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RESEARCH REPORT: RR 24975
(CSI 03150)
BASED UPON ICBO ES EVALUATION
REPORT NO. ER-4285

REEVALUATION DUE DATE:
December 1, 2010
Issued: April 1, 2009.
Code: 2002 LABC

GENERAL APPROVAL - Reevaluation/Clerical Modification - Ramset Epcon Ceramic 6 Epoxy Anchors.

DETAILS

The above assemblies and/or products are approved when in compliance with the description, use, identification and findings of Report No. ER-4285, dated November 1, 1998, of the I.C.B.O. Evaluation Service, Incorporated. The report, in its entirety, is attached and made part of this general approval.

The parts of Report No. ER- 4285 marked by the asterisks are deleted or revised by the Los Angeles Building Department from this approval.

CONDITIONS OF APPROVAL

1. The values in this report shall not be used in repair, retrofit and new construction of tilt-up wall anchorage (in tension) for the connection with the horizontal wood diaphragm.
2. A 25% reduction in all allowable loads specified in the research report shall be taken in hold-down devices as required by 2002 City of Los Angeles Building Code Section 91.2315.5.6.
3. Special inspection is required by a registered deputy inspector who must be licensed by the Material Control Section as required by Section 91.1701.5 of the Los Angeles City Building Code.

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ITW Ramset/Redhead

RE: Ramset Epcon Ceramic 6 Epoxy Anchors

4. Concrete anchors are limited by Table 19-D as to their allowable shear and tension values.
5. The adhesive anchor system shall not be used in the following situations:
 - a. For soffit or overhead installations.
 - b. For installations in areas where the temperature is 140 degrees Fahrenheit or higher.
 - c. For installations of any building component where a fire may cause a premature failure of the components and create a hazard.
 - d. The system shall not be used to resist sustained gravity loads.

DISCUSSION

The clerical modification is to company address.

This general approval will remain effective provided the Evaluation Report is maintained valid and unrevised with the issuing organization. Any revisions to the report must be submitted to this Department, with appropriate fee, for review in order to continue the approval of the revised report.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this approval have been met in the project in which it is to be used.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

The status of the referenced Evaluation Report No. ER-4285, dated November 1, 1998 which is currently beyond its reexamination date is still valid. The validity of the evaluation report was verified with ICBO.



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Attachments: ICBO ES Evaluation Report No. 4285 (6 Pages)



ICBO Evaluation Service, Inc.

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EVALUATION REPORT

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ER-4285

Reissued November 1, 1998

Filing Category: FASTENERS—Concrete and Masonry Anchors (066)

ITW RAMSET/RED HEAD EPCON SYSTEM

ITW RAMSET/RED HEAD
1300 NORTH MICHAEL DRIVE
WOOD DALE, ILLINOIS 60191

1.0 SUBJECT

ITW Ramset/Red Head Epcon System Ceramic 6 Epoxy Anchors.

2.0 DESCRIPTION

2.1 General:

The ITW Ramset/Red Head Epcon System Ceramic 6 Epoxy Anchors are stud-type adhesive anchors for use in concrete and unreinforced brick walls. The anchors consist of a polymer epoxy adhesive and either a threaded steel rod, nut and washer or deformed shank reinforcing bars. The threaded steel rods range from 3/8 inch through 1 1/4 inches (9.5 mm through 31.7 mm) in diameter, and must conform to ASTM A 307 [F_u = 60,000 psi (415 MPa) minimum]; ASTM A 193, Grade B7 [F_u = 125,000 psi (860 MPa) minimum]; or ASTM F 593, Grade F593A (Alloy Type 304) [F_u = 115,000 psi (795 MPa) minimum]. Deformed reinforcement bars range from No. 3 to No. 10 and must conform to ASTM A 615, A 616, A 617 or A 706, Grade 60. For installation in unreinforced brick walls, a threaded steel rod, screen tube, steel sleeve, steel plate, nut and washer are used with the epoxy adhesive.

