

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS

RESEARCH COMMITTEE RECOMMENDATION

CAL. CONT. LICENSE
160057

Report No. 1092
May, 1971

INLAND CELLUFLO, STEEL ROOF DECK, RIBFORM
ACOUSTIDECK AND HI-BOND DECKING
INLAND-RYERSON CONSTRUCTION PRODUCTS COMPANY
4131 WEST BURNHAM STREET
MILWAUKEE, WISCONSIN

I. Introduction: At the request of Inland-Ryerson Construction Products Company, Milwaukee, Wisconsin, the Research Committee of the International Conference of Building Officials has made a re-examination of the test data submitted in connection with Inland-Ryerson Construction Products Company floors, roof decks and wall panels.

II. Description: General: The roof and floor panels are cold-rolled from steel sheets conforming to U.B.C. Standard No. 27-1-67 and are supplied in six categories designated as Celluflo, Steel Roof Deck, Ribform, Acoustideck, Hi-Bond Decking and Wall Panels.

The panels are of three basic types consisting of a single fluted sheet, a fluted sheet resistance-welded in the shop to a flat sheet, or a fluted sheet resistance-welded in the shop to a ribbed sheet. The Hi-Bond decking is provided with raised lugs in the sloping webs of the fluted sections and serves as reinforcing steel for the concrete slab. All panels are galvanized or painted except Celluflo and T-Deck which are galvanized; Ribform either uncoated or galvanized; and Hi-Bond either phosphated and painted or galvanized. The dimensional characteristics and sectional properties are set forth in Table No. I.

Suggested weld specifications are set forth in Table No. II. Allowable diaphragm shear values and connection details are set forth in Tables Nos. III through XXII.

III. Evidence Submitted: Reports and analyses of tests on full scale diaphragms by S. B. Barnes and Associates are submitted.

Recommendation

IV. Recommendation: That the Inland-Ryerson Construction Products Company Floor, Roof Decks and Wall Panels are satisfactory alternate types of construction to that specified in the Uniform Building Code for use as floor or roof systems to resist vertical or horizontal forces provided:

1. The allowable span for vertical loads shall be based on the section properties set forth in Table No. I.
2. Where the decks are used as diaphragms the allowable shear values shall not exceed those specified in this report with no increase permitted for wind or seismic forces. Consideration shall be given to the deflection requirements set forth in reports by S. B. Barnes and Associates, consulting engineers.
3. The allowable spans for vertical loads for Inland Hi-Bond decking are as set forth in Tables Nos. XIX, XIX-A, XV and XX.
4. Where the decks are used for diaphragms the deck coatings shall be as set forth in the diaphragm shear tables.

This recommendation is subject to annual re-examination.

TABLE NO. I—SECTION PROPERTIES AND DIMENSIONAL CHARACTERISTICS¹

TYPE	GAUGE	DEPTH & WIDTH (in Inches)	I (in) ⁴ (per Foot)	S (in) ³ (per Foot)	END REACTION WITH 3" BEARING (12" Width)
CELLUFLO					
BF	20-20	1½-24	.37	.30	
	18-20		.50	.45	
	18-18		.58	.46	2190
	18-16		.61	.47	2190
	16-16		.77	.665	3360
	14-16		.95	.889	5000
	14-14		1.022	.910	5000
FB	12-14	1½-24	1.375	1.325	8900
	18-18		.610	.620	2190
	18-16		.715	.757	3360
	16-16		.793	.781	3360
	14-16		.874	.808	3360
	14-14		1.025	.980	5000
BF ₂	14-12	1½-24	1.307	1.314	8900
	18-16		.572	.48	2190
BF ₃	18-16	1½-24	.514	.47	2190
BB	18-18	3-24	1.930	1.131	2190
	18-16		2.167	1.195	2190
	16-16		2.530	1.516	3360
	14-16		2.920	1.700	3360
1% NF	14-14	1% -24	3.293	1.931	5000
	20-20		.37	.27	
	18-20		.51	.40	
	18-18		.56	.41	
	18-16		.58	.42	
3 NF	16-16	3-24	.75	.56	
	20-20		1.45	.59	
	18-20		1.98	.88	
	18-18		2.12	.90	1430
	18-16		2.25	.92	1430
	17-16		2.554	1.084	1845
3 FN	16-16	3-24	2.862	1.25	2290
	16-14		3.054	1.276	2290
	18-18		2.16	1.31	
3 HF	18-16	3-12	2.86	1.68	
	16-16		2.587	1.193	955
4.5 HF	18-18	4½-12	3.139	1.555	1525
	18-16		5.798	1.939	840
	16-16		6.237	1.973	840
	14-14		7.533	2.556	1355
4.5 FH	18-18	4½-12	9.905	3.384	2150
	18-16		4.99	1.92	
	16-16		6.50	2.53	
6 HF	18-18	6-12	10.95	2.81	
	18-16		11.79	2.86	
	16-16		14.18	3.68	
	14-14		18.47	4.83	
1% Ns	22	1% -24	.155	.165	
	20		.200	.217	
	18		.299	.302	
	16		.403	.387	

(Continued)

TABLE NO. I—SECTION PROPERTIES AND DIMENSIONAL CHARACTERISTICS^{1, 2} (Continued)

TYPE	GAUGE	DEPTH & WIDTH (in Inches)	I (in) ⁴ (per Foot)	S (in) ³ (per Foot)	END REACTION WITH 3" BEARING (12" Width)
TYPES A, B, H, N AND S					
A	22	1½-24	.121	.118	
	20		.154	.145	
	18		.222	.201	
B and S	24	1½-24	.130	.136	
	22		.183	.209	
	20		.233	.271	
	18		.338	.395	
	16		.440	.502	
	14		.567	.634	
N	22	3-24	.656	.380	
	20		.832	.491	
	18		1.228	.732	
	16		1.649	.943	
	14		2.196	1.209	
3 H	20	3-12	.942	.530	
	18		1.355	.717	
	16		1.690	.880	
4.5 H	20	4½-12	2.49	.97	
	18		3.45	1.30	
	16		4.44	1.64	
	14		5.70	2.07	
6 H	18	6-12	6.81	1.97	
	16		8.70	2.52	
	14		11.58	3.35	
	12		16.05	4.57	
7.5 H	18	7½-12	11.40	2.73	
	16		14.72	3.47	
	14		18.96	4.39	
	12		27.46	6.26	

TABLE NO. I—SECTION PROPERTIES AND DIMENSIONAL CHARACTERISTICS^{1, 2} (Continued)

TYPE	GAUGE	DEPTH & WIDTH (in Inches)	I (in) ⁴ (per Foot)	S (in) ³ (per Foot)	END REACTION WITH 3" BEARING (12" Width)
ACOUSTIDECK					
B	20	1½-24	.174	.209	
	18		.221	.271	
	16		.321	.395	
3 H	20	3-12	.848	.477	
	18		1.220	.645	
	20		2.24	.87	
4.5 H	18	4½-12	3.10	1.17	
	16		4.00	1.48	
	18		6.32	1.79	
6-H	16	6-12	8.16	2.27	
	14		10.94	2.99	
	18		10.67	2.43	
7.5 H	16	7½-12	13.77	3.08	
	14		17.63	3.88	
	20		.79	.47	
N	18	3-24	1.17	.70	
	16		1.57	.90	
	RIBFORM				
Standard	28	¾-28	.012	.034	
Heavy-Duty	26	1½-27	.044	.071	
Super-Duty	24	1¾-27	.104	.133	

TABLE NO. I-A — SECTION PROPERTIES AND DIMENSIONAL CHARACTERISTICS^{1, 2}

T-STEEL ROOF DECK ¹								
TYPE	GAUGE	TOP CHORD IN COMPRESSION		BOTTOM CHORD IN COMPRESSION		SAFE END REACTION		
		"I" per ft.	"S" per ft.	"I" per ft.	"S" per ft.	END BRG.		INT. BRG.
						2 Inches	2 Inches	5 Inches
4.5T	20	2.71	0.94	2.60	0.79	725	414	511
	18	3.74	1.26	3.51	1.08	1713	750	906
	16	4.70	1.56	4.62	1.45	2947	1177	1390
6T	20	5.22	1.32	4.30	1.00	534	361	458
	18	7.03	1.79	6.49	1.54	1257	753	950
	16	8.90	2.25	8.75	2.09	2468	1104	1370
8T	18	13.29	2.58	12.50	2.27	927	666	805
	16	16.80	3.24	16.68	3.04	1818	1013	1225
	15	18.88	3.63	18.84	3.45	2542	1287	1545

¹The properties of Cellufloor, Roof Decks A, B, and H and Acoustideck are based upon a working stress of 20,000 pounds per square inch. The respective working stresses for T-Steel Roof Deck and Ribform are 18,000 and 30,000 pounds per square inch.

