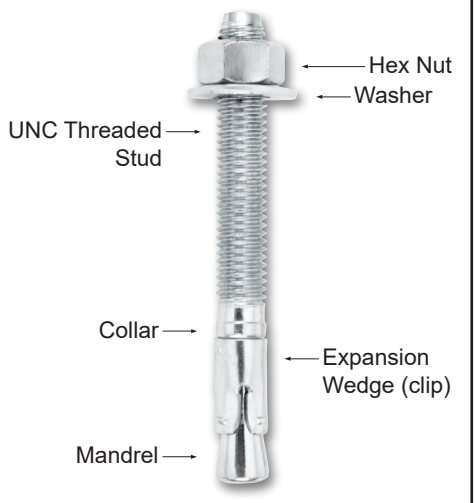
TECHNICAL DATA SHEET

Product Image



Material Specifications

Component	Material
Anchor Body	Medium Carbon Steel
Hex Nut	Carbon Steel, ASTM A 563, Grade A
Washer	Carbon Steel, ASTM F 844; meets dimensional requirements of ANSI B18.22.2. Type A Plain
Expansion Wedge (clip)	Carbon Steel
Plating	Zinc plating according to ASTM B 633, SC1 Type III (Fe/Zn 5).

Wedge Anchors

Wedge Anchors are torque-controlled expansion anchors that consist of a stud, nut, washer, and expander collar (clip), as illustrated in this document. The stud for all sizes is manufactured from cold-drawn carbon steel and is partially threaded with one end terminating in a flared mandrel. The expander collar (clip) is manufactured from hot-rolled carbon steel and is formed around the stud mandrel so that it can move freely. Nuts are manufactured in accordance with ASTM A563, and Grade A and washers are in accordance with ASTM F844 meeting the dimensional requirements of ANSI B18.22.2 All components, including nuts and washers, are coated in accordance with ASTM B633 Classification SC1, Type III.

Features and Benefits:

- Dependable Performance in Variety of Concrete Strengths
- Pilot on Hammered End to Prevent First Thread Damage
- Non-Bottom Bearing Anchor
- Can be Installed Through-Fixture on Standard Size Holes
- Length ID & Identifiable Marking Stamped on Head
- Fully Threaded
- Nut & Washer Included

General Applications & Uses:

- Seismic & Wind Loading Applications
- Structural Connections
- Cable Tray Support Systems
- Pipe Supports
- Fire Sprinklers
- Dead Loads & Live Loads

Applicable Base Materials:

- Cracked & Uncracked Concrete
- Normal / Lightweight
- Concrete over steel deck
- Grouted concrete masonry (CMU)

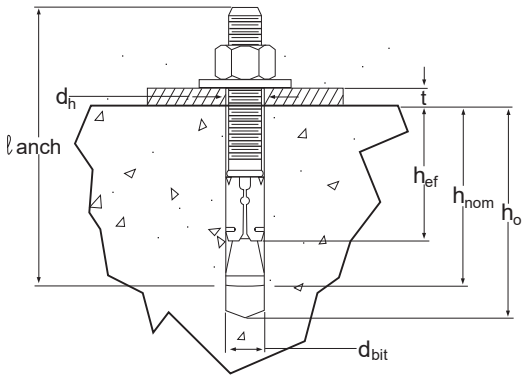
Approvals and Listings:

- International Code Council, ICC Evaluation Service (ICC-ES) ESR-3932 for cracked and uncracked concrete
- City of Los Angeles Department of Building and Safety (LADBS), ICC-ES ESR-3932 Supplement for 2017 City of Los Angeles Building Code (LABC) and 2017 City of Los Angeles Residential Code (LARC)
- State of Florida, ICC-ES ESR-3932 Supplement for 2014 Florida Building Code (FBC) – Building and 2014 Florida Building Code (FBC) – Residential
- Code compliant with 2006 IBC, 2006 IRC, 2009 IBC, 2009 IRC, 2012 IBC, 2012 IRC, 2015 IBC, 2015 IRCLength ID & Identifiable Marking Stamped on Head
- Tested in accordance with ACI 355.2/ASTM E488 and ICC-ES AC193 for use in structural concrete and under anchoring to concrete design provisions of ACI 318-14, ACI 318-11, ACI 318-08 and ACI 318-05