The Epcon polymer epoxy adhesive, identified as "Ceramic 6," comes in a 17.9-fluid-ounce (530 ml) cartridge that has equal amounts of resin and hardener components. The dual-component cartridge is used with a hand-powered injector tool and disposable plastic mixing nozzle that mixes the resin and hardener components as they are pumped through the nozzle.

The recommended shelf life of the cartridges is two years when stored at temperatures of 40°F to 125°F (4.4°C to 52°C).

2.2 Design:

Allowable static loads for anchors installed in accordance with this report are shown in Tables 4, 5 and 8. These values must be adjusted for in-service temperatures in accordance with Figure 1, and for spacing and edge effects in accordance with Tables 2 and 6. Allowable loads for anchors subjected to combined shear and tension forces are determined by the following equation:

$$\left(\frac{P_s}{P_t}\right)^{5/3} + \left(\frac{V_s}{V_t}\right)^{5/3} \leq 1$$

where:

P_s = Applied service tension load.

P_t = Service tension load.

V_s = Applied service shear load.

V_t = Service shear load.

Anchors are not permitted to be subjected to vibratory loads such as those encountered by supports for reciprocating engines, crane loads and moving loads due to vehicles. Anchors are permitted for live load, dead load, earthquake load, and wind load applications.

2.3 Concrete:

2.3.1 General: Anchors are used in normal-weight concrete with various compressive strengths. See Tables 3 and 7 for installation requirements for various threaded-rod sizes.

2.3.2 Installation: A hole is drilled and cleaned of dust and debris, using a nylon brush and a jet of compressed air, to accommodate the anchor. Holes for 3/8- and 1/2-inch (9.5 and 12.7 mm) threaded studs are drilled 1/16 inch (1.6 mm) larger than the stud diameter, to predetermined depths, with hand-held electropneumatic rotary hammer drills using carbide-tipped drill bits that comply with ANSI B212.15-1994. Holes for reinforcing bars and 5/8- through 1 1/4-inch (15.9 through 31.7 mm) threaded studs are drilled 1/8 inch (3.2 mm) larger than the bar or stud diameter.

Ambient and concrete temperatures shall be at least 65°F (18°C) during adhesive placement. A mixing nozzle is attached to the Epcon cartridge and the assembly is in turn attached to the injector tool. Before application, the epoxy is pumped out of the nozzle until the material achieves a uniform light-gray color. The hole and surrounding location shall be dry before the adhesive is placed. Holes are filled approximately one-half full with the mixed epoxy, and the threaded rods are inserted, with a rotating motion, to the bottom of the hole. Adhesives shall cure in accordance with Table 1 before placing attachments.

2.3.3 Special Considerations: The anchors may be used within fire-resistive construction, provided the anchors only resist wind and/or seismic forces. The anchors cannot be used to resist tension loads in ceiling or wall installations unless special consideration is given to fire-exposure conditions.

2.4 Unreinforced Brick Walls:

2.4.1 General: Anchors installed in existing unreinforced brick walls with Epcon Ceramic 6 Adhesive resist short-term wind or seismic loads only. Existing unreinforced brick walls must have a minimum thickness of 13 inches (330 mm). Anchors are installed in three configurations, with each utilizing the adhesives, threaded rod and screen tube. Configuration A, shown in Figure 2, has a straight threaded rod embedded 8 inches (203 mm) into the wall. Configuration B, shown in Figure 3, has a threaded rod, bent and installed 13 inches

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* deleted by City of L. A.

(330 mm) into the wall at a 22.5-degree angle. Configuration C uses a through-bolt, steel sleeve and steel plate, as shown in Figure 4.

The threaded rod for Configurations A and B is a zinc-plated, $\frac{3}{4}$ -inch-diameter (19.1 mm) ASTM A 307 threaded rod. A $\frac{5}{8}$ -inch-diameter (15.9 mm) ASTM A 307 threaded rod is used in Configuration C.

The screen tube is electrogalvanized steel wire cloth formed into a tube having a $\frac{15}{16}$ -inch (23.8 mm) diameter and a length of 8 inches (203 mm), except for Configuration B, in which the tube length is 13 inches (330 mm). The screen tubes used in Configuration C have a plastic bottom to prevent escape of adhesive and allow through drilling to complete the anchor installation.

