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RESEARCH REPORT: RR 25185
(CSI #03150)

Expires: May 1, 2011
Issued: October 1, 2009
Code: 2002 LABC

GENERAL APPROVAL - Renewal/Clerical Modification - Simpson Epoxy-Tie ET-22 and ET-56 Epoxy for Anchors Installed in Stone Aggregate Concrete.

DETAILS

Simpson Epoxy-Tie ET-22 and ET-56 are a two component epoxy paste contained in a Disposable cartridge which consists of 2 cylinders. The cylinders contain the hardener, which is kept separated from the resin until the components are dispensed through a motionless mixer nozzle, which is attached to the dispenser. The nozzle mixes the components at a accurate 1:1 ratio with caulking style gun operated manually, or by compressed air.

I. Directions for Anchoring in Stone Aggregate Concrete:

1. Drill hole to specified diameter and depth for the bolt or reinforcing bar to be embedded. For required diameter and depth refer to Table I.
2. Drill bits shall meet ANSI Specification B212.15.
3. Clean drilled hole using nylon brush and compressed air.
4. With $\frac{3}{8}$ " motionless mixer nozzle attached to cartridge, fill drilled hole approximately $\frac{2}{3}$ full. Dispensed epoxy shall be flowing at a uniform rate. The uniform flow shall be a mixed gray paste.
5. Insert thoroughly clean anchor with at least $\frac{1}{2}$ revolution. Twist to ensure complete coverage of the thread or ribs with epoxy.
6. Allow anchor to harden before bolt-up (see Table IV).

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7. Allowable loads shown in Table I for the Epoxy-Tie ET-22 and ET-56 Fastening System Are approved for installations in stone aggregate concrete, subject to the following conditions:
 - a. The values shown 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.
 - b. These anchors are not approved for masonry applications.
 - c. A 25% reduction in all allowable loads specified in the research report shall be taken in hold-down devices as required by the 2002 Los Angeles City Building Code Section 2315.5.6.
 - d. The values shown in Table I are for anchors installed in stone aggregate concrete having a minimum compressive strength of 2500 psi and 4500 psi. Values may be interpolated linearly for concrete strengths between 2500 and 4500 psi.
 - e. Epoxy type anchors shall not be installed into or used to support any fire-resistive construction.
 - f. The tabulated values must be reduced by load factors, as recommended by the manufacturer, when anchors are installed in locations where the concrete temperatures may exceed 72 degrees F. Attached is a thermal correction graph to reduce the allowable stress with increase in temperature (Figure No. 1).
 - g. The values may not be increased one-third when considering wind or seismic loads.
 - h. Before installation of the anchor, concrete shall have reached its design strength.
 - i. Installations of the anchor shall be in accordance with the manufacturer's Instructions except where specified otherwise herein. A copy of the installation instructions shall be provided at each jobsite.
 - j. The tabulated values are for threaded studs of A307 quality or better and deformed reinforcing bars of Grade 60 or better.
 - k. Allowable loads for anchors in concrete subject to combined shear and tension forces are determined by the ratio of the actual shear to the allowable shear plus the ratio of the actual tension to the allowable tension shall not exceed 1.00.
 - l. Minimum embedments, spacing and edge distances shall be in accordance with Tables I, II, and III.

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- m. The anchor shall not be installed in overhead applications such as in the soffit of a beam or arch or similar locations or overhead installations.
 - n. A called building inspection shall be requested prior to the installation of the bolts to verify:
 - installer qualification.
 - component identification
8. Anchors are not approved for use where supports will be subject vibratory or impact loads, such as supports for reciprocating engines or crane rails.
 9. Special inspection is required by reinforced concrete steel or reinforced masonry deputy inspector with controlled activity in drilled in anchor bolts.

DISCUSSION

The clerical modification is to change the address, the contact person, and the telephone number.

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.

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Attachments: 7 Pages.

Simpson Strong-Tie Co.

