

ESR-2611

Used for Florida State Wide Product Approval #

FL13628

Products on this Report which are approved:

Product	FL#
SB1X30	13628.1
SB1X30HDG	13628.1
SB5/8x24	13628.1
SB5/8x24HDG	13628.1
SB7/8X24	13628.1
SB7/8X24HDG	13628.1
SSTB16	13628.2
SSTB16HDG	13628.2
SSTB20	13628.2
SSTB20HDG	13628.2
SSTB20L	13628.2
SSTB20LHDG	13628.2
SSTB24	13628.2
SSTB24HDG	13628.2
SSTB24L	13628.2
SSTB24LHDG	13628.2
SSTB28	13628.2
SSTB28HDG	13628.2
SSTB28L	13628.2
SSTB28LHDG	13628.2
SSTB34	13628.2
SSTB34HDG	13628.2
SSTB36	13628.2
SSTB36HDG	13628.2



®

SIMPSON STRONG-TIE COMPANY, INC.

ICC-ES Evaluation Report

ESR-2611

Issued April 1, 2010

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

www.icc-es.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

DIVISION: 03—CONCRETE
Section: 03151—Concrete Anchoring
REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY, INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(800) 925-5099
www.strongtie.com

EVALUATION SUBJECT:
**SIMPSON STRONG-TIE PROPRIETARY SSTB SERIES
AND SB SERIES CAST-IN-PLACE ANCHOR BOLTS**
1.0 EVALUATION SCOPE
Compliance with the following codes:

- 2009 *International Building Code*® (2009 IBC)
- 2009 *International Residential Code*® (2009 IRC)
- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)

Property evaluated:

Structural

2.0 USES

Simpson Strong-Tie proprietary SSTB series and SB series cast-in-place anchor bolts are used to provide a continuous load path to the foundation for the lateral-force-resisting elements in buildings of light-frame wood construction designed to resist uplift forces (tension) due to earthquake and wind loads. These proprietary cast-in-place anchor bolts may be used in buildings resisting wind and seismic forces and located in areas designated Seismic Design Categories (SDC) A through F in accordance with IBC Section 1604.9 (2006 and 2009 IBC); and 2006 IRC Section R602.10.10 or 2009 IRC Section R602.10 (Wall Bracing); as applicable. The SSTB series and SB series cast-in-place anchor bolts are alternatives to cast-in-place anchors described in IBC Sections 1911 and 1912 (2006 and 2009 IBC) and IRC Sections R104.11 and R601.2 (2006 and 2009 IRC), as applicable.

3.0 DESCRIPTION
3.1 General:

3.1.1 SSTB Series Anchor Bolts: The SSTB series cast-in-place anchor bolts are ductile steel anchors that transmit applied tension forces into the concrete foundation stem-wall or concrete foundation. One end of the bolts has general-purpose, Unified National Coarse (UNC), rolled

threads compliant with ANSI B18.2.1, followed by a length of plain (unthreaded) bar where the manufacturer's identification is stamped onto the bar along with a stamped "embedment line" to facilitate the installation of the anchor with the required minimum embedment depth, l_e , into the concrete foundation stem-wall or foundation to achieve the tabulated allowable tension loads. Below the stamped "embedment line" mark, the anchor is bent $6\frac{1}{2}$ degrees. The S-shape embedded end of the SSTB anchor bolts develops a mechanical interlock with the surrounding concrete to achieve the tabulated allowable loads when transferring applied tension forces into normal-weight concrete foundation stem-walls or foundations. SSTB anchor bolts are available with standard and extended thread lengths. Refer to Table 1 and Figure 1 for product dimensions, installation details, minimum embedments, and allowable tension loads. The SSTBL models (e.g., SSTB24L) have the same capacity and characteristic as the comparable models (e.g., SSTB24), except they have longer thread lengths. See footnote 8 to Table 1 of this report.

