

# TAPER BOLT

## DESCRIPTION

The Taper Bolt® concrete fastener is a two-component, expansion-type anchor designed for applications where a high-strength, concrete anchor/fastener is needed. Irrespective of the type of head used, the anchor will always have one end with threads on a tapered body and a matching-thread, two-part expander nut. When the anchor is placed into a drilled hole, the expander nut bears against the sides of the hole and, as the anchor is turned, the nut expands parallel to the sides of the hole.

The bolt, fabricated from high strength materials that resist deformation, and the expander nut, fabricated from a deformable material (zinc alloys), allows for uniform compression to the concrete and thereby achieves its exceptional strength.

## WHY IS THE MKT TAPER BOLT UNIQUE?

Because the bolt and expander nut really become one integral part, this differs from most concrete anchors in that it can be considered in the same class as general fasteners, i.e., a nut and bolt. Its performance, therefore,

can be correlated to general fastener data more reliably than with any other type of concrete anchor. The ability to utilize forces such as clamp, tension, torque, and pre-load significantly aid the design and anchor selection process.

The Taper Bolt acts as a concrete “fastener.” It relies on the value of “clamp” force always equal to or greater than the tensile or shear strength required to fail the concrete. *The main concern for the engineer or specifier should be how well the anchor/fastener clamps down the work without any yield of the anchor, not how much force it takes to pull the anchor out of the concrete.*

A Taper Bolt will not yield until some change of movement or “initial slip” has occurred (this phenomenon is sometimes referred to as anchor “creep”). There cannot be any creep as long as the anchor is in clamp.

A Taper Bolt will not experience any “initial slip” (or anchor creep) as long as it is in clamp.

FEATURES	BENEFITS
Highest tensile, shear and clamp strength obtainable.	<ul style="list-style-type: none"> <li>Safely substitute smaller bolts resulting in reduced “in-place” cost</li> </ul>
“Controlled” friction of tapered expander nut.	<ul style="list-style-type: none"> <li>Incorporates same load characteristics of a threaded fastener, i.e., tensile and shear are not of consequence until they exceed the clamp load of the anchor</li> <li>Consistency of setting torque; permits re-torquing if needed</li> <li>High vibration resistance with immediate application of full clamp load after set. Certain head styles permit “low range” pre-load before set.</li> </ul>
Bolt-size = hole-size.	<ul style="list-style-type: none"> <li>Anchor holes can be drilled into concrete through structural member to be fastened.</li> </ul>
Expander nut remains in hole if bolt is removed.	<ul style="list-style-type: none"> <li>Bolt is removable/reuseable/resettable, and can be re-torqued to obtain original clamp load.</li> </ul>
“Matching” tapered thread of bolt and expander nut distributes compression on entire length of anchor.	<ul style="list-style-type: none"> <li>Increased area of compression results in uniform clamp load for a better grip to the concrete.</li> </ul>
Two (2) head configurations: Hex Head Bolt Eye Bolt	<ul style="list-style-type: none"> <li>Provides extremely wide range of use and application under severe environmental and clamp load conditions.</li> </ul>
Hex head bolt	<ul style="list-style-type: none"> <li>Tolerates “low range” clamp before set without secondary operations or use of nuts.</li> <li>Clean “flush head” appearance. No protruding threads.</li> </ul>
Eye bolt	<ul style="list-style-type: none"> <li>Same as Hex head bolt</li> </ul>

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## BOLT HEAD

- Controlled head clearance.
- Controlled head clearance permits low range clamp before “set.”
- Items to be fastened should be flat on surface of substrate.
- After “set,” high range clamp load is unrestricted.
- Nut may be pre-expanded to fit over-sized holes.
- Nut expands parallel to the sides of the hole distributing compression along the entire length of the expansion nut when set.

## CLAMPING AND TORQUE

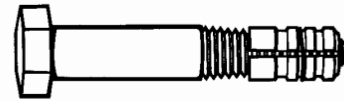
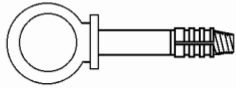
Torque is an alternative means of arriving at a given clamp load. The only consideration is to insure that the grade of bolt for a given diameter is adequate in relation to required tensile and shear values. The Hex Head Bolt and Eye Taper Bolt are SAE Grade 5 Steel.