RE: Simpson Epoxy-Tie ET-22 and ET-56 Epoxy for
Anchors Installed in Stone Aggregate Concrete

TABLE I
ALLOWABLE TENSILE FOR THREADED ROD INSTALLED
IN STONE AGGREGATE CONCRETE
(POUNDS)^{1,2,3,4,5,}

Stud Diameter (inch)	Drill Bit Diameter (inch)	Minimum Embedment Depth (inch)	Spacing (inch)	Edge Distance (inches)	Based on Bond Strength		Based on Steel Strength		
					f _c = 2500	f _c = 4500	A307 (SAE 1018)	A193 GRB (SAE 4140)	SS304
3/8	7/16	3-1/2	4-1/2	2-5/8	1000	1000	2080	4580	1670
1/2	9/16	4-1/2	6	3-1/4	1900	1900	3730	8210	2990
5/8	3/4	5	7-1/2	3-3/4	3000	3000	5870	12910	4700
3/4	7/8	6-3/4	9	5	4690	4815	8490	18680	6790
7/8	1	7-1/2	10-1/2	5-5/8	5100	5100	12000	26400	9500
1	1-1/8	8-1/4	12	6-1/4	6100	7300	15700	34500	12500

¹Allowable load must be the lesser of bond or steel strength.

²The allowable tension capacities based on bond strength reflect the higher short-term test values obtained. Allowable loads based on bond strength may not be increased for duration of load.

³The tabulated values are for anchors installed at the specified spacing (S) and edge (m) distances. Spacing and edge distances may be reduced in accordance with Table N^o V. Linear interpolation may be used for intermediate spacings.

⁴The anchor experience a reduction in tensile and shear capacity with increased ambient temperatures. The load factors noted in Figure N^o 1 must be applied to the values noted in the table above when the anchors are installed in locations where the ambient temperatures may exceed 72°F.

⁵The tabulated values are for anchors in concrete having the designated compressive strength at the time of installation.

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TABLE II
ALLOWABLE SHEAR LOADS FOR THREADED ROD INSTALLED
IN STONE AGGREGATE CONCRETE
(POUNDS)

Stud Diameter (inch)	Drill Bit Diameter (inch)	Minimum Embedment Depth (inch)	Spacing (inch)	Edge Distance (inches)	Based on Bond Strength		Based on Steel Strength		
					f _c = 2500	f _c = 4500	A307 (SAE 1018)	A193 GRB (SAE 4140)	SS304
3/8	7/16	3-1/2	4-1/2	2-5/8	1020	1020	1040	2290	1040
1/2	9/16	4-1/2	6	3-1/4	1250	1250	1870	4110	1870
5/8	3/4	5	7-1/2	3-3/4	2750	2750	2940	6460	2940
3/4	7/8	6-3/4	9	5	3420	3700	4250	9340	4250
7/8	1	7-1/2	10-1/2	5-5/8	3700	4050	6000	12800	6000
1	1-1/8	8-1/4	12	6-1/4	4125	5300	7820	17200	7820

¹The allowable loads must be the lesser of concrete or steel strength

²The tabulated values are for anchors installed at the specified spacing (S) and edge (m) distances. Spacing and edge distances may be reduced in accordance with Table N^o V. Linear interpolation may be used for intermediate spacings.

³The tabulated values are for anchors installed in concrete having the designated compressive strength at the time of installation.

⁴The anchors experience a reduction in tensile and shear capacity with increased ambient temperatures. The load factors noted in Figure N^o 1 must be applied to the values noted in the table above when the anchors are installed in locations where the ambient temperatures may exceed 72°F.

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TABLE III
ALLOWABLE TENSILE LOAD FOR ASTM A615 GRADE 60 REINFORCED BAR
INSTALLED IN STONE-AGGREGATE CONCRETE
(POUNDS)^{1,2,3,4}

Rebar Diameter	Drill Bit Diameter (inch)	Minimum Embedment Depth (inch)	Spacing (inches)	Edge Distance (inches)	Concrete Compression Strength	
					$f'_c = 2500$	$f'_c = 4500$
No. 4	9/16	4-1/4	6	3-1/4	1900	1900
No. 6	7/8	6-3/4	9	5	4690	4815
No. 8	1-1/8	8-1/4	12	6-1/4	6100	7300

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

²The allowable tension capacities based on bond strength reflect the higher short-term test values obtained. Allowable loads based on bond strength may not be increased for duration of load.

