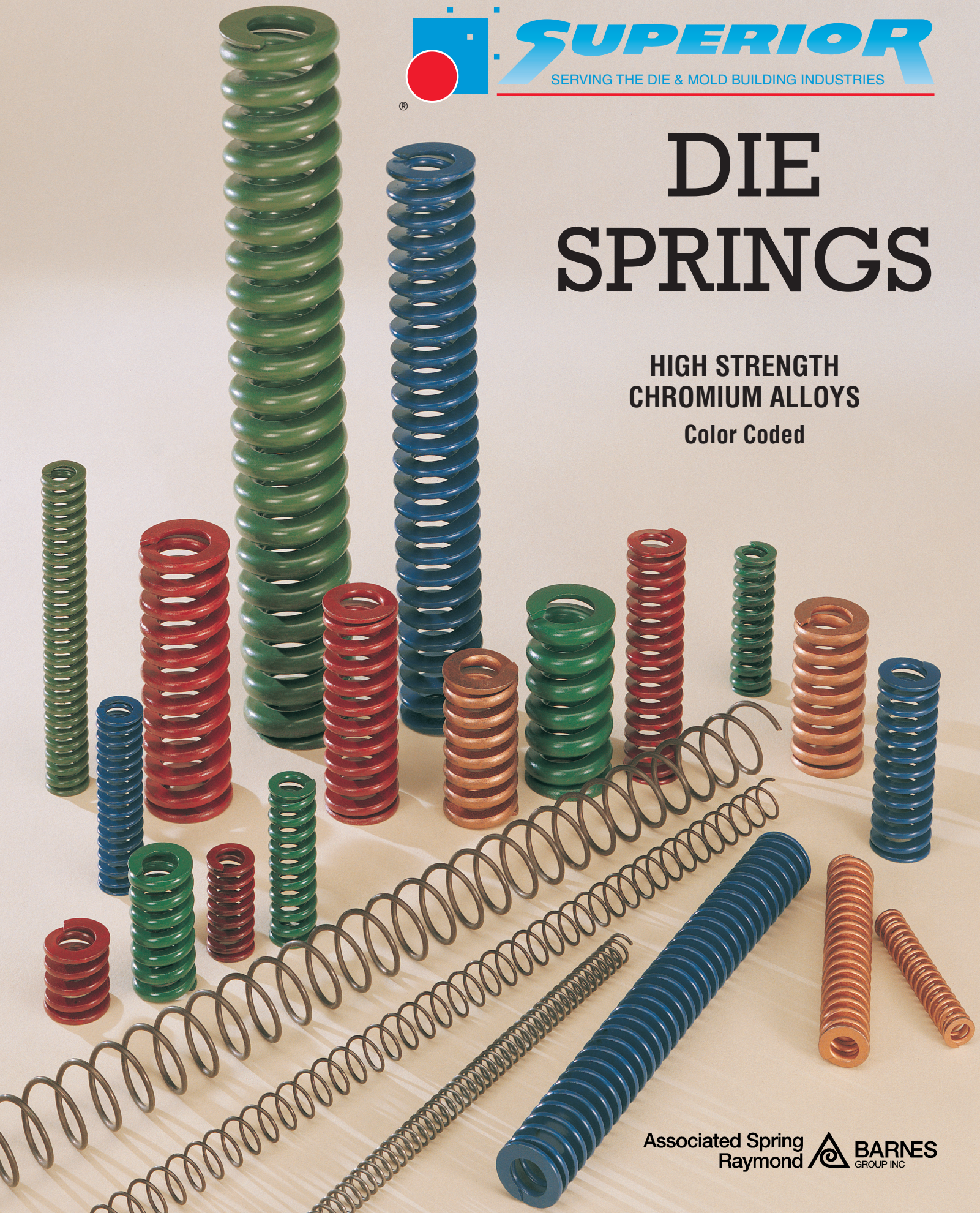
SUPERIOR®

SERVING THE DIE & MOLD BUILDING INDUSTRIES

DIE SPRINGS

HIGH STRENGTH CHROMIUM ALLOYS

Color Coded



Associated Spring Raymond

BARNES GROUP INC

DIE SPRING FEATURES AND BENEFITS

Raymond Die Springs Offer	Features	Benefits
Superior Materials & Wire Profile	• All Raymond die springs are made from high tensile strength chromium alloy steels. • Optimal wire cross section. • Spring ends are ground square. • Other raw materials are available for special conditions and environments.	• Inherent toughness to withstand heavy load demands. • Superior performance in high stress applications. • Heat resistance up to 350°F. • Readily available, cost efficient raw material. • Consistent controlled metallurgy. • Offers maximum design possibilities. • Wire cross section provides optimum deflection and protection against failure due to excessive stress build-up. • Square ends create reliable, flat, maximum load-bearing surface. • Specialty materials available to meet customer requirements.
Dimensional Consistency	• Dimensional requirements remain consistent and measurably the same from one batch of springs to the next.	• Provides uniform spring performance. • Insures consistent rate recordings. • Greater load accuracy at a given test height. • Certainty that OD will work freely in prescribed hole and ID will work freely over prescribed rod. • Raymond assurance of the highest production and quality standards. • Reliable performance engineered into every Raymond die spring.
Longer Spring Life	• Engineered to better withstand shock loading. • Designed to endure constant high-speed deflections. • Shot-peened to increase fatigue life. • Less downtime.	• Reliable, trouble-free performance. • Increased fatigue life by as much as 30%. • Reduced spring breakage. • Uniform performance over a longer lifetime. • More cost effective. • Extra performance margins.
Excellent Deflection	• Springs provide greater available travel to solid.	• More travel in each spring. • More travel in each spring. • Higher load capacities. • Increased fatigue life. • Greater application flexibility. • More reliable performance. • Lower solid height.

CONVERSION TABLES

Inch Die Spring Series

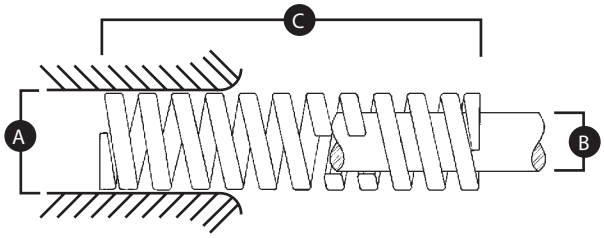
Free Length (in)	Medium-Duty Compressed Length (in)			Medium-Heavy Duty Compressed Length (in)			Heavy-Duty Compressed Length (in)			Extra-Heavy Duty Compressed Length (in)		
	Deflection in % free length			Deflection in % free length			Deflection in % free length			Deflection in % free length		
	25%	35%	40%	20%	25%	30%	15%	20%	25%	15%	17%	20%
1	0.75	0.65	0.60	0.80	0.75	0.70	0.85	0.80	0.75	0.85	0.83	0.80
1 1/4	0.94	0.81	0.75	1.00	0.94	0.88	1.06	1.00	0.94	1.06	1.04	1.00
1 1/2	1.13	0.98	0.90	1.20	1.13	1.05	1.28	1.20	1.13	1.28	1.25	1.20
1 3/4	1.31	1.14	1.05	1.40	1.31	1.23	1.49	1.40	1.31	1.49	1.45	1.40
2	1.50	1.30	1.20	1.60	1.50	1.40	1.70	1.60	1.50	1.70	1.66	1.60
2 1/2	1.88	1.63	1.50	2.00	1.88	1.75	2.13	2.00	1.88	2.13	2.08	2.00
3	2.25	1.95	1.80	2.40	2.25	2.10	2.55	2.40	2.25	2.55	2.49	2.40
3 1/2	2.63	2.28	2.10	2.80	2.63	2.45	2.98	2.80	2.63	2.98	2.91	2.80
4	3.00	2.60	2.40	3.20	3.00	2.80	3.40	3.20	3.00	3.40	3.32	3.20
4 1/2	3.38	2.93	2.70	3.60	3.38	3.15	3.83	3.60	3.38	3.83	3.74	3.60
5	3.75	3.25	3.00	4.00	3.75	3.50	4.25	4.00	3.75	4.25	4.15	4.00
5 1/2	4.13	3.58	3.30	4.40	4.13	3.85	4.68	4.40	4.13	4.68	4.57	4.40
6	4.50	3.90	3.60	4.80	4.50	4.20	5.10	4.80	4.50	5.10	4.98	4.80
6 1/2	4.88	4.23	3.90	5.20	4.88	4.55	5.53	5.20	4.88	5.53	5.40	5.20
7	5.25	4.55	4.20	5.60	5.25	4.90	5.95	5.60	5.25	5.95	5.81	5.60
7 1/2	5.63	4.88	4.50	6.00	5.63	5.25	6.38	6.00	5.63	6.38	6.23	6.00
8	6.00	5.20	4.80	6.40	6.00	5.60	6.80	6.40	6.00	6.80	6.64	6.40
10	7.50	6.50	6.00	8.00	7.50	7.00	8.50	8.00	7.50	8.50	8.30	8.00
12	9.00	7.80	7.20	9.60	9.00	8.40	10.20	9.60	9.00	10.20	9.96	9.60

