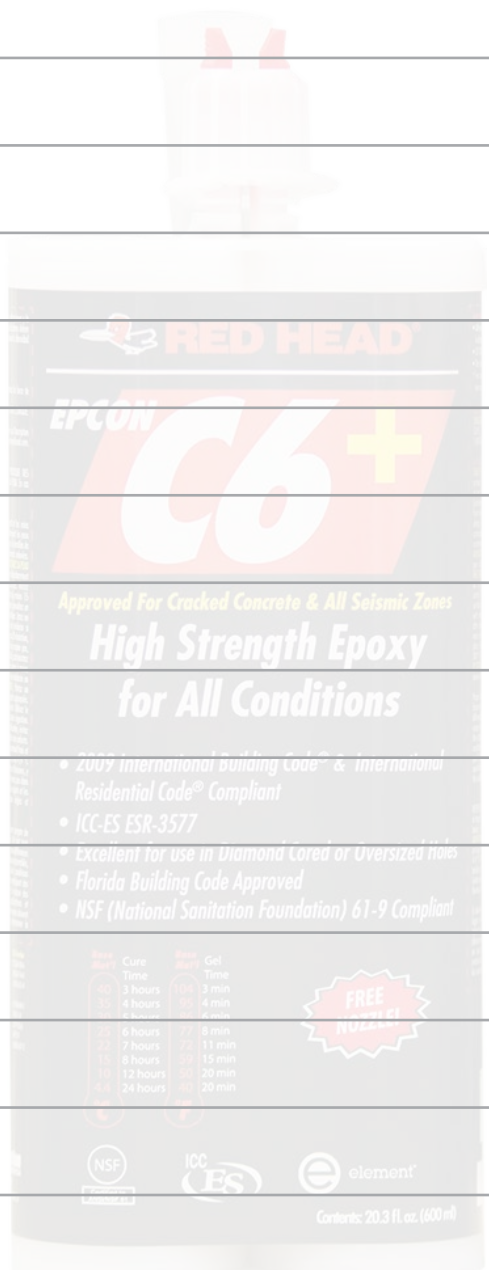
RED HEAD®

CONCRETE ANCHORING SYSTEMS

Notes



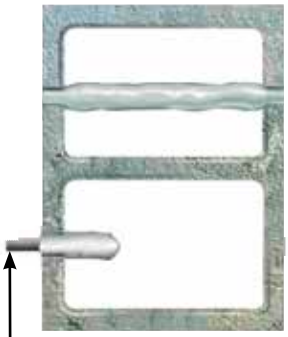
RED HEAD®
CONCRETE ANCHORING SYSTEMS

TABLE OF CONTENTS

RED HEAD®
CONCRETE ANCHORING SYSTEMS

The Inside Story About Mechanical and Adhesive Anchors

Types, Base Materials, Installation Procedures and More



Top View

For attachments to single face of block, see page RH 34 for information on "umbrella anchors" and "stubby screens"

HOLLOW CONCRETE BLOCK

Maximum holding strength in concrete block can be obtained by fastening to both the front and back of the block using an adhesive screen tube and threaded rod.

TYPES OF ANCHORS

Expansion Type—

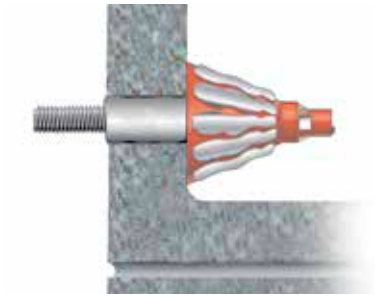
Tension loads are transferred to the base material through a portion of the anchor that is expanded inside the drill hole.

Examples: Red Head Trubolts, Dynabolts, Multi-Set II Anchors and Hammer-Sets

Adhesive Type—

Resistance to tension loads is provided by the presence of an adhesive between the threaded rod (or rebar) and the inside walls of the drill hole.

Examples: A7+, C6+ and G5 Adhesives



Keying Type—

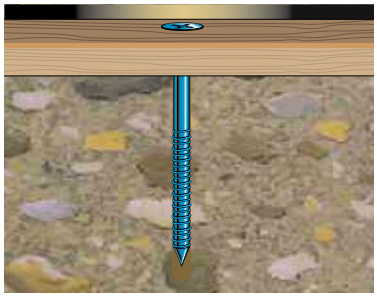
Holding strength comes from a portion of an anchor that is expanded into a hollow space in a base material that contains voids such as concrete block or brick.

Examples: Adhesives used in screen tubes or umbrella insert

Friction Type—

Load capacity is created by driving a fastener into a pre-drilled hole that is slightly smaller than the fastener itself.

Examples: Striker Nails and Redi-Drive Nails

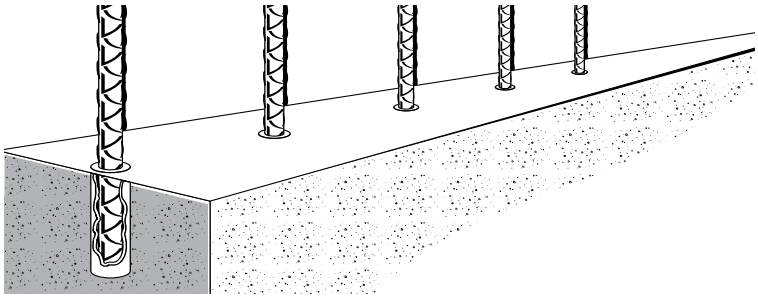


Mechanical Interlocking Type—

Tension loads are resisted by threads on the fastener engaging with threads cut into the base material.

Examples: LDT, Tapcon and E-Z Ancors

BASE MATERIALS



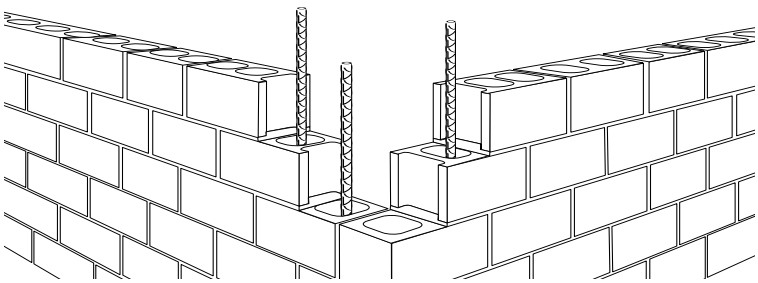
Concrete

Normal Weight Concrete is made from Portland cement, coarse and fine aggregates, water and various admixtures. The proportioning of these components controls the strength of the concrete. In North America, concrete strength is specified by the compressive strength* of concrete test cylinders. These test cylinders measure six inches in diameter by 12 inches in length and are tested on the 28th day after they are produced.

Lightweight Concrete consists of the same components (cement, coarse and fine aggregates, water and admixtures) as normal weight concrete, except it is made with lightweight aggregate. One of the most common uses of lightweight concrete has been as a structural fill of steel decking in the construction of strong, yet light floor systems.

Typical fasteners for both normal weight and lightweight concrete include Trubolt Wedge Anchors, LDT Self-Threading Anchors, Dynabolt Sleeve Anchors, Multi-Set II Drop-In Anchors, Stud Anchors and Adhesive Anchoring Systems.

* Compressive strengths shown in this catalog were the actual strengths at the time of testing. The load values listed were determined by testing in un-reinforced concrete.



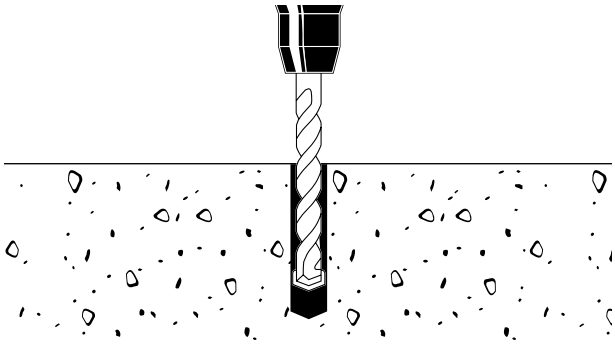
Masonry

Grout-Filled Concrete Block consists of three components: concrete, mortar and grout. The mortar is designed to join the units into an integral structure with predictable performance properties. Typical fasteners for grout-filled block include Dynabolt Sleeve Anchors, and A7+ Adhesive Anchoring Systems.

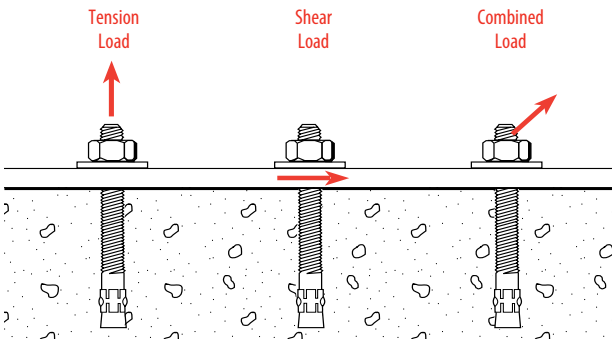
Hollow Concrete Block, Brick and Clay Tile are grouped together because they require special anchoring products that can be installed into a substrate that contains voids and still provide reliable holding values. Typical fasteners used in hollow block, brick and clay tile include Dynabolt Sleeve Anchors, Tapcon Self-Tapping Concrete Anchors, Adhesives with Screen Tubes and Adhesives used with the Umbrella Insert.

INSTALLATION PROCEDURES

Anchor drill holes are typically produced using carbide tipped drill bits and rotary hammer drills. Look at the product sections of this catalog for the correct drill hole diameter and depth of each type of anchoring system.



Careful cleaning of the anchor drill hole is important in order to obtain the best possible functioning of the anchor system. For each product in this catalog, detailed installation instructions are provided. Suggested clamping torques and curing times (for adhesive anchors) are also provided.



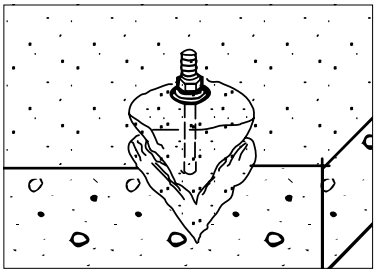
Loading

Holding values for the following types of loading are provided in this catalog:

- **Tension loads—** when load is applied along the axis of the anchor
- **Shear loads—** when the loads are applied perpendicular to the axis of the anchor
- **Combined loads—** when both tension and shear loads are applied to an anchor, a combined loading equation is provided to determine the maximum loads that can be applied to the anchor at the same time

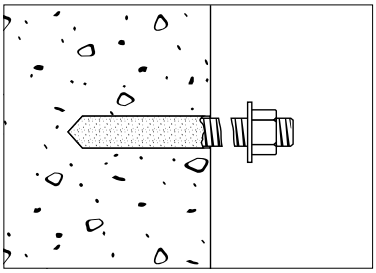
MODES OF FAILURE

When anchors are loaded to their maximum capacity, several different types (modes) of failure are possible depending on the type of anchor, strength of the base material, embedment depth, location of the anchor, etc. Common modes of failure include:



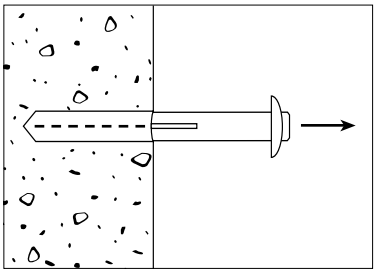
Concrete Spall Cone—

Usually occurs at shallow embedments where the resistance of the base material is less than the resistance of the anchor and the base material fails.



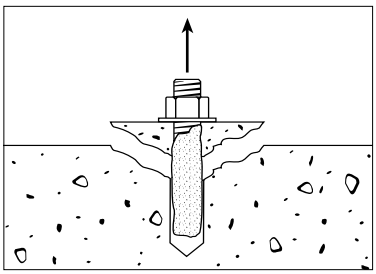
Steel Breakage—

The capacity of the anchorage exceeds the tensile or shear strength of the steel anchor or rod material.



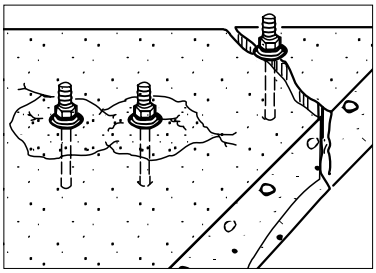
Anchor Pullout—

Base material adjacent to the extension portion of an anchor crushes, resulting in the anchor pulling out of the hole until the capacity of the spall cone is reached, at which point the concrete will spall. This type of failure happens more commonly when anchors are set with deep embedment depths.



Bond Failure—

Shear failure of the adhesive at rod-adhesive interface or adhesive-base material interface. Occurs more commonly in deep embedments using high strength steel rods.



Edge Distance and Spacing Reduction—

Reduces the holding values, when anchors are placed too close to the edge. This also occurs when two or more anchors are spaced closely together. See suggested edge distance, anchor spacing distances and reduction values in the product sections.

RED HEAD®
ADHESIVE ANCHORING SYSTEMS

Engineered to provide consistently strong holding power for superior anchoring in solid concrete and hollow masonry

The RED HEAD Adhesive Anchoring System includes a complete family of quality products and accessories designed to work in a variety of fastening applications. Get maximum anchoring performance with:

Epoxy Systems–Epoxies are very strong (1-1/2 times stronger than mechanical anchors) and insensitive to moisture. Mix ratio and thorough blending of the hardener and resin are important with epoxies. Maximum performance of RED HEAD epoxies is achieved by accurate proportions and mixing provided by our highly engineered cartridges, mixing nozzles, and dispensing tools.

Acrylic Systems– Combine an excellent mixing ability and chain reaction curing mechanism with a tough, styrene-free adhesive. Our acrylic chemistry is ideal for anchoring because it dispenses fast, is not mix ratio sensitive, provides ample working time, and cures extremely fast in small and large diameter holes. Rods are easier and faster to insert in acrylic adhesives than epoxy adhesives at all temperatures.

CONCRETE ANCHORING SPECIALISTS
SINCE 1910

RED HEAD®
ADHESIVE ANCHORING SYSTEMS

Adhesive Anchoring Selection Guide

COLD WEATHER USE
and lower -10°C -7°C 10°C
A7+ – BEST FORMULA
C6+ and G5

HOT WEATHER USE
27°C 32°C 38°C and higher
A7+ – BEST FORMULA
C6+ and G5


Doweling into Concrete with Rebar


Fastening to Concrete with Threaded Rod

Solid Concrete Applications

truspec 2.0

PRODUCT SYSTEMS	KEY FEATURES	PROPERTIES	ALLOWABLE TENSILE PERFORMANCE[2,3,4]

A7+
Fast Dispensing, Fast Curing Epoxy for All Conditions

Most versatile quick cure solution

NSF Certified to ANSI/NSF 61

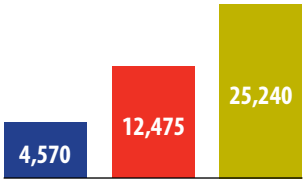
CRACKED & UNCRACKED SEISMIC APPROVED — ICC-ES ESR-3903 2015 IBC COMPLIANT — MASONRY APPROVED ICC-ES ESR-3951 — ICC ES

10 fluid oz. (275 ml) and 28 fluid oz. (825 ml) cartridges
(see page RH 10)

- All weather formula for for both hollow and solid base material
- Great performance in damp holes and underwater applications
- Applicable for both structural and non-structural anchoring
- Fast curing time, 45 minutes at 21°C
- No drip, no sag, easy clean up, low ordor
- Rods are easier to insert into the hole with A7+ compared with other adhesives
- Hole only needs to be 1/16" larger than the stud (competition requires 1/8" larger)
- Approved for cracked, uncracked, seismic, mansory
- NFS 61 approved

BASE MATERIAL (F°/C°)	WORKING TIME	FULL CURE TIME
110°/ 43°	1.5 minutes	45 minutes
90°/ 32°	2.5 minutes	45 minutes
70°/ 21°	5 minutes	45 minutes
50°/ 10°	16 minutes	90 minutes
32°/ 0°	35 minutes	4 hours
14°/ -10°	35 minutes	24 hours

Adhesive must be a minimum temperature of 32°F (0°C) for proper installation



C6+
Fast Curing Epoxy for All Conditions

Consistently handles all applications

NSF Certified to ANSI/NSF 61

10 fluid oz. (275 ml) and 20 fluid oz. (591 ml) cartridges
(see page RH 21)

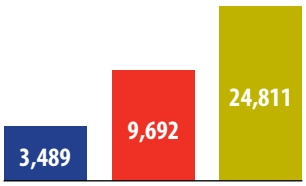
- Base Material Temperature 4°C -40°C (cartridge temperature must be ≥ 10°C)
- Saturated or Water-filled holes
- Horizontal or overhead installations

BASE MATERIAL [1] (F°/C°)	WORKING TIME [2]	FULL CURE TIME
104°/ 40°	3 minutes	3 hours
95°/ 35°	4 minutes	4 hours
86°/ 30°	6 minutes	5 hours
77°/ 25°	8 minutes	6 hours
72°/ 22°	11 minutes	7 hours
59°/ 15°	15 minutes	8 hours
50°/ 10°	20 minutes	12 hours
40°/ 4.4°	20 minutes	24 hours

[1] For concrete temperature between 4°C and 10°C, adhesive must be maintained at a minimum of 10°C during installation

[2] Working time is max time from the end of mixing to when the insertion of the anchor into the adhesive shall be completed. Gel Time per ASTM D2471 = 11 minutes at 22°C

ALLOWABLE TENSILE PERFORMANCE[1,2,3]



G5 *High Strength Epoxy Tested to ICC-ES AC308*

15 min. working time; 24 hour cure time (Per AC308) (21°C)

MADE IN USA

22 fluid oz. (650 ml) cartridge
(see page RH 29)

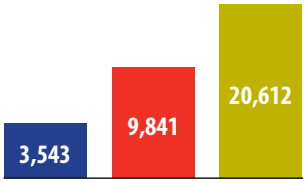
- Solid base materials
- Works in dry, damp, saturated, and underwater applications
- Gives more time to install anchors
- Easier to install anchors in hot weather
- Odorless
- Used for oversized and cored holes
- Improved wet/water-filled
- Fire rated: tested up to 4hrs FRP
- ICC ESR-1137 Approved

RECOGNIZED WORLDWIDE — Fire Tested BS476 4 Hrs FRP

International Standard Fire Resistance Performance

BASE MATERIAL (F°/C°)	WORKING TIME	FULL CURE TIME
110°/ 43°	9 minutes	24 hours
90°/ 32°	9 minutes	24 hours
70°/ 21°	15 minutes	24 hours
50°/ 10°	15 minutes	24 hours

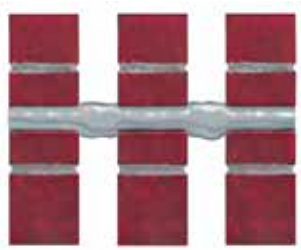
ALLOWABLE TENSILE PERFORMANCE[1,2,3]



[1] Diameter x Embedment in 4000 psi concrete. [2] All loads given in pounds.
[3] Temperature Range A, Uncracked concrete, dry hole, Seismic Category A or B, ASTM A193 Grade B7 Steel. [4] Allowable tensile performance of A7+ was calculated according to CSA 23.3

Hollow Base Material Applications

Use the following accessories with the A7+ adhesive anchoring systems for all of your hollow base material applications.



Brick Pinning

Fastening to hollow concrete block

SYSTEM ACCESSORIES	KEY FEATURES	ULTIMATE TENSILE[1,2] PERFORMANCE (LBS)
Nylon Screens  **Makes it possible to use adhesive for fastening to hollow block or brick walls** (see page RH 37)	■ 3/8" to 3/4" diameter sizes ■ 30%-50% lower cost than stainless screens ■ Special design makes screens easier to insert through block or brick ■ Does not get bent or crushed ■ Corrosion resistant	A7+ 2,360 (3/8"x8") 2,647 (3/4"x8")
Stainless Steel Screens  **Makes it possible to use adhesive for fastening to hollow block or brick walls** (see page RH 37)	■ 3/8" to 3/4" diameter sizes ■ Corrosion resistant ■ Available in multiple lengths to accommodate various material thicknesses	A7+ 2,360 (3/8"x8") 2,647 (3/4"x8")
Stubby Screens  **Makes it possible to use adhesive for fastening to the face of hollow block or tile** (see page RH 34)	■ 3/8", 1/2", 5/8" diameter sizes ■ Fasten to front face of block ■ Anchor remains perpendicular in wall	A7+ 2,458 (1/2") 2,543 (5/8")
Umbrella and Umbrella Inserts  Umbrella  Insert **Makes it possible to use adhesive for fastening to the face of hollow block or tile** (see page RH 34)	■ For 3/8" rods ■ 3/8" internal inserts ■ Fasten to front face of blocks ■ Creates large bearing surface inside block to achieve high loads	A7+ 3,558 (3/8") 3,558 (1/2")

[1]Testing performed in hollow concrete block. [2]Diameter x Embedment.

RED HEAD®
ADHESIVE ANCHORING SYSTEMS

A7+

DESCRIPTION/SUGGESTED SPECIFICATIONS*

*Suggested Specifications see pages RH 13

Fast Dispensing, Fast Curing Hybrid Adhesive

This hybrid epoxy is dispensed from a dual cartridge through a static mixing nozzle, directly into the anchor hole. A7+ is a quick cure adhesive specifically designed for both structural and non-structural anchoring applications. It comes in both 10 oz and 28 oz.

Most versatile quick cure adhesive solution for light, medium, and heavy duty concrete anchoring that meets code approval

ADVANTAGES

- All weather formula for for both hollow and solid base material
- Great performance in damp holes and under-water applications
- Applicable for both structural and non-structural anchoring
- Fast curing time, 45 minutes at 21°C
- No drip, no sag, easy clean up, low ordor
- Rods are easier to insert into the hole with A7+ compared with other adhesives
- Hole only needs to be 1/16" larger than the stud (competition requires 1/8" larger)
- Approved for cracked, uncracked, seismic, mansory
- NFS 61 approved

A7P-10 A7P28

A100

Spacing and Edge Distance

NOMINAL ANCHOR DIAMETER (IN.)	MINIMUM SPACING (IN.)	MINIMUM EDGE DISTANCE (IN.)
3/8	1	1
1/2	1-1/2	1-1/2
5/8	2-1/2	2-1/2
3/4	3	3
7/8	3-1/2	3-1/2
1	4	4
1-1/4	5	5

Curing Times

BASE MATERIAL (F°/C°)	WORKING TIME	FULL CURE TIME
110°/ 43°	1.5 minutes	45 minutes
90°/ 32°	2.5 minutes	45 minutes
70°/ 21°	5 minutes	45 minutes
50°/ 10°	16 minutes	90 minutes
32°/ 0°	35 minutes	4 hours
14°/ -10°	35 minutes	24 hours

*Adhesive must be a minimum temperature of 32°F (0°C) for proper installation

APPLICATIONS

Stadium Seating

The fast dispensing, fast curing properties of A7+ made it ideal for installing over 70,000 seats in this NFL football stadium and many others.

Roadway Doweling

A7+ dispenses so quickly and rebar inserts so easily that contractors find installed costs are lower than many other products including grout for doweling.

Water Treatment Facilities

The fast dispensing, fast curing properties of A7+ make it ideal for repetitive installation processes.

FEATURES

ANCHORAGE TO SOLID CONCRETE

Threaded Rod (Carbon or Stainless Steel) or Rebar supplied by contractor; rod does not need to be chisel pointed

A7+ adhesive completely fills area between rod and hole creating a stress free, high load anchorage

Pre-drilled hole in concrete; see performance tables for suggested hole sizes

APPROVALS/LISTINGS

ASTM C881 Type I, II, IV & V; Grade 3, Class A, B, & C with the exception of gel time (Class C only)

ICC ESR-3903 for concrete and ICC ESR-3951 for masonry

MTO Approval

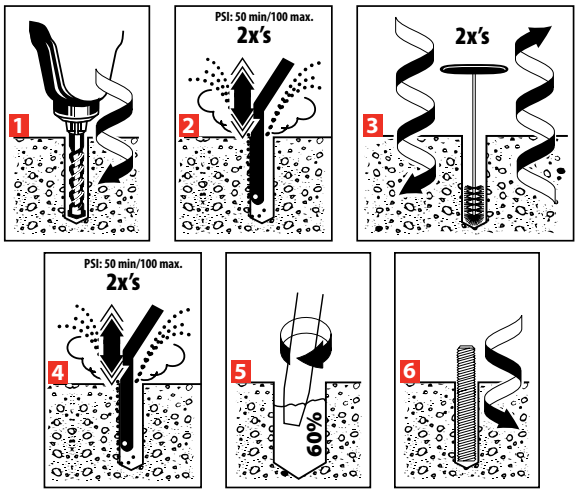
MTQ Approval

BC MoTI Approval

NSF 61 Compliant

NSF Certified to ANSI/NSF 61

INSTALLATION STEPS



1. Use a rotary hammer drill or pneumatic air drill with a carbide drill bit complying with ANSI B212.15. Drill hole to the required embedment depth. For installation of 3/8" – 1-1/4" anchors, see www.itwredhead.com for a bit diameters and min/max embedment depths.

2. Starting at the bottom of the hole, move a clean air nozzle in and out of the hole, cleaning with compressed air. Repeat until free of debris.**

3. Select appropriately sized Red Head brush based on anchor diameter and depth of hole. See www.itwredhead.com for brush specifications, including minimum diameter. Check brush for wear before use. Insert the brush into the hole with a clockwise motion until the bottom of hole is reached. Pull brush out of hole and repeat at least one additional time. For faster cleaning, attach the brush to a drill/drive.

4. Repeat Step 2

5. Place the cartridge/nozzle assembly into the dispensing tool. Note: Do not modify or remove mixing elements in nozzle. Review the gel time/cure time chart, based on the temperature at time of installation, in order to determine tool, cartridge and nozzle requirements. Dispense mixed adhesive outside of hole until uniform color is achieved. Insert the nozzle to the bottom of the hole and dispense adhesive until hole is 2/3 full. If nozzle does not reach the bottom of the hole, use Red Head extension tubing positioned on the end of the nozzle. For holes that contain water, keep dispensing adhesive below water in order to displace the water upward.

6. Immediately insert the rod/rebar assembly to the required embedment depth using a slow rotating motion. The anchor rod/rebar must be marked with the required embedment depth. Ensure the adhesive fills all voids and uniformly covers rod/concrete. Do not disturb anchor or apply load/torque until adhesive is fully cured.

A7P-28 fl. oz. Ordering Information

PART NUMBER	DESCRIPTION	BOX QTY
 A7P-28	28 Fluid Ounce Cartridge A7+ with nozzle	4
 S55	Mixing Nozzle for A7P-28 Cartridge Nozzle diameter fits holes for 3/8" diameter & larger anchors (overall length of nozzle 10")	24
 S75	High Flow Mixing Nozzle for A7P-28 Cartridge Nozzle diameter fits holes for 5/8" diameter & larger anchors (overall length of nozzle 9-1/4")	24

PART NUMBER	DESCRIPTION	BOX QTY
 E55	Mixing Nozzle for A7P-28 Cartridge Nozzle diameter fits 3/8" to 5/8" holes (overall length of nozzle 14")	24
 A102	*Largest hand dispensable cartridge—still easy to dispense* Hand Dispenser for A7P-28 Cartridge	24
 A200	Pneumatic Dispenser for A7P-28	1

Refer to page RH 39 for ordering information on wire brushes, brush extensions, and blow pump for deep holes.

ESTIMATING TABLE

A7+
28 Fluid Ounce Cartridge

Number of Anchoring Installations per Cartridge* Using Reinforcing Bar with A7+ Adhesive in Solid Concrete

REBAR	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
#3	7/16	560.3	280.2	186.8	140.1	112.1	93.4	80.0	70.0	62.3	56.0	50.9	46.7	43.1	40.0	37.4
#4	5/8	274.6	137.3	91.5	68.6	54.9	45.8	39.2	34.3	30.5	27.5	25.0	22.9	21.1	19.6	18.3
#5	3/4	190.7	95.3	63.6	47.7	38.1	31.8	27.2	23.8	21.2	19.1	17.3	15.9	14.7	13.6	12.7
#6	7/8	140.1	70.0	46.7	35.0	28.0	23.3	20.0	17.5	15.6	14.0	12.7	11.7	10.8	10.0	9.3
#7	1	107.2	53.6	35.7	26.8	21.4	17.9	15.3	13.4	11.9	10.7	9.7	8.9	8.2	7.7	7.1
#8	1-1/8	84.7	42.4	28.2	21.2	16.9	14.1	12.1	10.6	9.4	8.5	7.7	7.1	6.5	6.1	5.6
#9	1-1/4	68.6	34.3	22.9	17.2	13.7	11.4	9.8	8.6	7.6	6.9	6.2	5.7	5.3	4.9	4.6
#10	1-3/8	56.7	28.4	18.9	14.2	11.3	9.5	8.1	7.1	6.3	5.7	5.2	4.7	4.4	4.1	3.8
#11	1-3/4	35.0	17.5	11.7	8.8	7.0	5.8	5.0	4.4	3.9	3.5	3.2	2.9	2.7	2.5	2.3

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

ESTIMATING TABLE

A7+
28 Fluid Ounce Cartridge

Number of Anchoring Installations per Cartridge* Using Threaded Rod with A7+ Adhesive in Solid Concrete

THREADED ROD	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
1/4	5/16	1098.2	549.1	366.1	274.6	219.6	183.0	156.9	137.3	122.0	109.8	99.8	91.5	84.5	78.4	73.2
3/8	7/16	560.3	280.2	186.8	140.1	112.1	93.4	80.0	70.0	62.3	56.0	50.9	46.7	43.1	40.0	37.4
1/2	9/16	339.0	169.5	113.0	84.7	67.8	56.5	48.4	42.4	37.7	33.9	30.8	28.2	26.1	24.2	22.6
5/8	11/16	226.9	113.5	75.6	56.7	45.4	37.8	32.4	28.4	25.2	22.7	20.6	18.9	17.5	16.2	15.1
	3/4	190.7	95.3	63.6	47.7	38.1	31.8	27.2	23.8	21.2	19.1	17.3	15.9	14.7	13.6	12.7
3/4	13/16	162.5	81.2	54.2	40.6	32.5	27.1	23.2	20.3	18.1	16.2	14.8	13.5	12.5	11.6	10.8
	7/8	140.1	70.0	46.7	35.0	28.0	23.3	20.0	17.5	15.6	14.0	12.7	11.7	10.8	10.0	9.3
7/8	15/16	122.0	61.0	40.7	30.5	24.4	20.3	17.4	15.3	13.6	12.2	11.1	10.2	9.4	8.7	8.1
	1	107.2	53.6	35.7	26.8	21.4	17.9	15.3	13.4	11.9	10.7	9.7	8.9	8.2	7.7	7.1
1	1-1/16	95.0	47.5	31.7	23.8	19.0	15.8	13.6	11.9	10.6	9.5	8.6	7.9	7.3	6.8	6.3
	1-1/8	84.7	42.4	28.2	21.2	16.9	14.1	12.1	10.6	9.4	8.5	7.7	7.1	6.5	6.1	5.6
1-1/4	1-1/3	62.3	31.1	20.8	15.6	12.5	10.4	8.9	7.8	6.9	6.2	5.7	5.2	4.8	4.4	4.2
	1-3/8	56.7	28.4	18.9	14.2	11.3	9.5	8.1	7.1	6.3	5.7	5.2	4.7	4.4	4.1	3.8

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

A7P–10 fl. oz. Ordering Information

PART NUMBER	DESCRIPTION	BOX QTY
 A7P-10	9.5 Fluid Ounce Cartridge with nozzle	6
 A24S	Mixing Nozzle for A7P-10 Cartridge Nozzle diameter fits 3/8" to 5/8" holes (overall length of nozzle 6-3/8")	24
 A100	Hand Dispenser for A7P-10 Cartridge (26:1 Thrust Ratio)	1

Refer to page RH 39 for ordering information on wire brushes, brush extensions, and blow pump for deep holes.

PACKAGING

1. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio
2. The two components are dispensed through a static mixing nozzle that thoroughly mixes the material and places the material at the base of the pre-drilled hole
3. Cartridge markings: Include manufacturer's name, batch number and best-used-by date, mix ratio by volume, ANSI hazard classification, and appropriate ANSI handling precautions

SUGGESTED SPECIFICATIONS

HYBRID ADHESIVE:

High Strength HYBRID ADHESIVE: ARRA Certified

1. Two component vinyl ester adhesive, non-sag paste, moisture insensitive when cured, dark gray in color, fast cure times.
2. Meets NSF Standard 61, certified for use in conjunction with drinking water systems.
3. Works in wet, damp, submerged holes.
4. Shelf life: Best if used within 18 months.
5. All weather, cure time (45 min. at 21°C).
6. Dispenses easier and faster.
7. Dispenses and cures faster in hot weather, but works in cold weather.
8. Pumpable at -10°C without preheating.
9. Formula for use in solid and hollow base materials.
10. Suitable for oversized and diamond cored holes with increased depths.
11. Quick insertion time = less labor cost.

