

Evaluation Report

Vulcraft "1.5 B" & "1.5 PLB", Wide Rib Roof Deck Panels

Manufacturer:

Nucor Corporation – Vulcraft Division

1501 West Darlington Street
Florence, South Carolina 29501
(843) 662-0381

for

Florida Product Approval

FL 9942.1 R8

Florida Building Code FBC 8th Edition (2023)

Method: 2-B

Category: Structural Components

Sub - Category: Roof Deck

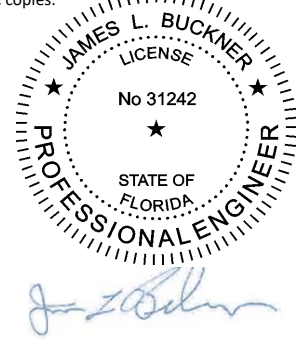
Product: "Vulcraft "1.5 B & 1.5 PLB"

Material: Steel

Prepared by:

James L. Buckner, P.E., S.E.C.B.
Florida Professional Engineer # 31242
Florida Evaluation ANE ID: 1916
Project Manager: Diana Galloway
Report No. 23-575-1.5B-ER
(Revises 20-235-1.5B-ER, FL9942.1 R6, R7)
Date: 08/16/2023

This item has been electronically signed and sealed by James L. Buckner, P.E., on this date using a Digital Signature. Printed copies of this document are not considered signed and sealed, and the signature must be verified on any electronic copies.



Contents:

Evaluation Report

Pages 1 – 10

Date: 2023.08.16
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Manufacturer: Nucor Corporation – Vulcraft Division
P.O. Box 100520
Florence, South Carolina 29501
(843) 662-0381
<http://nucor.com/>

Product Name: Vulcraft “1.5 B & 1.5 PLB”

Product Category: Structural Components

Product Sub-Category: Roof Deck

Compliance Method: State Product Approval Rule 61G20-3.005 (2) (b)

Product Description: Vulcraft Type B (Wide Rib) Single-fluted, Structural Steel Roof Decks:
1. 1.5 B-36
2. 1.5 PLB-36 PunchLok® II system Sidelap

Support: **Type:**
Steel Supports
(Design of steel support system is outside the scope of this evaluation.)

Performance: Wind Resistance:
• Design Uplift Pressure: - 45 PSF (Max.)
(Refer to Tables 2.0, 3.0, 3.1, 3.2 & 3.3 details herein)

Performance Standards:	The product described herein has demonstrated compliance with: FM 4471 (1992) – Approval Standard for Class I Roof Panels
Code Compliance:	The product(s) described herein have demonstrated compliance with the intent and principles of the standards adopted by the Florida Building Code 8th Edition (2023).
Evaluation Report Scope:	This product evaluation is limited to compliance with the structural requirements of the Florida Building Code, as related to the scope section to Florida Product Approval Rule 61G20-3.001.
Limitations and Conditions of Use:	• <u>Scope of “Limitations and Conditions of Use” for this evaluation:</u> This evaluation report for “Optional Statewide Approval” contains technical documentation, specifications and installation method(s) which include “Limitations and Conditions of Use” throughout the report in accordance with Rule 61G20-3.005. Per Rule 61G20-3.004, the Florida Building Commission is the authority to approve products under “Optional Statewide Approval”. • <u>Option for application outside “Limitations and Conditions of Use”</u> Rule 61G20-3.005(1)(e) allows engineering analysis for “project specific approval by the local authorities having jurisdiction in accordance with the alternate methods and materials authorized in the Code”. Any modification of the product as evaluated in this report and approved by the Florida Building Commission is outside the scope of this evaluation and will be the responsibility of others. • This report is a building code product evaluation per FLPE rule (FAC) 61G15-36 to comply with Florida product approval rule (FAC) 61G20-3. This evaluation report is part of the Florida Building Commission approval for the listed code related criteria. This report by James Buckner, P.E. and CBUCK Engineering is not a design certification of code compliance construction submittal documentation, per FBC section 107, for any individual structure, site specific or permit design. • All metal components and fasteners shall be corrosion resistant in accordance with applicable sections of FBC, including but limited to Sections 1504.3.2, 1506.6 and 1507.4.4. • Design of support system is outside the scope of this report. Support shall be designed by others and shall comply with the FBC Chapters 22 for steel and Chapter 16 for structural loading. • Fire Classification is outside the scope of Rule 61G20-3 and is therefore not included in this evaluation. • This evaluation report does not evaluate the use of this product for use in the High Velocity Hurricane Zone code section. (Dade & Broward Counties)
Quality Assurance:	The manufacturer has demonstrated compliance of roof panel products in accordance with the Florida Building Code and Rule 61G20-3.0005 (3) for manufacturing under a quality assurance program audited by an approved quality assurance entity FM Approvals, Norwood, MA (FBC Organization Number: QUA1860).

