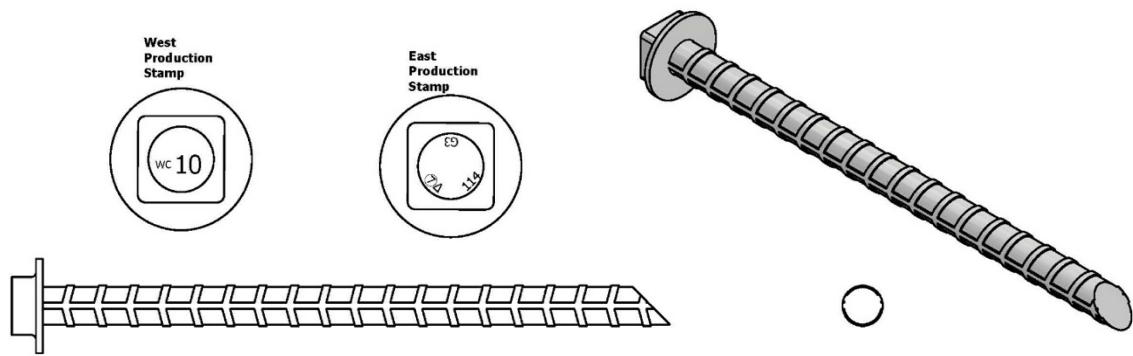


Forged head rebar

Category: Forged head



Overview

Forged Head Rebar is used to reinforce, stabilize, and strengthen rock mass in mining and civil engineering. The surface of this rebar bolt features a continuous series of ribs to promote a better bond with the resin or cement grout and improve anchorage.

	Bolt type	Diameter	Length	Drive nut & accessories	Coating	Packaging
Product specifics	Forged head rebar	20, 22, & 25 mm	1 m up to 3 m	1 1/8" square	Galvanized	Bundles of 250
	Threaded rebar	20 mm & 22 mm	1 m up to 3 m	Hemispherical nut & pin	N/A	Bundles of 100

Key features

- Made from Grade 400W steel or Grade 60W steel with a threaded section that includes a shear pin nut.
- The bolt can be installed in a drilled hole with either resin or cementitious grouts with equally similar properties.
- Both Threaded and Forged Head Rebar are resistant to corrosion when fully grouted
- Bevel toe end cut end at a 45° angle, ensures Rebar can effectively shred resin cartridges to activate chemical reaction.

Physical properties

Forged head rebar – product data

Dimensions	20mm	22mm
Nominal Bar Size E	0.750" (19.5 mm)	0.875" (22.2 mm)
Head Across Flats F	1.088" to 1.125" (27.64 mm to 28.58 mm)	1.088" to 1.125" (27.64 mm to 28.58 mm)
Head Across Corners G	1.425" to 1.591" (36.19 mm to 40.41 mm)	1.425" to 1.591" (36.19 mm to 40.41 mm)
Head Height, min. H	0.65-0.75"	0.65-0.75"

Forged head rebar – Technical data

Dimensions	20mm	22mm
Yield Strength	26,400 lbs (117 kN)	36,100 lbs (161 kN)
Tensile Strength	39,600 lbs (176 kN)	54,100 lbs (241 kN)
Elongation in 8" (200 mm)	9% minimum	9% minimum

Notes: USA - manufactured to ASTM F432 and ASTM A615 specifications; bolts MSHA approved
Canada - manufactured to ASTM F432, CSA M430 and CSA G30.18M specifications Grade 40 & 75 available where applicable. Notched rebar optional for bending.

Installation accessories

Nuts

Dome nuts

- for 3/4" thread A.F. = 1 1/8" square
- for 7/8" thread A.F. = 1 1/8" square
- for 1" thread A.F. = 1 5/8" hex

Plain nuts - used with pinched thread

- for 3/4" thread A.F. = 1 1/8" square
- for 7/8" thread A.F. = 1 1/8" square with flange
- for 1" thread A.F. = 1 5/8" hex Torq Bolts - system available
- for 3/4" and 7/8" thread A.F. = 1 1/8" square

Resin mixing system "crimped thread"

Hardened round washers

- to ASTM F436 / F436M - specifications
- for 3/4" thread:
- I.D. = 13/16", O.D. = 1 15/32", T = 0.122" to 0.177"
- for 7/8" thread:
- I.D. = 15/16", O.D. = 1 3/4", T = 0.136" to 0.177"
- for 1" thread:
- I.D. = 1 1/8", O.D. = 2", T = 0.136" to 0.177"