ESTIMATING TABLES

A7+
10 Fluid Ounce Cartridge

Number of Anchoring Installations per Cartridge Using Reinforcing Bar and Threaded Rod with A7+ Adhesive in Solid Concrete*

REBAR	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)			
		2 (50.8)	4 (101.6)	6 (152.4)	8 (203.2)
# 3	7/16	100.1	50.0	33.4	25.0
# 4	5/8	49.0	24.5	16.3	12.3
# 5	3/4	34.0	17.0	11.3	8.5
# 6	7/8	25.0	12.5	8.3	6.3
# 7	1	19.2	9.6	6.4	4.8
# 8	1-1/8	15.1	7.6	5.0	3.8

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

Rod In. (mm)	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)			
		2 (50.8)	4 (101.6)	6 (152.4)	8 (203.2)
3/8 (9.5)	7/16	100.1	50.0	33.4	25.0
1/2 (12.7)	9/16	60.5	30.3	20.2	15.1
5/8 (15.9)	11/16 3/4	40.5 34.0	20.3 17.0	13.5 11.3	10.1 8.5
3/4 (19.1)	13/16 7/8	29.0 25.0	14.5 12.5	9.7 8.3	7.3 6.3
7/8 (22.2)	15/16 1	21.8 19.2	10.9 9.6	7.3 6.4	5.4 4.8
1 (25.4)	1-1/16 1-1/8	17.0 15.1	8.5 7.6	5.7 5.0	4.2 3.8

A7+ Hybrid Adhesive — Factored Steel Strength for Threaded Rod

Threaded Rod Dia. In. (mm)	Tension kN (lb), Nsar [3]			Shear kN (lb) Vsar [4]			Seismic Shear kN (lb), Vsar,seismic [5]		
	Carbon Steel A36 [1]	Carbon Steel A193 B7 [1]	Stainless F593 [2]	Carbon Steel A36 [1]	Carbon Steel A193 B7 [1]	Stainless F593 [2]	Carbon Steel A36 [1]	Carbon Steel A193 B7 [1]	Stainless F593 [2]
3/8 (9.5)	14 (3,060)	29 (6,589)	19 (4,382)	6 (1,434)	14 (3,089)	9 (2,033)	4 (1,004)	10 (2,162)	6 (1,423)
1/2 (12.7)	25 (5,596)	54 (12,063)	36 (8,021)	14 (3,149)	30 (6,783)	17 (3,724)	10 (2,204)	21 (4,748)	12 (2,607)
5/8 (15.9)	40 (8,915)	85 (19,210)	57 (12,775)	22 (5,017)	48 (10,806)	26 (5,931)	16 (3,512)	34 (7,564)	18 (4,152)
3/4 (19.1)	59 (13,192)	126 (28,431)	67 (15,104)	33 (7,421)	71 (15,995)	31 (7,011)	23 (5,194)	50 (11,196)	22 (4,908)
7/8 (22.2)	81 (18,210)	175 (39,243)	93 (20,890)	46 (10,245)	98 (22,077)	43 (9,699)	32 (7,171)	69 (15,454)	30 (6,789)
1 (25.4)	106 (23,888)	229 (51,483)	122 (27,403)	60 (13,439)	129 (28,962)	57 (12,724)	42 (9,407)	90 (20,273)	40 (8,907)
1-1/4 (31.8)	170 (38,223)	366 (82,375)	195 (43,819)	96 (21,503)	206 (46,334)	90 (20,343)	67 (15,052)	144 (32,433)	63 (14,240)

1 Values correspond to a ductile steel element
2 Values correspond to a brittle steel element
3 Tension values calculated according to Cl. D6.1.2 in CSA A23.3-14 Annex D
4 Shear values calculated according to Cl. D7.1.2 in CSA A23.3-14 Annex D
5 Seismic shear was calculated according to Vsar*aV,seis

A7+ Hybrid Adhesive — Concrete Breakout and Bond Strength for Threaded Rod

	Symbol	Units	Nominal Rod Diameter In. (mm)						
Nominal Anchor Diameter	**do**		**3/8 (9.5)**	**1/2 (12.7)**	**5/8 (15.9)**	**3/4 (19.1)**	**7/8 (22.2)**	**1 (25.4)**	**1-1/4 (31.8)**
Concrete Breakout									
Effectiveness factor for uncracked concrete	k_{uncr}	–	10						
Effectiveness factor for cracked concrete	k_{cr}	–	7						
Modifcation factor for cracked and uncracked	$\Psi_{c,N}$	–	1						
Minimum concrete thickness	h_{min}	mm	h_{ef} + 31.75		h_{ef} + 2d				
Anchor embedment depth – minimum	$h_{ef,min}$	mm	60.3	69.9	79.4	88.9	88.9	101.6	127.0
Minimum spacing	s_{min}	mm	23.8	38.1	63.5	76.2	88.9	101.6	127.0
Minimum edge distance	c_{min}	mm	23.8	38.1	63.5	76.2	88.9	101.6	127.0
Critical edge distance	c_{ac}	mm	See Section 4.1.10 of the evaluation report ESR 3903						
Material resistance factor for concrete	Φ_c	–	0.65						
Strength reduction factor for tension, concrete failure modes [3,4]	R	Cond. A	1.15						
	R	Cond. B	1						
Strength reduction factor for shear, concrete failure modes [3,4]	R	Cond. A	1.15						
	R	Cond. B	1						
Modification Factor for concrete density	λ	–	1						

Bond Strength											
Nominal Rod Diameter In. (mm)					**3/8 (9.5)**	**1/2 (12.7)**	**5/8 (15.9)**	**3/4 (19.1)**	**7/8 (22.2)**	**1 (25.4)**	**1-1/4 (31.8)**
Temperature Range A [1]	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)		12.2 (1770)	12.2 (1770)	12.2 (1770)	12.2 (1770)	10.3 (1490)	10.3 (1490)	10.3 (1490)
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)		7.3 (1060)	5.4 (790)	5.9 (860)	6.1 (885)	4.8 (695)	4.5 (655)	4.0 (585)
Temperature Range B [2]	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)		8.8 (1275)	8.8 (1275)	8.8 (1275)	8.8 (1275)	7.4 (1080)	7.4 (1080)	7.4 (1080)
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)		5.3 (1080)	3.9 (570)	4.3 (620)	4.4 (640)	3.4 (500)	3.3 (475)	2.9 (420)
Continuous Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,ci}$	–		0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,ci}$	–		0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,ci}$	–		0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,ci}$	–		0.65	0.55	0.55	0.65	0.65	0.55	0.65
Periodic Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,pi}$	–		0.55	0.55	0.55	0.55	0.55	0.55	0.65
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,pi}$	–		0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,pi}$	–		0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,pi}$	–		0.65	0.45	0.45	0.65	0.55	0.45	0.65
Reduction factor for seismic tension		$a_{N,seis}$	–		0.89	0.75	0.76	0.66	0.77	0.80	0.80

1 Temperature Range A: Max short term temperature = 130°F (55°C), max long term temperature = 110°F (43°C)
2 Temperature Range B: Max short term temperature = 176°F (80°C), max long term temperature = 110°F (43°C)
3 Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member except where pullout or pryout resistance governs
4 Condition B applies where supplementary reinforcement is not provided or where pullout or pryout strength governs

A7+ Hybrid Adhesive — Factored Steel Strength for Rebar[1,2]

Rebar	Tension kN (lb), Nsar[2]		Shear kN (lb) Vsar[3]		Seismic Shear kN (lb), Vsar,seismic[4]	
No. 3	30	(6,732)	17	(3,787)	15	(3,446)
No. 4	54	(12,240)	31	(6,885)	28	(6,265)
No. 5	84	(18,972)	47	(10,672)	43	(9,711)
No. 6	120	(26,928)	67	(15,147)	61	(13,632)
No. 7	163	(36,720)	92	(20,655)	83	(18,590)
No. 8	215	(48,348)	121	(27,196)	86	(19,309)
No. 9	272	(61,200)	153	(34,425)	115	(25,819)
No. 10	346	(77,724)	194	(43,720)	138	(31,041)

1 Values correspond to a ductile steel element
2 Tension values calculated according to Cl. D6.1.2 in CSA A23.3-14 Annex D
3 Shear values calculated according to Cl. D7.1.2 in CSA A23.3-14 Annex D
4 Seismic shear was calculated according to Vsar*aV,seis
5 Carbon Steel Grade ASTM A615 Grade 60 Rebar

A7+ Hybrid Adhesive — Concrete Breakout and Bond Strength for Rebar

	Symbol	Units	Reinforcing Steel Bar Size							
Nominal Anchor Size	do		No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 9
Concrete Breakout										
Effectiveness factor for uncracked concrete	k_{uncr}	–	10							
Effectiveness factor for cracked concrete	k_{cr}	–	7							
Minimum concrete thickness	h_{min}	mm	h_{ef} + 31.75		h_{ef} + 2do					
Anchor embedment depth – minimum	$h_{ef,min}$	mm	60.3	69.9	79.4	88.9	88.9	101.6	114.3	127.0
Minimum spacing	s_{min}	mm	23.8	38.1	63.5	76.2	88.9	101.6	114.3	127.0
Minimum edge distance	c_{min}	mm	23.8	38.1	63.5	76.2	88.9	101.6	114.3	127.0
Critical edge distance	c_{ac}	mm	See Section 4.1.10 of the evaluation report ESR 3903							
Material resistance factor for concrete	Φ_c	–	0.65							
Strength reduction factor for tension, concrete failure modes [3,4]	R	Cond. A	1.15							
	R	Cond. B	1							
Strength reduction factor for shear, concrete failure modes [3,4]	R	Cond. A	1.15							
	R	Cond. B	1							
Modification Factor for concrete density	λ	–	1							

Bond Strength										
Nominal Anchor Size				No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
Temperature Range A[2]	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)	11.5 (1675)	13.3 (1935)	13.1 (1900)	11.7 (1700)	11.3 (1635)	11.1 (1615)	10.9 (1585)	10.7 (1550)
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)	5.2 (755)	5.2 (755)	5.2 (755)	4.0 (585)	4.0 (585)	4.0 (585)	4.0 (585)	4.2 (605)
Temperature Range B[3,4]	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)	8.3 (1210)	9.6 (1395)	9.5 (1210)	8.5 (1230)	8.1 (1180)	8.0 (1165)	7.9 (1145)	7.7 (1120)
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)	3.8 (545)	3.8 (545)	3.8 (545)	2.9 (420)	2.9 (420)	2.9 (420)	2.9 (420)	3.0 (435)
Continuous Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,ci}$	–	0.65	0.55	0.55	0.65	0.65	0.55	0.55	0.65
Periodic Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,pi}$	–	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.65
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,pi}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,pi}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,pi}$	–	0.65	0.45	0.45	0.65	0.55	0.45	0.45	0.65
Reduction factor for seismic tension		$a_{N,seis}$	–	0.92	0.92	0.92	0.82	0.82	0.82	0.82	0.83

1 Temperature Range A: Max short term temperature = 130°F (55°C), max long term temperature = 110°F (43°C)
2 Temperature Range B: Max short term temperature = 176°F (80°C), max long term temperature = 110°F (43°C)
3 Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member except where pullout or pryout resistance governs
4 Condition B applies where supplementary reinforcement is not provided or where pullout or pryout strength governs

Combined Tension and Shear Loading—for A7+ Adhesive Anchors

Allowable loads for anchors under tension and shear loading at the same time (combined loading) will be lower than the allowable loads for anchors subjected to 100% tension or 100% shear. For combined tension and shear loading, please see Section 4.2.2 of ICC ESR 3903

A7+ Hybrid Adhesive

Factored Concrete Breakout/Bond Failure Strength for Threaded Rod

Tension, kN (lbf)

Nominal anchor diameter In. (mm)	Effective Embedment In. (mm)	UNCRACKED						CRACKED					
		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)	
3/8 (9.5)	2-3/8 (60)	13.6	(3,060)	14.3	(3,215)	14.3	(3,215)	8.6	(1,925)	8.6	(1,925)	8.6	(1,925)
	3-3/8 (86)	20.3	(4,570)	20.3	(4,570)	20.3	(4,570)	12.2	(2,735)	12.2	(2,735)	12.2	(2,735)
	4-1/2 (114)	27.1	(6,095)	27.1	(6,095)	27.1	(6,095)	16.2	(3,645)	16.2	(3,645)	16.2	(3,645)
	7-1/2 (191)	45.2	(10,160)	45.2	(10,160)	45.2	(10,160)	27.0	(6,075)	27.0	(6,075)	27.0	(6,075)
1/2 (12.7)	2-3/4 (70)	17.0	(3,815)	20.8	(4,670)	22.1	(4,965)	9.9	(2,220)	9.9	(2,220)	9.9	(2,220)
	4-1/2 (114)	35.5	(7,985)	36.2	(8,130)	36.2	(8,130)	16.1	(3,630)	16.1	(3,630)	16.1	(3,630)
	6 (152)	48.2	(10,835)	48.2	(10,835)	48.2	(10,835)	21.5	(4,840)	21.5	(4,840)	21.5	(4,840)
	10 (254)	80.3	(18,060)	80.3	(18,060)	80.3	(18,060)	35.9	(8,065)	35.9	(8,065)	35.9	(8,065)
5/8 (15.9)	3-1/8 (79)	20.6	(4,620)	25.2	(5,660)	29.1	(6,535)	14.4	(3,235)	15.2	(3,425)	15.2	(3,425)
	5-5/8 (143)	49.6	(11,160)	56.5	(12,700)	56.5	(12,700)	27.4	(6,165)	27.4	(6,165)	27.4	(6,165)
	7-1/2 (191)	75.3	(16,935)	75.3	(16,935)	75.3	(16,935)	36.6	(8,220)	36.6	(8,220)	36.6	(8,220)
	12-1/2 (318)	125.5	(28,220)	125.5	(28,220)	125.5	(28,220)	61.0	(13,705)	61.0	(13,705)	61.0	(13,705)
3/4 (19.1)	3-1/2 (89)	24.4	(5,480)	29.8	(6,710)	34.5	(7,745)	17.1	(3,835)	20.9	(4,695)	21.1	(4,755)
	6-3/4 (171)	65.3	(14,670)	79.9	(17,970)	81.3	(18,290)	40.8	(9,170)	40.8	(9,170)	40.8	(9,170)
	9 (229)	100.5	(22,585)	108.5	(24,385)	108.5	(24,385)	54.4	(12,225)	54.4	(12,225)	54.4	(12,225)
	15 (381)	180.8	(40,640)	180.8	(40,640)	180.8	(40,640)	90.6	(20,375)	90.6	(20,375)	90.6	(20,375)
7/8 (22.2)	3-1/2 (89)	24.4	(5,480)	29.8	(6,710)	34.5	(7,745)	17.1	(3,835)	19.3	(4,335)	19.3	(4,335)
	7-7/8 (200)	82.2	(18,485)	93.4	(20,995)	93.4	(20,995)	43.4	(9,750)	43.4	(9,750)	43.4	(9,750)
	10-1/2 (267)	124.5	(27,990)	124.5	(27,990)	124.5	(27,990)	57.8	(13,000)	57.8	(13,000)	57.8	(13,000)
	17-1/2 (445)	207.5	(46,655)	207.5	(46,655)	207.5	(46,655)	96.4	(21,670)	96.4	(21,670)	96.4	(21,670)
1 (25.4)	4 (102)	29.8	(6,690)	36.5	(8,195)	42.1	(9,465)	20.8	(4,685)	23.8	(5,350)	23.8	(5,350)
	9 (229)	100.5	(22,585)	122.0	(27,420)	122.0	(27,420)	53.5	(12,040)	53.5	(12,040)	53.5	(12,040)
	12 (305)	154.7	(34,775)	162.6	(36,560)	162.6	(36,560)	71.4	(16,050)	71.4	(16,050)	71.4	(16,050)
	20 (508)	271.0	(60,935)	271.0	(60,935)	271.0	(60,935)	119.0	(26,750)	119.0	(26,750)	119.0	(26,750)
1-1/4 (31.8)	5 (127)	41.6	(9,355)	51.0	(11,455)	58.8	(13,225)	29.1	(6,545)	33.1	(7,440)	33.1	(7,440)
	11-1/4 (286)	140.4	(31,565)	172.0	(38,660)	190.6	(42,845)	74.5	(16,740)	74.5	(16,740)	74.5	(16,740)
	15 (381)	216.2	(48,600)	254.1	(57,125)	254.1	(57,125)	99.3	(22,320)	99.3	(22,320)	99.3	(22,320)
	25 (635)	423.5	(95,210)	423.5	(95,210)	423.5	(95,210)	165.5	(37,205)	165.5	(37,205)	165.5	(37,205)

A7+ Hybrid Adhesive

Factored Concrete Breakout/Bond Failure Strength for Threaded Rod

Shear, kN (lbf)

Nominal anchor diameter In. (mm)	Effective Embedment In. (mm)	UNCRACKED						CRACKED					
		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)	
3/8 (9.5)	2-3/8 (60)	13.6	(3,060)	14.3	(3,215)	14.3	(3,215)	8.6	(1,925)	8.6	(1,925)	8.6	(1,925)
	3-3/8 (86)	40.7	(9,145)	40.7	(9,145)	40.7	(9,145)	24.3	(5,470)	24.3	(5,470)	24.3	(5,470)
	4-1/2 (114)	54.2	(12,190)	54.2	(12,190)	54.2	(12,190)	32.4	(7,290)	32.4	(7,290)	32.4	(7,290)
	7-1/2 (191)	90.4	(20,320)	90.4	(20,320)	90.4	(20,320)	54.1	(12,155)	54.1	(12,155)	54.1	(12,155)
1/2 (12.7)	2-3/4 (70)	33.9	(7,630)	41.6	(9,345)	44.2	(9,935)	19.7	(4,435)	19.7	(4,435)	19.7	(4,435)
	4-1/2 (114)	71.0	(15,970)	72.3	(16,255)	72.3	(16,255)	32.3	(7,260)	32.3	(7,260)	32.3	(7,260)
	6 (152)	96.4	(21,675)	96.4	(21,675)	96.4	(21,675)	43.1	(9,680)	43.1	(9,680)	43.1	(9,680)
	10 (254)	160.7	(36,125)	160.7	(36,125)	160.7	(36,125)	71.8	(16,130)	71.8	(16,130)	71.8	(16,130)
5/8 (15.9)	3-1/8 (79)	41.1	(9,245)	50.4	(11,320)	58.1	(13,070)	28.8	(6,470)	121.9	(27,410)	121.9	(27,410)
	5-5/8 (143)	99.3	(22,320)	113.0	(25,400)	113.0	(25,400)	54.9	(12,335)	54.9	(12,335)	54.9	(12,335)
	7-1/2 (191)	150.6	(33,865)	150.6	(33,865)	150.6	(33,865)	73.1	(16,445)	73.1	(16,445)	73.1	(16,445)
	12-1/2 (318)	251.1	(56,445)	251.1	(56,445)	251.1	(56,445)	121.9	(27,410)	121.9	(27,410)	121.9	(27,410)
3/4 (19.1)	3-1/2 (89)	48.7	(10,955)	59.7	(13,420)	68.9	(15,495)	34.1	(7,670)	41.8	(9,390)	42.3	(9,510)
	6-3/4 (171)	130.5	(29,340)	159.8	(35,935)	162.7	(36,575)	81.6	(18,340)	81.6	(18,340)	81.6	(18,340)
	9 (229)	200.9	(45,175)	216.9	(48,765)	216.9	(48,765)	108.8	(24,450)	108.8	(24,450)	108.8	(24,450)
	15 (381)	361.5	(81,280)	361.5	(81,280)	361.5	(81,280)	181.3	(40,755)	181.3	(40,755)	181.3	(40,755)
7/8 (22.2)	3-1/2 (89)	48.7	(10,955)	59.7	(13,420)	68.9	(15,495)	34.1	(7,670)	38.6	(8,670)	38.6	(8,670)
	7-7/8 (200)	164.5	(36,975)	186.8	(41,990)	186.8	(41,990)	86.8	(19,500)	86.8	(19,500)	86.8	(19,500)
	10-1/2 (267)	249.0	(55,985)	249.0	(55,985)	249.0	(55,985)	115.7	(26,005)	115.7	(26,005)	115.7	(26,005)
	17-1/2 (445)	415.0	(93,305)	415.0	(93,305)	415.0	(93,305)	192.8	(43,340)	192.8	(43,340)	192.8	(43,340)
1 (25.4)	4 (102)	59.5	(13,385)	72.9	(16,395)	84.2	(18,930)	41.7	(9,370)	47.6	(10,700)	47.6	(10,700)
	9 (229)	200.9	(45,175)	243.9	(54,840)	243.9	(54,840)	107.1	(24,075)	107.1	(24,075)	107.1	(24,075)
	12 (305)	309.4	(69,550)	325.3	(73,120)	325.3	(73,120)	142.8	(32,100)	142.8	(32,100)	142.8	(32,100)
	20 (508)	542.1	(121,870)	542.1	(121,870)	542.1	(121,870)	238.0	(53,500)	238.0	(53,500)	238.0	(53,500)
1-1/4 (31.8)	5 (127)	83.2	(18,705)	101.9	(22,910)	117.7	(26,455)	58.2	(13,095)	66.2	(14,880)	66.2	(14,880)
	11-1/4 (286)	280.8	(63,135)	343.9	(77,320)	381.2	(85,690)	148.9	(33,485)	148.9	(33,485)	148.9	(33,485)
	15 (381)	432.4	(97,200)	508.2	(114,250)	508.2	(114,250)	198.6	(44,645)	198.6	(44,645)	198.6	(44,645)
	25 (635)	847.0	(190,420)	847.0	(190,420)	847.0	(190,420)	331.0	(74,405)	331.0	(74,405)	331.0	(74,405)

1 These load values are for the purposes of estimation only and should not be used in design
2 Assuming single anchor with no edge or spacing distances, nor environmental factors that would reduce the load.
3 Design loads include their respective Φc and Φs material resistance factors for concrete and steel from CSA A23.3-14 Cl. 8.4.2 and 8.4.3
4 Design loads include their respective strength reduction factor for dry, water saturated and water filled hole conditions. Refer to design information table for threaded rod for submerged conditions (Φsub).
5 All design loads are calculated according to Condition B for concrete failure mode factor R
6 Temperature Range A (long term temperature 43°C, short term temperature 55°C)
7 Temperature Range B (long term temperature 43°C, short term temperature 80°C)
8 Values for continuous inspection with dry, water saturated or water filled concrete

A7+ Hybrid Adhesive

Factored Concrete Breakout/Bond Failure Strength for Reinforcing Bars
Tension, kN (lbf)

US Rebar Size (mm)	Effective Embedment In. (mm)	UNCRACKED						CRACKED					
		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)	
# 3 (9.5)	3-1/2 (89)	20.0	(4,490)	20.0	(4,490)	20.0	(4,490)	9.0	(2,020)	9.0	(2,020)	9.0	(2,020)
	4-1/2 (114)	25.7	(5,770)	25.7	(5,770)	25.7	(5,770)	11.5	(2,595)	11.5	(2,595)	11.5	(2,595)
	7-1/2 (191)	42.8	(9,620)	42.8	(9,620)	42.8	(9,620)	19.2	(4,325)	19.2	(4,325)	19.2	(4,325)
# 4 (12.7)	4-1/2 (114)	35.5	(7,985)	39.5	(8,885)	39.5	(8,885)	15.4	(3,460)	15.4	(3,460)	15.4	(3,460)
	6 (152)	52.7	(11,850)	52.7	(11,850)	52.7	(11,850)	20.5	(4,615)	20.5	(4,615)	20.5	(4,615)
	10 (254)	87.8	(19,745)	87.8	(19,745)	87.8	(19,745)	34.2	(7,690)	34.2	(7,690)	34.2	(7,690)
# 5 (15.9)	5-3/4 (146)	51.3	(11,535)	62.0	(13,930)	62.0	(13,930)	24.6	(5,525)	24.6	(5,525)	24.6	(5,525)
	7-1/2 (191)	76.4	(17,185)	80.8	(18,170)	80.8	(18,170)	32.1	(7,210)	32.1	(7,210)	32.1	(7,210)
	12-1/2 (318)	134.7	(30,280)	134.7	(30,280)	134.7	(30,280)	53.4	(12,015	53.4	(12,015	53.4	(12,015
# 6 (19.1)	6-3/4 (171)	65.3	(14,670)	78.2	(17,575)	78.2	(17,575)	26.9	(6,050)	26.9	(6,050)	26.9	(6,050)
	9 (229)	100.5	(22,585)	104.2	(23,430)	104.2	(23,430)	35.9	(8,065)	35.9	(8,065)	35.9	(8,065)
	15 (381)	173.7	(39,055)	173.7	(39,055)	173.7	(39,055)	59.8	(13,440)	59.8	(13,440)	59.8	(13,440)
# 7 (22.2)	8 (203)	84.2	(18,930)	103.1	(23,185)	104.0	(23,370)	37.2	(8,360)	37.2	(8,360)	37.2	(8,360)
	10-1/2 (267)	126.6	(28,465	136.4	(30,675)	136.4	(30,675)	48.8	(10,975)	48.8	(10,975)	48.8	(10,975)
	17-1/2 (445)	227.4	(51,125)	227.4	(51,125)	227.4	(51,125)	81.4	(18,290)	81.4	(18,290)	81.4	(18,290)
# 8 (25.4)	9 (229)	100.5	(22,585)	123.1	(27,665)	131.9	(29,645)	47.8	(10,750)	47.8	(10,750)	47.8	(10,750)
	13 (330)	174.4	(39,210)	190.5	(42,820)	190.5	(42,820)	69.1	(15,530)	69.1	(15,530)	69.1	(15,530)
	20 (508)	293.0	(65,875)	293.0	(65,875)	293.0	(65,875)	106.3	(23,890)	106.3	(23,890)	106.3	(23,890)
# 9 (28.6)	10-1/2 (267)	126.6	(28,465)	155.1	(34,860)	170.1	(38,235)	62.8	(14,110)	62.8	(14,110)	62.8	(14,110)
	13-1/2 (343)	184.6	(41,495)	218.7	(49,155)	218.7	(49,155)	80.7	(18,145)	80.7	(18,145)	80.7	(18,145)
	20 (508)	323.9	(72,825)	323.9	(72,825)	323.9	(72,825)	119.6	(26,880)	119.6	(26,880)	119.6	(26,880)
# 10 (32.2)	12 (305)	154.7	(34,775)	189.5	(42,590)	211.1	(47,445)	82.2	(18,470)	82.2	(18,470)	82.2	(18,470)
	15 (381)	216.2	(48,600)	263.8	(59,310)	263.8	(59,310)	102.7	(23,090)	102.7	(23,090)	102.7	(23,090)
	25 (635)	439.7	(98,850)	439.7	(98,850)	439.7	(98,850)	171.2	(38,480)	171.2	(38,480)	171.2	(38,480)

A7+ Hybrid Adhesive

Factored Concrete Breakout/Bond Failure Strength for Reinforcing Bars
Shear, kN (lbf)

US Rebar Size (mm)	Effective Embedment In. (mm)	UNCRACKED						CRACKED					
		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)		f'c = 20 Mpa (2900 psi)		f'c = 30 Mpa (4350 psi)		f'c = 40 Mpa (5800 psi)	
# 3 (9.5)	3-1/2 (89)	39.9	(8,980)	39.9	(8,980)	39.9	(8,980)	18.0	(4,035)	18.0	(4,035)	18.0	(4,035)
	4-1/2 (114)	51.3	(11,545)	51.3	(11,545)	51.3	(11,545)	23.1	(5,190)	23.1	(5,190)	23.1	(5,190)
	7-1/2 (191)	85.6	(19,240)	85.6	(19,240)	85.6	(19,240)	38.5	(8,650)	38.5	(8,650)	38.5	(8,650)
# 4 (12.7)	4-1/2 (114)	71.0	(15,970)	79.1	(17,770)	79.1	(17,770)	30.8	(6,920)	30.8	(6,920)	30.8	(6,920)
	6 (152)	105.4	(23,695)	105.4	(23,695)	105.4	(23,695)	41.0	(9,225)	41.0	(9,225)	41.0	(9,225)
	10 (254)	175.7	(39,495)	175.7	(39,495)	175.7	(39,495)	68.4	(15,375)	68.4	(15,375)	68.4	(15,375)
# 5 (15.9)	5-3/4 (146)	102.6	(23,070)	123.9	(27,855)	123.9	(27,855)	49.2	(11,050)	49.2	(11,050)	49.2	(11,050)
	7-1/2 (191)	152.9	(34,365)	161.6	(36,335)	161.6	(36,335)	64.1	(14,415)	64.1	(14,415)	64.1	(14,415)
	12-1/2 (318)	269.4	(60,560)	269.4	(60,560)	269.4	(60,560)	106.9	(24,025)	106.9	(24,025)	106.9	(24,025)
# 6 (19.1)	6-3/4 (171)	130.5	(29,340)	156.3	(35,150)	156.3	(35,150)	53.8	(12,095)	53.8	(12,095)	53.8	(12,095)
	9 (229)	200.9	(45,175)	208.5	(46,865)	208.5	(46,865)	71.7	(16,125)	71.7	(16,125)	71.7	(16,125)
	15 (381)	347.4	(78,110)	347.4	(78,110)	347.4	(78,110)	119.6	(26,880)	119.6	(26,880)	119.6	(26,880)
# 7 (22.2)	8 (203)	168.4	(37,860)	206.2	(46,365)	207.9	(46,740)	74.4	(16,725)	74.4	(16,725)	74.4	(16,725)
	10-1/2 (267)	253.2	(56,925)	272.9	(61,350)	272.9	(61,350)	97.6	(21,950)	97.6	(21,950)	97.6	(21,950)
	17-1/2 (445)	454.8	(102,250)	454.8	(102,250)	454.8	(102,250)	162.7	(36,585)	162.7	(36,585)	162.7	(36,585)
# 8 (25.4)	9 (229)	200.9	(45,175)	246.1	(55,325)	263.7	(59,290)	95.6	(21,505)	95.6	(21,505)	95.6	(21,505)
	13 (330)	348.8	(78,420)	380.9	(85,640)	380.9	(85,640)	138.2	(31,060)	138.2	(31,060)	138.2	(31,060)
	20 (508)	586.1	(131,755)	586.1	(131,755)	586.1	(131,755)	212.6	(47,785)	212.6	(47,785)	212.6	(47,785)
# 9 (28.6)	10-1/2 (267)	253.2	(56,925)	310.1	(69,720)	310.1	(69,720)	125.5	(28,220)	125.5	(28,220)	125.5	(28,220)
	13-1/2 (343)	369.2	(82,990)	437.3	(98,315)	437.3	(98,315)	161.4	(36,285)	161.4	(36,285)	161.4	(36,285)
	20 (508)	647.9	(145,650)	647.9	(145,650)	647.9	(145,650)	239.1	(53,755)	239.1	(53,755)	239.1	(53,755)
# 10 (32.2)	12 (305)	309.4	(69,550)	378.9	(85,180)	422.1	(94,895)	164.3	(36,940)	164.3	(36,940)	164.3	(36,940)
	15 (381)	432.4	(97,200)	527.6	(118,615)	527.6	(118,615)	205.4	(46,175)	205.4	(46,175)	205.4	(46,175)
	25 (635)	879.4	(197,695)	879.4	(197,695)	879.4	(197,695)	342.3	(76,960)	342.3	(76,960)	342.3	(76,960)

1 These load values are for the purposes of estimation only and should not be used in design
2 Assuming single anchor with no edge or spacing distances, nor environmental factors that would reduce the load.
3 Design loads include their respective Φc and Φs material resistance factors for concrete and steel from CSA A23.3-14 Cl. 8.4.2 and 8.4.3
4 Design loads include their respective strength reduction factor for dry, water saturated and water filled hole conditions. Refer to design information table for threaded rod for submerged conditions (Φsub).
5 All design loads are calculated according to Condition B for concrete failure mode factor R
6 Temperature Range A (long term temperature 43°C, short term temperature 55°C)
7 Temperature Range B (long term temperature 43°C, short term temperature 80°C)
8 Values for continuous inspection with dry, water saturated or water filled concrete

A7+ Hybrid Adhesive — Average Ultimate Tension and Shear Loads[1,2] for Threaded Rod Installed in Grout Filled Concrete Block

THREADED ROD DIA.	DRILL HOLE DIAMETER In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR LOCATION In. (mm)	ULTIMATE TENSION Lbs. (kN)	ULTIMATE SHEAR Lbs. (kN)
1/2 (12.7)	5/8 (15.9)	4-1/4 (108.0)	GROUTED CELL	5,170 (23.0)	8,500 (37.8)
5/8 (15.9)	3/4 (19.1)	5 (127.0)	GROUTED CELL	6,320 (28.1)	10,850 (48.3)
3/4 (19.1)	7/8 (22.2)	6-5/8 (168.3)	GROUTED CELL	10,910 (48.5)	17,075 (76.0)

1 Allowable working loads for the single installations should not exceed 25% (an industry standard) capacity or the allowable load of the anchor rod. Loads based upon testing with ASTM A193, Grade B7 rods.

