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ICC-ES Listing Report

ELC-3981

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Issued 10/2017
This listing is subject to renewal 10/2018.

DIVISION: 03 00 00—CONCRETE
SECTION: 03 16 00—CONCRETE ANCHORS
DIVISION: 05 00 00—METALS
SECTION: 05 05 19—POST-INSTALLED CONCRETE ANCHORS

REPORT HOLDER:

BRIGHTON BEST INTERNATIONAL, INC.

12801 LEFFINGWELL AVENUE
SANTE FE SPRINGS, CALIFORNIA 90670

EVALUATION SUBJECT:

US ANCHOR ULTRAWEDGE+ WEDGE ANCHORS IN CRACKED AND UNCRACKED CONCRETE

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CSI: DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

Product Certification System:

The ICC-ES product-certification system includes evaluating reports of tests of standard manufactured products, prepared by accredited testing laboratories and provided by the listee, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the listee's quality system.

Product: US Anchor Ultrawedge+ Wedge Anchors in Cracked and Uncracked Concrete

Listee: BRIGHTON BEST INTERNATIONAL, INC.
12801 LEFFINGWELL AVENUE
SANTE FE SPRINGS, CALIFORNIA 90670
(562) 483-2740
www.brightonbest.com

Compliance with the following standards:

- Annex D, Anchorage of CSA A23.3 (-14, -04), Design of Concrete Structures, CSA Group.

Compliance with the following codes:

US Anchor Ultrawedge+ Wedge Anchors in cracked and uncracked concrete, as described in this listing report, are in conformance with CSA A23.3 (-14, 04), Annex D, as referenced in the applicable section of the following code editions:

- *National Building Code of Canada*® 2015 and 2010
  Applicable Section: Division B, Part 4, Section 4.3.3.

Description of anchors:

The US Anchor Ultrawedge+ Wedge Anchors are torque-controlled, mechanical expansion anchors. The anchors consist of a stud (anchor body), nut, washer, and expander wedge (clip) as illustrated in Figure 1. The stud for all sizes is manufactured from cold-drawn carbon steel meeting the requirements of UNS G10350, and is partially threaded with one end terminating in a flared mandrel. The expander wedge (clip) is manufactured from Chinese steel standard GB/T3522 Grade 50 steel subsequently through hardened to Rockwell HRC 28-32 and is formed around the stud mandrel so it is able to move freely. The clip movement is restrained by the mandrel taper and by a collar. All components, including nuts and washers, are zinc-coated in accordance with ASTM B633 classification SC1, Type III.

The anchor is installed in a predrilled hole with a hammer. When torque is applied to the nut of the installed anchor, the mandrel is drawn into the expansion element, which is in turn expanded against the wall of the drilled hole.

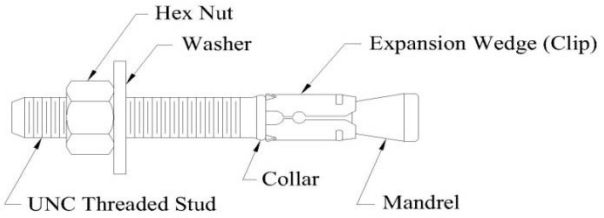

FIGURE 1—US ANCHOR ULTRAWEDGE+ WEDGE ANCHOR COMPONENTS

Identification: The anchors are identified by packaging labeled with the report holder's name (Brighton Best), product name, anchor diameter and length, part number, production lot number, the listing report number (ELC-3981), and the ICC-ES listing mark. Table 2 shows the length code identification system.

Installation: Installation parameters such as, embedment, spacing, edge distance, and concrete requirements, are provided in Table 1 and Figure 2. Installation of the US Anchor Ultrawedge+ Wedge Anchors must be in accordance with the manufacturer's published installation instructions (MPII) as provided below.

