ICC-ES Evaluation Report

ESR-1169

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This report also contains:
- City of LA Supplement
- City of Chicago Supplement
- CA Supplement w/ DSA and OSHPD
- FL Supplement

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DIVISION: 05 00 00—METALS Section: 05 31 00—Steel Decking	REPORT HOLDER: NEW MILLENNIUM BUILDING SYSTEMS, LLC	EVALUATION SUBJECT: NEW MILLENNIUM STEEL ROOF, COMPOSITE FLOOR, AND FORM DECK PANELS	

1.0 EVALUATION SCOPE

Compliance with the following code:

■ 2024, 2021, 2018, 2015, and 2012 *International Building Code*® (IBC)

Property evaluated:

■ Structural

2.0 USES

The New Millennium steel deck panels are used as roof, composite floor, and form decks panels to support construction, gravity, and lateral loads.

3.0 DESCRIPTION

The roof, composite floor, and form deck panels evaluated in this report are described in Table 1 and its footnotes. Dimensions and profiles are shown in Figures 1 and 2 and Table 2. Panels with perforation patterns are shown in Table 4 (for acoustical deck panels only). The panels are cold-formed from steel sheets complying with either of the following:

- ASTM A653 SS Grade 40, Grade 50 (Class 1, 3, & 4), or Grade 80 steel with galvanized or galvannealed coating. Optional primer or finish paint coatings applied over the galvanized or galvannealed coating are available for the top surface, bottom surface, or both surfaces.
- ASTM A1008 SS Grade 40, Grade 50, or Grade 80 steel with primer painted top and bottom surfaces. Optional finish paint coatings are available for the top surface, bottom surface, or both surfaces.

Refer to Table 3 for the structural steel grade of different deck panels and thicknesses. In cellular and cellular acoustical deck panels, liners are attached to hat sections with standard resistance (spot) welds or Atlas Copco self-piercing rivets (Rivets A50E44N and G50G44C). Rivet A50E44N is used for the following deck gauges: 20/20, 20/18, 18/20, and 18/18. Rivet G50G44C is used for the following deck gauges: 18/16, 16/18, and 16/16.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 Vertical Load Design: The deck panels must be designed in accordance with SDI SD using the panel properties in this report. For cellular and cellular acoustical deck panels, liner-to-hat connection shear strength per Section 4.1.4 shall be considered in deck design. For composite deck slabs (with hardened concrete)

design, only the hat section should be considered as the slab positive reinforcement.

4.1.2 Web Crippling Strength: The web crippling strength of deck panels to resist support reactions and concentrated loads must be determined in accordance with AISI S100 and deck panel properties provided in this report. Web crippling strength of the deck panels with perforated webs (BDA, NDA, NW32A and NW32IA) must be determined as described in Appendix A of this report.

4.1.3 Shear Strength: The shear strength of deck panels must be determined in accordance with AISI S100 and deck panel properties provided in this report. Shear strength of the deck panels with perforated webs (BDA, NDA and NW32A and NW32IA) must be determined as described in Appendix A of this report.

4.1.4 Liner-to-Hat Connection Shear Strength: The shear strength of resistance (spot) welded connections shall be determined in accordance with AISI S100 and deck panel properties provided in this report. The nominal shear strength of self-piercing riveted connections (P_{nv}), in kips, must be calculated as follows:

$$P_{nv} = \quad 0.0536\, t_2\, (1 + 21.6\, t_1)\, (189.8 + F_{u2}) \quad \ldots\ldots\ldots\ldots\ldots \quad Eq.1$$

where, t_1 and t_2 are thicknesses of members in contact with the rivet head (liner) and not in contact with the rivet head (hat), respectively, in inches, and F_{u2} is the tensile strength of the member not in contact with the rivet head (hat) in ksi.

The ASD safety factor, Ω, and LRFD resistance factor, Φ, for the riveted connections shall be taken as 2.62 and 0.61, respectively.

4.1.5 Lateral Load (Diaphragm) Design: The diaphragm shear strength and stiffness of deck panels must be determined in accordance with AISI S310 using the deck properties provided in this report.

4.2 Installation:

The deck panels must be installed in accordance with this report and also with New Millennium's published installation guidelines and instructions. If there is a conflict between New Millennium's published installation guidelines and instructions and this report, this report governs.

5.0 CONDITIONS OF USE:

The New Millennium's steel deck panels described in this report comply with, or are suitable alternatives to what is specified in, the code indicated in Section 1.0 of this report, subject to the following conditions:

5.1 The design base-metal thicknesses for all steel deck panels are indicated in Table 3. The thickness delivered to the jobsite must be at least 95 percent of the thickness noted in the tables.

5.2 The minimum loads of IBC Chapter 16 in addition to the construction loads required by references in IBC Section 2210.1.1 must be considered by the design professional based on the specific occupancy or use, as applicable.

5.3 Special inspections must be provided in accordance with Chapter 17 of the IBC.

5.4 Use of New Millennium's steel roof deck panels has not been evaluated for use without a roof covering.

5.5 Calculations and details demonstrating that the loads applied to the steel deck panels comply with this report must be submitted to the code official for approval. Calculations and drawings must be prepared, signed, and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.6 The steel deck panels are fabricated in Memphis, Tennessee; under an approved quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Steel Deck Roof and Floor Systems (AC43), dated August 2022 (editorially revised November 2023).

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-1169) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

7.2 In addition, each bundle of the New Millennium steel deck panels described in this report is identified by a label bearing the manufacturer's name (New Millennium Building Systems, LLC), the deck panel profile name, the design thickness, the minimum specified yield strength, the manufacturing location (MD—Memphis, Tennessee), and the cover width of the panel.

7.3 The report holder's contact information is the following:

NEW MILLENNIUM BUILDING SYSTEMS, LLC
7575 WEST JEFFERSON BOULEVARD
FORT WAYNE, INDIANA 46804
(260) 969-3500
www.newmill.com

SYMBOLS AND DEFINITIONS

Symbol	Definition
CW	Deck panel cover width.
c_p	Perforation center-to-center spacing.
D_d	Depth of deck panel.
d	Panel corrugation pitch.
d_p	Diameter of perforation.
e	One-half the bottom flange width of deck panel measured between points of intercepts.
e_w	Distance from cellular deck longitudinal fastener to web.
f	Top flange width of panel measured between points of intercepts.
h	Flat dimension of web measured in plane of web.
I_{DM}	Effective moment of inertia for multi-span deck for deflection calculations under uniform load.
I_{DS}	Effective moment of inertia for single-span deck for deflection calculations under uniform load.
I_{gx}	Moment of inertia of full unreduced section (considering perforations for acoustical deck).
I_{oi}	Effective moment of inertia in inverted (negative) bending.
I_{on}	Effective moment of inertia in normal (positive) bending.
R	Inside bend radius.
S_{ei}	Effective section modulus in inverted (negative) bending.
S_{en}	Effective section modulus in normal (positive) bending.
t	Minimum uncoated base metal thickness of deck panel (design thickness).
W_p	Width of perforation band in deck web.
w	Web width of deck panel measured between points of intercept in plane of web.
w_d	Distance measured across the width and between longitudinal rows of fasteners connecting the deck hat sections to the liner panel.
w_{dp}	Width of perforation bands within the liner panel width w_d.
θ	Web angle.

TABLE 1—DECK PANELS

APPLICATION	DECK PANELS			TYPE[3]		
	Series	Model[1,2]		Interlocking	Acoustical	Cellular
Roof Decks	B Deck Panels	B-Dek	BD	-	-	-
		B-Dek Acoustical	BDA	-	✓	-
		B-Dek Cellular	BDC	-	-	✓
		B-Dek Cellular Acoustical	BDCA	-	✓	✓
	N Deck Panels	N-Dek	ND	-	-	-
		N-Dek Acoustical	NDA	-	✓	-
		N-Dek Cellular	NDC	-	-	✓
		N-Dek Cellular Acoustical	NDCA	-	✓	✓
	NW32 Deck Panels	NW32	NW32	-	-	-
		NW32 Interlocking	NW32I	✓	-	-
		NW32 Acoustical	NW32A	-	✓	-
		NW32 Interlocking Acoustical	NW32IA	✓	✓	-
		NW32 Cellular	NW32C	-	-	✓
		NW32 Cellular Acoustical	NW32CA	-	✓	✓
Composite Floor Decks[4]	Composite Floor-Dek (CFD) Panels	1.5CFD		-	-	-
		2.0CFD, 3.0CFD & 3.0CFDES (Interlocking Panels)		✓	-	-
		1.5CFDC, 2.0CFDC, 3.0CFDC & 3.0CFDESC (Cellular Panels)		-	-	✓
		1.5CFDCA, 2.0CFDCA, 3.0CFDCA & 3.0CFDESCA (Cellular Acoustical Panels)		-	✓	✓
Form Decks	Form Deck Panels	1.5SD & 1.5SDR		-	-	-
		2.0SD, 3.0SD, and 3.0SDES (Interlocking Panels)		✓	-	-

[1] For geometry and dimensions of different deck panels, refer to Table 2 and Figure 1 of this report.

[2] For structural steel grades of different deck panels, refer to Table 3 of this report.

[3] Panels Types:

- Interlocking panel have one looped end to allow interlocking with other panel's end as shown here: 
- Acoustical panels are hat-section-panels with perforated webs as specified in Table 4.
- Cellular panels are hat-section-panels with a liner section attached to its bottom by resistance (spot) welds or self-piercing rivets.
- Cellular acoustical panels does not have perforated webs but their liner sections are perforated.

[4] Webs of all composite floor deck panels have web embossments as shown in Figure 2.