**Components/Materials
(by Manufacturer):**

Roof Deck Panel:

Material: Steel
Thicknesses: 18, 20 and 22 gauge
Panel Width: 36" Max. Coverage
Rib Height: 1-1/2"
Yield Strength: 40 ksi min.
Steel Grade: 33
Corrosion Resistance: ASTM A 653
Material Standard: In compliance with FBC Section 2203.2
Steel shall comply with American Iron and Steel Institute's "North American Specification for the Design of Cold-Formed Steel Structural Members", AISI S100-16.

Fastener/Attachment Options:

Roof Deck to Supports:

OPTION 1:

Type: Self-tapping sheet metal screws
Size : Site specific design by Design Professional
Corrosion Resistance: Per FBC Section 1506.6 and 1507.4.4
Standard: Factory Mutual approved

OPTION 2:

Type: Power-driven fastener
Size : Site specific design by Design Professional
Corrosion Resistance: Per FBC Section 1506.6 and 1507.4.4
Standard: Factory Mutual approved

OPTION 3:

Type: Quality welding procedure
Size : Site specific design by Design Professional
Corrosion Resistance: Per FBC Section 1506.6 and 1507.4.4
Standard: American National Standards Institute/American Welding Society Standard (ANSI/AWS), "Specification for Welding of Sheet Metal" or applicable standard in FBC Section 2214.3.

Panel to Panel, Side Lap Stitching:

Type: Button punch, FM approved fasteners or Nucor Vulcraft PunchLok® II system Sidelap
Spacing: 36" o.c. max.
Corrosion Resistance: Per FBC Section 1506.6 and 1507.4.4
Standard: Factory Mutual approved

Installation:

Installation Method:

(Refer to tables and drawings at the end of this report.)

Roof Deck to Supports:

Fastener Attachment to Steel Supports May Be Designed By A Qualified Design Professional As Required By The Florida Building Code For Site Specific Projects.

OPTION 1 or 2: FM Approved Fasteners

- Attachment Spacing: 12" o.c.
(at every support across the width of the panel)
- Support Spacing: Refer to Table 2.0

OPTION 3: FM Approved Puddle Weld

- Puddle Weld Diameter: Refer to Tables 3.0 – 3.3
- Puddle Weld Pattern: Refer to Tables 3.0 – 3.3
(at support across the width of the panel)
- Support Spacing: Refer to Tables 3.0 – 3.3

Panel to Panel, Side Lap Stitching:

- Side laps fastened along the panel laps at support intersections, midspans and supports with approved fasteners, Button Punch Tool or with Nucor Vulcraft Punchlock II Side Lap Crimping Tool
- Spacing: 36" o.c. max.

