/4-14	.240	.198	.0236 sq in
1/4-20	.246	.216	.0306 sq in
1/4-28	.246	.224	.0350 sq in
#15-13	.259	.163	.0268 sq in

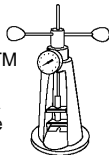
### Fastener Material Properties (IFI-104)

MATERIAL TYPE	TENSILE PSI	YIELD PSI
Carbon Steel	130,000	97,500
304 SS	90,000	50,000
316 SS	90,000	50,000
410 SS	125,000	95,000

### For this job you will need:

**Screw Gun**  
2,000 rpm max with depth sensing nosepiece. Used for fastener installation

**Pullout Tester**  
0-2,500 lbs.  
Certifiable to: ASTM E74  
MIL-STD 45662-A  
Used to determine fastener and roof condition.



**Chop Saw**  
14" 4.0 hp  
Abrasive Wheel-14" x 3/32" x 1"  
Used for cutting framing members.

**Drill**  
3/8" chuck.  
0-1200 rpm

**Drill Bits for 1/4" & #15 Self Tapping Fasteners**  
135° split point high-speed steel

Structural Thickness	BIT SIZE	
	1/4-14 Tapper	#15-13 Tapper
4 ga to 12 ga	#7 (.201)	7/32 (.218)
1/8"	#2 (.221)	1/4" (.250)
1/16" to 1/2"	#1 (.228)	1/4" (.250)

BIT LENGTH	
Roof Thickness	Drill Bit Length
0 to 3-3/8"	3-7/8"
3-3/8" to 5-1/2"	6"
5-1/2" to 11-1/2"	12"

### Self Drilling Fasteners



DIAMETER	LENGTHS	STRUCTURAL RANGE
#12-14	3/4" TO 4"	.075-.200
#12-24	7/8" TO 4"	.250-.500
1/4"-14	3/4" TO 8"	.075-.500
1/4"-20	1" TO 1-1/4"	.110-.250
1/4"-28	6"-8"	.250-.500

Material: Carbon Steel  
Finish: Zinc Plated with Long Life Coating  
Drive: HWH

### Self Tapping Fasteners



DIAMETER POINTS	LENGTHS	STRUCTURAL RANGE
1/4-14AB	1" TO 11"	.250 MAX
1/4-14B	1" TO 8"	.500 MAX
#15-13X	8" TO 16"	.250 MAX

Material & Finish  
\*Carbon Steel, zinc plated with long life coating  
\*18-8 Stainless Steel. Long life coated  
Drive: HH, HWH, and Phillips Truss

## HELPFUL HINTS

- ▽ Examine existing roof and perform pullout tests to determine roof condition and appropriate fastener. Failed roof system should be compression tested to assure the new roofing system can be supported. Contact TFC for job site assistance.
- ▽ Select fastener that meets or exceeds roof system manufacturers design load criteria for pullout, dead load, and deflection. Contact roof manufacturer for appropriate load requirements.
- ▽ Locate existing structure and prepare roof surface to accept the base design for the new framing system.
- ▽ Apply sealant to underside of framing base support.
- ▽ Install fastener perpendicular to roof surface. Drill point failure can occur during installation if threads tap before drilling is completed.
- ▽ Cover fastener and framing base with sealant to prevent leaks.

Information is compiled from numerous product manufacturers literature. Test results are based on laboratory conditions and should be used as a guide only. Job site conditions should be taken into consideration when determining the proper fastener and is a responsibility of the installer or specifier. TFC assumes no liability for the use of this information