3.1.2 SB Series Anchor Bolts: The SB Bolt series cast-in-place anchor bolts are ductile steel anchors that transmit applied tension forces into the concrete foundation stem-wall and concrete foundation. A mechanical interlock is formed between the hardened concrete and a factory-installed $\frac{3}{8}$ -inch-thick (9.5 mm) steel bearing plate (washer) held onto the end of the SB bolt with two hex head nuts, one having an indentation to prevent removal of the bearing plate. The SB anchor bolts have UNC rolled threads compliant with ASME B18.2.1, a straight length of plain (unthreaded) bar where the stamped manufacturer's identification is located and a stamped "embedment line" to facilitate the installation of the anchor with the required minimum embedment depth, l_e , into the concrete foundation stem-wall or concrete foundation to achieve the tabulated allowable tension loads. The bottom portion of the SB anchors has a large-radius bend, which provides increased concrete coverage for the steel bearing plate at the end of the anchors embedded in the concrete foundation stem-wall or concrete foundation. Refer to Table 2 and Figure 2 for product dimensions, installation details, minimum embedments and allowable tension loads.

3.2 Material:

3.2.1 Bolts: The proprietary SSTB or SB anchor bolts described in this report are manufactured from steel complying with ASTM F 1554 Grade 36, with a minimum yield strength of 36,000 psi (248 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). Some anchor bolts may also be available with batch hot-dipped

galvanized coating and have an average minimum specified coating weight of 1.25 ounces of zinc per square foot of surface area (381 g/m²), in accordance with ASTM A 153 Class C. These anchors are denoted by model numbers ending with the letters HDG; model numbers in this report do not list the HDG ending, but the information shown applies.

Anchor bolts used in contact with preservative-treated or fire-retardant-treated lumber must comply with IBC Section 2304.9.5 (2006 and 2009 IBC); or 2006 IRC Section R319.3, or 2009 IRC Section R317.3; as applicable. The lumber treater, the report holder (Simpson Strong-Tie Company), or both, should be contacted for recommendations on minimum corrosion resistance used with specific proprietary preservative-treated or fire-retardant-treated lumber.

3.2.2 Nuts and Washers: The end of each SB anchor bolt embedded in concrete has a factory-installed, $\frac{3}{8}$ -inch-thick (9.5 mm), ASTM A 36 steel bearing plate (washer) sandwiched between two hex head nuts.

Nuts and washers, or transition couplers, used to connect an SSTB or SB anchor bolt to a hold-down device or threaded rod are not supplied with the anchor bolts. Standard hex head nuts and washers, or transition couplers, must be specified by the report holder (Simpson Strong-Tie Company), the design professional, or both.

3.2.3 Concrete: Concrete must be normal-weight concrete complying with the provisions of IBC Chapter 19 (2006 and 2009 IBC) or IRC Section R402.2 (2006 and 2009 IRC), as applicable. The minimum specified concrete compressive strength, f'_c , must be 2,500 psi (17.24 MPa), unless required otherwise by 2006 IBC Section 1904.2.2, or 2009 IBC Section 1904.3, or IRC Section 402.2 (2006 and 2009 IRC), as applicable. Materials used to produce concrete must comply with applicable standards listed in ACI 318 Chapter 3.

3.2.4 Steel Reinforcement Bars (Rebar): Steel reinforcement must be minimum No. 4 deformed reinforcing bars complying with ACI 318 Section 3.5.3.

4.0 DESIGN AND INSTALLATION

4.1 Design:

Tables 1 and 2 specify Allowable Stress Design (ASD) tension loads for, respectively, the SSTB and SB series cast-in-place anchor bolts. Allowable tension loads are shown for different anchor locations, as indicated in the tables, and for type of loading (seismic or wind). When the governing load combination includes seismic loads, the allowable (ASD) seismic load values shown in the tables must be converted to design (LRFD) load values for compliance with IBC Section 1912 (2006 and 2009 IBC). The procedure for converting tabulated allowable (ASD) load values to design (LRFD) load values is provided in the footnotes to the tables.