MANUFACTURE'S PUBLISHED INSTALLATION INSTRUCTIONS:

1. Use a rotary hammer drill in the percussion mode with the correct size carbide drill bit meeting the requirements of ANSI Standard B212.15-1994 to drill the hole perpendicular to the concrete surface and to the required depth.
2. Use a hand pump, compressed air or vacuum to remove debris and dust from the drilling operation.
3. If installation is through a fixture, position the fixture over the hole and install the anchor through the hole in the fixture. Using a hammer, drive the anchor into the hole, insuring that it is installed to the minimum required embedment depth, h_{nom}.
4. Install the washer and nut on the projecting thread, and tighten the nut to the required installation torque value, T_{inst}, using a torque wrench.

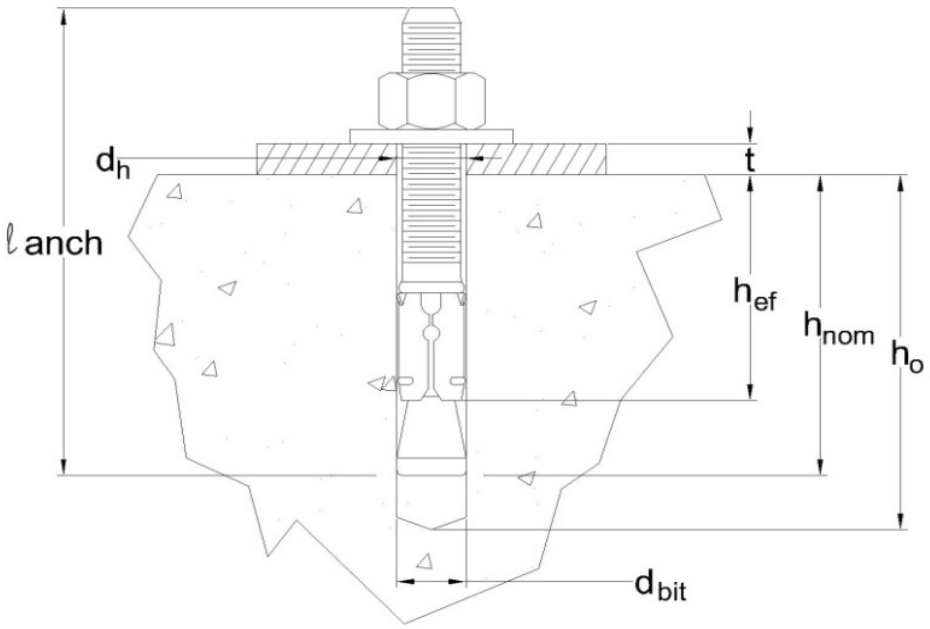

FIGURE 2—US ANCHOR ULTRAWEDGE+ WEDGE ANCHOR INSTALLATION

TABLE 1—DATA FOR US ANCHOR ULTRAWEDGE+ WEDGE ANCHORS FOR USE IN CRACKED AND UNCRACKED CONCRETE [1,2]