A $\frac{7}{8}$ -inch-long (194 mm) sleeve formed from No. 16 gage ASTM A 36 steel, used in the through-bolted Configuration C, has an outside diameter of $\frac{13}{16}$ inch (20.6 mm). A plastic plug is inserted in the tapered end of the sleeve. The flared end of the sleeve has hexagonal splines to accept a socket extension. A 6-inch-by-6-inch-by- $\frac{3}{8}$ -inch-thick (152 mm by 152 mm by 9.5 mm) ASTM A 36 steel plate is located on the back face of the wall at the end of the threaded rod of the through-bolted connection.

Allowable shear for Configuration A is 1,000 pounds (4450 N). The allowable tension for Configuration B is 1,200 pounds (5340 N). The allowable shear for Configuration C is 750 pounds (3340 N). Allowable values are for short-duration seismic or wind loads and cannot be increased for these short-term loads. Where the load combination equation (12.11) in Section 1612.3.1 of the code is used, the 0.75 factor is 1.0. The adhesive for the installed anchors must be protected from direct weather exposure.

2.4.2 Installation: The anchors are installed in 1-inch-diameter (25.4 mm) holes drilled into mortar joints by means of standard rotary drill bits for use in concrete or masonry and a rotary drill or rotary hammer drill used in the "rotation only" mode. The hole is drilled perpendicular to the wall face to an 8-inch (203 mm) depth for Configuration A, and through the wall for Configuration C. The hole for the Configuration B anchor is drilled at the angle and to the embedment described in Section 2.4.1, using a guide that is either hand-held or attached to the drill. The holes are cleaned with oil-free compressed air and a nylon brush.

The mixed adhesive is injected into the screen tube until completely full. The tube is then placed into the drilled hole, and the threaded rod of Configurations A and B or the steel sleeve of Configuration C is slowly pushed and continuously rotated into the screen tube, forcing the adhesive through the screen and into the hole. The adhesive must be cured at the temperature and for the time period noted in Table 1 before load application, in Configurations A and B, or before continuing installation of the Configuration C anchor. After the adhesive is cured in Configuration C, a $\frac{5}{8}$ -inch-diameter (15.9 mm) hole is drilled through the plastic plug in the end of the steel sleeve, using a standard rotary drill bit. The $\frac{5}{8}$ -inch (15.9 mm) threaded rod is inserted through the hole and attached to the opposite side of the wall using the metal plate and nut.

2.4.3 Miscellaneous: Acceptability is contingent on the following:

1. Approval by the project engineer.
2. Installation under special inspection in accordance with Section 2.5 of this report.
3. Only seismic or wind loads are imposed on anchors.
4. For seismic or wind shear loads on Configurations A and C:
 - a. Allowable load is applicable only where in-place shear tests indicate a minimum mortar strength of 55

psi (380 kPa) when tested in accordance with UBC Standard 21-6.

- b. Twenty-five percent of anchors are tested by a special inspector using a calibrated-torque wrench set to a minimum torque of 60 foot-pounds (80 N-m). No visible deflection or deformation is permitted under torque. Steel sleeves for anchors in Configuration C are tested prior to installation of threaded rods.
 - c. Anchors installed in accordance with details for Configuration A or C have a minimum edge distance and spacing of 16 inches (406 mm).
 - d. For each project, the project engineer and contractor must submit a report indicating compliance with this evaluation report to the local building department.
5. For seismic or wind tension loads for Configuration B:
- a. Allowable load is applicable only where in-place mortar shear tests indicate a minimum ultimate strength of 55 psi (380 kPa) when tested in accordance with UBC Standard 21-6.
 - b. Five percent of anchors are tested in accordance with ASTM E 488, with a minimum of two tests required. Where the wall thickness varies, at least one test is performed on an anchor that has the least embedment. Tests shall indicate that bolts can sustain a tensile load of 3,000 pounds (13 350 N) for a five-minute period with an allowable 10 percent deviation.

