Staff Report

Design Review Board

File Number: 7-D-23-DT

Meeting: 7/19/2023
Project: Hilton Parking Garage
Applicant: Jerrod Herron Knoxville Properties Partnership

Property Information

Location: 500 Clinch Ave.
Parcel ID 94 L G 00102
Zoning: DK (Downtown Knoxville)
Description: c.1980, concrete parking garage.

Description of Work

Level I Minor Alteration of an Existing Building/Structure, Sign

New signs for parking garage; new flat metal awnings. Awning review is after-the-fact; awnings have already been installed. The awning on Walnut St measures 5’ wide and 28’ long, and is installed 9.25’ above the sidewalk. The awning on Clinch Ave measures 5’ wide and 28’ long, and is currently installed at 8’-6” above the sidewalk level.

Both signs measure 36" wide by 120" tall (30 sq. ft.), and are internally illuminated, with push-through lights spelling Public Parking. The sign on Walnut St is 11’-6" above the sidewalk, and the sign on Clinch Ave is 10’-10" above the sidewalk. The applicant intends to install the new signs in the same location as the existing projecting signs.

Applicable Design Guidelines

Downtown Design Guidelines

B. Private Realm
1. Building Mass, Scale and Form
1c. Use building materials, cornice lines, signs, and awnings of a human scale in order to reduce the mass of buildings as experienced at the street level.

B. The Traditional Grid District
1. Recommended Signs
1b. Projecting signs of modest size (9 square feet, maximum); a larger sign must be approved by the board.

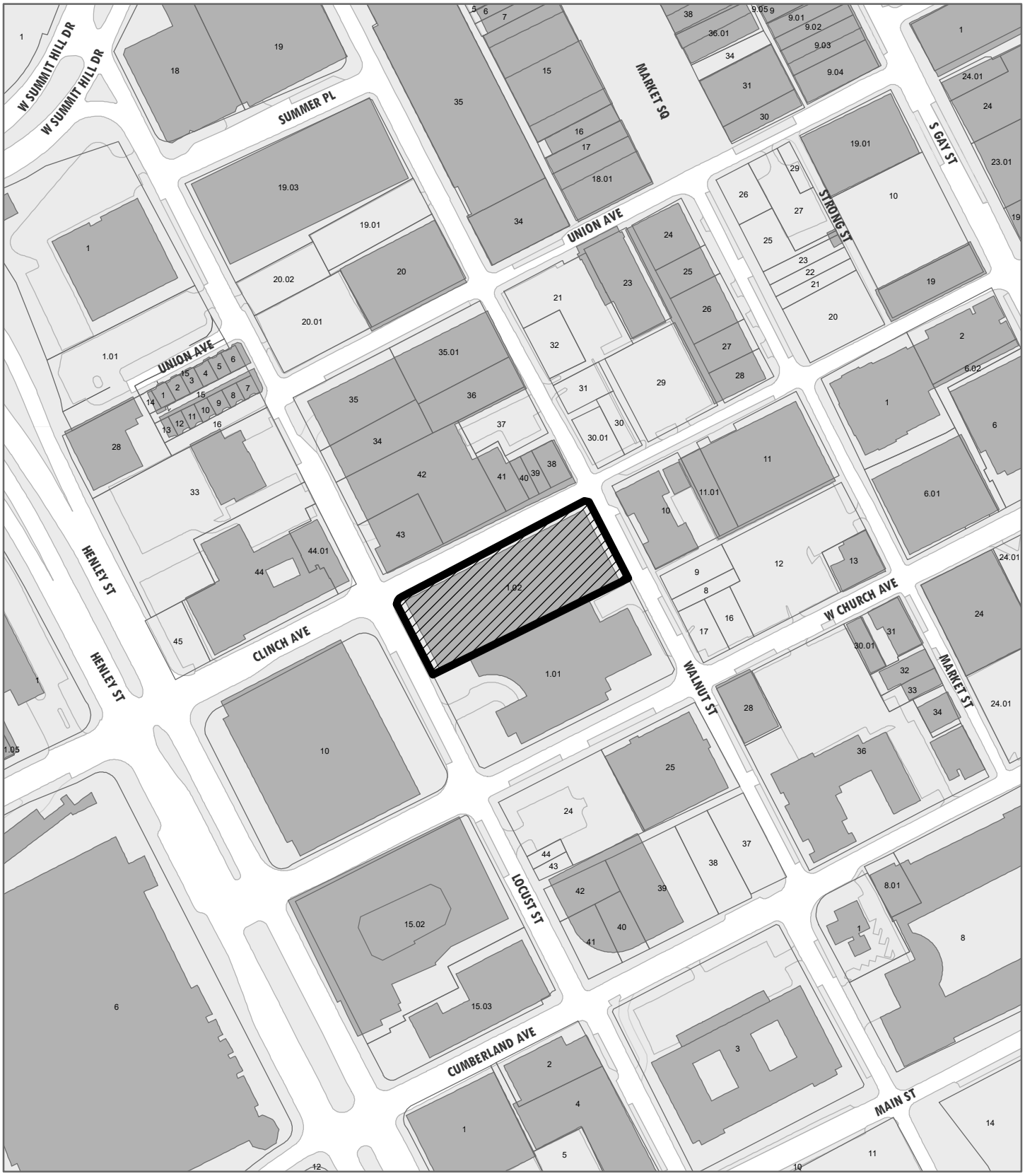
Comments

The guidelines for the Grid District recommend projecting signs on modest size (9 sq. ft.), with larger signs approved by the Board. New projecting signs approved by the Board are typically around 11-15’ sq. ft., with the largest projecting signs approved for businesses on Gay Street. The existing signs were installed prior to the creation of the Downtown Design Review Board and do not conform with the design guidelines. The new signs, both at 30 sq. ft., serve to indicate a parking garage, and should be reduced in size to meet the design guidelines. The internal illumination indicated on the sign drawings meets the guidelines and past Board approvals. The signs should meet the relevant aspects of the City sign code (13.5.B), with its width not extending closer than 20" to the curb.

The awnings were installed without the required City permits and design review approval. Awnings should meet the relevant aspects of the City zoning code, including 10.3.F, which requires a vertical clearance of at least 9’ from the sidewalk, not to exceed more than two-thirds width of the sidewalk. The Clinch Avenue awning does not currently meet code as installed, located 8’-6" above the sidewalk, and will need to seek a variance or be removed and reinstalled at least 9’ above the sidewalk. Awnings, as installed or revised, should meet the relevant aspects of the City zoning code and building codes.

Recommendation

Staff recommends approval of Certificate 7-D-23-DT, subject to the following conditions: 1) parking signs to be reduced in size, with approval by staff; 2) signs and awnings to meet relevant aspects of City zoning code and building codes, including the necessary revision or after-the-fact approval of awning on Clinch Avenue.



DOWNTOWN DESIGN REVIEW BOARD

7-D-23-DT

APPLICATION FOR CERTIFICATE OF APPROPRIATENESS

500 Clinch Ave.

Level 1: Minor alteration of an existing building/structure; Level 1: Sign

Original Print Date: 7/3/2023 Revised:

Knoxville/Knox County Planning · Downtown Design Review Board

Petitioner: Jerrod Herron Knoxville Properties Partnership

N

0 250

Feet

Planning
KNOXVILLE | KNOX COUNTY

DESIGN REVIEW REQUEST

- ■ DOWNTOWN DESIGN (DK)
- ☐ HISTORIC ZONING (H)
- ☐ INFILL HOUSING (IH)

Jerrod Herron
Applicant

6-22-23	July 19, 2023	7-D-23-DT
Date Filed	Meeting Date (if applicable)	File Number(s)

CORRESPONDENCE

All correspondence related to this application should be directed to the approved contact listed below.

■ Owner ☐ Contractor ☐ Engineer ☐ Architect/Landscape Architect

Jerrod Herron		Knoxville Properties Partnership		
Name		Company		
1225 Weisgarber Rd. Suite 390		Knoxville	TN	37909
Address		City	State	Zip
865-850-3073	jherron@ciprop.com			
Phone	Email			

CURRENT PROPERTY INFO

Knoxville Properties Partnership	1225 Weisgarber Rd	865-850-3073
Owner Name (if different from applicant)	Owner Address	Owner Phone
500 Clinch Ave.	094LG00102	
Property Address	Parcel ID	
	Downtown	
Neighborhood	Zoning	

AUTHORIZATION

Lindsay Crockett	Lindsay Crockett	6.26.23
Staff Signature	Please Print	Date
	Jerrod Herron	6-22-23
Applicant Signature	Please Print	Date

REQUEST

DOWNTOWN DESIGN

Level 1:

■ Signs ■ Alteration of an existing building/structure

Level 2:

☐ Addition to an existing building/structure

Level 3:

☐ Construction of new building/structure ☐ Site design, parking, plazas, landscape

See required Downtown Design attachment for more details.

