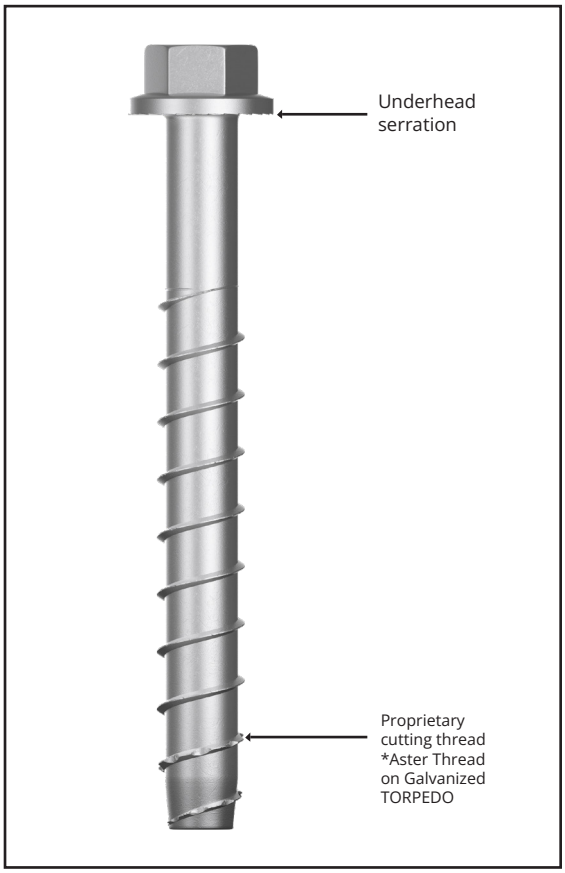
UCAN TORPEDO® BOLT

► DESCRIPTION

UCAN TORPEDO® BOLT is an excellent anchoring solution for medium duty applications. TORPEDO® is available in zinc plated and mechanically galvanized carbon steel, as well as types 410 and 316 Stainless Steel. For this reason, TORPEDO® can fulfill the widest variety of applications in the most economical manner.Matched with a standard UCAN ANSI tolerance drill bit, this fastener exhibits consistently high load values. UCAN TORPEDO® BOLT installs quickly leaving the clean appearance of a finished hex washer head on the working surface.



► FEATURES

- Grade 316 stainless UTB for high corrosion resistance applications. Also for exterior anchoring in normal environmental condition
- Use with UCAN standard ANSI compliant drill
- Fast installation and reduced edge distance requirements, compared to mechanical expansion anchors.
- One piece fastener with finished hex flange head and locking under-head serration
- Galvanized Torpedo Aster Screw with proprietary Aster thread facilitates ease of installation
- Anchor can be set with an impact or manual socket wrench.
- Removable–Ideal for temporary anchoring applications.
- Reusable–Reusing the anchor reduces the holding power and is not recommended.
- Anchor size is stamped on head for easy identification and

► LISTING AND APPROVALS

ICC-ES® Listed ESR- 4596
UTB 12212, UTB 123, UTB 124, UTB 125 & UTB 126

ICC-ES® - ESR 4596

► TYPICAL APPLICATIONS

- Racking, Railing, Sill plates, Stadium seating.
- Tilt-up braces, Formwork, Anchoring equipment

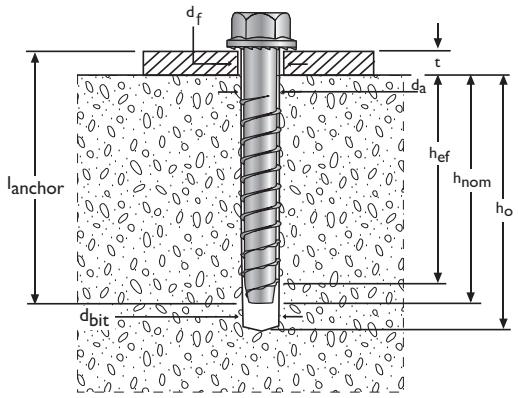
► LIMITATIONS

Not recommended for installation into uncured concrete(less than 7 days old).