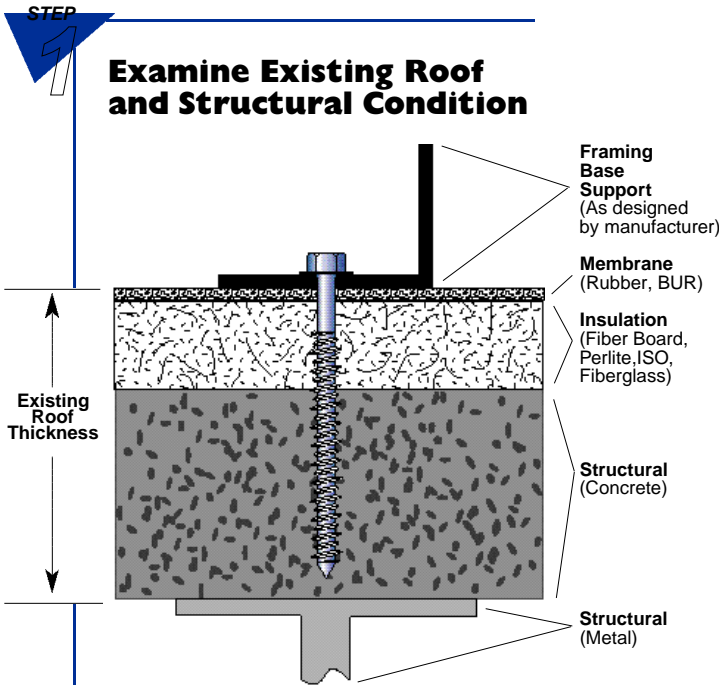
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# Retrofit Fastening Systems Guide

Structural material type  
**CONCRETE**



1. Pull out tests should be performed to help determine roof condition and fastener type. Contact TFC for assistance.
2. Analyze existing roof to assure that pullout, deflection and dead loads and corrosion specifications associated with the new roof system can be met. Refer to roof system manufacturer for design load criteria.
3. New roofing system should be attached into concrete with a minimum of 1" embedment.
4. Penetrations caused by pullout tests must be sealed to help prevent leaks prior to installation of new roofing system.

**STEP 2**

### Select Fastener

Choose anchor length based on roof thickness

#### Pullout & Shear Strengths (4000 psi Concrete)

FASTENER ANCHOR TYPE	EMBED. DEPTH	PULLOUT (POUNDS)	SHEAR (POUNDS)
1/4" Threaded	1"	718	2000
#15 Threaded	1"	733	N/A
3/8" Wedge	1-1/2"	3219	4029
1/2" Wedge	1-1/8"	6930	6900
3/8" Epoxy	1-1/2"	4780	6480
1/4" Drive	1-1/4"	1550	2750

#### 1/4" & #15 THREADED CONCRETE FASTENER

Determine roof thickness to structural concrete then choose appropriate fastener length. (1" minimum embedment)

Roofing Thickness	1-1/4" to 1-3/4"	1-3/4" to 2-1/4"	2-1/4" to 2-3/4"	2-1/2" to 3"	3-1/4" to 4"	4-1/4" to 5"	5" to 6"	6" to 7"	10" to 11"
Recommended Fastener	2-3/4" long	3-1/4" long	3-3/4" long	4" long	5" long	6" long	*7" long	*8" long	*12" long

(\*#15 Diameter Only)

#### 1/4" DRIVE ANCHOR

Determine roof thickness to structural concrete then choose appropriate anchor length. (1-1/4" minimum embedment)

Roofing Thickness	1-3/4" max	2-1/4" max	2-3/4" max	3-1/4" max	3-3/4" max	5-3/4" max	6-3/4" max	6-3/4" max	7-3/4" max
Recommended Anchor Length	3" long	3-1/2" long	4" long	4-1/2" long	5" long	6" long	7" long	8" long	9" long

#### 3/8" EPOXY ANCHORS

Determine roof thickness to structural concrete then choose appropriate anchor length. (1-1/2" minimum embedment)

Roofing Thickness	3-1/4" max	4-1/4" max	5-3/4" max	9-3/4" max
Recommended Anchor Length	4" long	6-1/2" long	8" long	12" long