²The minimum base metal thicknesses of the various gauge steel are as follows: No. 26 gauge .0179 inch; No. 24 gauge .0239 inch; No. 22 gauge .0299 inch; No. 20 gauge .0359 inch; No. 18 gauge .0478 inch; No. 17 gauge .0538 inch; No. 16 gauge .0598 inch; No. 14 gauge .0747 inch; No. 12 gauge .1046 inch.

TABLE NO. II—WELD SPECIFICATIONS¹

PLUG WELDS					SEAM AND FILLET WELDS			
THICKNESS OF DECK	Burn-off Rate (Inches per Minute)	Welder Setting	Rod Size (Inches)	Rod Type	Burn-off Rate (Inches per Minute)	Welder Setting	Rod Size (Inches)	Rod Type
2 sheets 18-16 Galv.	14	35V 320A	⅝	LH70 E7016	14	35V 200A	⅝	LH70 E7016
1 sheet 18 Galv.	14	35V 200A	⅝	LH70 E7016	12	35V 160A	⅝	LH70 E7016
1 sheet 20 painted	12	70V 200A	⅝	LH20 E7016	11	50V 150A	⅝	Arc Shielded E6012

¹Footnote on page 3.

FOOTNOTE TO TABLE NO. II

¹The rods indicated are made by the Lincoln Electric Company. The ends of all panels are plug welded in the trough of the rib directly to the supporting structural elements except for panels BB, FB, and FC. These panels require a No. 18 gauge closure angle or strip at the ends with appropriate fillet or plug welds to provide diaphragm continuity where trough of the rib is not accessible for welding.

TABLE NO. III — ALLOWABLE DIAPHRAGM SHEAR VALUES IN POUNDS PER FOOT FOR GALVANIZED RIBFORM WITH A LIGHTWEIGHT CONCRETE FILL^{1, 2}

SECTION		ATTACHMENT TO SUPPORTING MEMBERS					
Gauge	Minimum Span "L" to Compute Diaphragm Shears	Heavy		Medium		Light	
		Exterior Support Connection	Interior Support Connection	Exterior Support Connection	Interior Support Connection	Exterior Support Connection	Interior Support Connection
		5	3	5	2	1	1
		Formulas to Compute Allowable Diaphragm Shear ³					
22 (Super Duty Ribform)	6	$\frac{2690}{L} + 346$		$\frac{2290}{L} + 341$		$\frac{1240}{L} + 272$	
24 (Super Duty Ribform)	5	$\frac{1800}{L} + 353$		$\frac{1480}{L} + 343$		$\frac{744}{L} + 269$	
26 (Heavy Duty Ribform)	4	$\frac{1406}{L} + 378$		$\frac{1000}{L} + 358$		$\frac{396}{L} + 263$	

¹The allowable shear values listed are for welded attachments as described in Table No. V-A.

²The lightweight concrete fill shall have a minimum thickness above the top flute of 2 inches and shall conform with the following specifications:

- (a) Oven-dry weight approximately 26 pounds per cubic foot.
- (b) One to six mix by volume of cement to aggregate.
- (c) Aggregate conforms to U.B.C. Standard No. 26-5-67.
- (d) When tested in accordance with ASTM C-495-62T, 3-inch by 6-inch cylinders shall have a minimum compressive strength of 140 pounds per square inch.

³L = deck span in feet between members supporting vertical loads.

TABLE NO. III-A — WELD ATTACHMENTS FOR GALVANIZED RIBFORM WITH LIGHTWEIGHT CONCRETE FILL¹

CONNECTION DESIGNATION	DESCRIPTION OF 27-INCH WIDE DECK CONNECTION TO ALL SUPPORTING MEMBERS
Type 1	One fastener ² at each lap and one intermediate fastener ²
Type 2	One fastener ² at each lap and two intermediate fasteners ²
Type 3	One fastener ² at each lap and fasteners ² in each remaining corrugation
Type 5	One anchor bar ³ support at each lap, two intermediate anchor bar ³ supports and fasteners ² in each remaining corrugation

¹The spacing of welded marginal attachments to chord or strut members parallel to the flutes shall be as follows:

- (a) For diaphragms without anchor bar supports, fasteners shall be spaced 2 feet on center where diaphragm shears are less than 400 pounds per foot and 1 foot on center where diaphragm shears exceed 400 pounds per foot.
- (b) For diaphragms with anchor bar supports, fasteners shall be spaced 2 feet on center staggered with anchor bar supports at 2 feet.

²Fasteners consist of No. 14 gauge Grade C galvanized wing washers $\frac{1}{2}$ -inch deep attached to supporting members through a $\frac{1}{8}$ -inch long by $\frac{3}{8}$ -inch slot in the washer.

³Anchor bar supports consist of a No. 14 gauge Grade C angular member $3\frac{1}{2}$ inches and $3\frac{3}{4}$ inches high for the Heavy Duty Ribform and Super Duty Ribform respectively. The anchor bar is connected to the deck and supporting member with a plug weld through a $\frac{3}{8}$ -inch diameter hole. The anchor bar is notched to support a $\frac{3}{8}$ -inch diameter reinforcing bar.

**TABLE NO. IV—ALLOWABLE DIAPHRAGM SHEARS
IN POUNDS PER FOOT FOR GALVANIZED B DECK WITH WELDED SEAMS**

DECK GAUGE	NUMBER OF END WELDS PER 24" DECK UNIT ^{1, 2}	SEAM ATTACHMENT									
		1½" Seam Welds at 18" on Center					1½" Seam Welds at 12" on Center				
		Deck Span in Feet									
		5	6	7	8	9	5	6	7	8	9
16	3	1450	1290	1200	1110	1070	1320	1540	1460	1370	1340
	5	1760	1570	1430	1310	1260	2020	1830	1700	1580	1550
18	3	980	890	790	750	690	1160	1070	970	930	860
	5	1140	1030	900	840	960	1320	1220	1080	1010	950
20	3	470	420	390	380	350	570	520	490	470	450
	5	560	490	450	420	370	660	590	550	520	490
22	3	290	270	250	230	220	360	340	320	310	300
	5	340	310	270	260	250	410	370	360	340	320

DECK GAUGE	NUMBER OF END WELDS PER 24" DECK UNIT ^{1, 2}	SEAM ATTACHMENT														
		1½" Weld At Mid Span					1½" Weld At Third Points of Span					1½" Weld At Quarter Points of Span				
		Deck Span in Feet														
		5	6	7	8	9	5	6	7	8	9	5	6	7	8	9
16	3	1100	920	790	690	620	1240	1040	900	790	710	1390	1170	1010	890	800
	5	1390	1160	1000	880	780	1550	1300	1120	980	880	1700	1430	1240	1090	970
18	3	720	580	490	430	380	820	680	570	500	430	940	770	650	570	500
	5	880	720	600	530	450	990	810	690	590	520	1010	910	770	660	580
20	3	320	260	230	190	170	390	320	270	230	200	450	370	310	270	240
	5	410	330	290	250	220	470	380	330	280	240	530	430	370	320	280
22	3	190	150	130	120	100	230	190	160	140	130	280	230	200	170	150
	5	240	200	170	150	120	280	240	200	170	150	330	270	230	200	170

¹Puddle welds shall have a fusion area to supporting members not less than ¾ inch by 1 inch. Puddle welds to marginal members shall have a spacing in feet equal to $46,000 t + v$ where t = deck thickness in inches, v = actual diaphragm shear in pounds per foot. In no case shall the spacing of marginal welds exceed the deck span divided by three.