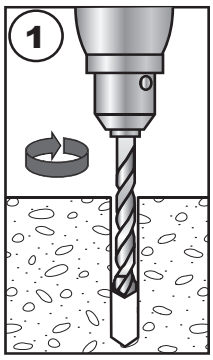
► MATERIAL SPECIFICATIONS

Properties	Carbon Steel	Stainless Steel	Stainless Steel - bimetal
Anchor body	Heat treated carbon steel	410 hardened stainless steel	316 Stainless steel body with carbon steel cutting up
Head style	Hex flange head with locking serrations		
Corrosion protection	Mechanically galvanized as per ASTM B-695, Class 65, Type 1	410 stainless steel, with RUSPRO® coated	316 Stainless steel, passivated, with yellow zinc plating on cutting tip

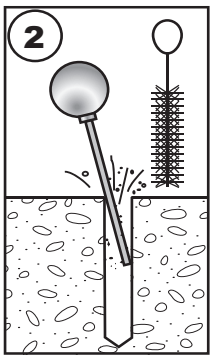
► INSTALLATION INFORMATION



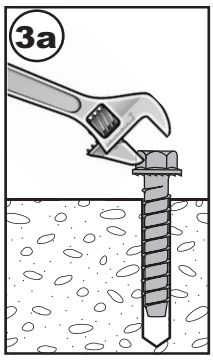
► INSTALLATION INSTRUCTION[1]



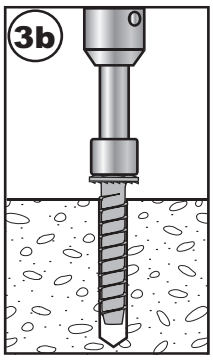
Drill hole to the specified diameter and depth



Blow out dust from the hole



Place anchor in drilled hole



Apply installation torque to set anchor

[1] When using impact wrench, there is a risk of over-tightening and damaging the screw, impact tool may not correlate properly with the above setting torques. Over torquing can damage the base material, anchor and/or reduce its holding capacity. Use calibrated hand torque wrench to finish the installation.

► TECHNICAL DATA FOR CARBON STEEL UTB FOR LIMIT STATE / STRENGTH DESIGN IN CRACKED AND UNCRACKED CONCRETE

TABLE 1- TORPEDO BOLT SCREW ANCHOR INSTALATION INFORMATION[1]

Characteristic	Symbol	Unit	Nominal Anchor diameter $^1/_2$-inch
Nominal Anchor Diameter	d_a	in (mm)	1/2 (12.7)
Nominal Drill Bit Diameter	d_{bit}	in (mm)	1/2 (12.7)
Nominal Embedment Depth	h_{nom}	in (mm)	3 (76)
Effective Embedment Depth	h_{ef}	in (mm)	2.28 (58)
Minimum Hole Depth	h_{hole}	in (mm)	3 1/4 (83)
Fixture Hole Diameter	d_f	in (mm)	5/8 (15.9)
Maximum Installation Torque	$T_{inst,max}$	ft.lbs (kN.m)	55 (75)
Maximum impact wrench torque rating	$T_{impact.max}$	ft.lbs (kN.m)	380 (515)
Minimum Concrete Thickness	h_{min}	in (mm)	4 1/2 (114)
Critical Edge Distance	c_{ac}	in (mm)	4 (102)
Minimum Edge Distance	c_{min}	in (mm)	2 (51)
Minimum Spacing	s_{min}	in (mm)	3 (76)

[1] The tabulated data is to be used in conjunction with the design criteria given in ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable.