■ Brief description of work: 2 new signs and 2 new awnings on existing parking garage

HISTORIC ZONING

Level 1:

■ Signs ☐ Routine repair of siding, windows, roof, or other features, in-kind; Installation of gutters, storm windows/doors

Level 2:

☐ Major repair, removal, or replacement of architectural elements or materials ☐ Additions and accessory structures

Level 3:

☐ Construction of a new primary building

Level 4:

☐ Relocation of a contributing structure ☐ Demolition of a contributing structure

See required Historic Zoning attachment for more details.

☐ Brief description of work:

INFILL HOUSING

Level 1:

☐ Driveways, parking pads, access point, garages or similar facilities ☐ Subdivisions

Level 2:

☐ Additions visible from the primary street ☐ Changes to porches visible from the primary street

Level 3:

☐ New primary structure

☐ Site built ☐ Modular ☐ Multi-Sectional

See required Infill Housing attachment for more details.

☐ Brief description of work:

STAFF USE ONLY

ATTACHMENTS

☐ Downtown Design Checklist

☐ Historic Zoning Design Checklist

☐ Infill Housing Design Checklist

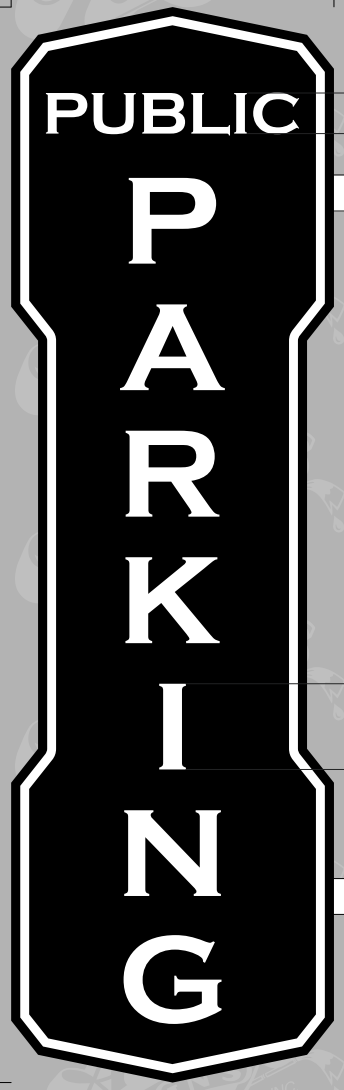
ADDITIONAL REQUIREMENTS

☐ Property Owners / Option Holders

Level 1: $50 • **Level 2:** $100 • **Level 3:** $250 • **Level 4:** $500

FEE 1:	TOTAL:
FEE 2:	
FEE 3:	

Illumination:



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Customer Approval:

ALVEYSIGNS.COM
13100 Hwy 57 N., Evansville, IN
1(888) 425-8397 (812) 867-2567 ph.
(812) 867-1465 fax

INTEGRATED IMAGE

File Location:

ARTWORK/I/INTEGRATED IMAGE/KNOXVILLE PARKING GARAGE

Job Description:

D/F Illuminated Blade Sign

SK85401

Date Completed:
3 - 13 - 2023

Drawn By:
KALEIGH

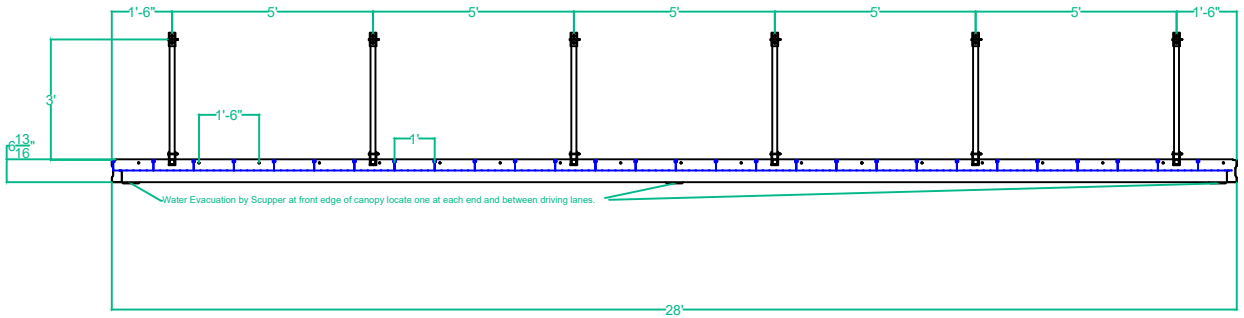
Salesperson:
Colleen Page-Thrall

THE INTENT OF THIS DRAWING IS TO SHOW A CONCEPTUAL REPRESENTATION OF THE PROPOSED SIGNAGE.


ONE
WAY

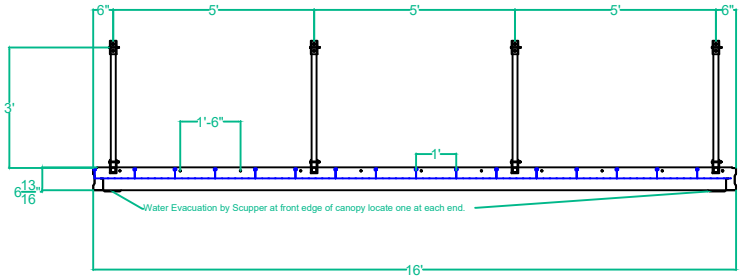

PARK


PARK
HERE



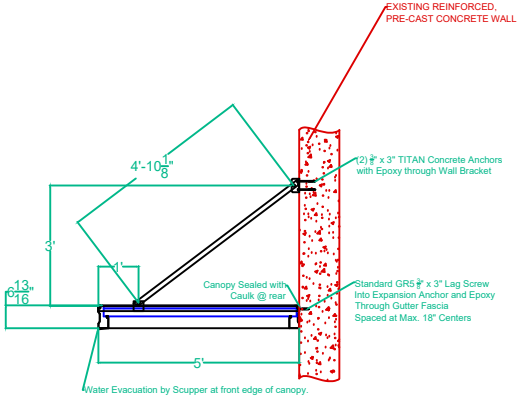
2 ALUMINUM, SUSPENDED CANOPY

ELEVATION - CLINCH ST. - Vehicle



1 ALUMINUM, SUSPENDED CANOPY

ELEVATION - WALNUT ST. - Pedestrian



3 ALUMINUM, SUSPENDED CANOPY

SECTION - TYPICAL for BOTH LOCATIONS

CLINCH AVE.
PARKING GARAGE

500 Clinch Ave.
Knoxville, TN 37902

SHOP DRAWINGS

Commercial & Investment Properties, Co.
1225 E Weisgarber Road
Suite 390
Knoxville, TN 37909
Phone: 865 584 3967
Fax: 865 584 4317

Job #: 36552
File Name: CDA_CIPCo_CAN1_0

Revision #	Revision Date	By
0	06-21-2023	E.Schwieter

Awning Base Drawings

CAN 1.0

PO Box 9183
1001 South Seminole Dr.
Chattanooga, TN 37412
www.awningschattanoogatn.com
423.629.5105 x.102
423.629.6457 FAX

Introduction

This manual provides technical information for Ballew's Products. However, you will often find that a variety of products can work in many applications when you consider span, wind or load–carrying capacity, and design constraints. Ballew's, with support from Britt Peters & Associates can assist in choosing the best system for your specific application. Contact us for help with any of the following:

- System selection
- Product selection
- Building department calculations sealed by a professional engineer
- Shop drawings
- Help with on site application problems

The data contained in this manual is intended to be informative and accurate. However, it is to be used as a technical guideline only and does not replace the judgments and designs of a qualified architect and/or engineer. Ballew's and its engineer do not replace or accept the responsibility of the design professional of record for any structure. However, Ballew's with support from Britt, Peters & Associates, Inc. can provide site specific design and drawings within the following states in which they are registered as Professional Engineers:

Alabama	Iowa	New Hampshire	Tennessee
Arizona	Kansas	New Jersey	Texas
Arkansas	Kentucky	New Mexico	Utah
California	Louisiana	New York	Virginia
Colorado	Maryland	North Carolina	Washington
Connecticut	Michigan	Ohio	West Virginia
Florida	Minnesota	Oklahoma	Wisconsin
Georgia	Mississippi	Pennsylvania	Wyoming
Idaho	Missouri	Rhode Island	
Illinois	Nebraska	South Carolina	
Indiana	Nevada	South Dakota	

Neither Ballew's nor Britt, Peters & Associates, Inc. SHALL BE LIABLE FOR INCIDENTAL AND CONSEQUENTIAL DAMAGES, DIRECTLY OR INDIRECTLY SUSTAINED, or for any loss caused by application of these goods for other than the intended use. Ballew's liability is expressly limited to replacement of defective goods.

