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How to select the right deck using load and diaphragm tables

Selecting the appropriate deck for your building project is not a standard decision. Looking at load and diaphragm tables to select the right deck for your application can significantly reduce costs.

Roof Decks - Types B, BI, BV, BIV

ASD

PROPERTIES					SECTION PROPERTIES				DESIGN STRENGTHS				
Gage	F_y (ksi)	Coverage (in.)	Thickness (in.)	Weight (psf)	I_p (in.^{4}/ft.)	I_n (in.^{4}/ft.)	S_p (in.^{3}/ft.)	S_n (in.^{3}/ft.)	Mn,p/Ω (in.-lb./ft.)	Mn,n/Ω (in.-lb./ft.)	Vn/Ω (lb./ft.)	Rbe/Ω (lb./ft.)	Rbi/Ω (lb./ft.)
22	33	36	0.0295	1.63	0.162	0.175	0.183	0.189	3626	3734	1738	539	974
20	33	36	0.0358	1.98	0.205	0.213	0.227	0.238	4484	4712	2100	769	1399
18	33	36	0.0474	2.62	0.281	0.281	0.307	0.315	6073	6233	2761	1285	2358
16	33	36	0.0598	3.30	0.355	0.355	0.393	0.395	7757	7800	3456	1964	3627

Notes: 1. Section properties are calculated in accordance with the AISI Cold-Formed Steel Design Specifications, 2007 Edition.
2. Rbe/Ω and Rbi/Ω values are based on minimum bearing lengths of 1.5" for end bearing and 3" for interior bearing.

ALLOWABLE UNIFORM LOADS AND MAXIMUM CONSTRUCTION SPANS

Span Condition	Gage	Allowable Uniform Total Load / Load that Produces L/240" Deflection (psf) Center to Center Span (ft. - in.)										Max. Constr. Span (Ctr. to Ctr.)
		4 - 0	5 - 0	6 - 0	7 - 0	8 - 0	9 - 0	10 - 0	11 - 0	12 - 0	13 - 0	
Single	22	151 / 165	97 / 85	67 / 49	49 / 31	-	-	-	-	-	-	6' - 0"
	20	187 / 210	120 / 108	83 / 62	61 / 39	47 / 26	-	-	-	-	-	7' - 5"
	18	253 / 288	162 / 147	112 / 85	83 / 54	63 / 36	50 / 25	40 / 18	33 / 14	-	-	10' - 1"
	16	323 / 363	207 / 186	144 / 108	106 / 68	81 / 45	64 / 32	52 / 23	43 / 17	36 / 13	31 / 11	12' - 11"
Double	22	152 / 416	98 / 213	68 / 123	50 / 78	39 / 52	-	-	-	-	-	7' - 3"
	20	191 / 516	124 / 264	86 / 153	64 / 96	49 / 65	39 / 45	31 / 33	-	-	-	9' - 0"
	18	253 / 695	163 / 356	114 / 206	84 / 130	65 / 87	51 / 61	41 / 44	34 / 33	29 / 26	25 / 20	12' - 2"
	16	317 / 876	205 / 448	143 / 260	105 / 163	81 / 109	64 / 77	52 / 56	43 / 42	36 / 32	31 / 26	15' - 6"
Triple	22	188 / 325	122 / 167	85 / 96	63 / 61	48 / 41	-	-	-	-	-	7' - 4"
	20	236 / 404	153 / 207	107 / 120	79 / 75	61 / 50	48 / 35	39 / 26	-	-	-	9' - 1"
	18	312 / 544	203 / 278	142 / 161	105 / 101	80 / 68	64 / 48	52 / 35	43 / 26	36 / 20	31 / 16	12' - 4"
	16	391 / 685	254 / 351	177 / 203	131 / 128	101 / 86	80 / 60	65 / 44	53 / 33	45 / 25	38 / 20	15' - 9"

This table shows standard allowable uniform load time and maximum construction span. Both of which are dependent on deck type and span condition. Construction spans and uniform loads are based on ANSI/SDI RD-2010 Standard for steel roof deck.

When selecting deck for particular projects there are many variables to consider such as, depth, costs, and attachment, among others. It is always beneficial to select the most economical deck type and gauge, whether it is roof or floor deck. To guide this decision, the Steel Deck Institute standardizes the gauge and yield stress of the material so that the most economical would mean the thinnest gauge and lowest yield strength for the design of the specific project. To help you make sense of the tables, New Millennium has developed a steel deck design tool to further guide you.

To get started, use the following questions as a guide to find the deck that meets your project needs:

- Is the project load and resistance factor design (LRFD) or allowable strength design (ASD)?
- What is the maximum loading for the deck area?
- What is the maximum span for this area? (You can use a smaller gauge for triple span conditions.)
- If this is floor deck, what is the construction loading? (LW or NW concrete, slab depth, method of placement, and finishing, etc.)
- What are the required deflection limits?
- What is the required diaphragm capacity?

