

Lbs of Force Required to Bend Shape to Desired Radius

E = 2.9E+07

Shape	ga	Area	I _{x-x}	12								Manual Pass (to Yield) *		
				Die Dist								force	deflect.	radius
				5'	10'	15'	20'	25'	30'	35'	40'			
1" box	16	0.2371	0.0342	15,635	8,017	5,396	4,067	3,264	2,557	2,340	2,049	711	0.026	116
1" box	14	0.2959	0.041	18,744	9,611	6,469	4,876	3,913	3,065	2,805	2,457	888	0.027	112
1" box	11	0.368	0.0476	21,762	11,159	7,510	5,661	4,543	3,559	3,256	2,852	1,104	0.029	104
1.5" box	16	0.3671	0.1251	57,193	29,327	19,738	14,877	11,939	9,353	8,558	7,497	1,101	0.011	275
1.5" box	14	0.4619	0.1534	70,131	35,961	24,203	18,243	14,640	11,469	10,494	9,193	1,386	0.011	268
1.5" box	11	0.586	0.186	85,035	43,603	29,346	22,120	17,751	13,906	12,724	11,146	1,758	0.012	256
2" box	16	0.4971	0.3085	141,039	72,320	48,674	36,688	29,441	23,065	21,104	18,487	1,491	0.006	500
2" box	14	0.6279	0.3823	174,779	89,621	60,318	45,465	36,484	28,582	26,152	22,909	1,884	0.006	490
2" box	11	0.804	0.4735	216,473	111,000	74,707	56,311	45,188	35,401	32,391	28,375	2,412	0.006	474
2.5" box	16	0.6271	0.617	282,078	144,640	97,348	73,376	58,883	46,129	42,208	36,974	1,881	0.004	793
2.5" box	14	0.7939	0.7693	351,706	180,343	121,377	91,488	73,418	57,516	52,626	46,101	2,382	0.004	781
2.5" box	11	1.022	0.9646	440,993	226,126	152,191	114,714	92,056	72,117	65,986	57,804	3,066	0.004	760
3" box	16	0.7571	1.083	495,123	253,882	170,872	128,795	103,355	80,969	74,086	64,899	2,271	0.003	1152
3" box	14	0.9599	1.3558	619,841	317,833	213,913	161,237	129,390	101,365	92,747	81,247	2,880	0.003	1138
3" box	11	1.24	1.7137	783,464	401,734	270,381	203,800	163,546	128,122	117,230	102,694	3,720	0.003	1113
1.5" pipe	sch. 40	0.799	0.31	141,725	72,672	48,911	36,866	29,585	23,177	21,206	18,577	2,397	0.010	313
1.5" pipe	sch. 80	1.07	0.391	178,756	91,660	61,690	46,499	37,315	29,233	26,747	23,431	3,210	0.010	294

Force Required to make bend (lbs)

Shape	ga	Area	I _{x-x}	16								Manual Pass *		
				Die Dist								force	deflect.	radius
				5'	10'	15'	20'	25'	30'	35'	40'			
1" box	16	0.2371	0.0342	12,204	6,024	4,050	3,052	2,449	2,045	1,755	1,537	533	0.046	87
1" box	14	0.2959	0.041	14,631	7,222	4,856	3,659	2,935	2,451	2,104	1,843	666	0.048	84
1" box	11	0.368	0.0476	16,986	8,384	5,637	4,248	3,408	2,846	2,443	2,140	828	0.051	78
1.5" box	16	0.3671	0.1251	44,642	22,035	14,816	11,163	8,957	7,479	6,420	5,623	826	0.019	206
1.5" box	14	0.4619	0.1534	54,741	27,020	18,167	13,689	10,983	9,171	7,872	6,896	1,039	0.020	201
1.5" box	11	0.586	0.186	66,374	32,762	22,028	16,598	13,317	11,119	9,545	8,361	1,319	0.021	192
2" box	16	0.4971	0.3085	110,088	54,340	36,536	27,529	22,087	18,443	15,831	13,867	1,118	0.011	375
2" box	14	0.6279	0.3823	136,424	67,339	45,277	34,115	27,371	22,855	19,618	17,185	1,413	0.011	368
2" box	11	0.804	0.4735	168,968	83,403	56,078	42,253	33,900	28,307	24,298	21,284	1,809	0.011	356
2.5" box	16	0.6271	0.617	220,176	108,679	73,073	55,059	44,174	36,885	31,662	27,735	1,411	0.007	594
2.5" box	14	0.7939	0.7693	274,524	135,505	91,110	68,649	55,078	45,990	39,478	34,581	1,786	0.007	585
2.5" box	11	1.022	0.9646	344,217	169,906	114,240	86,077	69,060	57,666	49,500	43,360	2,300	0.007	570
3" box	16	0.7571	1.083	386,468	190,761	128,262	96,643	77,537	64,744	55,576	48,682	1,703	0.005	864
3" box	14	0.9599	1.3558	483,817	238,812	160,570	120,986	97,068	81,052	69,575	60,945	2,160	0.005	853
3" box	11	1.24	1.7137	611,533	301,853	202,957	152,924	122,692	102,448	87,941	77,033	2,790	0.005	835
1.5" pipe	sch. 40	0.799	0.31	110,623	54,604	36,714	27,663	22,194	18,532	15,908	13,935	1,798	0.017	234
1.5" pipe	sch. 80	1.07	0.391	139,528	68,871	46,307	34,891	27,994	23,375	20,065	17,576	2,408	0.018	221