Spherical seat (compensation) washers

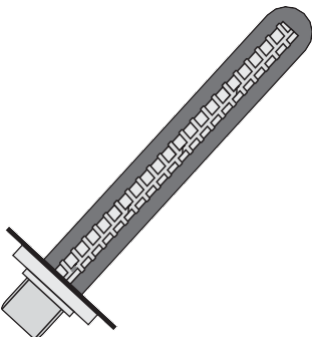
- ductile iron ASTM A536-24 Gr. 65-45-12
- for 3/4" thread:
- I.D. = 13/16", O.D. = 2", H = 13/16" (model TSW-4)
- I.D. = 15/16", O.D. = 2", H = 1/2" (model TSW)
- for 7/8" & 1" thread:
- I.D. = 1 1/16", O.D. = 2", H = 1/2" (model TSW-1)

Installation tools - for stopers/jacklegs

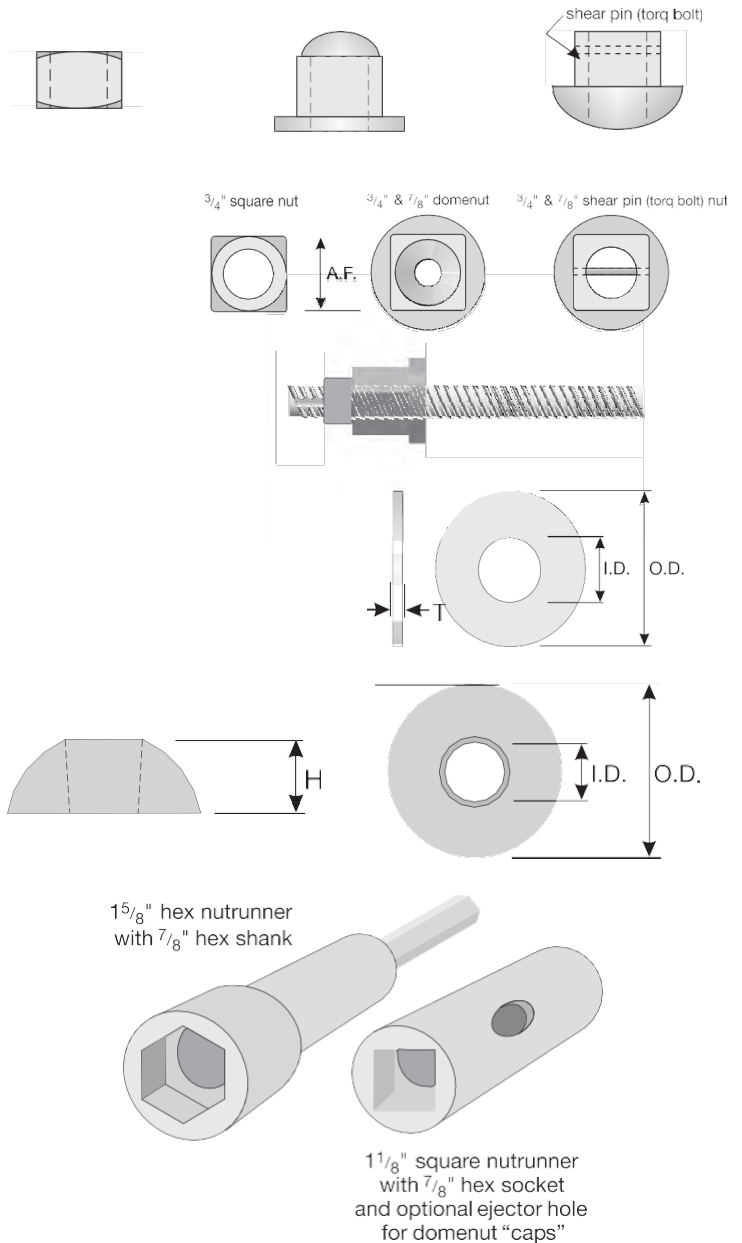
Forged head rebar driver (dolie)

- 1 1/8" square driver
- available with 7/8" hex socket or 3 1/4" long hex shank
- Threaded Rebar Nut runners
- 1 1/8" square nut runner (for 3/4" & 7/8" bolts)
- 1 5/8" hex nut runner (for 1" bolts)
- available with 7/8" hex socket or 3 1/4" long hex shank