³The tabulated values are for anchors installed at the specified spacing (S) and edge (m) distances. Spacing and edge distances may be reduced in accordance with Table N^o V. Linear interpolation may be used for intermediate spacings.

⁴The tabulated values are for anchors installed in concrete having the designated compressive strength at the time of installation.

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TABLE IV
RECOMMENDED HARDENING TIME FOR EPOXY-TIE ET-22 & ET-56

Temperature (°F)	Initial Set (Hours)¹	Initial Cure (Hours)²
100	4	12
90	4	16
80	4	24
70	5	24
60	6	24
50	12	48
40	18	72

¹Anchors are to be undisturbed during the initial set time.

²Application of allowable (design) tensile or shear loads shall occur after the initial cure time.

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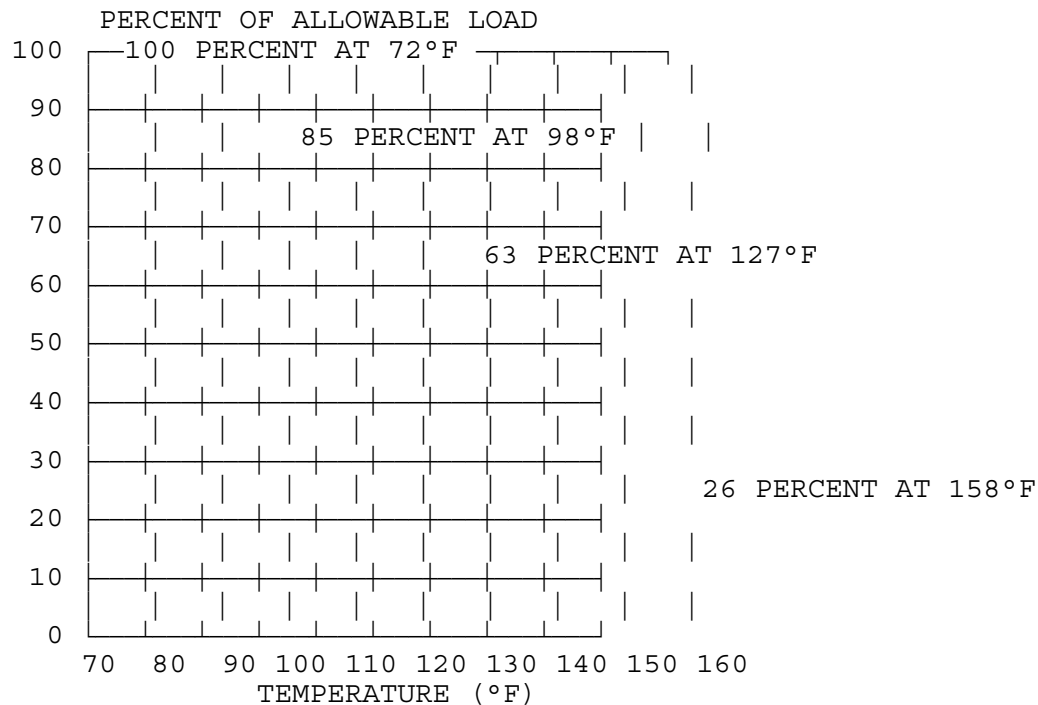
RE: Simpson Epoxy-Tie ET-22 and ET-56 Epoxy for
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TABLE V REDUCTION FACTORS^{1,2}

TENSION CAPACITY		SHEAR CAPACITY		
Spacing and Edge distance	Factor (Ft.)	Edge distance	Direction of load	Factor (Fs)
S min = 0.5S	0.5	m min = 0.5m	toward edge	0.5
m min = 0.5m	0.5	m min = 0.5m	not toward edge	0.5

¹Linear interpolation is allowed for edge distances which fall between 0.5m and 1.0m, and anchor bolt spacing which falls between 0.5S and 1.0S.