²The three-weld puddle weld pattern shall have the welds placed in the first, third and fifth ribs of each unit.

**TABLE NO. V — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR 24-INCH GALVANIZED OR PAINTED
B DECK WITH BATTON PUNCHED SEAMS¹
(IN POUNDS PER FOOT)**

DECK GAUGE	NUMBER OF WELDS PER PANEL ^{1,2}	SEAMS BOTTOM PUNCHED											
		24" ON CENTER				18" ON CENTER				12" ON CENTER			
		SPAN IN FEET											
		6	7	8	9	6	7	8	9	6	7	8	9
16	3	975	850	760	685	1010	885	790	720	1070	945	855	785
	5	1275	1110	985	885	1305	1140	1015	920	1370	1205	1085	990
18	3	700	615	550	500	725	640	575	525	785	700	635	585
	5	940	820	730	660	970	850	765	695	1030	915	825	755
20	3	405	355	320	290	425	380	345	315	475	425	395	365
	5	535	465	410	365	560	490	435	390	610	535	480	440
22	3	265	235	210	190	285	255	230	210	325	295	270	250
	5	350	305	270	245	370	325	290	265	410	365	330	305

¹The tabulated allowable diaphragm shear values are for painted or galvanized deck in pounds per foot. No increases are permitted for wind or seismic forces.

²Puddle welds shall have a fusion area to the supporting framing members of not less than ¾ inch by one inch. Puddle welds to marginal members shall have a spacing in feet equal to $30,000 t + v$, where: t = deck thickness in inches; v = diaphragm shear in pounds per foot. The spacing shall not exceed 3 feet.

³The three weld puddle weld pattern shall have the welds placed in the first, third, and fifth ribs of each unit.

**TABLE NO. VI — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR 30-INCH GALVANIZED OR PAINTED
TYPE A OR S ROOF DECK WITH WELDED SEAMS¹
(IN POUNDS PER FOOT)**

DECK GAUGE	NUMBER OF WELDS PER SHEET ^{2,3}	WELDED SEAMS ⁴											
		1½" AT 24"				1½" AT 18"				1½" AT 12"			
		SPAN IN FEET											
		5	6	7	8	5	6	7	8	5	6	7	8
18	4	1065	950	865	800	1200	1090	1005	940	1475	1365	1280	1215
	6	1350	1180	1050	960	1485	1310	1190	1095	1765	1590	1465	1375
20	4	490	440	410	385	565	520	485	465	720	675	645	620
	6	615	545	495	460	695	625	575	535	850	780	730	690
22	4	290	270	250	240	345	320	305	295	455	430	415	400
	6	365	330	300	280	420	385	355	335	530	490	465	445

¹The tabulated allowable diaphragm shear values are for painted or galvanized deck in pounds per foot. No increases are permitted for wind or seismic forces.

²Puddle welds shall have a fusion area to the supporting framing members of not less than ¾ inch by one inch. Puddle welds to marginal members shall have a spacing in feet equal to $30,000 t \div v$, where: t = deck thickness in inches; v = diaphragm shear in pounds per foot. The spacing shall not exceed 3 feet.

³The four weld puddle weld pattern shall have the welds placed in the first, third, fourth, and sixth ribs of each unit.

⁴Seam welds to be fillet welds 1½ inches long.

**TABLE NO. VII — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR 24-INCH GALVANIZED OR PAINTED
TYPE S ROOF DECK WITH WELDED SEAMS¹
(IN POUNDS PER FOOT)**

DECK GAUGE	NUMBER OF WELDS PER SHEET ^{2,3}	WELDED SEAMS ⁴											
		1½" AT 24"				1½" AT 18"				1½" AT 12"			
		SPAN IN FEET											
		5	6	7	8	5	6	7	8	5	6	7	8
18	3	1030	915	830	770	1165	1050	970	910	1445	1325	1245	1185
	5	1240	1080	970	890	1375	1220	1110	1025	1655	1495	1385	1305
20	3	475	430	400	375	550	505	475	450	705	665	630	610
	5	580	515	470	435	660	595	550	515	815	750	705	670
22	3	285	260	245	235	340	315	300	290	445	425	410	395
	5	350	315	290	270	405	370	345	325	510	475	450	435

¹The tabulated allowable diaphragm shear values are for painted or galvanized deck in pounds per foot. No increases are permitted for wind or seismic forces.

²Puddle welds shall have a fusion area to the supporting framing members of not less than ¾ inch by one inch. Puddle welds to marginal members shall have a spacing in feet equal to $30,000 t \div v$, where: t = deck thickness in inches; v = diaphragm shear in pounds per foot. The spacing shall not exceed 3 feet.

³The three weld puddle weld pattern shall have the welds placed in the first, third, and fifth ribs of each unit.

⁴Seam welds to be fillet welds 1½ inches long.

**TABLE NO. VIII — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR 24-INCH AND 30-INCH GALVANIZED
OR PAINTED TYPE A OR S ROOF DECK WITH SCREW ATTACHMENTS¹
(IN POUNDS PER FOOT)**

DECK GAUGE	NUMBER OF SCREWS PER SHEET ²		SEAM ATTACHMENT — SCREWS AT 16" O.C. ³							
			24-INCH WIDE SHEETS				30-INCH WIDE SHEETS			
			SPAN IN FEET							
	24" WIDE	30" WIDE	5	6	7	8	5	6	7	8
18	5	6	800	735	695	665	815	750	700	665
20	5	6	515	480	455	440	505	465	440	425
22	5	6	365	345	330	325	350	330	315	305

¹The tabulated allowable diaphragm shear values are for painted or galvanized deck in pounds per foot. No increases are permitted for wind or seismic forces.

²Screws at supports for deck units shall be #14 x ¾-inch Type B305 stainless steel cadmium plated with neoprene washer. Torque to a minimum of 100-inch pounds.

³Screws at side laps between deck unit shall be ¼-inch by ¾-inch TEK screws with .140 point diameter 410 stainless steel with neoprene washers. Torque screws to a minimum of 60-inch pounds.

⁴Fasten deck units to marginal members with #14 x ¾-inch Type B305 stainless steel cadmium plated screws with neoprene washer. Spacing of screws shall not exceed 3 feet or as given in formula $30,000 Cd \times t \div v$; where Cd is constant equal to .35 for screws, t is thickness of deck material in inches, and v = diaphragm shear in pounds per foot.

TABLE NO. IX — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR 24-INCH OR 30-INCH GALVANIZED OR PAINTED TYPE A OR S ROOF DECK WITH SCREW FASTENED SEAMS¹

DECK GAUGE	NUMBER OF END WELDS PER SHEET ^{2,3}		SEAM ATTACHMENT — SCREWS AT 18" O.C. ⁴							
			24-INCH WIDE SHEETS				30-INCH WIDE SHEETS			
			SPAN IN FEET							
	24" WIDE	30" WIDE	5	6	7	8	5	6	7	8
18	3		1315	1205	1125	1065				
	5	6	1525	1370	1265	1185	1635	1465	1345	1255
20	3		635	595	565	540				
	5	6	740	680	635	600	775	710	660	625
22	3		395	375	360	350				
	5	6	460	430	405	385	475	440	415	400

¹The tabulated allowable diaphragm shear values are for galvanized or painted deck in pounds per foot. No increase permitted for wind or seismic forces.

²Puddle welds shall have a fusion area to the supporting framing member of not less than $\frac{3}{8}$ inch by one inch. Puddle welds to marginal members shall have a spacing in feet equal to $30,000 t \div v$; where t = deck material thickness in inches; v = diaphragm shear in pounds per foot. The spacing shall not exceed 3 feet.