We reserved the right to change data, table, or charts shown herein without notification.

Ballew's Design Manual

Ballew's Aluminum Products, Inc.
367 Mayfield Road,
Duncan, South Carolina 29334
Phone: (864) 272-4453
1-800-231-6666
Fax: (864) 272-4456
Web: www.ballews.com

Britt, Peters and Associates, Inc.
101 Falls Park Drive, Suite 601
Greenville, South Carolina 29601
Phone: (864) 271-8869
Fax: (864) 233-5140
Web: www.brittpeters.com

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11/21/2019

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TX COA# 001045

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NC COA# C-1088

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General Notes

1. This Design Manual was Developed in accordance with the "Aluminum Association Specifications For Aluminum Structures, 2005 Edition" and the American Iron And Steel Institute "Cold-Formed Steel Design Manual, 1996 Edition".
2. Design criteria utilized in the design of this manual is as follows:
   Gravity Loads: Gravity loadings act downward only.
   Dead Load: Self weight of canopy members
   The maximum snow* or live load is presented in the tables within the manual.
   Wind Load: Wind loadings are calculated per ASCE7-05 and the maximum allowable wind speed is reported in the tables within the manual**.
   Deflections:
   Deck: Span/60
   Beams: Span/120
   Building Importance Factor: 1.0
   Design criteria shall be verified with the local building official.
   *The loads presented shall be compared to the flat roof snow load plus the rain on snow surcharge load as defined in ASCE7-05. Where canopies or awnings are adjacent to other structures consult with a professional engineer to evaluate the effects of drift prior to using the tables of this manual.
   ** Wind exposure C shall be used unless an exposure B can be verified by a professional engineer. If the structure is located in a flat, unobstructed area or near a large body of water or on an isolated hill consult with a professional engineer prior to using the wind load tables of this manual.
3. The material thickness used in design is actual metal thickness. The listed bare metal thickness on all these tables must be the minimum field delivered bare metal thickness.
4. It shall be the responsibility of the building permit holder to contact a professional engineer to evaluate the adequacy of existing structures to which the canopy or awning is connected.
5. Tabulated information is based on criteria identified here in and precluded to exclusive use of materials supplied by Ballew's Aluminum Products. Consult a professional engineer for special design considerations, local considerations, codes, splice locations, non uniform loading, concentrated loads, snow drifting, partially enclosed situations, web crippling, importance factors other than 1.0, wind exposure factor D, connections to walls, dynamic loading, seismic design, other requirements and additional information not included in this manual.
6. Fasteners shall be:
   a. ¼" and 3/8" diameter bolts shall be 300 series stainless steel or galvanized ASTM A307 bolts;
   b. ½" diameter or greater bolts shall be galvanized ASTM A325 bolts.
   c. All bolts shall be installed with washer under the bolt heads and nuts.
   d. All bolt holes shall not be more than 1/16" larger than the bolt diameter.
   e. #14 stainless steel self tapping screws, hex head, cadmium plated, with 5/8" diameter composite aluminum-neoprene washers (0.05" minimum aluminum thickness)
7. Section properties are for information only. Member design is governed by buckling or deflection in many cases and full section capacity may not be developed.
8. Dissimilar metals must be separated by painting with bituminous paint or other acceptable coating, or neoprene gasket material to prevent galvanic action.
9. Canopies are not designed to be enclosed in any way.
10. This manual is for information only. Actual building designs shall be reviewed by a licensed engineer for local conditions, codes, and requirements.

Material Properties

1. The following is a summary of material properties for products specified in this design manual. For further material information refer to Part 4 of the 2005 Aluminum Design Manual and Part 1 of the 2002 AISI Cold-Formed Steel Design Manual.

2. Aluminum Alloy 3004-H36
   - A. Tensile Ultimate Strength_____Ftu = 35 KSI
   - B. Tensile Yield Strength_____Fty = 28 KSI
   - C. Compressive Yield Strength_____Fcy = 25 KSI
   - D. Shear Ultimate Strength_____Fsu = 20 KSI
   - E. Compressive Modulus of Elasticity_____E = 10,100 KSI

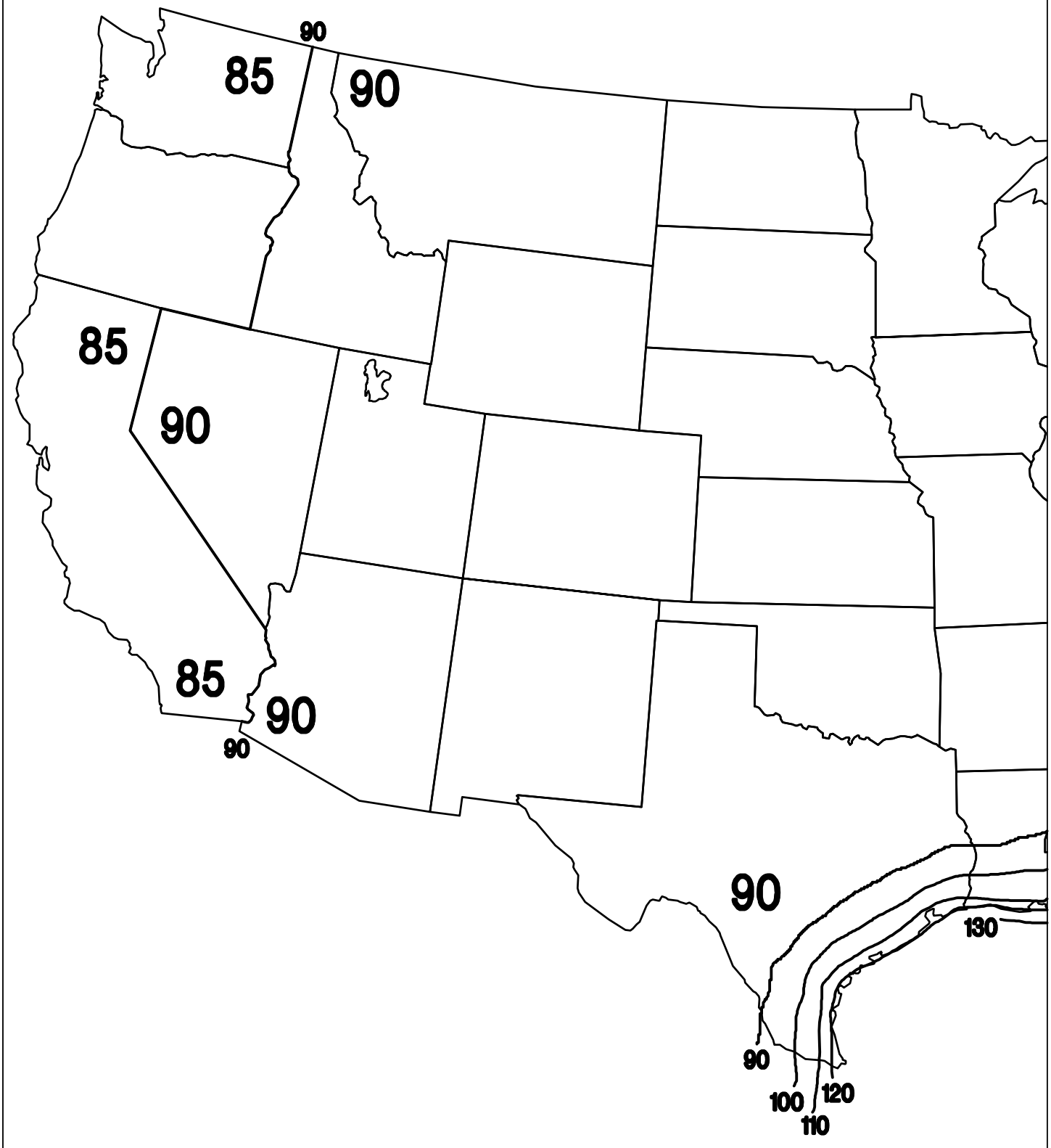
3. Aluminum Alloy 6005-T5
   - A. Tensile Ultimate Strength_____Ftu = 38 KSI
   - B. Tensile Yield Strength_____Fty = 35 KSI
   - C. Compressive Yield Strength_____Fcy = 35 KSI
   - D. Shear Ultimate Strength_____Fsu = 24 KSI
   - E. Compressive Modulus of Elasticity_____E = 10,100 KSI