#### 3/8" & 1/2" WEDGE ANCHORS

Determine roof thickness to structural concrete then choose appropriate anchor length. (1-1/8" minimum embedment)

Roofing Thickness	7/8" max	1-7/8" max	3-1/8" max	*4-1/2" max
Recommended Anchor Length	2-3/4" long	3-3/4" long	5" long	*7" long

(\*1/4" wedge anchor)

**STEP 3**

### Determine Fastener Length and Point Type

Anchor length must allow a minimum of 1" embedment

## HELPFUL HINTS

- ▽ Fastener strength should meet or exceed load requirements specified by the roofing system manufacturer.
- ▽ Fasteners should be supplied with long-life coating or be of stainless steel material for added corrosion protection.
- ▽ Actual job site results will vary. TFC assumes no liability for the use of these published test results.
- ▽ Contact TFC for job site assistance.

Refer to page 6 for Products and Installation Information

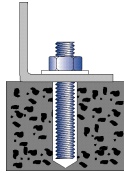


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# Concrete Application Product And Installation Information

The following information is designed to assist in determining the appropriate fastener for retrofit base framing attachment and provide tips for installation into concrete members. Care should be taken to examine existing roof to be sure that all design loads are achieved. Contact TFC for job site assistance and product support.



## Epoxy Anchor

DIAMETER	NUT SIZE	LENGTHS	STRUCTURAL EMBEDMENT	INSTALLATION TORQUE
3/8-16	9/16 Hex	4" to 12"	1-1/2"	13-18 ft lbs

Material: Carbon Steel, Zinc Plated, Stainless Steel  
 Approvals: FM, ICBO, City of LA, ASTM, C881-90  
 Type I V Grade 3, AASHTO M235-90 Type III Grade 3.

## Threaded Anchor



DIAMETER	LENGTHS	STRUCTURAL EMBEDMENT
1/4-14	1-1/4" to 6"	1"
#15-13	1-1/4" to 16"	1"

Material: Carbon Steel, 4100SS, 304SS  
 Finish: Zinc Plated with Long Life Coating  
 Drives: HWH, Phillips Truss  
 Approvals: ICBO, Metro Dade, City of NY, Palm Beach, city of LA

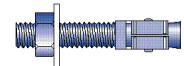
## Drive Anchor



DIAMETER	LENGTHS	STRUCTURAL EMBEDMENT
1/4"	2-3/4" to 12"	1-1/4"

Material: Carbon Steel, Zinc Plated, Stainless Steel

## Wedge Anchor



DIAMETER	LENGTHS	STRUCTURAL EMBEDMENT	INSTALLATION TORQUE
3/8-16	2-3/4" to 5"	1-1/8"	25 ft lbs
1/2-13	7"	1-1/8"	55 ft lbs

Material: Carbon Steel, Zinc Plated, Stainless Steel  
 Approvals: Government G.S.A spec FF-S-325 Group II, Type 4,  
 Class I.UL, FM, ICBO, City of LA, Metro Dade

## For this job you will need:

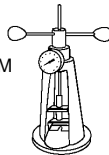


**Rotary Hammer**  
 7/8" SDS  
 6.9 amps  
 Used for drilling structural concrete and installing threaded anchors.

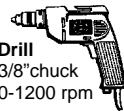


**Screw Gun**  
 2,000 rpm max with depth sensing nosepiece. Used for fastener installation.

**Pullout Tester**  
 0-2,500 lbs.  
 Certifiable to: ASTM E74  
 MIL-STD 45662-A  
 Used to determine fastener and roof condition.