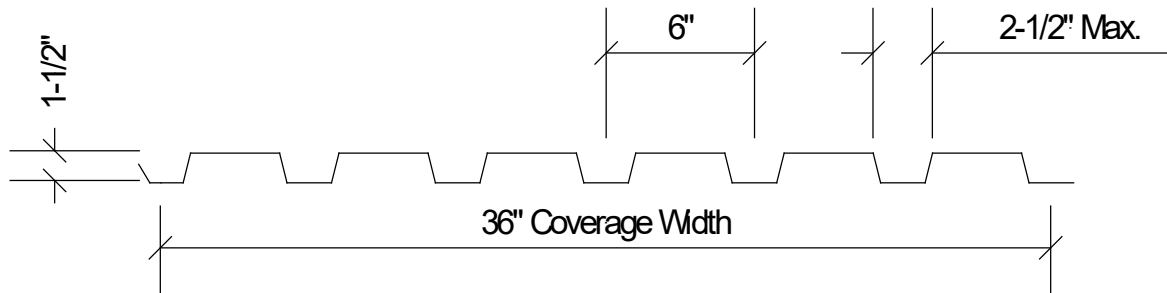
When fasteners are used, min. penetration thru bottom of supports, 3/4".

Install the Vulcraft "1.5 B & 1.5 PLB" roof deck in compliance with the installation method listed in this report and applicable code sections of FBC 8th Edition (2023). The installation method described herein is in accordance with the scope of this evaluation report. Refer to manufacturer's installation instructions as a supplemental guide for attachment.

Referenced Data:

1. FM Certification By FM Approvals (FBC Organization #CER ID: 1840)
FM Approval Links: <https://roofnav.fmglobal.com/>
Verified 8/19/2023
2. FM 4451 Steel Roof Deck Test including FM 4474 Wind Uplift
By Factory Mutual Research Corp. (FBC Organization #TST ID: 1867)
Report No. 0M4A1.AM, Report Date: 1/10/86
3. FM 4451 Steel Roof Deck Test (PL)
By Factory Mutual Research Corp. (FBC Organization #TST ID: 1867)
Report No. 3057375, Report Date: 4/06/16
4. Quality Assurance
By FM Approvals, (FBC Organization #QUA ID:1860)
5. Certification of Independence
By James L. Buckner, P.E. @ CBUCK Engineering
(FBC Organization # ANE 1916)

Engineering Properties Nucor Corp. – Vulcraft Group Vulcraft “1.5 B & 1.5 PLB” Steel Roof Deck Panel



Typical Panel Profile

		VULCRAFT "1.5 B" SECTION PROPERTIES ^{1,2,3,4}								
DECK THICKNESS	DESIGN THICKNESS	PANEL WEIGHT (PSF)		F _y	F _b	I _{gr}	I _{on}	S _{en}	I _{oi}	S _{ei}
(GA.)	(IN.)	GALV.	PAINTED	(KSI)	(KSI)	(IN ⁴ /FT)	(IN ⁴ /FT WIDTH)	(IN ³ /FT WIDTH)	(IN ⁴ /FT WIDTH)	(IN ³ /FT WIDTH)
18	0.0474	2.82	2.72	33	19.8	0.287	0.289	0.318	0.295	0.327
20	0.0358	2.04	2.14	33	19.8	0.216	0.201	0.234	0.222	0.247
22	0.0295	1.68	1.78	33	19.8	0.178	0.155	0.186	0.183	0.192

Table 1.0

Notes:

¹Section properties based on AISI S100-07/SI-10 & S2-10 American Iron and Steel Institute (AISI) North American Specification for the Design of Cold-Formed Steel Structural Members

²Effective Section Modulus values are net ("effective") values.