TABLE 2—DECK PANEL GEOMETRY

DECK PANEL	CW (in.)	HAT GAGE	D_d (in.)	d (in.)	R (in.)	e (in.)	f (in.)	w (in.)	w_d (in.)	e_w (in.)
1.5SDR, BD, BDA and 1.5CFD	36	22	1.47	6.0	0.260	0.771	3.479	1.550	-	-
		20				0.768	3.474	1.551	-	-
		18				0.764	3.466	1.554	-	-
		16				0.760	3.457	1.556	-	-
1.5SD	36	22	1.47	6.0	0.260	1.739	1.541	1.550	-	-
		20				1.737	1.537	1.551	-	-
		18				1.733	1.529	1.554	-	-
		16				1.729	1.520	1.556	-	-
BDC, BDCA, 1.5CFDC and 1.5CFDCA	25.5 or 37.5	20	1.47	6.0	0.260	0.768	3.474	1.551	6.0	0.768
		18				0.764	3.466	1.554	6.0	0.764
		16				0.760	3.457	1.556	6.0	0.760
ND and NDA	24	22	2.93	8.0	0.188	0.910	5.323	2.961	-	-
		20				0.907	5.317	2.962	-	-
		18				0.902	5.307	2.963	-	-
		16				0.897	5.297	2.965	-	-
NDC and NDCA	25.5	20	2.93	8.0	0.188	0.907	5.317	2.962	8.0	0.922
		18				0.902	5.307	2.963	8.0	0.917
		16				0.897	5.297	2.965	8.0	0.911
NW32, NW32A, NW32I and NW32IA	32	22	3.00	8.0	0.188	1.052	3.605	3.211	-	-
		20				1.050	3.600	3.213	-	-
		18				1.046	3.592	3.216	-	-
		16				1.042	3.584	3.219	-	-
NW32C and NW32CA	32.5	20	3.00	8.0	0.188	1.050	3.600	3.213	8.0	1.050
		18				1.046	3.592	3.216	8.0	1.046
		16				1.042	3.584	3.219	8.0	1.042
2.0CFD and 2.0SD	36	22	2.00	12.0	0.188	2.546	5.093	2.196	-	-
		20				2.544	5.089	2.198	-	-
		18				2.541	5.082	2.201	-	-
		16				2.537	5.074	2.204	-	-
2.0CFDC and 2.0CFDCA	24 or 36	20	2.00	12.0	0.188	2.544	5.089	2.198	9.113	1.925
		18				2.541	5.082	2.201	9.116	1.922
		16				2.537	5.074	2.204	9.120	1.918
3.0CFD and 3.0SD	36	22	3.00	12.0	0.188	2.512	5.024	3.155	-	-
		20				2.510	5.019	3.156	-	-
		18				2.505	5.011	3.159	-	-
		16				2.501	5.002	3.162	-	-
3.0CFDC and 3.0CFDCA	24 or 36	20	3.00	12.0	0.188	2.510	5.019	3.156	9.156	1.924
		18				2.505	5.011	3.159	9.160	1.920
		16				2.501	5.002	3.162	9.164	1.915
3.0CFDES and 3.0SDES	36	22	3.00	12.0	0.188	2.280	4.482	3.345	-	-
		20				2.278	4.478	3.346	-	-
		18				2.275	4.471	3.350	-	-
		16				2.271	4.463	3.353	-	-
3.0CFDESC and 3.0CFDESCA	24 or 36	20	3.00	12.0	0.188	2.278	4.478	3.346	9.252	1.676
		18				2.275	4.471	3.350	9.255	1.672
		16				2.271	4.463	3.353	9.259	1.669

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

TABLE 3—SECTION PROPERTIES [1,4]

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
1.5SDR, BD, and 1.5CFD	36	40	22	0.0295	0.176	0.160	0.173	0.165	0.174	0.177	0.181	1.153	71.56
			20	0.0358	0.213	0.203	0.210	0.206	0.211	0.218	0.225	1.151	71.41
			18	0.0474	0.281	0.280	0.280	0.280	0.281	0.294	0.298	1.148	71.12
			16	0.0598	0.353	0.353	0.353	0.353	0.353	0.376	0.376	1.144	70.82
		50	22	0.0295	0.176	0.155	0.172	0.162	0.173	0.173	0.175	1.153	71.56
			20	0.0358	0.213	0.198	0.210	0.203	0.211	0.215	0.223	1.151	71.41
			18	0.0474	0.281	0.277	0.279	0.278	0.280	0.291	0.296	1.148	71.12
			16	0.0598	0.353	0.353	0.353	0.353	0.353	0.372	0.373	1.144	70.82
1.5SDR and BD	36	80	22	0.0295	0.176	0.151	0.171	0.159	0.173	0.166	0.171	1.153	71.56
			20	0.0358	0.213	0.193	0.209	0.200	0.210	0.213	0.218	1.151	71.41
			18	0.0474	0.281	0.273	0.278	0.275	0.279	0.288	0.295	1.148	71.12
			16	0.0598	0.353	0.352	0.352	0.353	0.353	0.369	0.371	1.144	70.82
1.5SD	36	40	22	0.0295	0.176	0.173	0.160	0.174	0.174	0.181	0.177	1.153	71.56
			20	0.0358	0.213	0.210	0.203	0.211	0.211	0.225	0.218	1.151	71.41
			18	0.0474	0.281	0.280	0.280	0.281	0.281	0.298	0.294	1.148	71.12
			16	0.0598	0.353	0.353	0.353	0.353	0.353	0.376	0.376	1.144	70.82
		50	22	0.0295	0.176	0.172	0.155	0.173	0.173	0.175	0.173	1.153	71.56
			20	0.0358	0.213	0.210	0.198	0.211	0.211	0.223	0.215	1.151	71.41
			18	0.0474	0.281	0.279	0.277	0.280	0.280	0.296	0.291	1.148	71.12
			16	0.0598	0.353	0.353	0.353	0.353	0.353	0.373	0.372	1.144	70.82
		80	22	0.0295	0.176	0.171	0.151	0.173	0.173	0.171	0.166	1.153	71.56
			20	0.0358	0.213	0.209	0.193	0.210	0.210	0.218	0.213	1.151	71.41
			18	0.0474	0.281	0.278	0.273	0.279	0.279	0.295	0.288	1.148	71.12
			16	0.0598	0.353	0.352	0.352	0.352	0.353	0.371	0.369	1.144	70.82
BDA	36	40	22	0.0295	0.172	0.158	0.169	0.163	0.170	0.173	0.174	1.153	71.56
			20	0.0358	0.209	0.200	0.206	0.203	0.207	0.213	0.217	1.151	71.41
			18	0.0474	0.276	0.275	0.275	0.275	0.275	0.287	0.288	1.148	71.12
			16	0.0598	0.346	0.346	0.346	0.346	0.346	0.364	0.363	1.144	70.82
		50	22	0.0295	0.172	0.153	0.169	0.159	0.170	0.169	0.168	1.153	71.56
			20	0.0358	0.209	0.195	0.205	0.200	0.207	0.211	0.215	1.151	71.41
			18	0.0474	0.276	0.272	0.273	0.273	0.274	0.284	0.286	1.148	71.12
			16	0.0598	0.346	0.346	0.346	0.346	0.346	0.361	0.360	1.144	70.82
		80	22	0.0295	0.172	0.149	0.168	0.156	0.169	0.162	0.164	1.153	71.56
			20	0.0358	0.209	0.191	0.205	0.197	0.206	0.209	0.210	1.151	71.41
			18	0.0474	0.276	0.269	0.272	0.271	0.273	0.281	0.285	1.148	71.12
			16	0.0598	0.346	0.346	0.345	0.346	0.346	0.359	0.358	1.144	70.82
BDC and 1.5CFDC	25.5	40	20/20	0.0358 / 0.0358	0.413	0.368	0.325	0.383	0.383	0.281	0.383	1.151	71.41
			20/18	0.0358 / 0.0474	0.452	0.400	0.392	0.417	0.417	0.289	0.405	1.151	71.41
			18/20	0.0474 / 0.0358	0.505	0.485	0.394	0.492	0.492	0.413	0.456	1.148	71.12
			18/18	0.0474 / 0.0474	0.553	0.530	0.468	0.538	0.538	0.425	0.518	1.148	71.12
			18/16	0.0474 / 0.0598	0.597	0.571	0.548	0.580	0.580	0.435	0.541	1.148	71.12
			16/18	0.0598 / 0.0474	0.653	0.650	0.544	0.651	0.651	0.584	0.635	1.144	70.82
			16/16	0.0598 / 0.0598	0.706	0.703	0.634	0.704	0.704	0.598	0.662	1.144	70.82
		50	20/20	0.0358 / 0.0358	0.413	0.354	0.315	0.374	0.374	0.267	0.360	1.151	71.41
			20/18	0.0358 / 0.0474	0.452	0.384	0.379	0.407	0.407	0.275	0.401	1.151	71.41
			18/20	0.0474 / 0.0358	0.505	0.473	0.384	0.484	0.484	0.392	0.429	1.148	71.12
			18/18	0.0474 / 0.0474	0.553	0.517	0.454	0.529	0.529	0.403	0.514	1.148	71.12
			18/16	0.0474 / 0.0598	0.597	0.556	0.532	0.570	0.570	0.413	0.535	1.148	71.12
			16/18	0.0598 / 0.0474	0.653	0.642	0.529	0.646	0.646	0.555	0.630	1.144	70.82
			16/16	0.0598 / 0.0598	0.706	0.693	0.616	0.698	0.698	0.568	0.656	1.144	70.82
BDC	25.5	80	20/20	0.0358 / 0.0358	0.413	0.342	0.307	0.366	0.366	0.256	0.344	1.151	71.41
			20/18	0.0358 / 0.0474	0.452	0.371	0.369	0.398	0.398	0.265	0.399	1.151	71.41
			18/20	0.0474 / 0.0358	0.505	0.462	0.372	0.477	0.477	0.376	0.415	1.148	71.12
			18/18	0.0474 / 0.0474	0.553	0.505	0.443	0.521	0.521	0.387	0.510	1.148	71.12
			18/16	0.0474 / 0.0598	0.597	0.543	0.519	0.561	0.561	0.397	0.531	1.148	71.12
			16/18	0.0598 / 0.0474	0.653	0.632	0.518	0.639	0.639	0.532	0.609	1.144	70.82
			16/16	0.0598 / 0.0598	0.706	0.682	0.600	0.690	0.690	0.545	0.651	1.144	70.82

(Continued 1/8)