4. Aluminum Alloy 6061-T6
   - A. Tensile Ultimate Strength_____Ftu = 38 KSI
   - B. Tensile Yield Strength_____Fty = 35 KSI
   - C. Compressive Yield Strength_____Fcy = 35 KSI
   - D. Shear Ultimate Strength_____Fsu = 24 KSI
   - E. Compressive Modulus of Elasticity_____E = 10,100 KSI

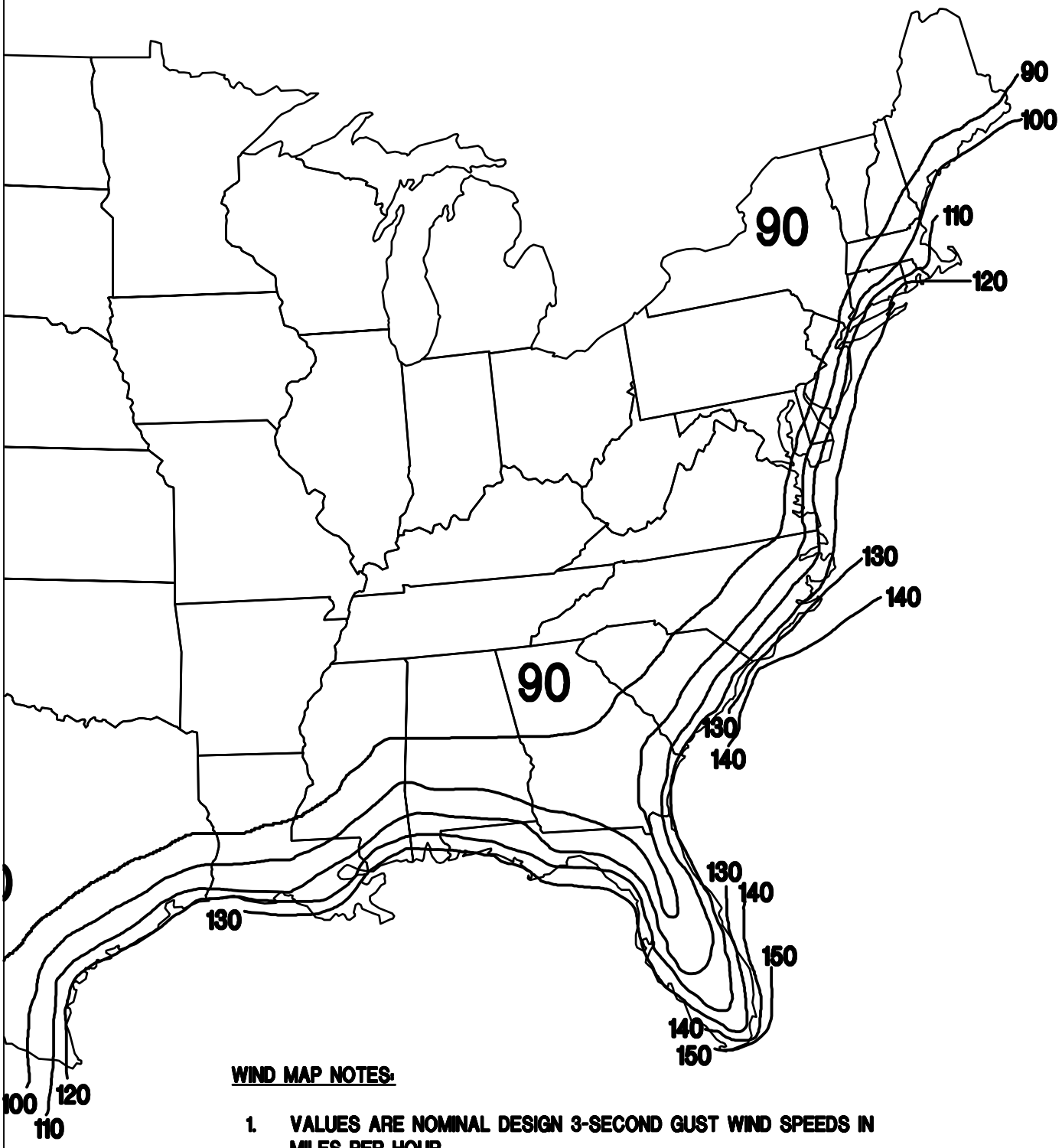
5. Aluminum Alloy 6063-T5
   - A. Tensile Ultimate Strength_____Ftu = 22 KSI
   - B. Tensile Yield Strength_____Fty = 16 KSI
   - C. Compressive Yield Strength_____Fcy = 16 KSI
   - D. Shear Ultimate Strength_____Fsu = 13 KSI
   - E. Compressive Modulus of Elasticity_____E = 10,100 KSI

6. Aluminum Alloy 6063-T6
   - A. Tensile Ultimate Strength_____Ftu = 30 KSI
   - B. Tensile Yield Strength_____Fty = 25 KSI
   - C. Compressive Yield Strength_____Fcy = 25 KSI
   - D. Shear Ultimate Strength_____Fsu = 19 KSI
   - E. Compressive Modulus of Elasticity_____E = 10,100 KSI

7. Sheet Steel ASTM A1008
   - A. Tensile Ultimate Strength_____Fu = 48 KSI
   - B. Tensile Yield Strength_____Fy = 30 KSI
   - C. Modulus of Elasticity_____E = 29,000 KSI



Wind Speed West

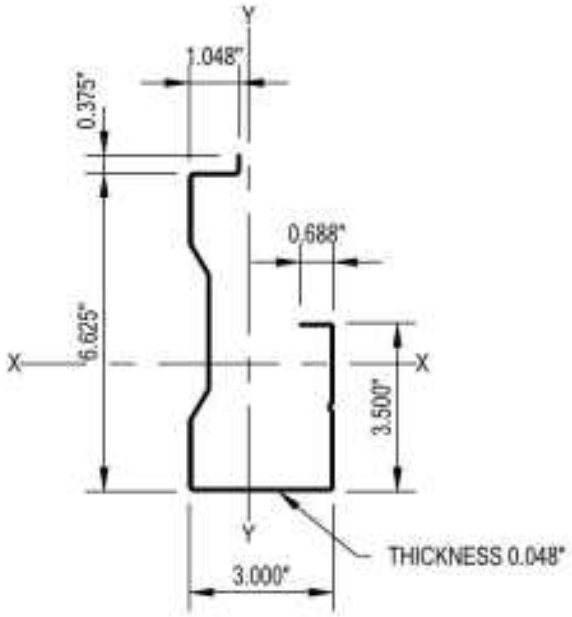


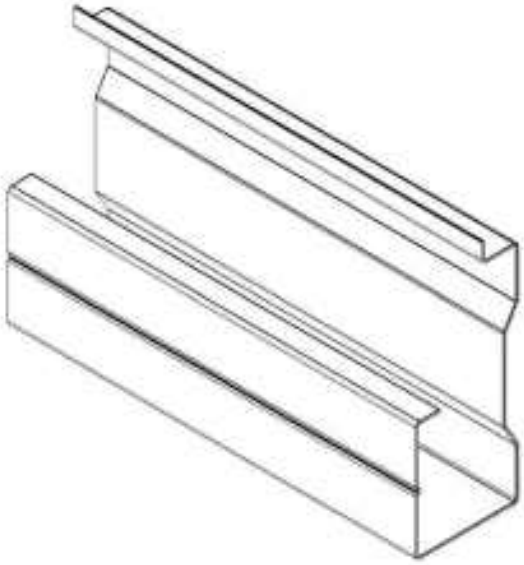
WIND MAP NOTES:

1. VALUES ARE NOMINAL DESIGN 3-SECOND GUST WIND SPEEDS IN MILES PER HOUR.
2. LINEAR INTERPOLATION BETWEEN CONTOURS IS PERMITTED.
3. WIND SPEEDS SHALL BE VERFIED WITH LOCAL CODE OFFICIALS.