Tests are under the supervision of the project engineer or an approved testing laboratory. At a minimum, the test report shall include:

 - Test location(s).
 - Brick/mortar condition.
 - Bolt movement/elongation.
 - Embedment depth.
 - Applied load.
 - c. Twenty-five percent of installed anchors are tested by a special inspector using a torque-calibrated wrench set to a minimum torque of 60 foot-pounds (80 N-m). No visible deflection or deformation is permitted under torque.
 - d. Configuration B anchors have a minimum edge distance and spacing of 16 inches (406 mm).
 - e. For each project, the project engineer and contractor must submit to the local building department a report that includes a statement of compliance with this evaluation report.

2.5 Special Inspection:

Adhesive anchor installations require special inspection in accordance with Section 1701 of the code. The special inspector records the drill bit compliance with ANSI B212.15-1994; hole depth and cleanliness; product description, including product name, rod diameter and length; adhesive expiration date; and verification of anchor installation in accordance with the manufacturer's published instructions and this report.

2.6 Identification:

The Epcon Ceramic 6 Epoxy Anchors are identified by labels on the packaging indicating the manufacturer's name (ITW Ramset/Red Head), product name, material type, serial number traceable to production date, length and diameter of the threaded rod, and evaluation report number (ICBO ES ER-4285).

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICBO ES Acceptance Criteria for Adhesive Anchors in Concrete and Masonry Elements (AC58), dated January 1998, including reports of creep and freeze-thaw tests; and the ICBO ES Acceptance Criteria for Unreinforced Masonry Anchors (AC60), dated January 1995.

* deleted by City of L.A.

4.0 FINDINGS

That the ITW Ramset/Read Head Epcon System Ceramic 6 Epoxy Anchors described in this report comply with the 1997 *Uniform Building Code*TM, subject to the following conditions:

- 4.1 The anchors are installed in accordance with the manufacturer's instructions and this report.
- 4.2 Anchors are installed in holes and substrates pre-drilled with a carbide-tipped masonry drill manufactured within the range of the maximum and minimum drill-tip dimensions of ANSI B212.15-1994 for the allowable values set forth in this report.
- 4.3 Special inspection in accordance with Section 2.5 is provided for all anchor installations.
- 4.4 Calculations and details showing compliance with this report are submitted to the local building official for approval.
- 4.5 Anchors are not used in conjunction with fire-resistant construction, except as noted in Section 2.3.3.
- 4.6 Anchors are not used to resist tension forces in ceiling or wall installations unless special consideration is given to fire-exposure conditions.
- 4.7 Anchors are not subjected to vibratory or shock loads, such as those encountered by supports for reciprocating engines or crane rails.

4.6 Adhesive anchors in unreinforced brick walls resist seismic or wind forces only.

4.9 Use of anchors in concrete to resist earthquake loads is permitted when reduced to 83 percent of tabulated tension values or 75 percent of tabulated shear values. The tabulated allowable load values may be increased by 33 1/3 percent for short-term loads, such as wind loads in accordance with Section 1612.3.3 of the code.

4.10 Anchors in concrete are limited to installation in uncracked concrete [which is defined as concrete subjected to maximum 170 psi (1172 kPa) tensile stress induced by external loads or deformations].

4.11 The anchors are limited to interior use, except that installation in concrete in severe, moderate or negligible exterior weathering locations, in accordance with Figure 21-1-1 of UBC Standard 21-1, is permitted when stainless steel threaded rods are installed.

4.12 During installation, the hole and surrounding location must be dry.

4.13 Adhesives are manufactured in Montgomeryville, Pennsylvania, and Wood Dale, Illinois, with quality control inspections by PFS/TECO (NER-QA251).

This report is subject to re-examination in two years.

TABLE 1—MANUFACTURER'S RECOMMENDED CURE TIME FOR EPCON CERAMIC 6 EPOXY ANCHORS

MINIMUM CONCRETE TEMPERATURE ¹ (°F)	INITIAL SET TIME ² (hours)	CURE TIME ³ (hours)
65	1.0	24
90	1.0	24

For SI: t°C = 5/9(t°F - 32).