TABLE 3—SECTION PROPERTIES [1,4] *(… Continued 2/8)*

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
BDC and 1.5CFDC	37.5	40	20/20	0.0358 / 0.0358	0.418	0.371	0.323	0.387	0.387	0.284	0.383	1.151	71.41
			20/18	0.0358 / 0.0474	0.456	0.404	0.392	0.421	0.421	0.291	0.409	1.151	71.41
			18/20	0.0474 / 0.0358	0.510	0.490	0.393	0.497	0.497	0.419	0.451	1.148	71.12
			18/18	0.0474 / 0.0474	0.559	0.536	0.467	0.544	0.544	0.430	0.524	1.148	71.12
			18/16	0.0474 / 0.0598	0.603	0.577	0.550	0.586	0.586	0.439	0.547	1.148	71.12
			16/18	0.0598 / 0.0474	0.660	0.657	0.544	0.658	0.658	0.592	0.643	1.144	70.82
			16/16	0.0598 / 0.0598	0.713	0.710	0.636	0.711	0.711	0.606	0.670	1.144	70.82
		50	20/20	0.0358 / 0.0358	0.418	0.357	0.313	0.377	0.377	0.269	0.360	1.151	71.41
			20/18	0.0358 / 0.0474	0.456	0.388	0.378	0.411	0.411	0.277	0.406	1.151	71.41
			18/20	0.0474 / 0.0358	0.510	0.478	0.384	0.489	0.489	0.398	0.427	1.148	71.12
			18/18	0.0474 / 0.0474	0.559	0.522	0.453	0.534	0.534	0.408	0.520	1.148	71.12
			18/16	0.0474 / 0.0598	0.603	0.562	0.533	0.575	0.575	0.417	0.542	1.148	71.12
			16/18	0.0598 / 0.0474	0.660	0.649	0.528	0.653	0.653	0.563	0.619	1.144	70.82
			16/16	0.0598 / 0.0598	0.713	0.701	0.616	0.705	0.705	0.576	0.665	1.144	70.82
BDC	37.5	80	20/20	0.0358 / 0.0358	0.418	0.345	0.301	0.369	0.369	0.259	0.344	1.151	71.41
			20/18	0.0358 / 0.0474	0.456	0.374	0.368	0.401	0.401	0.266	0.403	1.151	71.41
			18/20	0.0474 / 0.0358	0.510	0.467	0.373	0.482	0.482	0.381	0.414	1.148	71.12
			18/18	0.0474 / 0.0474	0.559	0.510	0.441	0.526	0.526	0.391	0.516	1.148	71.12
			18/16	0.0474 / 0.0598	0.603	0.548	0.519	0.566	0.566	0.400	0.538	1.148	71.12
			16/18	0.0598 / 0.0474	0.660	0.639	0.515	0.646	0.646	0.540	0.598	1.144	70.82
			16/16	0.0598 / 0.0598	0.713	0.689	0.600	0.697	0.697	0.552	0.660	1.144	70.82
BDCA and 1.5CFDCA	25.5	40	20/20	0.0358 / 0.0358	0.389	0.347	0.324	0.361	0.361	0.277	0.383	1.151	71.41
			20/18	0.0358 / 0.0474	0.426	0.379	0.378	0.394	0.394	0.285	0.404	1.151	71.41
			18/20	0.0474 / 0.0358	0.474	0.456	0.394	0.462	0.462	0.407	0.456	1.148	71.12
			18/18	0.0474 / 0.0474	0.520	0.499	0.456	0.506	0.506	0.418	0.518	1.148	71.12
			18/16	0.0474 / 0.0598	0.561	0.538	0.519	0.546	0.546	0.429	0.536	1.148	71.12
			16/18	0.0598 / 0.0474	0.613	0.610	0.533	0.611	0.611	0.575	0.635	1.144	70.82
			16/16	0.0598 / 0.0598	0.663	0.660	0.605	0.661	0.661	0.589	0.657	1.144	70.82
		50	20/20	0.0358 / 0.0358	0.389	0.334	0.315	0.352	0.352	0.263	0.360	1.151	71.41
			20/18	0.0358 / 0.0474	0.426	0.364	0.370	0.385	0.389	0.272	0.401	1.151	71.41
			18/20	0.0474 / 0.0358	0.474	0.445	0.384	0.455	0.455	0.386	0.429	1.148	71.12
			18/18	0.0474 / 0.0474	0.520	0.487	0.447	0.498	0.498	0.397	0.514	1.148	71.12
			18/16	0.0474 / 0.0598	0.561	0.525	0.509	0.537	0.537	0.408	0.532	1.148	71.12
			16/18	0.0598 / 0.0474	0.613	0.603	0.524	0.606	0.606	0.547	0.630	1.144	70.82
			16/16	0.0598 / 0.0598	0.663	0.651	0.592	0.655	0.655	0.560	0.653	1.144	70.82
BDCA	25.5	80	20/20	0.0358 / 0.0358	0.389	0.323	0.307	0.345	0.345	0.253	0.344	1.151	71.41
			20/18	0.0358 / 0.0474	0.426	0.352	0.363	0.376	0.384	0.261	0.399	1.151	71.41
			18/20	0.0474 / 0.0358	0.474	0.436	0.372	0.448	0.448	0.370	0.415	1.148	71.12
			18/18	0.0474 / 0.0474	0.520	0.476	0.439	0.490	0.490	0.381	0.510	1.148	71.12
			18/16	0.0474 / 0.0598	0.561	0.512	0.500	0.529	0.529	0.391	0.530	1.148	71.12
			16/18	0.0598 / 0.0474	0.613	0.594	0.516	0.600	0.600	0.524	0.609	1.144	70.82
			16/16	0.0598 / 0.0598	0.663	0.641	0.583	0.648	0.648	0.537	0.650	1.144	70.82
BDCA and 1.5CFDCA	37.5	40	20/20	0.0358 / 0.0358	0.392	0.350	0.323	0.364	0.364	0.280	0.383	1.151	71.41
			20/18	0.0358 / 0.0474	0.429	0.381	0.378	0.397	0.397	0.287	0.409	1.151	71.41
			18/20	0.0474 / 0.0358	0.478	0.460	0.393	0.466	0.466	0.413	0.451	1.148	71.12
			18/18	0.0474 / 0.0474	0.524	0.503	0.455	0.510	0.510	0.423	0.524	1.148	71.12
			18/16	0.0474 / 0.0598	0.566	0.543	0.521	0.551	0.551	0.433	0.543	1.148	71.12
			16/18	0.0598 / 0.0474	0.618	0.616	0.533	0.616	0.616	0.583	0.643	1.144	70.82
			16/16	0.0598 / 0.0598	0.668	0.665	0.606	0.666	0.666	0.596	0.666	1.144	70.82
		50	20/20	0.0358 / 0.0358	0.392	0.337	0.313	0.355	0.355	0.266	0.360	1.151	71.41
			20/18	0.0358 / 0.0474	0.429	0.367	0.370	0.388	0.390	0.273	0.406	1.151	71.41
			18/20	0.0474 / 0.0358	0.478	0.449	0.384	0.459	0.459	0.392	0.427	1.148	71.12
			18/18	0.0474 / 0.0474	0.524	0.491	0.446	0.502	0.502	0.402	0.520	1.148	71.12
			18/16	0.0474 / 0.0598	0.566	0.529	0.509	0.541	0.541	0.412	0.539	1.148	71.12
			16/18	0.0598 / 0.0474	0.618	0.608	0.523	0.611	0.611	0.554	0.619	1.144	70.82
			16/16	0.0598 / 0.0598	0.668	0.657	0.593	0.661	0.661	0.567	0.662	1.144	70.82
BDCA	37.5	80	20/20	0.0358 / 0.0358	0.392	0.326	0.301	0.348	0.348	0.255	0.344	1.151	71.41
			20/18	0.0358 / 0.0474	0.429	0.354	0.363	0.379	0.385	0.263	0.403	1.151	71.41
			18/20	0.0474 / 0.0358	0.478	0.439	0.373	0.452	0.452	0.375	0.414	1.148	71.12
			18/18	0.0474 / 0.0474	0.524	0.480	0.438	0.494	0.494	0.385	0.516	1.148	71.12
			18/16	0.0474 / 0.0598	0.566	0.517	0.500	0.533	0.533	0.395	0.537	1.148	71.12
			16/18	0.0598 / 0.0474	0.618	0.599	0.514	0.605	0.605	0.531	0.598	1.144	70.82
			16/16	0.0598 / 0.0598	0.668	0.647	0.582	0.654	0.654	0.544	0.659	1.144	70.82

(Continued 2/8)

TABLE 3—SECTION PROPERTIES [1,4] *(… Continued 3/8)*

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
ND	24	40	22	0.0295	0.823	0.625	0.787	0.691	0.799	0.349	0.394	2.612	81.67
			20	0.0358	0.997	0.827	0.971	0.884	0.980	0.457	0.504	2.608	81.57
			18	0.0474	1.316	1.193	1.310	1.234	1.312	0.657	0.701	2.600	81.38
			16	0.0598	1.654	1.590	1.654	1.611	1.654	0.849	0.902	2.593	81.18
		50	22	0.0295	0.823	0.597	0.776	0.673	0.792	0.334	0.370	2.612	81.67
			20	0.0358	0.997	0.788	0.962	0.857	0.974	0.437	0.489	2.608	81.57
			18	0.0474	1.316	1.155	1.300	1.208	1.305	0.647	0.692	2.600	81.38
			16	0.0598	1.654	1.551	1.654	1.585	1.654	0.837	0.891	2.593	81.18
		80	22	0.0295	0.823	0.582	0.765	0.662	0.785	0.323	0.348	2.612	81.67
			20	0.0358	0.997	0.756	0.953	0.836	0.968	0.421	0.476	2.608	81.57
			18	0.0474	1.316	1.122	1.290	1.187	1.299	0.625	0.679	2.600	81.38
			16	0.0598	1.654	1.515	1.650	1.561	1.652	0.827	0.882	2.593	81.18
NDA	24	40	22	0.0295	0.788	0.600	0.750	0.663	0.763	0.328	0.361	2.612	81.67
			20	0.0358	0.955	0.796	0.927	0.849	0.936	0.434	0.467	2.608	81.57
			18	0.0474	1.259	1.151	1.254	1.187	1.256	0.627	0.654	2.600	81.38
			16	0.0598	1.583	1.531	1.583	1.548	1.583	0.806	0.843	2.593	81.18
		50	22	0.0295	0.788	0.570	0.738	0.643	0.755	0.313	0.338	2.612	81.67
			20	0.0358	0.955	0.760	0.918	0.825	0.930	0.412	0.451	2.608	81.57
			18	0.0474	1.259	1.114	1.243	1.162	1.248	0.618	0.644	2.600	81.38
			16	0.0598	1.583	1.495	1.583	1.524	1.583	0.796	0.832	2.593	81.18
		80	22	0.0295	0.788	0.555	0.727	0.633	0.748	0.301	0.320	2.612	81.67
			20	0.0358	0.955	0.726	0.908	0.802	0.924	0.396	0.435	2.608	81.57
			18	0.0474	1.259	1.082	1.233	1.141	1.242	0.595	0.630	2.600	81.38
			16	0.0598	1.583	1.461	1.579	1.502	1.581	0.787	0.823	2.593	81.18
NDC	25.5	40	20/20	0.0358 / 0.0358	1.809	1.345	1.256	1.500	1.500	0.512	0.675	2.607	81.57
			20/18	0.0358 / 0.0474	1.973	1.449	1.552	1.624	1.692	0.540	0.915	2.607	81.57
			18/20	0.0474 / 0.0358	2.200	1.840	1.565	1.960	1.960	0.770	0.835	2.599	81.38
			18/18	0.0474 / 0.0474	2.406	1.996	1.849	2.133	2.133	0.789	1.100	2.599	81.38
			18/16	0.0474 / 0.0598	2.589	2.133	2.169	2.285	2.309	0.804	1.227	2.599	81.38
			16/18	0.0598 / 0.0474	2.829	2.563	2.166	2.652	2.652	1.087	1.264	2.592	81.18
			16/16	0.0598 / 0.0598	3.051	2.753	2.515	2.852	2.852	1.109	1.511	2.592	81.18
		50	20/20	0.0358 / 0.0358	1.809	1.291	1.203	1.464	1.464	0.471	0.642	2.607	81.57
			20/18	0.0358 / 0.0474	1.973	1.385	1.503	1.581	1.660	0.513	0.862	2.607	81.57
			18/20	0.0474 / 0.0358	2.200	1.766	1.506	1.911	1.911	0.734	0.808	2.599	81.38
			18/18	0.0474 / 0.0474	2.406	1.913	1.775	2.077	2.077	0.752	1.027	2.599	81.38
			18/16	0.0474 / 0.0598	2.589	2.042	2.099	2.224	2.263	0.764	1.217	2.599	81.38
			16/18	0.0598 / 0.0474	2.829	2.479	2.116	2.596	2.596	1.033	1.188	2.592	81.18
			16/16	0.0598 / 0.0598	3.051	2.659	2.440	2.789	2.789	1.054	1.490	2.592	81.18
		80	20/20	0.0358 / 0.0358	1.809	1.248	1.179	1.435	1.435	0.447	0.617	2.607	81.57
			20/18	0.0358 / 0.0474	1.973	1.315	1.466	1.534	1.635	0.474	0.823	2.607	81.57
			18/20	0.0474 / 0.0358	2.200	1.709	1.479	1.872	1.872	0.706	0.783	2.599	81.38
			18/18	0.0474 / 0.0474	2.406	1.848	1.739	2.034	2.034	0.720	0.989	2.599	81.38
			18/16	0.0474 / 0.0598	2.589	1.971	2.044	2.177	2.226	0.738	1.209	2.599	81.38
			16/18	0.0598 / 0.0474	2.829	2.397	2.076	2.541	2.541	0.992	1.152	2.592	81.18
			16/16	0.0598 / 0.0598	3.051	2.568	2.381	2.729	2.729	1.012	1.439	2.592	81.18
NDCA	25.5	40	20/20	0.0358 / 0.0358	1.681	1.262	1.256	1.402	1.402	0.516	0.675	2.607	81.57
			20/18	0.0358 / 0.0474	1.837	1.363	1.516	1.521	1.623	0.512	0.914	2.607	81.57
			18/20	0.0474 / 0.0358	2.044	1.721	1.565	1.828	1.828	0.756	0.835	2.599	81.38
			18/18	0.0474 / 0.0474	2.235	1.867	1.816	1.989	1.989	0.774	1.100	2.599	81.38
			18/16	0.0474 / 0.0598	2.408	1.998	2.077	2.135	2.187	0.790	1.221	2.599	81.38
			16/18	0.0598 / 0.0474	2.627	2.388	2.153	2.468	2.468	1.066	1.264	2.592	81.18
			16/16	0.0598 / 0.0598	2.832	2.565	2.425	2.654	2.654	1.088	1.505	2.592	81.18
		50	20/20	0.0358 / 0.0358	1.681	1.213	1.203	1.369	1.369	0.474	0.642	2.607	81.57
			20/18	0.0358 / 0.0474	1.837	1.308	1.484	1.484	1.601	0.472	0.862	2.607	81.57
			18/20	0.0474 / 0.0358	2.044	1.654	1.506	1.784	1.784	0.720	0.808	2.599	81.38
			18/18	0.0474 / 0.0474	2.235	1.791	1.774	1.939	1.939	0.737	1.027	2.599	81.38
			18/16	0.0474 / 0.0598	2.408	1.915	2.030	2.079	2.156	0.753	1.214	2.599	81.38
			16/18	0.0598 / 0.0474	2.627	2.313	2.114	2.418	2.418	1.013	1.188	2.592	81.18
			16/16	0.0598 / 0.0598	2.832	2.481	2.376	2.598	2.598	1.034	1.479	2.592	81.18
		80	20/20	0.0358 / 0.0358	1.681	1.175	1.179	1.344	1.346	0.443	0.617	2.607	81.57
			20/18	0.0358 / 0.0474	1.837	1.260	1.458	1.452	1.584	0.474	0.823	2.607	81.57
			18/20	0.0474 / 0.0358	2.044	1.601	1.479	1.749	1.749	0.692	0.783	2.599	81.38
			18/18	0.0474 / 0.0474	2.235	1.732	1.739	1.900	1.904	0.710	0.989	2.599	81.38
			18/16	0.0474 / 0.0598	2.408	1.850	1.993	2.036	2.131	0.721	1.208	2.599	81.38
			16/18	0.0598 / 0.0474	2.627	2.239	2.076	2.368	2.368	0.972	1.152	2.592	81.18
			16/16	0.0598 / 0.0598	2.832	2.399	2.337	2.543	2.543	0.992	1.437	2.592	81.18