CHARACTERISTIC	SYMBOL	UNITS	Nominal Anchor Diameter			
			$^3/_8$ inch	$^1/_2$ inch	$^5/_8$ inch	$^3/_4$ inch
Installation Information						
Anchor diameter	d_a	mm (in.)	9.5 ($^3/_8$)	12.7 ($^1/_2$)	15.9 ($^5/_8$)	19.1 ($^3/_4$)
Minimum diameter of hole clearance in fixture	d_h	mm (in.)	11.1 ($^7/_{16}$)	14.3 ($^9/_{16}$)	17.5 ($^{11}/_{16}$)	20.6 ($^{13}/_{16}$)
Nominal drill bit diameter	d_{bit}	in.	$^3/_8$ ANSI	$^1/_2$ ANSI	$^5/_8$ ANSI	$^3/_4$ ANSI
Minimum nominal embedment depth	h_{nom}	mm	60	64	90	105
Minimum effective embedment depth	h_{ef}	mm	51	51	76	89
Minimum hole depth	h_o	mm	70	70	95	114
Installation torque	T_{inst}	N-m	47	68	122	169
Minimum edge distance	c_{min}	mm	102	178	152	178
Minimum spacing	s_{min}	mm	152	305	203	229
Minimum concrete thickness	h_{min}	mm	114	165		
Critical edge distance	c_{ac}	mm	203	254	330	280
Anchor Design Data						
Category number	1, 2 or 3	–	1	1	1	1
Yield strength of anchor steel	f_{ya}	N/mm^2	601	579	563	563
Ultimate strength of anchor steel	f_{uta}	N/mm^2	752	724	703	703
Tension						
Effective tensile stress area (neck)	$A_{se,N}$	mm^2	36.1	66.5	105.8	153.5
Steel strength in tension	N_{sa}	kN	27.1	48.1	74.4	108.0
Resistance modification factor for steel strength, tension [4]	R	-	0.80			
Effectiveness factor for concrete breakout, cracked	k_{cr}	-	7	9	9	10
Effectiveness factor for concrete breakout, uncracked	k_{uncr}	-	10	10	11	11
Modification factor for cracked and uncracked concrete[5]	$\Psi_{c,N}$	-	1.0 See note 6	1.0 See note 6	1.0 See note 6	1.0 See note 6
Resistance modification factor for tension, concrete failure modes, Condition B [4]	R	-	1.0			
Pull-out resistance, cracked concrete [3,6]	$N_{p,cr}$	kN	N/A	N/A	18.0	N/A
Pull-out resistance, uncracked concrete [3,6]	$N_{p,uncr}$	kN	13.4	N/A	N/A	N/A
Pull-out resistance, seismic loads [3,6,9]	$N_{p,eq}$	kN	N/A	N/A	18.0	N/A
Resistance modification factor for tension, pullout strength, Condition B [4]	R	-	1.0			
Axial stiffness in service load range (cracked)	β_{cr}	kN/mm	6.5	7.8	7.1	9.8
Axial stiffness in service load range (uncracked)	β_{uncr}	kN/mm	48.6	40.3	18.5	70.3
Shear						
Effective shear stress area (threads)	$A_{se,V}$	mm^2	50.3	91.6	145.8	215.5
Load-bearing length of anchor	l_e	mm	51	51	76	89
Resistance modification factor for pryout strength [4]	R	-	1.0			
Coefficient for pryout strength	k_{cp}	-	1.0		2.0	
Steel strength in shear, non-seismic [7]	V_{sa}	kN	11.1	24.5	44.1	81.5
Steel strength in shear, seismic [7,8]	$V_{sa,eq}$	kN	8.9	19.6	35.3	73.3
Resistance modification factor for streel strength, shear, seismic [4]	R	-	0.75			

For **SI:** 1 in = 25.4 mm, 1 in^2 = 6.451×10^{-4} m, 1 ft-lb = 1.356 Nm, 1 lb/in^2 = 6.895 Pa.

[1]The information presented in this table must be used in conjunction with the design provisions of CSA A23.3 (-14,-04) Annex D, as applicable. For anchors resisting seismic load combinations the additional CSA A23.3 (-14, -04) D.4.3, as applicable, must apply.
[2]Installation must comply with the manufacturer's published installation instructions.
[3]N/A (not applicable) denotes that this value does not control for design.
[4]Anchors are considered to be manufactured using ductile steel in accordance with CSA A23.3-14 D.2 or CSA A23.3-04 D.2. All values of *R* for use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or 2010 NBCC, CSA A23.3-14 Annex C or CSA A23.3-04 Annex C, as applicable. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-14 D.5.3(c) or CSA A23.3-04 D.5.4(c), as applicable, is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the strength reduction factors associated with Condition A may be used.
[5]For all design cases $\Psi_{c,N}$ =1.0. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be used.
[6]For all design cases $\Psi_{c,P}$ =1.0. For the calculation of N_{cpr}, see CSA A23.3 (-14, -04) D.6.3.
[7]Tabulated values for steel strength in shear must be used for design. These tabulated values are lower than calculated results using equation D.31 in CSA A23.3-14.
[8]Tabulated values for steel strength in shear are for seismic applications and based on test results in accordance with ACI 355.2 (Section 9.6), as referenced in CSA A23.3-14 Annex D, Section D.4.3.4.
[9]Tabulated values for pull-out strength in tension are for seismic applications and based on test results in accordance with ACI 355.2 (Section 9.5), as referenced in CSA A23.3-14 Annex D, Section D.4.3.4.