Wind Speed East

TABLE OF CONTENTS





SECTION VIEW

ISOMETRIC VIEW

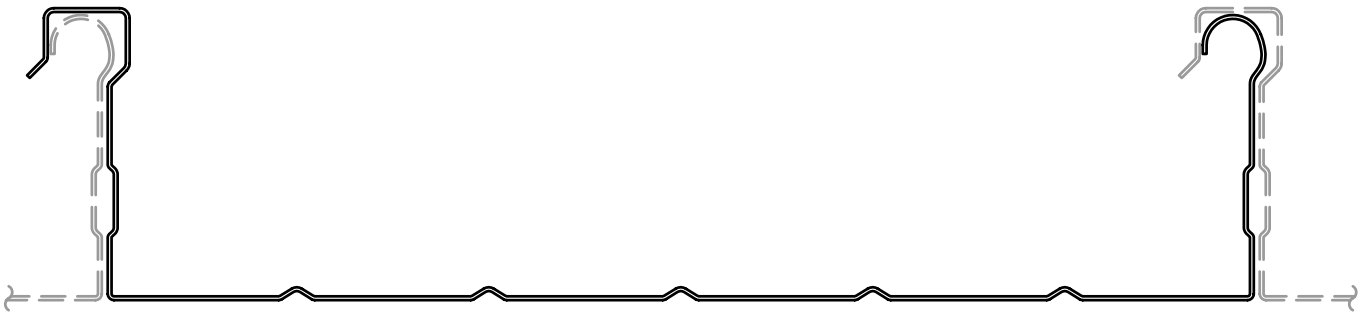
SECTION PROPERTIES (COMBINED SECTION):

1.	AREA	0.732	SQUARE INCHES
2.	WEIGHT	0.706	POUNDS PER FOOT
3.	MOMENT OF INERTIA (X-X)	3.7277	IN^4
4.	SECTION MODULUS TOP (X-X)	0.835	IN^3
5.	SECTION MODULUS BOTTOM (X-X)	1.401	IN^3
6.	RADIUS OF GYRATION (X-X)	2.257	IN
7.	MOMENT OF INERTIA (Y-Y)	1.0597	IN^4
8.	RADIUS OF GYRATION (Y-Y)	1.203	IN
9.	TORSION CONSTANT	7.787	IN^4
10.	POLAR RADIUS OF GYRATION	2.557	IN

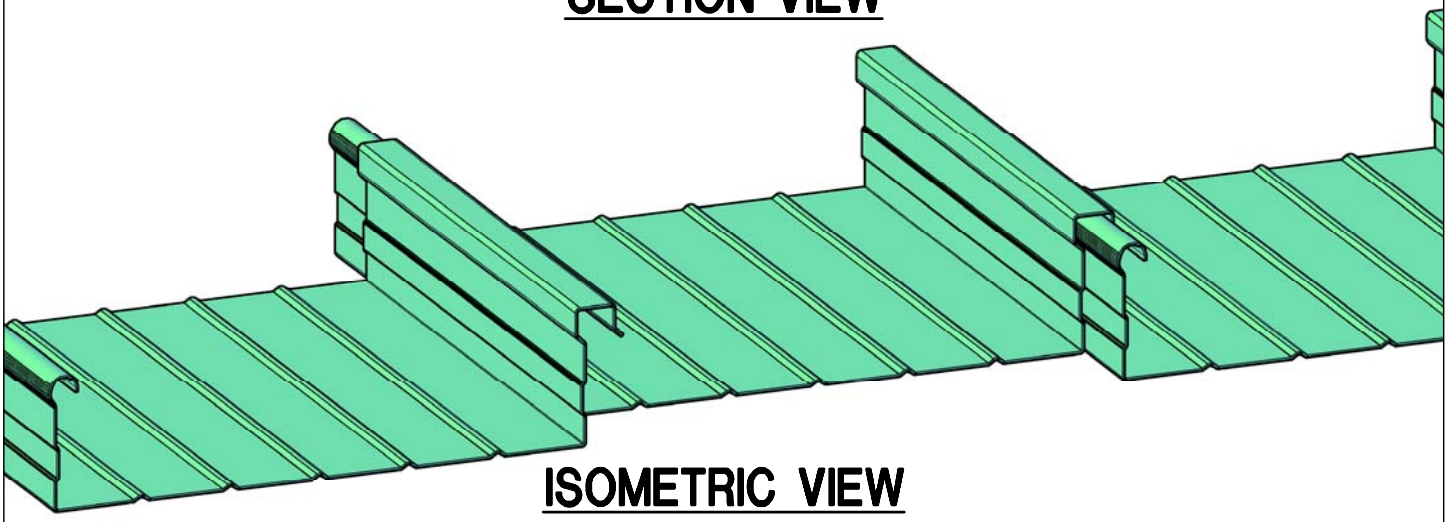
NOTES:

1. 7" ROLLED GUTTER IS FABRICATED FROM ALUMINUM ALLOY 3004-H36.
2. ROLLED GUTTERS ARE PROVIDED CUT TO LENGTH.
3. TYPICALLY USED TO SUPPORT DECK BETWEEN COLUMNS.
4. SECTION PROPERTIES ARE FOR INFORMATION ONLY. MEMBER DESIGNS ARE OFTEN GOVERNED BY BUCKLING OR DEFLECTION AND THE FULL SECTION CAPACITY MAY NOT BE DEVELOPED.

ITEM NO.	DESCRIPTION
43-5000	7"x3" Roll Formed Gutter



SECTION VIEW



ISOMETRIC VIEW

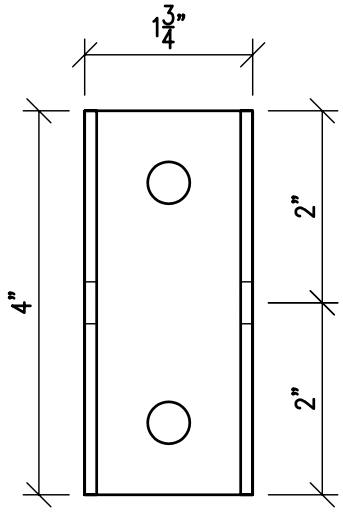
SECTION PROPERTIES:

MATERIAL	ALUMNIUM	ALUMNIUM	STEEL
THICKNESS	0.025"	0.032"	26 GAGE (0.0179")
1. AREA	0.493 IN^2	0.656 IN^2	0.366 IN^2
2. WEIGHT	0.578 PSF	0.770 PSF	1.245 PSF
3. MOMENT OF INERTIA	0.585 IN^4	0.777 IN^4	0.430 IN^4
4. SECTION MODULUS TOP	0.260 IN^3	0.345 IN^3	0.191 IN^3
5. SECTION MODULUS BOTTOM	0.754 IN^3	0.998 IN^3	0.560 IN^3

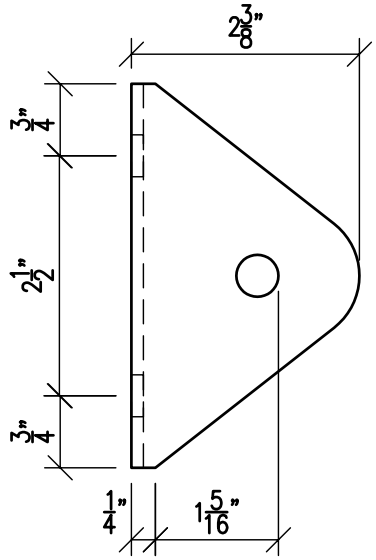
NOTES:

1. ALUMNIUM DECK IS FABRICATED FROM ALUMNIUM ALLOY 3004-H36.
2. STEEL DECK IS FABRICATED FROM ASTM A1008 STEEL.
3. DECK IS PROVIDED CUT TO LENGTH.
4. SECTION PROPERTIES ARE FOR INFORMATION ONLY. MEMBER DESIGNS ARE OFTEN GOVERNED BY BUCKLING OR DEFLECTION AND THE FULL SECTION CAPACITY MAY NOT BE DEVELOPED.