³The three weld puddle weld pattern shall have the welds placed in the first, third, and fifth flutes.

⁴Screws for seam fastening shall be $\frac{3}{4}$ by $\frac{3}{4}$ TEK screws with .140 point diameter 410 stainless steel with neoprene washers. Screws to be torqued to minimum of 60 inch pounds.

**TABLE NO. X — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR PAINTED AND GALVANIZED N DECK WITH BUTTON PUNCHED SEAMS
(In Pounds per Foot)**

DECK GAUGE	NO. OF END WELDS PER 24" DECK UNIT ^{1, 2}	GALVANIZED OR PAINTED N DECK	SEAM ATTACHMENT							
			Button Punch at 24" on Center				Button Punch at 12" on Center			
			Span in Feet							
			8	10	12	14	8	10	12	14
16	2	G	430	360	320	290	520	460	410	390
		P	280	240	210	190	340	300	270	250
	4	G	720	590	510	460	800	680	600	550
		P	470	380	330	300	520	440	390	360
18	2	G	290	250	230	210	370	330	310	290
		P	190	160	150	130	240	220	200	190
	4	G	500	420	360	320	580	490	440	400
		P	330	270	240	210	380	320	290	260
20	2	G	170	150	130	120	230	210	200	190
		P	120	100	90	80	150	140	130	120
	4	G	280	240	210	190	340	300	280	260
		P	190	160	140	130	230	200	180	170
22	2	G	120	100	90	---	170	160	150	---
		P	80	70	60	---	110	100	90	---
	4	G	180	160	140	---	230	210	190	---
		P	120	100	90	---	150	140	130	---

¹Round end welds shall have a minimum effective fusion diameter of $\frac{1}{2}$ inch. Oblong end welds shall have an effective fusion area not less than $\frac{1}{8}$ inch by $\frac{3}{4}$ inch.

²Welds to marginal members shall have a spacing in feet equal to $46,000 C_1 t \div v$, where: $C_1 = 1.0$ for galvanized deck and $C_1 = .65$ for painted deck, t = deck thickness in inches, v = diaphragm shear in pounds per foot. In no case shall the spacing exceed the deck span divided by three.

³The two-weld end weld pattern shall have the welds placed in the first and third ribs of each unit.

TABLE NO. XI — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR GALVANIZED AND PAINTED N DECK WITH WELDED SEAMS
(In Pounds per Foot)

DECK GAUGE	NO. OF END WELDS PER 24" DECK UNIT ^{1, 2}	GALVANIZED OR PAINTED N DECK	SEAM ATTACHMENT							
			1½" Welds at 24" on Center				1½" Welds at 12" on Center			
			Span In Feet							
			8	10	12	14	8	10	12	14
16	2	G	740	680	640	620	1130	1080	1050	1040
		P	480	440	410	390	730	700	680	660
	4	G	1000	890	820	770	1380	1280	1220	1190
		P	650	580	530	500	890	830	790	770
18	2	G	480	430	410	390	760	720	690	670
		P	340	320	300	290	540	520	510	500
	4	G	680	590	530	490	960	870	810	770
		P	470	420	390	370	660	620	590	580
20	2	G	230	220	210	200	390	380	360	350
		P	210	200	190	180	350	340	330	320
	4	G	320	290	260	240	480	440	420	400
		P	280	260	240	230	420	400	380	370
22	2	G	150	140	130	---	260	250	240	---
		P	140	130	120	---	250	240	230	---
	4	G	200	180	170	---	310	290	280	---
		P	190	170	160	---	290	280	270	---

¹Round end welds shall have a minimum effective fusion diameter of ½ inch. Oblong end welds shall have an effective fusion area not less than ⅛ inch by ¾ inch.

Welds to marginal members shall have a spacing in feet equal to $46,000 C_1 t + v$, where: $C_1 = 1.0$ for galvanized deck and $C_1 = .65$ for painted deck, t = deck thickness in inches, v = diaphragm shear in pounds per foot. In no case shall the spacing exceed the deck span divided by three.

²The two-weld end weld pattern shall have the welds placed in the first and third ribs of each unit.

TABLE NO. XII — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR GALVANIZED AND PAINTED 1½" N_s DECK
(In Pounds per Foot)

DECK GAUGE	NO. OF END WELDS PER 24" DECK UNIT ^{1, 2}	GALVANIZED OR PAINTED	SEAM ATTACHMENT								
			1½" Welds at 24" O.C.			1½" Welds at 18" O.C.			1½" Welds at 12" O.C.		
			Span (In Feet)								
			6	7	8	6	7	8	6	7	8
22	2	G	234	221	211	283	270	260	380	367	357
		P	233	221	211	281	270	260	377	367	357
	4	G	293	270	253	342	319	302	439	416	399
		P	293	270	253	342	319	302	439	416	399
20	2	G	368	344	326	438	414	396	578	554	536
		P	322	304	291	383	366	354	505	490	479
	4	G	470	429	398	540	499	468	680	639	608
		P	442	410	387	507	477	455	639	611	591
18	2	G	742	685	642	867	809	767	1115	1058	1015
		P	501	469	446	585	555	533	754	725	706
	4	G	966	871	800	1090	995	924	1339	1244	1173
		P	701	645	605	791	737	699	972	922	887

¹Puddle welds shall have a fusion area to the supporting framing members not less than ¾ inch by 1 inch. Puddle welds to marginal members shall have a spacing in feet equal to $30,000 t + v$. Where t = deck thickness in inches, v = diaphragm shear in pounds per foot. In no case shall the spacing exceed 3 feet.

²The two puddle weld patterns shall have the welds placed in the first and third ribs of each unit.

TABLE NO. XIII — ALLOWABLE DIAPHRAGM SHEAR IN POUNDS PER FOOT FOR GALVANIZED
4.5T, 6T AND 8T DECK BASED ON DECK GAUGE AND SEAM WELDING¹

Deck Gauge	Spacing of 1½-Inch Long Seam Welds				
	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"
15	—	—	—	1080	750
16	—	—	—	960	670
18	—	—	1040	770	530
20	—	780	580	470	390

¹See Table No. XIV for shear values based on type of shear transfer element.

TABLE NO. XIV — ALLOWABLE DIAPHRAGM SHEAR VALUES IN POUNDS PER FOOT BASED ON TYPE OF SHEAR TRANSFER ELEMENT

GAUGE OF SHEAR TRANSFER ELEMENT	CONTINU- OUS ANGLE	SHEAR PLATE				PROFILE CHANNEL			
		1'-0" o.c.	2'-0" o.c.	3'-0" o.c.	4'-0" o.c.	1'-0" o.c.	2'-0" o.c.	3'-0" o.c.	4'-0" o.c.
Height = 4½ Inches									
14			720	480	360		950	670	480
16	1020	920	460	300	230		610	410	300
18	650	590	290	200	150	780	390	260	200
20	340	330	160	110	80	440	220	150	110
Height = 8 Inches									
14			620	410	310		830	550	420
16	880	790	400	260	200	1060	530	350	260
18	560	510	250	170	130	680	340	230	170
20	320	290	140	90	70	380	190	130	100
Height = 8 Inches									
14			540	360	270		710	480	360
16	760	690	340	230	170	910	460	300	230
18	490	440	220	150	110	590	290	200	150
20	270	250	120	80	60	330	160	110	80

¹The thickness of starting channels shall be at least of the same thickness steel as is the deck section. The welds connecting the deck to the starting channels shall be at least the same size and spacing as provided in the seams.

²Starting channels and deck sections transferring shear from diaphragm web to framing shall be welded to the framing with fillet welds at least the same size and spacing as the seam welds.

³The gauge of continuous closure angles, profile channels, and shear plates shall be that required to resist the design shears.

⁴Continuous closure angles shall be welded to the deck and to the framing with 1½-inch fillet welds at 12 inches on center.

⁵Profile channels shall be welded to the deck and framing member with two 1-inch fillet welds spaced at 8 inches on center minimum, top and bottom.