**Chop Saw**  
 14" 4.0 hp  
 Abrasive Wheel-14" x 3/32" x 1"  
 Used for cutting framing members.



**Drill**  
 3/8" chuck  
 0-1200 rpm



## Drill Bits Selection for Concrete Anchors

Carbide Tipped-Wide Flute

ROOF THICKNESS	THREADED 1/4-14	THREADED #15-13	WEDGE 3/8-16	WEDGE 1/2-13	DRIVE 1/4"	EPOXY 3/8-16
2" max	3/16"x3-1/2"	-	3/8"x4"	-	-	-
3" max	3/16"x4-1/2"	-	-	-	-	-
4" max	3/16"x5-1/2"	-	3/8"x6"	1/2"x6"	1/4"x6"	1/2"x6"
7" max	-	7/32"x8"	-	-	1/4"x8-1/2"	-
10" max	-	7/32"x11"	3/8"x12"	1/2"x12"	1/4"x12"	1/2"x12"

## HELPFUL HINTS

- ▽ Examine existing roof and perform pullout tests to determine roof condition and appropriate fastener. Failed roof system should be compression tested to assure the new roofing system can be supported. Contact TFC for job site assistance.
- ▽ Select anchor that meets or exceeds roof system manufacturer design load criteria for pullout, dead load, deflection, and corrosion resistance. Contact roof manufacturer for appropriate load requirements and TFC for product support.
- ▽ Prepare roof surface to accept the base design for the new framing system.
- ▽ Drill into concrete using carbide tip wide flute bit. For best results, drill hole using a rotary hammer.
- ▽ Apply sealant to underside of base.
- ▽ Concrete fasteners should be spaced a distance apart at a minimum of 10 diameters of the anchor size. (Example 3/8" wedge = 3-3/4" minimum spacing.)
- ▽ Cover anchor and "clip" with sealant to prevent leaks.

Information is compiled from numerous product manufacturers literature. Test results are based on laboratory conditions and should be used as a guide only. Job site conditions should be taken into consideration when determining the proper fastener and is a responsibility of the installer or specifier. TFC assumes no liability for the use of this information.



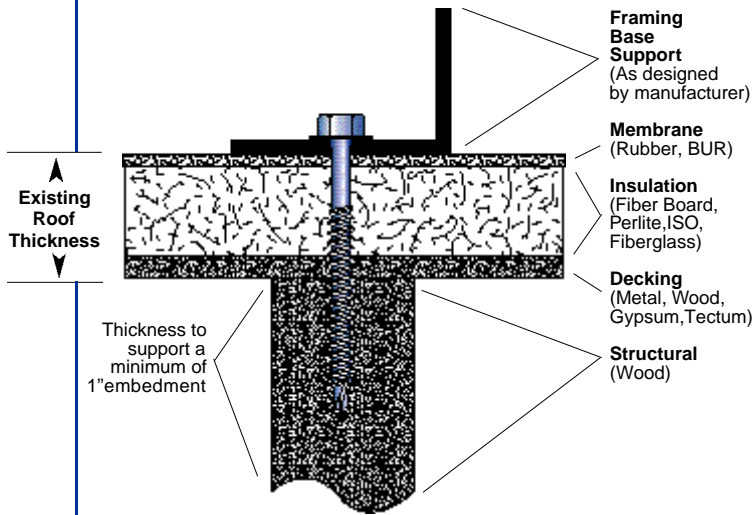
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STEP

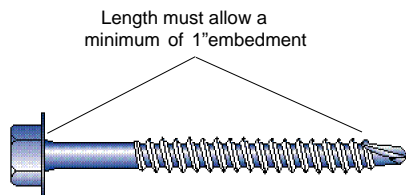
## 1 Examine Existing Roof and Structural Condition



1. Pull out tests should be performed to help determine roof condition and fastener type. Contact TFC for assistance.
2. Analyze existing roof to assure that pullout, deflection, dead loads and corrosion specifications associated with the new roof system can be met. Refer to roof system manufacturer for design load criteria.
3. New roofing system should be attached to existing wood structure.
4. It is recommended that existing wood structure be capable of 1" minimum fastener embedment to accept new roof load requirements.
5. Penetrations caused by pullout tests should be sealed to help prevent leaks prior to installation of new roofing system.