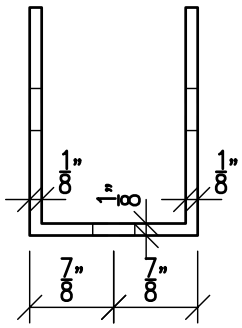
ITEM NO.	DESCRIPTION
40-0000	3.0"x12" FLAT Pan Deck



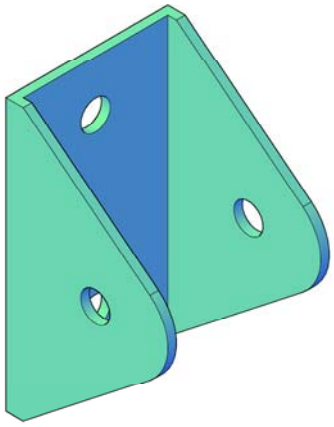
FRONT VIEW



SIDE VIEW



BOTTOM VIEW

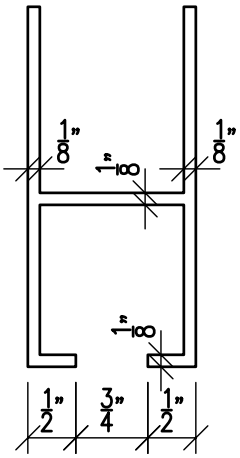


ISOMETRIC VIEW

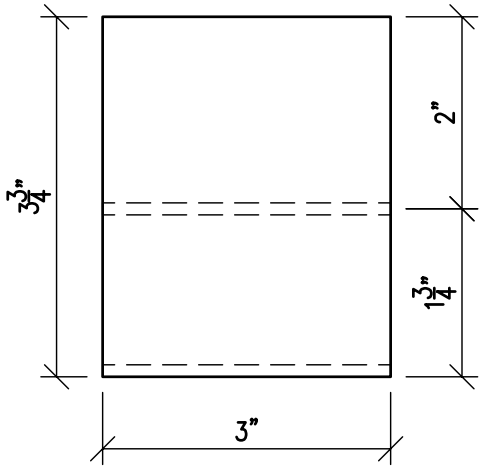
NOTES:

1. UPPER WALL BRACKETS ARE EXTRUDED SHAPES FABRICATED FROM ALUMNIUM ALLOY 6005–T5.
2. HOLES ARE TYPICALLY DRILLED IN THE SHOP.
3. TYPICALLY USED TO CONNECT THE TOP END OF STRUTS IN WALL HUNG CANOPIES TO THE SUPPORTING WALL.
4. SECTION PROPERTIES ARE FOR INFORMATION ONLY. MEMBER DESIGNS ARE OFTEN GOVERNED BY BUCKLING OR DEFLECTION AND THE FULL SECTION CAPACITY MAY NOT BE DEVELOPED.

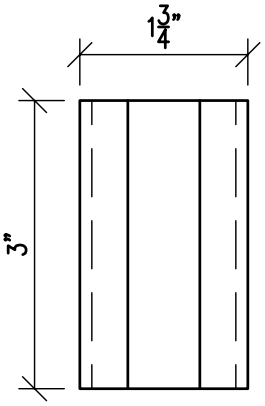
ITEM NO.	DESCRIPTION
70-9100	UPPER WALL BRACKET



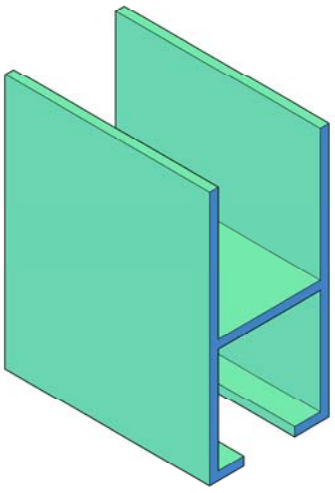
FRONT VIEW



SIDE VIEW



BOTTOM VIEW

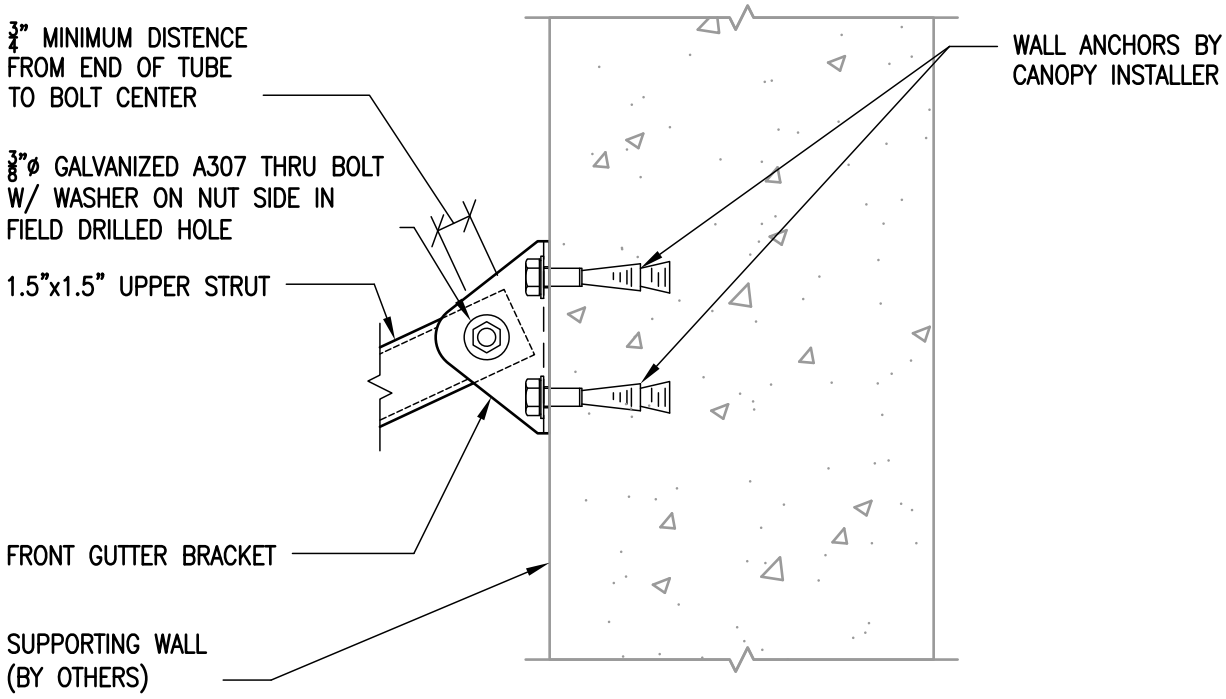


ISOMETRIC VIEW

NOTES:

1. SADDLE BRACKETS ARE EXTRUDED SHAPES FABRICATED FROM ALUMNIUM ALLOY 6005–T5.
2. HOLES ARE TYPICALLY DRILLED IN THE FIELD.
3. TYPICALLY USED TO CONNECT THE LOWER STRUTS IN WALL HUNG CANOPIES TO THE UPPER STRUTS.
4. SECTION PROPERTIES ARE FOR INFORMATION ONLY. MEMBER DESIGNS ARE OFTEN GOVERNED BY BUCKLING OR DEFLECTION AND THE FULL SECTION CAPACITY MAY NOT BE DEVELOPED.