Installation Instructions

1. Select overall anchor length so that the minimum required embedment, h*nom*, is achieved. See **Installation Specifications** section below for h*nom* values for each anchor diameter. Anchor length will depend on the thickness of the material being fastened. Add h*nom* + the material thickness + the thickness of the nut and washer (approximately equal to the anchor diameter) together & select at least the next longer anchor length or longer (embedments deeper than h*nom* can be used).
2. Use a rotary hammer drill in the percussion mode with the correct size carbide drill bit meeting the requirements of ANSI Standard B212-15 to drill the hole perpendicular to the concrete surface & to the required depth. See **Installation Specifications** section below for minimum hole depth, h*o*, values for each anchor diameter.
3. Use a hand pump, compressed air or vacuum to remove debris and dust from the drilling operation.
4. If installation is through a fixture, position the fixture over the hole & install the anchor through the hole in the fixture. Using a hammer drive the anchor into the hole insuring that it is installed to the minimum required embedment depth, h*nom*.
5. Install the washer & nut on the projecting thread & tighten the nut to the required installation torque value, T*inst*, using a torque wrench.

FIGURE 2 - ANCHOR INSTALLATION



INSTALLATION SPECIFICATIONS	SYMBOL	UNITS	Nominal Anchor Diameter, in.		
			1/4"	3/8"	1/2"
Anchor diameter	d_a (d_o)	in.	1/4"	3/8"	1/2"
Minimal diameter of fixture hole clearance	d_h	in.	5/16"	7/16"	9/16"
Nominal drill bit diameter	d_{bit}	in.	1/4"	3/8"	1/2"
Minimum nominal embedment depth	h_{nom}	in.	1-3/4"	2-1/2"	2-1/2"
Minimum effective embedment depth	h_{ef}	in.	1-1/2"	2-1/4"	2-1/4"
Minimum hole depth	h_o	in.	2"	2-3/4"	2-3/4"
Installation torque	T_{inst}	ft-lb	8	25	35
Minimum concrete thickness	h_{min}	in.	4"	4"	6"

ALLOWABLE STRESS VALUES FOR ANCHORAGES TO NORMAL-WEIGHT CONCRETE

ESR-3932 provides design information for load factor and resistance design (LRFD), however allowable stress design (ASD) is still in use by some users. Translation of LRFD to ASD values is possible, however it is dependent on the levels of dead load and live load. Dead load is defined in the ACI 318 Building Code Requirements for Structural Concrete as "the weights of members, supported structure and permanent attachments that are likely to be present on a structure in service". Live load is defined in ACI 318-14 as "load that is not permanently applied to a structure, but is likely to occur during the service life of the structure (excluding environmental loads)". Examples of live loads are traffic on a walkway and nonpermanent loads associated with usage of a structure. Live load values are stipulated in the build in code for various loading conditions and parts of structures.

ESR-3932 Section 4.2 provides the method and details of the calculations for the translation of LRFD to ASD loads, and the ESR provides example calculations in Table 3. The method and details are not repeated here, and the user should review the noted ESR provisions if so desired. They are used to calculate the ASD tension and shear loads in the following tables. See ESR-3932 Section 4.2.2 to address interaction of tensile and shear forces.

To facilitate the translation of LRFD design values to ASD design values, two scenarios of dead load and live load levels are used to conservatively address the most common applications as follows: **- 100% Dead Load - 10% Dead Load and 90% Live Load**

For 100% dead load, ACI 318-14 Table 5.3.1 Equation (5.3.1a) provides an α conversion factor of 1.4 which is divided into the LRFD design loads and multiplied by the applicable ϕ factor of 0.65 to determine an equivalent ASD tension and shear loads.

For 10% dead and 90% live load, ACI 318-14 Table 5.3.1 Equation (5.3.1b) provides a weighted α conversion factor of 1.56 which is divided into the LRFD design loads and multiplied by the applicable ϕ factor of 0.65 to determine an equivalent ASD tension and shear loads.