¹Adhesives shall be installed in substrates at temperatures of at least 65°F. Installation in substrates at temperatures below 65°F is beyond the scope of this report.

²Anchors are to be undisturbed during the initial set time.

³Cure time required prior to application of allowable (design) tensile and shear loads.

TABLE 2—REDUCTION FACTORS FOR REDUCED SPACING AND EDGE DISTANCES FOR THREADED ROD INSTALLED IN CONCRETE WITH EPCON CERAMIC 6 ADHESIVE^{1,2}

TENSION CAPACITY		SHEAR CAPACITY	
Spacing (s) and Edge Distance (c)	Factor (F _t)	Edge Distance (c)	Factor (F _v)
s _{min} = 0.75E	0.75	c _{min} = 0.5E	0.3
c _{min} = 0.50E	0.7		

¹Linear interpolation is allowed for edge distances that fall between 0.5E and 1.25E and anchor spacing that falls between 0.75E and 1.5E. (E = embedment.)

²Load reduction factors should be combined (multiplied) where applicable. In the case where three or more anchors are used, spacing reduction factors must be combined (multiplied). Where two or more edge distances affect performance, edge reduction factors must be combined (multiplied). When a group of anchors is affected by both reduced spacing and reduced edge distances, the edge and spacing reduction factors must be combined (multiplied).

TABLE 3—SPECIFICATIONS AND DETAILS FOR INSTALLATION OF THREADED ROD IN CONCRETE WITH EPCON CERAMIC 6 EPOXY ADHESIVE

PROPERTY	ROD DIAMETER					
	3/8 inch	1/2 inch	5/8 inch	3/4 inch	1 inch	1 1/4 inches
A _s [Tensile stress area of rod (in. ²)]	0.0775	0.142	0.226	0.334	0.606	0.969
A _b [Nominal area of rod (in. ²)]	0.1042	0.1867	0.2935	0.4246	0.7589	1.19
BD [Nom. bit diameter (in.)]	7/16	9/16	3/4	7/8	1 1/8	1 3/8
E [Min. anchor embed. (in.)]	3 3/8	4 1/2	5 5/8	6 3/4	9	11 1/4
T [Max. tightening torque (ft.-lbf)]	18	25	80	160	330	450
H [Min. base material thickness (in.)]	5 1/2	6 1/2	7 3/4	9	12	15

For SI: 1 inch = 25.4 mm, 1 in.² = 645.16 mm², 1 ft.-lbf = 1.36 N-m.

* deleted by City of L.A.

TABLE 4—ALLOWABLE TENSILE LOADS FOR THREADED ROD INSTALLED IN NORMAL-WEIGHT CONCRETE WITH EPON CERAMIC 6 EPOXY ADHESIVE^{1,2,3,4,5,6,7}

ANCHOR DIAMETER (Inches)	MIN. EMBED. DEPTH, h_e ¹⁰ (Inches)	SPACING, s (Inches)	EDGE, c (Inches)	TENSILE LOAD BASED ON CONCRETE AND BOND STRENGTH (lb) ^{8,9}		TENSILE LOAD BASED ON STEEL STRENGTH (lb _f)		
				$f_c = 2,000$ psi	$f_c = 4,000$ psi	A 307 (SAE 1018)	A 193 Grade B7 (SAE 4140)	F 593 SS 304
3/8	3 3/8 4 1/2	5 6 3/4	4 1/4 5 3/8	1,800 1,100 2,080 1,100	2,110 1,100 2,505 1,100	2,080	4,340	3,995
1/2	4 1/2 6	6 3/4 9	5 5/8 7 1/2	3,315 1,900 4,780 2,080	4,420 1,900 4,900 3,410	3,730	7,780	7,155
5/8	5 5/8 7 1/2	8 7/16 11 1/4	7 9 3/8	4,425 3,000 5,660 4,510	6,130 3,000 7,100 5,280	5,870	12,230	11,250
3/4	6 3/4 9	10 1/8 13 1/2	8 7/16 11 1/4	7,195 4,500 7,940 5,400	7,885 4,500 10,245 6,400	8,490	17,690	14,860
1	9 12	13 1/2 18	11 1/4 15	10,085 6,270 12,180 6,270	11,970 6,270 15,545 8,430	15,180	31,620	26,560
1 1/4	11 1/4 15	16 7/8 22 1/2	14 18 3/4	13,915 16,340	14,245 19,930	23,800	49,580	34,670

For SI: 1 inch = 25.4 mm, 1 lbf = 4.48 N, 1 psi = 6.89 kPa, t°C = 5/9 (t°F - 32).