(Continued 3/8)

TABLE 3—SECTION PROPERTIES [1,4] *(… Continued 4/8)*

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
NW32	32	50	22	0.0295	0.783	0.649	0.741	0.694	0.755	0.352	0.386	2.933	69.10
			20	0.0358	0.951	0.836	0.926	0.875	0.935	0.457	0.496	2.930	69.03
			18	0.0474	1.256	1.192	1.252	1.213	1.254	0.672	0.711	2.926	68.90
			16	0.0598	1.581	1.561	1.581	1.568	1.581	0.902	0.937	2.921	68.76
		80	22	0.0295	0.783	0.633	0.730	0.683	0.747	0.342	0.360	2.933	69.10
			20	0.0358	0.951	0.811	0.915	0.858	0.927	0.443	0.482	2.930	69.03
			18	0.0474	1.256	1.168	1.248	1.197	1.250	0.648	0.692	2.926	68.90
			16	0.0598	1.581	1.542	1.581	1.555	1.581	0.893	0.920	2.921	68.76
NW32A	32	50	22	0.0295	0.763	0.630	0.720	0.675	0.734	0.336	0.363	2.933	69.10
			20	0.0358	0.927	0.815	0.902	0.852	0.910	0.439	0.472	2.930	69.03
			18	0.0474	1.224	1.163	1.221	1.183	1.222	0.651	0.682	2.926	68.90
			16	0.0598	1.540	1.523	1.540	1.529	1.540	0.877	0.903	2.921	68.76
		80	22	0.0295	0.763	0.615	0.708	0.664	0.727	0.325	0.343	2.933	69.10
			20	0.0358	0.927	0.789	0.890	0.835	0.902	0.424	0.458	2.930	69.03
			18	0.0474	1.224	1.139	1.216	1.168	1.218	0.626	0.663	2.926	68.90
			16	0.0598	1.540	1.505	1.540	1.517	1.540	0.868	0.885	2.921	68.76
NW32I	32	50	22	0.0295	0.777	0.642	0.754	0.687	0.762	0.348	0.405	2.933	69.10
			20	0.0358	0.941	0.826	0.933	0.864	0.936	0.451	0.514	2.930	69.03
			18	0.0474	1.242	1.178	1.242	1.199	1.242	0.663	0.721	2.926	68.90
			16	0.0598	1.562	1.543	1.562	1.549	1.562	0.890	0.934	2.921	68.76
		80	22	0.0295	0.777	0.627	0.745	0.677	0.755	0.338	0.388	2.933	69.10
			20	0.0358	0.941	0.801	0.926	0.848	0.931	0.437	0.503	2.930	69.03
			18	0.0474	1.242	1.154	1.242	1.183	1.242	0.640	0.708	2.926	68.90
			16	0.0598	1.562	1.523	1.562	1.536	1.562	0.880	0.928	2.921	68.76
NW32IA	32	50	22	0.0295	0.757	0.624	0.734	0.668	0.741	0.332	0.386	2.933	69.10
			20	0.0358	0.917	0.805	0.909	0.842	0.911	0.433	0.491	2.930	69.03
			18	0.0474	1.211	1.149	1.211	1.170	1.211	0.642	0.693	2.926	68.90
			16	0.0598	1.522	1.505	1.522	1.511	1.522	0.864	0.900	2.921	68.76
		80	22	0.0295	0.757	0.608	0.724	0.658	0.735	0.321	0.369	2.933	69.10
			20	0.0358	0.917	0.779	0.901	0.825	0.906	0.418	0.480	2.930	69.03
			18	0.0474	1.211	1.125	1.210	1.154	1.211	0.618	0.680	2.926	68.90
			16	0.0598	1.522	1.486	1.522	1.498	1.522	0.856	0.894	2.921	68.76
NW32C	32.5	50	20/20	0.0358 / 0.0358	1.655	1.405	1.184	1.488	1.488	0.493	0.680	2.930	69.03
			20/18	0.0358 / 0.0474	1.791	1.485	1.428	1.587	1.587	0.526	0.760	2.930	69.03
			18/20	0.0474 / 0.0358	2.030	1.881	1.459	1.931	1.931	0.785	0.866	2.925	68.90
			18/18	0.0474 / 0.0474	2.202	2.034	1.737	2.090	2.090	0.805	0.983	2.925	68.90
			18/16	0.0474 / 0.0598	2.354	2.170	1.985	2.231	2.231	0.800	1.026	2.925	68.90
			16/18	0.0598 / 0.0474	2.608	2.535	2.052	2.559	2.559	1.089	1.210	2.920	68.76
			16/16	0.0598 / 0.0598	2.792	2.712	2.319	2.739	2.739	1.112	1.262	2.920	68.76
		80	20/20	0.0358 / 0.0358	1.655	1.340	1.146	1.445	1.445	0.461	0.625	2.930	69.03
			20/18	0.0358 / 0.0474	1.791	1.409	1.392	1.536	1.536	0.494	0.753	2.930	69.03
			18/20	0.0474 / 0.0358	2.030	1.841	1.439	1.904	1.904	0.759	0.837	2.925	68.90
			18/18	0.0474 / 0.0474	2.202	1.989	1.699	2.060	2.060	0.754	0.971	2.925	68.90
			18/16	0.0474 / 0.0598	2.354	2.120	1.939	2.198	2.198	0.749	1.016	2.925	68.90
			16/18	0.0598 / 0.0474	2.608	2.494	2.015	2.532	2.532	1.052	1.200	2.920	68.76
			16/16	0.0598 / 0.0598	2.792	2.666	2.269	2.708	2.708	1.074	1.253	2.920	68.76
NW32CA	32.5	50	20/20	0.0358 / 0.0358	1.543	1.316	1.183	1.391	1.391	0.496	0.680	2.930	69.03
			20/18	0.0358 / 0.0474	1.672	1.418	1.394	1.503	1.503	0.493	0.759	2.930	69.03
			18/20	0.0474 / 0.0358	1.893	1.758	1.459	1.803	1.803	0.769	0.866	2.925	68.90
			18/18	0.0474 / 0.0474	2.051	1.900	1.708	1.950	1.950	0.788	0.982	2.925	68.90
			18/16	0.0474 / 0.0598	2.195	2.029	1.903	2.084	2.084	0.805	1.019	2.925	68.90
			16/18	0.0598 / 0.0474	2.429	2.364	2.028	2.386	2.386	1.066	1.210	2.920	68.76
			16/16	0.0598 / 0.0598	2.600	2.528	2.239	2.552	2.552	1.089	1.256	2.920	68.76
		80	20/20	0.0358 / 0.0358	1.543	1.279	1.146	1.367	1.367	0.463	0.625	2.930	69.03
			20/18	0.0358 / 0.0474	1.672	1.350	1.370	1.457	1.471	0.461	0.752	2.930	69.03
			18/20	0.0474 / 0.0358	1.893	1.721	1.439	1.779	1.779	0.743	0.837	2.925	68.90
			18/18	0.0474 / 0.0474	2.051	1.859	1.683	1.923	1.923	0.762	0.971	2.925	68.90
			18/16	0.0474 / 0.0598	2.195	1.984	1.873	2.054	2.054	0.755	1.012	2.925	68.90
			16/18	0.0598 / 0.0474	2.429	2.326	1.999	2.361	2.361	1.030	1.200	2.920	68.76
			16/16	0.0598 / 0.0598	2.600	2.486	2.206	2.524	2.524	1.052	1.250	2.920	68.76

(Continued 4/8)