Metric Die Spring Series

Free Length (mm)	Medium-Duty Compressed Length (mm)			Medium-Heavy Duty Compressed Length (mm)			Heavy-Duty Compressed Length (mm)			Extra-Heavy Duty Compressed Length (mm)		
	Deflection in % free length			Deflection in % free length			Deflection in % free length			Deflection in % free length		
	25%	35%	40%	20%	25%	30%	15%	20%	25%	15%	17%	20%
25	19	17	15	20	19	18	22	20	19	22	21	20
32	24	21	19	25	24	22	27	25	24	27	26	25
38	29	25	23	30	29	27	32	30	29	32	32	30
44	33	29	27	36	33	31	38	36	33	38	37	36
51	38	33	30	41	38	36	43	41	38	43	42	41
64	48	41	38	51	48	44	54	51	48	54	53	51
76	57	50	46	61	57	53	65	61	57	65	63	61
89	67	58	53	71	67	62	76	71	67	76	74	71
102	76	66	61	81	76	71	86	81	76	86	84	81
114	86	84	69	91	86	80	97	91	86	97	95	91
127	95	83	76	102	95	89	108	102	95	108	105	102
140	105	91	84	112	105	98	119	112	105	119	116	112
152	114	99	91	122	114	107	130	122	114	130	126	122
165	124	107	99	132	124	116	140	132	124	140	137	132
178	133	116	107	142	133	124	151	142	133	151	148	142
191	143	124	114	152	143	133	162	152	143	162	158	152
203	152	132	122	163	152	142	173	163	152	173	169	163
254	191	165	152	203	191	178	216	203	191	216	211	203
305	229	198	183	244	229	213	259	244	229	259	253	244

RAYMOND® MEDIUM-DUTY DIE SPRINGS





Raymond® MEDIUM-DUTY DIE SPRINGS INCH SERIES BLUE®													
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE								
					For Optimum Life (25% of free length)		For Long Life (35% of free length)		Maximum Operating Def. (40% of free length)		*Maximum Deflection (50% of free length)	
A	B	C			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
3/8 (9.5 mm)	3/16 (4.7 mm)	1	341-0604	6.0	15.0	0.25	21.0	0.35	24.0	0.40	30.0	0.50
		1 1/4	341-0605	5.4	16.9	0.31	23.6	0.44	27.0	0.50	33.8	0.63
		1 1/2	341-0606	4.0	15.0	0.38	21.0	0.53	24.0	0.60	30.0	0.75
		1 3/4	341-0607	3.4	14.9	0.44	20.8	0.61	23.8	0.70	29.8	0.88
		2	341-0608	2.8	14.0	0.50	19.6	0.70	22.4	0.80	28.0	1.00
		2 1/2	341-0610	2.4	15.0	0.63	21.0	0.88	24.0	1.00	30.0	1.25
		3	341-0612	2.1	15.8	0.75	22.0	1.05	25.2	1.20	31.5	1.50
		12	341-0648	0.6	18.0	3.00	25.2	4.20	28.8	4.80	36.0	6.00
1/2 (13 mm)	9/32 (7 mm)	1	341-0804	11.0	27.5	0.25	38.5	0.35	44.0	0.40	55.0	0.50
		1 1/4	341-0805	8.2	25.6	0.31	35.9	0.44	41.0	0.50	51.3	0.63
		1 1/2	341-0806	6.8	25.5	0.38	35.7	0.53	40.8	0.60	51.0	0.75
		1 3/4	341-0807	6.0	26.3	0.44	36.8	0.61	42.0	0.70	52.5	0.88
		2	341-0808	5.5	27.5	0.50	38.5	0.70	44.0	0.80	55.0	1.00
		2 1/2	341-0810	4.5	28.1	0.63	39.4	0.88	45.0	1.00	56.3	1.25
		3	341-0812	3.5	26.3	0.75	36.8	1.05	42.0	1.20	52.5	1.50
		3 1/2	341-0814	3.0	26.3	0.88	36.8	1.23	42.0	1.40	52.5	1.75
		4 1/2	341-0818	2.5	28.1	1.13	39.4	1.58	45.0	1.80	56.3	2.25
		5 1/2	341-0822	2.1	28.9	1.38	40.4	1.93	46.2	2.20	57.8	2.75
		6 1/2	341-0826	1.4	22.8	1.63	31.9	2.28	36.4	2.60	45.5	3.25
		7 1/2	341-0830	1.2	22.5	1.88	31.5	2.63	36.0	3.00	45.0	3.75
		12	341-0848	0.7	21.0	3.00	29.4	4.20	33.6	4.80	42.0	6.00
5/8 (16 mm)	11/32 (8.7 mm)	1	341-1004	16.4	41.0	0.25	57.4	0.35	65.6	0.40	82.0	0.50
		1 1/4	341-1005	12.8	40.0	0.31	56.0	0.44	64.0	0.50	80.0	0.63
		1 1/2	341-1006	10.8	40.5	0.38	56.7	0.53	64.8	0.60	81.0	0.75
		1 3/4	341-1007	9.6	42.0	0.44	58.8	0.61	67.2	0.70	84.0	0.88
		2	341-1008	8.8	44.0	0.50	61.6	0.70	70.4	0.80	88.0	1.00
		2 1/2	341-1010	6.0	37.5	0.63	52.5	0.88	60.0	1.00	75.0	1.25
		3	341-1012	5.6	42.0	0.75	58.8	1.05	67.2	1.20	84.0	1.50
		3 1/2	341-1014	4.8	42.0	0.88	58.8	1.23	67.2	1.40	84.0	1.75
		4	341-1016	4.4	44.0	1.00	61.6	1.40	70.4	1.60	88.0	2.00
		12	341-1048	1.6	48.0	3.00	67.2	4.20	76.8	4.80	96.0	6.00
3/4 (19.5 mm)	3/8 (9.5 mm)	1	341-1204	31.2	78.0	0.25	109.2	0.35	124.8	0.40	156.0	0.50
		1 1/4	341-1205	25.6	80.0	0.31	112.0	0.44	128.0	0.50	160.0	0.63
		1 1/2	341-1206	20.0	75.0	0.38	105.0	0.53	120.0	0.60	150.0	0.75
		1 3/4	341-1207	17.6	77.0	0.44	107.8	0.61	123.2	0.70	154.0	0.88
		2	341-1208	14.4	72.0	0.50	100.8	0.70	115.2	0.80	144.0	1.00
		2 1/2	341-1210	12.0	75.0	0.63	105.0	0.88	120.0	1.00	150.0	1.25
		3	341-1212	9.6	72.0	0.75	100.8	1.05	115.2	1.20	144.0	1.50
		3 1/2	341-1214	8.0	70.0	0.88	98.0	1.23	112.0	1.40	140.0	1.75
		4	341-1216	7.2	72.0	1.00	100.8	1.40	115.2	1.60	144.0	2.00
		4 1/2	341-1218	6.4	72.0	1.13	100.8	1.58	115.2	1.80	144.0	2.25
		5	341-1220	6.0	75.0	1.25	105.0	1.75	120.0	2.00	150.0	2.50
		5 1/2	341-1222	5.5	75.6	1.38	105.9	1.93	121.0	2.20	151.3	2.75
		6	341-1224	5.0	75.0	1.50	105.0	2.10	120.0	2.40	150.0	3.00
		6 1/2	341-1226	4.5	73.1	1.63	102.4	2.28	117.0	2.60	146.3	3.25
		7 1/2	341-1230	3.8	71.3	1.88	99.8	2.63	114.0	3.00	142.5	3.75
		12	341-1248	2.4	72.0	3.00	100.8	4.20	115.2	4.80	144.0	6.00

*Tabulated load values shown represent loads near solid and are for design information only.
See Current Price List for Quantity Prices.
Raymond® die spring color blue is a registered trademark of Barnes Group Inc.