- ¹ Allowable load must be the lesser of bond and steel strength. The steel strength values in the table are in accordance with Section 2.1.
- ² The allowable tension capacities may be increased for duration of load in accordance with Section 1612.3.3 of the code. Resistance to earthquake loads is permitted when bond and steel load are reduced to 83 percent of tabulated values.
- ³ The tabulated values are for anchors installed at the specified spacing (s) and edge (c) distances. Spacing and edge distances may be reduced in accordance with Table 2. Linear interpolation may be used for intermediate spacings.
- ⁴ The tabulated values are for anchors installed in concrete having the designated compressive strength or higher at the time of installation.
- ⁵ Epon anchors experience a reduction in tensile and shear capacity with increased ambient temperatures. The load factors noted in Figure 1 must be applied to the values noted in the table above when the anchors are installed in locations in which the ambient temperatures may exceed 85°F.
- ⁶ Special inspection in accordance with Section 2.5 must be provided for all anchor installations.
- ⁷ Section 2.3.3 contains special considerations for anchor load conditions.
- ⁸ Bond strength load based on a safety factor of 4.
- ⁹ Displacement under load is 1/8 inch or less.
- ¹⁰ Minimum member or slab thickness is 1.5 h_v .

TABLE 5—ALLOWABLE SHEAR LOADS FOR THREADED ROD INSTALLED IN NORMAL-WEIGHT CONCRETE WITH EPON EPOXY ADHESIVE^{1,2,3,4,5,6}

ANCHOR DIAMETER (Inches)	MIN. EMBED. DEPTH, h_e ⁹ (Inches)	SPACING, s (Inches)	EDGE, c (Inches)	SHEAR LOAD BASED ON CONCRETE AND BOND STRENGTH (lb) ^{7,8}		SHEAR LOAD BASED ON STEEL STRENGTH (lb _f)		
				$f_c = 2,000$ psi	$f_c = 4,000$ psi	A 307 (SAE 1018)	A193 Grade B7 (SAE 4140)	SS 304
3/8	3 3/8	5	4 1/4	1,300 1,100	1,465 1,100	1,040	2,170	1,995
1/2	4 1/2	6 3/4	5 5/8	2,855 1,550	2,145 1,750	1,870	3,895	3,585
5/8	5 5/8	8 7/16	7	4,575 2,900	4,050 3,050	2,940	6,125	5,635
3/4	6 3/4	10 1/8	8 7/16	6,420 4,250	6,040 4,400	4,250	8,855	7,440
1	9	13 1/2	11 1/4	9,630 3,750	10,085 5,300	7,590	15,810	13,285
1 1/4	11 1/4	16 7/8	14	16,270	13,865	11,900	24,790	18,840

For SI: 1 inch = 25.4 mm, 1 lbf = 4.48 N, 1 psi = 6.89 kPa, t°C = 5/9 (t°F - 32).

- ¹ Allowable load must be the lesser of concrete and steel strength. The steel strength values in the table are in accordance with Section 2.1.
- ² The tabulated values are for anchors installed at the specified spacing (s) and edge (c) distances. Spacing and edge distances may be reduced in accordance with Table 2. Linear interpolation may be used for intermediate spacings.
- ³ The tabulated values are for anchors installed in concrete having the designated compressive strength or higher at the time of installation.
- ⁴ Special inspection in accordance with Section 2.5 must be provided for all anchor installations.
- ⁵ Epon anchors experience a reduction in tensile and shear capacity with increased ambient temperatures. The load factors noted in Figure 1 must be applied to the values noted in the table above when the anchors are installed in locations in which the ambient temperatures may exceed 85°F.
- ⁶ Allowable loads may be increased for duration of load in accordance with Section 1612.3.3 of the code. Resistance to earthquake loads is permitted when bond and steel load is reduced to 75 percent of tabulated values.
- ⁷ Bond strength load based on a safety factor of 4.
- ⁸ Displacement under load is 1/8 inch or less.
- ⁹ Minimum member or slab thickness is 1.5 h_v .