STEP

## 2 Determine Fastener Length and Point Type



STEP

## Select Fastener

Choose fastener based on load requirements.

### Pullout Results for Self Tapping Fastener in 2x4 Wood "Structure"

Fastener Diameters

EMBEDMENT DEPTH	#12-13 Tapper	#14-13 Tapper	#15-13 Tapper
1"	784#	852#	863#
Available Lengths	8" Max	12" Max	16" Max

Average Lbs. Ultimate to Failure

Choose Length Based on Roof Thickness.

SELF TAPPING FASTENER LENGTH							
Roofing Thickness	1/2" to 3-1/2"	1" to 4"	2" to 5"	3" to 6"	4" to 7"	6" to 9"	8" to 11"
Recommended Fastener Length	4-1/2" long	5" long	6" long	7" long	8" long	10" long	12" long

Note: #12 diameter max length is 5"

## HELPFUL HINTS

- ▽ Fastener strength should meet or exceed load requirements specified by the roofing system manufacturer.
- ▽ Choose fastener diameter based on expected minimum pullout results.
- ▽ Fasteners should be supplied with long-life coating or be of stainless steel material for added corrosion protection.
- ▽ Actual job site results will vary. TFC assumes no liability for the use of these published results.
- ▽ Contact TFC for job site assistance.

Refer to page 8 for Products and Installation Information



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## Wood Application Product And Installation Information

The following information is designed to assist in determining the appropriate fastener for retrofit base framing attachment and provide tips for installation into structural steel members. Care should be taken to examine existing roof to be sure that all design loads are achieved. Contact TFC for job site assistance and product support.

### Fastener Mechanical Properties

DIAMETER	TORSIONAL (Inch lbs.)	TENSILE (lbs)	SHEAR (lbs)
#12-13	100	2656	1229
#14-10	125	3150	2150
#14-13	88	3647	1510
#15-13	162	4297	2327


### Fastener Physical Properties

DIAMETER	THREAD MAJOR DIA.	TENSILE STRESS AREA
#12-13	.209/.215	.0134 sq in
#14-10	.245/.252	.0236 sq in
#14-13	.243/.250	.0306 sq in
#15-13	.256/.262	.0268 sq in

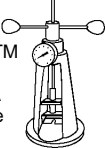
### Fastener Material Properties (IFI-104)

MATERIAL TYPE	TENSILE PSI	YIELD PSI
Carbon Steel	130,000	97,500
304 SS	90,000	50,000
316 SS	90,000	50,000
410 SS	125,000	95,000


### For this job you will need:



**Screw Gun**  
2,000 rpm max with depth sensing nose-piece. Used for fastener installation



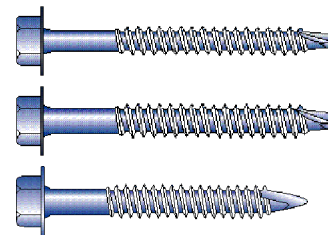
**Pullout Tester**  
0-2,500 lbs.  
Certifiable to: ASTM E74  
MIL-STD 45662-A  
Used to determine fastener and roof condition.



**Chop Saw**  
14" 4.0 hp  
Abrasive Wheel-14" x 3/32" x 1"  
Used for cutting framing members.



**Drill**  
3/8" chuck.  
0-1200 rpm



### Self-Tapping Fasteners

DIAMETER	LENGTHS
#12-13	1-5/8" TO 8"
#14-10	1" TO 6"
#14-13	1-1/4" TO 12"
#15-13	1-1/4" TO 16"

Material & Finish  
Carbon Steel, zinc plated with long life coating  
Stainless Steel  
Drive: HH, HWH, and Phillips Truss

## HELPFUL HINTS

▽ Examine existing roof and perform pullout tests to determine roof condition and appropriate fastener. Failed roof system should be compression tested to assure the new roofing system could be supported. Contact TFC for job site assistance.