TABLE 3—SECTION PROPERTIES [1,4] *(… Continued 5/8)*

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
2.0CFD and 2.0SD	36	40	22	0.0295	0.330	0.320	0.311	0.323	0.323	0.253	0.252	1.935	65.61
			20	0.0358	0.400	0.396	0.389	0.397	0.397	0.336	0.333	1.933	65.51
			18	0.0474	0.528	0.525	0.524	0.526	0.526	0.498	0.492	1.930	65.34
			16	0.0598	0.665	0.661	0.662	0.662	0.663	0.639	0.640	1.926	65.15
		50	22	0.0295	0.330	0.313	0.305	0.319	0.319	0.239	0.240	1.935	65.61
			20	0.0358	0.400	0.392	0.383	0.395	0.395	0.319	0.317	1.933	65.51
			18	0.0474	0.528	0.525	0.521	0.526	0.526	0.476	0.470	1.930	65.34
			16	0.0598	0.665	0.661	0.662	0.662	0.663	0.628	0.628	1.926	65.15
2.0SD	36	80	22	0.0295	0.330	0.307	0.298	0.315	0.315	0.229	0.230	1.935	65.61
			20	0.0358	0.400	0.387	0.377	0.391	0.391	0.305	0.304	1.933	65.51
			18	0.0474	0.528	0.525	0.518	0.526	0.526	0.457	0.453	1.930	65.34
			16	0.0598	0.665	0.661	0.660	0.662	0.662	0.606	0.606	1.926	65.15
2.0CFDC	24	40	20/20	0.0358 / 0.0358	0.652	0.647	0.507	0.649	0.649	0.381	0.402	1.933	65.51
			20/18	0.0358 / 0.0474	0.697	0.693	0.600	0.694	0.694	0.388	0.428	1.933	65.51
			18/20	0.0474 / 0.0358	0.811	0.808	0.620	0.809	0.809	0.557	0.522	1.929	65.34
			18/18	0.0474 / 0.0474	0.869	0.866	0.735	0.867	0.867	0.568	0.552	1.929	65.34
			18/16	0.0474 / 0.0598	0.921	0.918	0.824	0.919	0.919	0.578	0.571	1.929	65.34
			16/18	0.0598 / 0.0474	1.042	1.038	0.878	1.039	1.039	0.723	0.680	1.926	65.15
			16/16	0.0598 / 0.0598	1.105	1.101	0.979	1.102	1.102	0.736	0.705	1.926	65.15
		50	20/20	0.0358 / 0.0358	0.652	0.639	0.485	0.643	0.643	0.361	0.395	1.933	65.51
			20/18	0.0358 / 0.0474	0.697	0.683	0.585	0.688	0.688	0.368	0.424	1.933	65.51
			18/20	0.0474 / 0.0358	0.811	0.808	0.597	0.809	0.809	0.532	0.515	1.929	65.34
			18/18	0.0474 / 0.0474	0.869	0.866	0.717	0.867	0.867	0.542	0.545	1.929	65.34
			18/16	0.0474 / 0.0598	0.921	0.918	0.807	0.919	0.919	0.552	0.567	1.929	65.34
			16/18	0.0598 / 0.0474	1.042	1.038	0.856	1.039	1.039	0.709	0.672	1.926	65.15
			16/16	0.0598 / 0.0598	1.105	1.101	0.958	1.102	1.102	0.722	0.700	1.926	65.15
	36	40	20/20	0.0358 / 0.0358	0.651	0.646	0.520	0.648	0.648	0.379	0.405	1.933	65.51
			20/18	0.0358 / 0.0474	0.696	0.691	0.606	0.692	0.692	0.386	0.428	1.933	65.51
			18/20	0.0474 / 0.0358	0.810	0.807	0.636	0.808	0.808	0.556	0.527	1.929	65.34
			18/18	0.0474 / 0.0474	0.868	0.865	0.744	0.866	0.866	0.566	0.553	1.929	65.34
			18/16	0.0474 / 0.0598	0.919	0.916	0.829	0.917	0.917	0.575	0.572	1.929	65.34
			16/18	0.0598 / 0.0474	1.041	1.037	0.887	1.038	1.038	0.722	0.683	1.926	65.15
			16/16	0.0598 / 0.0598	1.103	1.099	0.986	1.101	1.101	0.734	0.706	1.926	65.15
		50	20/20	0.0358 / 0.0358	0.651	0.637	0.500	0.642	0.642	0.359	0.399	1.933	65.51
			20/18	0.0358 / 0.0474	0.696	0.681	0.592	0.686	0.686	0.366	0.425	1.933	65.51
			18/20	0.0474 / 0.0358	0.810	0.807	0.616	0.808	0.808	0.530	0.521	1.929	65.34
			18/18	0.0474 / 0.0474	0.868	0.865	0.726	0.866	0.866	0.540	0.548	1.929	65.34
			18/16	0.0474 / 0.0598	0.919	0.916	0.814	0.917	0.917	0.549	0.568	1.929	65.34
			16/18	0.0598 / 0.0474	1.041	1.037	0.866	1.038	1.038	0.708	0.676	1.926	65.15
			16/16	0.0598 / 0.0598	1.103	1.099	0.967	1.101	1.101	0.719	0.701	1.926	65.15
2.0CFDCA	24	40	20/20	0.0358 / 0.0358	0.622	0.618	0.491	0.619	0.619	0.376	0.399	1.933	65.51
			20/18	0.0358 / 0.0474	0.666	0.662	0.572	0.663	0.663	0.384	0.424	1.933	65.51
			18/20	0.0474 / 0.0358	0.774	0.771	0.607	0.772	0.772	0.551	0.520	1.929	65.34
			18/18	0.0474 / 0.0474	0.829	0.826	0.706	0.827	0.827	0.561	0.546	1.929	65.34
			18/16	0.0474 / 0.0598	0.879	0.876	0.780	0.877	0.877	0.571	0.564	1.929	65.34
			16/18	0.0598 / 0.0474	0.994	0.990	0.847	0.991	0.991	0.715	0.674	1.926	65.15
			16/16	0.0598 / 0.0598	1.054	1.050	0.931	1.051	1.051	0.727	0.697	1.926	65.15
		50	20/20	0.0358 / 0.0358	0.622	0.610	0.473	0.614	0.614	0.357	0.393	1.933	65.51
			20/18	0.0358 / 0.0474	0.666	0.653	0.561	0.658	0.658	0.363	0.420	1.933	65.51
			18/20	0.0474 / 0.0358	0.774	0.771	0.587	0.772	0.772	0.526	0.512	1.929	65.34
			18/18	0.0474 / 0.0474	0.829	0.826	0.692	0.827	0.827	0.536	0.541	1.929	65.34
			18/16	0.0474 / 0.0598	0.879	0.876	0.767	0.877	0.877	0.545	0.561	1.929	65.34
			16/18	0.0598 / 0.0474	0.994	0.990	0.830	0.991	0.991	0.701	0.667	1.926	65.15
			16/16	0.0598 / 0.0598	1.054	1.050	0.915	1.051	1.051	0.713	0.693	1.926	65.15
	36	40	20/20	0.0358 / 0.0358	0.621	0.617	0.500	0.618	0.618	0.375	0.402	1.933	65.51
			20/18	0.0358 / 0.0474	0.665	0.661	0.574	0.662	0.662	0.382	0.424	1.933	65.51
			18/20	0.0474 / 0.0358	0.774	0.771	0.619	0.772	0.772	0.550	0.524	1.929	65.34
			18/18	0.0474 / 0.0474	0.828	0.825	0.708	0.826	0.826	0.560	0.548	1.929	65.34
			18/16	0.0474 / 0.0598	0.878	0.874	0.780	0.875	0.875	0.569	0.564	1.929	65.34
			16/18	0.0598 / 0.0474	0.993	0.989	0.850	0.990	0.990	0.713	0.676	1.926	65.15
			16/16	0.0598 / 0.0598	1.052	1.048	0.931	1.050	1.050	0.725	0.697	1.926	65.15

(Continued 5/8)