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After answering the questions on the preceding page, review the deck load tables and locate the appropriate span and condition. If the desired gauge is not adequate for the uniform total load or the required deflection, an increase in gauge thickness may be required. Note that the deflection requirements can still be checked on the load tables by multiplying the load for the deflection listed by the appropriate factor. The allowable loading will increase with the rising gauge thickness. Additionally, the maximum construction span must be greater than the maximum spacing in the area to avoid shoring. If the required load is greater than the largest allowable load on the table, then a deeper deck profile and/or thicker slab for floors may be needed.

Selecting diaphragm

Diaphragm capacities can be approached in the same manner of using tables. If additional strength is needed for floor decks, refer to New Millennium's diaphragm tables, which include shear strengths. Note that the capacities given in diaphragm tables are nominal strengths. These strengths must be multiplied by the appropriate resistance factor or divided by the appropriate safety factor listed in the upper right corner or in the table. These tables can be used once the deck type and gauge have been selected to design the attachment for the required diaphragm. Minimum bearing lengths, published in the table notes, should be verified to meet project conditions. If the minimum bearing lengths are not met, it will require another check for web crippling. Web crippling is the check for local buckling due to the shear force in the deck.

Learn more about the steel deck design tool and download the tables:
www.newmill.com/bim-design-tools/tools/steel-decking-tools.html.

Roof Decks - Type B 20 GA. Diaphragm Design

Fy = 33 ksi, Design Thickness = 0.0358 in.
Support Fasteners: 5/8" puddle welds
Side Lap Fasteners: # 10 screws

Φ (EQ): 0.55 Ω (EQ): 3.00
Φ (WIND): 0.70 Ω (WIND): 2.35
Φ (Other): 0.60 Ω (Other): 2.65
Φ (Buckling): 0.80 Ω (Buckling): 2.00

Support Fastener Pattern	Side Lap Conn. per Span	Nominal Diaphragm Shear Strength (plf) Center to Center Span (ft. - in.)														K_1 ($ft.^{-1}$)
		4 - 0	4 - 6	5 - 0	5 - 6	5 - 9	6 - 0	6 - 3	6 - 6	6 - 9	7 - 0	7 - 6	8 - 0	8 - 6	9 - 0	
36/9 Dn = 68	0	1671	1493	1334	1205	1149	1097	1050	1006	966	928	860	801	749	702	0.357
	1	1827	1649	1488	1345	1283	1225	-	-	-	-	-	-	-	-	0.299
	2	1977	1789	1631	1485	1416	1354	1296	1243	1193	1148	1065	993	929	873	0.258
	3	2121	1924	1757	1616	1550	1482	1419	1361	1307	1257	1168	1089	1020	958	0.226
	4	2258	2054	1880	1732	1665	1604	1542	1479	1421	1367	1270	1185	1110	1044	0.202
	5	2388	2178	1999	1844	1775	1710	1650	1593	1535	1477	1373	1281	1201	1129*	0.182
	6	2512	2298	2113	1953	1881	1814	1751	1692	1636	1584	1475	1377*	1291*	1214*	0.166
	7	2630	2413	2224	2059	1985	1915	1850	1788	1731	1676	1577*	1473*	1382*	1300*	0.152
	8	2741	2522	2330	2161	2085	2013	1946	1882	1822	1766	1662*	1569*	1472*	1385*	0.141
	9	2847	2627	2432	2260	2182	2109	2039	1974	1912	1854*	1747*	1650*	1562*	1471*	0.131
	10	2947	2726	2530	2356	2276	2201	2130	2063	2000*	1940*	1829*	1730*	1640*	1556*	0.122
36/7 Dn = 68	0	1038	918	822	743	709	678	649	622	597	574	533	497	465	437	0.535
	1	1219	1089	976	883	843	806	-	-	-	-	-	-	-	-	0.415
	2	1384	1245	1129	1023	976	934	895	859	825	794	738	689	646	608	0.340
	3	1542	1391	1265	1159	1110	1062	1018	977	939	904	841	785	737	693	0.287
	4	1693	1531	1396	1282	1231	1184	1140	1095	1053	1014	943	881	827	779	0.249
	5	1836	1666	1522	1400	1346	1295	1248	1204	1163	1123	1046	977	917	864	0.219
	6	1971	1795	1644	1515	1458	1404	1354	1307	1263	1222	1147	1074	1008	949	0.196

Typical nominal diaphragm shear strength table. Diaphragm is dependent on the deck type and attachment pattern. All diaphragm capacitates from the table must be divided by the appropriate Ω or multiplied by the appropriate Φ given.

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