³I_{gr} = gross moment of inertia

I_{on} = effective moment of inertia, normal position

S_{en} = effective section modulus, normal position

I_{oi} = effective moment of inertia, inverted position

S_{ei} = effective section modulus, inverted position

⁴The following equations are permitted to determine deflections:

I_D = moment of inertia used in deflection calculations

For simple spans under uniform load:

I_D = (I_{gr} + 2I_{on})/3, or I_{on}

For multiple spans under uniform load:

I_D = (I_{gr} + 2I_{oi})/3, (I_{gr} + 2I_{on})/2, or the minimum of I_{on} and I_{oi}

Installation Method
Nucor Corporation – Vulcraft Group
Vulcraft “1.5 B & 1.5 PLB” Steel Roof Deck Panel

ALLOWABLE LOAD (PSF) FOR NOMINAL SUPPORT SPACING ^{1,2,3}				
ATTACHED WITH FM APPROVED FASTENERS				
GAUGE	SPAN CONDITION	SUPPORT SPACING (IN.)	LOAD CONDITION	PSF
18	SINGLE	93	NEGATIVE	45
	2 OR MORE	109	NEGATIVE	45
20	SINGLE	80	NEGATIVE	45
	2 OR MORE	95	NEGATIVE	45
22	SINGLE	73	NEGATIVE	45
	2 OR MORE	86	NEGATIVE	45

Table 2.0

ALLOWABLE LOAD (PSF) FOR NOMINAL SUPPORT SPACING ^{1,2,3,4}				
ATTACHED WITH PUDDLE WELDS				
WELD DIAMETER (IN.)		0.625	WELD PATTERN	36/4 , 36/5
GAUGE	SPAN CONDITION	SUPPORT SPACING (IN.)	LOAD CONDITION	PSF
18	SINGLE	93	NEGATIVE	45
	DOUBLE	82	NEGATIVE	45
	3 OR MORE	102	NEGATIVE	45
20	SINGLE	80	NEGATIVE	45
	DOUBLE	63	NEGATIVE	45
	3 OR MORE	79	NEGATIVE	45
22	SINGLE	73	NEGATIVE	45
	DOUBLE	52	NEGATIVE	45
	3 OR MORE	65	NEGATIVE	45

Table 3.0

Installation Method
Nucor Corporation – Vulcraft Group
Vulcraft “1.5 B & 1.5 PLB” Steel Roof Deck Panel

ALLOWABLE LOAD (PSF) FOR NOMINAL SUPPORT SPACING ^{1,2,3,4}				
ATTACHED WITH PUDDLE WELDS				
WELD DIAMETER (IN.)		0.75	WELD PATTERN	36/4 , 36/5
GAUGE	SPAN CONDITION	SUPPORT SPACING (IN.)	LOAD CONDITION	PSF
18	SINGLE	93	NEGATIVE	45
	DOUBLE	99	NEGATIVE	45
	3 OR MORE	109	NEGATIVE	45
20	SINGLE	80	NEGATIVE	45
	DOUBLE	76	NEGATIVE	45
	3 OR MORE	95	NEGATIVE	45
22	SINGLE	73	NEGATIVE	45
	DOUBLE	63	NEGATIVE	45
	3 OR MORE	79	NEGATIVE	45

Table 3.1

ALLOWABLE LOAD (PSF) FOR NOMINAL SUPPORT SPACING ^{1,2,3,4}				
ATTACHED WITH PUDDLE WELDS				
WELD DIAMETER (IN.)		0.875	WELD PATTERN	36/4 , 36/5
GAUGE	SPAN CONDITION	SUPPORT SPACING (IN.)	LOAD CONDITION	PSF
18	SINGLE	93	NEGATIVE	45
	DOUBLE	109	NEGATIVE	45
	3 OR MORE	109	NEGATIVE	45
20	SINGLE	80	NEGATIVE	45
	DOUBLE	90	NEGATIVE	45
	3 OR MORE	95	NEGATIVE	45
22	SINGLE	73	NEGATIVE	45
	DOUBLE	74	NEGATIVE	45
	3 OR MORE	86	NEGATIVE	45

Table 3.2

Installation Method
Nucor Corporation – Vulcraft Group
Vulcraft “1.5 B & 1.5 PLB” Steel Roof Deck Panel