TABLE 2 - RESISTANCE FACTORS FOR LIMIT STATE DESIGN IN ACCORDANCE WITH CSA A23.3-14, ANNEX D[1]

Setting information	Symbol	Units	Nominal Anchor Diameter 1/2"
Concrete material resistance factor	Φ_C	-	0.65
Steel material resistance factor	Φ_S	-	0.85
Strength reduction factor for tension, steel failure modes	R		0.80
Strength reduction factor for shear, steel failure modes	R		0.75
Strength reduction factor for tension, concrete failure modes	R	Cond. A	1.15
		Cond. B	1.00
Strength reduction factor for Shear, concrete failure modes	R	Cond. A	1.15
		Cond. B	1.00

TABLE 3 - TORPEDO BOLT SCREW ANCHOR DESIGN INFORMATION[1,2,3,4]

Characteristic	Symbol	Unit	Nominal Anchor diameter
			1/2-inch
Nominal Embedment Depth	h_{nom}	in (mm)	3 (76)
Anchor Category	1, 2 or 3	-	1
Steel Strength in Tension and Shear			
Minimum specified ultimate strength	f_{uta}	psi (N/mm^2)	147,000 (1,014)
Minimum specified yield strength	f_y	psi (N/mm^2)	117,600 (811)
Effective stress area (screw anchor body)	A_{se}	in^2 (mm^2)	0.193 (124.5)
Steel Strength in Tension	N_{sa}	lb (KN)	24,125 (107.3)
Strength Reduction Factor for Steel Failure in Tension	Ø	-	0.65
Steel Strength in Shear	V_{sa}	lb (KN)	6.570 (29.2)
Steel Strength in Shear, Seismic	$V_{sa,eq}$	lb (KN)	6.570 (29.2)
Strength Reduction Factor for Steel Failure in Shear	Ø	-	0.60
Pullout Strength in Tension[3]			
Pullout Strength in Uncracked Concrete	$N_{p,uncr}$	lb (KN)	-
Pullout Strength in Cracked Concrete	$N_{p,cr}$	lb (KN)	-
Pullout Strength in Cracked Concrete, Seismic	$N_{p,eq}$	lb (KN)	-
Concrete Breakout Strength in Tension			
Effective embedment	h_{ef}	im (mm)	2.28 (58)
Effectiveness Factor for Uncracked Concrete	k_{uncr}	-	27
Effectiveness Factor for Cracked Concrete	k_{cr}	-	17
Strength Reduction Factor for Concrete Breakout Strength in Tension	Ø	-	0.65
Axial stiffness in service load range in uncracked concrete	$ß_{uncr}$	lb/inch (N/mm)	189,880 (33,250)
Axial stiffness in service load range in cracked concrete	$ß_{cr}$	lb/inch (N/mm)	101,150 (17,715)
Concrete Breakout Strength in Shear			
Nominal Diameter	d_a	in (mm)	1/2 (12.7)
Load Bearing Length of Anchor	l_e	in (mm)	2.28 (58)
Reduction Factor for Concrete Breakout Strength in Shear	Ø	-	0.70
Concrete Pryout Strength in Shear			
Coefficient for Pryout Strength	k_{cp}	-	1.0
Reduction Factor for Pryout Strength in Shear	Ø	-	0.70

[1] The tabulated data is to be used in conjunction with the design criteria given in ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable.
[2] All values of Ø were determined from the load combinations of IBC Section 1605.2, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable. If the load combinations of ACI 318-11 Appendix C are used, then the appropriate value of Ø must be determined in accordance with ACI 318-11 D.4.4. For reinforcement that meets ACI 318-14 Chapter 17 or ACI 318 Appendix D, as applicable, requirements for Condition A, see ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, for the appropriate Ø factor when the load combinations of IBC Section 1605.2, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used.
[3] Where no value is reported for pullout strength, this resistance does not need to be considered.
[4] For Limit State Design as per CSA A23.3-19 Annex D, material resistance factors (Φ) and resistance modification factor (R) listed in Table 2 shall be used.