2 The tabulated values are for anchors installed at minimum 12 inch edge distance and minimum 8 inch spacing.

A7+ Hybrid Adhesive — Average Ultimate Tension and Shear Loads[1] for Threaded Rod Installed in Grouted[2] Brick Masonry Constructed of Solid Red Brick Units

THREADED ROD DIA.	DRILL HOLE DIAMETER In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR LOCATION In. (mm)	ULTIMATE TENSION Lbs. (kN)	ULTIMATE SHEAR Lbs. (kN)
1/4 (6.4)	3/8 (9.5)	3-1/2 (88.9) 6 (152.4)	CENTER OF BRICK FACE	2,130 (9.5) 3,575 (15.9)	1,165 (5.2) 1,550 (6.9)
3/8 (9.5)	1/2 (12.7)	3-1/2 (88.9) 6 (152.4)	CENTER OF BRICK FACE	2,130 (9.5) 8,875 (39.5)	4,150 (18.5) 6,950 (30.9)
1/2 (12.7)	5/8 (15.9)	3-1/2 (88.9) 6 (152.4)	CENTER OF BRICK FACE	2,130 (9.5) 12,155 (54.1)	3,090 (13.7) 7,910 (35.2)

1 Allowable working loads for the single installations should not exceed 25% (an industry standard) capacity or the allowable load of the anchor rod. Loads based upon testing with ASTM A193, Grade B7 rods.

2 Void between brick wythes was grouted solid; therefore the use of screens was not necessary.

A7+ Hybrid Adhesive — Recommended Edge Distance Requirements for Tension Loads Installed in Solid Concrete

ANCHOR DIAMETER In. (mm)	EMBEDMENT DEPTH In. (mm)	CRITICAL EDGE DISTANCE In. (mm) (100% LOAD CAPACITY)	INTERPOLATED EDGE DISTANCE In. (mm) (90% LOAD CAPACITY)	INTERPOLATED EDGE DISTANCE In. (mm) (80% LOAD CAPACITY)	MINIMUM EDGE DISTANCE In. (mm) (70% LOAD CAPACITY)
3/8 (9.5)	3-3/8 (85.7) 4-1/2 (114.3)	2-1/2 (63.5) 3-3/8 (85.7)	1-15/16 (49.2) 2-5/8 (66.7)	1-3/8 (34.9) 1-7/8 (47.6)	13/16 (26.2) 1-1/8 (28.6)
1/2 (12.7)	4-1/2 (114.3) 6 (152.4)	3-3/8 (85.7) 4-1/2 (114.3)	2-5/8 (66.7) 3-1/2 (88.9)	1-7/8 (47.6) 2-1/2 (63.5)	1-1/8 (28.6) 1-1/2 (38.1)
5/8 (15.9)	5-5/8 (142.9) 7-1/2 (190.5)	4-3/16 (106.4) 5-5/8 (142.9)	3-1/4 (82.6) 4-3/8 (111.1)	2-5/16 (58.7) 3-1/8 (79.4)	1-3/8 (34.9) 1-7/8 (47.6)
3/4 (19.1)	6-3/4 (171.5) 9 (228.6)	5-1/16 (128.6) 6-3/4 (171.5)	3-15/16 (100.0) 5-1/4 (133.4)	2-13/16 (71.4) 3-3/4 (95.3)	1-5/8 (15.9) 2-1/4 (57.2)
1 (25.4)	9 (228.6) 12 (304.8)	6-3/4 (171.5) 9 (228.6)	5-1/4 (133.4) 7 (177.8)	3-3/4 (95.3) 5 (127.0)	2-1/4 (57.2) 3 (76.2)
1-1/4 (31.8)	11-1/4 (285.8) 15 (381.0)	8-7/16 (214.3) 11-1/4 (285.8)	6-9/16 (166.7) 8-3/4 (222.2)	4-3/4 (120.7) 6-1/4 158.8)	2-7/8 (73.0) 3-3/4 (95.3)

A7+ Quick-Cure Adhesive

Grout-filled Concrete Block: Allowable Tension and Shear Loads based on Steel Design Information for U.S. Customary Unit Threaded Rod [1, 2, 3]

Anchor Diameter (in.)	Tension (lb)			Shear (lb)		
	ASTM A307 F_u = 60 ksi	ASTM A193 Grade B7 F_u = 125 ksi	ASTM F593 SS 304 F_u = 100 ksi	ASTM A307 F_u = 60 ksi	ASTM A193 Grade B7 F_u = 125 ksi	ASTM F593 SS 304 F_u = 100 ksi
3/8	2,185	4,555	3,645	1,125	2,345	1,875
1/2	3,885	8,100	6,480	2,000	4,170	3,335
5/8	6,075	12,655	10,125	3,130	6,520	5,215
3/4	8,750	18,225	12,390	4,505	9,390	6,385

For SI: 1 inch = 25.4mm, 1 lbf = 4.45N, 1ft-lbf = 1.356 N-M, 1 psi = 0.006895 MPa

1 Allowable load used in the design must be the lesser of bond values and tabulated steel element values.

2 Allowable tension and shear loads for threaded rods to resist short term loads, such as wind or seismic, must be calculated in accordance with Section 4.1 as applicable.

3 Allowable steel loads are based on allowable tension and shear stresses equal to 0.33X Fu and 0.17xFu, respectively.

A7+ Quick-Cure Adhesive

Grout-filled Concrete Block: Allowable Tension Loads for Threaded Rod [1, 2, 3, 4, 7, 9, 10, 11, 12]

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} (lb)	Spacing[5]			Edge Distance[6]		
			Critical s_{cr} (inches)	Minimum s_{min} (inches)	Load reduction factor for s_{min} [8]	Critical c_{cr} (inches)	Minimum c_{min} (inches)	Load reduction factor for c_{min} [8]
3/8	3-3/8	1,125	13.5	4	1.00	12	4	1.00
1/2	4-1/2	1,695	18	4	0.60	20	4	0.90
5/8	5-5/8	2,015	22.5	4	0.60	20	4	0.90
3/4	6-3/4	3,145	27	4	0.60	20	4	0.63

A7+ Quick-Cure Adhesive

Grout-filled Concrete Block: Allowable Shear Loads for Threaded Rod [1, 2, 3, 4, 7, 9, 10, 11, 12]

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} (lb)	Spacing[5]			Edge Distance[6]		
			Critical s_{cr} (inches)	Minimum s_{min} (inches)	Load reduction factor for s_{min} [8]	Critical c_{cr} (inches)	Minimum c_{min} (inches)	Load reduction factor for c_{min} [8]
3/8	3-3/8	750	13.5	4	0.50	12	4	0.95
1/2	4-1/2	1,520	18	4	0.50	20	4	.044
5/8	5-5/8	2,285	22.5	4	0.50	22	4	0.26
3/4	6-3/4	2,345	27	4	0.50	20	4	0.26

For SI: 1 inch = 25.4mm, 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa. (Refer to Table 4 for footnotes)

1 All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi (10.3 MPa). Concrete masonry units must be light-, medium, or normal-weight conforming to ASTM C 90. Allowable loads have been calculated using a safety factor of 5.0.

3 Anchors may be installed in any location in the face of the masonry wall (cell, web, bed joint) as shown in Figure 2.

4 A maximum of two anchors may be installed in a single masonry cell in accordance with the spacing and edge or end distance requirements. Embedment is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor. See Figure 2 of this report.

5 The critical spacing distance, scr, is the anchor spacing where full load values in the table may be used. The minimum spacing distance, smin, is the minimum anchor spacing for which values are available and installation is permitted. Spacing distance is measured from the centerline to centerline between two anchors.

6 The critical edge or end distance, ccr, is the distance where full load values in the table may be used. The minimum edge or end distance, cmin, is the minimum distance for which values are available and installation is permitted. Edge or end distance is measured from anchor centerline to the closest unrestrained edge.

7 The tabulated values are applicable for anchors in the ends of grout-filled concrete masonry units where minimum edge distances are maintained.

8 Load values for anchors installed less than scr and ccr must be multiplied by the appropriate load reduction factor based on actual spacing (s) or edge distance (c). Load factors are multiplicative; both spacing and edge reduction factors must be considered.

9 Linear interpolation of load values between minimum spacing (smin) and critical spacing (scr) and between minimum edge or end distance (cmin) and critical edge or end distance (ccr) is permitted.

10 Concrete masonry width (wall thickness) must be equal to or greater than 1.5 times the anchor embedment depth (e.g. 3/8-inch- and 1/2-inch-diameter anchors are permitted in minimum nominally 6-inch-thick concrete masonry). The 5/8- and 3/4-inch-diameter anchors must be installed in minimum nominally 8-inch-thick concrete masonry.

11 Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel strength values given in Table 2.

12 Tabulated allowable bond loads must be adjusted for increased in-service base material temperatures in accordance with Figure 1, as applicable.

A7+ Quick-Cure Adhesive — Grout-filled Concrete Block: Allowable Tension and Shear Loads for Rebar [1, 2, 3]

Rebar Size	Tension (lb)	Shear (lb)
	ASTM A615, Grade 60	ASTM A615, Grade 60
No. 3	3,270	1,685
No. 4	5,940	3,060
No. 5	9,205	4.745
No. 6	13,070	6,730

For SI: 1 inch = 25.4mm, 1 lbf = 4.45N, 1ft-lbf = 1.356 N-M, 1 psi = 0.006895 MPa

1 Allowable load used in the design must be the lesser of bond values and tabulated steel element values.

2 Allowable tension and shear loads for threaded rods to resist short term loads, such as wind or seismic, must be calculated in accordance with Section 4.1 as applicable.

3 Allowable steel loads are based on allowable tension and shear stresses equal to 0.33X Fu and 0.17xFu, respectively.

A7+ Quick-Cure Adhesive — Grout-filled Concrete Block: Allowable Tension Loads for Rebar [1, 2, 3, 4, 7, 9, 10, 11, 12]

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} (lb)	Spacing[5]			Edge Distance[6]		
			Critical s_{cr} (inches)	Minimum s_{min} (inches)	Load reduction factor for s_{min} [8]	Critical c_{cr} (inches)	Minimum c_{min} (inches)	Load reduction factor for c_{min} [8]
3/8	3-3/8	1,530	13.5	4	1.00	12	4	1.00
1/2	4-1/2	1,845	18	4	0.60	20	4	0.90
5/8	5-5/8	2,465	22.5	4	0.60	20	4	0.90
3/4	6-3/4	2,380	27	4	0.60	20	4	0.63

A7+ Quick-Cure Adhesive — Grout-filled Concrete Block: Allowable Shear Loads for Rebar [1, 2, 3, 4, 7, 9, 10, 11, 12]

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} (lb)	Spacing[5]			Edge Distance[6]		
			Critical s_{cr} (inches)	Minimum s_{min} (inches)	Load reduction factor for s_{min} [8]	Critical c_{cr} (inches)	Minimum c_{min} (inches)	Load reduction factor for c_{min} [8]
3/8	3-3/8	1,410	13.5	4	0.50	12	4	0.95
1/2	4-1/2	1,680	18	4	0.50	20	4	0.44
5/8	5-5/8	3,245	22.5	4	0.50	12	4	0.26
3/4	6-3/4	4,000	27	4	0.50	20	4	0.26

For SI: 1 inch = 25.4 mm; 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa.

(The following footnotes apply to both Tables 6 and 7)

1 All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi (10.3 MPa). Concrete masonry units must be light-, medium, or normal-weight conforming to ASTM C 90. Allowable loads have been calculated using a safety factor of 5.0.

3 Anchors may be installed in any location in the face of the masonry wall (cell, web, bed joint) as shown in figure 2.

4 A maximum of two anchors may be installed in a single masonry cell in accordance with the spacing and edge or end distance requirements. Embedment is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor. See Figure 2 of this report.

5 The critical spacing distance, scr, is the anchor spacing where full load values in the table may be used. The minimum spacing distance, smin, is the minimum anchor spacing for which values are available and installation is permitted. Spacing distance is measured from the centerline to centerline between two anchors.

6 The critical edge or end distance, ccr, is the distance where full load values in the table may be used. The minimum edge or end distance, cmin, is the minimum distance for which values are available and installation is permitted. Edge or end distance is measured from anchor centerline to the closest unrestrained edge.

7 The tabulated values are applicable for anchors in the ends of grout-filled concrete masonry units where minimum edge distances are maintained.

8 Load values for anchors installed less than scr and ccr must be multiplied by the appropriate load reduction factor based on actual spacing (s) or edge distance (c). Load factors are multiplicative; both spacing and edge reduction factors must be considered.

9 Linear interpolation of load values between minimum spacing (smin) and critical spacing (scr) and between minimum edge or end distance (cmin) and critical edge or end distance (ccr) is permitted.

10 Concrete masonry width (wall thickness) must be equal to or greater than 1.5 times the anchor embedment depth (e.g. No. 3 and No. 4 reinforcing bars are permitted in minimum nominally 6-inch-thick concrete masonry). No. 5 and No. 6 reinforcing bars must be installed in minimum nominally 8-inch-thick concrete masonry.

11 Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel strength values given in Table 4.

12 Tabulated allowable bond loads must be adjusted for increased in-service base material temperatures in accordance with Figure 1, as applicable.

RED HEAD®
ADHESIVE ANCHORING SYSTEMS

C6+

Performance—Highest Cracked Concrete Bond Strength

DESCRIPTION/SUGGEST SPECIFICATIONS*

*Suggested Specifications see page RH 24

High Performance Epoxy for All Conditions

The hardener and resin are completely mixed as they are dispensed from the dual cartridge through a static mixing nozzle. The pre-mixed adhesive is injected directly into the anchor hole. C6+ can be used with threaded rod or rebar (for fastening to hollow base materials, see pages RH 34 to RH 37).

ADVANTAGES

- ICC-ES Evaluation Report No. 3577
- Works in damp holes and water-filled holes
- Minimum shrinkage—can be used in oversized holes and diamond cored holes
- Free nozzle included with each cartridge
- NSF standard 61 certified for drinking water systems
- Extensively tested—earthquake, underwater, creep, freeze-thaw, radiation, fire, fatigue, electrical isolation, ozone and many more test programs have been conducted on C6+
- Best in class performance, On average the highest bond strength in dry, saturated and water-filled conditions.

Curing Times

BASE MATERIAL[1] (F°/C°)	WORKING TIME[2]	FULL CURE TIME
104°/ 40°	3 minutes	3 hours
95°/ 35°	4 minutes	4 hours
86°/ 30°	6 minutes	5 hours
77°/ 25°	8 minutes	6 hours
72°/ 22°	11 minutes	7 hours
59°/ 15°	15 minutes	8 hours
50°/ 10°	20 minutes	12 hours
40°/ 4°	20 minutes	24 hours

[1] For concrete temperature between 4°C and 10°C, adhesive must be maintained at a minimum of 10°C during installation

[2] Working time is max time from the end of mixing to when the insertion of the anchor into the adhesive shall be completed. Gel Time per ASTM D2471 = 11 minutes at 22°C

APPLICATIONS

- Formulated and approved for use in dry concrete, water saturated concrete and water-filled concrete.
- Highest bond strength compared with other adhesives
- NSF standard 61 certified for drinking water systems

Spacing and Edge Distance

NOMINAL ANCHOR DIAMETER (IN.)	MINIMUM SPACING (IN.)	MINIMUM EDGE DISTANCE (IN.)
3/8	1-1/2	1-1/2
1/2	1-1/2	1-1/2
5/8	1-3/4	1-3/4
3/4	1-7/8	1-7/8
7/8	2	2
1	2	2
1-1/4	2-1/2	2-1/2

APPLICATIONS

Gene Leahy Mall Renovation
Anchors were installed with no concerns with the environment using ITW Epcon C6+.

Boston, San Diego, Evanston
Contractors enjoy the easy pump, easy storage and superior performance for rebar dowling and brick tie application.

FEATURES

ANCHORAGE TO SOLID CONCRETE

- Threaded Rod (Carbon or Stainless Steel) or Rebar supplied by contractor; rod does not need to be chisel pointed
- C6+ adhesive completely fills area between rod and hole creating a stress-free, high load anchorage
- Pre-drilled hole in concrete; see performance tables for suggested hole sizes

APPROVALS/LISTINGS

ICC Evaluation Service, Inc. – #ESR-3577, approved for Cracked, Uncracked, and all Seismic Zones (A - F)

NSF Standard 61 Certified for Drinking Water Components

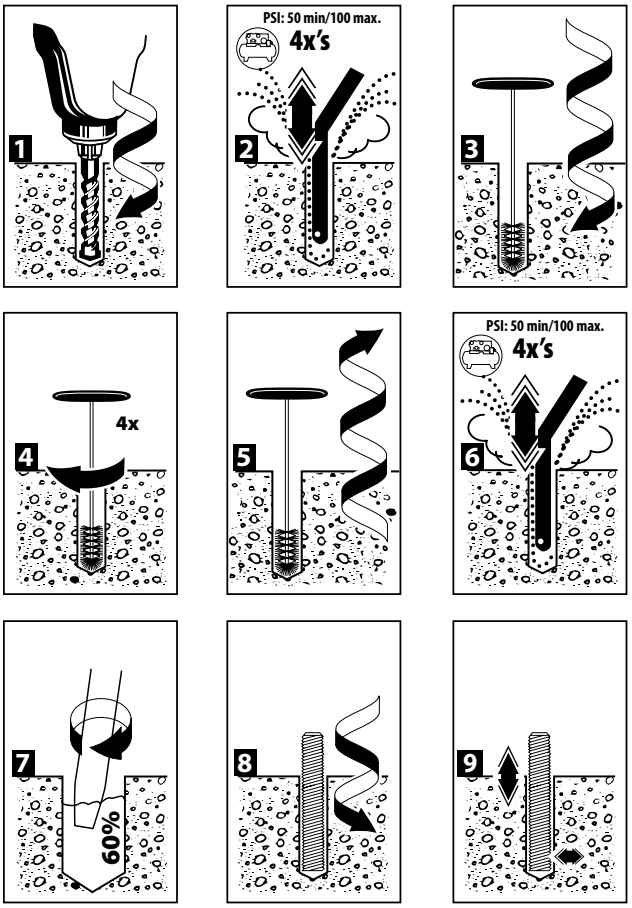
IBC 2003/2006/2009/2012/2015

IRC 2003/2006/2009/2012/2015

Florida Building Code

NSF Certified to ANSI/NSF 61

INSTALLATION STEPS



C6+ –20 fl. oz. Ordering Information

PART NUMBER	DESCRIPTION	BOX QTY
 C6P-20	20 Fluid Ounce Cartridge C6+ with nozzle	4
 S75	High Flow Mixing Nozzle for C6P-20 Cartridge Nozzle diameter fits holes for 5/8″ diameter & larger anchors (overall length of nozzle 9-1/4″)	24
 S55	Mixing Nozzle for C6P-20 Cartridge Nozzle diameter fits holes for 3/8″ diameter & larger anchors (overall length of nozzle 10″)	24

PART NUMBER	DESCRIPTION	BOX QTY
 E102-V2	Hand Dispenser for C6P-20	1
 E202	Pneumatic Dispenser for C6P-20	1

Refer to page RH 39 for ordering information on wire brushes, brush extensions, and blow pump for deep holes.

ESTIMATING TABLES

C6+ 20 Fluid Ounce Cartridge

Number of Anchoring Installations per Cartridge* Using Reinforcing Bar with C6+ Adhesive in Solid Concrete

REBAR	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
#3	7/16	400.2	200.1	133.4	100.1	80.0	66.7	57.2	50.0	44.5	40.0	36.4	33.4	30.8	28.6	26.7
#4	5/8	196.1	98.1	65.4	49.0	39.2	32.7	28.0	24.5	21.8	19.6	17.8	16.3	15.1	14.0	13.1
#5	3/4	136.2	68.1	45.4	34.0	27.2	22.7	19.5	17.0	15.1	13.6	12.4	11.3	10.5	9.7	9.1
#6	7/8	100.1	50.0	33.4	25.0	20.0	16.7	14.3	12.5	11.1	10.0	9.1	8.3	7.7	7.1	6.7
#7	1	76.6	38.3	25.5	19.2	15.3	12.8	10.9	9.6	8.5	7.7	7.0	6.4	5.9	5.5	5.1
#8	1-1/8	60.5	30.3	20.2	15.1	12.1	10.1	8.6	7.6	6.7	6.1	5.5	5.0	4.7	4.3	4.0
#9	1-1/4	49.0	24.5	16.3	12.3	9.8	8.2	7.0	6.1	5.4	4.9	4.5	4.1	3.8	3.5	3.3
#10	1-3/8	40.5	20.3	13.5	10.1	8.1	6.8	5.8	5.1	4.5	4.1	3.7	3.4	3.1	2.9	2.7
#11	1-3/4	25.0	12.5	8.3	6.3	5.0	4.2	3.6	3.1	2.8	2.5	2.3	2.1	1.9	1.8	1.7

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

ESTIMATING TABLES

C6+ 20 Fluid Ounce Cartridge

Number of Anchoring Installations per Cartridge* Using Threaded Rod with C6+ Adhesive in Solid Concrete

THREADED ROD	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
1/4	5/16	784.5	392.2	261.5	196.1	156.9	130.7	112.1	98.1	87.2	78.4	71.3	65.4	60.3	56.0	52.3
3/8	7/16	400.2	200.1	133.4	100.1	80.0	66.7	57.2	50.0	44.5	40.0	36.4	33.4	30.8	28.6	26.7
1/2	9/16	242.1	121.1	80.7	60.5	48.4	40.4	34.6	30.3	26.9	24.2	22.0	20.2	18.6	17.3	16.1
5/8	11/16	162.1	81.0	54.0	40.5	32.4	27.0	23.2	20.3	18.0	16.2	14.7	13.5	12.5	11.6	10.8
	3/4	136.2	68.1	45.4	34.0	27.2	22.7	19.5	17.0	15.1	13.6	12.4	11.3	10.5	9.7	9.1
3/4	13/16	116.0	58.0	38.7	29.0	23.2	19.3	16.6	14.5	12.9	11.6	10.5	9.7	8.9	8.3	7.7
	7/8	100.1	50.0	33.4	25.0	20.0	16.7	14.3	12.5	11.1	10.0	9.1	8.3	7.7	7.1	6.7
7/8	15/16	87.2	43.6	29.1	21.8	17.4	14.5	12.5	10.9	9.7	8.7	7.9	7.3	6.7	6.2	5.8
	1	76.6	38.3	25.5	19.2	15.3	12.8	10.9	9.6	8.5	7.7	7.0	6.4	5.9	5.5	5.1
1	1-1/16	67.9	33.9	22.6	17.0	13.6	11.3	9.7	8.5	7.5	6.8	6.2	5.7	5.2	4.8	4.5
	1-1/8	60.5	30.3	20.2	15.1	12.1	10.1	8.6	7.6	6.7	6.1	5.5	5.0	4.7	4.3	4.0
1-1/4	1-1/3	44.5	22.2	14.8	11.1	8.9	7.4	6.4	5.6	4.9	4.4	4.0	3.7	3.4	3.2	3.0
	1-3/8	40.5	20.3	13.5	10.1	8.1	6.8	5.8	5.1	4.5	4.1	3.7	3.4	3.1	2.9	2.7

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

C6+–10 fl. oz. Ordering Information

PART NUMBER	DESCRIPTION	BOX QTY
 C6P-10	10 Fluid Ounce Cartridge C6+ with nozzle	6
 A24S	Additional Mixing Nozzle for C6P-10 Cartridge Nozzle diameter fits holes for 3/8" diameter & larger anchors (overall length of nozzle 7-3/8")	24
 A100	Hand Dispenser for C6P-10 (26:1 Thrust Ratio)	1

Refer to page RH 39 for ordering information on wire brushes, brush extensions, and blow pump for deep holes.

ESTIMATING TABLES

C6+ 10 Fluid Ounce Cartridge

Number of Anchoring Installations per Cartridge* Using Reinforcing Bar and Threaded Rod with C6+ Adhesive in Solid Concrete

REBAR	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)			
		2 (50.8)	4 (101.6)	6 (152.4)	8 (203.2)
# 3	7/16	100.1	50.0	33.4	25.0
# 4	5/8	49.0	24.5	16.3	12.3
# 5	3/4	34.0	17.0	11.3	8.5
# 6	7/8	25.0	12.5	8.3	6.3
# 7	1	19.2	9.6	6.4	4.8
# 8	1-1/8	15.1	7.6	5.0	3.8

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

ROD In (mm)	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)			
		2 (50.8)	4 (101.6)	6 (152.4)	8 (203.2)
3/8 (9.5)	7/16	100.1	50.0	33.4	25.0
1/2 (12.7)	9/16	60.5	30.3	20.2	15.1
5/8 (15.9)	11/16 3/4	40.5 34.0	20.3 17.0	13.5 11.3	10.1 8.5
3/4 (19.1)	13/16 7/8	29.0 25.0	14.5 12.5	9.7 8.3	7.3 6.3
7/8 (22.2)	15/16 1	21.8 19.2	10.9 9.6	7.3 6.4	5.4 4.8
1 (25.4)	1-1/16 1-1/8	17.0 15.1	8.5 7.6	5.7 5.0	4.2 3.8

PACKAGING

1. Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper mixing ratio
2. Epoxy components dispensed through a static mixing nozzle that thoroughly mixes the material and places the epoxy at the base of the pre-drilled hole
3. Cartridge markings: Include manufacturer's name, batch number and best-used-by date, mix ratio by volume, ANSI hazard classification, and appropriate ANSI handling precautions

SUGGESTED SPECIFICATIONS

EPOXY ADHESIVE:

High Strength EPOXY ADHESIVE: USA Made, ARRA Certified

1. Two component resin and hardener, 100% solids (containing no solvents or VOC's), non-sag paste, insensitive to moisture, grey in color, early working time and gel time appropriate for sever installation conditions, suitable for extreme temperature ranges, for all conditions or substrate materials.
2. Meets NSF Standard 61, certified for use in conjunction with drinking water systems.
3. Works in wet, damp, submerged holes.
4. Conforms to ASTM C881-02; Type I & IV; Grade 3; Class A, B, and C; with exceptions.
5. Compressive strength, ASTM D695-02: 12,090 psi minimum.
6. Heat deflection temperature: 60°C minimum.
7. Extended Shelf life: Best if used within 2 years.
8. Reliable performance in solid or hollow base materials.
9. Oversized and/or diamond cored holes permitted.

C6+ – 20 oz. CARTRIDGE

Qty./Carton : 4
C6P-20 (11553546)

TOOL

E102-V2
(0123111)

E202

NOZZLE

Qty./Carton : 24 "High Flow" Mixing Nozzle
S75 (2115712)

Qty./Carton : 24 Mixing Nozzle
S55 (2115709)

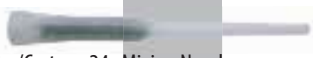
C6+ – 10 oz. CARTRIDGE

Qty./Carton : 6
C6P-10 (11553563)

TOOL

A100
(0226156)

NOZZLE



Qty./Carton : 24 Mixing Nozzle
A24S (0123107)

PERFORMANCE TABLE

C6+ Epoxy Adhesive — Adhesive Anchor Bond Strength for Threaded Rod[1]

CHARACTERISTIC		SYMBOL	UNITS	NOMINAL ROD DIAMETER (inch)						
				3/8	1/2	5/8	3/4	7/8	1	1-1/4
Anchor embedment depth - minimum		h_{ef}	in	2-3/8	2-3/4	3-1/8	3-1/2	4	4	5
Anchor embedment depth - maximum		h_{ef}	in	7-1/2	10	12-1/2	15	17-1/2	20	25
Temperature Range A [2,4]	Characteristic Bond Strength for Uncracked Concrete	$t_{k,uncr}$	psi	1,350						
	Characteristic Bond Strength for Cracked Concrete	$t_{k,cr}$	psi	1,150	1,090	1,025	965	900	840	715
Temperature Range B [3,4]	Characteristic Bond Strength for Uncracked Concrete	$t_{k,uncr}$	psi	725						
	Characteristic Bond Strength for Cracked Concrete	$t_{k,cr}$	psi	620	620	620	620	620	620	620

[1] Bond strength values correspond to concrete compressive strengths f'c = 2,500psi. Bond strength values must not be increased for increased concrete compressive strength.

[2] Temperature range A: Maximum short term temperature of 55°C and maximum long term temperature of 43°C

[3] Temperature range B: Maximum short term temperature of 80°C and maximum long term temperature of 43°C

[4] Short-term elevated concrete temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling. Long-term concrete temperatures are roughly constant over significant periods of time.

C6+ Epoxy Adhesive — Adhesive Anchor Bond Strength for Reinforcing Bar[1]

CHARACTERISTIC		SYMBOL	UNITS	REINFORCING BAR						
				#3	#4	#5	#6	#7	#8	#10
Anchor embedment depth - minimum		h_{ef}	in	2-3/8	2-3/4	3-1/8	3-1/2	4	4	5
Anchor embedment depth - maximum		h_{ef}	in	7-1/2	10	12-1/2	15	17-1/2	20	25
Temperature Range A[2,4]	Characteristic Bond Strength for Uncracked Concrete	$t_{k,uncr}$	psi	1,350						
	Characteristic Bond Strength for Cracked Concrete	$t_{k,cr}$	psi	1,150	1,090	1,025	965	900	840	715
Temperature Range B[3,4]	Characteristic Bond Strength for Uncracked Concrete	$t_{k,uncr}$	psi	725						
	Characteristic Bond Strength for Cracked Concrete	$t_{k,cr}$	psi	620	620	620	620	620	620	620

[1] Bond strength values correspond to concrete compressive strengths f'c = 2,500psi. Bond strength values must not be increased for increased concrete compressive strength.

[2] Temperature range A: Maximum short term temperature of 55°C and maximum long term temperature of 43°C

[3] Temperature range B: Maximum short term temperature of 80°C and maximum long term temperature of 43°C

[4] Short-term elevated concrete temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling. Long-term concrete temperatures are roughly constant over significant periods of time.

C6+ Epoxy Adhesive — Bond Strength Reduction Factors for Threaded Rod[1, 2]

CHARACTERISTIC		SYMBOL	NOMINAL ROD DIAMETER (inch)						
			3/8	1/2	5/8	3/4	7/8	1	1-1/4
Continuous Inspection[3]	Strength Reduction Factor – Dry Concrete	$Ø_{dry, ci}$	0.65						
	Strength Reduction Factor – Saturated Concrete	$Ø_{sat, ci}$	0.65						
	Strength Reduction Factor – Water-Filled Holes	$Ø_{wf, ci}$	0.65						
Periodic Inspection[3]	Strength Reduction Factor – Dry Concrete	$Ø_{dry, pi}$	0.65						
	Strength Reduction Factor – Saturated Concrete	$Ø_{sat, pi}$	0.55			0.65			
	Strength Reduction Factor – Water-Filled Holes	$Ø_{wf, pi}$	0.55						

[1] Φ reduction factors must be applied to calculated adhesive design loads

[2] The tabulated value of Φ applies when the load combination of Section 1605.2 of the IBC, or ACI 318 Section 9.2 are used in accordance with ACI 318 D.4.4. If the load combinations of ACI 318 Appendix C are used, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.

[3] Inspections per 2009 IBC Section 1702.1

C6+ Epoxy Adhesive — Bond Strength Reduction Factors for Reinforcing Bars[1, 2]

	CHARACTERISTIC	SYMBOL	NOMINAL ROD DIAMETER (inch)						
			#3	#4	#5	#6	#7	#8	#10
Continuous Inspection[3]	Strength Reduction Factor – Dry Concrete	$Ø_{dry, ci}$	0.65						
	Strength Reduction Factor – Saturated Concrete	$Ø_{sat, ci}$	0.65						
	Strength Reduction Factor – Water-Filled Holes	$Ø_{wf, ci}$	0.65						
Periodic Inspection[3]	Strength Reduction Factor – Dry Concrete	$Ø_{dry, pi}$	0.65						
	Strength Reduction Factor – Saturated Concrete	$Ø_{sat, pi}$	0.55			0.65			
	Strength Reduction Factor – Water-Filled Holes	$Ø_{wf, pi}$	0.65						

[1] Φ reduction factors must be applied to calculated adhesive

[2] The tabulated value of Φ applies when the load combination of Section 1605.2 of the IBC, or ACI 318 Section 9.2 are used in accordance with ACI 318 D.4.4. If the load combinations of ACI 318 Appendix C are used, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.