ALLOWABLE LOAD (PSF) FOR NOMINAL SUPPORT SPACING ^{1,2,3,4}				
ATTACHED WITH PUDDLE WELDS				
WELD DIAMETER (IN.)	0.625, 0.75 or 0.875	WELD PATTERN		36/7 , 36/9
GAUGE	SPAN CONDITION	SUPPORT SPACING (IN.)	LOAD CONDITION	PSF
18	SINGLE	93	NEGATIVE	45
	DOUBLE	109	NEGATIVE	45
	3 OR MORE	109	NEGATIVE	45
20	SINGLE	80	NEGATIVE	45
	DOUBLE	95	NEGATIVE	45
	3 OR MORE	95	NEGATIVE	45
22	SINGLE	73	NEGATIVE	45
	DOUBLE	86	NEGATIVE	45
	3 OR MORE	86	NEGATIVE	45

Table 3.3

Notes for Tables 2.0 – 3.3:

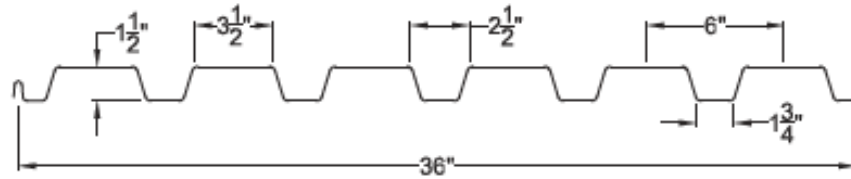
¹Allowable negative load based on FM Class 1-90

²Values do not include a 1/3 stress increase

³Diaphragm and axial load capacity is outside the scope of this evaluation.

⁴Weld Electrode, E70XX 60 ksi

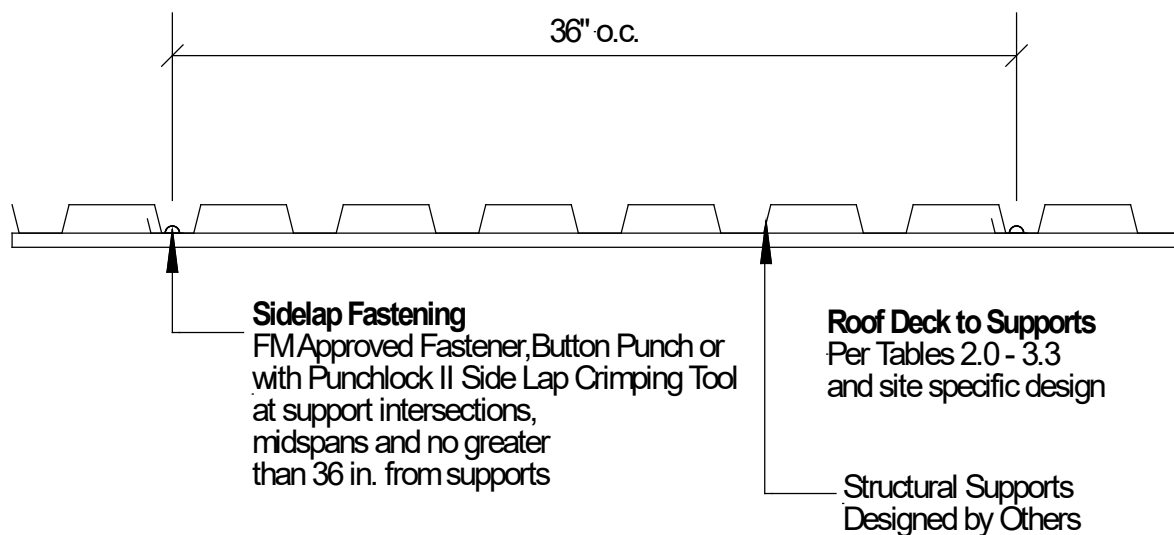
Installation Method Nucor Corporation – Vulcraft Group Vulcraft “1.5 B & 1.5 PLB” Steel Roof Deck Panel



Typical Panel Profile



Sidelap Detail



Typical Assembly Profile View