The first exception to IBC Section 1613.1 (2006 and 2009 IBC) permits one- and two-family dwellings assigned to Seismic Design Category (SDC) A, B, or C to be exempt from the seismic design provisions of the code.

4.2 Installation:

Installation of the proprietary bolts must be in accordance with this evaluation report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

The installation of the SSTB and SB series cast-in-place anchor bolts must be in normal-weight concrete foundation walls or stem-walls having the minimum thickness shown in the tables, or in a monolithic concrete slab with integral footing with minimum dimensions shown in the tables. A horizontal cold joint is not allowed within the anchor's required minimum embedment depth, unless provisions are made to transfer the load.

Anchor bolts must be installed with the minimum embedment depth, l_e , noted in the tables of this report. Each anchor bolt has a stamped embedment line to facilitate proper installation. Placement of the S-shaped end of the SSTB anchor bolts and the larger-radius bent end of the SB anchor bolt must be between 45 and 90 degrees relative to the edge of concrete foundation walls or stem-walls or foundation, except for corner and end-wall installations where it must be 45 degrees. Anchors must be installed with a minimum concrete edge to top of bolt distance of $1\frac{3}{4}$ inches (44.5 mm) and a minimum end to top of bolt distance equal to the embedment depth, l_e , to achieve the tabulated maximum allowable tension loads. Tables 1 and 2 also provide allowable tension loads when the anchors are installed at reduced end distances. Minimum anchor center-to-center spacing, S_{min} , is three times the minimum required embedment depth, l_e , that is, $S_{min} = 3 \times l_e$, for anchors acting in tension at the same time for each anchor to be assigned the tabulated maximum allowable tension load.

The tabulated allowable tension loads are based on anchors installed in concrete reinforced with one No. 4 deformed steel reinforcing bar located within the potential concrete failure region at the top portion of the foundation wall where the proprietary anchor bolt is located. The No. 4 steel reinforcing bar must be installed from 3 to 5 inches (75.6 mm to 126 mm) from top of foundation, and centered within the concrete stem-wall or placed 3 to 4 inches (75.6 mm to 100.8 mm) from the edge of a monolithic concrete slab with integral footing. The No. 4 reinforcing bar is not required to be tied to the anchor bolt provided the reinforcing bar is installed at locations shown in the figures of this report and as described in the manufacturer's published installation instructions. The anchor bolts and the required No. 4 deformed steel reinforcing bar must be accurately placed and supported to preclude dislocation during placement of concrete.

When the foundation is reinforced structural concrete, the foundation rebar may be used in lieu of installing the No. 4 rebar previously described, provided the foundation rebar is located within the potential concrete failure region at the top portion of the foundation wall where the proprietary anchor bolt is placed.

When the foundation (footings and foundation walls) is permitted to consist of plain (unreinforced) structural concrete in accordance with 2006 IBC Section 1805, or 2009 IBC Section 1807, or IRC Chapter 4 (2006 and 2009 IRC), installation of one No. 4 rebar is required within the potential concrete failure region at the top portion of the foundation wall where the proprietary anchor bolt is located, except the rebar need not be continuous throughout the foundation wall. The rebar must have the minimum length and must be placed as shown in Figures 2 and 7.

4.3 Special Inspection:

For installations complying with the 2009 IBC, continuous special inspection is required in accordance with Section 1707.1 unless exempted as noted in the section.

For installations complying with the IBC, periodic special inspection must be provided for components within the seismic-force resisting system in Seismic Design Categories C, D, E, and F, in accordance with IBC Section 1707.3 or 1707.4 (2006 and 2009 IBC), with the exception of those structures that qualify under IBC Section 1704.1(2006 and 2009 IBC).