## TYPICAL APPLICATIONS

Motor and pump mounts, conveyors, stadium seating, tilt wall supports, bridge expansion joints, highway guard rails, crane and pallet rack rails, machinery, fascia and skin framing, safety line rigging, slab lifting eyelets, mountain climbing pitons, dock bumpers, light posts, postal box fixing, fencing posts, “undercut” bolting.

## PRODUCT INFORMATION

Taper Bolt Hex Head Bolts are multi-component, general purpose, high strength mechanical anchors consisting of a “headed” grade 5 steel bolt and an expander nut that have matching tapered threads. Eye bolt heads are drop forged steel with a corrosion resistant coating of electroplated zinc or are mechanically galvanized. Taper Bolt is particularly useful in applications demanding consistency of performance and speed of installation.

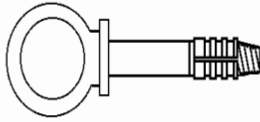


Order Code*	Size*	Minimum Embed	Hole Diameter	Required Torque To Set (ft. lbs.)	Required Head Clearance	Ultimate Tensile & Shear Loads in Lbs. Concrete Strength (psi)				Qty. /Box
						3000 psi		5000 psi		
						Tension	Shear	Tension	Shear	
3420000 3421000 3422000 3423000	3/8 X 2-1/4 3/8 X 2-5/8 3/8 X 3 3/8 X 4	1-7/8"	3/8"	40	3/16"	4,030	7,177	4,987	8,567	50 50 50 50
3430000 3431000 3432000	1/2 X 2-7/8 1/2 X 4 1/2 X 5	2-3/8"	1/2"	90	1/4"	8,165	12,177	9,346	15,217	25 25 20
3440000 3441000 3442000 3443000	5/8 X 3-1/2 5/8 X 4-1/2 5/8 X 6 5/8 X 7	2-7/8"	5/8"	125	5/16"	9,990	17,030	10,470	17,257	20 25 25 25
3450000 3451000 3452000 3453000	3/4 X 4-1/8 3/4 X 5-1/2 3/4 X 7 3/4 X 8	3-3/8"	3/4"	250	7/16"	11,906	27,916	17,073	28,110	20 20 15 15
3460000 3462000	1 X 5-5/8 1 X 7-1/4	4-5/8"	1"	550	5/8"	28,263	36,257	30,817	38,487	10 10

\*Standard sizes – other sizes available by special order.

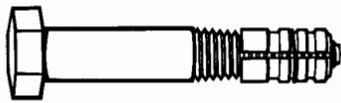
# TAPER BOLT

PRODUCT DESIGNATIONS	ORDER CODE	SIZE	QTY./BOX
Expander Nuts	3420200	3/8	100
	3420200	1/2	50
	3440200	5/8	50
	3450200	3/4	50
	3460200	1	10



DRILL BITS - Drill bits should conform to ANSI B212.15.

NOMINAL DRILL DIAMETER	TOLERANCE BAND
3/8	.398 - .390
1/2	.530 - .520
5/8	.660 - .650
3/4	.787 - .775
7/8	.917 - .775
1	1.042 - 1.030



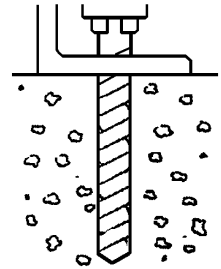
THIN SLAB TEST DATA FOR TILT-WALL APPLICATIONS 3/4 x 4- 1/8 TAPER BOLT					
TEST #	EMBED. DEPTH (IN.)	SETTING TORQUE (LBS)	1ST SLIP (LBS.)	ULT. LOAD (LBS.)	FAILURE
1	3-1/4	250	10830	14440	Not recorded
2	3-1/4	270	10830	12274	Spall
3	3-1/4	N.A.	13257	13719	Spall
4	3-1/4	260	15884	15884	Concrete Cracked
5	3-1/4	280	13718	13718	Spall

Specs: 3500 psi concrete 6" thick reinforced.