⁶Shear plates shall be welded to the deck and framing members with four 1-inch long welds top and bottom.

⁷At the ends of deck units, the diaphragm shear may be transferred to adjacent units by splice plates. The splice plates shall have a stiffener rib in the center comparable to the stiffener ribs of the deck top elements. The total width of splice plate shall not exceed 5 inches. The thickness of the splice plate steel shall be at least the same as the adjacent deck units. Fillet welds of the same size and spacing as the seam welds shall be used at the edges of the splice plate to fasten it to the top elements of deck units on each side of the splice.

TABLE NO. XV—ALLOWABLE DIAPHRAGM SHEARS FOR GALVANIZED
CELLULAR STEEL AND GALVANIZED TYPE N ROOF DECKS

TYPE OF DECK	MAXIMUM UNSUPPORTED SPAN OF DECK ¹	CONCRETE FILL		Allowable Shear (Pounds per Foot)	Weld Pattern
		Minimum Thickness (in inches)	Ultimate Strength (Pounds per Square Inch)		
BF18-18	8'0"	Not required		820	B
BF18-16	8'0"	Not required		1030	B
BF16-16	8'0"	Not required		1140	B
BF18-18	8'0"	2½	2000	1510	B
BF18-18	8'0"	2½	2500	1600	B
BF18-18	8'0"	2½	3500	2370	B
BF18-16	8'0"	2½	2000	1580	B
BF18-16	8'0"	2½	2500	1690	B
BF18-16	8'0"	2½	3500	2450	B
BF18-16	8'0"	2½	3500	2610	B
BF16-16	8'0"	2½	2000	1650	B
BF16-16	8'0"	2½	2500	1750	B
BF16-16	8'0"	2½	3500	2520	B
FB18-16	12'0"	Not required		710	C
BB18-18	12'0"	Not required		235	B
BB18-16	12'0"	Not required		294	B
BB16-18	12'0"	Not required		330	B
BB18-16	12'0"	2½	2000	1060	B
BB18-16	12'0"	2½	2500	1330	B
BB18-16	12'0"	2½	3500	1860	B
FC18-16	18'0"	Not required		710	C
3HF18-16	7'6"	Not required		1010	D
3HF16-16	8'6"	Not required		930	D
3HF18-16	7'6"	2½	2000	1670	D
3HF16-16	8'6"	2½	2000	1630	D

WELD PATTERNS

(A)

At diaphragm perimeter: ¼-inch diameter plug welds—two per panel at end bearing, ½-inch fillet 12 inches on center on closure angle.

At panel sides located at diaphragm perimeter members: 2½-inch fillets 12 inches on center.

At diaphragm interior connections: ¼-inch diameter plug welds 18 inches on center.

Side Laps: Dimpled at 24 inches on center.

(B)

At diaphragm perimeters: ¼-inch diameter plug welds—three per panel at end bearing.

At panel sides located at diaphragm perimeter members: ¼-inch diameter plug weld 12 inches on center.

At diaphragm interior connections: ¼-inch diameter plug welds—12 inches on center.

Side Laps: Dimpled at 12 inches on center.

(C)

At diaphragm perimeters: ¼-inch diameter plug welds—two per panel at end bearing, ¼-inch fillet at 12 inches on center on closure angle.

At panel sides located at diaphragm perimeter members: 1½ inches fillet weld at 18 inches on center.

At diaphragm interior connections: 1½-inch fillet at 18 inches on center.

Side lap connections: 1-inch fillet at 24 inches on center.

(D)

At all supports: ¼-inch diameter plug welds—two per panel.

At panel sides located at diaphragm perimeter members: ¼-inch diameter plug welds at 18 inches on center.

Side Lap connections: Button punched 24 inches on center.

¹All spans may be increased up to a maximum of one-third provided the allowable shear is multiplied by the factor " L_v/L_s " where " L_s " is the span to be used and " L_v " is the allowable span in Table No. VI. In no case shall the span exceed that allowed for vertical loads.

TABLE NO. XVI—ALLOWABLE DIAPHRAGM SHEAR VALUES FOR GALVANIZED 4.5", 6" OR 7.5" DEEP
TYPE HF ROOF DECK¹
(IN POUNDS PER FOOT)

DECK GAUGE	NUMBER OF WELDS PER PANEL AT SUPPORTS ²	SEAM: BOTTOM PUNCHED AT 24" O.C.												
		SPAN IN FEET												
		18	19	20	21	22	23	24	25	26	27	28	29	30
16-16	3	440	425	410	395	380	370	360	350	340	335	325	320	315
18-18	3	365	350	340	325	315	310	300	290	285	280	270	265	255

¹The tabulated allowable diaphragm shear values are for painted or galvanized deck in pounds per foot. No increases are permitted for seismic or wind forces.

²Puddle welds shall have a fusion area to the supporting framing members of not less than ¼-inch diameter. Puddle welds to marginal members shall have a spacing in feet equal to $30,000 (t_1 + t_2/4) + v$; where t_1 and t_2 are thickness of deck sheet in inches; and v is diaphragm shear in pounds per foot. Spacing shall not exceed 3 feet.

³Values are for acoustic or non-acoustic decks.

TABLE NO. XVII — ALLOWABLE DIAPHRAGM SHEAR VALUES FOR GALVANIZED OR PAINTED TYPE H
ROOF DECK¹
(IN POUNDS PER FOOT)

DEPTH	GAUGE	NUMBER OF END WELDS PER SHEET ²	SEAMS															
			UNFASTENED								1" x 3/8" WELDS @ 3' ³							
			SPANS (FEET)															
			12'	13'	14'	15'	16'	17'	18'		12'	13'	14'	15'	16'	17'	18'	
4.5	16	2				335	315	295	280					610	595	585	575	
	18	2			245	230	215	200					395	380	370	360		
	20	2	150	140	130	120					205	200	195	190				
			18'	19'	20'	21'	22'	23'	24'	25'	18'	19'	20'	21'	22'	23'	24'	25'
6	16	2				230	220	210	200	195				530	525	520	515	505
	18	2	175	165	160	150	145				345	340	335	325	320			
			22'	23'	24'	25'	26'	27'	28'		22'	23'	24'	25'	26'	27'	28'	
7.5	16	2			195	185	180	170	165				495	495	590	490	485	
	18	2	135	130	125	120	115				320	315	310	305	300			

¹The tabulated allowable diaphragm shear values are for painted or galvanized deck in pounds per foot. No increases are permitted for wind or seismic forces.

²Puddle welds shall have a fusion area to the supporting framing members of not less than 1/2-inch diameter. Puddle welds to marginal members shall have a spacing in feet equal to $30,000 t \div v$, where: t = deck thickness in inches; v = diaphragm shear in pounds per foot. The spacing shall not exceed 3 feet.

³Seam welds to be 1-inch x 3/8-inch plug welds located at center of valley through both deck thicknesses.

⁴Values are for acoustic or non-acoustic decks.

TABLE NO. XVIII — SECTION PROPERTIES¹ — HI-BOND

TYPE DECK	GAUGE	GAL- VANIZED WEIGHT (Lbs. per Sq. Ft.)	I INCH ⁴	S INCH ³	AREA INCH ²	Σo ² INCH	Y INCH
B	22	2.00	.183	.209	.545	13.25	.870
	20	2.50	.233	.271	.650	13.25	.873
	18	3.20	.338	.395	.858	13.25	.877
	16	3.90	.440	.502	1.065	13.25	.881
BR	22	2.00	.183	.209	.545	13.25	.645
	20	2.50	.233	.271	.650	13.25	.645
	18	3.20	.338	.395	.858	13.25	.647
	16	3.90	.440	.502	1.065	13.25	.649
N	22	2.40	.66	.38	.63	17.13	1.827
	20	2.80	.83	.49	.75	17.13	1.832
	18	3.60	1.23	.73	1.00	17.13	1.841
	16	4.45	1.62	.94	1.25	17.13	1.851
1 1/2 NF	20-20		.37	.27	1.04	9.93	.46
	18-20		.51	.40	1.22	9.93	.57
	18-18		.56	.41	1.37	9.93	.50
	18-16		.58	.42	1.44	9.93	.61
	16-16		.75	.58	1.66	9.93	.67
3 NF	20-20		1.45	.59	1.18	17.13	1.10
	18-20		1.98	.88	1.41	17.13	1.35
	18-18		2.12	.90	1.56	17.13	.95
	18-16		2.25	.92	1.72	17.13	.87
	16-16		2.86	1.25	1.94	17.13	1.01
BF	20-20		.37	.30	.99	13.25	.61
	18-20		.50	.45	1.26	13.25	.64
	18-18		.58	.46	1.42	13.25	.50
	18-16		.61	.47	1.57	13.25	.47
3 NV	18-20		1.71	.72	1.26	17.13	1.26
	18-18		1.85	.73	1.42	17.13	1.13
	18-16		1.96	.74	1.59	17.13	1.02
	16-18		2.36	1.01	1.61	17.13	1.24

¹Section properties per foot of cross section.