▽ Select fastener that meets or exceeds roof system manufacturers design load criteria for pullout, dead load, and deflection. Contact roof manufacturer for appropriate load requirements.

▽ Locate existing wood structure and prepare roof surface to accept the base design for the new framing system.

▽ Apply sealant to underside of base support to guard against leaks.

▽ Install fastener so that a minimum of 1" embedment is achieved.

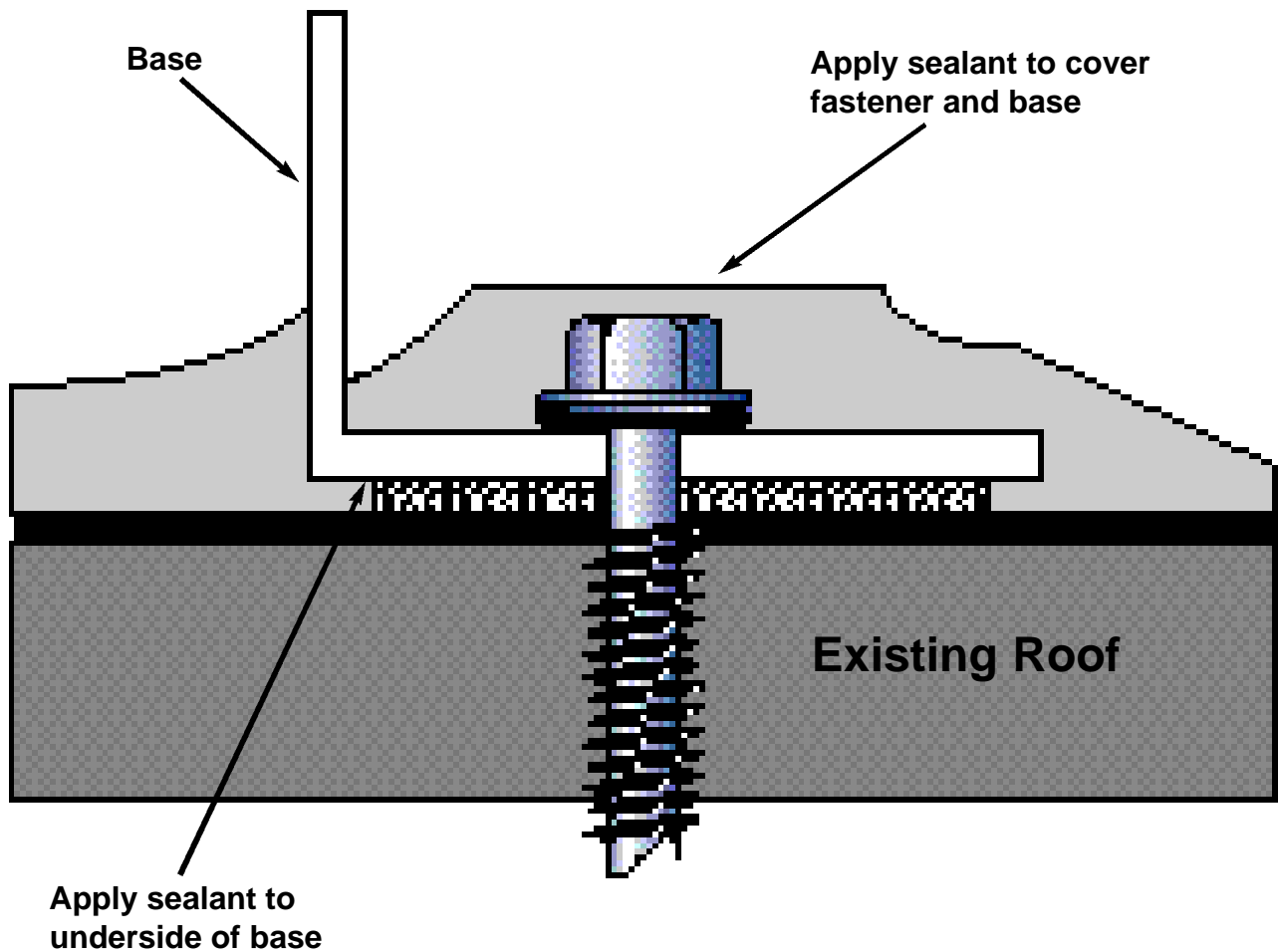
▽ Cover fastener and base with sealant to prevent leaks.