## INSTALLATION

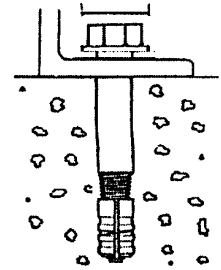
### DRILL

Drill and clean hole to the same diameter as the Taper Bolt using the fixture as a template. Taper Bolt works in a bottomless hole.



### HAMMER

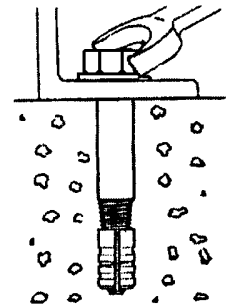
Drive Taper Bolt into place leaving recommended head clearance. If hole is oversized, simply remove and pre-expand the expansion nut to fit hole.



### TIGHTEN

Tighten Taper Bolt to recommended torque.

For bigger jobs, set Taper Bolt with an impact wrench. This method offers speed, consistency and greater installer productivity.



NOTE: Use drill bit conforming to ANSI B212.15-94.

## HOW TO REMOVE A TAPER BOLT

When removal is necessary, simply unscrew. A Taper Bolt can then be re-inserted and torqued to its original holding power.

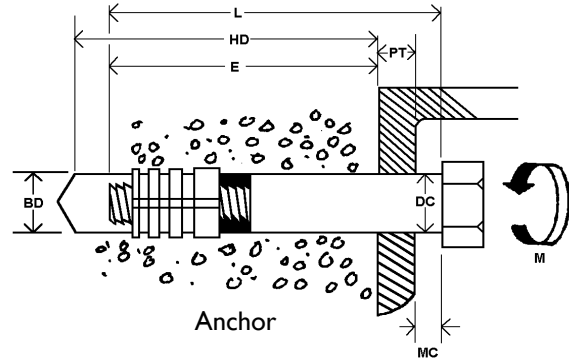
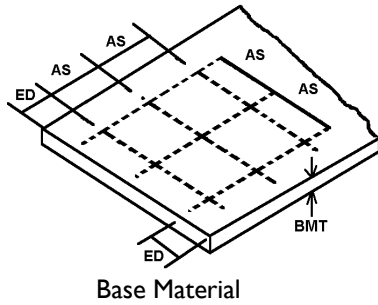
The expander nut remains in the concrete like a cast-in-place insert.

## HOW TO RE-USE A TAPER-BOLT

1. After removing bolt, clean threads with a wire brush to remove dust and debris.
2. To get maximum performance and more re-uses, lubricate threads with wax or heavy grease.
3. Add a new expander nut - and use it again.

# TAPER BOLT

## SPECIFICATION TABLE



DETAILS	ANCHOR SIZE	3/8"	1/2"	5/8"	3/4"	1"
BD	Bit diameter (in.) per ANSI B212.15	.398 / .390	.530 / .520	.660 / .650	.787 / .775	1.042 / 1.030
HD	Min. hole depth (in.)	2-1/4	2-7/8	3-1/4	4-1/8	5-5/8
E	Min. depth of embedment (in.)	1-7/8	2-3/8	2-7/8	3-3/8	4-5/8
PT	Max. thickness of component fastened (in.)	3/8 to 2-1/8	1/2 to 2-5/8	5/8 to 4-1/8	3/4 to 4-5/8	1 to 2-5/8
L	Min. length of anchor (in.)	2-1/4	2-7/8	3-1/2	4-1/8	5-5/8
M	Tightening torque (ft. lbs.)	40	90	125	250	550
Wrench size	(in.)	9/16	3/4	15/16	1-1/8	1-1/2
DC	Min. clearance hole (in.)	13/32	9-16	11/16	13/16	1-1/16
MC	Head clearance (in.)	3/16	1/4	5/16	7/16	5/8
BMT	Min. base material thickness (in.)	2-1/4	2-7/8	3-1/2	4-1/8	5-5/8
AS*	Spacing required to obtain maximum working load (in.)	2-5/8	3-1/2	4-3/8	5	7
AS <sub>min</sub>		1-5/8	2	2-3/4	3	4
ED*	Edge distance required to obtain max. working load (in.)	2	3	4	5	6
ED <sub>min</sub>		1	1-1/2	2	2-1/2	3
Ultimate Load 3000 psi	Tensile	4,030	8,165	9,900	11,906	28,263
	Shear	7,177	12,177	17,030	27,916	36,257
Ultimate Load 5000 psi	Tensile	4,987	9,346	10,470	17,073	30,817
	Shear	8,567	15,317	17,257	28,110	38,487
Tests show ultimate loads – not safe working loads. Manufacturer's recommended safe working load = 25% of the average load shown in test data.						
*Dimensions required for 100% anchor efficiency in unreinforced concrete. Reduce loads by 50% when installing at minimum dimensions, with linear interpolation permitted in between.						
To calculate combined loading: $T_{\text{appl}}/T_{\text{allow}} + S_{\text{appl}}/S_{\text{allow}} \leq 1.0$						

