

ICC-ES Evaluation Report

ESR-4771

Reissued May 2024


This report also contains:

Subject to renewal May 2025

- CBC Supplement
- FBC Supplement
- LABC Supplement

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<p>DIVISION: 05 00 00—METALS</p> <p>Section: 05 05 27—Metal Connectors</p> <p>DIVISION: 05 00 00—METALS</p> <p>Section: 05 52 00—Metal Railings</p>	<p>REPORT HOLDER:</p> <p>NILL BUILDING SOLUTIONS</p>	<p>EVALUATION SUBJECT:</p> <p>NB1C ANCHOR FLANGE</p>	
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1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021 and 2018 [International Building Code® \(IBC\)](#)
- 2021 and 2018 [International Residential Code® \(IRC\)](#)

For evaluation for compliance with codes adopted by Los Angeles Department of Building and Safety (LADBS), see [ESR-4771 LABC and LARC Supplement](#).

Properties evaluated:

- Structural

2.0 USES

The NB1C anchor flanges are used to support metal base shoes in railing systems (guards and handrails) and other structural applications.

The anchor flanges may be used under the IBC; and under the IRC when an engineered design is prepared in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 Anchor Flanges:

The NB1C anchor flanges are made from annealed stainless steel Type 304 with a minimum yield strength of 30 ksi (205 MPa) and a minimum tensile strength of 85 ksi (586 MPa). The anchor flanges consist of a port and a flange as shown in [Figure 1](#). The port is all around factory-welded to the flange at the top with grade ER308 weld.

The port of the NB1C is internally threaded to receive a 1/2" – 13 UNC stainless steel threaded rod or bolt.

3.2 Threaded Rods and Bolts:

Threaded rods and bolts that are intended to be installed into the port of the NB1C anchor flange must have 1/2" – 13 UNC threads Class. The threaded rods and bolts must comply with ASTM F593, Type 304 or stronger and ANSI/ASME B18.2.1, as applicable. Nuts must comply with ASTM F564, Group I and ANSI/ASME B18.2.2.

3.3 Fasteners:

The fasteners used to install the anchor flange to the supporting member must be #14 countersunk screws with minimum head diameter of 0.462 inch (11.7 mm) and must be galvanized or made from stainless steel. The selection of fasteners and their installation are outside the scope and must comply with the applicable standards or be addressed in an ICC-ES evaluation report for similar application.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The Allowable (ASD) load values in [Tables 1](#) and [2](#) are for the anchor flanges only. The values do not include: the connection of the base shoe to the anchor flange; and the connection of anchor flange to the supporting substrate. The values do include the effects of the fasteners on the anchor flange which is why information is provided on the size of the fasteners but not the capacity of the fasteners. For the provided design values, the elements in contact with the anchor flange (e.g., base shoe or washer) were considered rigid, such that the flexibility of the attached elements does not affect the design of the anchor flange.

The number and spacings of the anchor flanges that are required for the railing system must be determined based on the design values in [Tables 1](#) and [2](#), and [Figure 3](#). Design values in [Tables 1](#) and [2](#) are based on the capacity of an individual anchor flange in railing system (e.g., glass railings and balustrade systems) with a minimum base shoe width of 2.5 inches (63.5 mm). The maximum on-center spacings in [Table 2](#) and [Figure 3](#) were calculated for different transverse pressures and based on the design loads specified in Section 1607.9.1 of the 2021 IBC (Section 1607.8.1 of the 2018 IBC) and Table R301.5 in the IRC.

A minimum 2.5 x 2.5 inch (63.5 x 63.5 mm) square metal or rigid washer may be used between the base shoe of the railing system and the anchor flange.

Design values in this evaluation report were determined, without considering the weld between the port and the anchor flange's plate.

4.2 Installation:

The anchor flanges must be installed in accordance with Nill Building Solutions' published installation instructions, the applicable code, and this report. If there is a conflict, the most restrict governs. A copy of the Nill Building Solutions' published installation instructions must be available on the jobsite at all times during installation.

The NB1C anchor flanges must be installed to the supporting substrate with at least six fasteners with the X-axis of the anchor flange in the same direction of the railing system as shown in [Figure 2](#).

The bolt or threaded rod must be screwed all the way through the port's internal threads. The minimum threads engagement depth must be 1.5 times the diameter of the bolt or threaded rod. The bolt's head or threaded rod's nut, which is holding the base shoe against the anchor flange must be tightened to a specified torque of 60 lb.ft (81 N.m) to secure the assembly in place.

5.0 CONDITIONS OF USE:

The anchor flanges described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 Loads applied to the anchor flanges shall be determined by a registered design professional and comply with applicable loads from the IBC Chapter 16.
- 5.2 Complete plans and calculations demonstrating compliance with this report must be submitted to the code official for approval prior to field installation. All calculation and design details 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 The NB1C anchor flanges are not intended to support posts in railing systems.
- 5.4 The evaluation scope of this report and the provided capacities and design values in [Table 1](#) and [2](#) are limited to the anchor flanges only. Design of the supporting substrate, the supported member, and their connection with the anchor flange (including fasteners) is outside the scope of this evaluation report.
- 5.5 The anchor flange components must not be in direct contact with dissimilar metallic materials (e.g., carbon steel or aluminum) without a protective coating between the dissimilar metals.