TABLE 3—SECTION PROPERTIES [1,4] *(… Continued 6/8)*

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
2.0CFDCA	36	50	20/20	0.0358 / 0.0358	0.621	0.609	0.484	0.613	0.613	0.355	0.396	1.933	65.51
			20/18	0.0358 / 0.0474	0.665	0.652	0.563	0.656	0.656	0.362	0.420	1.933	65.51
			18/20	0.0474 / 0.0358	0.774	0.771	0.602	0.772	0.772	0.524	0.518	1.929	65.34
			18/18	0.0474 / 0.0474	0.828	0.825	0.695	0.826	0.826	0.534	0.543	1.929	65.34
			18/16	0.0474 / 0.0598	0.878	0.874	0.768	0.875	0.875	0.543	0.561	1.929	65.34
			16/18	0.0598 / 0.0474	0.993	0.989	0.835	0.990	0.990	0.700	0.670	1.926	65.15
			16/16	0.0598 / 0.0598	1.052	1.048	0.917	1.050	1.050	0.711	0.693	1.926	65.15
3.0CFD and 3.0SD	36	40	22	0.0295	0.798	0.780	0.759	0.786	0.786	0.416	0.426	2.861	71.97
			20	0.0358	0.967	0.964	0.945	0.965	0.965	0.549	0.560	2.858	71.89
			18	0.0474	1.277	1.275	1.271	1.276	1.276	0.798	0.813	2.853	71.75
			16	0.0598	1.607	1.605	1.606	1.606	1.606	1.029	1.028	2.848	71.60
		50	22	0.0295	0.798	0.766	0.744	0.776	0.776	0.395	0.395	2.861	71.97
			20	0.0358	0.967	0.956	0.932	0.960	0.960	0.523	0.535	2.858	71.89
			18	0.0474	1.277	1.275	1.264	1.276	1.276	0.764	0.780	2.853	71.75
			16	0.0598	1.607	1.605	1.606	1.606	1.606	1.009	1.024	2.848	71.60
3.0SD	36	80	22	0.0295	0.798	0.752	0.730	0.767	0.767	0.380	0.379	2.861	71.97
			20	0.0358	0.967	0.945	0.919	0.952	0.952	0.502	0.515	2.858	71.89
			18	0.0474	1.277	1.275	1.257	1.276	1.276	0.736	0.753	2.853	71.75
			16	0.0598	1.607	1.605	1.602	1.606	1.606	0.975	1.006	2.848	71.60
3.0CFDC	24	40	20/20	0.0358 / 0.0358	1.535	1.531	1.176	1.532	1.532	0.603	0.639	2.858	71.89
			20/18	0.0358 / 0.0474	1.638	1.634	1.408	1.635	1.635	0.607	0.683	2.858	71.89
			18/20	0.0474 / 0.0358	1.910	1.908	1.446	1.908	1.908	0.895	0.832	2.853	71.75
			18/18	0.0474 / 0.0474	2.041	2.039	1.731	2.039	2.039	0.911	0.884	2.853	71.75
			18/16	0.0474 / 0.0598	2.157	2.154	1.928	2.155	2.155	0.924	0.913	2.853	71.75
			16/18	0.0598 / 0.0474	2.446	2.443	2.069	2.444	2.444	1.163	1.087	2.847	71.60
			16/16	0.0598 / 0.0598	2.587	2.584	2.294	2.585	2.585	1.181	1.130	2.847	71.60
		50	20/20	0.0358 / 0.0358	1.535	1.515	1.132	1.521	1.521	0.560	0.627	2.858	71.89
			20/18	0.0358 / 0.0474	1.638	1.599	1.375	1.612	1.612	0.589	0.673	2.858	71.89
			18/20	0.0474 / 0.0358	1.910	1.908	1.390	1.908	1.908	0.857	0.817	2.853	71.75
			18/18	0.0474 / 0.0474	2.041	2.039	1.689	2.039	2.039	0.872	0.868	2.853	71.75
			18/16	0.0474 / 0.0598	2.157	2.154	1.890	2.155	2.155	0.872	0.907	2.853	71.75
			16/18	0.0598 / 0.0474	2.446	2.443	2.010	2.444	2.444	1.140	1.074	2.847	71.60
			16/16	0.0598 / 0.0598	2.587	2.584	2.247	2.585	2.585	1.157	1.123	2.847	71.60
	36	40	20/20	0.0358 / 0.0358	1.534	1.530	1.223	1.531	1.531	0.603	0.646	2.858	71.89
			20/18	0.0358 / 0.0474	1.637	1.633	1.425	1.634	1.634	0.606	0.686	2.858	71.89
			18/20	0.0474 / 0.0358	1.909	1.907	1.485	1.908	1.908	0.895	0.843	2.853	71.75
			18/18	0.0474 / 0.0474	2.040	2.038	1.751	2.038	2.038	0.910	0.888	2.853	71.75
			18/16	0.0474 / 0.0598	2.155	2.153	1.943	2.154	2.154	0.923	0.917	2.853	71.75
			16/18	0.0598 / 0.0474	2.445	2.442	2.091	2.443	2.443	1.163	1.098	2.847	71.60
			16/16	0.0598 / 0.0598	2.586	2.583	2.310	2.584	2.584	1.181	1.134	2.847	71.60
		50	20/20	0.0358 / 0.0358	1.534	1.514	1.161	1.521	1.521	0.559	0.634	2.858	71.89
			20/18	0.0358 / 0.0474	1.637	1.598	1.391	1.611	1.611	0.589	0.678	2.858	71.89
			18/20	0.0474 / 0.0358	1.909	1.907	1.436	1.908	1.908	0.857	0.831	2.853	71.75
			18/18	0.0474 / 0.0474	2.040	2.038	1.710	2.038	2.038	0.872	0.876	2.853	71.75
			18/16	0.0474 / 0.0598	2.155	2.153	1.907	2.154	2.154	0.871	0.911	2.853	71.75
			16/18	0.0598 / 0.0474	2.445	2.442	2.034	2.443	2.443	1.140	1.083	2.847	71.60
			16/16	0.0598 / 0.0598	2.586	2.583	2.268	2.584	2.584	1.157	1.127	2.847	71.60
3.0CFDCA	24	40	20/20	0.0358 / 0.0358	1.466	1.463	1.150	1.464	1.464	0.604	0.634	2.858	71.89
			20/18	0.0358 / 0.0474	1.566	1.562	1.348	1.563	1.563	0.604	0.678	2.858	71.89
			18/20	0.0474 / 0.0358	1.825	1.823	1.419	1.824	1.824	0.885	0.828	2.853	71.75
			18/18	0.0474 / 0.0474	1.949	1.947	1.666	1.948	1.948	0.900	0.878	2.853	71.75
			18/16	0.0474 / 0.0598	2.061	2.059	1.832	2.059	2.059	0.913	0.903	2.853	71.75
			16/18	0.0598 / 0.0474	2.336	2.333	1.998	2.334	2.334	1.149	1.079	2.847	71.60
			16/16	0.0598 / 0.0598	2.470	2.467	2.188	2.468	2.468	1.167	1.119	2.847	71.60
		50	20/20	0.0358 / 0.0358	1.466	1.448	1.111	1.454	1.454	0.560	0.623	2.858	71.89
			20/18	0.0358 / 0.0474	1.566	1.542	1.324	1.550	1.550	0.560	0.666	2.858	71.89
			18/20	0.0474 / 0.0358	1.825	1.823	1.368	1.824	1.824	0.848	0.804	2.853	71.75
			18/18	0.0474 / 0.0474	1.949	1.947	1.634	1.948	1.948	0.862	0.862	2.853	71.75
			18/16	0.0474 / 0.0598	2.061	2.059	1.803	2.059	2.059	0.873	0.899	2.853	71.75
			16/18	0.0598 / 0.0474	2.336	2.333	1.956	2.334	2.334	1.126	1.068	2.847	71.60
			16/16	0.0598 / 0.0598	2.470	2.467	2.153	2.468	2.468	1.143	1.113	2.847	71.60

(Continued 6/8)

TABLE 3—SECTION PROPERTIES [1,4] *(… Continued 7/8)*

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
3.0CFDCA	36	40	20/20	0.0358 / 0.0358	1.465	1.462	1.167	1.463	1.463	0.604	0.640	2.858	71.89
			20/18	0.0358 / 0.0474	1.565	1.561	1.352	1.562	1.562	0.603	0.679	2.858	71.89
			18/20	0.0474 / 0.0358	1.825	1.822	1.451	1.823	1.823	0.885	0.838	2.853	71.75
			18/18	0.0474 / 0.0474	1.948	1.946	1.673	1.946	1.946	0.900	0.879	2.853	71.75
			18/16	0.0474 / 0.0598	2.059	2.057	1.833	2.058	2.058	0.913	0.904	2.853	71.75
			16/18	0.0598 / 0.0474	2.335	2.332	2.004	2.333	2.333	1.150	1.084	2.847	71.60
			16/16	0.0598 / 0.0598	2.468	2.465	2.190	2.466	2.466	1.167	1.121	2.847	71.60
		50	20/20	0.0358 / 0.0358	1.465	1.447	1.135	1.453	1.453	0.560	0.629	2.858	71.89
			20/18	0.0358 / 0.0474	1.565	1.541	1.328	1.549	1.549	0.560	0.669	2.858	71.89
			18/20	0.0474 / 0.0358	1.825	1.822	1.406	1.823	1.823	0.848	0.827	2.853	71.75
			18/18	0.0474 / 0.0474	1.948	1.946	1.642	1.946	1.946	0.862	0.868	2.853	71.75
			18/16	0.0474 / 0.0598	2.059	2.057	1.807	2.058	2.058	0.873	0.900	2.853	71.75
			16/18	0.0598 / 0.0474	2.335	2.332	1.963	2.333	2.333	1.127	1.076	2.847	71.60
			16/16	0.0598 / 0.0598	2.468	2.465	2.158	2.466	2.466	1.143	1.115	2.847	71.60
3.0CFDES and 3.0SDES	36	40	22	0.0295	0.757	0.747	0.729	0.750	0.750	0.405	0.420	3.093	63.76
			20	0.0358	0.917	0.916	0.905	0.917	0.917	0.532	0.550	3.091	63.70
			18	0.0474	1.212	1.211	1.211	1.211	1.211	0.772	0.769	3.088	63.59
			16	0.0598	1.526	1.524	1.524	1.524	1.525	0.968	0.969	3.084	63.47
		50	22	0.0295	0.757	0.735	0.716	0.742	0.742	0.386	0.402	3.093	63.76
			20	0.0358	0.917	0.913	0.896	0.914	0.914	0.508	0.527	3.091	63.70
			18	0.0474	1.212	1.211	1.209	1.211	1.211	0.745	0.763	3.088	63.59
			16	0.0598	1.526	1.524	1.524	1.524	1.525	0.968	0.967	3.084	63.47
3.0SDES	36	80	22	0.0295	0.757	0.723	0.703	0.735	0.735	0.364	0.387	3.093	63.76
			20	0.0358	0.917	0.905	0.884	0.909	0.909	0.489	0.508	3.091	63.70
			18	0.0474	1.212	1.211	1.200	1.211	1.211	0.720	0.742	3.088	63.59
			16	0.0598	1.526	1.524	1.524	1.524	1.525	0.949	0.961	3.084	63.47
3.0CFDESC	24	40	20/20	0.0358 / 0.0358	1.469	1.468	1.163	1.468	1.468	0.581	0.609	3.091	63.70
			20/18	0.0358 / 0.0474	1.569	1.555	1.353	1.560	1.560	0.612	0.650	3.091	63.70
			18/20	0.0474 / 0.0358	1.827	1.826	1.441	1.826	1.826	0.875	0.791	3.088	63.59
			18/18	0.0474 / 0.0474	1.955	1.953	1.663	1.954	1.954	0.891	0.840	3.088	63.59
			18/16	0.0474 / 0.0598	2.067	2.065	1.853	2.066	2.066	0.901	0.869	3.088	63.59
			16/18	0.0598 / 0.0474	2.341	2.340	1.987	2.340	2.340	1.107	1.038	3.084	63.47
			16/16	0.0598 / 0.0598	2.479	2.477	2.203	2.477	2.477	1.124	1.075	3.084	63.47
		50	20/20	0.0358 / 0.0358	1.469	1.449	1.093	1.455	1.455	0.539	0.598	3.091	63.70
			20/18	0.0358 / 0.0474	1.569	1.525	1.320	1.539	1.539	0.567	0.644	3.091	63.70
			18/20	0.0474 / 0.0358	1.827	1.826	1.349	1.826	1.826	0.845	0.781	3.088	63.59
			18/18	0.0474 / 0.0474	1.955	1.953	1.622	1.954	1.954	0.850	0.833	3.088	63.59
			18/16	0.0474 / 0.0598	2.067	2.065	1.815	2.066	2.066	0.848	0.863	3.088	63.59
			16/18	0.0598 / 0.0474	2.341	2.340	1.934	2.340	2.340	1.107	1.020	3.084	63.47
			16/16	0.0598 / 0.0598	2.479	2.477	2.159	2.477	2.477	1.124	1.067	3.084	63.47
	36	40	20/20	0.0358 / 0.0358	1.469	1.468	1.176	1.468	1.468	0.581	0.616	3.091	63.70
			20/18	0.0358 / 0.0474	1.569	1.555	1.369	1.559	1.559	0.611	0.653	3.091	63.70
			18/20	0.0474 / 0.0358	1.828	1.826	1.455	1.827	1.827	0.876	0.801	3.088	63.59
			18/18	0.0474 / 0.0474	1.955	1.953	1.682	1.954	1.954	0.891	0.844	3.088	63.59
			18/16	0.0474 / 0.0598	2.066	2.065	1.867	2.065	2.065	0.901	0.872	3.088	63.59
			16/18	0.0598 / 0.0474	2.342	2.340	2.007	2.341	2.341	1.107	1.043	3.084	63.47
			16/16	0.0598 / 0.0598	2.479	2.477	2.219	2.477	2.477	1.124	1.079	3.084	63.47
		50	20/20	0.0358 / 0.0358	1.469	1.449	1.119	1.455	1.455	0.539	0.605	3.091	63.70
			20/18	0.0358 / 0.0474	1.569	1.524	1.336	1.539	1.539	0.566	0.647	3.091	63.70
			18/20	0.0474 / 0.0358	1.828	1.826	1.387	1.827	1.827	0.845	0.792	3.088	63.59
			18/18	0.0474 / 0.0474	1.955	1.953	1.642	1.954	1.954	0.850	0.837	3.088	63.59
			18/16	0.0474 / 0.0598	2.066	2.065	1.832	2.065	2.065	0.848	0.867	3.088	63.59
			16/18	0.0598 / 0.0474	2.342	2.340	1.958	2.341	2.341	1.107	1.029	3.084	63.47
			16/16	0.0598 / 0.0598	2.479	2.477	2.179	2.477	2.477	1.124	1.072	3.084	63.47
3.0CFDESCA	24	40	20/20	0.0358 / 0.0358	1.403	1.402	1.141	1.402	1.402	0.582	0.605	3.091	63.70
			20/18	0.0358 / 0.0474	1.500	1.498	1.295	1.499	1.499	0.581	0.644	3.091	63.70
			18/20	0.0474 / 0.0358	1.745	1.744	1.421	1.744	1.744	0.865	0.788	3.088	63.59
			18/18	0.0474 / 0.0474	1.866	1.864	1.602	1.865	1.865	0.881	0.834	3.088	63.59
			18/16	0.0474 / 0.0598	1.974	1.972	1.760	1.973	1.973	0.894	0.859	3.088	63.59
			16/18	0.0598 / 0.0474	2.235	2.233	1.923	2.233	2.233	1.093	1.032	3.084	63.47
			16/16	0.0598 / 0.0598	2.365	2.363	2.103	2.363	2.363	1.110	1.063	3.084	63.47