²Σo = Assumed effective bonding perimeter.

TABLE NO. XIX' — TOTAL ALLOWABLE SUPERIMPOSED LOAD FOR UNSHORED HI-BOND DECKS
TYPES B, BF, S, SR, BR, 1½ NF, 3 N, 3 NF AND 3 NV' (In Pounds per Square Foot)

TYPES B AND BF									
Slab Thickness ¹	4 Inches			4½ Inches			4¾ Inches		
Resisting Moment Ft. lb/Ft. Width	1600			1800			1900		
Maximum Shear V Ft. lb/Ft. Width	700			800			850		
Deck Span Condition	One Span	Two Span	Three Span	One Span	Two Span	Three Span	One Span	Two Span	Three Span
Span	Allowable Superimposed Load								
6'-0"	230	230	230	250	250	250	250	250	250
6'-6"	215	215	215	245	245	245	250	250	250
7'-0"	200	200	200	230	230	230	245	245	245
7'-6"	185	185	185	215	215	215	225	225	225
8'-0"	175	175	175	200	200	200	210	210	210
8'-6"	165	164	165	190	190	190	200	200	200
9'-0"	155	155	155	175	175	175	185	185	185
9'-6"	140	140	140	160	160	160	170	170	170
10'-0"	130	130	130	145	145	145	150	150	150
10'-6"	—	115	115	—	130	130	—	140	140
11'-0"	—	105	105	—	120	120	—	125	125
11'-6"	—	—	95	—	—	110	—	—	115
12'-0"	—	—	90	—	—	100	—	—	105
TYPES S AND SR									
Slab Thickness ¹	4 Inches			4½ Inches			4¾ Inches		
Resisting Moment Ft. lb/Ft. Width	1600			1800			2000		
Maximum Shear V Ft. lb/Ft. Width	600			700			800		
Deck Span Condition	One Span	Two Span	Three Span	One Span	Two Span	Three Span	One Span	Two Span	Three Span
Span	Allowable Superimposed Load								
6'-0"	200	200	200	200	200	200	200	200	200
6'-6"	185	185	185	200	200	200	200	200	200
7'-0"	170	170	170	200	200	200	200	200	200
7'-6"	160	160	160	185	185	185	200	200	200
8'-0"	150	150	150	175	175	175	185	185	185
8'-6"	140	140	140	165	165	165	175	175	175
9'-0"	135	135	135	155	155	155	165	165	165
9'-6"	125	125	125	145	145	145	160	160	160
10'-0"	120	120	120	140	140	140	—	—	150
10'-6"	—	—	115	—	—	135	—	—	135
11'-0"	—	—	105	—	—	120	—	—	—
TYPES BR AND 1½ NF									
Slab Thickness ¹	4 Inches			4½ Inches			5 Inches		
Resisting Moment Ft. lb/Ft. Width	1600			1800			2000		
Maximum Shear V Ft. lb/Ft. Width	700			800			900		
Deck Span Condition	One Span	Two Span	Three Span	One Span	Two Span	Three Span	One Span	Two Span	Three Span
Span	Allowable Superimposed Load								
6'-0"	200	200	200	200	200	200	200	200	200
6'-6"	200	200	200	200	200	200	200	200	200
7'-0"	200	200	200	200	200	200	200	200	200
7'-6"	195	195	195	200	200	200	200	200	200
8'-0"	180	180	180	200	200	200	200	200	200
8'-6"	170	170	170	180	200	200	180	200	200
9'-0"	160	160	160	—	180	180	160	180	190
9'-6"	140	145	145	—	160	165	—	160	170
10'-0"	—	130	130	—	140	150	—	140	155

(Continued)

TABLE NO. XIX' — TOTAL ALLOWABLE SUPERIMPOSED LOAD FOR UNSHORED HI-BOND DECKS
TYPES B, BF, S, SR, BR, 1½ NF, 3 N, 3 NF AND 3 NV' (In Pounds per Square Foot) (Continued)

Slab Thickness ¹	TYPES 3 N AND 3 NF								
	5½ Inches			6 Inches			6¼ Inches		
Resisting Moment Ft. lb./Ft. Width	2100 (For 3 N) 3400 (For 3 NF)			2300 (For 3 N) 3700 (For 3 NF)			2400 (For 3 N) 3850 (For 3 NF)		
Maximum Shear V Ft. lb./Ft. Width	900			1000			1050		
Deck Span Condition	One Span	Two Span	Three Span	One Span	Two Span	Three Span	One Span	Two Span	Three Span
Span	Allowable Superimposed Load								
6'-0"	200	200	200	200	200	200	200	200	200
6'-6"	200	200	200	200	200	200	200	200	200
7'-0"	200	200	200	200	200	200	200	200	200
7'-6"	200	200	200	200	200	200	200	200	200
8'-0"	200	200	200	200	200	200	200	200	200
8'-6"	200	200	200	200	200	200	200	200	200
9'-0"	200	200	200	200	200	200	200	200	200
9'-6"	185	185	185	200	200	200	200	200	200
10'-0"	170	170	170	185	185	185	190	190	190
10'-6"	150	150	150	165	165	165	175	175	175
11'-0"	140	140	140	150	150	150	160	160	160
11'-6"	130	130	130	140	140	140	145	145	145
12'-0"	115	115	115	125	125	125	135	135	135
12'-6"	105	105	105	115	115	115	125	125	125
13'-0"	90	100	100	85	110	110	115	115	115
13'-6"	75	90	90	—	105	105	—	110	110
14'-0"	—	85	85	—	95	95	—	100	100
Slab Thickness ¹	TYPE 3 NV								
	5½ Inches			6 Inches			6¼ Inches		
Resisting Moment Ft. lb./Ft. Width	4110			4500			4680		
Maximum Shear V Ft. lb./Ft. Width	1370			1500			1560		
Deck Span Condition	One Span	Two Span	Three Span	One Span	Two Span	Three Span	One Span	Two Span	Three Span
Span	Allowable Superimposed Load								
9'-0"	250	250	250	250	250	250	250	250	250
9'-6"	250	250	250	250	250	250	250	250	250
10'-0"	250	250	250	250	250	250	250	250	250
10'-6"	245	245	245	250	250	250	250	250	250
11'-0"	230	230	230	250	250	250	250	250	250
11'-6"	220	220	220	245	245	245	250	250	250
12'-0"	215	215	215	235	235	235	245	245	245
12'-6"	195	195	195	215	215	215	225	225	225
13'-0"	180	180	180	200	200	200	205	205	205
13'-6"	170	170	170	185	185	185	190	190	190
14'-0"	155	155	155	170	170	170	180	180	180
14'-6"	145	145	145	160	160	160	165	165	165
15'-0"	135	135	135	150	150	150	155	155	155

¹Use Table No. XIX in conjunction with Table No. XIX-A.

Example:

Problem: Select a Hi-Bond Deck section not more than 4½ inches thick capable of supporting a total superimposed load of 180 pounds per square foot and spanning 7½ feet each for a two-span condition.