[3] Inspections per 2009 IBC Section 1702.1

C6+ Epoxy Adhesive — Threaded Rod Strength Design Tension Load Estimation Table[1,2,3]

THREADED ROD DIAMETER (IN.)	EFFECTIVE EMBEDMENT DEPTH (IN.)	DRY CONCRETE		SATURATED CONCRETE	
		UNCRACKED (LBS)	CRACKED (LBS)	UNCRACKED (LBS)	CRACKED (LBS)
3/8	2-3/8	2455	2091	2078	1770
	3-3/8	3489	2972	2952	2515
	7-1/2	7268	6605	6561	5589
1/2	2-3/4	3791	3061	3207	2590
	4-1/2	6203	5008	5248	4238
	10	13305	11129	11663	9417
5/8	3-1/8	5384	3861	4556	3459
	5-5/8	9692	7359	8201	6226
	12-1/2	21188	16352	18224	13837
3/4	3-1/2	6460	4576	6460	4576
	6-3/4	13956	9976	13956	9976
	15	31013	22169	31013	22169
7/8	3-1/2	6460	4576	6460	4576
	7-7/8	18996	12664	18996	12664
	17-1/2	42213	28142	42213	28142
1	4	7893	5591	7893	5591
	9	24811	15438	24811	15438
	20	55135	34306	55135	34306
1-1/4	5	11031	7814	11031	7814
	11-1/4	37229	20532	37229	20532
	25	86148	45627	86148	45627

[1] Additional reduction factors required for working and dead loads

[2] Assuming single anchor with no edge or spacing distances, environmental factors that would reduce the load. Design loads include their respective Φ reduction factor from ACI 318 Appendix D, Condition B.

[3] Temperature Range A (long term temperature 55°C, short term temperature 43°C)

[4] Concrete compressive strength of 4,000 psi

[5] For periodic and continuous inspection with dry concrete

[6] Steel tensile strength of 125,000 psi (ASTM A193 Grade B7)

FAILURE MODE	CONCRETE	ADHESIVE	STEEL

Refer to Truspec Software for all design needs

C6+ Epoxy Adhesive — Reinforcing Bar Strength Design Tension Load Estimation Table[1,2,3]

REINFORCING BAR SIZE	EFFECTIVE EMBEDMENT DEPTH (IN.)	DRY CONCRETE		SATURATED CONCRETE	
		UNCRACKED (LBS)	CRACKED (LBS)	UNCRACKED (LBS)	CRACKED (LBS)
#3 (3/8")	2-3/8	2455	2091	2078	1770
	3-3/8	3489	2972	2952	2515
	7-1/2	6435	6435	6435	5589
#4 (1/2")	2-3/4	3791	3061	3207	2590
	4-1/2	6203	5008	5248	4238
	10	11700	11129	11663	9417
#5 (5/8")	3-1/8	5384	3861	4556	3459
	5-5/8	9692	7539	8201	6226
	12-1/2	18135	16352	18135	13837
#6 (3/4")	3-1/2	6460	4576	6460	4576
	6-3/4	13956	9976	13956	9976
	15	25740	22169	25740	22169
#7 (7/8")	3-1/2	6460	4576	6460	4576
	7-7/8	18996	12664	18996	12664
	17-1/2	35100	28142	35100	28142
#8 (1")	4	7893	5591	7893	5591
	9	24811	15438	24811	15438
	20	46215	34306	46215	34306
#10 (1-1/4")	5	11031	7814	11031	7814
	11-1/4	37229	20532	37229	20532
	25	74295	45627	74295	45627

[1] Additional reduction factors required for working and dead loads
[2] Assuming single anchor with no edge or spacing distances, environmental factors that would reduce the load. Design loads include their respective Φ reduction factor from ACI 318 Appendix D, Condition B.
[3] Temperature Range A (long term temperature 21°C, short term temperature 43°C)
[4] Temperature Range C (long term temperature 43°C, short term temperature 80°C)
[5] Concrete compressive strength of 4,000 psi
[6] For periodic and continuous inspection with dry concrete
[7] Steel tensile strength of 125,000 psi (ASTM A193 Grade B7)

FAILURE MODE	CONCRETE	ADHESIVE	STEEL

C6+ Epoxy Adhesive — Strength Design Shear Load Estimation Table[1,2,3]

NOMINAL THREADED ROD ANCHOR DIAMETER	EFFECTIVE EMBEDMENT DEPTH (IN)	DESIGN SHEAR $ØV_N$ (LBS.)
3/8"	2-3/8	3,778
	3-3/8	3,778
	7-1/2	3,778
1/2"	2-3/4	4,845
	4-1/2	6,918
	10	6,918
5/8"	3-1/8	5,870
	5-5/8	11,018
	12-1/2	11,018
3/4"	3-1/2	6,957
	6-3/4	16,305
	15	16,305
7/8"	3-1/2	6,957
	7-7/8	22,509
	17-1/2	22,509
1"	4	8,500
	9	28,688
	20	29,530
1-1/4"	5	11,879
	11-1/4	40,093
	25	47,244

[1] These load values are for the purposes of estimation only and should not be used in design
[2] Assuming single anchor with no edge or spacing distances, environmental factors that would reduce the load. Design loads include their respective reduction factors from ACI 318 Appendix D, Condition B
[3] Temperature Range A (long-term temperature 21°C, short-term temperature 43°C)
[4] Concrete compressive strength of 4,000 psi (Cracked)
[5] For periodic and continuous inspection with dry concrete
[6] Steel tensile strength of 125,000 psi (ASTM A193 Grade B7)

FAILURE MODE	CONCRETE[4,5]	STEEL[6]

G5

High Strength Epoxy Tested in Accordance to ICC-ES AC308

DESCRIPTION/SUGGEST SPECIFICATIONS*

*Suggested Specifications see pages RH 32

The epoxy resin and hardener are completely mixed as they are dispensed from the dual cartridge through a static mixing nozzle, directly into the anchor hole. G5 can be used with threaded rod or rebar.

Compliant with 2003, 2006, 2009, 2012, & 2015 IBC. Category 1 performance rating.

ADVANTAGES

FORMULATED FOR HOT OR WARM WEATHER

- Fire rated: tested up to 4hrs FRP
- High strength Epoxy
- 15 minute nozzle life at 21°C

RECOGNIZED WORLDWIDE
Fire Tested BS476 4 Hrs FRP

International Standard Fire Resistance Performance

Easy to open, snap-off tip, no cutting required

NON-OFFENSIVE ODOR

- Virtually odorless, can be used indoors

G5-22

E102-V2

Curing Times

MADE IN USA

BASE MATERIAL (F°/C°)	WORKING TIME	FULL CURE TIME
110°/ 43°	9 minutes	24 hours
90°/ 32°	9 minutes	24 hours
70°/ 21°	15 minutes	24 hours
50°/ 10°	15 minutes	24 hours

APPLICATIONS

Anchoring a concrete traffic barrier wall to concrete bridge deck.

Doweling rebar into bridge deck and forming to pour new barrier wall using G5.

Doweling rebar into concrete foundation wall prior to building concrete block wall using G5.

FEATURES

ANCHORAGE TO SOLID CONCRETE

Rebar (shown) or Threaded Rod (carbon or stainless steel) supplied by contractor

G5 adhesive completely fills area between rod and hole creating a stress-free, high load anchorage

Pre-drilled hole in concrete; see performance tables for suggested hole sizes

APPROVALS/LISTINGS

Conforms to ASTM C881-02; Type I & IV; Grade 3; Class A, B, and C; with exceptions

ICC Evaluation Service, Inc.– No. ESR 1137

DOT Approvals

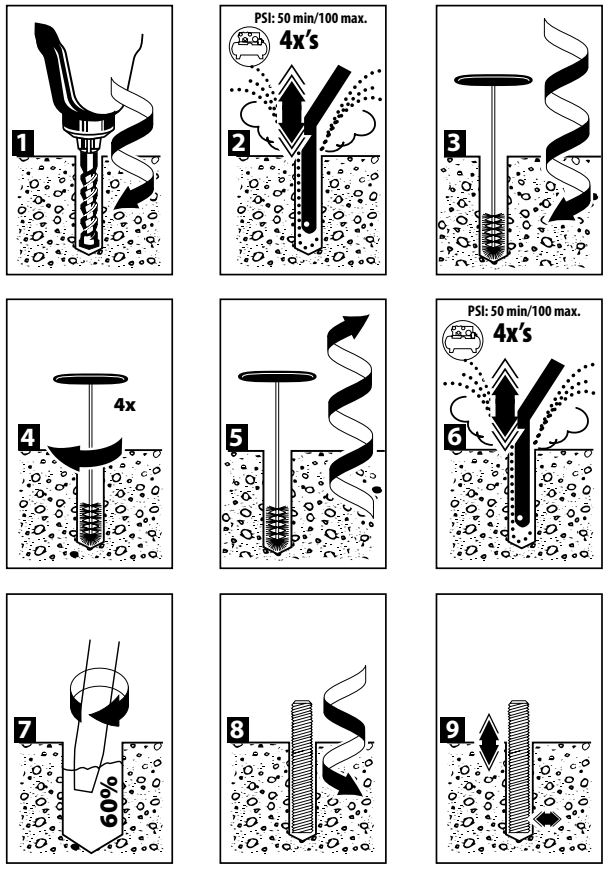
Miami-Dade County # 04-0405.01

Florida Building Code Approved

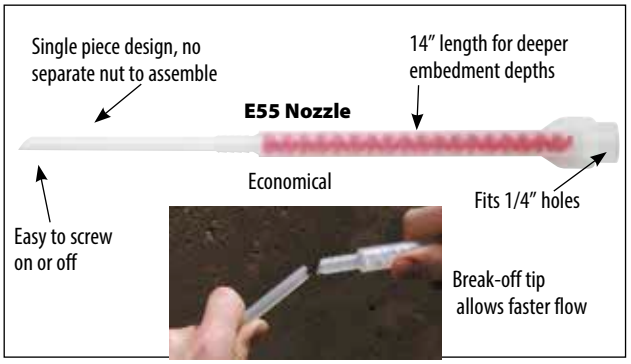
Patent No. 6,874,661

2015 IBC Compliant

INSTALLATION STEPS



*For ICC-ES cleaning method, please go online to www.icc-es.org or www.itwredhead.com.



G5–22 fl. oz. Ordering Information

PART NUMBER	DESCRIPTION	BOX QTY
 G5-22	G5 Adhesive, 22 Fluid Oz. Cartridge	6
 E55	Mixing Nozzle for G5-22 Cartridge Nozzle diameter fits 3/8" to 5/8" holes (overall length of nozzle 14")	24
 E102-V2	Hand Dispenser for G5-22 Cartridge Dispenses both 18 oz. and 22 oz. Cartridges	1

Refer to page RH 39 for ordering information on wire brushes, brush extensions, and blow pump for deep holes.

ESTIMATING TABLE

G5 22 Fluid Ounce Cartridge

Number of Anchoring Installations Per Cartridge* Using Reinforcing Bar with G5 Adhesive in Concrete

REBAR	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
#3	1/2	337.1	168.5	112.4	84.3	67.4	56.2	48.2	42.1	37.5	33.7	30.6	28.1	25.9	24.1	22.5
#4	5/8	215.7	107.9	71.9	53.9	43.1	36.0	30.8	27.0	24.0	21.6	19.6	18.0	16.6	15.4	14.4
#5	3/4	149.8	74.9	49.9	37.5	30.0	25.0	21.4	18.7	16.6	15.0	13.6	12.5	11.5	10.7	10.0
#6	7/8	110.1	55.0	36.7	27.5	22.0	18.3	15.7	13.8	12.2	11.0	10.0	9.2	8.5	7.9	7.3
#7	1-1/8	66.6	33.3	22.2	16.6	13.3	11.1	9.5	8.3	7.4	6.7	6.1	5.5	5.1	4.8	4.4
#8	1-1/4	53.9	27.0	18.0	13.5	10.8	9.0	7.7	6.7	6.0	5.4	4.9	4.5	4.1	3.9	3.6
#9	1-3/8	44.6	22.3	14.9	11.1	8.9	7.4	6.4	5.6	5.0	4.5	4.1	3.7	3.4	3.2	3.0
#10	1-1/2	37.5	18.7	12.5	9.4	7.5	6.2	5.4	4.7	4.2	3.7	3.4	3.1	2.9	2.7	2.5
#11	1-3/4	27.5	13.8	9.2	6.9	5.5	4.6	3.9	3.4	3.1	2.8	2.5	2.3	2.1	2.0	1.8

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

* Oversized holes acceptable but volume of adhesive will increase.

ESTIMATING TABLE

G5 22 Fluid Ounce Cartridge

Number of Anchoring Installations Per Cartridge* Using Threaded Rod with G5 Adhesive in Concrete

THREADED ROD	DRILL HOLE DIA. INCHES	EMBEDMENT DEPTH IN INCHES (mm)														
		1 (25.4)	2 (50.8)	3 (76.2)	4 (101.6)	5 (127.0)	6 (152.4)	7 (177.8)	8 (203.2)	9 (228.6)	10 (254.0)	11 (279.4)	12 (304.8)	13 (330.2)	14 (355.6)	15 (381.0)
1/4	5/16	862.9	431.4	287.6	215.7	172.6	143.8	123.3	107.9	95.9	86.3	78.4	71.9	66.4	61.6	57.5
3/8	7/16	440.3	220.1	146.8	110.1	88.1	73.4	62.9	55.0	48.9	44.0	40.0	36.7	33.9	31.4	29.4
1/2	9/16	266.3	133.2	88.8	66.6	53.3	44.4	38.0	33.3	29.6	26.6	24.2	22.2	20.5	19.0	17.8
5/8	3/4	149.8	74.9	49.9	37.5	30.0	25.0	21.4	18.7	16.6	15.0	13.6	12.5	11.5	10.7	10.0
3/4	7/8	110.1	55.0	36.7	27.5	22.0	18.3	15.7	13.8	12.2	11.0	10.0	9.2	8.5	7.9	7.3
7/8	1	84.3	42.1	28.1	21.1	16.9	14.0	12.0	10.5	9.4	8.4	7.7	7.0	6.5	6.0	5.6
1	1-1/8	66.6	33.3	22.2	16.6	13.3	11.1	9.5	8.3	7.4	6.7	6.1	5.5	5.1	4.8	4.4
1-1/4	1-3/8	44.6	22.3	14.9	11.1	8.9	7.4	6.4	5.6	5.0	4.5	4.1	3.7	3.4	3.2	3.0

* The number of anchoring installations is based upon calculations of hole volumes using ANSI tolerance carbide tipped drill bits, the nominal areas of the reinforcing bars and the stress areas of the threaded rods. These estimates do not account for waste.

PACKAGING

1. Disposable, self-contained 22 ounce cartridge system capable of dispensing both epoxy components in the proper mixing ratio
2. Epoxy components dispensed through a static mixing nozzle that thoroughly mixes the material and places the epoxy at the base of the pre-drilled hole
3. Cartridge markings: Include manufacturer's name, batch number and best-used-by date, mix ratio by volume, ANSI hazard classification, and appropriate ANSI handling precautions

SUGGESTED SPECIFICATIONS

EPOXY ADHESIVE:

High Strength EPOXY ADHESIVE: USA Made, ARRA Certified

1. Odorless, two component resin and hardener, 100% solids (containing no solvents or VOC's), non-sag paste, insensitive to moisture, grey in color, extended working time, medium gel time for warm concrete.
2. Works in wet, damp, or submerged holes.
3. Conforms to ASTM C881-02; Type I & IV; Grade 3; Class A, B, and C; with exceptions.
4. Compressive Strength, ASTM D695-02: 10,344 psi minimum.
5. Heat Deflection Temperature; 62°C minimum.
6. Shelf life: Best if used within 18 months.
7. Formulated for use in warmer concrete, solid grout-filled masonry, and solid brick.
8. Oversized and/or Core drilled holes permitted.
9. Fire-Resistance Performance of 4 Hours

PERFORMANCE TABLE

DRILL HOLE DIAMETERS PROVIDED ON PAGE RH 35

G5 Epoxy Adhesive — Average Ultimate Tension and Shear Loads[1,2,3] for Threaded Rod Installed in Solid Concrete

THREADED ROD DIA. In. (mm)	MAX. CLAMPING FORCE AFTER PROPER CURE Ft.-Lbs. (Nm)	EMBEDMENT CONCRETE In. (mm)	2000 PSI (13.8 MPa) CONCRETE ULTIMATE TENSION Lbs. (kN)	2000 PSI (13.8 MPa) CONCRETE ULTIMATE SHEAR Lbs. (kN)	4000 PSI (27.6 MPa) CONCRETE ULTIMATE TENSION Lbs. (kN)	4000 PSI (27.6 MPa) CONCRETE ULTIMATE SHEAR Lbs. (kN)
3/8 (9.5)	9 (12.2)	3-3/8 (85.7)	5,060 (22.5)	6,227 (27.7)	8,396 (37.3)	6,227 (27.7)
		4-1/2 (114.3)	6,465 (28.8)	6,227 (27.7)	10,490 (46.7)	6,227 (27.7)
1/2 (12.7)	16 (21.6)	4-1/2 (114.3)	10,484 (46.6)	12,016 (53.5)	13,476 (59.9)	12,016 (53.5)
		6 (152.4)	12,392 (55.1)	12,016 (53.5)	19,166 (85.3)	12,016 (53.5)
		7-1/2 (190.5)	–– ––	12,016 (53.5)	20,572 (91.5)	12,016 (53.5)
5/8 (15.9)	47 (63.5)	5-5/8 (142.9)	14,634 (65.1)	17,547 (78.1)	20,880 (92.9)	17,547 (78.1)
		7-1/2 (190.5)	20,182 (89.8)	17,547 (78.1)	27,939 (124.3)	17,547 (78.1)
		9-3/8 (238.1)	–– ––	17,547 (78.1)	32,249 (143.5)	17,547 (78.1)
3/4 (19.1)	90 (121.5)	6-3/4 (171.5)	18,966 (84.4)	24,918 (110.8)	29,019 (129.1)	24,918 (110.8)
		9 (228.6)	25,988 (115.6)	24,918 (110.8)	43,812 (194.9)	24,918 (110.8)
		11-1/4 (285.8)	–– ––	24,918 (110.8)	47,927 (213.2)	24,918 (110.8)
1 (25.4)	276 (372.6)	9 (228.6)	43,804 (194.9)	43,648 (194.2)	53,531 (238.1)	43,648 (194.2)
		12 (304.8)	45,351 (201.6)	43,648 (194.2)	64,022 (284.8)	43,648 (194.2)
		15 (381.0)	–– ––	43,648 (194.2)	82,547 (367.2)	43,648 (194.2)

1 Allowable working loads for the single installations under static loading should not exceed 25% (an industry standard) capacity or the allowable load of the anchor rod.

2 Ultimate load values in 2000 and 4000 psi stone aggregate concrete. Ultimate loads are indicated for the embedment shown in the Embedment in Concrete column. Performance values are based on the use of high strength threaded rod (ASTM A193 Gr. B7). The use of lower strength rods will result in lower ultimate tension and shear loads.

3 Linear interpolation may be used for intermediate spacing and edge distances. (See page RH 33)

G5 Epoxy Adhesive — Allowable Tension Loads[1] for Threaded Rod Installed in Solid Concrete

THREADED ROD DIA. In. (mm)	MIN. EMBEDMENT DEPTH In. (mm)	ALLOWABLE TENSION LOAD BASED ON EPOXY BOND STRENGTH 2000 PSI (13.8 MPa) CONCRETE bs. (kN)	ALLOWABLE TENSION LOAD BASED ON EPOXY BOND STRENGTH 4000 PSI (27.6 MPa) CONCRETE Lbs. (kN)	ALLOWABLE TENSION LOAD BASED ON STEEL STRENGTH ASTM A307 (SAE 1018) Lbs. (kN)	ASTM A193 GR. B7 (SAE 4140) Lbs. (kN)	ASTM F593 AISI 304 SS Lbs. (kN)
3/8 (9.5)	3-3/8 (85.7)	1,265 (5.6)	2,092 (9.3)	2,080 (9.3)	4,340 (19.3)	3,995 (17.8)
	4-1/2 (114.3)	1,616 (7.2)	2,622 (11.7)	2,080 (9.3)	4,340 (19.3)	3,995 (17.8)
1/2 (12.7)	4-1/2 (114.3)	3,004 (13.4)	3,369 (15.0)	3,730 (16.6)	7,780 (34.6)	7,155 (31.8)
	6 (152.4)	3,098 (13.8)	4,791 (21.3)	3,730 (16.6)	7,780 (34.6)	7,155 (31.8)
5/8 (15.9)	5-5/8 (142.9)	3,659 (16.3)	5,220 (23.2)	5,870 (26.1)	12,230 (54.4)	11,250 (50.0)
	7-1/2 (190.5)	5,046 (22.4)	6,985 (31.1)	5,870 (26.1)	12,230 (54.4)	11,250 (50.0)
3/4 (19.1)	6-3/4 (171.5)	4,742 (21.1)	7,255 (32.3)	8,490 (37.8)	17,690 (78.7)	14,860 (66.1)
	9 (228.6)	6,497 (28.9)	10,057 (44.7)	8,490 (37.8)	17,690 (78.7)	14,860 (66.1)
1 (25.4)	9 (228.6)	10,951 (48.7)	11,209 (49.9)	15,180 (67.5)	31,620 (140.6)	26,560 (118.1)
	12 (304.8)	11,338 (50.4)	15,923 (70.8)	15,180 (67.5)	31,620 (140.6)	26,560 (118.1)

1 Use lower value of either bond or steel strength for allowable tensile load.

2 Linear interpolation may be used for intermediate spacing and edge distances. (See page RH 33)

Combined Tension and Shear Loading—for G5 Adhesive Anchors

Allowable loads for anchors under tension and shear loading at the same time (combined loading) will be lower than the allowable loads for anchors subjected to 100% tension or 100% shear. Use the following equation to evaluate anchors in combined loading conditions:

$$\left(\frac{Na}{Ns}\right) + \left(\frac{Va}{Vs}\right) \leq 1$$

Na = Applied Service Tension Load
Ns = Allowable Tension Load
Va = Applied Service Shear Load
Vs = Allowable Shear Load

G5 Epoxy Adhesive — Allowable Shear Loads[1,2] for Threaded Rod Installed in Solid Concrete

THREADED ROD DIA. In. (mm)	MIN. EMBEDMENT DEPTH In. (mm)	ALLOWABLE SHEAR LOAD BASED ON CONCRETE STRENGTH		ALLOWABLE SHEAR LOAD BASED ON STEEL STRENGTH		
		2000 PSI (13.8 MPa) CONCRETE Lbs. (kN)	4000 PSI (27.6 MPa) CONCRETE Lbs. (kN)	ASTM A307 (SAE 1018) Lbs. (kN)	ASTM A193 GR. B7 (SAE 4140) Lbs. (kN)	ASTM F593 AISI 304 SS Lbs. (kN)
3/8 (9.5)	3-3/8 (85.7)	1,557 (6.9)	1,557 (6.9)	1,040 (4.6)	2,170 (9.7)	1,995 (8.9)
1/2 (12.7)	4-1/2 (114.3)	3,004 (13.4)	3,004 (13.4)	1,870 (8.3)	3,895 (17.3)	3,585 (15.9)
5/8 (15.9)	5-5/8 (142.9)	4,387 (19.5)	4,387 (19.5)	2,940 (13.1)	6,125 (27.2)	5,635 (25.1)
3/4 (19.1)	6-3/4 (171.5)	6,230 (27.7)	6,230 (27.7)	4,250 (18.9)	8,855 (39.4)	7,440 (33.1)
1 (25.4)	9 (228.6)	10,912 (48.5)	10,912 (48.5)	7,590 (33.8)	15,810 (70.3)	13,285 (59.1)

1 Use lower value of either concrete or steel strength for allowable shear load.

2 Linear interpolation may be used for intermediate spacing and edge distances. (See below)

G5 Epoxy Adhesive — Average Ultimate Tension Loads[1,2,3] for Reinforcing Bar Installed in Solid Concrete

REINFORCING BAR In. (mm)	EMBEDMENT IN CONCRETE In. (mm)	2000 PSI (13.8 MPa) IN CONCRETE ULTIMATE TENSION Lbs. (kN)	4000 PSI (27.6 MPa) IN CONCRETE ULTIMATE TENSION Lbs. (kN)	ULTIMATE TENSILE AND YIELD STRENGTH GRADE 60 REBAR	
				MINIMUM YIELD STRENGTH Lbs. (kN)	MINIMUM ULTIMATE TENSILE STRENGTH Lbs. (kN)
# 3 (9.5)	3-3/8 (85.7)	7,480 (33.3)	8,090 (35.9)	6,600 (29.4)	9,900 (44.0)
	4-1/2 (114.3)	–– ––	10,488 (46.6)	6,600 (29.4)	9,900 (44.0)
# 4 (12.7)	4-1/2 (114.3)	–– ––	14,471 (64.4)	12,000 (53.4)	18,000 (80.1)
	6 (152.4)	11,235 (50.0)	20,396 (90.7)	12,000 (53.4)	18,000 (80.1)
# 5 (15.9)	5-5/8 (142.9)	–– ––	21,273 (94.6)	18,600 (82.7)	27,900 (124.1)
	7-1/2 (190.5)	18,108 (80.6)	31,863 (141.7)	18,600 (82.7)	27,900 (124.1)
# 6 (19.1)	6-3/4 (171.5)	–– ––	27,677 (123.1)	26,400 (117.4)	39,600 (176.2)
	9 (228.6)	29,338 (130.5)	47,879 (212.9)	26,400 (117.4)	39,600 (176.2)
# 7 (22.2)	7-7/8 (200.0)	–– ––	43,905 (195.3)	36,000 (160.1)	54,000 (240.2)
	10-1/2 (266.7)	–– ––	52,046 (231.5)	36,000 (160.1)	54,000 (240.2)
# 8 (25.4)	9 (228.6)	–– ––	55,676 (247.7)	47,400 (210.9)	71,100 (316.3)
	12 (304.8)	48,000 (213.5)	77,358 (344.1)	47,400 (210.9)	71,100 (316.3)
# 9 (28.6)	10-1/8 (257.2)	–– ––	62,443 (277.8)	60,000 (266.9)	90,000 (400.4)
	13-1/2 (342.9)	–– ––	71,959 (320.1)	60,000 (266.9)	90,000 (400.4)
# 10 (31.8)	11-1/4 (285.8)	–– ––	70,165 (312.1)	76,200 (339.0)	114,300 (508.5)
	15 (381.0)	–– ––	78,545 (349.4)	76,200 (339.0)	114,300 (508.5)

1 Allowable working loads for the single installations under static loading should not exceed 25% ultimate capacity or the allowable load of the anchor rod.

2 Ultimate load values in 2000 and 4000 psi stone aggregate concrete. Ultimate loads are indicated for the embedment shown in the Embedment in Concrete column. Performance values are based on the use of minimum Grade 60 reinforcing bar. The use of lower strength rods will result in lower ultimate tension and shear loads.

3 SHEAR DATA: Provided the distance from the rebar to the edge of the concrete member exceeds 1.25 times the embedment depth of the rebar, calculate the ultimate shear load for the rebar anchorage as 60% of the ultimate tensile strength of the rebar.

G5 Adhesive Anchoring System Edge/Spacing Distance Load Factor Summary[1, 2]

LOAD FACTOR	DISTANCE FROM EDGE OF CONCRETE
Critical Edge Distance—Tension	
100% Tension Load →	1.25 x Anchor Embedment
Minimum Edge Distance—Tension	
70% Tension Load →	0.50 x Anchor Embedment
Critical Edge Distance—Shear	
100% Shear Load →	1.25 x Anchor Embedment
Minimum Edge Distance—Shear	
30% Shear Load →	0.30 x Anchor Embedment

LOAD FACTOR	DISTANCE FROM ANOTHER ANCHOR
Critical Spacing—Tension	
100% Tension Load →	1.50 x Anchor Embedment
Minimum Spacing—Tension	
75% Tension Load →	0.75 x Anchor Embedment
Critical Spacing—Shear	
100% Shear Load →	1.50 x Anchor Embedment
Minimum Spacing—Shear	
30% Shear Load →	0.50 x Anchor Embedment

1 Use linear interpolation for load factors at edge distances or spacing distances between critical and minimum.

2 Anchors are affected by multiple combination of spacing and/or edge distance loading and direction of the loading. Use the product of tension and shear loading factors in design.

Umbrella Inserts and Stubby Screens

High Performance Adhesive Systems for Fastening to Hollow Base Materials

A7P-10

9200

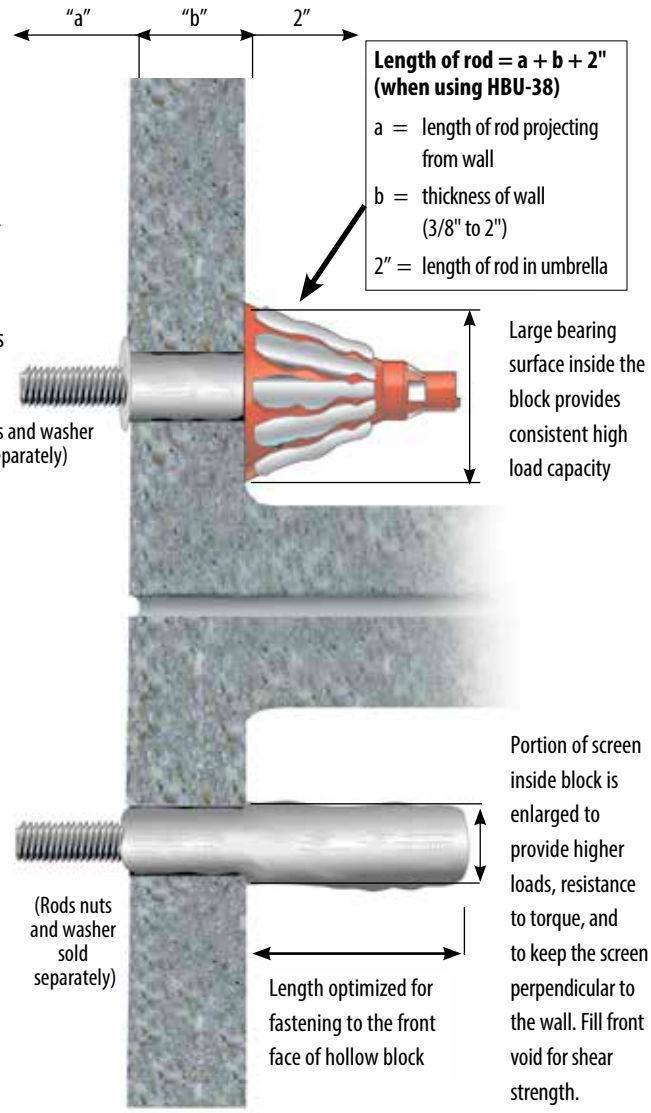
9215

DESCRIPTION/ADVANTAGES

Hollow Block Fastening with A7+ Adhesive

9200

Umbrella Inserts—specially designed for fastening to the face of hollow concrete block, brick, clay tile or terra cotta. Accepts 3/8" rods

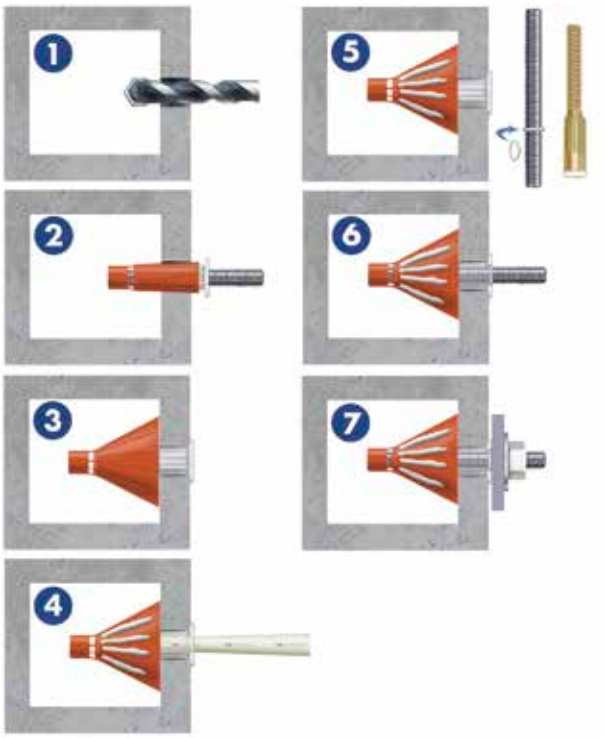


STUBBY SCREENS

Specially designed stainless steel screens provide maximum performance for a screen in the front face of hollow concrete block. Screens available for rods 1/4" to 5/8"

Section View—Concrete Block

INSTALLATION STEPS



1. Drill 3/4" diameter hole, 3-3/4" deep using rotation only drilling mode and carbide tipped drill bit. Clean out hole with forced air. Complete hole preparation with use of a brush and repeat cleaning with compressed air (leave no dust or slurry).
2. Place umbrella on piece of threaded rod, stretch umbrella over the rod by pulling the white collar back approximately 1". Squeeze orange portion of umbrella and push umbrella into hole.
3. Push umbrella body through the hole and completely into void. Remove threaded rod. (Do not use in solid base materials. For anchoring into block web, ends and mortar joints, use screens.) View and verify umbrella wings expanded behind wall.
4. Dispense and discard a sufficient amount of adhesive from new cartridge until a uniform adhesive mix is achieved. Inject approximately 1-1/2 fl. oz. of adhesive into umbrella (7 to 8 pumps using manual dispenser) to completely fill umbrella.
5. 3/8" rod uses a centering ring (supplied with inserts) to keep rod perpendicular to the wall.
6. Insert rod into the filled umbrella using a slow, soft twisting motion until it contacts the back of umbrella.
7. Wait for appropriate temperature/cure time before tightening fixture to the recommended torque of 10 ft./lbs.