²The application of load factors is cumulative.



**FIGURE N° 1 TEMPERATURE OF
CONCRETE VERSES LOAD SENSITIVITY
GRAPH FOR EPOXY-TIE ET-22 & ET-56**

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TABLE VI
ALLOWABLE TENSILE FOR THREADED ROD INSTALLED
IN 2000 PSI STONE AGGREGATE CONCRETE
(POUND)^{1,2,3,4,5}

Stud Diameter (inch)	Drill Bit Diameter (inch)	Minimum Embedment Depth (inch)	Spacing (inch)	Edge Distance (inches)	Based on Bond Strength	Based on Steel Strength		
					$f'_c = 2000$	A307 (SAE 1018)	A193 GRB (SAE 4140)	SS304
3/8	7/16	3-1/2	6-1/8	5-1/4	1000	2080	4580	1670
1/2	9/16	4-1/4	7-1/2	6-3/8	2800	3730	8210	2990
5/8	3/4	5	8-3/4	7-1/2	4100	5870	12910	4700
3/4	7/8	6-3/4	12	10-1/8	5400	8490	18680	6790
7/8	1	7-3/4	13-5/8	11-5/8	5400	12000	26400	9500
1	1-1/8	9	15-3/4	13-1/2	5700	15700	34500	12500

¹Allowable load must be the lesser of bond or steel strength.

²The allowable tension capacities based on bond strength reflect the higher short-term test values obtained. Allowable loads based on bond strength may not be increased for duration of load.

³The tabulated values are for anchors installed at the specified spacing (S) and edge (m) distances. Spacing and edge distances may be reduced in accordance with Table N^o V. Linear interpolation may be used for intermediate spacings.

⁴The anchor experience a reduction in tensile and shear capacity with increased ambient temperatures. The load factors noted in Figure N^o 1 must be applied to the values noted in the table above when the anchors are installed in locations where the ambient temperatures may exceed 72°F.

⁵The tabulated values are for anchors in concrete having the designated compressive strength at the time of installation.

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TABLE VII
ALLOWABLE SHEAR LOADS FOR THREADED ROD INSTALLED
IN 2000 PSI STONE AGGREGATE CONCRETE
(POUNDS)

Stud Diameter (inch)	Drill Bit Diameter (inch)	Minimum Embedment Depth (inch)	Spacing (inch)	Edge Distance (inches)	Based on Bond Strength	Based on Steel Strength		
					$f'_c = 2000$	A307 (SAE 1018)	A193 GRB (SAE 4140)	SS304
3/8	7/16	3-1/2	6-1/8	5-1/4	1040	1040	2290	1040
1/2	9/16	4-1/4	7-1/2	6-3/8	1550	1870	4110	1870
5/8	3/4	5	8-3/4	7-1/2	2900	2940	6460	2940
3/4	7/8	6-3/4	12	10-1/8	4250	4250	9340	4250
7/8	1	7-3/4	13-5/8	11-5/8	4250	6000	12800	6000
1	1-1/8	9	15-3/4	13-1/2	4250	7820	17200	7820

¹The allowable loads must be the lesser of concrete or steel strength

²The tabulated values are for anchors installed at the specified spacig (S) and edge (m) distances. Spacing and edge distances may be reduced in accordance with Table N^o V. Linear interpolation may be used for intermediate spacings.

³The tabulated values are for anchors installed in concrete having he designated compressive strength at the time of installation.

⁴The anchors experince a reduction in tensile and shear capacity with increased ambient temperatures. The load factors noted in Figure N^o 1 must be applied to the values noted in the table above when the anchors are installed in locations where the ambient temperatures may exceed 72°F.