(Continued 7/8)

TABLE 3—SECTION PROPERTIES [1,4] *(… Continued 8/8)*

DECK PANEL	CW (in.)	STEEL GRADE	THICKNESS [2,3] (Hat or Hat/Liner Sections)		I_{gx} (in.^{4}/ft)	EFFECTIVE MOMENT OF INERTIA (in.^{4}/ft)				EFF. SEC. MODULUS (in.^{3}/ft)		h (in.)	θ (deg.)
			Gage	t (in.)		I_{on}	I_{oi}	I_{DS}	I_{DM}	S_{en}	S_{ei}		
3.0CFDESCA	24	50	20/20	0.0358 / 0.0358	1.403	1.395	1.073	1.398	1.398	0.540	0.594	3.091	63.70
			20/18	0.0358 / 0.0474	1.500	1.472	1.272	1.481	1.481	0.540	0.639	3.091	63.70
			18/20	0.0474 / 0.0358	1.745	1.744	1.326	1.744	1.744	0.835	0.778	3.088	63.59
			18/18	0.0474 / 0.0474	1.866	1.864	1.572	1.865	1.865	0.850	0.827	3.088	63.59
			18/16	0.0474 / 0.0598	1.974	1.972	1.732	1.973	1.973	0.850	0.854	3.088	63.59
			16/18	0.0598 / 0.0474	2.235	2.233	1.882	2.233	2.233	1.093	1.015	3.084	63.47
			16/16	0.0598 / 0.0598	2.365	2.363	2.069	2.363	2.363	1.110	1.058	3.084	63.47
	36	40	20/20	0.0358 / 0.0358	1.403	1.402	1.144	1.402	1.402	0.582	0.610	3.091	63.70
			20/18	0.0358 / 0.0474	1.499	1.498	1.299	1.499	1.499	0.581	0.646	3.091	63.70
			18/20	0.0474 / 0.0358	1.746	1.744	1.426	1.745	1.745	0.865	0.796	3.088	63.59
			18/18	0.0474 / 0.0474	1.866	1.864	1.607	1.865	1.865	0.881	0.836	3.088	63.59
			18/16	0.0474 / 0.0598	1.973	1.972	1.761	1.972	1.972	0.894	0.860	3.088	63.59
			16/18	0.0598 / 0.0474	2.235	2.233	1.927	2.234	2.234	1.093	1.035	3.084	63.47
			16/16	0.0598 / 0.0598	2.365	2.363	2.103	2.363	2.363	1.111	1.065	3.084	63.47
		50	20/20	0.0358 / 0.0358	1.403	1.395	1.092	1.398	1.398	0.540	0.599	3.091	63.70
			20/18	0.0358 / 0.0474	1.499	1.472	1.276	1.481	1.481	0.539	0.641	3.091	63.70
			18/20	0.0474 / 0.0358	1.746	1.744	1.357	1.745	1.745	0.835	0.788	3.088	63.59
			18/18	0.0474 / 0.0474	1.866	1.864	1.578	1.865	1.865	0.850	0.830	3.088	63.59
			18/16	0.0474 / 0.0598	1.973	1.972	1.736	1.972	1.972	0.851	0.856	3.088	63.59
			16/18	0.0598 / 0.0474	2.235	2.233	1.887	2.234	2.234	1.093	1.021	3.084	63.47
			16/16	0.0598 / 0.0598	2.365	2.363	2.073	2.363	2.363	1.111	1.060	3.084	63.47

For **SI** Units: 1 inch = 25.4 mm, 1 ft = 0.305 m

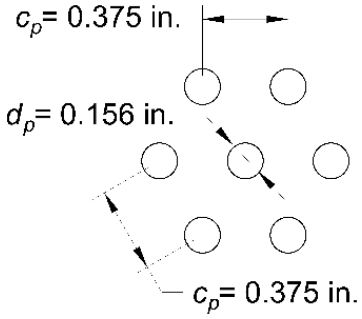
[1] Effective properties are based on the design yield stress corresponding to the tabulated grade in accordance with AISI S100.

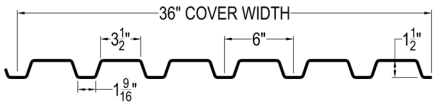
[2] The design thickness, t, is the minimum uncoated base-metal thickness of the deck panel.

[3] For the cellular and cellular acoustical deck panels, the first gauge and design thickness numbers correspond to the hat sections, and the second numbers correspond to the liner sections.

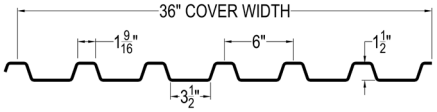
[4] For the cellular and cellular acoustical deck panels, effective properties are for cases where the hat-to-liner connections (resistance welds or self-pierced rivets) are spaced at 6" o.c., assuming the connections strength does not control the design (see Section 4.1.4 for the need to consider the connections strength in design). For different connections spacings, section properties must be determined in accordance with AISI S100.

TABLE 4—ACOUSTICAL PERFORATION PROPERTIES

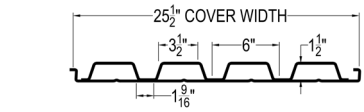
DECK TYPE	WIDTH OF PERFORATED BAND IN WEBS OF NON-CELLULAR DECKS, W_p, OR IN LINER PANEL OF CELLULAR DECKS, w_{dp}, (in.)	NUMBER OF PERFORATED BANDS PER DECK PANEL	PERFORATION PATTERN
BDA	0.906	12	
NDA	2.063	6	
NW32A and NW32IA	2.031	8	
BDCA and 1.5CFDCA	3.531	4 (25.5 in. CW) 6 (37.5 in. CW)	
NDCA	5.406	3	
NW32CA	5.406	4	
2.0CFDCA, 3.0CFDCA, and 3.0CFDESCA	6.531	2 (24 in. CW) 3 (36 in. CW)	

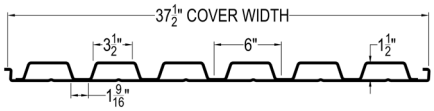


1.5SDR, BD, BDA, and 1.5CFD

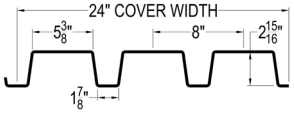


1.5SD

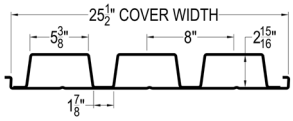




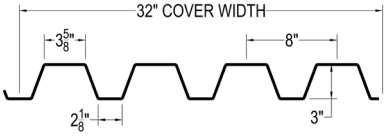
BDC, BDCA, 1.5CFDC, and 1.5CFDCA



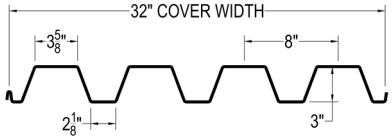
ND and NDA



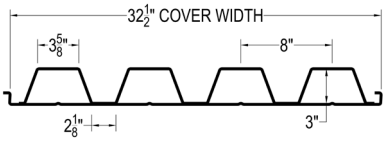
NDC and NDCA



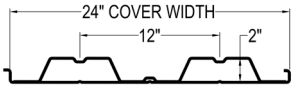
NW32 and NW32A

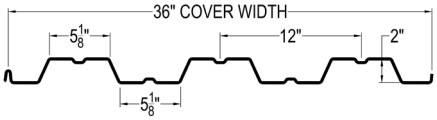


NW32I and NW32IA

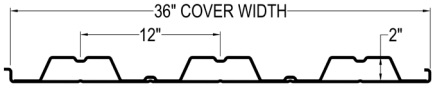


NW32C and NW32CA

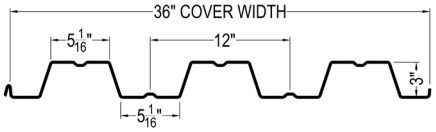




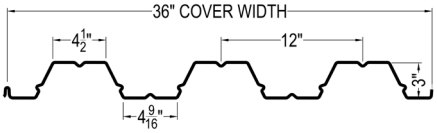
2.0CFD and 2.0SD



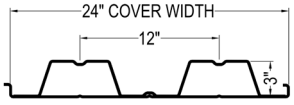
2.0CFDC and 2.0CFDCA

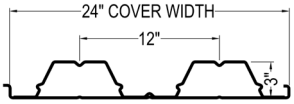


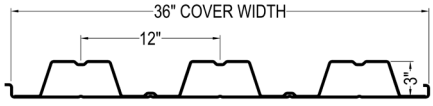
3.0CFD and 3.0SD



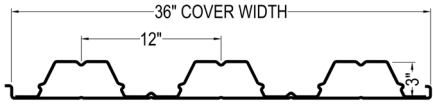
3.0CFDES and 3.0SDES





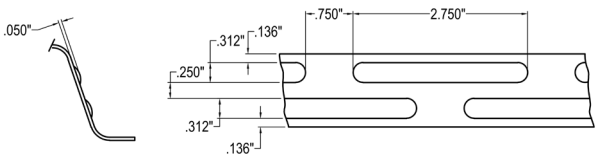


3.0CFDC and 3.0CFDCA



3.0CFDESC and 3.0CFDESCA

FIGURE 1—STEEL DECK PANEL PROFILES



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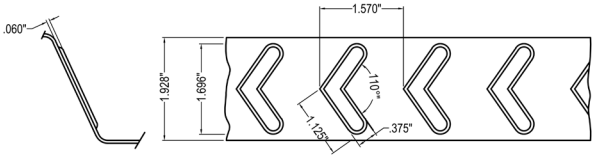