Installation instructions for stubby screens provided on page RH 37.

SELECTION CHART
Umbrella Inserts

DESCRIPTION	PART NO.	BOX CONTENTS
Umbrella Anchor 	9200	20 Umbrellas 20 Centering Rings
3/8" Internally Threaded Insert with Umbrella 	9215	10 Umbrellas 10 Flush Sleeve Insert

SELECTION CHART
Stubby Screens

PART NO.	DESCRIPTION	QTY/BOX
HB 38-312	3/8" x 3-1/2" Stainless Screen	100
HB 12-312	1/2" x 3-1/2" Stainless Screen	50
HB 58-412	5/8" x 4-1/2" Stainless Screen	50

ESTIMATING TABLE
Umbrella Inserts

Number of Anchoring Installations Per Cartridge* Using Threaded Rod and Umbrella Inserts with A7+ Adhesives in Hollow Base Material

ROD In (mm)	DRILL HOLE DIA. INCHES	VOLUME OF CARTRIDGE	UMBRELLA INSERT WITH EMBEDMENT OF 3-3/4"
3/8 (9.5)	3/4	A7+ 10 fluid oz.	6
		A7+ 28 fluid oz.	17

* These estimates do not account for waste.

ESTIMATING TABLE

Stubby Screens — Number of Anchoring Installations Per Cartridge* Using Threaded Rod and Stubby Screens with A7+ Adhesives in Hollow Base Material

ROD In (mm)	DRILL HOLE DIA. INCHES	VOLUME OF CARTRIDGE	SCREEN LENGTH PLUS 1 DIAMETER (INCHES)		
			2"	3-1/2"	4-1/2"
3/8 (9.5)	1/2	A7+ 10 fluid oz.		21	
		A7+ 28 fluid oz.		62	
1/2 (12.7)	5/8	A7+ 10 fluid oz.		15	
		A7+ 28 fluid oz.		43	
5/8 (15.9)	3/4	A7+ 10 fluid oz.			11
		A7+ 28 fluid oz.			24

* These estimates do not account for waste.

PERFORMANCE TABLE

Load Values[1, 2] Using A7+ in Hollow Concrete Block

	ROD DIA. In. (mm)	MAX CLAMPING FORCE AFTER PROPER CURE Ft.-Lbs. (Nm)	DRILL HOLE DIA. In. (mm)	EMBEDMENT (SCREEN LENGTH) In. (mm)	ULTIMATE TENSION Lbs. (Kn)	ULTIMATE SHEAR Lbs. (Kn)
Umbrella	3/8 (9.5)	10 (13)	3/4 (19.1)	3-3/4 (95.3)	3,558 (15.8)	3,109 (13.8)
Stubby Screens	3/8 (9.5)	7 (9)	1/2 (12.7)	3-7/8 (98.4)	1,661 (7.4)	2,071 (9.2)
	1/2 (12.7)	10 (13)	5/8 (15.9)	4 (101.6)	2,458 (10.9)	4,467 (19.9)
	5/8 (15.9)	13 (17)	3/4 (19.1)	5-1/8 (130.2)	2,543 (10.9)	5,047 (22.4)

1 Allowable working loads should not exceed 25% ultimate capacity. Based upon testing using ASTM A193, Grade B7 rod.

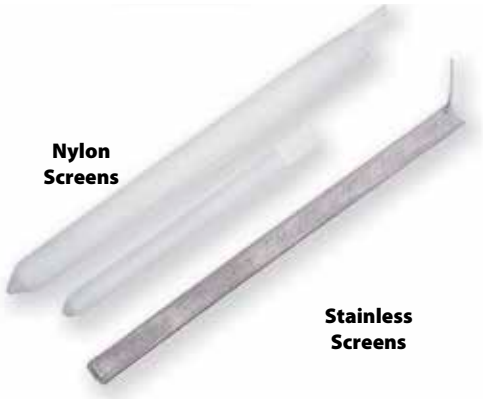
2 The tabulated values are for anchors installed at a minimum 12 inch edge distance and minimum 8 inch spacing.

RED HEAD®
ADHESIVE ANCHORING SYSTEMS

Screen Tubes

Quality Adhesive Systems for Fastening Through Block and for Brick Pinning Applications

A7P-10



Nylon Screens

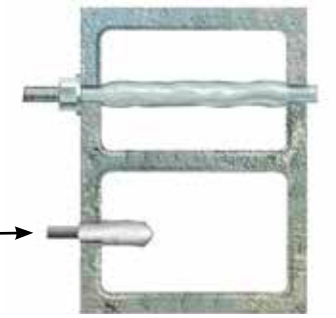
Stainless Screens

DESCRIPTION/SUGGESTED SPECIFICATIONS

Screens Used with A7+

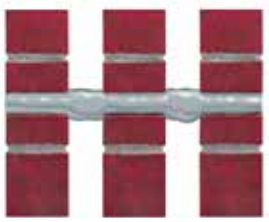
HOLLOW CONCRETE BLOCK
Maximum holding strength in concrete block can be obtained by fastening to both the front and back of the block using an adhesive screen tube and threaded rod.

For attachments to single face of block, see page RH 34 for information on "umbrella anchors" and "stubby screens"



Top View

BRICK WALL
Systems designed for Seismic Retrofit, Brick Pinning or fastening to brick—various lengths and diameters available to accommodate site conditions.



Section

The no-drip feature of A7+ adhesive makes it particularly well suited for brick pinning applications.

ADVANTAGES

HBP SERIES—NYLON SCREENS

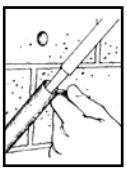
- 30%-50% savings from stainless steel screens
- Comparable performance values
- Easier to insert and span across voids
- Flexible material is less susceptible to damage from crushing

HB SERIES—STAINLESS SCREENS

- Corrosion resistant
- Available in 3/8" to 3/4" diameters
- Special version, "dosage control" available for overhead and underwater installations

INSTALLATION STEPS

1. Drill hole to the length of the screen plus 1 diameter, using rotation-only drilling mode. Clean out hole with forced air. Complete hole preparation with use of a brush and repeat cleaning with forced air (leave no dust or slurry).



2. When starting new cartridge or new nozzle, dispense and discard enough adhesive until uniform adhesive mix is achieved. Insert the nozzle into the bottom of the screen and **fill screen completely full** (use extension tube if needed to reach bottom of screen).

3. Insert the filled screen completely into the hole (subflush).

4. While holding the tab of the screen against the wall, hand insert the selected rod slowly into the screen tube with a slow twisting motion. Pull screen flush to face and coat with adhesive. Wait for appropriate cure time before torquing fixture in place.

Screen Tubes

ESTIMATING TABLE

Screen Tubes — Number of Anchoring Installations Per Cartridge* Using Threaded Rod and Screen Tubes with A7+ Adhesives in Hollow Base Material

ROD In (mm)	DRILL HOLE DIA. INCHES	VOLUME OF CARTRIDGE	SCREEN LENGTH (INCHES)			
			6"	8"	10"	13"
3/8 (9.5)	1/2	A7+ 10 fluid oz.	12	10	7.5	
		A7+ 28 fluid oz.	37	29	23	
1/2 (12.7)	5/8	A7+ 10 fluid oz.	9	6	5	
		A7+ 28 fluid oz.	26	18	14	
5/8 (15.9)	3/4	A7+ 10 fluid oz.	6	5	4	
		A7+ 28 fluid oz.	18	14	10	
3/4 (19.1)	7/8	A7+ 10 fluid oz.			2.5	1.75
		A7+ 28 fluid oz.			6	5

* These estimates do not account for waste.

SELECTION CHART

Screen Tubes

HB Stainless Screen

HBP Nylon Screen

ROD DIA. In. (mm)	SCREEN LENGTH In. (mm)	STAINLESS STEEL SCREENS			NYLON SCREENS		
		PART NO.	QTY/BOX	QTY/MASTER	PART NO.	QTY/BOX	QTY/MASTER
3/8 (9.5)	6 (152.4)	––	––	––	HBP 38-6	50	100
3/8 (9.5)	8 (203.2)	––	––	––	HBP 38-8	25	50
3/8 (9.5)	10 (254.0)	HB 38-10	25	––	HBP 38-10	25	50
1/2 (12.7)	6 (152.4)	––	––	––	HBP 12-6	50	100
1/2 (12.7)	8 (203.2)	––	––	––	HBP 12-8	25	50
1/2 (12.7)	10 (254.0)	––	––	––	HBP 12-10	25	50
5/8 (15.9)	6 (152.4)	––	––	––	HBP 58-6	40	––
5/8 (15.9)	8 (203.2)	––	––	––	HBP 58-8	40	––
5/8 (15.9)	10 (254.0)	––	––	––	HBP 58-10	40	––
3/4 (19.1)	8 (203.2)	––	––	––	*	*	*
3/4 (19.1)	10 (254.0)	HB 34-10	10	––	HBP 34-10	20	––
3/4 (19.1)	13 (330.2)	––	––	––	HBP 34-13	20	––

* Not available in standard strength nylon screens. Longer screens available through specials.

PERFORMANCE TABLE

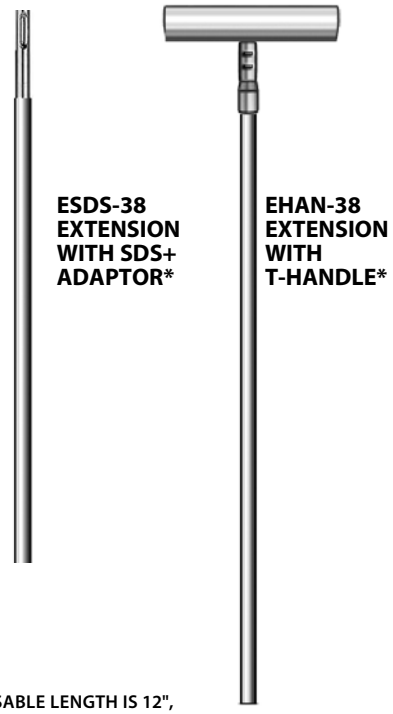
Load Values — Average Ultimate Loads for HBP (nylon) or HB (stainless) Screens Used with A7+ in Hollow Concrete Block[1]

ROD DIA. In. (mm)	DRILL HOLE DIA. In. (mm)	MAX CLAMPING FORCE AFTER PROPER CURE Ft.-Lbs. (Nm)	SCREEN EMBEDMENT (LENGTH) In. (mm)	ULTIMATE TENSION Lbs. (kN)	ULTIMATE SHEAR Lbs. (kN)
1/4 (6.4)	3/8 (9.5)	5 (6)	8 (203.2)	2,072 (9.2)	2,264 (10.1)
3/8 (9.5)	1/2 (12.7)	12 (16)	8 (203.2)	2,360 (10.5)	2,668 (11.9)
1/2 (12.7)	5/8 (15.9)	19 (25)	8 (203.2)	2,647 (11.8)	2,668 (11.9)
5/8 (15.9)	3/4 (19.1)	26 (35)	8 (203.2)	2,647 (11.8)	3,578 (15.9)
3/4 (19.1)	7/8 (22.2)	28 (37)	8 (203.2)	2,647 (11.8)	4,573 (20.3)

1 Allowable working loads should not exceed 25% of ultimate capacity. Loads based upon testing with ASTM A193, Grade B7 rods.

Accessories

Wire Brush Extensions



* USABLE LENGTH IS 12",
GOOD FOR ALL HOLES EXCEPT 7/16" DIAMETER

DESCRIPTION/ADVANTAGES

Wire Brushes

Proper hole cleaning using a brush is essential to achieve optimum performance

1/8" NPT
(National Pipe
Thread Taper)

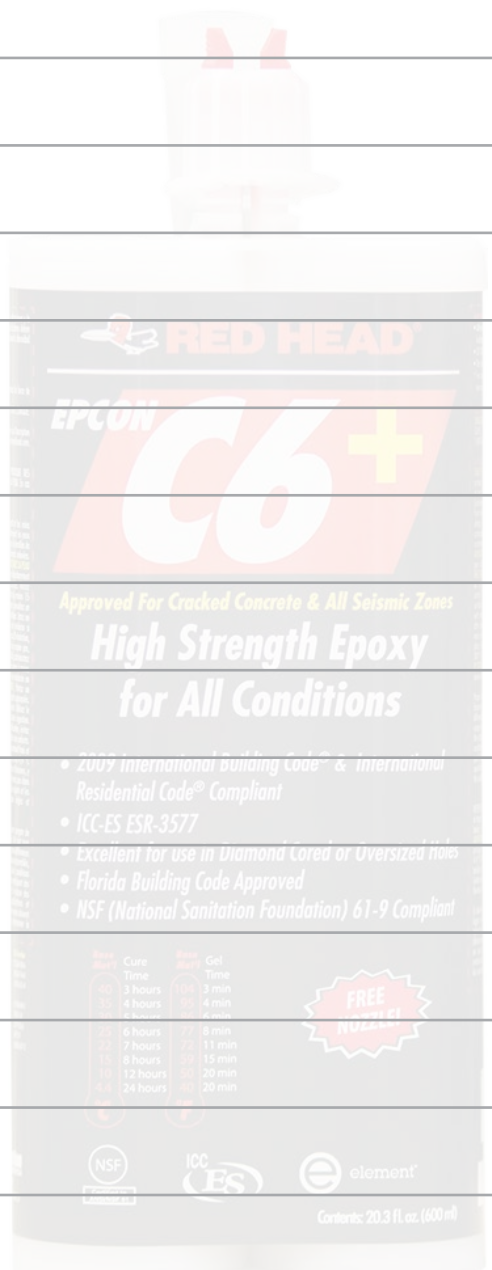
PART #	ANCHOR DIA.	REBAR	DRILL BIT DIA.	BRUSH DIA.	QTY/BAG
SB038	3/8"	No. 3	7/16"	5/8"	4
SB058	5/8"	No. 5	3/4"	1"	4
SB034	3/4"	No. 6	7/8"	1-1/4"	4
SB078	7/8"	—	1"	1-1/2"	4
SB125	1-1/4"	—	1-3/8"	1-3/4"	4
ESDS-38	Wire brush 12" usable extension with SDS+ adaptor				1
EHAN-38	Wire brush 12" usable extension with T-Handle				1

* Proper hole cleaning using a wire brush is essential to achieve optimum performance.
Brush may be used up to 50 holes depending on concrete strength.
Brushes required for installation of No. 4, No. 8 rebar and larger are available with lead time.

Blow Pump

DESCRIPTION	PART #	QTY/BAG
Blow Pump	065990	1

Notes



RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Since 1910, the brand trusted by the construction industry for quality, innovation and engineering support

The RED HEAD product line has long been respected by both contractors and specifiers in the construction industry. Because ITW RED HEAD proactively gets RED HEAD products specified before the job starts, contractors save time and money, plus the hassle of getting products approved. We will continue to pursue code approvals for specific anchor usages.

RED HEAD has also been on the forefront of concrete anchoring industry innovation and development.

RED HEAD is committed to providing contractors with quality products and developing new products to meet the demand of contractors worldwide.

CONCRETE ANCHORING SPECIALISTS
SINCE 1910

For example, we

- developed the first anchor (the Self-Drill in 1910)
- developed the full threaded Trubolt® Wedge anchor with a stainless steel clip
- developed the lipped Multi-Set II® Drop-In anchor
- helped develop (as part of ITW) markets for the Tapcon® and E-Z Ancor™

ITW Construction Products

RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Selection Guide

Anchors for Concrete Applications

truspec 2.0

ANCHOR TYPE	KEY FEATURES	SIZE RANGE (Inches)
 **Trubolt+®** Wedge Anchors  (see page RH 47)	■ 2015 IBC Compliants ■ All seismic zones (A-F) and cracked concrete approved ■ Fully threaded ■ Length ID head stamped ■ CSA 23.3 Annex D - Design Information	**Diameter:** 3/8 – 3/4 **Length:** 3 – 10
 **Trubolt®** Wedge Anchors  (see page RH 52)	■ 2015 IBC Compliant ■ Seismic zone (A-B) approved ■ Fully-threaded ■ Length ID head stamped ■ Stainless steel clip ■ Through-fixture fastening	**Diameter:** 1/4 – 1 **Length:** 1-3/4 – 12
 **Large Diameter Tapcon (LDT) and LDTX** Self-Threading Anchor   (see page RH 56)	■ Anti-rotation serrated washer ■ Extra large hex washer head ■ Length ID head stamped ■ Through-fixture fastening	**Diameter:** 3/8 – 3/4 **Length:** 1-3/4 – 6-1/4 **LDTX with EnvireX Coating** **Diameter:** 3/8 & 1/2 **Length:** 3 – 5
 **Multi-Set II®** Drop-In Anchors  RM RL RX (see page RH 61)	■ RM: Flanged body to keep anchor flush with surface of concrete ■ RL: Non-flanged body for recessed setting ■ RX: Designed for hollow core and post tension concrete	**Diameter:** 1/4 – 3/4 **Length:** 1 – 3-3/16 **Diameter:** 1/4 – 3/4 **Length:** 1 – 3-3/16 **Diameter:** 3/8 & 1/2 **Length:** 3/4

	CORROSION RESISTANCE	PERFORMANCE	HEAD STYLES	APPROVALS/LISTINGS
Trubolt+ cont'd	■ Zinc-plated carbon steel to ASTM B633, SC1, Type III	Factored pullout resistance. Performance in 4000 psi Concrete up to 10,605 lbf (3/4" diameter)	Hex nut	ICC Evaluation Service, Inc. # ESR-2251 - Category 1 performance rating - 2015 IBC compliant - Meets ACI 318 ductility requirements - Tested in accordance with ACI 355.2 and ICC-ES AC193 -Listed for use in seismic zones A - F Underwriters Laboratories Factory Mutual
Trubolt cont'd	■ Zinc-plated carbon steel to ASTM B633, SC1, Type III ■ Type 304 and 316 stainless steel	Ultimate Pullout Performance in 4000 psi Concrete up to 26,540 lbs. (1" diameter)	Hex nut Tie-Wire version	ICC Evaluation Service, Inc. # ESR-2251 (see page RH 55 for more details) Underwriters Laboratories Factory Mutual City of Los Angeles - #RR2748 California State Fire Marshall Caltrans Meets or exceeds U.S. Government G.S.A. Specification A-A-1923A Type 4 (formerly GSA: FF-S-325 Group II, Type 4, Class 1) Listed for use in seismic zones A & B
LDT cont'd	■ Zinc-plated carbon steel to ASTM B695 & B633	Ultimate Pullout Performance in 4,000 psi Concrete up to 23,266 lbs. (3/4" diameter)	Finished bolt style	Miami-Dade County – #04-1025.08 Florida Building Code
	■ Now with *EnvireX*™ coating Approved for use in ACQ and MCQ lumber* *Excessive content of copper in the ACQ and MCQ lumber may affect the anchor finish.			1,000 hours salt spray ASTM B117
Multi-Set II Drop-In cont'd	■ Zinc-plated carbon steel to ASTM B633, SC1, Type III ■ Type 18-8 and 316 stainless steel	Ultimate Pullout Performance in 4000 psi Concrete up to 9,480 lbs. (3/4" diameter)	RM: Flanged body RL: Non-flanged body Use any bolt or threaded rod	GSA: A-A-55614 Type 1 (Formerly GSA: FF-S-325 Group VIII) Underwriters Laboratories Factory Mutual City of Los Angeles – #RR2748 California State Fire Marshal Caltrans

continued on next page

Anchors for Concrete Applications

continued from pages RH 42-43

ANCHOR TYPE	KEY FEATURES	SIZE RANGE (Inches)
 **Dynabolt®** Masonry Sleeve Anchors  For both Hollow and Solid Concrete Applications (see page RH 65)	■ Concrete, block and brick ■ Many choices of head styles ■ Through-fixture fastening ■ Available in 304 stainless steel	**Diameter:** 1/4 – 3/4 **Length:** 1-3/8 – 6-1/4
 **Redi-Drive®** High performance Hammer-Drive Anchors  Finished Head (see page RH 68)	■ Bottom bearing ■ Hammer-driven ■ Ideal for jacking or leveling ■ Easy installation	**Diameter:** 1/4 **Length:** 3/4", 1-1/8"
Hammer-Set™ Nail-drive Anchors  (see page RH 70)	■ Easy installation ■ Low profile head ■ Through-fixture fastening	**Diameter:** 3/16 & 1/4 **Length:** 7/8 – 2
Striker **Concrete Nails**  (see page RH 71)	■ Fast, easy installation ■ Drill bit included in packaged product ■ High corrosion resistant	**Accepts:** #12 **Length:** 1-1/8" – 4"

	CORROSION RESISTANCE	PERFORMANCE	HEAD STYLES	APPROVALS/LISTINGS
Dynabolt cont'd	■ Zinc-plated carbon steel to ASTM B633, SC1, Type III ■ Type 304 stainless steel	Ultimate Pullout Performance in 4000 psi Concrete up to 8,900 lbs. (3/4" diameter)	Flat head Hex nut Tie-Wire	GSA: A-A-1922A (Formerly GSA: FF-S-325 Group II, Type 3, Class 3) Factory Mutual California State Fire Marshal
Redi-Drive cont'd	■ Zinc-plated carbon steel	Ultimate Pullout Performance in 4000 psi Concrete up to 2,300 lbs.	Mushroom head	FF-S-325 Group VI Factory Mutual (3/8" Pipe-Drive)
Hammer-Set cont'd	■ Zinc alloy	Ultimate Pullout Performance in 4000 psi Concrete up to 793 lbs.	Mushroom head	GSA: A-A-1925A Type 1 (zinc mushroom) (Formerly GSA: FF-S-325 Group V, Type 2, Class 3)
Striker cont'd	■ Hot Dipped Galvanized	Light duty	Nail head	

RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Wedge Anchors

Medium and Heavy-Duty, Wedge Type Expansion Anchors

Trubolt®+ Trubolt®

DESCRIPTION/SUGGESTED SPECIFICATIONS

Wedge Type Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE

Trubolt Wedge anchors feature an innovative expansion clip design, threaded stud body, nut, and washer. Anchor bodies are made of plated high-strength carbon steel, also available in 304 and 316 stainless steel for the Trubolt version.

- Heavy-Duty anchoring performance includes applications in cracked and uncracked concrete, and all seismic zones (A-F).

The exposed end of the anchor is stamped to identify anchor length. Stampings should be preserved during installation for any subsequent embedment verification.

Use carbide tipped hammer drill bits made in accordance with ANSI B212.15-1994 to install anchors.

Anchors are tested to ACI 355.2 and ICC-ES AC193. Anchors are listed by the following agencies as required by the local building code: ICC-ES, UL, FM.

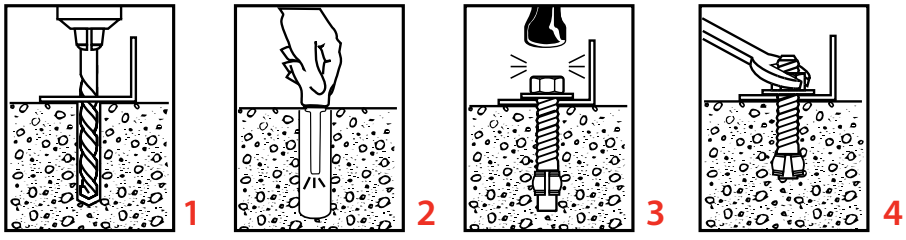
See pages RH 49 - RH 55 for performance values in accordance to 2015 IBC and CSA 23.3-14

LENGTH INDICATOR CODE*

CODE	LENGTH OF ANCHOR	CODE	LENGTH OF ANCHOR
A	1-1/2 < 2 (38.1 < 50.8)	K	6-1/2 < 7 (165.1 < 177.8)
B	2 < 2-1/2 (50.8 < 63.5)	L	7 < 7-1/2 (177.8 < 190.5)
C	2-1/2 < 3 (63.5 < 76.2)	M	7-1/2 < 8 (190.5 < 203.2)
D	3 < 3-1/2 (76.2 < 88.9)	N	8 < 8-1/2 (203.2 < 215.9)
E	3-1/2 < 4 (88.9 < 101.6)	O	8-1/2 < 9 (215.9 < 228.6)
F	4 < 4-1/2 (101.6 < 114.3)	P	9 < 9-1/2 (228.6 < 241.3)
G	4-1/2 < 5 (114.3 < 127.0)	Q	9-1/2 < 10 (241.3 < 254.0)
H	5 < 5-1/2 (127.0 < 139.7)	R	10 < 11 (254.0 < 279.4)
I	5-1/2 < 6 (139.7 < 152.4)	S	11 < 12 (279.4 < 304.8)
J	6 < 6-1/2 (152.4 < 165.1)	T	12 < 13 (304.8 < 330.2)

* Located on top of anchor for easy inspection.
Trubolt+ anchors include a + sign next to the code letter.

INSTALLATION STEPS



1. Select a carbide drill bit with a diameter equal to the anchor diameter. Drill hole at least 1/4" deeper than normal anchor embedment.
2. Clean hole with pressurized air or vacuum to remove any excess dust/debris.
3. Using the washer and nut provided, assemble the anchor, leaving nut one half turn from the end of the anchor to protect threads. Drive anchor through fixture to the specified embedment. Fasten nut and washer flush to surface of fixture.
4. Expand anchor by tightening nut 3-5 to the specified setting torque.

RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Trubolt®+

Seismic and Cracked Concrete Wedge Anchors

The Industry Leader in Pullout Strength and Design Flexibility

Trubolt®+

DESCRIPTION/SUGGESTED SPECIFICATIONS

Seismic Wedge Type Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE

Trubolt+ anchors consist of a high-strength threaded stud body, expansion clip, nut and washer. Anchor bodies are made of plated steel. New innovative and unique clip design increases anchor pullout strength making Trubolt+ the go-to wedge anchor solution for any project.

Patented design delivers higher pullout value than competitive carbon steel anchors – makes the anchor stronger than concrete.

The exposed end of the anchor is stamped to identify anchor length. Stampings should be preserved during installation for any subsequent embedment verification.

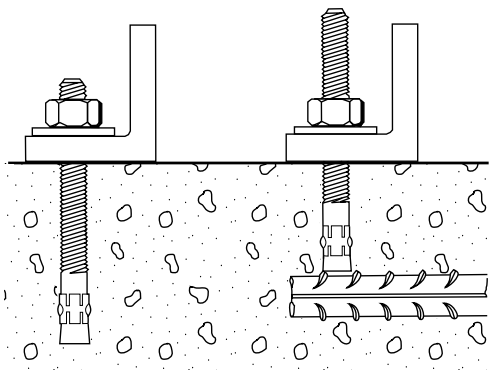
- New design interaction with concrete allows tightest anchor spacing, closest edge placement with least embedment depth.

Anchors are tested to ACI 355.2 and ICC-ES AC193. Seismic and cracked concrete approved listed on the ICC ESR-3772.

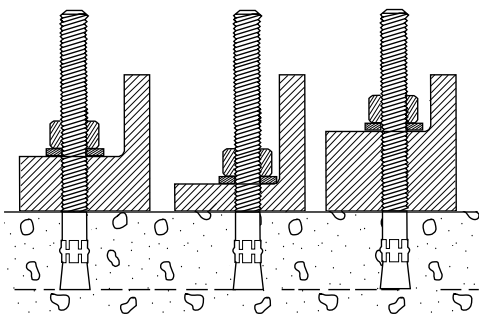
See pages RH 49 - RH 51 for CSA 23.3-14 design information and performance tables.

Fully Threaded Advantage

Trubolt's fully threaded feature eliminates subsurface obstruction problems.



Fully threaded design accommodates various material thicknesses at the same embedment. One anchor length saves time and money.



APPROVALS/LISTINGS

Trubolt®+
Wedge Anchors

ICC Evaluation Service, Inc. # ESR-2251
- -Category 1 performance rating
- -2015 IBC compliant
- -Meets ACI 318 ductility requirements
- -Tested in accordance with ACI 355.2 and ICC-ES AC193
- -Listed for use in seismic zones A - F

Underwriters Laboratories
Factory Mutual

Trubolt+ Carbon Steel with Zinc Plating

Meets ASTM B633 SC1, Type III specifications for electroplating of 5um = .0002" thickness.
This material is well suited for non-corrosive environments.

Trubolt +

PART NUMBER	THREAD LENGTH In. (mm)	ANCHOR DIA. & DRILL BIT SIZE (THREADS) PER INCH	OVERALL LENGTH In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CARTON lbs.
TB4C-1416	3/4 (19.1)	1/4" - 20	1-3/4 (44.5)	3/8 (9.5)	100/ 3.1	1000/ 32
TB4C-1422	1-1/4 (31.8)		2-1/4 (57.2)	7/8 (22.2)	100/ 3.6	1000/ 37
TB4C-1432	2-1/4 (57.2)		3-1/4 (82.6)	1-7/8 (47.6)	100/ 4.7	800/ 39
TB4C-3830* +	1-3/4 (44.5)	3/8" - 16	3 (76.2)	1-1/8 (28.6)	50/ 5.0	400/ 41
TB4C-3836* +	2-1/2 (63.5)		3-3/4 (95.3)	1-7/8 (47.6)	50/ 5.9	300/ 36
TB4C-3850* +	3-3/4 (95.2)		5 (127.0)	3-1/8 (79.4)	50/ 7.4	250/ 38
TB4C-3870 +	3-7/8 (98.4)		7 (177.8)	5-1/8 (130.2)	50/ 10.4	250/ 53
TB4C-1236* +	2-1/4 (57.2)	1/2" - 13	3-3/4 (95.3)	1 (25.4)	25/ 5.7	150/ 35
TB4C-1242* +	2-3/4 (69.9)		4-1/4 (108.0)	1-1/2 (38.1)	25/ 6.2	150/ 38
TB4C-1244 +	3 (76.2)		4-1/2 (114.3)	1-3/4 (44.5)	25/ 6.5	150/ 39
TB4C-1254* +	4 (101.6)		5-1/2 (139.7)	2-3/4 (69.9)	25/ 7.7	150/ 47
TB4C-1270* +	5-1/2 (139.7)		7 (177.8)	4-1/4 (108.0)	25/ 9.3	150/ 57
TB4C-5850* +	3-1/4 (82.6)	5/8" - 11	5 (127.0)	1-5/8 (41.3)	10/ 4.7	100/ 48
TB4C-5860* +	4-1/4 (107.9)		6 (152.4)	2-5/8 (66.7)	10/ 5.4	50/ 28
TB4C-5870* +	5-1/4 (133.4)		7 (177.8)	3-5/8 (92.1)	10/ 6.2	30/ 19
TB4C-5884* +	5-3/4 (146.0)		8-1/2 (215.9)	5-1/8 (130.2)	10/ 8.0	30/ 25
TB4C-58100 +	5-3/4 (146.0)		10 (254.0)	6-5/8 (168.3)	10/ 9.4	30/ 29
TB4C-3454* +	3-5/8 (92.1)	3/4" - 10	5-1/2 (139.7)	1-1/2 (38.1)	10/ 8.1	50/ 41
TB4C-3462* +	4-3/8 (111.1)		6-1/4 (158.8)	2-1/4 (57.2)	10/ 9.1	30/ 28
TB4C-3470* +	5-1/8 (130.2)		7 (177.8)	3 (76.2)	10/ 9.7	30/ 30
TB4C-3484* +	5-3/4 (146.0)		8-1/2 (215.9)	4-1/2 (114.3)	10/ 12.3	30/ 38
TB4C-34100* +	5-3/4 (146.0)		10 (254.0)	6 (152.4)	10/ 14.0	30/ 43

* FM Approved + UL Approved

Typical Applications—Structural Columns, Machinery, Equipment, etc.

Environment—Interior (non-corrosive)

Level of Corrosion—Low

Trubolt Carbon Steel with Zinc Plating

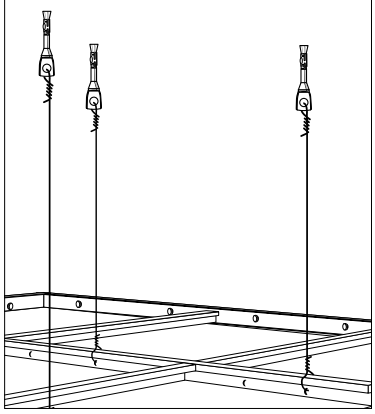
Meets ASTM B633 SC1, Type III specifications for electroplating of 5um = .0002" thickness.
This material is well suited for non-corrosive environments.