Information is compiled from numerous product manufacturers literature. Test results are based on laboratory conditions and should be used as a guide only. Job site conditions should be taken into consideration when determining the proper fastener and is a responsibility of the installer or specifier. TFC assumes no liability for the use of this information



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## Base Fastening

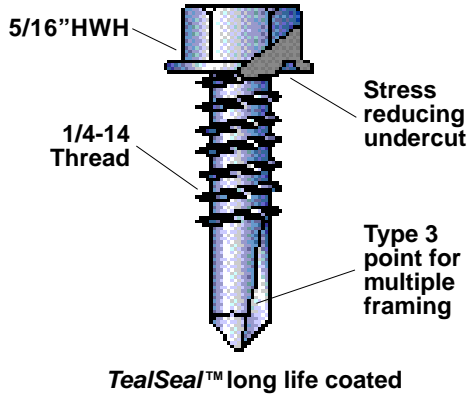
### HELPFUL HINTS

- ▽ Prepare existing roof surface to accept base support.
- ▽ Apply compatible sealant to underside of base.
- ▽ Fasten into structure using proper fastener.
- ▽ Cover base and fastener with compatible sealant.
- ▽ Contact TFC for application support.

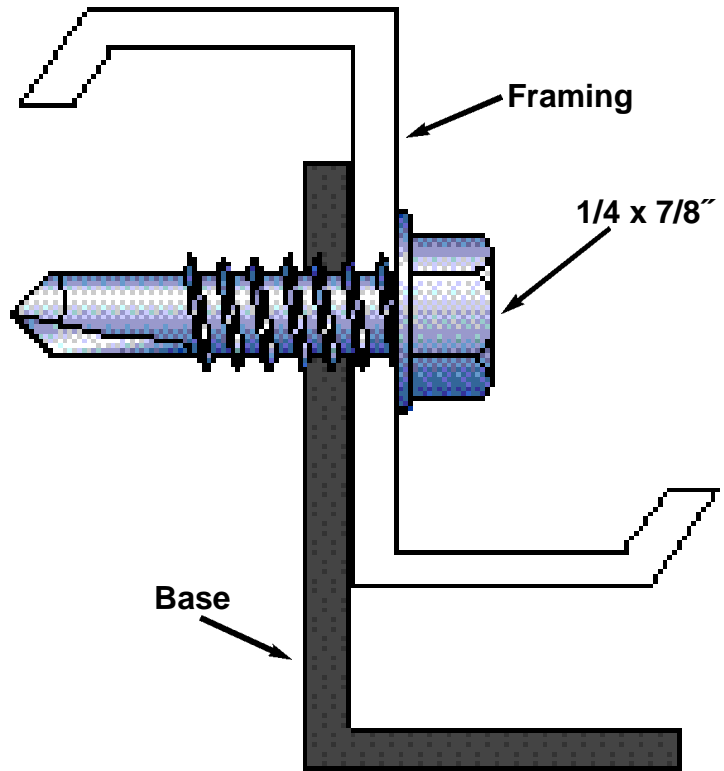
Refer to page 10 for Products  
and Installation Information

# Base and Framing Attachment

## Stress Less™ FRAMING FASTENER



## Framing Fastening



### Fastener Physical Properties

1/4-14 X 7/8" SELF-DRILLING FASTENER WITH STRESS REDUCING UNDERCUT	
Point Type:	Type 3 self-drilling point.
Head Style:	5/16 across flats, hex washer head.
Material:	C1018-C1022 carbon steel.
Heat Treatment:	Case hardened to SAE J78 specification.
Finish:	.0003 min mechanical zinc plating with two coats of long-life fluoropolymer coating.