5.6 The anchor flanges are manufactured in Bellport, New York under a quality control program with inspection by ICC-ES.

6.0 EVIDENCE SUBMITTED

- 6.1 Test report in accordance with ASTM E72: Standard Test Methods of Conducting Strength Tests for Panels for Building Construction.
- 6.2 Engineering analysis and calculations in accordance with Section 6.2 of ASCE 8.
- 6.3 Quality documentation in accordance with [ICC-ES Acceptance Criteria for Quality Documentation \(AC10\)](#), dated May 2022.

7.0 IDENTIFICATION

- 7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-4771) along with the name, registered trademark, or registered logo of the report holder [and/or listee] must be included in the product label. [Electronic labeling is the ICC-ES web address (www.icc-es.org); specific URL related to the report; or the ICC-ES machine-readable code placed on the aforementioned items.]
- 7.2 In addition, the anchor flanges are identified by the part number (NB1C).
- 7.3 The report holder’s contact information is the following:

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TABLE 1—ALLOWABLE (ASD) LATERAL LOAD CAPACITY OF ONE ANCHOR FLANGE¹

ANCHOR FLANGE MODEL	ALLOWABLE CAPACITIES ²				ROTATIONAL ANGLE AT ALLOWABLE CAPACITY (Deg.) ³
	Lateral Load in Y-axis Direction at 21-inch Height Above the Anchor Flange Surface (lbf)		Lateral Load in Y-axis Direction at 42-inch Height Above the Anchor Flange Surface		
	Lateral Load (lbf)	Moment at Base (lbf.in.)	Lateral Load (lbf)	Moment at Base (lbf.in.)	
NB1C	205	4285	105	4365	2.14°

For SI: 1 inch = 25.4 mm; 1 pound = 4.45 N.

¹The provided design values were conservatively determined without considering the contribution of the weld between the port and the anchor flange’s plate.

²See [Figures 1](#) and [2](#) for load direction.

³The provided rotational angle is the angle, which the anchor flange port rotates relative to its original location due to applying the allowable capacity load at 42 inches above the anchor flange surface.

TABLE 2—MAXIMUM ANCHOR FLANGE SPACING IN INCHES FOR RAILING SYSTEMS^{1,2,3}

ANCHOR FLANGE MODEL	HEIGHT OF RAILING SYSTEM (inches)	MAXIMUM ON CENTER SPACING BETWEEN ANCHOR FLANGES (inches) ⁴					
		S ₁ : BASED ON IBC & IRC ⁵	S ₂ : For Allowable (ASD) Transverse Pressure (from wind) of ⁶				
			25 psf	50 psf	58 psf	68 psf	75 psf
NB1C	36	21	32	16	14	12	10
	42	22	27	13	12	10	9

For S₁: 1 inch = 25.4 mm; 1 pound = 4.45 N.

¹The provided design values were conservatively determined without considering the contribution of the weld between the port and the anchor flange's plate.
²The minimum number of anchor flanges per panel is 2. The end distance (measured from the panel end to the center of the first anchor flange) is the least of 6 inches and 0.5S₂.

³For cases of discontinuous top rails or no connections between panels ends, the first 18 inches of the panel (measured from the panel's end) for railing systems of 36-inch height and the first 21 inches of the panel for railing systems of 42-inch height must be supported by at least 2 anchor flanges as shown in Figure 3.

⁴The least anchor flange spacing based on the IBC and IRC live loads and based on the allowable transverse pressure must be selected (least of S₁ and S₂).

⁵The provided maximum on-center spacings, S₁, are satisfactory to resist the loads specified in Section 1607.9.1 of the 2021 IBC (Section 1607.8.1 of the 2018 IBC) and IRC Table R301.5 as follows:

- A linear load of 50 plf (730 N/m) in any direction on the top of the railing system.
- A concentrated load of 200 lbs (890 N) in any direction at the top of the railing system.
- A horizontally applied normal load of 50 lbs (220 N) on an area of 1ft² (930 cm²) of railing system infill/panel.

⁶The provided allowable transverse pressure is the allowable wind pressure on the railing system (0.6W in Section 1605.2 of the 2021 IBC and Section 1605.3 of the 2018 IBC).