Trubolt

PART NUMBER	THREAD LENGTH In. (mm)	ANCHOR DIA. & DRILL BIT SIZE (THREADS) PER INCH	OVERALL LENGTH In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CARTON lbs.
WS-1416	3/4 (19.1)	1/4" - 20	1-3/4 (44.5)	3/8 (9.5)	100/ 3.1	1000/ 32
WS-1422	1-1/4 (31.8)		2-1/4 (57.2)	7/8 (22.2)	100/ 3.6	1000/ 37
WS-1432	2-1/4 (57.2)		3-1/4 (82.6)	1-7/8 (47.6)	100/ 4.7	800/ 39
WS-3822* +	1-1/8 (28.6)	3/8" - 16	2-1/4 (57.2)	3/8 (9.5)	50/ 4.1	500/ 41
WS-3826* +	1-5/8 (41.3)		2-3/4 (69.9)	7/8 (22.2)	50/ 4.7	400/ 39
WS-1226* +	1-1/4 (31.8)	1/2" - 13	2-3/4 (69.9)	1/8 (3.2)	25/ 4.6	200/ 38
WS-5834* +	1-3/4 (44.5)	5/8" - 11	3-1/2 (88.9)	1/8 (3.2)	10/ 3.6	100/ 37
WS-5842* +	2-1/2 (63.5)		4-1/4 (108.0)	7/8 (22.2)	10/ 4.1	100/ 42
WS-3442* +	2-3/8 (60.3)	3/4" - 10	4-1/4 (108.0)	1/4 (31.8)	10/ 6.8	60/ 42
WS-3446* +	2-7/8 (73.0)		4-3/4 (120.7)	3/4 (19.1)	10/ 7.4	60/ 45
WS-34120 +	1-3/4 (44.5)		12 (304.8)	8 (203.2)	10/ 16.6	30/ 51
WS-7860	2-1/2 (63.5)	7/8" - 9	6 (152.4)	1-3/8 (34.9)	5/ 6.3	25/ 32
WS-10060	2-1/2 (63.5)	1" - 8	6 (152.4)	1/2 (12.7)	5/ 8.3	25/ 43
WS-10090	2-1/2 (63.5)		9 (228.6)	3-1/2 (88.9)	5/ 11.6	15/ 36
WS-100120	2-1/2 (63.5)		12 (304.8)	6-1/2 (165.1)	5/ 15.0	15/ 46
TIE WIRE						
TW-1400	N/A	1/4"	2-1/8 (54.0)	9/32-hole (7.1)	100/ 3.6	1000/36

* FM Approved + UL Approved

Tie Wire Wedge for hanging suspended ceiling



See page RH 53 for stainless steel Trubolt wedge anchors.

Strength Design Performance values in accordance to CSA 23.3-14

ITW RED HEAD TRUBOLT+ WEDGE ANCHOR

DESIGN INFORMATION TESTED TO ICC-ES AC193 AND ACI 355.2, DEFINED IN ICC ESR-3772

Trubolt®+ Wedge Anchors

TRUBOLT +WEDGE ANCHOR DESIGN INFORMATION[1,2,3]

PARAMETER	Symbol	Units	Nominal Anchor Diameter					
			1/4"	3/8"	1/2"	5/8"	3/4"	
Anchor outer diameter	$d_a[d_o]^2$	mm	6.4	9.5	12.7	15.9	19.1	
Minimum specified yield strength	f_y	MPa	621	621	552	552	552	
Minimum specified ultimate strength	f_{uta}	MPa	827	827	689	724	724	
Effective tensile stress area	$A_{se,N}$ [A_{se}][6]	mm^2	19	36	71	108	161	
Effective shear stress area	$A_{se,V}$ [A_{se}][6]	mm^2	23	48	92	140	214	
Resistance modification factor, tension, steel failure modes	R	-	0.80					CSA 23.3-14
Resistance modification factor, shear, steel failure modes	R	-	0.75					D5.3
Resistance factor for steel anchors	Φs	-	0.85					D5.3
Factored steel resistance, tension	$N_{,sar}$	kN	10.5	20.3	33.3	53.4	79.4	8.4.3
Factored steel resistance, shear	$V_{,sar}$	kN	11.9	25.5	40.3	64.6	98.9	D.6.1.2
Factored steel resistance, seismic tension	$V_{,sar,eq}$	kN	11.9	20.6	40.3	64.6	91.1	D.7.1.2
Effectiveness factor for uncracked concrete	k_{uncr}	-	10					
Effectiveness factor for cracked concrete	k_{cr}	-	7					D.6.2.2
Modification factor for resistance in tension to account for uncracked concrete	Ψc, N	-	1					D.6.2.2
Anchor category	-	-	1					D.6.2.6
Material resistance factor for concrete	Φc	-	0.65					
Strength reduction factor for tension and shear, concrete failure modes	R	Cond. A	1.15					8.4.2
	R	Cond. B	1					D.5.3c
Modification Factor for concrete density	λ	-	1					D.5.3c
Factored pullout resistance in 20 MPa uncracked concrete	$N_{pr,\ uncr}$	kN	6.3	Pullout does not control	Pullout does not control	Pullout does not control	Pullout does not control	8.6.5
Factored pullout resistance in 20 MPa cracked concrete	$N_{pr,\ cr}$	kN	2.3	Pullout does not control	Pullout does not control	Pullout does not control	Pullout does not control	D.6.3.2

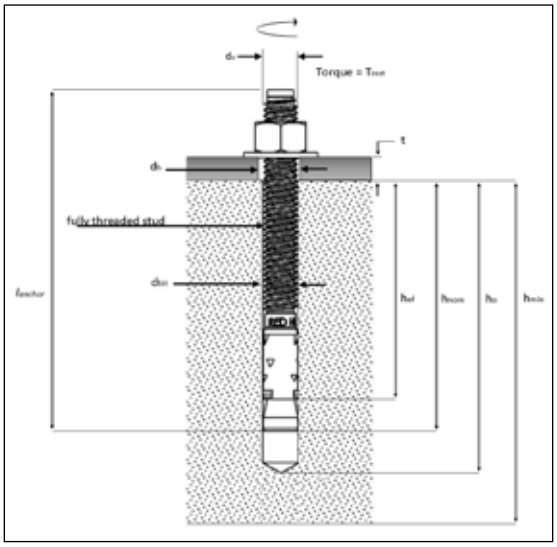
1. The data in this table was taken from ICC ESR-3772 and converted for used with the design provisions of CSA 23.3-14 or CSA 23.3-04, Chapter 8 and Annex D, as applicable.
2. Installation must comply with the manufacturers printed installation instructions and details described in the ICC ESR-3772 and this ITW Red Head catalog
3. The 1/4", 3/8", 1/2", 5/8", and 3/4" Trubolt+ carbon steel anchors are considered ductile steel elements
4. For all design cases, Ψc, N = 1. The appropriate effectiveness factor for cracked (kcr) or uncracked concrete (kuncr) must be used.
5. Condition B was assumed for the strength reduction factor for tension and shear (concrete failure modes). For cases where the presence of supplementary reinforcement in conformance with CSA 23.3-14 D.5.3 can be verified, the modification factor for condition A may be used
6. Where Pullout strength does not control anchor design, determine steel and concrete breakout capacities only.

TRUBOLT+ WEDGE INSTALLATION INFORMATION

PARAMETER	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER															
			1/4	3/8			1/2				5/8				3/4			
Anchor outer diameter	$d_a[d_o]^2$	mm.	6.4	9.5			12.7				15.9				19.1			
Nominal carbide bit diameter	d_{bit}	in.	1/4	3/8			1/2				5/8				3/4			
Effective embedment depth	h_{ef}	mm.	38	41		51	51		83		70	102			95		121	
		in.	(1-1/2)	(1-5/8)		(2)	(2)		(3-1/4)		(2-3/4)	(4)			(3-3/4)		(4-3/4)	
Nominal anchor embedment depth	h_{nom}	mm.	44	51		60	64		95		86	117			114		140	
		in.	(1 3/4)	(2)		(2-3/8)	(2-1/2)		(3-3/4)		(3-3/8)	(4-5/8)			(4-1/2)		(5-1/2)	
Minimum hole depth	h_o	mm.	51	57		67	70		102		92	124			121		146	
		in.	(2)	(2-1/4)		(2-5/8)	(2-3/4)		(4)		(3-5/8)	(4-7/8)			4-3/4)		(5-3/4)	
Minimum concrete member thickness	h_{min}	mm.	102	102	127	102	102	152	152	203	127	152	203	152	203		203	
		in.	(4)	(4)	(5)	(4)	(4)	(6)	(6)	(8)	(5)	(6)	(8)	(6)	(8)		(8)	
Critical edge distance	c_{ac}	mm.	89	89	76	102	102	76	171	146	203	222	171	254	203		229	
		in.	(3 1/2)	(3 1/2)	(3)	(4)	(4)	(3)	(6-3/4)	(5-3/4)	(8)	(8-3/4)	(6-3/4)	(10)	(8)		(9)	
Minimum anchor spacing	s_{min}	mm.	38	64		51	64		51		89	76			95		95	
		in.	(1 1/2)	(2-1/2)		(2)	(2-1/2)		(2)		(3-1/2)	(3)			(3-3/4)		(3-3/4)	
	for c ≥	mm.	51	76		76	114		64		127	108			203		191	
		in.	(2)	(3)		(3)	(4-1/2)		(2-1/2)		(5)	(4-1/4)			(8)		(7-1/2)	
Minimum edge distance	c_{min}	mm.	44	51		44	64		44		89	76			89		102	
		in.	(1 3/4)	(2)		(1-3/4)	(2-1/2)		(1-3/4)		(3-1/2)	(3)			(3-1/2)		(4)	
	for s ≥	mm.	51	102		114	102		114		152	133			254		222	
		in.	(2)	(4)		(4-1/2)	(4)		(4-1/2)		(6)	(5-1/4)			(10)		(8-3/4)	
Minimum overall anchor length	l_{anchor}	mm.	57	76		89	95		114		114	152			140		178	
		in.	(2-1/4)	(3)		(3-1/2)	(3-3/4)		(4-1/2)		(4-1/2)	(6)			(5-1/2)		(7)	
Installation torque	T_{inst}	ft-lb	8	25			45				90				100			

1. Use carbide tipped hammer drill bits made in accordance with ANSI B212.15-1994 to install anchors.

TRUBOLT+ WEDGE ANCHOR (INSTALLED)



FACTORED STEEL RESISTANCE FOR TRUBOLT+ CARBON STEEL ANCHORS

Nominal Anchor Diameter	Effective Embedment Depth mm. (in.)	Tensile kN (lbf)	Shear kN (lbf)	Seismic Shear kN (lbf)
1/4	38 (1-1/2)	10.5 (2,365)	11.9 (2,680)	11.9 (2,680)
3/8	41 (1-5/8)	20.3 (4,570)	25.5 (5,740)	20.6 (4,625)
	51 (2)			
1/2	51 (2)	33.3 (7,480)	40.3 (9,055)	40.3 (9,055)
	83 (3-1/4)			
5/8	70 (2-3/4)	53.4 (11,995)	64.6 (14,525)	64.6 (14,525)
	102 (4)			
3/4	95 (3-3/4)	79.4 (17,850)	98.9 (22,225)	91.1 (20,470)
	121 (4-3/4)			

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

1. The 1/4", 3/8", 1/2", 5/8", and 3/4" Trubolt+ carbon steel anchors are considered ductile steel elements
2. Tension values calculated according to Clause D6.1.2 in CSA A23.3-14 Annex D
3. Shear values calculated according to Clause D7.1.2 in CSA A23.3-14 Annex D
4. Seismic shear was calculated by reducing Vsar based on correlation between Vsa and Veq from the ICC ESR-3772

Strength Design Performance values in accordance to 2015 IBC

Trubolt+®
Wedge Anchors

FACTORED CONCRETE BREAKOUT/PULLOUT, TENSION kN (lbf)

			CONCRETE COMPRESSIVE STRENGTH (UNCRACKED)					CONCRETE COMPRESSIVE STRENGTH (CRACKED)				
Nominal Anchor Diameter	**Effective Embedment Depth mm. (in.)**	**Nominal Embedment Depth mm. (in.)**	**20 MPa** (2900)	**25 MPa** (3625)	**30 MPa** (4350)	**40 MPa** (5800)	**50 MPa** (7250)	**20 MPa** (2900)	**25 MPa** (3625)	**30 MPa** (4350)	**40 MPa** (5800)	**50 MPa** (7250)
1/4	38 (1-1/2)	44 (1-3/4)	6.3 (1,420)	7.1 (1,585)	7.7 (1,740)	8.9 (2,005)	10.0 (2,245)	2.3 (515)	2.6 (575)	2.8 (630)	3.2 (730)	3.6 (815)
3/8	41 (1-5/8)	51 (2)	7.7 (1,735)	8.6 (1,935)	9.4 (2,120)	10.9 (2,450)	12.2 (2,740)	5.4 (1,215)	6.0 (1,355)	6.6 (1,485)	7.6 (1,715)	8.5 (1,920)
	51 (2)	60 (2-3/8)	10.5 (2,365)	11.8 (2,645)	12.9 (2,900)	14.9 (3,345)	16.6 (3,740)	7.4 (1,655)	8.2 (1,850)	9.0 (2,030)	10.4 (2,340)	11.6 (2,620)
1/2	51 (2)	64 (2-1/2)	10.5 (2,365)	11.8 (2,645)	12.9 (2,900)	14.9 (3,345)	16.6 (3,740)	7.4 (1,655)	8.2 (1,850)	9.0 (2,030)	10.4 (2,340)	11.6 (2,620)
	83 (3-1/4)	95 (3-3/4)	21.8 (4,900)	24.4 (5,480)	26.7 (6,005)	30.8 (6,930)	34.5 (7,750)	15.3 (3,430)	17.1 (3,835)	18.7 (4,200)	21.6 (4,850)	24.1 (5,425)
5/8	70 (2-3/4)	86 (3-3/8)	17.0 (3,815)	19.0 (4,265)	20.8 (4,670)	24.0 (5,395)	26.8 (6,030)	11.9 (2,670)	13.3 (2,985)	14.5 (3,270)	16.8 (3,775)	18.8 (4,220)
	102 (4)	117 (4-5/8)	29.8 (6,690)	33.3 (7,480)	36.5 (8,195)	42.1 (9,465)	47.1 (10,580)	20.8 (4,685)	23.3 (5,240)	25.5 (5,740)	29.5 (6,625)	32.9 (7,405)
3/4	95 (3-3/4)	114 (4-1/2)	27.0 (6,075)	30.2 (6,790)	33.1 (7,440)	38.2 (8,590)	42.7 (9,605)	18.9 (4,250)	21.1 (4,755)	23.2 (5,210)	26.8 (6,015)	29.9 (6,725)
	121 (4-3/4)	140 (5-1/2)	38.5 (8,660)	43.1 (9,685)	47.2 (10,605)	54.5 (12,250)	60.9 (13,695)	27.0 (6,060)	30.1 (6,780)	33.0 (7,425)	38.1 (8,575)	42.6 (9,585)

1. Linear interpolation between embedment depths and concrete compressive strength is not permitted.
2. Single anchor with no spacing, edge distance, and concrete thickness factors included. Apply these factors according to project conditions and compare to steel values to determine anchor strength for design.
3. Tabular values are for normal weight concrete only. For different concrete densities, apply modification factors according to CSA 23.3-14 8.6.5
4. Tabular values are for static loads only. For seismic tension refer to section 4.1.10.2 of the ICC ESR-3772.
5. Values are for Condition B in conformance with CSA 23.3-14 D.5.3

FACTORED CONCRETE PRYOUT/STEEL RESISTANCE, SHEAR kN (lbf)

			CONCRETE COMPRESSIVE STRENGTH (UNCRACKED)					CONCRETE COMPRESSIVE STRENGTH (CRACKED)				
Nominal Anchor Diameter	**Effective Embedment Depth mm. (in.)**	**Nominal Embedment Depth mm. (in.)**	**20 MPa** (2900)	**25 MPa** (3625)	**30 MPa** (4350)	**40 MPa** (5800)	**50 MPa** (7250)	**20 MPa** (2900)	**25 MPa** (3625)	**30 MPa** (4350)	**40 MPa** (5800)	**50 MPa** (7250)
1/4	38 (1-1/2)	44 (1-3/4)	6.8 (1,535)	7.6 (1,720)	8.4 (1,880)	9.7 (2,175)	10.8 (2,430)	4.8 (1,075)	5.4 (1,205)	5.9 (1,320)	6.8 (1,520)	7.6 (1,700)
3/8	41 (1-5/8)	51 (2)	7.7 (1,735)	8.6 (1,935)	9.4 (2,120)	10.9 (2,450)	12.2 (2,740)	5.4 (1,215)	6.0 (1,355)	6.6 (1,485)	7.6 (1,715)	8.5 (1,920)
	51 (2)	60 (2-3/8)	10.5 (2,365)	11.8 (2,645)	12.9 (2,900)	14.9 (3,345)	16.6 (3,740)	7.4 (1,655)	8.2 (1,850)	9.0 (2,030)	10.4 (2,340)	11.6 (2,620)
1/2	51 (2)	64 (2-1/2)	10.5 (2,365)	11.8 (2,645)	12.9 (2,900)	14.9 (3,345)	16.6 (3,740)	7.4 (1,655)	8.2 (1,850)	9.0 (2,030)	10.4 (2,340)	11.6 (2,620)
	83 (3-1/4)	95 (3-3/4)	40.3 (9,060)	40.3 (9,060)	40.3 (9,060)	40.3 (9,060)	40.3 (9,060)	30.5 (6860)	34.1 (7670)	37.4 (8405)	40.3 (9060)	40.3 (9060)
5/8	70 (2-3/4)	86 (3-3/8)	33.9 (7,630)	37.9 (8,530)	41.6 (9,345)	48.0 (10,790)	53.7 (12,065)	23.8 (5,340)	26.6 (5,970)	29.1 (6,540)	33.6 (7,555)	37.6 (8,445)
	102 (4)	117 (4-5/8)	59.5 (13,385)	64.6 (14,525)	64.6 (14,525)	64.6 (14,525)	64.6 (14,525)	41.7 (9,370)	46.6 (10,475)	51.0 (11,475)	58.9 (13,250)	64.6 (14,525)
3/4	95 (3-3/4)	114 (4-1/2)	54.0 (12,150)	60.4 (13,585)	66.2 (14,880)	76.4 (17,185)	85.5 (19,210)	37.8 (8,505)	42.3 (9,510)	46.3 (10,415)	53.5 (12,030)	59.8 (13,445)
	121 (4-3/4)	140 (5-1/2)	77.0 (17,320)	86.1 (19,365)	94.4 (21,215)	98.9 (22,235)	98.9 (22,235)	53.9 (12,125)	60.3 (13,555)	66.1 (14,850)	76.3 (17,145)	85.3 (19,170)

1. Linear interpolation between embedment depths and concrete compressive strength is not permitted.
2. Single anchor with no spacing, edge distance, and concrete thickness factors included. Apply these factors according to project conditions and compare to steel strength values to determine anchor strength for design.
3. Tabular values are for normal weight concrete only. For different concrete densities, apply modification factors according to CSA 23.3-14 8.6.5
4. Tabular values are for static loads only. For seismic shear compare values in this table with steel strength values.
5. Values are for Condition B in conformance with CSA 23.3-14 D.5.3

RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Trubolt® Wedge Anchors

Dependable, Inspectable, Wedge Type Expansion Anchor

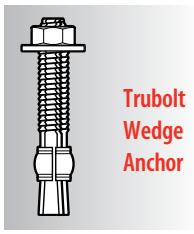
Trubolt®
Wedge Anchors

DESCRIPTION/SUGGESTED SPECIFICATIONS

Wedge Type Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE

Trubolt Wedge anchors feature a stainless steel expansion clip, threaded stud body, nut and washer. Anchor bodies are made of plated carbon steel, type 304 stainless steel or type 316 stainless steel as identified in the drawings or other notations.



The exposed end of the anchor is stamped to identify anchor length. Stampings should be preserved during installation for any subsequent embedment verification.

Anchors are tested to ACI 355.2 and ICC-ES AC193. Anchors are listed by the following agencies as required by the local building code: ICC-ES, UL, FM, City of Los Angeles, California State Fire Marshal and Caltrans.

See pages RH 54 - RH 55 for performance values in accordance to 2015 IBC.

FEATURES

Length ID Head Stamp—provides for embedment inspection after installation

Fully Threaded Design

Cold-Formed—manufacturing process adds strength

Stainless steel split expansion ring

Anchor Body—available in zinc-plated steel, 304 stainless steel and 316 stainless steel

APPLICATIONS

Anchoring machinery and conveyors is a common wedge anchor application. The Trubolt is fully threaded to allow a large range of embedment and fixture thickness.

Stainless steel Trubolt wedge anchors provide higher corrosion resistance allowing anchoring in tougher environments.

Trubolt Type 304 Stainless Steel

Serves many applications well. It withstands rusting in architectural and food processing environments and resists organic chemicals, dye stuffs and many inorganic chemicals.

Typical Applications—Cladding, Stadium Seating, etc.

Environment—Urban (slight to moderate degree of pollution)

Level of Corrosion—Medium

PART NUMBER	THREAD LENGTH In. (mm)	ANCHOR DIA. & DRILL BIT SIZE (THREADS) PER INCH	OVERALL LENGTH In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CARTON lbs.
WW-1416	3/4 (19.1)	1/4" - 20	1-3/4 (44.5)	3/8 (9.5)	100/ 3.2	1000/ 32
WW-1422	1-1/4 (31.8)		2-1/4 (57.2)	7/8 (22.2)	100/ 3.7	1000/ 37
WW-1432	2-1/4 (57.2)		3-1/4 (82.6)	1-7/8 (47.6)	100/ 4.8	800/ 39
WW-3822* +	1-1/8 (28.6)	3/8" - 16	2-1/4 (57.2)	3/8 (9.5)	50/ 4.1	500/ 41
WW-3826* +	1-5/8 (41.3)		2-3/4 (69.9)	7/8 (22.2)	50/ 4.8	400/ 39
WW-3830* +	1-3/4 (44.5)		3 (76.2)	1-1/8 (28.6)	50/ 5.1	400/ 42
WW-3836* +	2-1/2 (63.5)		3-3/4 (95.3)	1-7/8 (47.6)	50/ 6.0	300/ 37
WW-3850* +	3-3/4 (95.3)		5 (127.0)	3-1/8 (79.4)	50/ 7.5	250/ 39
WW-1226* +	1-1/4 (31.8)	1/2" - 13	2-3/4 (69.9)	1/8 (3.2)	25/ 4.7	200/ 38
WW-1236* +	2-1/4 (57.2)		3-3/4 (95.3)	1 (25.4)	25/ 5.8	150/ 36
WW-1242* +	2-3/4 (69.9)		4-1/4 (108.0)	1-1/2 (38.1)	25/ 6.3	150/ 39
WW-1254* +	3 (76.2)		5-1/2 (139.7)	2-3/4 (69.9)	25/ 7.7	150/ 47
WW-1270* +	3-1/2 (88.9)		7 (177.8)	4-1/4 (108.0)	25/ 9.4	150/ 57
WW-5834 +	1-3/4 (44.5)	5/8" - 11	3-1/2 (88.9)	1/8 (3.2)	10/ 3.6	100/ 37
WW-5842 +	2-1/2 (63.5)		4-1/4 (108.0)	7/8 (22.2)	10/ 4.2	100/ 43
WW-5850* +	3-1/4 (82.6)		5 (127.0)	1-5/8 (41.3)	10/ 4.8	100/ 49
WW-5860* +	4-1/4 (107.9)		6 (152.4)	2-5/8 (66.7)	10/ 5.5	50/ 28
WW-5870* +	3-1/2 (88.9)		7 (177.8)	3-5/8 (92.1)	10/ 6.2	30/ 20
WW-5884 +	3-1/2 (88.9)		8-1/2 (215.9)	5-1/8 (130.2)	10/ 8.0	30/ 25
WW-3446* +	2-7/8 (73.0)	3/4" - 10	4-3/4 (120.7)	3/4 (19.1)	10/ 6.7	60/ 41
WW-3454* +	3-5/8 (92.1)		5-1/2 (139.7)	1-1/2 (38.1)	10/ 7.5	50/ 38
WW-3470* +	3-1/2 (88.9)		7 (177.8)	3 (76.2)	10/ 9.2	30/ 28

* FM Approved + UL Approved For continuous extreme low temperature applications, use stainless steel.

Trubolt Type 316 Stainless Steel

Contains more nickel and chromium than Type 304, and 2%-3% molybdenum, which gives it better corrosion resistance. It is especially more effective in chloride environments that tend to cause pitting.

Typical Applications—Pumps, Diffusers, Gates, Weir Plates, etc.

Environment—Industrial (moderate to heavy atmospheric pollution)

Level of Corrosion—Medium to High

Typical Applications—Tunnels, Dams, Tiles, Lighting Fixtures, etc.

Environment—Marine (heavy atmospheric pollution)

Level of Corrosion—High

PART NUMBER	THREAD LENGTH In. (mm)	ANCHOR DIA. & DRILL BIT SIZE (THREADS) PER INCH	OVERALL LENGTH In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CARTON lbs.
SWW-1242* +	2-3/4 (69.9)	1/2" -13	4-1/4 (108.0)	1-1/2 (38.1)	25/ 6.5	150/ 40
SWW-1254 +	3 (76.2)		5-1/2 (139.7)	2-3/4 (69.9)	25/ 7.8	150/ 48

* FM Approved + UL Approved

For continuous extreme low temperature applications, use stainless steel.

See page RH 48 for carbon steel Trubolt wedge anchors.

Strength Design Performance values in accordance to 2015 IBC

ITW RED HEAD TRUBOLT WEDGE ANCHOR

DESIGN INFORMATION TESTED TO ICC-ES AC193 AND ACI 355.2, IN ACCORDANCE WITH 2015 IBC

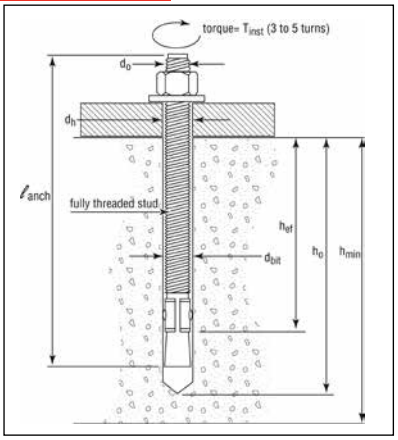
Trubolt® Wedge Anchors

TRUBOLT WEDGE ANCHOR DESIGN INFORMATION[1,2,3]

DESIGN INFORMATION	Symbol	Units	Nominal Anchor Diameter									
			1/4"		3/8"		1/2"		5/8"		3/4"	
Anchor O.D.	d_o	in	0.250		0.375		0.500		0.625		0.750	
Effective embedment	h_{ef}	in	1-1/2	2	1-3/4	2-5/8	1-7/8	3-3/8	2-1/2	4	3-1/2	4-3/4
Minimum member thickness	h_{min}	in	4	4	4	5	5	6	5	8	6	8
Critical edge distance	c_{ac}	in	2-5/8	3	2-5/8	5-1/4	3-3/4	6-3/4	5	8	7	9
Minimum edge distance	c_{min}	in	1-3/4	1-1/2	2-1/4	2	3-3/4	3-3/4	4-1/4	3-1/4	3-3/4	3-1/2
Minimum anchor spacing	s_{min}	in	1-3/4	1-1/2	2-1/4	2	3-3/4	3-3/4	4-1/4	3-1/4	3-3/4	3-1/2
Min. Specified Yield Strength	f_y	lb/in^2	55,000									
Min. Specified Ultimate Strength	f_{uta}	lb/in^2	75,000									
Effective tensile stress area	A_{se}	in^2	0.032		0.078		0.142		0.226		0.334	
Steel strength in tension	N_s	lb	2,385		5,815		10,645		16,950		25,050	
Steel strength in shear	V_s	lb	1,430		2,975	3,490	4,450	6,385	6,045	10,170	10,990	15,030
Pullout strength, uncracked concrete	$N_{p,uncr}$	lb	1,392	1,706	2,198	3,469	2,400	4,168	4,155	6,638	8,031	10,561
Anchor Category (All anchors are ductile)			1									
Effectiveness factor k_{uncr} uncracked concrete			24									
Axial stiffness in service load range	β	lb/in	14,651	9,385	17,515	26,424	32,483	26,136	42,899	21,749	43,576	28,697
Coefficient for variation for axial stiffness in service load range			34	47	28	45	17	33	55	22	63	28
Strength reduction factor ϕ for tension, steel failure modes			0.75									
Strength reduction factor ϕ for shear, steel failure modes			0.65									
Strength reduction factor ϕ for tension, concrete failure modes, Condition B			0.65									
Strength reduction factor ϕ for shear, concrete failure modes, Condition B			0.70									

[1] Trubolt Anchor Design Strengths must be determined in accordance with ACI 318-05 Appendix D and this table
[2] The Trubolt Wedge Anchor is a ductile steel element as defined by ACI 318 D.1
[3] 1/4", 3/8", & 1/2" diameter data is listed in ICC-ES ESR-2251.

TRUBOLT WEDGE ANCHOR (INSTALLED)



Trubolt® Wedge Anchors

TRUBOLT WEDGE INSTALLATION INFORMATION

	Symbol	Units	Nominal Anchor Diameter (in.)									
			1/4"		3/8"		1/2"		5/8"		3/4"	
Anchor outer diameter	d_o	in	0.25		0.375		0.5		0.625		0.750	
Nominal carbide bit diameter	d_{bit}	in	1/4		3/8		1/2		5/8		3/4	
Effective embedment depth	h_{ef}	in	1-1/2	2	1-3/4	2-5/8	1-7/8	3-3/8	2-1/2	4	3-1/2	4-3/4
Min hole depth	h_o	in	2	2-1/2	2-1/2	3-3/8	2-3/4	4-1/4	3-3/4	5-1/4	4-3/4	6
Min slab thickness	h_{min}	in	4		4	5	5	6	5	8	6	8
Installation torque	T_{inst}	ft-lb	4		25		55		90		110	
Min hole diameter in fixture	d_h	in	5/16		7/16		9/16		11/16		13/16	

Strength Design Performance values in accordance to 2015 IBC

Trubolt®
Wedge Anchors

TRUBOLT WEDGE PULLOUT STRENGTH ($N_{p, unc}$) (POUNDS) [1]

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Concrete Compressive Strength			
		f'c = 2,500 psi	f'c = 3,000 psi	f'c = 4,000 psi	f'c = 6,500 psi
1/4	1-1/2	1,392	1,525	1,610	1,822
	2	1,706	1,869	1,947	2,151
3/8	1-3/4	2,198	2,408	2,621	3,153
	2-5/8	3,469	3,800	3,936	4,275
1/2	1-7/8	2,400	2,629	3,172	4,520
	3-3/8	4,168	4,520	4,520	4,520
5/8	2-1/2	4,155	4,155	4,376	5,578
	4	6,638	6,900	7,968	10,157
3/4	3-1/2	8,031	8,322	9,610	12,251
	4-3/4	10,561	10,561	10,561	12,251

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa
1 Values are for single anchors with no edge distance or spacing reduction.

TRUBOLT WEDGE ANCHOR ALLOWABLE STATIC TENSION (ASD), NORMAL-WEIGHT UNCRACKED CONCRETE [1-6]

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Concrete Compressive Strength			
		f'c = 2,500 psi	f'c = 3,000 psi	f'c = 4,000 psi	f'c = 6,500 psi
1/4	1-1/2	611	670	707	800
	2	749	821	855	945
3/8	1-3/4	965	1,058	1,151	1,385
	2-5/8	1,524	1,669	1,729	1,878
1/2	1-7/8	1,054	1,155	1,393	1,985
	3-3/8	1,831	1,985	1,985	1,985
5/8	2-1/2	1,825	1,825	1,922	2,450
	4	2,915	3,030	3,499	4,461
3/4	3-1/2	3,527	3,655	4,221	5,381
	4-3/4	4,638	4,638	4,638	5,381

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa
Design Assumptions:
1 Single anchor with static tension load only.
2 Concrete determined to remain uncracked for the life of the anchorage.
3 Load combinations from 2015 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).
4 Thirty percent dead load and 70 percent live load, controlling load combination 1.2D + 1.6L
5 Calculation of weighted average: 1.2D + 1.6L = 1.2 (0.3) + 1.6 (0.7) = 1.48
6 Values do not include edge distance or spacing reductions.

2015 IBC Compliant for Uncracked Concrete

TRUBOLT WEDGE ANCHOR ALLOWABLE STATIC SHEAR (ASD), STEEL (POUNDS)[1-5]

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Allowable Steel Capacity, Static Shear
1/4	1-1/2	628
	2	
3/8	1-3/4	1,307
	2-5/8	1,533
1/2	1-7/8	1,954
	3-3/8	2,804
5/8	2-1/2	2,655
	4	4,467
3/4	3-1/2	4,827
	4-3/4	6,601

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa
Design Assumptions:
1 Single anchor with static shear load only.
3 Load combinations from 2015 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).
3 Thirty percent dead load and 70 percent live load, controlling load combination 1.2D + 1.6L
4 Calculation of weighted average: 1.2D + 1.6L = 1.2 (0.3) + 1.6 (0.7) = 1.48
5 Values do not include edge distance or spacing reductions.

RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Large Diameter Tapcon (LDT) Anchors

Finished Head, Removable Anchor

LDT

(3/8" & 1/2") (5/8" & 3/4") Sawtooth™

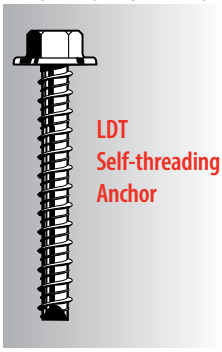
3/8" and 1/2" are available with Envirex™ coating

Uses standard drill bits—no special drill bits to purchase or lose!