Solution: From Table No. XIII a 4½-inch thick slab of a Type S or SR deck section is acceptable. To determine the minimum gauge of steel deck required, refer to Table No. XIII-A to obtain the following alternate solutions.

Type S, 4½-inch regular weight concrete fill — No. 18 gauge.

Type SR, 4½-inch light weight concrete fill — No. 20 gauge.

Type SR, 4½-inch regular weight concrete fill — No. 18 gauge.

Type SR, 4½-inch light weight concrete fill — No. 20 gauge.

Design Criteria:

- As form: Deck gauge based on dead weight of slab plus 20 pounds per square foot. $f_s = 20,000$ pounds per square inch.
- As composite concrete/steel deck: Maximum stresses (not to be exceeded) $f_c = 1350$ pounds per square inch. ($f_c = 3000$ pounds per square inch minimum); $f_s = 20,000$ pounds per square inch (represents sum of stress as both form and composite section); $u = 40$ pounds per square inch.
- Moment: $M = WL^2/8$.
- Shear: $V = WL/2$.
- Temperature reinforcing shall be provided in accordance with Section 2617 of the Uniform Building Code except the ratio of reinforcement to the area of concrete may be 0.001 with a minimum of 10 by 10-10/10 EWM in size.

¹Slab thicknesses shown indicate the dimension from the lower face of the bottom flute or plate to the top of the concrete fill.

TABLE NO. XIX-A' — MAXIMUM ALLOWABLE SPANS FOR HI-BOND DECKS
TYPES B, BF, S, SR, BR, 1½ NF, 3 N, 3 NF AND 3 NV

TYPE B															
Slab Thickness	4" Regular			4½" Regular			4" Lightweight			4½" Lightweight			4¾" Lightweight		
Weight (Pounds per Sq. Ft.)	40			45			32			35			37		
Deck Span Condition	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span
Gauge²	Maximum Span (In Feet)														
22	6.5	7	7.5	6	7	7	6.5	7.5	8	6.5	7.5	7.5	6.5	7	7.5
20	7	8	8.5	6.5	7.5	8	7.5	8.5	9	7.5	8.5	9	7	8	8.5
18	8.5	10.5	11.5	8.5	10	10.5	9.5	12	12	9.5	11.5	12	9	11	12
16	10	12	12	9.5	12	12	11.5	12	12	11	12	12	10.5	12	12
TYPE BF															
20-20	8	9.5	10.5	7.5	9	10	8.5	10	11	8	9.5	11	8	9.5	10.5
18-20	9.5	10	11.5	9	9.5	11	10	10.5	12	10	10.5	12	9.5	10.5	11.5
18-18	9.5	10.5	12	9	10	11.5	10	11	12	10	11	12	9.5	11	12
18-16	9.5	11	12	9	10.5	11.5	10	11.5	12	10	11	12	10	11	12
TYPE S															
Slab Thickness	4" Regular			4½" Regular			4" Lightweight			4½" Lightweight			4¾" Lightweight		
Weight (Pounds per Sq. Ft.)	38			44			29			33			36		
Deck Span Condition	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span
Gauge	Maximum Span (In Feet)														
22	6.5	6.5	7.5	6	6	7	7	7	8	7	7	7.5	6.5	6.5	7.5
20	7.5	7.5	8.0	7	7	8	8	8	8.5	7.5	7.5	8.5	7.5	7.5	8
18	8.5	8.5	9.5	8	8	9.5	9	9	10.5	9	9	10.5	9	9	10
16	9.5	9.5	11	9	9	10.5	10.5	10.5	11.5	10	10	11.5	9.5	9.5	11
TYPE SR															
Slab Thickness	4" Regular			4½" Regular			4" Lightweight			4½" Lightweight			4¾" Lightweight		
Weight (Pounds per Sq. Ft.)	44			50			34			39			41		
Deck Span Condition	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span
Gauge	Maximum Span (In Feet)														
22	6	6	7	6	6	6.5	7	7	7.5	6.5	6.5	7	6.5	6.5	7
20	7	7	8	6.5	6.5	7.5	7.5	7.5	8.5	7.5	7.5	8	7	7	8
18	8.5	8.5	9	8	8	8.5	9	9	10	8.5	8.5	9.5	8.5	8.5	9
16	9	9	10.5	9	9	10	10	10	11	9.5	9.5	11	9.5	9.5	10.5
TYPE BR															
Slab Thickness	4" Regular			4½" Regular			4" Lightweight			4½" Lightweight			5" Lightweight		
Weight (Pounds per Sq. Ft.)	44			50			34			39			44		
Deck Span Condition	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span
Gauge	Maximum Span (In Feet)														
22	6.5	6.5	7	6	6	6.5	6.5	7.5	8	6.5	7	7.5	6	6.5	7
20	7	7	7.5	6.5	6.5	7.5	7.5	8.5	9	7.5	8	8.5	7	7.5	8
18	8	8	9	8	8	8.5	9.5	10	10	9.5	10	10	8.5	9.5	10
16	9	9	10	9	9	10	10	10	10	10	10	10	9.5	10	10

(Continued)

TABLE NO. XIX-A' — MAXIMUM ALLOWABLE SPANS FOR HI-BOND DECKS
TYPES B, BF, S, SR, BR, 1½ NF, 3 N, 3 NF AND 3 NV (Continued)

TYPE 1½ NF															
Slab Thickness	4" Regular			4½" Regular			4" Lightweight			4½" Lightweight			5" Lightweight		
Weight (Pounds per Sq. Ft.)	40			46			35			40			44		
Deck Span Condition	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span
Gauge²	Maximum Span (In Feet)														
18-20	9	9.5	10.5	8.5	9	10	9	10	10.5	8.5	9.5	10.5	8.5	9.5	10.5
18-18	9	10.5	11.5	8.5	10	11.5	9.5	11	11.5	8.5	10.5	12	8.5	10.5	12
18-16	9	11.5	11.5	8.5	11	12	9.5	11	11.5	8.5	11	12	8.5	11.5	12
16-16	9	11.5	11.5	8.5	11	12	9.5	11.5	11.5	8.5	11	12	8.5	11.5	12
TYPE 3 N															
Slab Thickness	5½" Regular			6" Regular			5½" Lightweight			6" Lightweight			6¼" Lightweight		
Weight (Pounds per Sq. Ft.)	47			54			37			45			42		
Deck Span Condition	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span
Gauge²	Maximum Span (In Feet)														
22	7.5	9	8.5	7.5	8.5	8.5	8	10	9.5	8	9.5	9.5	8	9	9.5
20	8.5	10	10.5	8.5	9.5	10	9	11	12	9	10.5	11.5	9	10.5	11
18	11	12	13.5	10.5	11.5	13	12.5	13	14	12	12.5	14	11.5	12	12.5
16	13	13.5	14	12.5	13	14	14	14	14	13.5	14	14	13.5	14	14
TYPE 3 NF															
18-20	10.5	13.5	14	10	13	14	11	14	14	10.5	14	14	10.5	13.5	14
18-18	12.5	14	14	12	14	14	13.5	14	14	13	14	14	12.5	14	14
18-16	12.5	14	14	12.5	14	14	13.5	14	14	13	14	14	13	14	14
16-16	14	14	14	13.5	14	14	14	14	14	14	14	14	14	14	14
TYPE 3 NV															
Slab Thickness	Regular			Regular			5½" Lightweight			6" Lightweight			6¼" Lightweight		
Weight (Pounds per Sq. Ft.)							44			50			53		
Deck Span Condition	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span	1 Span	2 Span	3 Span
Gauge²	Maximum Span (In Feet)														
18-20							15	15	15	14.5	15	15	14	15	15
18-18							15	15	15	14.5	15	15	14	15	15
18-16							15	15	15	14.5	15	15	14.5	15	15
16-18							15	15	15	14.5	15	15	15	15	15

¹Use Table No. XIX-A in conjunction with Table No. XIX. See Examples in Footnote No. 1 of Table No. XIX.