RAYMOND® MEDIUM-DUTY DIE SPRINGS

Efficient Operating Range
25 to 35% of Free Length

Maximum Deflection
50% of Free Length

Ordering Procedure
Please Specify: • Quantity • Spring Type • Hole Diameter • Free Length • Catalog Number

Raymond® MEDIUM-DUTY DIE SPRINGS — INCH SERIES — BLUE®

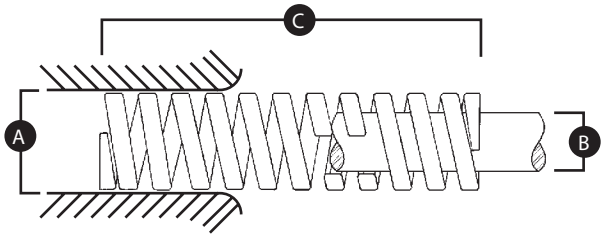
Hole Dia. (in) A	Rod Dia. (in) B	Free Length (in) C	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE							
					For Optimum Life (25% of free length)		For Long Life (35% of free length)		Maximum Operating Def. (40% of free length)		*Maximum Deflection (50% of free length)	
					Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
1 (25.5 mm)	**1/2 (13 mm)**	1	341-1604	55.0	137.5	0.25	192.5	0.35	220.0	0.40	275.0	0.50
		1 1/4	341-1605	45.0	140.6	0.31	196.9	0.44	225.0	0.50	281.3	0.63
		1 1/2	341-1606	35.0	131.3	0.38	183.8	0.53	210.0	0.60	262.5	0.75
		1 3/4	341-1607	30.0	131.3	0.44	183.8	0.61	210.0	0.70	262.5	0.88
		2	341-1608	26.0	130.0	0.50	182.0	0.70	208.0	0.80	260.0	1.00
		2 1/2	341-1610	20.0	125.0	0.63	175.0	0.88	200.0	1.00	250.0	1.25
		3	341-1612	16.5	123.8	0.75	173.3	1.05	198.0	1.20	247.5	1.50
		3 1/2	341-1614	15.0	131.3	0.88	183.8	1.23	210.0	1.40	262.5	1.75
		4	341-1616	12.0	120.0	1.00	168.0	1.40	192.0	1.60	240.0	2.00
		4 1/2	341-1618	10.4	117.0	1.13	163.8	1.58	187.2	1.80	234.0	2.25
		5	341-1620	9.6	120.0	1.25	168.0	1.75	192.0	2.00	240.0	2.50
		5 1/2	341-1622	8.8	121.0	1.38	169.4	1.93	193.6	2.20	242.0	2.75
		6	341-1624	8.0	120.0	1.50	168.0	2.10	192.0	2.40	240.0	3.00
		7	341-1628	7.2	126.0	1.75	176.4	2.45	201.6	2.80	252.0	3.50
		8	341-1632	6.0	120.0	2.00	168.0	2.80	192.0	3.20	240.0	4.00
		12	341-1648	4.0	120.0	3.00	168.0	4.20	192.0	4.80	240.0	6.00
1 1/4 (32 mm)	**5/8 (16 mm)**	1 1/2	341-2006	49.6	186.0	0.38	260.4	0.53	297.6	0.60	372.0	0.75
		1 3/4	341-2007	42.4	185.5	0.44	259.7	0.61	296.8	0.70	371.0	0.88
		2	341-2008	35.2	176.0	0.50	246.4	0.70	281.6	0.80	352.0	1.00
		2 1/2	341-2010	28.8	180.0	0.63	252.0	0.88	288.0	1.00	360.0	1.25
		3	341-2012	24.0	180.0	0.75	252.0	1.05	288.0	1.20	360.0	1.50
		3 1/2	341-2014	20.0	175.0	0.88	245.0	1.23	280.0	1.40	350.0	1.75
		4	341-2016	17.6	176.0	1.00	246.4	1.40	281.6	1.60	352.0	2.00
		4 1/2	341-2018	16.0	180.0	1.13	252.0	1.58	288.0	1.80	360.0	2.25
		5	341-2020	13.6	170.0	1.25	238.0	1.75	272.0	2.00	340.0	2.50
		5 1/2	341-2022	12.8	176.0	1.38	246.4	1.93	281.6	2.20	352.0	2.75
		6	341-2024	12.0	180.0	1.50	252.0	2.10	288.0	2.40	360.0	3.00
		7	341-2028	10.4	182.0	1.75	254.8	2.45	291.2	2.80	364.0	3.50
		8	341-2032	8.8	176.0	2.00	246.4	2.80	281.6	3.20	352.0	4.00
		10	341-2040	7.2	180.0	2.50	252.0	3.50	288.0	4.00	360.0	5.00
		12	341-2048	6.0	180.0	3.00	252.0	4.20	288.0	4.80	360.0	6.00
1 1/2 (38.5 mm)	**3/4 (19.5 mm)**	2	341-2408	53.0	265.0	0.50	371.0	0.70	424.0	0.80	530.0	1.00
		2 1/2	341-2410	45.0	281.3	0.63	393.8	0.88	450.0	1.00	562.5	1.25
		3	341-2412	36.0	270.0	0.75	378.0	1.05	432.0	1.20	540.0	1.50
		3 1/2	341-2414	30.0	262.5	0.88	367.5	1.23	420.0	1.40	525.0	1.75
		4	341-2416	27.0	270.0	1.00	378.0	1.40	432.0	1.60	540.0	2.00
		4 1/2	341-2418	23.0	258.8	1.13	362.3	1.58	414.0	1.80	517.5	2.25
		5	341-2420	21.0	262.5	1.25	367.5	1.75	420.0	2.00	525.0	2.50
		5 1/2	341-2422	18.5	254.4	1.38	356.1	1.93	407.0	2.20	508.8	2.75
		6	341-2424	17.0	255.0	1.50	357.0	2.10	408.0	2.40	510.0	3.00
		7	341-2428	14.5	253.8	1.75	355.3	2.45	406.0	2.80	507.5	3.50
		8	341-2432	12.8	256.0	2.00	358.4	2.80	409.6	3.20	512.0	4.00
		10	341-2440	10.0	250.0	2.50	350.0	3.50	400.0	4.00	500.0	5.00
		12	341-2448	8.0	240.0	3.00	336.0	4.20	384.0	4.80	480.0	6.00
2 (51 mm)	**1/2 (25.5 mm)**	2 1/2	341-3210	100.0	625.0	0.63	875.0	0.88	1000.0	1.00	1250.0	1.25
		3	341-3212	83.0	622.5	0.75	871.5	1.05	996.0	1.20	1245.0	1.50
		3 1/2	341-3214	64.8	567.0	0.88	793.8	1.23	907.2	1.40	1134.0	1.75
		4	341-3216	60.0	600.0	1.00	840.0	1.40	960.0	1.60	1200.0	2.00
		4 1/2	341-3218	53.0	596.3	1.13	834.8	1.58	954.0	1.80	1192.5	2.25
		5	341-3220	47.0	587.5	1.25	822.5	1.75	940.0	2.00	1175.0	2.50
		5 1/2	341-3222	39.2	539.0	1.38	754.6	1.93	862.4	2.20	1078.0	2.75
		6	341-3224	39.0	585.0	1.50	819.0	2.10	936.0	2.40	1170.0	3.00
		7	341-3228	31.2	546.0	1.75	764.4	2.45	873.6	2.80	1092.0	3.50
		8	341-3232	28.5	570.0	2.00	798.0	2.80	912.0	3.20	1140.0	4.00
		10	341-3240	20.8	520.0	2.50	728.0	3.50	832.0	4.00	1040.0	5.00
		12	341-3248	17.5	525.0	3.00	735.0	4.20	840.0	4.80	1050.0	6.00

*Tabulated load values shown represent loads near solid and are for design information only.
See Current Price List for Quantity Prices.

SUPERIOR DIE SET CORPORATION
• 900 W. Drexel Ave. • Oak Creek, WI 53154-0008
• WATS 1-800-558-6040 • FAX 1-800-657-0855 • Local 764-4900