ITEM NO.	DESCRIPTION
99-HBRK	SADDLE BRACKET



UPPER WALL BRACKET CONNECTION DETAIL

DESCRIPTION

Marque Design Table

FRAME SIZE

1.5"x1.5"x0.125" Frame

Projection (Feet)	Spacing (Feet)	Gravity (PSF)	WIND EXP B (MPH)	WIND EXP C (MPH)	Vert. Reaction (LB)	Horiz. Reaction (LB)
4.0	1.0	194	150	150	906	2036
4.0	2.0	97	150	150	906	2036
4.0	3.0	65	150	150	906	2036
4.0	4.0	48	150	130	906	2036
4.0	5.0	39	140	110	906	2036
4.0	6.0	32	120	100	906	2036
4.0	7.0	26	110	90	845	1899
5.0	1.0	160	150	150	906	2036
5.0	2.0	80	150	150	906	2036
5.0	3.0	53	150	130	906	2036
5.0	4.0	40	140	110	906	2036
5.0	5.0	32	120	100	906	2036
5.0	6.0	27	110	90	906	2036
5.0	7.0	21	100	85	817	1836
6.0	1.0	136	150	150	906	2036
6.0	2.0	68	150	150	906	2036
6.0	3.0	45	150	120	906	2036
6.0	4.0	34	130	100	906	2036
6.0	5.0	27	110	90	906	2036
6.0	6.0	23	100	85	906	2036
7.0	1.0	119	150	150	906	2036
7.0	2.0	59	150	130	906	2036
7.0	3.0	40	130	100	906	2036
7.0	4.0	30	110	90	906	2036
7.0	5.0	24	100	-	906	2036
8.0	1.0	105	150	140	906	2036
8.0	2.0	53	120	100	906	2036
8.0	3.0	35	100	85	906	2036
8.0	4.0	26	90	-	906	2036
9.0	1.0	94	150	120	906	2036
9.0	2.0	47	100	85	906	2036
9.0	3.0	31	85	-	906	2036
10.0	1.0	85	120	100	906	2036
10.0	2.0	43	90	-	906	2036

Titen HD® Heavy-Duty Screw Anchor

A high-strength screw anchor for use in cracked and uncracked concrete, as well as uncracked masonry. The Titen HD offers low installation torque and outstanding performance. Designed for use in dry, interior, non-corrosive environments or temporary outdoor applications.

Features

- Tested in accordance with ACI 355.2, AC193 and AC106
- Qualified for static and seismic loading conditions
- Thread design undercuts to efficiently transfer the load to the base material
- Standard fractional sizes
- Specialized heat-treating process creates tip hardness for better cutting without compromising the ductility
- No special drill bit required — designed to install using standard-sized ANSI tolerance drill bits
- Hex-washer head requires no separate washer, unless required by code, and provides a clean installed appearance
- Removable — ideal for temporary anchoring (e.g. formwork, bracing) or applications where fixtures may need to be moved
- Reuse of the anchor will not achieve listed loads and is not recommended

Codes: ICC-ES ESR-2713 (concrete);
ICC-ES ESR-1056 (masonry);
City of LA Supplement within ESR-2713 (concrete);
City of LA Supplement within ESR-1056 (masonry);
Florida FL15730 (concrete and masonry);
FM 3017082, 3035761 and 3043442;
Multiple DOT listings

Material: Carbon steel

Coating: Zinc plated or mechanically galvanized.
Not recommended for permanent exterior use or highly corrosive environments.

Titen HD Screw Anchor

Cracked Concrete CODE LISTED

Serrated teeth on the tip of the Titen HD® screw anchor facilitate cutting and reduce installation torque.

Installation

Holes in steel fixtures to be mounted should match the diameter specified in the table below.

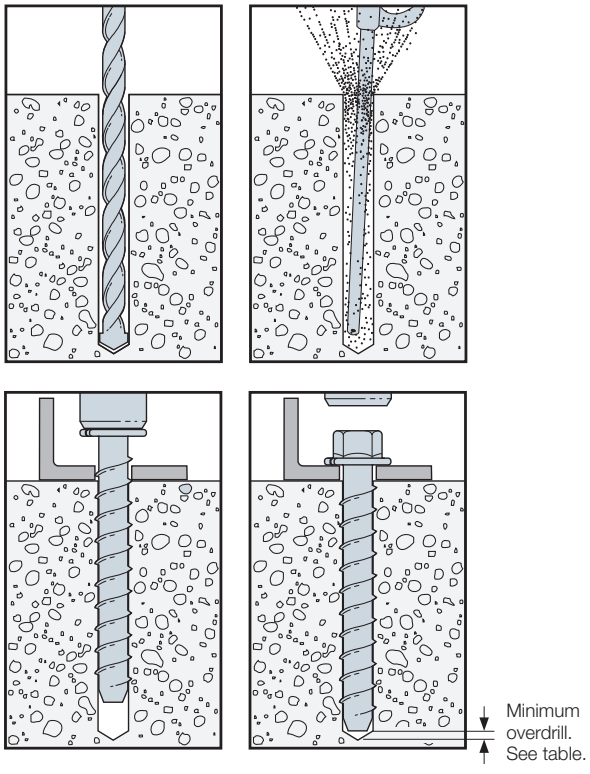
Use a Titen HD screw anchor one time only — installing the anchor multiple times may result in excessive thread wear and reduce load capacity.

Do not use impact wrenches to install into hollow CMU.

Caution: Oversized holes in base material will reduce or eliminate the mechanical interlock of the threads with the base material and reduce the anchor's load capacity.

1. Drill a hole in the base material using a carbide drill bit the same diameter as the nominal diameter of the anchor to be installed. Drill the hole to the specified embedment depth plus minimum hole depth overdrill (see table below) to allow the thread tapping dust to settle, and blow it clean using compressed air. (Overhead installations need not be blown clean.) Alternatively, drill the hole deep enough to accommodate embedment depth and the dust from drilling and tapping.
2. Insert the anchor through the fixture and into the hole.
3. Tighten the anchor into the base material until the hex-washer head contacts the fixture.

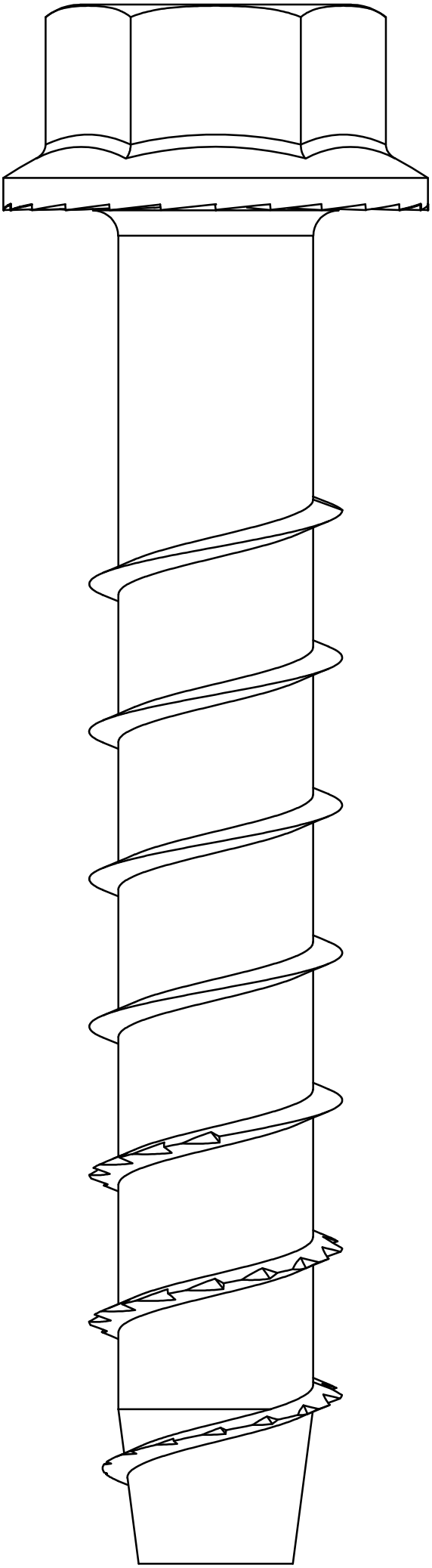
Installation Sequence

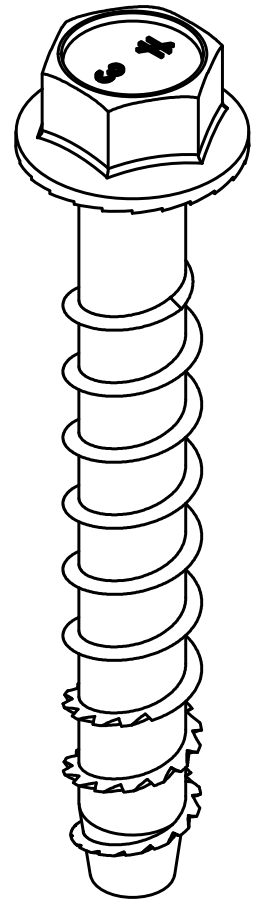


Additional Installation Information

Titen HD® Diameter (in.)	Wrench Size (in.)	Recommended Steel Fixture Hole Size (in.)	Minimum Hole Depth Overdrill (in.)
¼	⅜	⅜ to 7⁄16	⅛
⅜	9⁄16	½ to 9⁄16	¼
½	¾	⅝ to 11⁄16	½
⅝	15⁄16	¾ to 13⁄16	½
¾	1 ⅛	⅞ to 15⁄16	½

Suggested fixture hole sizes are for structural steel thicker than 12 gauge only. Larger holes are not required for wood or thinner cold-formed steel members.