DESCRIPTION/SUGGESTED SPECIFICATIONS

Self-threading Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE



LDT Self-threading Anchor

The LDT anchor is a high performance anchor that cuts its own threads into concrete.

Anchor bodies are made of hardened carbon steel and zinc plated.

The anchors shall have a finished hex washer head with anti-rotation serrations to prevent anchor back-out. The head of the anchor is stamped with a length identification code for easy inspection.

The anchor shall be installed with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994.

ADVANTAGES

SAVE TIME

EASILY INSTALLED

- Installs in less than half the time of wedge anchors or adhesive anchors
- Simply drill a pilot hole and drive the LDT anchor by hand or impact

EASILY REMOVED

- No torching or grinding required to remove anchors

SAVE MONEY

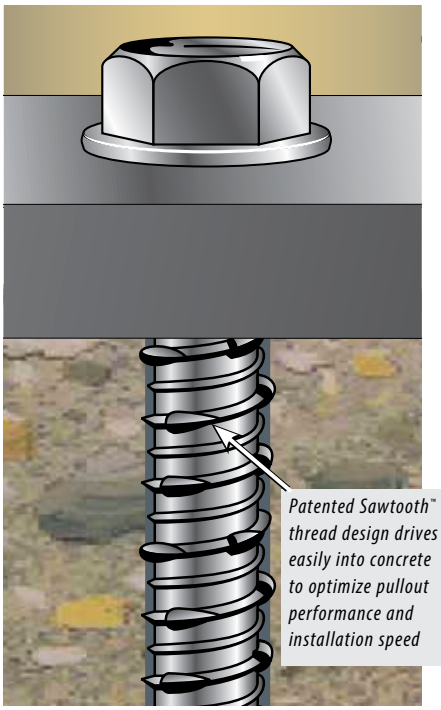
LOWER DRILL BIT COSTS

- Use standard ANSI bits instead of proprietary bits
- Single piece design, no nut and washer to assemble

USE STANDARD ANSI BITS

- No special proprietary bits to purchase or lose
- Reduce chances for anchor failure due to incorrect bit usage

Sawtooth Threads™, now available on 5/8" and 3/4"



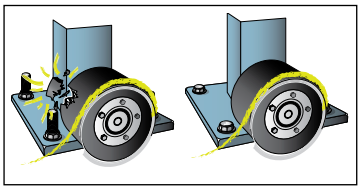
IMPROVED PERFORMANCE IN LARGE DIAMETER HOLES

- Superior performance to wedge anchor
- Higher loads in shallow embedments
- Closer edge/spacing distance than mechanical anchors
- More threads for better thread engagement and higher pullout resistance
- Durable induction-hardened tip

EASY INSTALLATION

- Easy 2-step installation, simply drill a pilot hole and drive
- Installs in less than half the time of a wedge anchor
- Efficient thread cutting
- Use standard drill bit sizes
- Single piece design—no nut and washer assembly
- Easily removed

APPLICATIONS

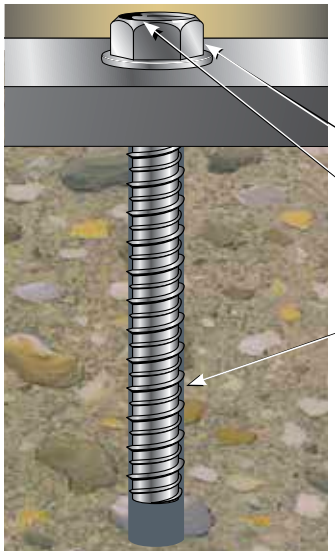


Racking, shelving and conveyors are just a few high volume applications ideal for Large Diameter Tapcon (LDT™). The ease and speed of installation of the LDT can reduce installation time to less than half the time of typical systems used today.

For installation speed, high performance and easy removability, LDT is the anchor of choice.

The LDT's finished head and lack of exposed threads virtually eliminates tire damage on fork lift trucks.

FEATURES



Easy Installation
Installs into concrete by hand or impact wrench

Anti-rotation Serrated Washer
— Prevents anchor back-out

Extra Large Hex Washer Head
— With increased bearing surface

Length Identification Head Stamp
— For embedment inspection after installation

Hi-Lo Threads
— Cuts its own threads into concrete for greater pull-out resistance

LDT 3/8" and 1/2" are available with *Envire*X™ coating

1,000 hours salt spray ASTM B117. Approved for use in ACQ and MCQ lumber*

*Excessive content of copper in the ACQ and MCQ lumber may affect the anchor finish.

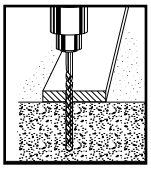
APPROVALS/LISTINGS

Miami-Dade County – #04-1025.08

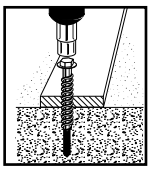
Florida Building Code

INSTALLATION STEPS

Installation Steps for Concrete, Lightweight Concrete and Metal Deck

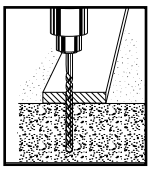


1. Using the proper size carbide bit (see chart) drill "a pilot hole at least 1" deeper than anchor embedment.

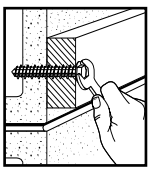


2. Using an electric impact wrench, or socket wrench (hand install) insert anchor into hole and tighten anchor until fully seated. (see chart for socket size) (do not over tighten).

Installation Steps for Hollow or Grout-Filled CMU
(3/8" and 1/2" diameter)



1. Using a 5/16" (for 3/8" LDT) or 7/16" (for 1/2" LDT) carbide tipped bit, drill a pilot hole at least 1" deeper than anchor embedment.



2. Using a socket wrench insert anchor into hole and hand tighten anchor until fully seated. (9/16" socket for 3/8" and 3/4" socket for 1/2") (do not over tighten).

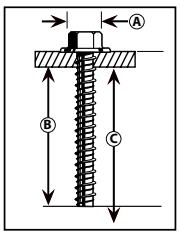
LDT's can be installed by hand or with an impact wrench

Installation by hand—is easy, simply using a socket wrench

Installation by impact wrench—is recommended for faster installations or for high volume projects. Installation with impact wrench—is ***not*** recommended for hollow block.

Selection Chart

LDT Size	ANSI Standard Drill Bit Diameter	Ⓐ Anchor Head (Socket Size) Diameter	Washer Diameter	Ⓑ Minimum Embedment	Ⓒ Hole Depth	USE IN		
						Concrete	CMU Hollow	CMU Grout-filled*
LDT 3/8"	5/16"	9/16"	13/16"	1-1/2"	2-1/2"	YES	YES	YES
LDT 1/2"	7/16"	3/4"	1"	2-1/2"	3-1/2"	YES	NO	YES
LDT 5/8"	1/2"	13/16"	1-3/16"	2-3/4"	3-3/4"	YES	NO	YES
LDT 3/4"	5/8"	15/16"	1-5/16"	3-1/4"	4-1/4"	YES	NO	YES

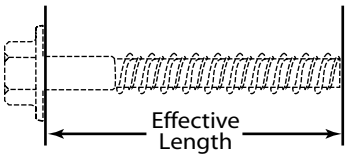


Ⓒ See catalog for effective lengths and length indication code. *please call technical service for grout-filled instructions.

SELECTION CHART

LDT Carbon Steel with Zinc Plating

Meets ASTM B695 and B633 specifications for zinc plating of 5um = .0002" thickness. This material is well suited for non-corrosive interior environments.



X denotes available with corrosion resistant *Envire*X™ coating

PART NUMBER FOR CARBON STEEL	ANCHOR DIA. In. (mm)	DRILL BIT DIA. In. (mm)	EFFECTIVE LENGTH In. (mm) (see detail on left)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CARTON lbs.
LDT-3816	3/8 (9.5)	5/16 (7.9)	1-3/4 (44.5)	1/4 (6.4)	50/ 3.0	400/ 24.0
LDT-3824	3/8 (9.5)	5/16 (7.9)	2-1/2 (63.5)	1 (25.4)	50/ 4.5	400/ 34.0
LDT-3830 X	3/8 (9.5)	5/16 (7.9)	3 (76.2)	1-1/2 (38.1)	50/ 5.0	400/ 40.0
LDT-3840	3/8 (9.5)	5/16 (7.9)	4 (101.6)	2-1/2 (63.5)	50/ 6.5	400/ 52.0
LDT-1230	1/2 (12.7)	7/16 (11.1)	3 (76.2)	1/2 (12.7)	25/ 4.5	150/ 27.0
LDT-1240 X	1/2 (12.7)	7/16 (11.1)	4 (101.6)	1-1/2 (38.1)	25/ 6.0	150/ 36.6
LDT-1250 X	1/2 (12.7)	7/16 (11.1)	5 (127.0)	2-1/2 (63.5)	25/ 7.6	150/ 45.6
LDT-1260	1/2 (12.7)	7/16 (11.1)	6 (152.4)	4 (101.6)	20/ 9.0	120/ 54.0
LDT-5830	5/8 (15.9)	1/2 (12.7)	3 (76.2)	1/4 (6.4)	10 / 3.5	100 / 35.0
LDT-5840	5/8 (15.9)	1/2 (12.7)	4 (101.6)	1-1/4 (31.8)	10 / 4.0	100 / 40.0
LDT-5850	5/8 (15.9)	1/2 (12.7)	5 (127.0)	2-1/4 (57.1)	10 / 4.7	100 / 47.0
LDT-5860	5/8 (15.9)	1/2 (12.7)	6 (152.4)	3-1/4 (82.6)	10 / 5.4	50 / 27.0
LDT-3444	3/4 (19.1)	5/8 (15.9)	4-1/2 (114.3)	1-1/4 (31.8)	10 / 7.4	50 / 37.0
LDT-3462	3/4 (19.1)	5/8 (15.9)	6-1/4 (158.8)	3 (76.2)	10 / 9.1	30 / 27.3

DESIGN GUIDE

For proper selection of anchor diameters based upon predrilled holes in base plates and fixtures.

HOLE DIAMETER IN FIXTURE In. (mm)	SUGGESTED LDT DIAMETER In. (mm)
7/16 (11.1)	3/8 (9.5)
1/2 (12.7)	3/8 (9.5)
9/16 (14.3)	1/2 (12.7)
5/8 (15.9)	1/2 (12.7)
3/4 (19.1)	5/8 (15.9)
7/8 (22.2)	3/4 (19.1)

LENGTH INDICATION CODE*

CODE	LENGTH OF ANCHOR In. (mm)
A	1-1/2 < 2 (38.1 < 50.8)
B	2 < 2-1/2 (50.8 < 63.5)
C	2-1/2 < 3 (63.5 < 76.2)
D	3 < 3-1/2 (76.2 < 88.9)
E	3-1/2 < 4 (88.9 < 101.6)
F	4 < 4-1/2 (101.6 < 114.3)
G	4-1/2 < 5 (114.3 < 127.0)
H	5 < 5-1/2 (127.0 < 139.7)
I	5-1/2 < 6 (139.7 < 152.4)
J	6 < 6-1/2 (152.4 < 165.1)

*Located on top of anchor for easy inspection.

PERFORMANCE TABLE

LDT Anchors

Ultimate Tension and Shear Values (Lbs/kN) in Concrete

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	f'c = 2000 PSI (13.8 MPa)		f'c = 3000 PSI (20.7 MPa)		f'c = 4000 PSI (27.6 MPa)	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	1-1/2 (38.1)	1,336 (5.9)	2,108 (9.4)	1,652 (7.3)	2,764 (12.3)	1,968 (8.8)	3,416 (15.2)
	2 (50.8)	1,492 (6.6)	3,036 (13.5)	2,024 (9.0)	3,228 (14.4)	2,552 (11.4)	3,420 (15.2)
	2-1/2 (63.5)	3,732 (16.6)	3,312 (14.7)	3,748 (16.7)	3,364 (15.0)	3,760 (16.7)	3,424 (15.2)
	3-1/2 (88.9)	5,396 (24.0)	3,312 (14.7)	6,624 (29.5)	3,368 (15.0)	7,852 (34.9)	3,428 (15.2)
1/2 (12.7)	2 (50.8)	3,580 (15.9)	5,644 (25.1)	3,908 (17.4)	6,512 (29.0)	4,236 (18.8)	7,380 (32.8)
	3-1/2 (88.9)	7,252 (32.3)	6,436 (28.6)	8,044 (35.8)	7,288 (32.4)	8,836 (39.3)	8,140 (36.2)
	4-1/2 (114.3)	10,176 (45.3)	7,384 (32.8)	10,332 (46.0)	7,968 (35.4)	10,488 (46.7)	8,552 (38.0)
5/8 (15.9)	2-3/4 (69.9)	5,276 (23.5)	8,656 (38.5)	6,560 (29.2)	11,064 (49.2)	7,844 (34.8)	13,476 (59.9)
	3-1/2 (88.9)	7,972 (35.5)	10,224 (45.5)	9,848 (43.8)	12,144 (54.0)	11,724 (52.2)	14,060 (62.5)
	4-1/2 (114.3)	11,568 (51.5)	12,316 (54.8)	13,432 (59.8)	13,580 (60.4)	16,892 (75.1)	14,840 (66.0)
3/4 (19.1)	3-1/4 (82.6)	6,876 (30.6)	7,140 (31.8)	9,756 (43.4)	10,728 (47.7)	12,636 (56.2)	14,316 (63.6)
	4-1/2 (114.3)	10,304 (45.8)	13,120 (58.4)	14,424 (64.2)	16,868 (75.0)	18,540 (82.5)	20,612 (91.7)
	5-1/2 (139.7)	13,048 (58.0)	17,908 (79.7)	18,156 (80.8)	21,718 (96.9)	23,268 (130.5)	25,652 (114.1)

LDT Anchors — Allowable Tension and Shear Values* (Lbs/kN) in Concrete Carbon and Stainless Steel

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	f'c = 2000 PSI (13.8 MPa)		f'c = 3000 PSI (20.7 MPa)		f'c = 4000 PSI (27.6 MPa)	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	1-1/2 (38.1)	334 (1.5)	527 (2.3)	413 (1.8)	691 (3.1)	492 (2.1)	854 (3.8)
	2 (50.8)	373 (1.7)	759 (3.4)	506 (2.2)	807 (3.6)	638 (2.8)	855 (3.8)
	2-1/2 (63.5)	933 (4.2)	828 (3.7)	937 (4.2)	841 (3.7)	940 (4.2)	856 (3.8)
	3-1/2 (88.9)	1,349 (6.0)	828 (3.7)	1,656 (7.4)	842 (3.7)	1,963 (8.7)	857 (3.8)
1/2 (12.7)	2 (50.8)	895 (4.0)	1,411 (6.3)	977 (4.3)	1,628 (7.2)	1,059 (4.7)	1,845 (8.2)
	3-1/2 (88.9)	1,813 (8.0)	1,609 (7.2)	2,011 (8.9)	1,822 (8.1)	2,209 (9.8)	2,035 (9.0)
	4-1/2 (114.3)	2,544 (11.3)	1,846 (8.2)	2,583 (11.5)	1,992 (8.9)	2,622 (11.7)	2,138 (9.5)
5/8 (15.9)	2-3/4 (69.9)	1,319 (5.9)	2,164 (9.7)	1,640 (7.3)	2,766 (12.3)	1,961 (8.7)	3,369 (15.0)
	3-1/2 (88.9)	1,993 (8.9)	2,556 (11.4)	2,462 (10.9)	3,036 (13.5)	2,931 (13.0)	3,515 (15.6)
	4-1/2 (114.3)	2,892 (12.9)	3,079 (13.7)	3,358 (14.9)	3,395 (15.1)	4,223 (18.8)	3,710 (16.5)
3/4 (19.1)	3-1/4 (82.6)	1,719 (7.6)	1,785 (7.9)	2,439 (10.8)	2,682 (11.9)	3,159 (14.0)	3,579 (15.9)
	4-1/2 (114.3)	2,576 (11.5)	3,280 (14.6)	3,606 (16.0)	4,217 (18.7)	4,635 (20.6)	5,153 (22.9)
	5-1/2 (139.7)	3,262 (14.5)	4,477 (19.9)	4,539 (20.2)	5,445 (24.2)	5,817 (25.9)	6,413 (28.5)

* Allowable values are based upon a 4 to 1 safety factor. (Ultimate/4)

LDT Anchors — Recommended Edge & Spacing Requirements for Tension Loads* Carbon and Stainless Steel

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	LOAD FACTOR APPLIED AT MIN. EDGE DISTANCE 1-3/4 Inches (44mm)	SPACING DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	LOAD FACTOR APPLIED AT MIN. SPACING DISTANCE 3 Inches (76mm)
3/8 (9.5)	1-1/2 (38.1)	2 (50.8)	70%	6 (152.4)	44%
	2 (50.8)	2 (50.8)	70%	6 (152.4)	44%
	2-1/2 (63.5)	3 (76.2)	70%	6 (152.4)	44%
	3-1/2 (88.9)	4 (101.6)	70%	6 (152.4)	44%
1/2 (12.7)	2 (50.8)	2-1/4 (57.2)	65%	8 (203.2)	27%
	3-1/2 (88.9)	3 (76.2)	65%	8 (203.2)	27%
	4-1/2 (114.3)	4 (101.6)	65%	8 (203.2)	27%

* Edge and spacing distance shall be divided by .75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

For 5/8" and 3/4" LDT Anchors, the critical edge distance for these anchors is 10 times the anchor diameter. The edge distance of these anchors may be reduced to 1-3/4" provided a 0.65 load factor is used for tension loads, a 0.15 load factor is used for shear loads applied perpendicular to the edge, or a 0.60 load factor is used for shear loads applied parallel to the edge. Linear interpolation may be used for intermediate edge distances.

LDT Anchors — Recommended Edge & Spacing Requirements for Shear Loads* Carbon and Stainless Steel

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	LOAD FACTOR APPLIED AT MIN. EDGE DISTANCE 1-3/4 Inches (44mm)	SPACING DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	LOAD FACTOR APPLIED AT MIN. SPACING DISTANCE 3 Inches (76mm)
3/8 (9.5)	1-1/2 (38.1)	3 (76.2)	25%	6 (152.4)	57%
	2 (50.8)	4 (101.6)	25%	6 (152.4)	57%
	2-1/2 (63.5)	5 (127.0)	25%	6 (152.4)	57%
	3-1/2 (88.9)	5 (127.0)	25%	6 (152.4)	57%
1/2 (12.7)	2 (50.8)	5 (127.0)	25%	8 (203.2)	60%
	3-1/2 (88.9)	5 (127.0)	25%	8 (203.2)	60%
	4-1/2 (114.3)	5-1/2 (139.7)	25%	8 (203.2)	60%

* Edge and spacing distances shall be divided by .75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

PERFORMANCE TABLE

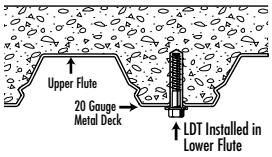
LDT Anchors — Ultimate Tension Load (Lbs/kN) in Concrete Block
(anchors should be installed by hand in hollow block)

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	HOLLOW CONCRETE BLOCK		GROUT FILLED CONCRETE BLOCK	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	1-1/2 (38.1)	916 (4.1)	3,176 (14.1)	1,592 (7.1)	3,900 (17.3)
1/2 (12.7)	2-1/2 (63.5)	–– ––	–– ––	5,924 (26.4)	6,680 (29.7)

LDT Anchors — Allowable Tension and Shear* (Lbs/kN) in Concrete Block
(anchors should be installed by hand in hollow block)

ANCHOR DIA. In. (mm)	EMBEDMENT DEPTH In. (mm)	HOLLOW CONCRETE BLOCK		GROUT FILLED CONCRETE BLOCK	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	1-1/2 (38.1)	229 (1.0)	794 (3.5)	398 (1.8)	975 (4.3)
1/2 (12.7)	2-1/2 (63.5)	–– ––	–– ––	1,481 (6.6)	1,670 (7.4)

* Allowable values are based upon a 4 to 1 safety factor. (Ultimate/4)

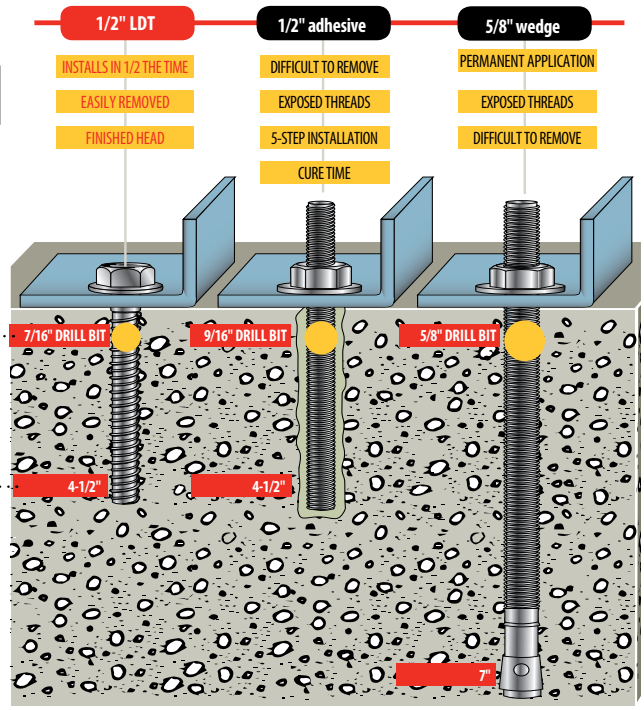


LDT Anchors — Anchoring Overhead in 3000 PSI Lightweight Concrete On Metal Deck

ANCHOR	DRILL HOLE DIAMETER In. (mm)	EMBEDMENT In. (mm)	3000PSI (20.7 MPa) CONCRETE		
				ULTIMATE TENSION LOAD Lbs. (kN)	ALLOWABLE WORKING LOAD Lbs. (kN)
3/8" LDT	5/16 (7.9)	1-1/2 (38.1)	Upper Flute	2,889 (12.9)	722 (3.2)
			Lower Flute	1,862 (8.3)	465 (2.1)

The Easy, Fast, High Performing, Removable Tapcon Anchor, Now Available in 3/8" and 1/2" Diameter

For use in concrete and concrete block



DRILL BIT SIZE REQUIRED
LDT anchors specify a smaller & less expensive drill bit than those required with the 1/2" adhesive threaded rod or the 5/8" wedge.

HOLE DEPTH REQUIRED
At 4-1/2" embedment the LDT anchor will give you performance (2000 PSI concrete) similar to 1/2" adhesive anchor of the same depth or 5/8" wedge anchors at 7" deep. (2000 PSI concrete)

RED HEAD®
ADHESIVE ANCHORING SPECIALISTS

Multi-Set II Drop-In Anchors

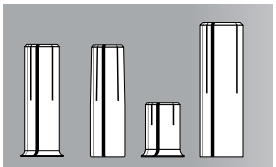
Internally Threaded Heavy-Duty Anchoring Systems

DESCRIPTION/SUGGESTED SPECIFICATIONS

Drop-In, Shell-Type Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE

Drop-In, shell-type anchors feature an internally threaded, all-steel shell with expansion cone insert and flush embedment lip. Anchors are manufactured from zinc-plated carbon steel, 18-8 stainless steel.


Multi-Set II Drop-In Anchors

Anchors should be installed with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 specifications.

Anchors should be tested to ASTM E488 criteria. Anchors should also be listed by the following agencies as required by the local building code: UL, FM, City of Los Angeles, California State Fire Marshal and Caltrans.

ADVANTAGE

Depth Charge Stop Drill Anchors

DepthCharge™ Stop Drill

- Shoulder prevents over drilling
- Less likely to hit reinforcing steel or post-tension cable in concrete
- No lost time or energy drilling farther than necessary
- Anchor is set at a specified depth, does not drop too far into hole

RM Drop-In Anchor

- Lipped anchor body keeps anchor flush
- Easy installation
- Keeps all rods same length
- Easy inspection
- Available in carbon steel, 18-8

RX Drop-In Anchor

- Optimized for use in hollow-core, pre-cast plank and post-tension slabs
- Lip keeps anchor flush during installation
- Shallow drilling—fast installation

RL Drop-In Anchor

- Below surface setting for easy patch work
- Higher performance potential with deep embedment setting

Multi-Set II Anchors

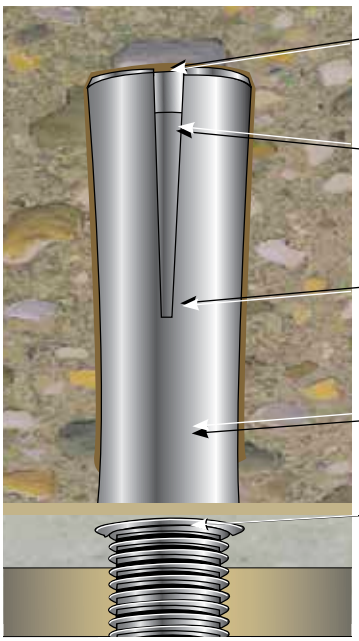
APPLICATIONS

Pumps and heavy piping are common applications for larger diameter Multi-Set Drop-In Anchors.

Cable tray and strut suspended from concrete ceilings are ideal Multi-Set applications. In post-tension or hollow-core slabs use the RX-38.

The Multi-Set Anchor is the standard for pipe-hanging. The RM version has a retainer lip to keep all anchors flush at the surface, keeping all your threaded rod the same length.

FEATURES



Expander Slots—allow for easy setting and superior performance

Cone Insert—that expands the anchor when driven with setting tool and hammer

Body—available in zinc-plated steel, 18-8 stainless steel

Easy Depth Inspection—keeps threaded rod drop lengths consistent

Retainer Lip—to keep anchor flush with surface

For use with threaded rods or headed bolts (supplied by contractor)

PART NUMBER RT-138
1 setting tool per master carton
(See page RH 61 for part numbers.)

APPROVALS/LISTINGS

Meets or exceeds U.S. Government G.S.A. Specification A-A-55614 Type 1 (Formerly GSA: FF-S-325 Group VIII)

Underwriters Laboratories

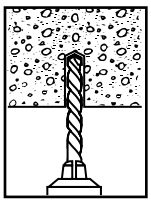
Factory Mutual

City of Los Angeles – #RR2748

California State Fire Marshal

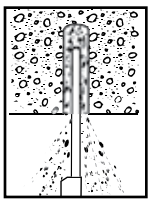
Caltrans

INSTALLATION STEPS

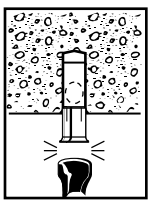


To set anchor flush with surface:

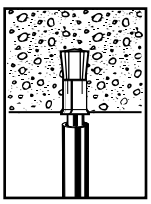
1. Drill hole to required embedment (see Table on page RH 63).



2. Clean hole with pressurized air.



3. Drive anchor flush with surface of concrete.



4. Expand anchor with setting tool provided (see chart on page RH 61). Anchor is properly expanded when shoulder of setting tool is flush with top of anchor.

To set anchor below surface:

Drill hole deeper than anchor length. Thread bolt into anchor. Hammer anchor into hole until bolt head is at desired depth. Remove bolt and set anchor with setting tool.

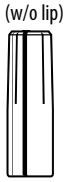
PART NUMBER RTX-138
For use with RX-38 only.

PART NUMBER RTX-112
For use with RX-12 only.

SELECTION CHART

Multi-Set II
Drop-In Anchors

One setting tool per master carton.
For continuous extreme low temperature, use stainless steel.

USER TYPE	APPLICATION	BASE MATERIAL	CORROSION RESISTANCE LEVEL	DROP-IN ANCHOR TYPE	PART NUMBER	SETTING TOOL PART NUMBER	BOLT SIZE-THREADS PER INCH	DRILL BIT DIA. In. (mm)	THREAD DEPTH In. (mm)	EMBEDMENT MIN. HOLE DEPTH In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CTN lbs.
HVAC/Fire Sprinkler		Solid concrete/ lightweight fill deck	Low	RM 	RM-14	RT-114	1/4" - 20	3/8 (9.5)	3/8 (9.5)	1 (25.4)	100/ 2.6	1000/ 28
					RM-38* +	RT-138	3/8" - 16	1/2 (12.7)	1/2 (12.7)	1-5/8 (41.3)	50/ 3.4	500/ 36
					RM-12* +	RT-112	1/2" - 13	5/8 (15.9)	3/4 (19.1)	2 (50.8)	50/ 5.8	400/ 49
					RM-58* +	RT-158	5/8" - 11	7/8 (22.2)	1 (25.4)	2-1/2 (63.5)	25/ 7.8	125/ 41
					RM-34* +	RT-134	3/4" - 10	1 (25.4)	1-1/4 (31.8)	3-3/16 (81.0)	25/11.9	100/ 49
		Hollow-core pre-cast or Post-tension	Low	RX 	RX-38*	RTX-138	3/8" - 16	1/2 (12.7)	3/8 (9.5)	3/4 (19.1)	100/ 3.5	1000/ 36
					RX-12	RTX-112	1/2" - 13	5/8 (15.9)	1/2 (12.7)	1 (25.4)	50/ 3.0	500/ 31
		Solid concrete/ lightweight fill deck	Medium	SRM** 18-8 S.S. 	SRM-38* +	RT-138	3/8" - 16	1/2 (12.7)	1/2 (12.7)	1 - 5/8 (41.3)	50/ 3.4	500/ 36
					SRM-12* +	RT-112	1/2" - 13	5/8 (15.9)	3/4 (19.1)	2 (50.8)	50/ 6.0	400/ 50
					SRM-58* +	RT-158	5/8" - 11	7/8 (22.2)	1 (25.4)	2 - 1/2 (63.5)	25/18.0	125/ 42
					SRM-34	RT-134	3/4" - 10	1 (25.4)	1-1/4 (31.8)	3-3/16 (81.0)	25/12.0	100/ 50
Concrete Cutting/ Sawing Contractor/Misc. Metal		Solid concrete/ lightweight fill deck	Low	RL (w/o lip) 	RL-14	RT-114	1/4" - 20	3/8 (9.5)	3/8 (9.5)	1 (25.4)	100/ 2.6	1000/ 28
					RL-38	RT-138	3/8" - 16	1/2 (12.7)	1/2 (12.7)	1 - 5/8 (41.3)	50/ 3.4	500/ 36
					RL-12	RT-112	1/2" - 13	5/8 (15.9)	3/4 (19.1)	2 (50.8)	50/ 5.8	400/ 49
					RL-58	RT-158	5/8" - 11	7/8 (22.2)	1 (25.4)	2 - 1/2 (63.5)	25/ 7.8	125/ 41
					RL-34	RT-134	3/4" - 10	1 (25.4)	1-1/4 (31.8)	3-3/16 (81.0)	25/11.9	100/ 49

* FM Approved + UL Approved

Multi-Set II
Depth Charge Anchors

PART NUMBER	DESCRIPTION	DRILL DEPTH
DC-38	1/2" x 1-11/16" CARBIDE DRILL BIT FOR 3/8" DROP-IN	1-11/16"
DC-12	5/8" x 2-1/6" CARBIDE DRILL BIT FOR 1/2" DROP-IN	2-1/6"
DCX-138	1/2" x 13/16" CARBIDE DRILL BIT FOR 3/8" STUBBY DROP-IN	13/16"

DepthCharge™ Stop Drill

- Shoulder prevents over drilling
- Less likely to hit reinforcing steel or post-tension cable in concrete

- No lost time or energy drilling farther than necessary
- Anchor is set at a specified depth, does not drop too far into hole

PERFORMANCE TABLES

Multi-Set II
Drop-In Anchors

Ultimate Tension and Shear Values (Lbs/kN) in Concrete*

BOLT DIA. In. (mm)	ANCHOR DIA. In. (mm)	MIN. EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	TENSION Lbs. (kN)			SHEAR Lbs. (kN)
				f'c = 2000 PSI (13.8 MPa)	f'c = 4000 PSI (27.6 MPa)	f'c = 6000 PSI (41.4 MPa)	f'c ≥ 2000 PSI (13.8 MPa)
1/4 (6.4)	3/8 (9.5)	1 (25.4)	RM, RL or CL-Carbon or SRM-18-8 S.S.	1,680 (7.5)	2,360 (10.5)	2,980 (13.3)	1,080 (4.8)
3/8 (9.5)	1/2 (12.7)	1-5/8 (41.3)		2,980 (13.3)	3,800 (16.9)	6,240 (27.8)	3,160 (14.1)
1/2 (12.7)	5/8 (15.9)	2 (50.8)		3,300 (14.7)	5,840 (26.0)	8,300 (36.9)	4,580 (20.4)
5/8 (15.9)	7/8 (22.2)	2-1/2 (63.5)		5,500 (24.5)	8,640 (38.4)	11,020 (49.0)	7,440 (33.1)
3/4 (19.1)	1 (25.4)	3-3/16 (81.0)		8,280 (36.8)	9,480 (42.2)	12,260 (54.5)	10,480 (46.6)

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.
* For continuous extreme low temperature applications, use stainless steel.