RAYMOND® MEDIUM-HEAVY DUTY DIE SPRINGS





Raymond®	MEDIUM-HEAVY DUTY DIE SPRINGS				INCH SERIES						RED®
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE						
					For Optimum Life (20% of free length)		For Long Life (25% of free length)		Maximum Operating Def. (30% of free length)		*Maximum Deflection (37% of free length)	
A	B	C			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
3/8 (9.5 mm)	3/16 (4.7 mm)	1	342-0604	9.0	18.0	0.20	22.5	0.25	27.0	0.30	33.3	0.37
		1 1/4	342-0605	7.3	18.3	0.25	22.8	0.31	27.4	0.38	33.8	0.46
		1 1/2	342-0606	6.7	20.1	0.30	25.1	0.38	30.2	0.45	37.2	0.56
		1 3/4	342-0607	5.8	20.3	0.35	25.4	0.44	30.5	0.53	37.6	0.65
		2	342-0608	5.0	20.0	0.40	25.0	0.50	30.0	0.60	37.0	0.74
		2 1/2	342-0610	4.2	21.0	0.50	26.3	0.63	31.5	0.75	38.9	0.93
		3	342-0612	3.0	18.0	0.60	22.5	0.75	27.0	0.90	33.3	1.11
		12	342-0648	0.9	21.6	2.40	27.0	3.00	32.4	3.60	40.0	4.44
1/2 (13 mm)	9/32 (7 mm)	1	342-0804	16.8	33.6	0.20	42.0	0.25	50.4	0.30	62.2	0.37
		1 1/4	342-0805	13.0	32.5	0.25	40.6	0.31	48.8	0.38	60.1	0.46
		1 1/2	342-0806	9.5	28.5	0.30	35.6	0.38	42.8	0.45	52.7	0.56
		1 3/4	342-0807	8.5	29.8	0.35	37.2	0.44	44.6	0.53	55.0	0.65
		2	342-0808	7.5	30.0	0.40	37.5	0.50	45.0	0.60	55.5	0.74
		2 1/2	342-0810	6.0	30.0	0.50	37.5	0.63	45.0	0.75	55.5	0.93
		3	342-0812	5.7	34.2	0.60	42.8	0.75	51.3	0.90	63.3	1.11
		3 1/2	342-0814	4.0	28.0	0.70	35.0	0.88	42.0	1.05	51.8	1.30
		12	342-0848	1.2	28.8	2.40	36.0	3.00	43.2	3.60	53.3	4.44
5/8 (16 mm)	11/32 (8.7 mm)	1	342-1004	30.0	60.0	0.20	75.0	0.25	90.0	0.30	111.0	0.37
		1 1/4	342-1005	21.5	53.8	0.25	67.2	0.31	80.6	0.38	99.4	0.46
		1 1/2	342-1006	19.0	57.0	0.30	71.3	0.38	85.5	0.45	105.5	0.56
		1 3/4	342-1007	16.8	58.8	0.35	73.5	0.44	88.2	0.53	108.8	0.65
		2	342-1008	14.8	59.2	0.40	74.0	0.50	88.8	0.60	109.5	0.74
		2 1/2	342-1010	11.5	57.5	0.50	71.9	0.63	86.3	0.75	106.4	0.93
		3	342-1012	10.0	60.0	0.60	75.0	0.75	90.0	0.90	111.0	1.11
		3 1/2	342-1014	8.5	59.5	0.70	74.4	0.88	89.3	1.05	110.1	1.30
		4	342-1016	7.6	60.8	0.80	76.0	1.00	91.2	1.20	112.5	1.48
		12	342-1048	2.7	64.8	2.40	81.0	3.00	97.2	3.60	119.9	4.44
3/4 (19.5 mm)	3/8 (9.5 mm)	1	342-1204	50.0	100.0	0.20	125.0	0.25	150.0	0.30	185.0	0.37
		1 1/4	342-1205	38.0	95.0	0.25	118.8	0.31	142.5	0.38	175.8	0.46
		1 1/2	342-1206	32.0	96.0	0.30	120.0	0.38	144.0	0.45	177.6	0.56
		1 3/4	342-1207	28.8	100.8	0.35	126.0	0.44	151.2	0.53	186.5	0.65
		2	342-1208	24.8	99.2	0.40	124.0	0.50	148.8	0.60	183.5	0.74
		2 1/2	342-1210	19.2	96.0	0.50	120.0	0.63	144.0	0.75	177.6	0.93
		3	342-1212	14.4	86.4	0.60	108.0	0.75	129.6	0.90	159.8	1.11
		3 1/2	342-1214	12.8	89.6	0.70	112.0	0.88	134.4	1.05	165.8	1.30
		4	342-1216	12.0	96.0	0.80	120.0	1.00	144.0	1.20	177.6	1.48
		4 1/2	342-1218	11.2	100.8	0.90	126.0	1.13	151.2	1.35	186.5	1.67
		5	342-1220	9.0	90.0	1.00	112.5	1.25	135.0	1.50	166.5	1.85
		5 1/2	342-1222	8.0	88.0	1.10	110.0	1.38	132.0	1.65	162.8	2.04
		6	342-1224	7.5	90.0	1.20	112.5	1.50	135.0	1.80	166.5	2.22
		12	342-1248	3.6	86.4	2.40	108.0	3.00	129.6	3.60	159.8	4.44

*Tabulated load values shown represent loads near solid and are for design information only.
See Current Price List for Quantity Prices.
Raymond® die spring color red is a registered trademark of Barnes Group Inc.

RAYMOND® MEDIUM-HEAVY DUTY DIE SPRINGS

Efficient Operating Range
20 to 25% of Free Length

Maximum Deflection
37% of Free Length

Ordering Procedure
Please Specify: • Quantity • Spring Type • Hole Diameter • Free Length • Catalog Number

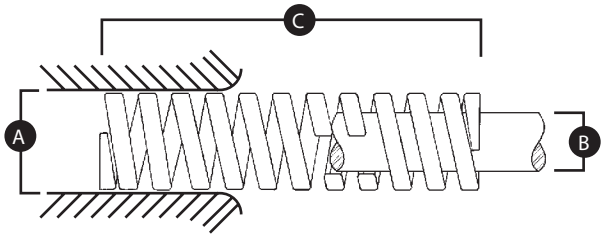
Raymond®	MEDIUM-HEAVY DUTY DIE SPRINGS			INCH SERIES							RED®
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE							
					For Optimum Life (20% of free length)		For Long Life (25% of free length)		Maximum Operating Def. (30% of free length)		*Maximum Deflection (37% of free length)	
A	B	C			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
1 (25.5 mm)	**1/2 (13 mm)**	1	342-1604	76.0	152.0	0.20	190.0	0.25	228.0	0.30	281.2	0.37
		1 1/4	342-1605	62.4	156.0	0.25	195.0	0.31	234.0	0.38	288.6	0.46
		1 1/2	342-1606	49.6	148.8	0.30	186.0	0.38	223.2	0.45	275.3	0.56
		1 3/4	342-1607	44.0	154.0	0.35	192.5	0.44	231.0	0.53	284.9	0.65
		2	342-1608	40.0	160.0	0.40	200.0	0.50	240.0	0.60	296.0	0.74
		2 1/2	342-1610	31.0	155.0	0.50	193.8	0.63	232.5	0.75	286.8	0.93
		3	342-1612	25.0	150.0	0.60	187.5	0.75	225.0	0.90	277.5	1.11
		3 1/2	342-1614	21.6	151.2	0.70	189.0	0.88	226.8	1.05	279.7	1.30
		4	342-1616	18.4	147.2	0.80	184.0	1.00	220.8	1.20	272.3	1.48
		4 1/2	342-1618	17.0	153.0	0.90	191.3	1.13	229.5	1.35	283.1	1.67
		5	342-1620	14.4	144.0	1.00	180.0	1.25	216.0	1.50	266.4	1.85
		5 1/2	342-1622	12.8	140.8	1.10	176.0	1.38	211.2	1.65	260.5	2.04
		6	342-1624	12.0	144.0	1.20	180.0	1.50	216.0	1.80	266.4	2.22
		7	342-1628	10.0	140.0	1.40	175.0	1.75	210.0	2.10	259.0	2.59
		8	342-1632	8.8	140.8	1.60	176.0	2.00	211.2	2.40	260.5	2.96
		12	342-1648	6.2	148.8	2.40	186.0	3.00	223.2	3.60	275.3	4.44
1 1/4 (32 mm)	**5/8 (16 mm)**	1 1/2	342-2006	114.4	343.2	0.30	429.0	0.38	514.8	0.45	634.9	0.56
		1 3/4	342-2007	100.8	352.8	0.35	441.0	0.44	529.2	0.53	652.7	0.65
		2	342-2008	86.4	345.6	0.40	432.0	0.50	518.4	0.60	639.4	0.74
		2 1/2	342-2010	62.4	312.0	0.50	390.0	0.63	468.0	0.75	577.2	0.93
		3	342-2012	51.2	307.2	0.60	384.0	0.75	460.8	0.90	568.3	1.11
		3 1/2	342-2014	44.0	308.0	0.70	385.0	0.88	462.0	1.05	569.8	1.30
		4	342-2016	36.8	294.4	0.80	368.0	1.00	441.6	1.20	544.6	1.48
		4 1/2	342-2018	32.0	288.0	0.90	360.0	1.13	432.0	1.35	532.8	1.67
		5	342-2020	29.0	290.0	1.00	362.5	1.25	435.0	1.50	536.5	1.85
		5 1/2	342-2022	26.4	290.4	1.10	363.0	1.38	435.6	1.65	537.2	2.04
		6	342-2024	25.0	300.0	1.20	375.0	1.50	450.0	1.80	555.0	2.22
		7	342-2028	20.0	280.0	1.40	350.0	1.75	420.0	2.10	518.0	2.59
		8	342-2032	18.4	294.4	1.60	368.0	2.00	441.6	2.40	544.6	2.96
		10	342-2040	14.5	290.0	2.00	362.5	2.50	435.0	3.00	536.5	3.70
		12	342-2048	12.4	297.6	2.40	372.0	3.00	446.4	3.60	550.6	4.44
1 1/2 (38.5 mm)	**3/4 (19.5 mm)**	2	342-2408	108.0	432.0	0.40	540.0	0.50	648.0	0.60	799.2	0.74
		2 1/2	342-2410	85.6	428.0	0.50	535.0	0.63	642.0	0.75	791.8	0.93
		3	342-2412	62.4	374.4	0.60	468.0	0.75	561.6	0.90	692.6	1.11
		3 1/2	342-2414	52.8	369.6	0.70	462.0	0.88	554.4	1.05	683.8	1.30
		4	342-2416	48.0	384.0	0.80	480.0	1.00	576.0	1.20	710.4	1.48
		4 1/2	342-2418	43.2	388.8	0.90	486.0	1.13	583.2	1.35	719.3	1.67
		5	342-2420	36.8	368.0	1.00	460.0	1.25	552.0	1.50	680.8	1.85
		5 1/2	342-2422	34.4	378.4	1.10	473.0	1.38	567.6	1.65	700.0	2.04
		6	342-2424	30.4	364.8	1.20	456.0	1.50	547.2	1.80	674.9	2.22
		7	342-2428	26.4	369.6	1.40	462.0	1.75	554.4	2.10	683.8	2.59
		8	342-2432	22.0	352.0	1.60	440.0	2.00	528.0	2.40	651.2	2.96
		10	342-2440	17.6	352.0	2.00	440.0	2.50	528.0	3.00	651.2	3.70
		12	342-2448	14.4	345.6	2.40	432.0	3.00	518.4	3.60	639.4	4.44
2 (51 mm)	**1 (25.5 mm)**	2 1/2	342-3210	118.4	592.0	0.50	740.0	0.63	888.0	0.75	1095.2	0.93
		3	342-3212	96.0	576.0	0.60	720.0	0.75	864.0	0.90	1065.6	1.11
		3 1/2	342-3214	80.0	560.0	0.70	700.0	0.88	840.0	1.05	1036.0	1.30
		4	342-3216	66.4	531.2	0.80	664.0	1.00	796.8	1.20	982.7	1.48
		4 1/2	342-3218	60.0	540.0	0.90	675.0	1.13	810.0	1.35	999.0	1.67
		5	342-3220	56.0	560.0	1.00	700.0	1.25	840.0	1.50	1036.0	1.85
		5 1/2	342-3222	50.4	554.4	1.10	693.0	1.38	831.6	1.65	1025.6	2.04
		6	342-3224	47.2	566.4	1.20	708.0	1.50	849.6	1.80	1047.8	2.22
		7	342-3228	40.0	560.0	1.40	700.0	1.75	840.0	2.10	1036.0	2.59
		8	342-3232	35.2	563.2	1.60	704.0	2.00	844.8	2.40	1041.9	2.96
		10	342-3240	26.0	520.0	2.00	650.0	2.50	780.0	3.00	962.0	3.70
		12	342-3248	22.4	537.6	2.40	672.0	3.00	806.4	3.60	994.6	4.44