## HELPFUL HINTS

- ▽ 1/4" diameter fastener recommended for added strength.
- ▽ Long life coated to guard against corrosion failure.
- ▽ Install framing fasteners with 2,000 RPM screw gun with depth sensing nosepiece.

### Fastener Mechanical Properties

DRILLING & TAPPING THICKNESS	TORSIONAL (Inch lbs.)	TENSILE (lbs)	SHEAR (lbs)
.096" to .250"	150 (min)	3850 (ultimate)	2600 (ultimate)

Information is compiled from numerous product manufacturers literature. Test results are based on laboratory conditions and should be used as a guide only. Job site conditions should be taken into consideration when determining the proper fastener and is a responsibility of the installer or specifier. TFC assumes no liability for the use of this information

### Pullout Results

18 ga	16 ga	14 ga	12 ga	3/16"	1/4"
613	883	1148	1861	4553	5036

\*Average ultimate lbs



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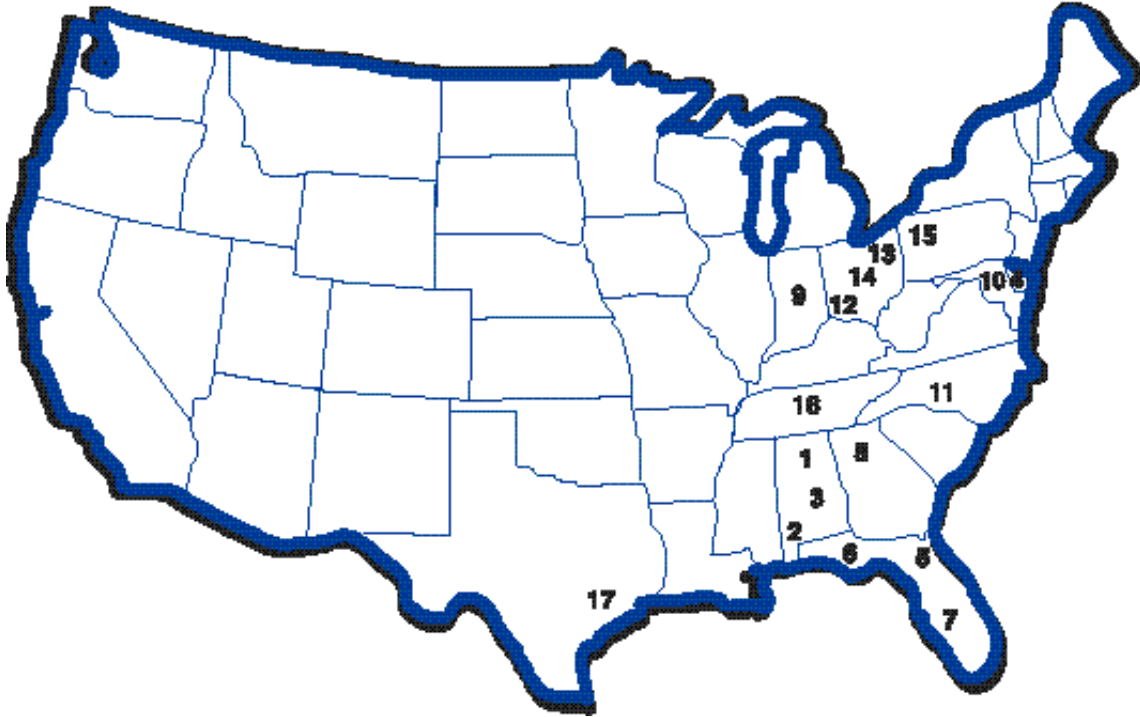
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