Force Required to make bend (lbs)

Shape	ga	Area	I _{x-x}	20								Manual Pass *		
				Die Dist								force	deflect.	radius
				5'	10'	15'	20'	25'	30'	35'	40'			
1" box	16	0.2371	0.0342	9,537	4,831	3,244	2,443	1,960	1,636	1,404	1,230	427	0.072	70
1" box	14	0.2959	0.041	11,433	5,791	3,889	2,929	2,349	1,961	1,683	1,475	533	0.075	67
1" box	11	0.368	0.0476	13,274	6,723	4,515	3,400	2,727	2,277	1,954	1,712	662	0.080	63
1.5" box	16	0.3671	0.1251	34,885	17,670	11,865	8,936	7,168	5,985	5,137	4,499	661	0.030	165
1.5" box	14	0.4619	0.1534	42,777	21,667	14,549	10,958	8,790	7,338	6,299	5,517	831	0.031	161
1.5" box	11	0.586	0.186	51,868	26,272	17,641	13,286	10,657	8,898	7,637	6,690	1,055	0.033	153
2" box	16	0.4971	0.3085	86,028	43,575	29,260	22,037	17,676	14,758	12,667	11,095	895	0.017	300
2" box	14	0.6279	0.3823	106,607	53,999	36,259	27,309	21,905	18,288	15,697	13,750	1,130	0.017	294
2" box	11	0.804	0.4735	132,039	66,881	44,909	33,823	27,131	22,651	19,442	17,030	1,447	0.018	285
2.5" box	16	0.6271	0.617	172,055	87,150	58,520	44,074	35,353	29,516	25,334	22,191	1,129	0.011	476
2.5" box	14	0.7939	0.7693	214,525	108,662	72,965	54,953	44,080	36,802	31,588	27,668	1,429	0.011	468
2.5" box	11	1.022	0.9646	268,986	136,248	91,488	68,904	55,270	46,144	39,607	34,693	1,840	0.011	456
3" box	16	0.7571	1.083	302,003	152,972	102,718	77,361	62,054	51,808	44,469	38,951	1,363	0.007	691
3" box	14	0.9599	1.3558	378,075	191,504	128,592	96,848	77,685	64,859	55,670	48,762	1,728	0.007	683
3" box	11	1.24	1.7137	477,878	242,057	162,537	122,413	98,192	81,980	70,365	61,635	2,232	0.007	668
1.5" pipe	sch. 40	0.799	0.31	86,446	43,787	29,402	22,144	17,762	14,830	12,729	11,149	1,438	0.027	188
1.5" pipe	sch. 80	1.07	0.391	109,033	55,228	37,085	27,930	22,404	18,705	16,055	14,063	1,926	0.028	177

Force Required to make bend (lbs)

N.B. - This document is meant only as a rough guide to the forces involved in roll bending steel. The information in this table has not been reviewed by a licensed engineer. The author is not liable for any damages, injuries, or any such negative stuff that results from use of this document. Be smart and use appropriately.

Notes on Manual Pass section: (manual roll bending)

1. Describes the force required to reach the yield point of the steel shape specified. Computes the resulting deflection and radius based on the die distance. This part of the table is accurate for the first pass only. After passing the shape's yield point, the steel should bend more easily.
2. For each n increase in x deflection: first pass radius * $1/n$