*Tabulated load values shown represent loads near solid and are for design information only.
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RAYMOND® HEAVY-DUTY DIE SPRINGS





Raymond®	HEAVY-DUTY DIE SPRINGS				INCH SERIES						GOLD®	
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE							
					For Optimum Life (15% of free length)		For Long Life (20% of free length)		Maximum Operating Def. (25% of free length)		*Maximum Deflection (30% of free length)	
A	B	C			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
3/8 (9.5 mm)	3/16 (4.7 mm)	1	343-0604	11.0	16.5	0.15	22.0	0.20	27.5	0.25	33.0	0.30
		1 1/4	343-0605	9.8	18.4	0.19	24.5	0.25	30.6	0.31	36.8	0.38
		1 1/2	343-0606	8.0	18.0	0.23	24.0	0.30	30.0	0.38	36.0	0.45
		1 3/4	343-0607	8.4	22.1	0.26	29.4	0.35	36.8	0.44	44.1	0.53
		2	343-0608	7.2	21.6	0.30	28.8	0.40	36.0	0.50	43.2	0.60
		2 1/2	343-0610	5.5	20.6	0.38	27.5	0.50	34.4	0.63	41.3	0.75
		3	343-0612	4.2	18.9	0.45	25.2	0.60	31.5	0.75	37.8	0.90
		12	343-0648	1.2	21.6	1.80	28.8	2.40	36.0	3.00	43.2	3.60
1/2 (13 mm)	9/32 (7 mm)	1	343-0804	23.6	35.4	0.15	47.2	0.20	59.0	0.25	70.8	0.30
		1 1/4	343-0805	18.6	34.9	0.19	46.5	0.25	58.1	0.31	69.8	0.38
		1 1/2	343-0806	15.5	34.9	0.23	46.5	0.30	58.1	0.38	69.8	0.45
		1 3/4	343-0807	13.8	36.2	0.26	48.3	0.35	60.4	0.44	72.5	0.53
		2	343-0808	11.0	33.0	0.30	44.0	0.40	55.0	0.50	66.0	0.60
		2 1/2	343-0810	8.4	31.5	0.38	42.0	0.50	52.5	0.63	63.0	0.75
		3	343-0812	7.4	33.3	0.45	44.4	0.60	55.5	0.75	66.6	0.90
		3 1/2	343-0814	6.0	31.5	0.53	42.0	0.70	52.5	0.88	63.0	1.05
		12	343-0848	1.6	28.8	1.80	38.4	2.40	48.0	3.00	57.6	3.60
5/8 (16 mm)	11/32 (8.7 mm)	1	343-1004	42.4	63.6	0.15	84.8	0.20	106.0	0.25	127.2	0.30
		1 1/4	343-1005	29.6	55.5	0.19	74.0	0.25	92.5	0.31	111.0	0.38
		1 1/2	343-1006	27.2	61.2	0.23	81.6	0.30	102.0	0.38	122.4	0.45
		1 3/4	343-1007	24.0	63.0	0.26	84.0	0.35	105.0	0.44	126.0	0.53
		2	343-1008	20.8	62.4	0.30	83.2	0.40	104.0	0.50	124.8	0.60
		2 1/2	343-1010	17.0	63.8	0.38	85.0	0.50	106.3	0.63	127.5	0.75
		3	343-1012	14.4	64.8	0.45	86.4	0.60	108.0	0.75	129.6	0.90
		3 1/2	343-1014	12.2	64.1	0.53	85.4	0.70	106.8	0.88	128.1	1.05
		4	343-1016	10.8	64.8	0.60	86.4	0.80	108.0	1.00	129.6	1.20
		12	343-1048	3.0	54.0	1.80	72.0	2.40	90.0	3.00	108.0	3.60
3/4 (19.5 mm)	3/8 (9.5 mm)	1	343-1204	108.0	162.0	0.15	216.0	0.20	270.0	0.25	324.0	0.30
		1 1/4	343-1205	88.0	165.0	0.19	220.0	0.25	275.0	0.31	330.0	0.38
		1 1/2	343-1206	65.6	147.6	0.23	196.8	0.30	246.0	0.38	295.2	0.45
		1 3/4	343-1207	60.0	157.5	0.26	210.0	0.35	262.5	0.44	315.0	0.53
		2	343-1208	49.6	148.8	0.30	198.4	0.40	248.0	0.50	297.6	0.60
		2 1/2	343-1210	40.0	150.0	0.38	200.0	0.50	250.0	0.63	300.0	0.75
		3	343-1212	34.0	153.0	0.45	204.0	0.60	255.0	0.75	306.0	0.90
		3 1/2	343-1214	28.0	147.0	0.53	196.0	0.70	245.0	0.88	294.0	1.05
		4	343-1216	25.0	150.0	0.60	200.0	0.80	250.0	1.00	300.0	1.20
		4 1/2	343-1218	22.0	148.5	0.68	198.0	0.90	247.5	1.13	297.0	1.35
		5	343-1220	19.5	146.3	0.75	195.0	1.00	243.8	1.25	292.5	1.50
		5 1/2	343-1222	17.0	140.3	0.83	187.0	1.10	233.8	1.38	280.5	1.65
		6	343-1224	16.0	144.0	0.90	192.0	1.20	240.0	1.50	288.0	1.80
		12	343-1248	8.0	144.0	1.80	192.0	2.40	240.0	3.00	288.0	3.60

*Tabulated load values shown represent loads near solid and are for design information only.
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Raymond® die spring color gold is a registered trademark of Barnes Group Inc.