TABLE 2—US ANCHOR ULTRAWEDGE+ WEDGE ANCHOR LENGTH CODE IDENTIFICATION SYSTEM

Length ID marking on threaded stud head		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**
Overall anchor length, l_{anch}, (mm)	From	38	51	64	76	89	102	114	127	140	152	165	178	191	203	216	229	241	254	279
	Up to but not including	51	64	76	89	102	114	127	140	152	165	178	191	203	216	229	241	254	279	305

For **SI**: 1 inch = 25.4 mm.

Ultimate Limit States Design:

Design resistance of anchors for compliance with the 2015 NBCC must be determined in accordance with CSA A23.3-14 Annex D, and this listing report.

Design resistance of anchors for compliance with the 2010 NBCC must be determined in accordance with CSA A23.3-04 Annex D, and this listing report.

Design parameters provided in Table 1of this listing report are based on the 2015 NBCC and 2010 NBCC (CSA A23.3-14 and CSA A23.3-04). The limit states design of anchors must comply with CSA A23.3 (-14, -04) D.5.1, except as required in CSA A23.3 (-14, -04) D.4.3.1.

Material resistance factors must be $\phi_c = 0.65$ and $\phi_s = 0.85$ in accordance with CSA A23.3 (-14, 04) Sections 8.4.2 and 8.4.3, and resistance modification factor, *R,* as given in CSA A23.3-14 Section D.5.3, or CSA A23.3-04 Section D.5.4, and noted in Table 1 of this listing report, must be used for load combinations calculated in accordance with Division B, Part 4, Section 4.1.3 of the 2015 and 2010 NBCC, or Annex C of CSA A23.3 (-14, -04). The nominal steel strength N_{sa} or V_{sa}, in Table 1 of this listing report must be multiplied by ϕ_s and R to determine the factored resistance N_{sar} or V_{sar}. The nominal pullout strengths $N_{p,uncr}$, $N_{p,cr}$ or $N_{p,eq}$ in Table 1 of this listing report must be multiplied by ϕ_c and R to determine the factored resistance $N_{cpr,uncr}$, $N_{cpr,cr}$, or $N_{cpr,eq}$, respectively..

Conditions of listing:

1. The listing report addresses only conformance with the standards and code sections noted above.
2. Approval of the product's use is the sole responsibility of the local code official.
3. The listing report applies only to the materials tested and as submitted for review by ICC-ES.
4. Anchor sizes, dimensions, minimum embedment depths and other installation parameters are as set forth in this listing report.
5. The anchors must be installed in cracked or uncracked normal-weight or lightweight concrete having a specified compressive strength, f'_c, of 17.2 MPa to 58.6 MPa (2,000 psi to 8,500 psi).
6. The values of f'_c, used for calculation purposes must not exceed 55 MPa (8,000 psi).
7. Limit states design values must be established in accordance with this listing report.
8. The use of fatigue or shock loading for these anchors under such conditions is beyond the scope of this listing report.
9. Anchors may be used to resist short-term loading due to wind or seismic forces in locations designed according to NBCC 2015 and NBCC 2010.
10. Where not otherwise prohibited in the code as referenced in CSA A23.3 (-14, -04), US Anchor Ultrawedge+ Wedge Anchors are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:
    a. Anchors are used to resist wind or seismic forces only.
    b. Anchors that support a fire-resistance-rated envelope or a fire- resistance-rated membrane are protected by approved fire-resistance- rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
    c. Anchors are used to support nonstructural elements.
11. Use of anchors is limited to dry, interior locations.