²Where two gauges are indicated, the first represents the thickness of the fluted section and the second represents the plate thickness.

**TABLE NO. XX — TOTAL ALLOWABLE SUPERIMPOSED LOAD
FOR TYPE BR HI-BOND DECK WITH MIDSPAN SHORING**

GAUGE	Slab Thickness ¹	4 Inches		4½ Inches		5 Inches	
	Weight ²	44 #/Ft. ²		50 #/Ft. ²		56 #/Ft. ²	
	Temporary Bars	#3 @ 13½"		#3 @ 12"		#3 @ 11"	
	Top Bars ³	#3 @ 10"	#4 @ 8"	#4 @ 10"	#4 @ 7"	#3 @ 10"	#4 @ 6"
	+ M — in Ft. Lbs.	1600	1600	1800	1800	2000	2000
	V — in Lbs.	900	900	1000	1000	1100	1100
	— M in Ft. Lbs.	560	1300	650	1700	740	2300
	Span	Superimposed Load (Pounds per Sq. Ft.) ⁴					
20	10'-6"		74		104		118
	11'-0"		63		90		109
	11'-6"		54		79		95
	12'-0"				68		83
18	12'-6"				59		72
	13'-0"				50		62
	13'-6"						54
	14'-0"						46

¹The thickness shown is measured above the bottom flute of the deck.

²As a form the shored deck can support the weight of the wet concrete plus a construction live load of 20 pounds per square foot.

³The negative reinforcement specified is based on a ¼-inch maximum clearance from the top of the slab and will develop the negative resisting moment shown in the Table.

⁴In addition to the slab dead weight the tabulated superimposed load can be supported as a composite concrete/steel deck. See Footnote No. 2, Table No. XIII for design stress criteria.

**TABLE NO. XXI
ALLOWABLE DIAPHRAGM SHEAR FOR GALVANIZED OR PHOSPHATED/PAINTED
HI-BOND WITH CONCRETE FILL¹**

SECTION	GAUGE	PUDDLE WELD AT SUPPORT ^{2, 3}	CONCRETE OVEN DRY DENSITY					CONCRETE OVEN DRY DENSITY				
			MINIMUM 100#/FT. ³					MINIMUM 145#/FT. ³				
			DECK SPAN					DECK SPAN				
			6'0"	7'0"	8'0"	9'0"	10'0"	6'0"	7'0"	8'0"	9'0"	10'0"
			ALLOWABLE SHEAR (IN #/FT.)					ALLOWABLE SHEAR (IN #/FT.)				
B BF ₂ BF ₃	22	3 Welds Per Unit	1190	1100	1030	980	940	1610	1520	1460	1410	1370
	20		1310	1200	1120	1060	1010	1730	1630	1550	1490	1440
	18		1540	1410	1310	1230	1160	1980	1840	1730	1650	1590
	16		1780	1610	1480	1380	1310	2220	2050	1920	1820	1740
	22	5 Welds Per Unit	1340	1230	1150	1080	1030	1770	1660	1570	1550	1460
	20		1490	1360	1260	1190	1130	1920	1790	1690	1610	1550
	18		1800	1630	1500	1390	1310	2230	2050	1920	1820	1740
	16		2100	1880	1720	1600	1490	2540	2320	2150	2020	1920
SR BR	22	Welds at 6" o.c.	1450	1410	1370	1350	1330	1580	1560	1540	1520	1510
	20		1510	1460	1420	1390	1360	1610	1580	1560	1550	1530
	18		1630	1560	1510	1470	1440	1670	1640	1610	1590	1570
	16		1760	1670	1600	1550	1510	1720	1680	1650	1630	1610
	22	Welds at 12" o.c.	1270	1200	1150	1100	1070	1790	1750	1710	1670	1640
	20		1380	1290	1220	1170	1130	1860	1800	1760	1720	1700
	18		1580	1470	1380	1310	1250	1990	1920	1860	1810	1780
	16		1790	1640	1530	1450	1380	2110	2020	1960	1900	1860
SF3	18-16	Welds at 6" o.c.	2070	1890	1740	1640	1550	2060	1990	1930	1890	1850
BF	18-16	3 Welds Per Unit	2720	2420	2190	2020	1870	2850	2710	2590	2460	2320
	18-16	5 Welds Per Unit	3300	2920	2630	2400	2220	3080	2930	2800	2700	2610
3 RF	18-18	2 Welds ⁴ Per Unit	2020	1980	1950	1910	1890	1870	1830	1800	1770	1760
	18-16		2070	2010	1970	1950	1910	1910	1870	1830	1800	1780

(Continued)

TABLE NO. XXI
ALLOWABLE DIAPHRAGM SHEAR FOR GALVANIZED OR PHOSPHATED/PAINTED
HI-BOND WITH CONCRETE FILL¹ (Continued)

SECTION	GAUGE	PUDDLE WELD AT SUPPORT ²	CONCRETE OVEN DRY DENSITY					CONCRETE OVEN DRY DENSITY				
			MINIMUM 100#/FT. ³					MINIMUM 145#/FT. ³				
			DECK SPAN					DECK SPAN				
			6'0"	7'0"	8'0"	9'0"	10'0"	6'0"	7'0"	8'0"	9'0"	10'0"
			ALLOWABLE SHEAR (IN #/FT.)					ALLOWABLE SHEAR (IN #/FT.)				
			DECK SPAN					DECK SPAN				
			7'0"	8'0"	9'0"	10'0"	12'0"	7'0"	8'0"	9'0"	10'0"	12'0"
			ALLOWABLE SHEAR (In #/Ft.)					ALLOWABLE SHEAR (In #/Ft.)				
3N	22	2 Welds ⁴ Per Unit	—	1040	990	950	890	—	1480	1430	1390	1330
	20		—	1120	1070	1020	950	—	1570	1510	1460	1390
	18		—	1300	1220	1160	1070	—	1740	1660	1600	1510
	16		—	1480	1380	1300	1180	—	1920	1820	1740	1630
	22	4 Welds Per Unit	1170	1100	1040	990	920	1610	1540	1480	1440	1370
	20		1280	1200	1130	1080	990	1720	1640	1570	1520	1430
	18		1510	1390	1300	1230	1120	1950	1840	1750	1680	1565
	16		1740	1590	1480	1390	1250	2180	2040	1930	1840	1700
1 1/2" & 3NF	20-20	2 Welds ⁴ Per Unit	1700	1610	1540	1480	1390	2220	2120	2050	1990	1900
	18-20		1790	1680	1600	1530	1430	2300	2190	2110	2040	1940
	18-18		1920	1800	1700	1620	1500	2430	2310	2210	2150	2010
	18-16		2060	1910	1800	1710	1580	2570	2420	2310	2220	2080
	20-20	4 Welds Per Unit	1800	1690	1610	1540	1440	2310	2200	2120	2050	1950
	18-20		1890	1770	1680	1600	1490	2400	2280	2190	2110	2000
	18-18		2040	1900	1790	1700	1570	2550	2410	2300	2210	2080
	18-16		2200	2030	1910	1810	1660	2710	2550	2420	2320	2170

¹Concrete fill shall be not less than 2 1/4 inches above the top flute of the steel deck and shall have a minimum compressive strength of 3000 pounds per square inch. The concrete fill shall be reinforced with a minimum of 6 x 6 -10 -10 wire mesh.

²Puddle welds shall have an effective fusion area of 1/2 inch if round or 3/4 x 3/4 inch if oblong.

³See Table No. XVI for required spacing of plug welds to marginal members.

⁴Two puddle weld patterns shall have the welds placed in the first and fourth ribs of each unit.

TABLE NO. XXII
MARGINAL WELD SPACING FACTOR

DECK GAUGE	FACTOR ¹
22	1380
20	1650
18	2200
16	2750
18-18	3670
18-16	4050

¹Divide factor in this Table by the actual diaphragm shear to get spacing of welds in feet to framing members parallel to flutes. The spacing in no case should exceed one-third of the vertical load span of the deck.