RAYMOND® HEAVY-DUTY DIE SPRINGS

Efficient Operating Range
15 to 20% of Free Length

Maximum Deflection
30% of Free Length

Ordering Procedure
Please Specify: • Quantity • Spring Type • Hole Diameter • Free Length • Catalog Number

Raymond® HEAVY-DUTY DIE SPRINGS — INCH SERIES — GOLD®

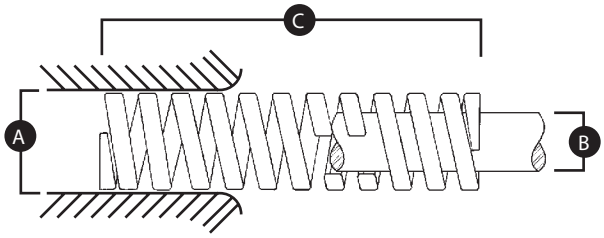
Hole Dia. (in) A	Rod Dia. (in) B	Free Length (in) C	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE							
					For Optimum Life (15% of free length)		For Long Life (20% of free length)		Maximum Operating Def. (25% of free length)		*Maximum Deflection (30% of free length)	
					Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
1 (25.5 mm)	**1/2 (13 mm)**	1	343-1604	208.0	312.0	0.15	416.0	0.20	520.0	0.25	624.0	0.30
		1 1/4	343-1605	171.2	321.0	0.19	428.0	0.25	535.0	0.31	642.0	0.38
		1 1/2	343-1606	118.4	266.4	0.23	355.2	0.30	444.0	0.38	532.8	0.45
		1 3/4	343-1607	104.0	273.0	0.26	364.0	0.35	455.0	0.44	546.0	0.53
		2	343-1608	90.0	270.0	0.30	360.0	0.40	450.0	0.50	540.0	0.60
		2 1/2	343-1610	68.0	255.0	0.38	340.0	0.50	425.0	0.63	510.0	0.75
		3	343-1612	54.4	244.8	0.45	326.4	0.60	408.0	0.75	489.6	0.90
		3 1/2	343-1614	45.6	239.4	0.53	319.2	0.70	399.0	0.88	478.8	1.05
		4	343-1616	40.0	240.0	0.60	320.0	0.80	400.0	1.00	480.0	1.20
		4 1/2	343-1618	35.2	237.6	0.68	316.8	0.90	396.0	1.13	475.2	1.35
		5	343-1620	31.2	234.0	0.75	312.0	1.00	390.0	1.25	468.0	1.50
		5 1/2	343-1622	28.8	237.6	0.83	316.8	1.10	396.0	1.38	475.2	1.65
		6	343-1624	25.6	230.4	0.90	307.2	1.20	384.0	1.50	460.8	1.80
		7	343-1628	22.4	235.2	1.05	313.6	1.40	392.0	1.75	470.4	2.10
		8	343-1632	19.2	230.4	1.20	307.2	1.60	384.0	2.00	460.8	2.40
		12	343-1648	12.0	216.0	1.80	288.0	2.40	360.0	3.00	432.0	3.60
1 1/4 (32 mm)	**5/8 (16 mm)**	1 1/2	343-2006	212.0	477.0	0.23	636.0	0.30	795.0	0.38	954.0	0.45
		1 3/4	343-2007	181.6	476.7	0.26	635.6	0.35	794.5	0.44	953.4	0.53
		2	343-2008	149.6	448.8	0.30	598.4	0.40	748.0	0.50	897.6	0.60
		2 1/2	343-2010	117.6	441.0	0.38	588.0	0.50	735.0	0.63	882.0	0.75
		3	343-2012	95.2	428.4	0.45	571.2	0.60	714.0	0.75	856.8	0.90
		3 1/2	343-2014	75.2	394.8	0.53	526.4	0.70	658.0	0.88	789.6	1.05
		4	343-2016	66.4	398.4	0.60	531.2	0.80	664.0	1.00	796.8	1.20
		4 1/2	343-2018	58.4	394.2	0.68	525.6	0.90	657.0	1.13	788.4	1.35
		5	343-2020	53.0	397.5	0.75	530.0	1.00	662.5	1.25	795.0	1.50
		5 1/2	343-2022	47.2	389.4	0.83	519.2	1.10	649.0	1.38	778.8	1.65
		6	343-2024	42.4	381.6	0.90	508.8	1.20	636.0	1.50	763.2	1.80
		7	343-2028	36.8	386.4	1.05	515.2	1.40	644.0	1.75	772.8	2.10
		8	343-2032	32.8	393.6	1.20	524.8	1.60	656.0	2.00	787.2	2.40
		10	343-2040	25.6	384.0	1.50	512.0	2.00	640.0	2.50	768.0	3.00
		12	343-2048	20.8	374.4	1.80	499.2	2.40	624.0	3.00	748.8	3.60
1 1/2 (38.5 mm)	**3/4 (19.5 mm)**	2	343-2408	190.4	571.2	0.30	761.6	0.40	952.0	0.50	1142.4	0.60
		2 1/2	343-2410	155.0	581.3	0.38	775.0	0.50	968.8	0.63	1162.5	0.75
		3	343-2412	130.0	585.0	0.45	780.0	0.60	975.0	0.75	1170.0	0.90
		3 1/2	343-2414	106.4	558.6	0.53	744.8	0.70	931.0	0.88	1117.2	1.05
		4	343-2416	91.2	547.2	0.60	729.6	0.80	912.0	1.00	1094.4	1.20
		4 1/2	343-2418	78.4	529.2	0.68	705.6	0.90	882.0	1.13	1058.4	1.35
		5	343-2420	71.2	534.0	0.75	712.0	1.00	890.0	1.25	1068.0	1.50
		5 1/2	343-2422	64.0	528.0	0.83	704.0	1.10	880.0	1.38	1056.0	1.65
		6	343-2424	58.4	525.6	0.90	700.8	1.20	876.0	1.50	1051.2	1.80
		7	343-2428	49.6	520.8	1.05	694.4	1.40	868.0	1.75	1041.6	2.10
		8	343-2432	43.2	518.4	1.20	691.2	1.60	864.0	2.00	1036.8	2.40
		10	343-2440	34.4	516.0	1.50	688.0	2.00	860.0	2.50	1032.0	3.00
		12	343-2448	28.8	518.4	1.80	691.2	2.40	864.0	3.00	1036.8	3.60
2 (51 mm)	**1 (25.5 mm)**	2 1/2	343-3210	260.0	975.0	0.38	1300.0	0.50	1625.0	0.63	1950.0	0.75
		3	343-3212	200.0	900.0	0.45	1200.0	0.60	1500.0	0.75	1800.0	0.90
		3 1/2	343-3214	170.0	892.5	0.53	1190.0	0.70	1487.5	0.88	1785.0	1.05
		4	343-3216	150.0	900.0	0.60	1200.0	0.80	1500.0	1.00	1800.0	1.20
		4 1/2	343-3218	120.0	810.0	0.68	1080.0	0.90	1350.0	1.13	1620.0	1.35
		5	343-3220	110.0	825.0	0.75	1100.0	1.00	1375.0	1.25	1650.0	1.50
		5 1/2	343-3222	100.0	825.0	0.83	1100.0	1.10	1375.0	1.38	1650.0	1.65
		6	343-3224	94.0	846.0	0.90	1128.0	1.20	1410.0	1.50	1692.0	1.80
		7	343-3228	82.0	861.0	1.05	1148.0	1.40	1435.0	1.75	1722.0	2.10
		8	343-3232	73.0	876.0	1.20	1168.0	1.60	1460.0	2.00	1752.0	2.40
		10	343-3240	55.0	825.0	1.50	1100.0	2.00	1375.0	2.50	1650.0	3.00
		12	343-3248	42.0	756.0	1.80	1008.0	2.40	1260.0	3.00	1512.0	3.60

*Tabulated load values shown represent loads near solid and are for design information only.
See Current Price List for Quantity Prices.

SUPERIOR DIE SET CORPORATION
• 900 W. Drexel Ave. • Oak Creek, WI 53154-0008
• WATS 1-800-558-6040 • FAX 1-800-657-0855 • Local 764-4900