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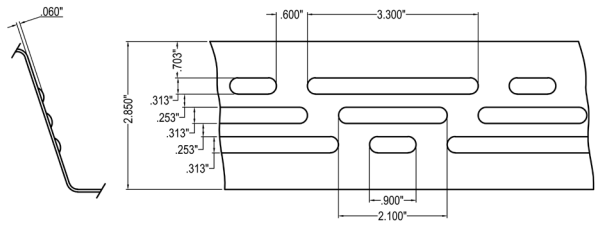
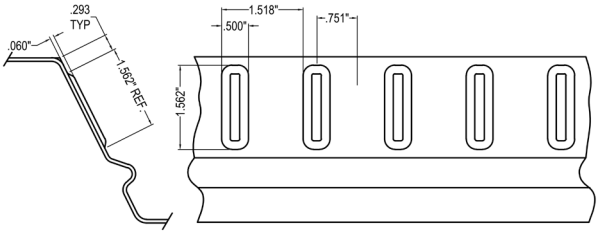


3.0CFD, 3.0CFDC, and 3.0CFDCA



3.0CFDES, 3.0CFDESC, and 3.0CFDESCA

FIGURE 2—EMBOSSMENTS OF COMPOSITE FLOOR DEKS

APPENDIX A

Web-Perforated Deck Calculations

A1.0 Web Crippling Strength of Deck Panels with Perforated Webs (BDA, NDA, NW32A, and NW32IA)

The nominal web crippling strength of deck panels with perforated webs, P_{np}, shall be calculated in accordance with Section G5 of AISI S100-16 with the following modified equation:

$$P_{np} = Ct^2F_y \sin\theta \left(1 - C_R\sqrt{\frac{R}{t}}\right)\left(1 + C_N\sqrt{\frac{N}{t}}\right)\left(1 - C_h\sqrt{\frac{h}{q_s t}}\right) \quad \text{(AISI S100 Eq. G5-1 Modified)}$$

$$q_s = 1 - (1 - k_e)\frac{W_p}{h} \quad \text{(Eq. A1-2)}$$

$$k_e = \begin{cases} 1 - 2.175p_o \text{ for } p_o < 0.20 \\ 0.9 + p_o^2 - 1.875p_o \text{ for } 0.20 \le p_o \le 0.58 \end{cases} \quad \text{(Eq. A1-3)}$$

$$p_o = 0.9069\left(\frac{d_p}{c_p}\right)^2 \quad \text{(Eq. A1-4)}$$

where q_s is reduction factor; θ is web angle; k_e is efficiency of the perforated area relative to a solid area of the same material; W_p is perforated band width in deck web; h is flat dimension of web measured in plane of web; p_o perforation open area; d_p is diameter of perforation; c_p is perforation center-to-center spacing; and all other variables are as defined in AISI S100.

The ASD safety factor, Ω, and LRFD resistance factor, ϕ, must be in accordance with AISI S100.

A2.0 Shear Strength of Deck Panels with Perforated Webs (BDA, NDA, NW32A, and NW32IA)

The nominal vertical shear strength of deck panels with perforated webs, V_{np}, shall be calculated as follows:

$$V_{np} = q_s n_w V_n \sin\theta \quad \text{(Eq. A2-1)}$$

where q_s is reduction factor determined as described in Section A1.0; n_w is number of webs per foot of deck panel width; V_n is the nominal shear strength calculated per AISI S100 Section G2.1, without considering web perforations; and θ is web angle.

The ASD safety factor, Ω, and LRFD resistance factor, ϕ, must be in accordance with AISI S100.

ICC-ES Evaluation Report

ESR-1169 City of LA Supplement

Issued June 2025

This report is subject to renewal June 2026.

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DIVISION: 05 00 00—METALS
Section: 05 31 00—Steel Decking

REPORT HOLDER:

NEW MILLENNIUM BUILDING SYSTEMS, LLC

EVALUATION SUBJECT:

NEW MILLENNIUM STEEL ROOF, COMPOSITE FLOOR, AND FORM DECK PANELS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in ICC-ES evaluation report ESR-1169, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code edition:

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

2.0 CONCLUSIONS

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-1169, comply with the LABC Chapter 22, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-1169.
- The design, installation, conditions of use and identification of the New Millennium Steel Roof, Composite Floor, and Form Deck Panels are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report ESR-1169.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16, 17 and 22, and City of Los Angeles Information Bulletin P/BC 2023-046, as applicable.
- When exposed to weather, the steel deck panels shall be galvanized.

This supplement expires concurrently with the evaluation report, reissued June 2024 and revised June 2025.

ICC-ES Evaluation Report

ESR-1169 Chicago Title 14 Supplement

Issued June 2025

This report is subject to renewal June 2026.

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DIVISION: 05 00 00—METALS
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NEW MILLENNIUM BUILDING SYSTEMS, LLC

EVALUATION SUBJECT:

NEW MILLENNIUM STEEL ROOF, COMPOSITE FLOOR, AND FORM DECK PANELS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in ICC-ES evaluation report ESR-1169, have also been evaluated for compliance with the Chicago Construction Code (Title 14 of the Chicago Municipal Code) as noted below.

Applicable code edition:

- 2019 *Chicago Building Code, Title 14B* (with Revised April 2022 Supplement)

2.0 CONCLUSIONS

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-1169, comply with Chapter 22 of the 2019 *Chicago Building Code, Title 14B* (with Revised April 2022 Supplement) and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-1169.
- The design, installation, conditions of use and identification of the New Millennium Steel Roof, Composite Floor, and Form Deck Panels must be in accordance with the 2018 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-1169.
- The design, installation and inspection are in accordance with additional requirements of Chapters 16, 17, and 22 of Title 14B, as applicable.

This supplement expires concurrently with the evaluation report, reissued June 2024 and revised June 2025.

DIVISION: 05 00 00—METALS
Section: 05 31 00—Steel Decking

REPORT HOLDER:

NEW MILLENNIUM BUILDING SYSTEMS, LLC

EVALUATION SUBJECT:

NEW MILLENNIUM STEEL ROOF, COMPOSITE FLOOR, AND FORM DECK PANELS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in ICC-ES evaluation report ESR-1169, have also been evaluated for compliance with the code noted below.

Applicable code edition:

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 and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1 and 2.2 below.

2.0 CONCLUSIONS

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-1169, comply with CBC Chapters 22, provided the design and installation are in accordance with the 2021 *International Building Code*® provisions noted in the evaluation report and the additional requirements of the CBC Chapters 16, 17 and 22, as applicable.

The products have not been evaluated under Chapter 7A for use in the exterior design and construction of new buildings located in a Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area.

2.1 OSHPD:

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-1169, comply with CBC Chapters 16, 17 and 22 and applicable amendments, and Chapters 16A, 17A and 22A, 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 in Sections 2.1.1 and 2.1.2 of this supplement:

2.1.1 Conditions of Use:

1. All loads applied to the deck panels must be determined by the registered design professional and must comply with the applicable loads from CBC amended sections in Chapter 16 and Chapter 16A.
2. Structural analysis must explicitly include consideration of stiffness of diaphragm in accordance with Section 1604A.4 [OSHPD 1 & 4]
3. The maximum span-depth ratio for diaphragms must not exceed the values determined in accordance with Section 1604A.3.8 [OSHPD 1 & 4].

4. Attachment of decks to exterior walls must be in accordance with Sections 1604A.8.2 and 1604A.8.3 [OSHPD 1 & 4].
5. Structures assigned to Seismic Design Category D, E or F having horizontal structural irregularity Type 1b of Table 12.3-1 or vertical structural irregularities Type 1b, 5a or 5b of Table 12.3-2 of ASCE 7-16 must not be permitted, except as specified in Section 1617A.1.10 [OSHPD 1 & 4].
6. Steel roof deck must comply with Section 2210.1.1.2 [OSHPD 1R, 2 & 5].
7. Design of cold-formed steel structures must comply with Section 2210.2 [OSHPD 1R, 2 & 5], Section 2210A [OSHPD 1 & 4].

2.1.2 Special Inspection Requirements:

1. Periodic special inspections must be required in accordance with Sections 1705A.12.2 and 1705A.13.3 [OSHPD 1 & 4].
2. Deck weld (if any) special inspection must satisfy the requirements in Section 1705.2.5 [OSHPD 1R, 2 & 5], Table 1705A.2.1 and Section 1705A.2.5 as specified in Section 1705A.2.2 [OSHPD 1 & 4].

2.2 DSA:

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-1169, comply with CBC amended Chapters 16 and 22, and Chapters 16A, 17A and 22A, 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 in Sections 2.2.1 and 2.2.2 of this supplement:

2.2.1 Conditions of Use:

1. All loads applied to the deck panels must be determined by the registered design professional and must comply with the applicable loads from CBC amended sections in Chapter 16 and Chapter 16A.
2. Structural analysis must explicitly include consideration of stiffness of diaphragm in accordance with Sections 1617.2.1.4 [DSA-SS/CC] and 1604A.4 [DSA-SS].
3. The maximum span-depth ratio for diaphragms must not exceed the values determined in accordance with Sections 1617.2.1.1 [DSA-SS/CC] and 1604A.3.8 [DSA-SS].
4. Diaphragm shear design for composite decks must comply with DSA IR 22-1, as applicable.
5. Attachment of decks to exterior walls must be in accordance with Sections 1604A.8.2 and 1604A.8.3 [DSA-SS].
6. Structures assigned to Seismic Design Category D, E or F having horizontal structural irregularity Type 1b of Table 12.3-1 or vertical structural irregularities Type 1b, 5a or 5b of Table 12.3-2 of ASCE 7-16 must not be permitted, except as specified in Section 1617A.1.10 [DSA-SS].
7. Design of cold-formed steel structures must comply with Section 2210A [DSA-SS].

2.2.2 Special Inspection Requirements:

1. Periodic special inspections must be required in accordance with Sections 1705A.12.2 and 1705A.13.3 [DSA-SS/CC].
2. Deck weld (if any) special inspection must satisfy the requirements in Table 1705A.2.1 and Section 1705A.2.5 as specified in Section 1705A.2.2 [DSA-SS/CC].

This supplement expires concurrently with the evaluation report, reissued June 2024 and revised June 2025.

DIVISION: 05 00 00—METALS
Section: 05 31 00—Steel Decking

REPORT HOLDER:

NEW MILLENNIUM BUILDING SYSTEMS, LLC

EVALUATION SUBJECT:

NEW MILLENNIUM STEEL ROOF, COMPOSITE FLOOR, AND FORM DECK PANELS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in ICC-ES evaluation report ESR-1169, have also been evaluated for compliance with the code noted below.

Applicable code editions:

- 2023 *Florida Building Code—Building*

2.0 CONCLUSIONS

The New Millennium Steel Roof, Composite Floor, and Form Deck Panels, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-1169, comply with the *Florida Building Code—Building.* The design requirements must be determined in accordance with the *Florida Building Code-Building.* The installation requirements noted in ICC-ES evaluation report ESR-1169 for the 2021 *International Building Code®* meet the requirements of the *Florida Building Code-Building*.

Use of the New Millennium Steel Roof, Composite Floor, and Form Deck Panels for compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code-Building* has not been evaluated, and is outside the scope of this supplement report.

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). Florida Rule 61G20-3 is applicable to products and/or systems, which comprise the building envelope and structural frame, for compliance with the structural requirements of the Florida Building Code.

This supplement expires concurrently with the evaluation report, reissued June 2024 and revised June 2025.