► TECHNICAL DATA FOR CARBON STEEL UTB FOR ALLOWABLE STRENGTH DESIGN IN UNCRACKED CONCRETE

TABLE 4 - INSTALLATION DETAILS

Characteristic	Symbol	Unit	Nominal Anchor diameter							
Anchor diameter	d_a	in.	1/4	3/8		5/8		3/4		
Drill bit diameter	d_{bit}	in.	1/4	3/8		5/8		3/4		
Clearance hole diameter	d_f	in.	3/8	1/2		3/4		7/8		
Installation Torque	T_{inst}	ft-lbs	19	25		85		150		
Nominal embedment	h_{nom}	in.	1-3/4	2	3-3/4	2	3-3/4	3-3/4	4-1/2	
Effective embedment	h_{ef}	in.	1-1/2	1-3/4	3-1/2	1-3/4	3-1/2	3-1/2	4-1/4	
Minimum hole depth	h_o	in.	2	2-1/2	4-1/4	2-1/2	4-1/4	4-1/4	5	
Critical edge distance	-	in.	2	3-1/2	5-1/2	3-1/2	5-1/2	5-1/2	6-3/4	
Minimum edge distance	-	in.	1-3/4	1-3/4		1-3/4		1-3/4		
Critical anchor spacing	-	in.	3	4-1/2		7-1/2		9		
Minimum anchor spacing	-	in.	1	1-1/2		2-1/2		3		
Head height	-	in.	1/4	3/8		19/32		45/64		
Washer OD	-	in.	1/2	3/4		1-5/32		1-3/8		
Wrench socket size	-	in.	7/16	9/16		1-5/16		1-1/8		

TABLE 5 - ULTIMATE AND ALLOWABLE LOAD DATA[1]

Anchor diameter	Drill bit diameter	Nominal embedment		Allowable Load Data				Ultimate Load Data			
				3000 psi concrete		6000 psi concrete		3000 psi concrete		6000 psi concrete	
in.	in.	in.	Units	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
1/4	1/4	1-1/2	lbs	181	430	256	670	725	1719	1025	2680
			kN	0.81	1.91	1.14	2.98	3.22	7.65	4.56	11.92
1/4	1/4	2-1/2	lbs	610	430	863	670	2440	1719	3450	2680
			kN	2.71	1.91	3.84	2.98	10.85	7.65	15.35	11.92
3/8	3/8	2	lbs	916	892	1295	1742	3664	3567	5182	6967
			kN	4.07	3.97	5.76	7.75	16.30	15.87	23.05	30.99
3/8	3/8	3-1/2	lbs	2080	2050	2941	3007	8319	8199	11764	12030
			kN	9.25	9.12	13.08	13.38	37.00	36.47	52.33	53.51
5/8	5/8	2	lbs	864	1164	1221	1643	3454	4657	4885	6573
			kN	3.84	5.18	5.43	7.31	15.37	20.72	21.73	29.24
5/8	5/8	3-1/2	lbs	2324	2389	3287	3168	9296	9557	13147	12670
			kN	10.34	10.63	14.62	14.09	41.35	42.51	58.48	56.36
3/4	3/4	2-1/2	lbs	1078	1569	1525	2254	4313	6276	6099	9015
			kN	4.80	6.98	6.78	10.03	19.18	27.92	27.13	40.1
3/4	3/4	4	lbs	2632	3167	3723	4729	10530	12667	14891	18918
			kN	11.71	14.09	16.56	21.04	46.84	56.35	66.24	84.15

[1] Note: The data presented in this table is based on independent laboratory testing at critical anchor spacing and edge distance.

► LOAD ADJUSTMENT FACTORS (ALLOWABLE STRESS DESIGN)

Anchor Spacing

Diameter	Critical spacing		Minimum Spacing		Reduction Factor	
	Tension	Shear	Tension	Shear	Tension	Shear
1/4	3"	3"	1"	1"	0.5	0.7
3/8	4-1/2"	4-1/2"	1-1/2"	1-1/2"		
1/2	6"	6"	2"	2"		
5/8	7-1/2"	7-1/2"	2-1/2"	2-1/2"		
3/4	9"	9"	3"	3"		

Edge Distance

Diameter	Critical Edge Distance		Minimum Edge Distance		Reduction Factor	
	Tension	Shear	Tension	Shear	Tension	Shear
1/4	$1.5 \times h_{ef}$		$0.8 \times h_{ef}$	1-3/4"	0.75	0.25
3/8						
1/2						
5/8						
3/4						

Note: Reduction factor at critical distances equals 1.0. For edge and spacing distances between critical and minimum distances, use linear interpolation. Reduction factors are cumulative.