For installations under the IRC, special inspection is not normally required. However, for an engineered design where calculations are required to be signed by a registered design professional, special inspection is required for installations under the IRC in accordance with Section 1704.1 of the IBC.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie SSTB Series and SB series cast-in-place anchor bolts described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 Proprietary bolt sizes, dimensions, minimum embedment depths, spacing and edge distances are as set forth in this report.
- 5.2 Calculations showing compliance with this report must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.3 Under the conditions noted in this report, the proprietary bolts are limited to resisting only tension forces.

5.4 Use of proprietary bolts with preservative- or fire-retardant-treated lumber must be in accordance with Section 3.2.1 of this report.

5.5 Special inspection is provided in accordance with Section 4.3 of this report.

5.6 The Simpson Strong-Tie SSTB series and SB series cast-in-place anchor bolts are manufactured by Conklin and Conklin, Inc., and Mid West Fabrication Co. with quality control inspections by Professional Service Industries Inc. (AA-660).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Cast-in-place Proprietary Bolts in Concrete for Light-frame Construction (AC399), dated October 2008.

7.0 IDENTIFICATION

The cast-in-place proprietary bolts described in this report are identified with the Simpson Strong-Tie Company trademark logo ("no equal" symbol, ≠), the model number length (for example, "16" for model SSTB16), and bolt orientation stamped onto the top of the bolt head. Stamped onto the bolt below the threaded portion is the manufacturer's identification code ("CC" refers to Conklin and Conklin, Inc., and "MW" refers to Mid West Fabricating Co.). In addition, the evaluation report number (ESR-2611) will be on the carton or container.

TABLE 1—ALLOWABLE STRENGTH DESIGN (ASD) LOADS FOR SSTB SERIES CAST-IN-PLACE ANCHOR BOLTS⁸

SSTB ANCHOR BOLT			INSTALLATION ^{1,2}		ALLOWABLE TENSION LOADS ^{3,4,5} (lbs.) BASED ON ANCHOR LOCATION:								
Model No.	Major Thread Dia. (in.)	Total Length (in.)	Min. Stem-Wall Width ⁵ (in.)	Min. Anchor Embed., l_e (in.)	Continuous Concrete Foundation Stem Wall (See Figure 3)			Corner of Concrete Foundation Stem Wall ⁶ (See Figure 4)			End of Concrete Foundation Stem Wall ⁶ (See Figure 5)		
					Seismic Design Categories		Wind	Seismic Design Categories		Wind	Seismic Design Categories		Wind
					A, B ⁽⁷⁾	C ⁽⁷⁾ , D, E, F		A, B ⁽⁷⁾	C ⁽⁷⁾ , D, E, F		A, B ⁽⁷⁾	C ⁽⁷⁾ , D, E, F	
SSTB16	5/8	17 ⁵ / ₈	6	12 ⁵ / ₈	3,610	2,550	3,610	3,610	2,550	3,610	3,610	2,550	3,610
SSTB20		21 ⁵ / ₈		16 ⁵ / ₈	4,315	3,145	4,315	4,040	2,960	4,040	4,040	2,960	4,040
SSTB24		25 ⁵ / ₈		20 ⁵ / ₈	5,025	3,740	5,025	4,470	3,325	4,470	4,470	3,325	4,470
SSTB28	7/8	29 ⁷ / ₈	8	24 ⁷ / ₈	9,900	8,315	9,900	8,710	7,315	8,710	7,615	6,395	7,615
SSTB34		34 ⁷ / ₈		28 ⁷ / ₈	9,900	8,315	9,900	8,710	7,315	8,710	7,615	6,395	7,615
SSTB36		36 ⁷ / ₈		28 ⁷ / ₈	9,900	8,315	9,900	8,710	7,315	8,710	7,615	6,395	7,615

For SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N, 1 psi = 6.895 kPa.

¹Minimum specified concrete compressive strength, f'_c is 2,500 psi, unless required otherwise by 2006 IBC Section 1904.2.2, or 2009 IBC Section 1904.3, or IRC Section 402.2 (2006 or 2009 IRC), as applicable.

²Allowable loads for all installations are based on minimum edge distance of 1³/₄ inches (measured from the edge of the concrete to the centerline of the SSTB anchor bolt).