* deleted by City of L.A.
** revised by City of L.A.

TABLE 6—REDUCTION FACTORS FOR REDUCED SPACING AND EDGE DISTANCES FOR REINFORCING BAR INSTALLED IN CONCRETE WITH EPON ADHESIVE^{1,2}

TENSION CAPACITY	
Spacing (s) and Edge Distance (c)	Factor (F_1)
$s_{min} = 0.75E$	0.75
$c_{min} = 0.50E$	0.7

- ¹ Linear interpolation is allowed for edge distances that fall between $0.5E$ and $1.25E$, and anchor spacing that falls between $0.75E$ and $1.5E$.
- ² Load reduction factors should be combined (multiplied) where applicable. In the case where three or more anchors are used, spacing reduction factors must be combined (multiplied). Where two or more edge distances affect performance, edge reduction factors must be combined (multiplied). When a group of anchors is affected by both reduced spacing and reduced edge distances, the edge and spacing reduction factors must be combined (multiplied).

TABLE 7—SPECIFICATION AND INSTALLATION DETAILS FOR REINFORCING BAR INSTALLED IN CONCRETE WITH EPCON ADHESIVE

d Rebar Size	No. 3	No. 4	No. 5	No. 6	No. 8	No. 10
A_{br} Nominal area of rebar (in. ²)	0.11	0.20	0.31	0.44	0.79	1.27
d_b Nominal bit diameter (in.)	1/2	5/8	3/4	7/8	1 1/4	1 1/2
E Minimum anchor embedment (in.)	3 3/8	4 1/2	5 5/8	6 3/4	9	11 1/4

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm².

TABLE 8—ALLOWABLE LOADS FOR ASTM GRADE 60 REINFORCING BAR INSTALLED IN NORMAL-WEIGHT CONCRETE WITH EPCON CERAMIC 6 ADHESIVE^{1,2,3,4,5}

REBAR SIZE	MINIMUM EMBEDMENT DEPTH, h_a ⁸ (Inches)	SPACING, s (Inches)	EDGE DISTANCE, c (Inches)	TENSION (lb) ^{6,7} ϕ	
				$\phi = 2,000$ psi	$\phi = 4,000$ psi
No. 3	3 3/8	5	4 1/4	1,765-1,100	2,300-1,100
	4 1/2	6 3/4	5 5/8	2,250-1,100	2,885-1,100
No. 4	4 1/2	6 3/4	5 5/8	2,085-1,900	2,785-1,900
	6	9	7 1/2	4,175-3,080	4,720-3,410
No. 5	5 5/8	8 7/16	7	3,530-3,000	6,035-3,000
	7 1/2	11 1/4	9 3/8	5,010-4,510	7,680-5,280
No. 6	6 3/4	10 1/8	8 7/16	4,485-4,500	7,300-4,500
	9	13 1/2	11 1/4	6,380-5,400	10,410-12,400
No. 8	9	13 1/2	11 1/4	7,740	13,545
	12	18	15	7,460	16,355
No. 10	11 1/4	16 7/8	14	11,150	19,125
	15	22 1/2	18 3/4	12,305	20,580

For SI: 1 inch = 25.4 mm, 1 lbf = 4.48 N, 1 psi = 6.89 kPa, $t^{\circ}C = 5/9 (t^{\circ}F - 32)$.

¹The tabulated values are for rebar installed in concrete having the designated compressive strength or higher at the time of installation.

²The tabulated values are for anchors installed at the specified spacing (s) and edge (c) distances. Spacing and edge distances may be reduced in accordance with Table 6. Linear interpolation may be used for intermediate spacings.