Components



Untensioned forget head



Forged head rebar – product data

Resin Usage

	Hole diameters (inches)										
	1"	1 1/4"	1 3/8"	1 1/2"	1 5/8"	1 1/2"	1 5/8"	1 3/4"	1 7/8"	2"	2 1/4"
ASTM											
A615											
Bar Size	Cartridge diameter (mm)										
	23	28	32	32	32	35	35	40	40	40	40
#6(3/4")	18.5"	13"	-	-	-	-	-	-	-	-	-
#7(7/8")	-	16"	14"	-	-	12.5"	-	-	-	-	-
#8(1")	-	22.5"	17.5"	12.5"	-	15.5"	11.5"	12"	-	-	-
#10(1-1/4")	-	-	-	-	15.5"	-	18.5"	17"	13"	-	-
#11(1-3/8")	-	-	-	-	-	-	-	23"	16"	12"	-
#14(1-5/8")	-	-	-	-	-	-	-	-	-	-	11"

- Chart indicates inches of bolt encapsulation based on standard 12" length Fasloc resin capsule.
- This chart is prepared as a guide based on average drilling conditions in concrete or rock. Field trials should be conducted to determine actual resin requirements.
- Example: When a 1 1/2" hole is drilled, using a 1" diameter deformed rebar bolt, one 35 mm x 12" cartridge will grout 15.5 linear inches of the bolt.
- Inches grouted include a typical 15% loss.
- Blank spaces are non-recommended bolt/hole combinations.

Terminology

The following are items to be aware of when using/installing resin grouted rebar and rock bolts:

Type of Ground - The nature of the ground must be evaluated. Soft strata requires a larger plate washer bearing area and a longer anchorage length if point anchored. Soft ground results in larger hole sizes for a given bit size (due to bit rattling and reaming). This can adversely affect the mixing of the resin.

Scaling - The ground should be thoroughly scaled i.e. barred down, before drilling and bolting. Periodic re-scaling may be required while drilling.

Strength and Yield Capacity of Bolt - The mechanical properties of the bolt should be appropriate for the ground conditions, bolt length and bolting pattern. Pull tests should be performed to determine yield and ultimate strengths of the bolts as well as resin anchorage capacities.

Condition of Rebar Threads - Threaded rebar should be inspected before installation. Increased friction on the threads can adversely affect tensioning of the rebar. Threads are generally immune to defects and damage.

Fillet on Forged Head Rebar - Forged head rebar bolts should be inspected to ensure a fillet of 1/8" radius is present where the shaft connects to the forged head. Sharp transitions may weaken the bolt.

Shelf Life of Resin - Resin has a practical shelf life. Although the chemical ingredients do not change with time, most resin cartridges are water based and thus dry out with age. The shelf life thus refers to the workability of the resin cartridge. Aged cartridges are still effective; however, because they are drier, the ingredients are crumbly and harder to mix properly. The bolts are more difficult to insert through old resin as well. Set times may also be reduced somewhat with older resin. The resin cartridge box will have the manufacturing date written on it. Resin should be used as soon as possible. Stock should be rotated so older resin does not accumulate.

Storage - Resin should be stored in a cool location to maximize shelf life. Elevated temperatures dry out the resin cartridges.

Temperature and Set Time - Temperature greatly affects the gel (set) time of resin cartridges. A 20°F rise in temperature reduces the set time by approximately 50%. Conversely, a 20°F drop in temperature will approximately double the set time of the resin. Resin should be stored and used at room temperature whenever possible.

Resin Size, Bolt Size and Hole Size - The size of the bolt relative to the cartridge and hole size is critical. The above chart gives the recommended combinations of bar, hole and cartridge sizes. The numbers in the chart refer to the yield i.e. length of encapsulation of the bolt per 12" resin cartridge. Blank spaces are non-recommended bolt and hole combinations.

Hole Condition - The hole should be cleaned and examined to ensure the resin cartridges and the rock bolt will insert smoothly.

Hole Length - If holes are drilled too short then excessive lengths of the bolt will stick out of the hole. The plate may not be effectively installed. If holes are drilled too long, then resin will be wasted at the end of the hole. This will reduce the encapsulation length for a point anchored rock bolt and can reduce the load capacity of the bolt. The bolt may not be able to be tensioned adequately.

Oversize Holes - If the hole size is too large relative to the bolt size, poor mixing of the resin will result. The grout yield per resin cartridge will also be reduced. This is particularly important with point anchored bolts. Oversized holes can be caused by using the wrong bit size, leaving the drill running while flushing the hole, soft ground (faults, gouge, etc.) and bent drill steel.

Undersized Holes - Undersized holes will result in insufficient bonding of the bolt to the rock. Difficulties in inserting the bolt into the hole may also be experienced. Undersized holes are usually caused by worn bits and/or wrong bit sizes being used.

Spinning of the Bolt - refer to Resin and Cement cartridge section.