³One No. 4 rebar must be installed in the breakout zone of the concrete foundation stem-wall where the SSTB anchor is located. Typically, providing one No. 4 rebar located from 3 to 5 inches from the top of the stem wall is adequate. May be foundation rebar; not post-tensioned cable.

⁴Minimum center-to-center spacing is 3 times the required anchor embedment ($S_{min.} = 3 \times l_e$) for SSTB bolts acting in tension simultaneously for the tabulated tension load assigned to each anchor.

⁵For compliance with IBC-06 Section 1912 or IBC-09 Section 1912, the allowable (ASD) seismic or wind loads must be converted to design (LRFD) load values by multiplying the tabulated Allowable Strength Design (ASD) load values by 1.4 or 1.6, respectively. The tabulated ASD loads are adjusted nominal strength values and include a strength reduction factor, $\Phi = 0.75$, for tension (uplift) loads. Consequently, when using the load combinations of IBC (IBC-06 and IBC-09) Section 1605.2.1, it is not necessary to apply a strength reduction factor, Φ , because it is already incorporated into the derived design (LRFD) load values.

⁶Tabulated allowable tension loads shown in the table for SSTB anchor bolts installed at corner and end of concrete foundation stem walls are based on a minimum end distance of 5 inches from the centerline of the anchor bolt to the end of the concrete foundation stem wall. See Figures 4 and 5. Allowable tension loads under the header "Continuous Concrete Foundation Stem-Wall" are used when the SSTB anchor is installed 1.5 x l_e , or greater from the end. For this condition, terminate rebar at the end of the stem wall with concrete clear cover as required by ACI 318 or if a stem wall return exists, extend rebar into return similar to Figure 4.

⁷According to the first exception to IBC (IBC-06 and IBC-09) Section 1613.1, detached one- and two-family dwellings assigned to Seismic Design Category (SDC) A, B, or C are exempt from the seismic design provisions of IBC (IBC-06 and IBC-09) Section 1613. When this is the case, the allowable wind loads assigned to the SSTB anchor bolts should be used.

⁸For SSTBL models, longer thread lengths are: 16L = 5¹/₂ inches; 20L = 6 inches; 24L = 6¹/₂ inches; 28L = 6¹/₂ inches.

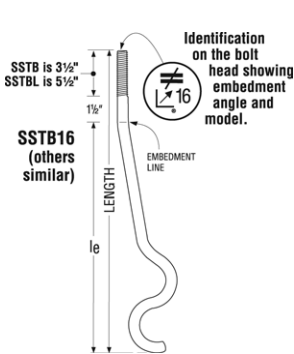


FIGURE 1—TYPICAL SSTB ANCHOR BOLT (Identification on Bolt Top, Req'd Embedment, l_e)

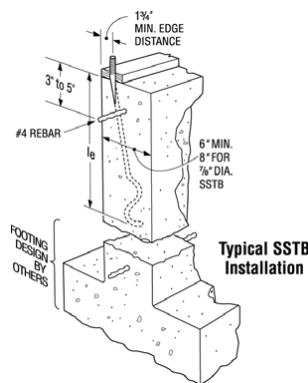


FIGURE 2—TYPICAL SSTB ANCHOR BOLT INSTALLATION (No. 4 Rebar in Breakout Zone, Min. 1³/₄\"/>

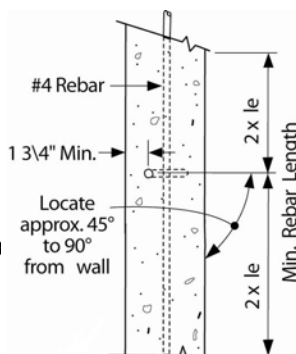


FIGURE 3—SSTB ANCHOR BOLT INSTALLATION—ALONG CONTINUOUS STEM WALL (No. 4 Rebar Min. Length = 4x l_e , Min. 1³/₄\"/>