## MATERIAL SPECIFICATIONS

- Hex Bolts: ▶SAE Grade 5 heat treated steel  
▶Material Hardness - R.C. 25/34  
▶Proof Load - 85,000 psi  
▶Tensile Strength - 120,000 psi minimum  
▶Commercial Zinc Plating ASTM B633 Type III, Class Fe/Zn 5, SC-I
- Expander Nut: ▶Shield Specification SAE 903  
▶Die cast Zamak No. 3 zinc alloy  
▶Tensile Strength - 41,000 psi min.

## SPECIFICATION

### Concrete Expansion Anchors

- 1.0 PERFORMANCE
- 1.1 Heavy duty, finished head, hole-size bolt-size wedge anchor.
- 1.2 Anchors shall have a cold headed, finished hex head bolt with a longitudinally tapered, threaded end and a thread expander nut.
- 1.2.1 Anchor bolt shall be removable, reusable, and resettable in original hole to original torque and clamp load.
- 1.2.2 Standard anchor bolt material shall be heat treated to SAE Grade 5, 120,000 psi min tensile strength.
- 1.2.3 Corrosion resistant coating on bolt shall be zinc electroplate according to ASTM B633, Type III, Class Fe/Zn 5, SC-I.
- 1.2.4 Expander nut material shall be die cast zinc alloy, Zamak #3, tensile strength = 41,000 psi minimum per SAE 903.
- 1.3 Bolts shall be installed in holes drilled with carbide tipped drill bits conforming to ANSI Specification B212.15. Method of installation shall be as recommended by manufacturer.
- 2.0 ALTERNATE
- 2.1 Concrete anchors shall be Taper Bolt as manufactured by MKT Fastening, LLC, 1 Gunnebo Drive, Lonoke, Arkansas, USA.

## TESTED AND/OR APPROVED BY:

PTL (Pittsburgh Testing Laboratories, Inc.)

## REFERENCES

- Independent test reports of TAPER BOLT® for use in dowelling of freshly poured concrete to existing pavement. Twin City Testing and Engineering Laboratory, Inc. May 24, 1973.
- Independent Test Report - Salt Spray Exposure, American Testing Laboratories, Inc., March 22, 1976, ATL Project No. 27764.
- Test of TAPER BOLT Masonry Anchors, Pittsburgh Testing Laboratory, February 4, 1976. Report No. PG-2170.
- Test Report, Time vs. Temperature, Comparative tension tests of U.S.E. Diamond, Inc. Proof Set TAPER BOLT and Hilti HVA and HSL., Arnold Green Testing Laboratories, Inc., Jan. 10, 1984. Report No. 42346-I to Sverdrup, Parsons, Brinkerhoff.
- Test Report, Tension tests of TAPER BOLT in thin, lengthy reinforced concrete slab used tilt wall environment witnessed form series, Inc. Linthum, MD 1984 U.S.E. Diamond, Inc.
- Report on Pipe Hangers for Fire Protection Service, Underwriters Laboratories Inc. File No. Ex 3524, Project 82NK16248, June 28, 1983 for U.S.E. Diamond, Inc.

**CAUTION:** Hex head bolt configuration is not designed for high range clamp load before anchor “set.” Items to be fastened should be relatively flat on surface of concrete between the tie down points.