RAYMOND® EXTRA-HEAVY DUTY DIE SPRINGS





Raymond®		EXTRA-HEAVY DUTY DIE SPRINGS			INCH SERIES			GREEN®			
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE						
					For Optimum Life (15% of free length)		For Long Life (17% of free length)		Maximum Operating Def. (20% of free length)		*Maximum Deflection (25% of free length)	
A	B	C			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
3/8 (9.5 mm)	3/16 (4.7 mm)	1	344-0604	22.0	33.0	0.15	37.4	0.17	44.0	0.20	55.0	0.25
		1 1/4	344-0605	16.0	30.0	0.19	34.0	0.21	40.0	0.25	50.0	0.31
		1 1/2	344-0606	12.5	28.1	0.23	31.9	0.26	37.5	0.30	46.9	0.38
		1 3/4	344-0607	11.5	30.2	0.26	34.2	0.30	40.3	0.35	50.3	0.44
		2	344-0608	9.0	27.0	0.30	30.6	0.34	36.0	0.40	45.0	0.50
		2 1/2	344-0610	7.0	26.3	0.38	29.8	0.43	35.0	0.50	43.8	0.63
		3	344-0612	6.5	29.3	0.45	33.2	0.51	39.0	0.60	48.8	0.75
		12	344-0648	1.5	27.0	1.80	30.6	2.04	36.0	2.40	45.0	3.00
1/2 (13 mm)	9/32 (7 mm)	1	344-0804	32.0	48.0	0.15	54.4	0.17	64.0	0.20	80.0	0.25
		1 1/4	344-0805	24.0	45.0	0.19	51.0	0.21	60.0	0.25	75.0	0.31
		1 1/2	344-0806	20.0	45.0	0.23	51.0	0.26	60.0	0.30	75.0	0.38
		1 3/4	344-0807	17.0	44.6	0.26	50.6	0.30	59.5	0.35	74.4	0.44
		2	344-0808	14.0	42.0	0.30	47.6	0.34	56.0	0.40	70.0	0.50
		2 1/2	344-0810	11.5	43.1	0.38	48.9	0.43	57.5	0.50	71.9	0.63
		3	344-0812	9.0	40.5	0.45	45.9	0.51	54.0	0.60	67.5	0.75
		3 1/2	344-0814	8.0	42.0	0.53	47.6	0.60	56.0	0.70	70.0	0.88
		12	344-0848	2.5	45.0	1.80	51.0	2.04	60.0	2.40	75.0	3.00
5/8 (16 mm)	11/32 (8.7 mm)	1	344-1004	63.0	94.5	0.15	107.1	0.17	126.0	0.20	157.5	0.25
		1 1/4	344-1005	47.0	88.1	0.19	99.9	0.21	117.5	0.25	146.9	0.31
		1 1/2	344-1006	38.0	85.5	0.23	96.9	0.26	114.0	0.30	142.5	0.38
		1 3/4	344-1007	32.0	84.0	0.26	95.2	0.30	112.0	0.35	140.0	0.44
		2	344-1008	29.0	87.0	0.30	98.6	0.34	116.0	0.40	145.0	0.50
		2 1/2	344-1010	22.0	82.5	0.38	93.5	0.43	110.0	0.50	137.5	0.63
		3	344-1012	19.0	85.5	0.45	96.9	0.51	114.0	0.60	142.5	0.75
		3 1/2	344-1014	16.0	84.0	0.53	95.2	0.60	112.0	0.70	140.0	0.88
		4	344-1016	13.5	81.0	0.60	91.8	0.68	108.0	0.80	135.0	1.00
		12	344-1048	4.5	81.0	1.80	91.8	2.04	108.0	2.40	135.0	3.00
3/4 (19.5 mm)	3/8 (9.5 mm)	1	344-1204	140.0	210.0	0.15	238.0	0.17	280.0	0.20	350.0	0.25
		1 1/4	344-1205	110.0	206.3	0.19	233.8	0.21	275.0	0.25	343.8	0.31
		1 1/2	344-1206	89.0	200.3	0.23	227.0	0.26	267.0	0.30	333.8	0.38
		1 3/4	344-1207	75.0	196.9	0.26	223.1	0.30	262.5	0.35	328.1	0.44
		2	344-1208	68.0	204.0	0.30	231.2	0.34	272.0	0.40	340.0	0.50
		2 1/2	344-1210	50.0	187.5	0.38	212.5	0.43	250.0	0.50	312.5	0.63
		3	344-1212	40.5	182.3	0.45	206.6	0.51	243.0	0.60	303.8	0.75
		3 1/2	344-1214	34.5	181.1	0.53	205.3	0.60	241.5	0.70	301.9	0.88
		4	344-1216	30.0	180.0	0.60	204.0	0.68	240.0	0.80	300.0	1.00
		4 1/2	344-1218	26.5	178.9	0.68	202.7	0.77	238.5	0.90	298.1	1.13
		5	344-1220	23.5	176.3	0.75	199.8	0.85	235.0	1.00	293.8	1.25
		5 1/2	344-1222	21.5	177.4	0.83	201.0	0.94	236.5	1.10	295.6	1.38
		6	344-1224	19.5	175.5	0.90	198.9	1.02	234.0	1.20	292.5	1.50
		12	344-1248	9.5	171.0	1.80	193.8	2.04	228.0	2.40	285.0	3.00

*Tabulated load values shown represent loads near solid and are for design information only.
See Current Price List for Quantity Prices.
Raymond® die spring color green is a registered trademark of Barnes Group Inc.

RAYMOND® EXTRA-HEAVY DUTY DIE SPRINGS

Efficient Operating Range
15 to 20% of Free Length

Maximum Deflection
25% of Free Length

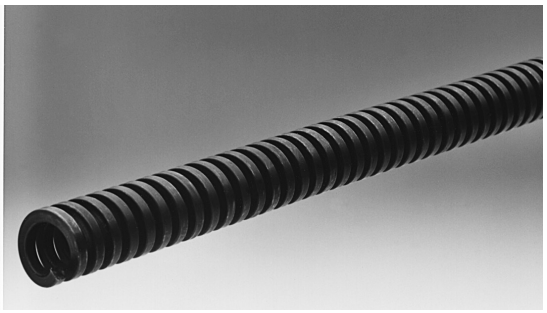
Ordering Procedure
Please Specify: • Quantity • Spring Type • Hole Diameter • Free Length • Catalog Number

Raymond®	EXTRA-HEAVY DUTY DIE SPRINGS				INCH SERIES						GREEN®	
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE							
					For Optimum Life (15% of free length)		For Long Life (17% of free length)		Maximum Operating Def. (20% of free length)		*Maximum Deflection (25% of free length)	
A	B	C			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)
1 (25.5 mm)	**1/2 (13 mm)**	1 1/2	344-1606	160.0	360.0	0.23	408.0	0.26	480.0	0.30	600.0	0.38
		2	344-1608	116.0	348.0	0.30	394.4	0.34	464.0	0.40	580.0	0.50
		2 1/2	344-1610	89.6	336.0	0.38	380.8	0.43	448.0	0.50	560.0	0.63
		3	344-1612	73.6	331.2	0.45	375.4	0.51	441.6	0.60	552.0	0.75
		3 1/2	344-1614	62.4	327.6	0.53	371.3	0.60	436.8	0.70	546.0	0.88
		4	344-1616	55.2	331.2	0.60	375.4	0.68	441.6	0.80	552.0	1.00
		4 1/2	344-1618	48.8	329.4	0.68	373.3	0.77	439.2	0.90	549.0	1.13
		5	344-1620	43.2	324.0	0.75	367.2	0.85	432.0	1.00	540.0	1.25
		6	344-1624	36.0	324.0	0.90	367.2	1.02	432.0	1.20	540.0	1.50
		12	344-1648	17.6	316.8	1.80	359.0	2.04	422.4	2.40	528.0	3.00
1 1/4 (32 mm)	**5/8 (16 mm)**	2	344-2008	192.0	576.0	0.30	652.8	0.34	768.0	0.40	960.0	0.50
		2 1/2	344-2010	144.0	540.0	0.38	612.0	0.43	720.0	0.50	900.0	0.63
		3	344-2012	118.4	532.8	0.45	603.8	0.51	710.4	0.60	888.0	0.75
		3 1/2	344-2014	100.8	529.2	0.53	599.8	0.60	705.6	0.70	882.0	0.88
		4	344-2016	84.0	504.0	0.60	571.2	0.68	672.0	0.80	840.0	1.00
		4 1/2	344-2018	78.4	529.2	0.68	599.8	0.77	705.6	0.90	882.0	1.13
		5	344-2020	68.0	510.0	0.75	578.0	0.85	680.0	1.00	850.0	1.25
		6	344-2024	56.0	504.0	0.90	571.2	1.02	672.0	1.20	840.0	1.50
		8	344-2032	41.6	499.2	1.20	565.8	1.36	665.6	1.60	832.0	2.00
		10	344-2040	33.6	504.0	1.50	571.2	1.70	672.0	2.00	840.0	2.50
		12	344-2048	26.4	475.2	1.80	538.6	2.04	633.6	2.40	792.0	3.00
1 1/2 (38.5 mm)	**3/4 (19.5 mm)**	2	344-2408	376.0	1128.0	0.30	1278.4	0.34	1504.0	0.40	1880.0	0.50
		2 1/2	344-2410	294.4	1104.0	0.38	1251.2	0.43	1472.0	0.50	1840.0	0.63
		3	344-2412	231.2	1040.4	0.45	1179.1	0.51	1387.2	0.60	1734.0	0.75
		3 1/2	344-2414	196.0	1029.0	0.53	1166.2	0.60	1372.0	0.70	1715.0	0.88
		4	344-2416	171.2	1027.2	0.60	1164.2	0.68	1369.6	0.80	1712.0	1.00
		4 1/2	344-2418	148.0	999.0	0.68	1132.2	0.77	1332.0	0.90	1665.0	1.13
		5	344-2420	136.0	1020.0	0.75	1156.0	0.85	1360.0	1.00	1700.0	1.25
		6	344-2424	110.4	993.6	0.90	1126.1	1.02	1324.8	1.20	1656.0	1.50
		8	344-2432	80.8	969.6	1.20	1098.9	1.36	1292.8	1.60	1616.0	2.00
		10	344-2440	67.2	1008.0	1.50	1142.4	1.70	1344.0	2.00	1680.0	2.50
		12	344-2448	54.4	979.2	1.80	1109.8	2.04	1305.6	2.40	1632.0	3.00
2 (51 mm)	**1 (25.5 mm)**	2 1/2	344-3210	381.6	1431.0	0.38	1621.8	0.43	1908.0	0.50	2385.0	0.63
		3	344-3212	312.0	1404.0	0.45	1591.2	0.51	1872.0	0.60	2340.0	0.75
		3 1/2	344-3214	254.4	1335.6	0.53	1513.7	0.60	1780.8	0.70	2226.0	0.88
		4	344-3216	220.0	1320.0	0.60	1496.0	0.68	1760.0	0.80	2200.0	1.00
		4 1/2	344-3218	188.8	1274.4	0.68	1444.3	0.77	1699.2	0.90	2124.0	1.13
		5	344-3220	172.8	1296.0	0.75	1468.8	0.85	1728.0	1.00	2160.0	1.25
		6	344-3224	141.6	1274.4	0.90	1444.3	1.02	1699.2	1.20	2124.0	1.50
		8	344-3232	100.0	1200.0	1.20	1360.0	1.36	1600.0	1.60	2000.0	2.00
		10	344-3240	84.0	1260.0	1.50	1428.0	1.70	1680.0	2.00	2100.0	2.50
		12	344-3248	71.2	1281.6	1.80	1452.5	2.04	1708.8	2.40	2136.0	3.00

*Tabulated load values shown represent loads near solid and are for design information only.
See Current Price List for Quantity Prices.