Titen HD® Heavy-Duty Screw Anchor

Titen HD Anchor Product Data — Mechanically Galvanized

Size (in.)	Model No.	Thread Length (in.)	Drill Bit Diameter (in.)	Wrench Size (in.)	Quantity	
					Box	Carton
⅜ x 3	THD37300HMG	2½	⅜	9⁄16	50	200
⅜ x 4	THD37400HMG	3½			50	200
⅜ x 5	THD37500HMG	4½			50	100
⅜ x 6	THD37600HMG	5½			50	100
½ x 4	THD50400HMG	3½	½	¾	20	80
½ x 5	THD50500HMG	4½			20	80
½ x 6	THD50600HMG	5½			20	80
½ x 6½	THD50612HMG	5½			20	40
½ x 8	THD50800HMG	5½			20	40
½ x 12	THD501200HMG	5½			5	20
⅝ x 5	THDB62500HMG	4½	⅝	15⁄16	10	40
⅝ x 6	THDB62600HMG	5½			10	40
⅝ x 6½	THDB62612HMG	5½			10	40
⅝ x 8	THDB62800HMG	5½			10	20
¾ x 5	THD75500HMG	4½	¾	1⅛	5	20
¾ x 6	THDT75600HMG	4½			5	20
¾ x 8½	THD75812HMG	5½			5	10
¾ x 10	THD75100HMG	5½			5	10

Mechanical galvanizing meets ASTM B695, Class 65, Type 1. Intended for some pressure-treated wood sill plate applications. Not for use in other corrosive or outdoor environments. See p. 261 or visit **strongtie.com/info** for more corrosion information.

Titen HD Installation Information and Additional Data[1]

IBC LW*

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)										
			¼		⅜		½		⅝		¾		
Installation Information													
Drill Bit Diameter	d_{bit}	in.	¼		⅜		½		⅝		¾		
Baseplate Clearance Hole Diameter	d_c	in.	⅜		½		⅝		¾		⅞		
Maximum Installation Torque	$T_{inst,max}$	ft.-lbf	24[2]		50[2]		65[2]		100[2]		150[2]		
Maximum Impact Wrench Torque Rating	$T_{impact,max}$	ft.-lbf	125[3]		150[3]		340[3]		340[3]		385[3]		
Minimum Hole Depth	h_{hole}	in.	1¾	2⅝	2¾	3½	3¾	4½	4½	6	4½	6	6¾
Nominal Embedment Depth	h_{nom}	in.	1⅝	2½	2½	3¼	3¼	4	4	5½	4	5½	6¼
Critical Edge Distance	c_{ac}	in.	3	6	2 11⁄16	3⅝	3 9⁄16	4½	4½	6⅜	6	6⅜	7 5⁄16
Minimum Edge Distance	c_{min}	in.	1½		1¾								
Minimum Spacing	s_{min}	in.	1½		3						2¾	3	
Minimum Concrete Thickness	h_{min}	in.	3¼	3½	4	5	5	6¼	6	8½	6	8¾	10
Additional Data													
Anchor Category	Category	—	1										
Yield Strength	f_{ya}	psi	100,000		97,000								
Tensile Strength	f_{uta}	psi	125,000		110,000								
Minimum Tensile and Shear Stress Area	A_{se}	in²	0.042		0.099		0.183		0.276		0.414		
Axial Stiffness in Service Load Range — Uncracked Concrete	β_{uncr}	lb./in.	202,000		672,000								
Axial Stiffness in Service Load Range — Cracked Concrete	β_{cr}	lb./in.	173,000		345,000								

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 and ACI 318-11 Appendix D.
2. $T_{inst,max}$ is the maximum permitted installation torque for the embedment depth range covered by this table using a torque wrench.
3. $T_{impact,max}$ is the maximum permitted torque rating for impact wrenches for the embedment depth range covered by this table.

** See p. 12 for an explanation of the load table icons.*

Titen HD® Design Information — Concrete

Titen HD Tension Strength Design Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)										
			¼		⅜		½		⅝		¾		
Nominal Embedment Depth	h_{nom}	in.	1⅝	2½	2½	3¼	3¼	4	4	5½	4	5½	6¼
Steel Strength in Tension — ACI 318-14 Section 17.4.1 or ACI 318-11 Section D.5.1													
Tension Resistance of Steel	N_{sa}	lb.	5,195		10,890		20,130		30,360		45,540		
Strength Reduction Factor — Steel Failure	ϕ_{sa}	—	0.65[2]										
Concrete Breakout Strength in Tension[6] — ACI 318-14 Section 17.4.2 or ACI 318-11 Section D.5.2													
Effective Embedment Depth	h_{ef}	in.	1.19	1.94	1.77	2.40	2.35	2.99	2.97	4.24	2.94	4.22	4.86
Critical Edge Distance[6]	c_{ac}	in.	3	6	2 11/16	3⅝	3 9/16	4½	4½	6⅜	6	6⅜	7 5/16
Effectiveness Factor — Uncracked Concrete	k_{uncr}	—	30		24						27	24	
Effectiveness Factor — Cracked Concrete	k_{cr}	—	17										
Modification Factor	$\Psi_{c,N}$	—	1.0										
Strength Reduction Factor — Concrete Breakout Failure	ϕ_{cb}	—	0.65[7]										
Pullout Strength in Tension — ACI 318-14 Section 17.4.3 or ACI 318-11 Section D.5.3													
Pullout Resistance, Uncracked Concrete (f'_c = 2,500 psi)	$N_{p,uncr}$	lb.	—[3]	—[3]	2,700[4]	—[3]	—[3]	—[3]	—[3]	9,810[4]	—[3]	—[3]	—[3]
Pullout Resistance, Cracked Concrete (f'_c = 2,500 psi)	$N_{p,cr}$	lb.	—[3]	1,905[4]	1,235[4]	2,700[4]	—[3]	—[3]	3,040[4]	5,570[4]	—[3]	6,070[4]	7,195[4]
Strength Reduction Factor — Concrete Pullout Failure	ϕ_p	—	0.65[5]										
Tension Strength for Seismic Applications — ACI 318-14 Section 17.4.2.3.3 or ACI 318-11 Section D.3.3.3													
Nominal Pullout Strength for Seismic Loads (f'_c = 2,500 psi)	$N_{p,eq}$	lb.	—[3]	1,905[4]	1,235[4]	2,700[4]	—[3]	—[3]	3,040[4]	5,570[4]	3,840[4]	6,070[4]	7,195[4]
Strength Reduction Factor — Breakout or Pullout Failure	ϕ_{eq}	—	0.65[5]										

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 and ACI 318-11 Appendix D, except as modified below.
2. The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318-11 D.4.4. Anchors are considered brittle steel elements.
3. Pullout strength is not reported since concrete breakout controls.
4. Adjust the characteristic pullout resistance for other concrete compressive strengths by multiplying the tabular value by $(f'_{c,specified} / 2{,}500)^{0.5}$.
5. The tabulated value of ϕ_p or ϕ_{eq} applies when the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3.(c) or ACI 318-11 D.4.3(c) for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, appropriate value of ϕ must be determined in accordance with ACI 318-11 Section D.4.4(c).
6. The modification factor $\Psi_{cp,N}$ = 1.0 for cracked concrete. Otherwise, the modification factor for uncracked concrete without supplementary reinforcement to control splitting is either:

   (1) $\Psi_{cp,N}$ = 1.0 if $c_{a,min} \geq c_{ac}$ or (2) $\Psi_{cp,N} = \frac{c_{a,min}}{c_{ac}} \geq \frac{1.5h_{ef}}{c_{ac}}$ if $c_{a,min} < c_{ac}$

   The modification factor, $\Psi_{cp,N}$ is applied to the nominal concrete breakout strength, N_{cb} or N_{cbg}.
7. The tabulated value of ϕ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the ϕ_{cb} factors described in ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition A are allowed. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318-11 D.4.4(c).

** See p. 12 for an explanation of the load table icons.*