Underspinning - The bolt is spun into the resin cartridge to mix the two separate components (the catalyst and the resin matrix). Improper mixing will result in a poor installation. Underspinning results in inadequate mixing of the resin and insufficient gelling may occur. Operators will complain the resin will not set up.

No Spinning - If the bolt is simply pushed through the resin cartridge without rotation, a detrimental effect may be caused by the resin catalyst being picked up by the end of the bolt. This may cause both undercatalysed and overcatalysed areas to be created. Overcatalysed resin yields an understrength crumbly type of anchor. Undercatalysed resin stays soft virtually indefinitely because it does not have enough catalyst to speed up the gelling reaction.

Overspinning - Overspinning will grind up the resin as it sets. Poor anchorage will result. The bolt may not be able to be tensioned properly. Consequently, the operator will once again complain the resin is not setting up!

Tensioning with Fast/Slow Set Resins - As a general guideline, when bolts are to be tensioned, fast set resin should be used at the toe of the hole for 1/3" the bolt length (minimum 24"). Slow set resin is used for the remaining 2/3" length to fully encapsulate the bolt. The slow set must be sufficiently slow to allow the plate washer and nut to be installed and the bar tensioned before the resin set up. Rebar bolts can be tensioned by torquing the nut. Bolts require a greater torque to achieve adequate tension.

Proper Grade Plates - Thin or weak plates will deform at low bolt tension. The bolt could also rip through the plate during installation or by bolt loading. Plates should meet ASTM F432 standards.

Perpendicular Installation - Bolts should be installed as near perpendicular to the rock surface as possible. Bolts not perpendicular to the plate and rock surface will be marginally weaker and will not be pretensioned properly. Spherical seat washers are available to correct for angularity.

Hardened Steel Washers - Hardened steel washers should be used between the forged head or nut and the plate washer. The washer reduces friction and enhances tensioning in threaded rebar. Minimum grade should be ASTM F436 Type 1 or 2 and hole size in plate washer should be no more than 3/8" diameter larger than bolt size if a spherical seat washer is not used.

Rock Bolt Dollies - Installation dollies should only transfer rotational energy to the bolt during installation, not percussive energy when drills are used to rotate the bolt. The shank end of the dollies must be short enough to avoid contact with the drill piston in stopers and jacklegs. Typically, these rock bolt dollies have a 7/8" hex shank and are only 3 1/4" long. Besides being the proper size for the rock bolt head or nut, the dolly must also have sufficient socket depth to allow nuts to be run onto the threaded portion of the bolt.

Gloves - Gloves and eye wear should be worn when handling resin.

Odour - Polystyrene monomers in the resin have a particularly noticeable smell. Properly installed bolts (i.e. properly set up resin) will have no odour. The smell of styrene underground implies broken cartridges at the work place or insufficiently mixed resin in the hole.

Education - Proper education of mining personnel and supervisors is mandatory. Resin anchored bolts in particular require skilled miners. As manpower turnover is relatively frequent in bolting crews, education must be continuous. Forget this and you waste money.

Monitoring - Installation must be monitored to ensure proper procedures and quality are maintained. Pull-test measurements should be routinely conducted on resin anchored bolts. Torque measurements can also be taken on threaded rebar bolts and monitored for changes. Torque testing is best done by a crew supervisor (or dedicated technician) while visiting work areas during his rounds.

Packaging - Vendors must package bolting products in an acceptable manner both for convenience of use as well as prevention of damage to the product during shipping and handling. Particular care must be paid to wrapping of the thread ends to prevent damage and corrosion. Resin cartridges must be robust so as to not rip or tear during normal handling. Good packaging costs more but is worth the added cost by reducing wastage on site.

Standard lengths & packaging – forged head rebar

- Standard diameters are 20mm, 22mm and 25 mm. Other diameters can be produced upon request.
- Bevel Toe ends are standard, however, blunt ends available upon request.
- They come packaged in bundles of 100 that are bound together by 3 steel straps.
- Wire tie in packs of 5, alternate ends.
- Use 1" x 4" wooden spacers between rows.
- 250/Bundle, 500/Pallet (32" x 42")

Standard lengths & packaging – threaded rebar

- Standard diameters are 20mm and 22mm. Other diameters can be produced upon request.
- Bevel Toe ends are standard, however, blunt ends available upon request.
- They come packaged in bundles of 100 that are bound together by 3 steel straps.

Legal disclaimer

All dimensions, weights, quantities, and specifications are those applicable at the time of this publication and may be amended from time to time. Please contact your local representative for final confirmation of any key specifications.

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