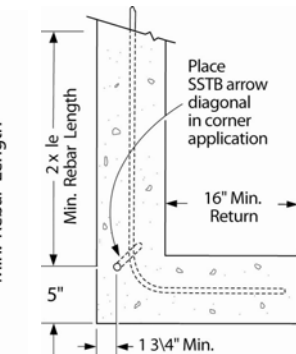


FIGURE 4—SSTB ANCHOR BOLT INSTALLATION—CORNER OF STEM WALL (Min. 16\"/>

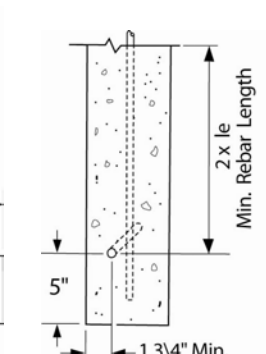


FIGURE 5—SSTB ANCHOR BOLT INSTALLATION—END OF STEM WALL (Min. 5\"/>

TABLE 2—ALLOWABLE STRENGTH DESIGN (ASD) LOADS FOR SB SERIES CAST-IN-PLACE ANCHOR BOLTS

SB ANCHOR BOLT				INSTALLATION ^{1,2}		ALLOWABLE TENSION LOADS ^{3,4,5} (lbs.) BASED ON ANCHOR LOCATION:								
Model No.	Major Thread Dia. (in.)	Thread Length (in.)	Total Length (in.)	Min. Stem-Wall Width (in.)	Min. Anchor Embed. l_e (in.)	Continuous Concrete Foundation Stem Wall			Corner of Concrete Foundation Stem Wall ⁶			End of Concrete Foundation Stem Wall ⁶		
						Seismic Design Categories		Wind	Seismic Design Categories		Wind	Seismic Design Categories		Wind
						A, B ⁽⁸⁾	C ⁽⁸⁾ , D, E, F		A, B ⁽⁸⁾	C ⁽⁸⁾ , D, E, F		A, B ⁽⁸⁾	C ⁽⁸⁾ , D, E, F	
SB5/8x24	5/8	6	24	6	18	6,675	6,675	6,675	6,675	5,730	6,675	6,675	5,730	6,675
SB7/8x24 ⁽⁸⁾	7/8	6	24	8	18	10,470	8,795	10,470	9,355	7,855	9,355	6,820	5,730	6,820
SB1x30	1	6	30	8	24	13,655	11,470	13,655	9,905	8,315	9,905	7,220	6,065	7,220

For SI: 1 inch = 25.4 mm, 1 lb. = 4.45 N, 1 psi = 6.895 kPa.

¹Minimum specified concrete compressive strength, f'_c is 2,500 psi, unless required otherwise by 2006 IBC Section 1904.2.2, or 2009 IBC Section 1904.3, or IRC Section 402.2 (2006 or 2009 IRC), as applicable.

²Allowable loads for all installations are based on minimum edge distance of 1 3/4 inches (measured from the edge of the concrete to the centerline of the SB anchor bolt).

³One No. 4 rebar must be installed in the breakout zone of the concrete foundation stem-wall where the SB anchor is located. Typically, providing one No. 4 rebar located from 3 to 5 inches from the top of the stem wall is adequate. May be foundation rebar; not post-tensioned cable.

⁴Minimum center-to-center spacing is 3 times the required anchor embedment ($S_{min.} = 3 \times l_e$) for SB bolts acting in tension simultaneously for the tabulated tension load assigned to each anchor.

⁵For compliance with IBC-06 Section 1912 or IBC-09 Section 1912, the allowable (ASD) seismic or wind loads must be converted to design (LRFD) load values by multiplying the tabulated Allowable Strength Design (ASD) load values by 1.4 or 1.6, respectively. The tabulated ASD loads are adjusted nominal strength values and include a strength reduction factor, $\Phi = 0.75$, for tension (uplift) loads. Consequently, when using the load combinations of IBC (IBC-06 and IBC-09) Section 1605.2.1, it is not necessary to apply a strength reduction factor, Φ , because it is already incorporated into the derived design (LRFD) load values.