Multi-Set II Drop-In Anchors — Ultimate Tension and Shear Values (Lbs/kN) in Lightweight Concrete*

BOLT DIA. In. (mm)	ANCHOR DIA. In. (mm)	MINIMUM EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	LIGHTWEIGHT CONCRETE f'c = 3000 PSI (20.7 MPa) TENSION Lbs. (kN)	LIGHTWEIGHT CONCRETE f'c = 3000 PSI (20.7 MPa) SHEAR Lbs. (kN)	LOWER FLUTE OF STEEL DECK WITH LIGHTWEIGHT CONCRETE FILL f'c = 3000 PSI (20.7 MPa) TENSION Lbs. (kN)	LOWER FLUTE OF STEEL DECK WITH LIGHTWEIGHT CONCRETE FILL f'c = 3000 PSI (20.7 MPa) SHEAR Lbs. (kN)
3/8 (9.5)	1/2 (12.7)	1-5/8 (39.7)	RM, RL or CL-Carbon or SRM-18-8 S.S	3,860 (17.2)	4,420 (19.6)	3,340 (14.9)	4,420 (19.6)
1/2 (12.7)	5/8 (15.9)	2 (50.8)		4,080 (18.1)	5,640 (25.1)	3,200 (14.2)	4,940 (22.0)
5/8 (15.9)	7/8 (22.2)	2-1/2 (63.5)		6,280 (27.9)	10,440 (46.4)	5,960 (26.5)	5,840 (26.0)
3/4 (19.1)	1 (25.4)	3-3/16 (81.0)		11,000 (48.9)	15,780 (70.2)	8,180 (36.4)	9,120 (40.6)

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

Multi-Set II Drop-In Anchors — Recommended Edge and Spacing Distance Requirements*

BOLT DIA. In. (mm)	DRILL BIT SIZE In. (mm)	EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE	EDGE DISTANCE REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. EDGE DISTANCE AT WHICH LOAD FACTOR APPLIED =.80 FOR TENSION =.70 FOR SHEAR In. (mm)	SPACING REQUIRED TO OBTAIN MAX. WORKING LOAD In. (mm)	MIN. ALLOWABLE SPACING BETWEEN ANCHORS LOAD FACTOR APPLIED =.80 FOR TENSION =.55 FOR SHEAR In. (mm)
1/4 (6.4)	3/8 (9.5)	1 (25.4)	RM, RL or CL-Carbon or SRM-18-8 S.S.	1-3/4 (44.5)	7/8 (22.2)	3-1/2 (88.9)	1-3/4 (44.5)
3/8 (9.5)	1/2 (12.7)	1-5/8 (41.3)		2-7/8 (73.0)	1-7/16 (36.5)	5-11/16 (144.5)	2-7/8 (73.0)
1/2 (12.7)	5/8 (15.9)	2 (50.8)		3-1/2 (88.9)	1-3/4 (44.5)	7 (177.8)	3-1/2 (88.9)
5/8 (15.9)	7/8 (22.2)	2-1/2 (63.5)		4-3/8 (111.1)	2-3/16 (55.6)	8-3/4 (222.3)	4-3/8 (111.1)
3/4 (19.1)	1 (25.4)	3-3/16 (81.0)		5-5/8 (142.9)	2-13/16 (71.4)	11-3/16 (284.2)	5-5/8 (142.9)

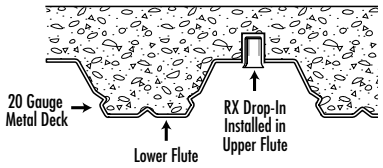
* Spacing and edge distances shall be divided by 0.75 when anchors are placed in structural lightweight concrete. Linear interpolation may be used for intermediate spacing and edge distances.

Multi-Set II Drop-In Anchors — Ultimate Tension and Shear Values (Lbs/kN) for RX-series (3/4" and 1" Embedment)*

BOLT DIA. In. (mm)	DRILL BIT SIZE In. (mm)	EMBEDMENT In. (mm)	2500 PSI (17.2 MPa) CONCRETE TENSION Lbs. (kN)	2500 PSI (17.2 MPa) CONCRETE SHEAR Lbs. (kN)	4000 PSI (27.6 MPa) CONCRETE TENSION Lbs. (kN)	4000 PSI (27.6 MPa) CONCRETE SHEAR Lbs. (kN)	HOLLOW CORE TENSION Lbs. (kN)	HOLLOW CORE SHEAR Lbs. (kN)
3/8 (9.5)	1/2 (12.7)	3/4 (19.1)	1,571 (7.0)	2,295 (10.2)	1,987 (8.8)	2,903 (12.9)	1,908 (8.5)	2,401 (10.7)
1/2 (12.7)	5/8 (15.9)	1 (25.4)	2,113 (9.4)	2,585 (11.5)	2,673 (11.9)	3,270 (14.5)	2,462 (11.0)	2,401 (10.7)

* The tabulated values are for RX anchors installed at a minimum of 12 diameters on center and minimum edge distance of 6 diameters for 100 percent anchor efficiency. Spacing and edge distance may be reduced to 6 diameters spacing and 3 diameter edge distance provided the values are reduced 50 percent. Linear Interpolation may be used for intermediate spacings and edge margins.

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.



Multi-Set II Drop-In Anchors — Anchoring Overhead in 3000 PSI Lightweight Concrete On Metal Deck

ANCHOR	DRILL HOLE DIAMETER In. (mm)	EMBEDMENT In. (mm)	3000PSI (20.7 MPa) CONCRETE ULTIMATE TENSION LOAD Lbs. (kN)		ALLOWABLE WORKING LOAD Lbs. (kN)	
RX-38 Drop-In	1/2 (12.7)	3/4 (19.1)	Upper Flute	1,410 (6.3)	353	(1.6)
			Lower Flute	1,206 (5.4)	301	(1.3)

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values.

Combined Tension and Shear Loading—for Multi-Set Anchors

Allowable loads for anchors subjected to combined shear and tension forces are determined by the following equation:

$$(Ps/Pt)^{5/3} + (Vs/Vt)^{5/3} \leq 1$$

Ps = Applied tension load **Vs = Applied shear load** **Pt = Allowable tension load** **Vt = Allowable shear load**

RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Dynabolt® Sleeve Anchors

Versatile, Medium-Duty Sleeve Anchor

Dynabolt
Hex Nut Sleeve Anchor

DESCRIPTION/SUGGESTED SPECIFICATIONS

Sleeve Type Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE, MASONRY, GROUT-FILLED BLOCK AND HOLLOW BLOCK

Dynabolt Masonry Sleeve Anchor

Sleeve type anchors feature a split expansion sleeve over a threaded stud bolt body and integral expander, nut and washer.

Anchors are made of Plated Carbon Steel, or Type 304 Stainless Steel.

Anchors should be installed with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994.

Anchors are tested to ASTM E488 criteria.

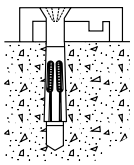
ADVANTAGES

- Anchor diameter equals hole diameter
- Available in hex head and six other head styles
- Available 5/16 - 3/4" diameter up to 6-1/4" length
- Zinc plated carbon steel and 304 stainless steel
- Provides full 360° hole contact over large area and reduces concrete stress
- Heavy-loading capacity
- Preassembled for faster, easier installations
- Dynabolt can be installed through object to be fastened
- Sleeve design improves holding power
- No pre-spotting of holes necessary

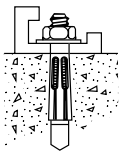
Available Head Styles

Full range of head style, corrosion protection, and sizes makes the Dynabolt Sleeve the right product for almost any application.

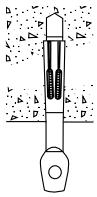
Phillips Flat Head **(FS)**



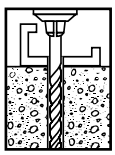
Hex Nut **(HN)**



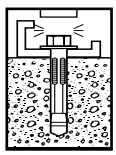
Tie Wire **(TW)**



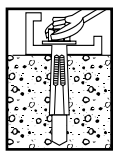
INSTALLATION STEPS



1. Use a bit with a diameter equal to the anchor. See selection chart to determine proper size bit for anchor used. Drill hole to any depth exceeding minimum embedment. Clean hole.



2. Insert assembled anchor into hole, so that washer or head is flush with materials to be fastened.



3. Expand anchor by tightening nut or head 2 to 3 turns.

APPROVALS/LISTINGS

Meets or exceeds U.S. Government G.S.A. Specification A-A-1922A (Formerly GSA: FF-S-325 Group II, Type 3, Class 3)

Factory Mutual

California State Fire Marshal

APPLICATIONS

Electrical junction boxes are common applications for the Dynabolt Sleeve anchor because it works well in solid concrete, concrete block, and brick. It is also available in several finished head styles.

The Dynabolt Sleeve anchor works well in hollow materials like brick and block. It is available in zinc-plated carbon steel and 304 stainless steel.

Door and window frames are commonly attached to the structure with Dynabolt Sleeve anchors because of their finished & threshold head styles and performance in block & brick.

Dynabolt Sleeve Anchors

SELECTION CHART

Dynabolt
Carbon Steel with Zinc Plating

Typical Applications—Shelf ledgers, electrical boxes, conduit

Environment—Interior (non-corrosive)

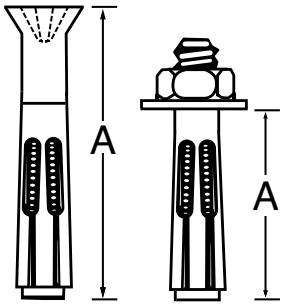
Level of Corrosion—Low

HEAD STYLE	PART NUMBER	ANCHOR DIA. & DRILL BIT SIZE	EFFECTIVE ANCHOR LENGTH* In. (mm)	BOLT DIA./ THREADS PER INCH	MIN. EMBEDMENT In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CARTON lbs.
HEX NUT	HN-1614	5/16"	1-1/2 (38.1)	1/4" /20	1-1/4 (31.8)	1/4 (6.4)	100/ 4.0	1000/ 41
	HN-3817*	3/8"	1-7/8 (47.6)	5/16" /18	1-1/2 (38.1)	3/8 (9.5)	50/ 3.5	500/ 36
	HN-3830*		3 (76.2)	5/16" /18	1-1/2 (38.1)	1-1/2 (38.1)	50/ 4.9	400/ 40
	HN-1222*	1/2"	2-1/4 (57.2)	3/8" /16	1-7/8 (47.6)	3/8 (9.5)	25/ 3.3	250/ 34
	HN-1230*		3 (76.2)	3/8" /16	1-7/8 (47.6)	1-1/8 (28.6)	25/ 4.0	200/ 33
	HN-1240*		4 (101.6)	3/8" /16	1-7/8 (47.6)	2-1/8 (54.0)	25/ 5.3	200/ 44
	HN-1260*		6 (152.4)	3/8" /16	1-7/8 (47.6)	4-1/8 (104.8)	20/ 5.6	200/ 56
	HN-5830*	5/8"	3 (76.2)	1/2" /13	2 (50.8)	1 (25.4)	25/ 7.0	150/ 46
	HN-5842*		4-1/4 (108.0)	1/2" /13	2 (50.8)	2-1/4 (57.2)	10/ 3.9	100/ 41
	HN-3440*	3/4"	4 (101.6)	5/8" /11	2-1/4 (57.2)	1-3/4 (44.5)	5/ 3.2	50/ 33
PHILLIPS FLAT HEAD	FS-3826	3/8"	2-7/8 (73.0)	5/16" /18	1-1/2 (38.1)	1-3/8 (34.9)	50/ 3.8	500/ 40
	FS-3840	(head dia. .722)	4 (101.6)	5/16" /18	1-1/2 (38.1)	2-1/2 (63.5)	50/ 5.3	400/ 44
	FS-3850		5 (127.0)	5/16" /18	1-1/2 (38.1)	3-1/2 (88.9)	50/ 5.6	300/ 40
	FS-3860		6 (152.4)	5/16" /18	1-1/2 (38.1)	4-1/2 (114.3)	50/ 8.0	300/ 48
TIE WIRE	TW-1614	5/16"	1-1/2 (38.1)	1/4" /20	1-1/2 (38.1)	9/32 (7.1)	100/ 4.9	1000/ 50

* FM Approved

Phillips flat head uses a standard 80°–82° counter sink.

*** Effective Anchor Length**



(FS) **(HN)**

SELECTION CHART

Dynabolt
Type 304 Stainless Steel

Typical Applications—Cladding and Brick Ties

Environment—Slight to moderate degree of pollution

Level of Corrosion—Medium

HEAD STYLE	PART NUMBER	ANCHOR DIA. & DRILL BIT SIZE	EFFECTIVE ANCHOR LENGTH* In. (mm)	BOLT DIA./ THREADS PER INCH	MIN. EMBEDMENT In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENER In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CARTON lbs.
HEX NUT	SHN-3817*	3/8"	1-7/8 (47.6)	5/16" /18	1-1/2 (38.1)	3/8 (9.5)	50/ 3.5	500/ 36
	SHN-5842*	5/8"	4-1/4 (108.0)	1/2" /13	2 (50.8)	2-1/4 (57.2)	10/ 3.9	100/ 41
PHILLIPS FLAT HEAD	SFS-3826	3/8"	2-7/8 (73.0)	5/16" /18	1-1/2 (38.1)	1-3/8 (34.9)	50/ 3.8	500/ 40

* FM Approved

Phillips flat head uses a standard 80°–82° counter sink.

For continuous extreme low temperature applications, use stainless steel.

PERFORMANCE TABLE

Dynabolt Sleeve Anchors — Ultimate Tension and Shear Values in Concrete (Lbs/kN)*

ANCHOR DIA. In. (mm)	INSTALLATION TORQUE Ft. Lbs. (Nm)	BOLT DIA. In. (mm)	MINIMUM EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE (STEEL)	f'c = 2000 PSI (13.8 MPa)		f'c = 3000 PSI (20.7 MPa)		f'c = 4000 PSI (27.6 MPa)	
					TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
5/16 (7.9)	8 (10.8)	1/4 (6.4)	1-1/4 (31.8)	Carbon or Stainless	1,400 (6.2)	2,040 (9.1)	1,920 (8.5)	2,220 (9.9)	2,600 (11.6)	2,400 (10.7)
3/8 (9.5)	14 (19.0)	5/16 (7.9)	1-1/2 (38.1)		1,620 (7.2)	2,560 (11.4)	2,240 (10.0)	2,800 (12.5)	3,100 (13.8)	3,040 (13.5)
1/2 (12.7)	20 (27.1)	3/8 (9.5)	1-7/8 (47.6)		2,220 (9.9)	4,000 (17.8)	3,140 (14.0)	4,500 (20.0)	4,400 (19.6)	5,000 (22.2)
5/8 (15.9)	48 (65.1)	1/2 (12.7)	2 (50.8)		3,080 (13.7)	6,440 (28.6)	4,400 (19.6)	7,240 (32.2)	6,120 (27.2)	8,080 (35.9)
3/4 (19.1)	90 (122.0)	5/8 (15.9)	2-1/4 (57.2)		4,200 (18.7)	10,200 (45.4)	6,060 (27.0)	11,600 (51.6)	8,900 (39.6)	13,100 (58.3)

* For continuous extreme low temperature applications, use stainless steel.

Dynabolt Sleeve Anchors — Ultimate Tension and Shear Values in Lightweight Concrete (Lbs/kN)*

ANCHOR DIA. In. (mm)	INSTALLATION TORQUE Ft. Lbs. (Nm)	BOLT DIA. In. (mm)	MINIMUM EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE (STEEL)	f'c = 4000 PSI (27.6 MPa)		f'c = 6000 PSI (41.4 MPa)	
					TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
5/16 (7.9)	8 (10.8)	1/4 (6.4)	1-1/4 (31.8)	Carbon or Stainless	1,260 (5.6)	1,680 (7.5)	1,440 (6.4)	2,220 (9.9)
3/8 (9.5)	14 (19.0)	5/16 (7.9)	1-1/2 (38.1)		1,620 (7.2)	2,300 (10.2)	2,240 (10.0)	2,800 (12.5)
1/2 (12.7)	25 (33.9)	3/8 (9.5)	1-7/8 (47.6)		2,600 (11.6)	3,920 (17.4)	3,160 (14.1)	4,840 (21.5)
5/8 (15.9)	48 (65.1)	1/2 (12.7)	2 (50.8)		3,240 (14.4)	5,600 (24.9)	4,300 (19.1)	7,840 (34.9)
3/4 (19.1)	90 (122.0)	5/8 (15.9)	2-1/4 (57.2)		3,640 (16.2)	8,640 (38.4)	5,800 (25.8)	12,480 (55.5)

Dynabolt Sleeve Anchors — Ultimate Tension and Shear Values in Masonry Units (Lbs/kN)*

ANCHOR DIA. In. (mm)	INSTALLATION TORQUE Ft. Lbs. (Nm)	BOLT DIA. In. (mm)	MINIMUM EMBEDMENT DEPTH In. (mm)	ANCHOR TYPE (STEEL)	LIGHTWEIGHT				MEDIUM WEIGHT			
					HOLLOW CORE		GROUT FILLED		HOLLOW CORE		GROUT FILLED	
					TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/8 (9.5)	15 (20.3)	5/16 (7.9)	1-1/2 (38.1)	Carbon	1,360 (6.0)	2,560 (11.4)	1,360 (6.0)	2,560 (11.4)	1,360 (6.0)	2,560 (11.4)	1,360 (6.0)	2,560 (11.4)
				Stainless	1,160 (5.2)	2,560 (11.4)	1,160 (5.2)	2,560 (11.4)	1,160 (5.2)	2,560 (11.4)	1,160 (5.2)	2,560 (11.4)
1/2 (12.7)	25 (33.9)	3/8 (9.5)	1-7/8 (47.6)	Carbon	— —	— —	2,220 (9.9)	4,000 (17.8)	— —	— —	2,220 (9.9)	4,000 (17.8)
				Stainless	— —	— —	2,100 (9.3)	4,000 (17.8)	— —	— —	2,100 (9.3)	4,000 (17.8)
5/8 (15.9)	55 (74.6)	1/2 (12.7)	2 (50.8)	Carbon	— —	— —	3,080 (13.7)	6,440 (28.6)	— —	— —	3,080 (13.7)	6,440 (28.6)
				Stainless	— —	— —	3,080 (13.7)	6,440 (28.6)	— —	— —	2,820 (12.5)	6,440 (28.6)
3/4 (19.1)	90 (122.0)	5/8 (15.9)	2-1/2 (63.5)	Carbon	— —	— —	4,200 (18.7)	10,200 (45.4)	— —	— —	4,200 (18.7)	10,200 (45.4)

* Allowable values are based upon a 4 to 1 safety factor. Divide by 4 for allowable load values. **The tabulated values are for anchors installed in a minimum of 12 diameters on center and a minimum edge distance of 6 diameters for 100 percent anchor efficiency. Spacing and edge distance may be reduced to 6 diameter spacing and 3 diameter edge distance, provided the values are reduced 50 percent. Linear interpolation may be used for intermediate spacings and edge distances.**

Combined Tension and Shear Loading—for Dynabolt Anchors

Allowable loads for anchors subjected to combined shear and tension forces are determined by the following equation: $(Ps/Pt) + (Vs/Vt) \leq 1$

Ps = Applied tension load Vs = Applied shear load Pt = Allowable tension load Vt = Allowable shear load

RED HEAD®
ADHESIVE ANCHORING SPECIALISTS

Redi-Drive Anchors

Redi-Drive Anchors—High Performance Without Torquing

Finished Head

DESCRIPTION/SUGGESTED SPECIFICATIONS

Light-Duty Hammer-Drive Masonry Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE, BLOCK AND BRICK

The Redi-Drive is a high performance small diameter one-piece hammer-drive anchor. The anchor holds based on a friction principle—the shank diameter is larger than the drill hole size. Anchors shall be installed with carbide-tipped hammer drill bits made in accordance to ANSI B212.15-1994.

Redi-Drive High Performance Hammer-Drive Anchor

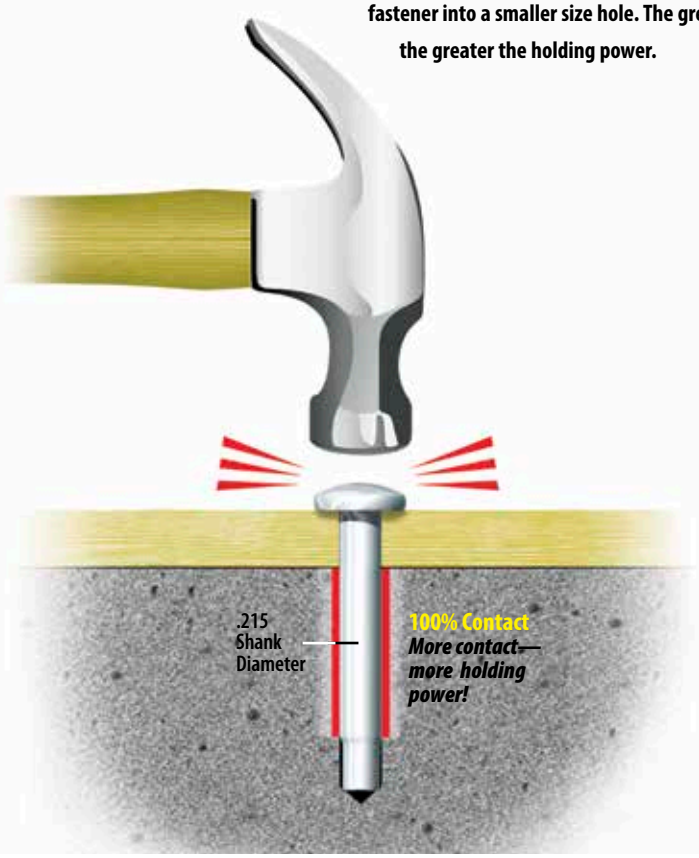
The Redi-Drive is available in mushroom head. Anchor performance in solid concrete at one inch embedment shall exceed 400 lbs. allowable tension load and 750 lbs. allowable shear load.

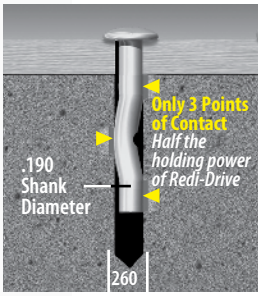
ADVANTAGES

- High performance provides superior holding values in concrete and other masonry materials
- Fire resistant
- Tamper resistant
- Standard 3/16" drill hole size—cheaper bit and faster installation
- Available in 3/4", 1-1/8" lengths
- Most economical steel anchor available
- Provides fast, high performance drive-type fastening without torquing or need for special setting equipment

As simple as using a nail—

drive into predrilled holes for tremendous holding strength in concrete. **Compressive strength is created by forcing a larger diameter fastener into a smaller size hole. The greater the degree of contact the greater the holding power.**





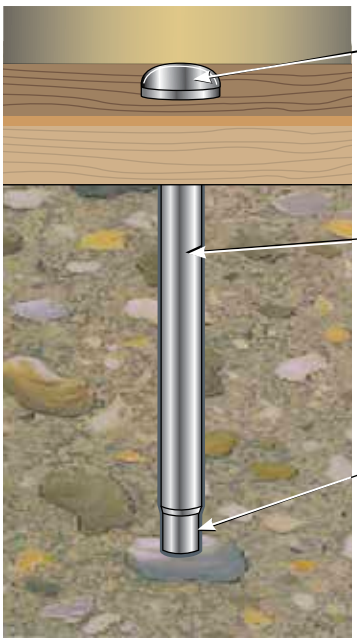
APPLICATIONS

- Signage and other light duty metal products
- Wood attachments
- Electrical boxes and conduit clips

APPROVALS/LISTINGS

Meets or exceeds U.S. Government G.S.A. Specification FF-S-325 Group VI

FEATURES

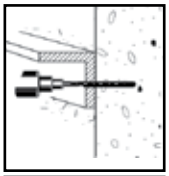


Tamper-Proof—mushroom head

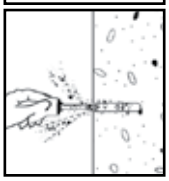
100% Hole Contact—.215 shank in .198 hole

Dog-Point—for easy insertion and installation

INSTALLATION STEPS

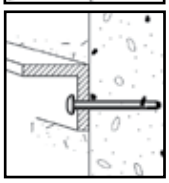


1. Drill a proper-sized diameter hole at a minimum depth (see chart below, ANSI B212.15–1994).



2. Clean hole.
Please note hole is 3/16" but diameter of Redi -Drive is 1/4"

3. Insert anchor through material to be fastened (insert tie-wire or pipe version Redi-Drive anchors into drilled holes) and drive anchor with a 3-lb. hammer until the head is flush with surface or desired embedment.



Anchor is now set for Redi-Drive Anchor.

SELECTION CHART

Redi-Drive Anchors

Typical Applications—Electrical boxes, conduit clips, and duct work

PART NUMBER	HEAD DIA. In. (mm)	DRILL BIT SIZE In. (mm)	TOTAL LENGTH In. (mm)	MIN. EMBEDMENT In. (mm)	MAX. FIXTURE THICKNESS In. (mm)	CLEARANCE HOLE SIZE In. (mm)	QTY/WT PER BX lbs.	QTY/WT PER MASTER CARTON lbs.
RD4-034	7/16 (11.1)	3/16 (4.8)	3/4 (19.1)	11/16 (17.5)	1/16 (1.6)	1/4 (6.4)	100/ 1.4	1000/15
RD4-118	7/16 (11.1)	3/16 (4.8)	1-1/8 (28.6)	3/4 (19.1)	3/8 (9.5)	1/4 (6.4)	100/ 1.6	1000/17

PERFORMANCE TABLE

Redi-Drive Anchors

Ultimate Tension and Shear Values (Lbs/kN) in Concrete, Hollow Block and Grout Filled

SHANK DIA. ANCHOR	EMBEDMENT In. (mm)	4500 PSI (31.0 MPa)		CMU (HOLLOW BLOCK) PSI (MPa)		CMU (GROUT FILLED) PSI (MPa)	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)	TENSION Lbs. (kN)	SHEAR Lbs. (kN)
Redi-Drive	3/4 (19.1)	1,215 (5.4)	1,857 (8.3)	382 (1.7)	683 (3.0)	731 (3.3)	1,614 (7.2)
	1 (25.4)	1,667 (7.4)	3,112 (13.8)	392 (1.7)	987 (4.4)	870 (3.9)	1,766 (7.9)
	1-1/4 (31.8)	2,373 (10.6)	3,355 (14.9)	398 (1.8)	1,381 (6.1)	1,543 (6.9)	2,778 (12.4)

Safe working loads for single installations under static loading conditions should not exceed 25% of the ultimate capacity.

The tabulated values are for anchors installed in a minimum of 12 diameters on center and a minimum edge distance of 10 diameters for 100 percent anchor efficiency.
Space and edge distance may be reduced to six diameters spacing and five diameter edge distance provided values are reduced 50%. Linear interpolation may be used for intermediate spacing and edge margins.

RED HEAD®
ADHESIVE ANCHORING SPECIALISTS

Hammer-Set™ Anchors

Nail-Drive Anchors

APPLICATIONS

* For overhead applications refer to page RH 69 for Redi-Drive information and performance data

NOT FOR USE IN OVERHEAD APPLICATIONS*

- Electrical boxes
- Conduit clips
- Drywall track
- Roof flashing

DESCRIPTION/SUGGESTED SPECIFICATIONS

Hammer-Set Nail Drive Anchors—

SPECIFIED FOR ANCHORAGE INTO CONCRETE, BLOCK AND BRICK

Hammer-Set Nail-Drive Anchor

The Hammer-Set one-piece zinc plated steel anchor consists of an expansion body and expander drive pin. Anchors meet or exceed GSA specification A-A-1925A Type 1. (Formerly GSA: FF-S-325 Group V, Type 2, Class 3)

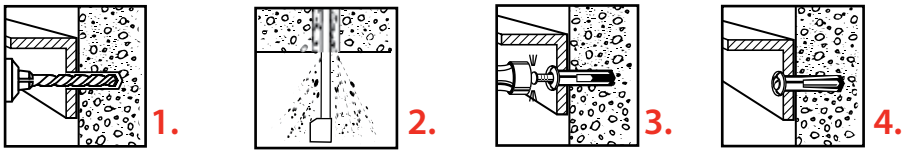
ADVANTAGES

- Fast, easy installation
- Works in concrete, block and brick
- Install through material to be fastened
- Low profile mushroom head style

APPROVALS/LISTINGS

Meets or exceeds GSA specification A-A-1925A Type 1 (Formerly GSA: FF-S-325 Group V, Type 2, Class 3)

INSTALLATION STEPS



1. Drill proper size hole through material to be fastened into base material. (See Chart for bit size).
2. Clean hole.
3. Insert Hammer-Set into hole until head of anchor body is flush with material to be fastened. Tap the nail until flush with head of anchor. Ensure minimum embedment is 1/4" deeper than anchor embedment. Be sure head is firmly against fixture
4. Anchor is now set. ** NOT RECOMMENDED FOR OVERHEAD **

SELECTION CHART

Hammer-Set

PART NUMBER	DESCRIPTION In. (mm)	DRILL SIZE In. (mm)	MAX. FIXTURE THICKNESS In. (mm)	MIN. EMBEDMENT In. (mm)	MIN. HOLE DEPTH In. (mm)	QTY/WT PER BOX lbs.	QTY/WT PER MASTER CTN-lbs.
HS-1607	3/16 x 7/8 (4.8 x 22.2)	3/16 (4.8)	1/4 (6.4)	5/8 (15.9)	1-1/8 (28.6)	100/ 2.0	1000/ 20
HS-1412	1/4 x 1-1/4 (6.4 x 31.8)	1/4 (6.4)	1/2 (12.7)	3/4 (19.1)	1-1/2 (38.1)	100/ 2.6	1000/ 26
HS-1414	1/4 x 1-1/2 (6.4 x 38.1)	1/4 (6.4)	3/4 (19.1)	3/4 (19.1)	1-3/4 (44.5)	100/ 2.8	1000/ 28
HS-1420	1/4 x 2 (6.4 x 50.8)	1/4 (6.4)	1-1/4 (31.8)	3/4 (19.1)	2-1/4 (57.2)	100/ 3.5	1000/ 35

PERFORMANCE TABLE

Hammer-Set

Ultimate Tension and Shear Values in Concrete (Lbs/kN)*

ANCHOR DIA. In. (mm)	EMBEDMENT In. (mm)	4000 PSI (27.6 MPa)	
		TENSION Lbs. (kN)	SHEAR Lbs. (kN)
3/16" (4.8)	5/8" (15.9)	640 (2.8)	810 (3.6)
1/4" (6.4)	3/4" (19.1)	880 (3.9)	970 (4.3)
1/4" (6.4)	1" (25.4)	950 (4.2)	970 (4.3)
1/4" (6.4)	1-1/4" (31.8)	1,025 (4.6)	970 (4.3)

Safe working loads for single installations under static loading conditions should not exceed 25% of the ultimate capacity.

RED HEAD®
CONCRETE ANCHORING SPECIALISTS

Striker Nails

Fast Installation, Light Duty Application Anchors

DESCRIPTION/SUGGESTED SPECIFICATIONS

Striker Concrete Nails—

SPECIFIED FOR ANCHORAGE INTO MASONRY

#12 diameter hardened spiral concrete nail provides secure and economical fastening to concrete, block or brick. Hot dip galvanized for superior corrosion resistance (exceeds requirement of Factory Mutual #4470). Applications include installation to walls or roof decks and wood or metal studs to concrete. Packaged product supplied complete with a 3/16" diameter coice tolerance drill bit.

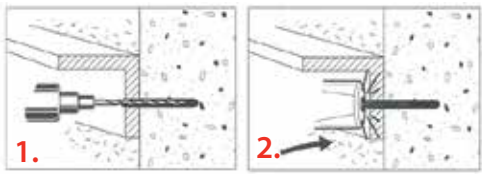
ADVANTAGES

- Fast, Easy installation
- Drill bit included in packaged product
- High corrosion resistant
- Versatile application, can be used in concrete, hollow block and brick

APPLICATIONS

- Plywood to concrete
- Furring strips, sheet metal and exterior track
- 2 x 4 to concrete, wood ledgers and concrete form work

INSTALLATION STEPS



1. Drill a 3/16" diameter hole to the recommended depth (see chart) and clean hole. (3/16" diameter carbide bit included).
2. Insert anchor and drive anchor with a 3-lb. hammer until head is flush with surface.

SELECTION CHART

Striker Nails

PART NUMBER *	DRILL DIAMETER INCHES	ANCHOR LENGTH INCHES	QTY/WT PER CASE lbs.
6901	3/16	1-1/2	1000/18
6902	3/16	2	1000/23
6903	3/16	2-1/2	1000/29
6904	3/16	3	1000/32
6905	3/16	3-1/2	1000/39
6906	3/16	4	750/32

* Available in 100 Pack Box.

PERFORMANCE TABLE

Striker Nails

Ultimate Tension Load 5326 LBS.
Ultimate Shear Load 2887 LBS.

EMBEDMENT DEPTH (Inches)	PULLOUT VALUE (lbf) IN 3000 PSI CONCRETE CURED 40 DAYS
1	1100
1-1/2	1500
2	1940

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