It is the responsibility of the user to select the appropriate ASD values based on the example loadings shown in this document or alternative loadings that may be applicable to the specific design.

The ASD values are provided in the following tables for tension and shear for each load scenario.

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Length Code Identification System

Length ID marking on threaded stud head		A	B	C	D	E	F	G	H	I
Overall anchor length, lanch, (inches)	From	1-1/2″	2″	2-1/2″	3″	3-1/2″	4″	4-1/2″	5″	5-1/2″
	Up to but not including	2″	2-1/2″	3″	3-1/2″	4″	4-1/2″	5″	5-1/2″	6″

ALLOWABLE TENSION LOADS FOR ANCHORS Installed in UNCRACKED NORMAL-WEIGHT CONCRETE RESISTING 100% DEAD LOAD (Pounds)[1,2]

ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH, f_{c}[1], psi				
		2500	3000	4000	5000	6000
1/4″	1-3/4″	553	605	699	781	856
3/8″	2-1/2″	1365	1495	1727	1930	2115
1/2″	2-1/2″	1880	2060	2378	2859	2913

ALLOWABLE NON-SEISMIC SHEAR LOADS FOR ANCHORS INSTALLED IN UNCRACKED NORMAL-WEIGHT CONCRETE RESISTING 100% DEAD LOAD (Pounds)[1,2]

ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH$_{2}$
		f_{c}[1] 2500 psi
1/4″	1-3/4″	488
3/8″	2-1/2″	850
1/2″	2-1/2″	1676

ALLOWABLE TENSION LOADS FOR ANCHORS INSTALLED IN UNCRACKED NORMAL-WEIGHT CONCRETE RESISTING 10% DEAD LOAD, 90% LIVE LOAD (Pounds)[1,2]

ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH, f_{c}[1], psi				
		2500	3000	4000	5000	6000
1/4″	1-3/4″	496	543	627	701	768
3/8″	2-1/2″	1225	1342	1550	1732	1898
1/2″	2-1/2″	1688	1849	2135	2386	2614

1. Based on ESR-3932 LRFD values
2. The tabulated values are for anchors installed in normal-weight concrete that has reached the minimum designated compressive strength at the time of installation.
3. Measured from the concrete surface to the embedded end of the anchor (h_{nom}, nominal embedment)

ALLOWABLE NON-SEISMIC SHEAR LOADS FOR ANCHORS INSTALLED IN UNCRACKED NORMAL-WEIGHT CONCRETE RESISTING 10% DEAD LOAD, 90% LIVE LOAD (Pounds)[1,2]		
ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH
		$f_{c'}$ 2500 psi
1/4″	1-3/4″	438
3/8″	2-1/2″	763
1/2″	2-1/2″	1504

ALLOWABLE TENSION LOADS FOR ANCHORS INSTALLED IN CRACKED NORMAL-WEIGHT CONCRETE RESISTING 100% DEAD LOAD (Pounds)[1,2]						
ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH, fc′, psi				
		2500	3000	4000	5000	6000
3/8″	2-1/2″	618	676	781	873	957
1/2″	2-1/2″	501	549	634	709	777

ALLOWABLE SEISMIC SHEAR LOADS FOR ANCHORS INSTALLED IN CRACKED NORMAL-WEIGHT CONCRETE RESISTING 100% DEAD LOAD (Pounds)[1,2]		
ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH
		$f_{c'}$ 2500 psi
3/8″	2-1/2″	766
1/2″	2-1/2″	1509

1. Based on ESR-3932 LRFD values
2. The tabulated values are for anchors installed in normal-weight concrete that has reached the minimum designated compressive strength at the time of installation.
3. Measured from the concrete surface to the embedded end of the anchor (h_{nom}, nominal embedment)