⁶Tabulated allowable loads for end of stem wall and corner installations are based on a minimum end distance of 4 1/2 inches for SB7/8, and 5 inches for SB1 from the end of the wall. See Figures 9 and 10. Allowable tension loads under the header "Continuous Concrete Foundation Stem-Wall" are used when the SB anchor is installed 1.5 x l_e , or greater from the end. For this condition, terminate rebar at the end of the stem wall with concrete clear cover as required by ACI 318 or if a stem wall return exists, extend rebar into return similar to Figure 9.

⁷For SB7/8x24 installed in concrete having a minimum specified compressive strength of 3,000 psi, the seismic values listed under the column "Continuous Concrete Foundation Stem Wall" may be adjusted: Allowable Load for SDC A, B = 11,205 lb and SDC C, D, E, and F = 9,415 lbs.

⁸According to the first exception to IBC (IBC-06 and IBC-09) Section 1613.1, detached one- and two-family dwellings assigned to Seismic Design Category (SDC) A, B, or C are exempt from the seismic design provisions of IBC (IBC-06 and IBC-09) Section 1613. When this is the case, the allowable wind loads assigned to the SB anchor bolts should be used.

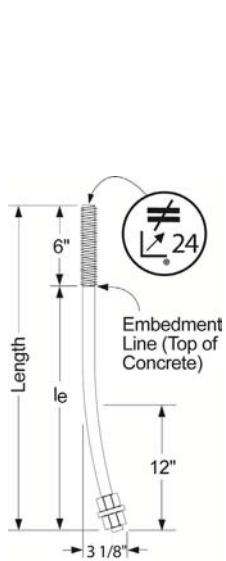


FIGURE 6—TYPICAL SB ANCHOR BOLT

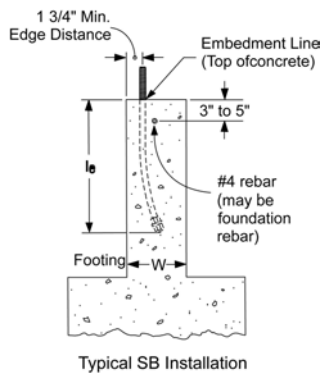


FIGURE 7—SB ANCHOR BOLT—TYPICAL INSTALLATION

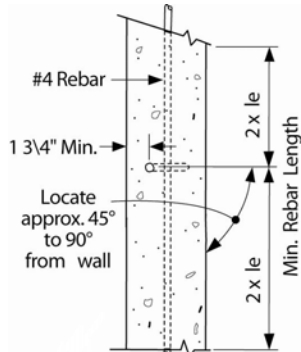


FIGURE 8—SB ANCHOR BOLT INSTALLATION—CONTINUOUS STEM WALL

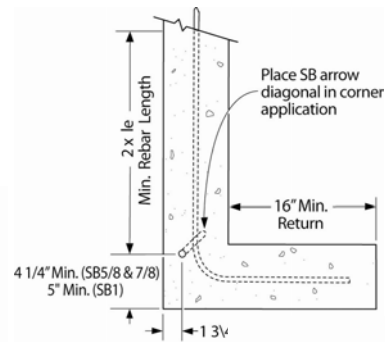


FIGURE 9—SB ANCHOR BOLT INSTALLATION—CORNER OF STEM WALL

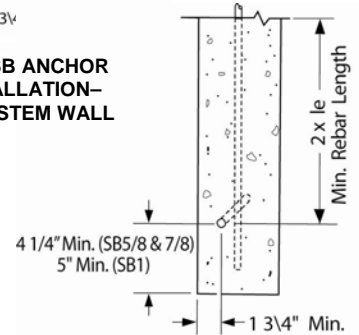


FIGURE 10—SB ANCHOR BOLT INSTALLATION—END OF STEM WALL