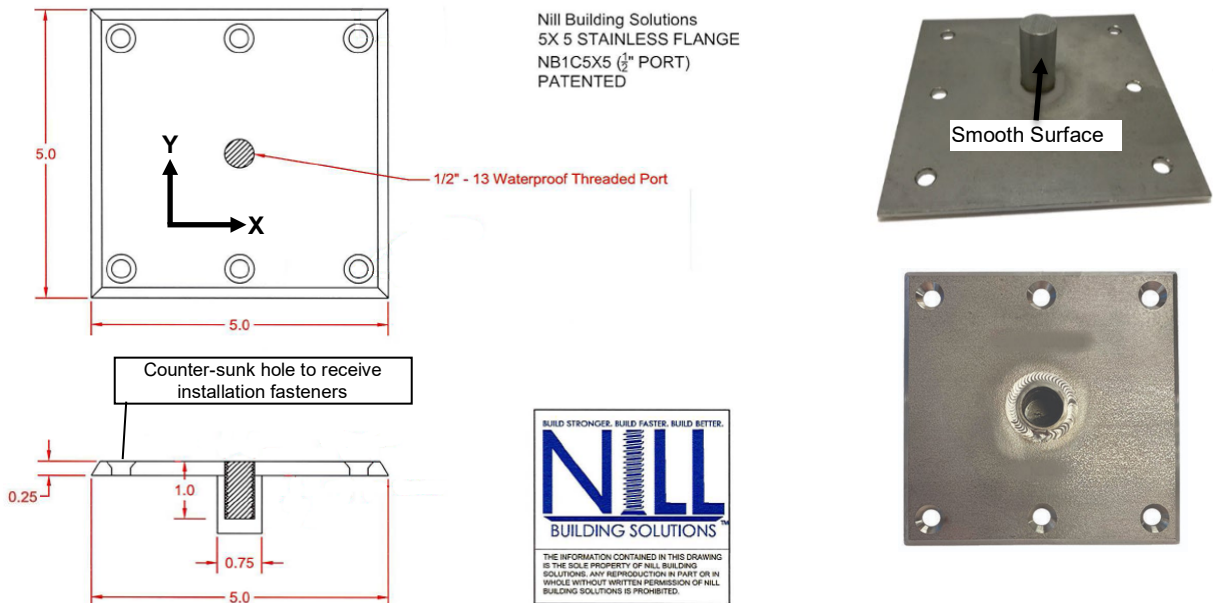


FIGURE 1—NB1C ANCHOR FLANGE

DIVISION: 05 00 00—METALS
Section: 05 05 23—Metal Connectors

DIVISION: 05 00 00—METALS
Section: 05 52 00—Metal Railings

REPORT HOLDER:

NILL BUILDING SOLUTIONS

EVALUATION SUBJECT:

NB1C ANCHOR FLANGE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the NB1C anchor flange, described in ICC-ES evaluation report [ESR-4771](#), has also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The NB1C anchor flange, described in Sections 2.0 through 7.0 of the evaluation report [ESR-4771](#), complies with the LABC Chapter 10 and 16, and the LARC Chapter 3, and is subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The NB1C anchor flange described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-4771](#).
- The design, installation, conditions of use and identification of the NB1C anchor flange are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-4771](#).
- The design and installation are in accordance with additional requirements of LABC Chapters 10 and 16, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, reissued May 2024.

DIVISION: 05 00 00—METALS**Section: 05 05 23—Metal Connectors****DIVISION: 05 00 00—METALS****Section: 05 52 00—Metal Railings****REPORT HOLDER:****NILL BUILDING SOLUTIONS****EVALUATION SUBJECT:****NB1C ANCHOR FLANGE****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that the NB1C anchor flange, described in ICC-ES evaluation report ESR-4771, has also been evaluated for compliance with the codes noted below.

Applicable code edition(s):

- 2022 *California Building Code* (CBC)

For evaluation of applicable Chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2022 *California Residential Code* (CRC)

2.0 CONCLUSIONS**2.1 CBC:**

The NB1C anchor flange, described in Sections 2.0 through 7.0 of the evaluation report ESR-4771, complies with CBC Chapters 10 and 16, provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 10 and 16, as applicable.

2.1.1 OSHPD: The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.2 DSA: The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CRC:

The NB1C anchor flange, described in Sections 2.0 through 7.0 of the evaluation report ESR-4771, complies with CRC Chapter 3, provided the design and installation are in accordance with the 2021 *International Residential Code*® (IRC) provisions noted in the evaluation report.

This supplement expires concurrently with the evaluation report, reissued May 2024.

DIVISION: 05 00 00—METALS
Section: 05 05 23—Metal Connectors

DIVISION: 05 00 00—METALS
Section: 05 52 00—Metal Railings

REPORT HOLDER:

NILL BUILDING SOLUTIONS

EVALUATION SUBJECT:

NB1C ANCHOR FLANGE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the NB1C anchor flange, recognized in ICC-ES evaluation report ESR-4771, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2020 *Florida Building Code—Building*
- 2020 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The NB1C anchor flange, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-4771, complies with the *Florida Building Code—Building* and *Florida Building Code—Residential*. The design requirements must be determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report ESR-4771 for the 2018 *International Building Code*® (IBC) meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable., with the following conditions:

Use of the NB1C anchor flanges has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* or the *Florida Building Code—Residential*. *This does not circumvent any requirements related to railing systems that use the anchor flanges.*

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, reissued May 2024.