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ALLOWABLE TENSION LOADS FOR ANCHORS INSTALLED IN CRACKED NORMAL-WEIGHT CONCRETE RESISTING 10% DEAD LOAD, 90% LIVE LOAD (Pounds)[1,2]						
ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH, f_{c}[1], psi				
		2500	3000	4000	5000	6000
3/8″	2-1/2″	554	607	701	784	859
1/2″	2-1/2″	450	493	569	636	697

ALLOWABLE SEISMIC SHEAR LOADS FOR ANCHORS INSTALLED IN CRACKED NORMAL-WEIGHT CONCRETE RESISTING 10% DEAD LOAD, 90% LIVE LOAD (Pounds)[1,2]		
ANCHOR DIAMETER (inches)	MINIMUM NOMINAL EMBEDMENT (inches)[3]	MINIMUM CONCRETE COMPRESSIVE STRENGTH
		f_{c}[1] 2500 psi
3/8″	2-1/2″	688
1/2″	2-1/2″	1354

ULTIMATE STRENGTH DATA FOR ANCHOR STEET FAILURE					
CHARACTERISTIC	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER, in.		
			1/4″	3/8″	1/2″
Yield strength of anchor steel	f_{ya}	lb/in^2	91,700	91,200	88,600
Ultimate strength of anchor steel	f_{uta}	lb/in^2	103,100	102,600	99,700
Tension					
Effective tensile stress area (neck)	$A_{se,N}$	in^2	0.022	0.053	0.101
Steel strength in tension	N_{sa}	lb.	2270	5440	10,070
Shear					
Effective shear stress area (threads)	$A_{se,V}$	in^2	0.022	0.053	0.101
Steel strength in shear	V_{sa}	lb.	1050	1830	3610

1. Based on ESR-3932 LRFD values
2. The tabulated values are for anchors installed in normal-weight concrete that has reached the minimum designated compressive strength at the time of installation.
3. Measured from the concrete surface to the embedded end of the anchor (h_{nom}, nominal embedment)

LOAD ADJUSTMENT FACTORS FOR SPACING & EDGE DISTANCES FOR CRACKED OR UNCRACKED NORMAL-WEIGHT CONCRETE, TENSION AND SHEAR [1]			
Spacing and/or Edge Distances, in.	ANCHOR DIAMETER, in.		
	1/4"	3/8"	1/2"
2-1/2"	0.50		
2-3/4"	0.55		
3"	0.60		
3-1/4"	0.65		
3-1/2"	0.70		
3-3/4"	0.75	0.50	0.50
4"	0.80	0.53	0.53
4-1/4"	0.85	0.57	0.57
4-1/2"	0.90	0.60	0.60
4-3/4"	0.95	0.63	0.63
5"	1.00	0.67	0.67
5-1/4"	1.00	0.70	0.70
5-1/2"	1.00	0.73	0.73
5-3/4"	1.00	0.77	0.77
6"	1.00	0.80	0.80
6-1/4"	1.00	0.83	0.83
6-1/2"	1.00	0.87	0.87
6-3/4"	1.00	0.90	0.90
7"	1.00	0.93	0.93
7-1/4"	1.00	0.97	0.97
7-1/2"	1.00	1.00	1.00
7-3/4"	1.00	1.00	1.00
8"	1.00	1.00	1.00
8-1/4"	1.00	1.00	1.00
8-1/2"	1.00	1.00	1.00
8-3/4"	1.00	1.00	1.00
9"	1.00	1.00	1.00
9-1/4"	1.00	1.00	1.00
9-1/2"	1.00	1.00	1.00
9-3/4"	1.00	1.00	1.00
10"	1.00	1.00	1.00
10-1/4"	1.00	1.00	1.00
10-1/2"	1.00	1.00	1.00
10-3/4"	1.00	1.00	1.00
11"	1.00	1.00	1.00
11-1/4"	1.00	1.00	1.00
11-1/2"	1.00	1.00	1.00
11-3/4"	1.00	1.00	1.00
12"	1.00	1.00	1.00

[1]Multiply factor(s) times the applicable allowable tension or shear load value from the tables for desired edge distance or spacing. Where both edge and spacing distances have factors less than 1.00, multiply both factors together and multiply the resulting factor times the allowable load from the tables.