³The anchors cannot be used to resist tension forces in overhead and wall installations unless proper consideration is given to fire conditions.

⁴The allowable load values shall not be increased for duration of load in accordance with Section 1612.3.3 of the code. Resistance to earthquake loads is beyond the scope of this evaluation report.

⁵The anchors experience a reduction in tensile capacity with increased ambient temperatures. The load factors noted in Figure 1 must be applied to the values noted in the above table when the anchors are installed in locations in which the concrete temperature may exceed 85°F.

⁶Load based on a safety factor of 4.

⁷Displacement under load is 1/8 inch or less.

⁸Minimum slab or member thickness is 1.5 h_a .

* deleted by City of L.A.
 ** revised by city of L.A.

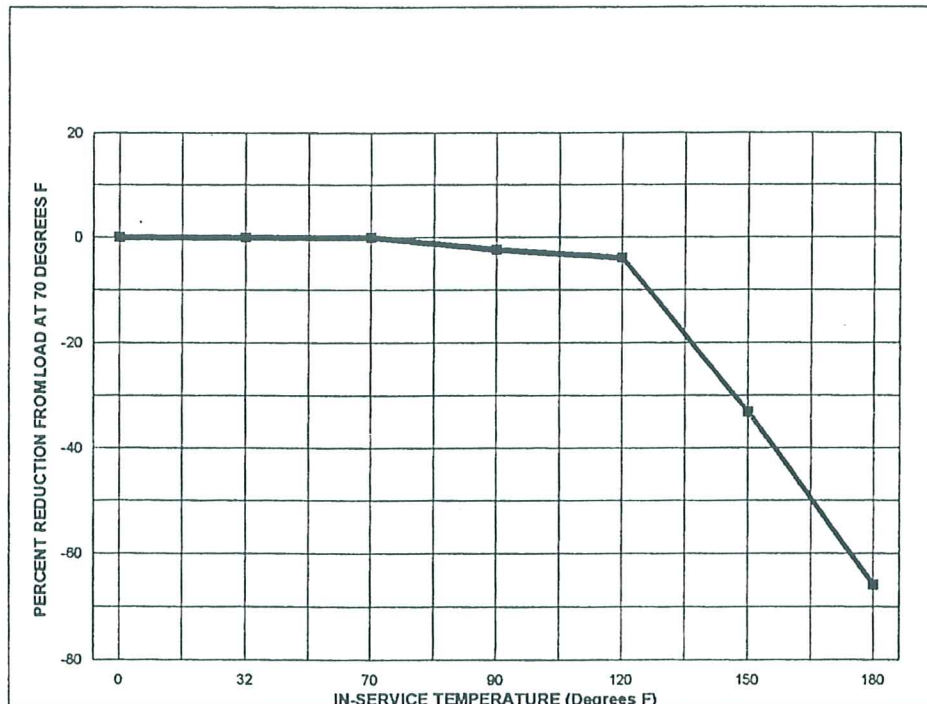


FIGURE 1—LOAD REDUCTION BASED ON IN-SERVICE TEMPERATURE

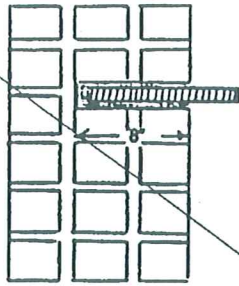


FIGURE 2—CONFIGURATION A

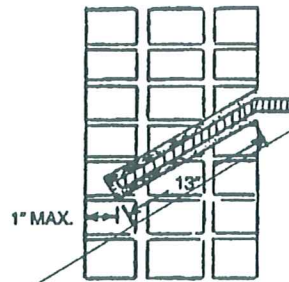


FIGURE 3—CONFIGURATION B

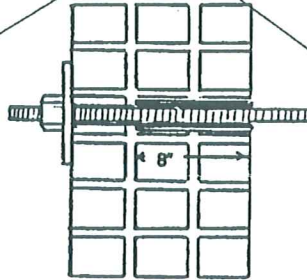


FIGURE 4—CONFIGURATION C

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