SUPERIOR DIE SET CORPORATION • 900 W. Drexel Ave. • Oak Creek, WI 53154-0008
• WATS 1-800-558-6040 • FAX 1-800-657-0855 • Local 764-4900

RAYMOND® DIE SPRINGS



- Heavy duty square wire design
- Hole sizes 3/8" diameter to 2 9/16" diameter
- Packed in boxes containing 12 each

Ordering Procedure

Specify

- Quantity
- Spring Type
- Hole Diameter
- Free Length
- Catalog Number

Square Wire Die Springs — Plain End Springs - 12" Length

New Part Number	Old Part Number	Hole Size (in)	Rod Size (in)	Square Wire Size (in)	Space Between Coils (in)	Unit Pack
345-1001	SR-0	3/8	3/16	0.063	0.047	12
345-1002	SR-1A	7/16	1/4	0.063	0.079	12
345-1003	SR-1B	1/2	1/4	0.094	0.079	12
345-1004	SR-1	9/16	5/16	0.094	0.094	12
345-1005	SR-2	11/16	7/16	0.094	0.125	12
345-1006	SR-3	13/16	9/16	0.094	0.125	12
345-1007	SR-4	9/16	1/4	0.125	0.063	12
345-1008	SR-5	11/16	3/8	0.125	0.094	12
345-1009	SR-6	13/16	1/2	0.125	0.109	12
345-1010	SR-7	15/16	5/8	0.125	0.125	12
345-1011	SR-8	1 1/16	3/4	0.125	0.188	6
345-1012	SR-9	1 3/16	7/8	0.125	0.250	6
345-1013	SR-10	11/16	5/16	0.156	0.063	12
345-1014	SR-11	13/16	7/16	0.156	0.109	12
345-1015	SR-12	15/16	9/16	0.156	0.109	12
345-1016	SR-13	1 1/16	11/16	0.156	0.172	6
345-1017	SR-14	1 3/16	13/16	0.156	0.188	6
345-1018	SR-15	1 5/16	15/16	0.156	0.250	6
345-1019	SR-16	13/16	3/8	0.188	0.094	12
345-1020	SR-17	15/16	1/2	0.188	0.094	12
345-1021	SR-18	1 1/16	5/8	0.188	0.156	6
345-1022	SR-19	1 3/16	3/4	0.188	0.188	6
345-1023	SR-20	1 5/16	7/8	0.188	0.188	6
345-1024	SR-21	1 7/16	1	0.188	0.312	6
345-1025	SR-22	1 9/16	1 1/8	0.188	0.312	6
345-1026	SR-23	1 1/16	7/16	0.250	0.109	6
345-1027	SR-24	1 3/16	9/16	0.250	0.125	6
345-1028	SR-25	1 5/16	11/16	0.250	0.156	6
345-1029	SR-26	1 7/16	13/16	0.250	0.172	6
345-1030	SR-27	1 9/16	15/16	0.250	0.203	6
345-1031	SR-28	1 13/16	1 3/16	0.250	0.344	6
345-1032	SR-29	2 1/16	1 7/16	0.250	0.438	6
345-1033	SR-30	2 5/16	1 11/16	0.250	0.531	6
345-1034	SR-31	1 9/16	13/16	0.312	0.188	6
345-1035	SR-32	1 13/16	1 1/16	0.312	0.250	6
345-1036	SR-33	2 1/16	1 5/16	0.312	0.297	6
345-1037	SR-34	2 5/16	1 9/16	0.312	0.406	6
345-1038	SR-35	2 9/16	1 13/16	0.312	0.438	6



- High quality plain edge springs furnished in 10" lengths
- Hole sizes from 3/32" diameter to 1/2" diameter
- Packed in boxes containing 12 each

Ordering Procedure

Specify

- Quantity
- Spring Type
- Hole Diameter
- Free Length
- Catalog Number

Round Wire / Music Wire — Plain Ends - 10" Length

Part Number	Hole Size (in)	Wire Diameter (in)	Spring Rate (lb/in)	Approx. Solid Height (in)	Unit Pack
345-2001	3/32	0.010	0.11	2.80	12
345-2002	3/32	0.014	0.48	3.99	12
345-2003	1/8	0.012	0.09	3.00	12
345-2004	1/8	0.016	0.35	4.00	12
345-2005	3/16	0.014	0.09	2.17	12
345-2006	3/16	0.018	0.24	2.52	12
345-2007	3/16	0.026	1.34	3.43	12
345-2008	3/16	0.035	3.30	6.65	12
345-2009	1/4	0.018	0.14	1.71	12
345-2010	1/4	0.022	0.26	2.53	12
345-2011	1/4	0.026	0.67	2.55	12
345-2012	1/4	0.031	1.37	3.10	12
345-2013	1/4	0.035	1.73	4.73	12
345-2014	1/4	0.041	5.40	3.69	12
345-2015	1/4	0.047	9.17	4.70	12
345-2016	5/16	0.022	0.15	2.24	12
345-2017	5/16	0.031	0.57	3.41	12
345-2018	5/16	0.037	1.27	4.07	12
345-2019	5/16	0.041	2.70	3.28	12
345-2020	5/16	0.047	5.45	3.53	12
345-2021	5/16	0.055	10.27	4.40	12
345-2022	3/8	0.031	0.32	3.41	12
345-2023	3/8	0.035	0.58	3.50	12
345-2024	3/8	0.043	2.06	3.01	12
345-2025	3/8	0.047	2.52	4.00	12
345-2026	3/8	0.055	7.29	3.30	12
345-2027	3/8	0.062	11.29	4.03	12
345-2028	3/8	0.075	30.57	5.25	12
345-2029	7/16	0.035	0.54	2.45	12
345-2030	7/16	0.047	1.81	3.29	12
345-2031	7/16	0.055	4.12	3.30	12
345-2032	7/16	0.062	6.45	4.03	12
345-2033	7/16	0.075	18.18	4.13	12
345-2034	7/16	0.085	30.19	5.10	12
345-2035	1/2	0.035	0.26	3.15	12
345-2036	1/2	0.047	1.06	3.53	12
345-2037	1/2	0.055	2.25	3.85	12
345-2038	1/2	0.062	6.77	2.48	12
345-2039	1/2	0.075	14.35	3.38	12
345-2040	1/2	0.091	30.81	4.55	12
345-2041	1/2	0.115	87.36	6.33	12

RAYMOND® DIE SPRINGS

Plain Ends, Carbon Steel - 18" Lengths

Part Number	Hole Size* (in)	Wire Diameter (in)	Spring Rate (lb/in)	Approx. Solid Height (in)	Assortment Quantity	Unit Pack
345-2042	1/2	0.041	0.60	3.32	1	12
345-2043	1/2	0.054	1.98	3.89	1	12
345-2044	9/16	0.062	1.84	6.45	1	12
345-2045	9/16	0.072	5.10	5.18	1	12
345-2046	5/8	0.054	1.31	2.92	1	12
345-2047	11/16	0.062	1.82	3.35	1	12
345-2048	11/16	0.072	3.03	4.25	1	12
345-2049	11/16	0.068	2.24	4.28	1	12
345-2050	13/16	0.062	1.30	2.79	1	12
345-2051	13/16	0.080	3.50	3.60	1	12
345-2052	7/8	0.098	7.79	4.02	1	12
345-2053	15/16	0.125	15.00	6.25	1	12
345-2054	1 1 /8	0.125	7.57	6.25	1	6
345-2055	15/16	0.080	2.52	3.60	1	12
345-2056	1	0.098	5.69	3.53	1	6
345-2057	1 1/16	0.125	12.73	4.50	1	6
345-2058	1 1/8	0.135	10.78	7.29	1	6
345-2059	1 1/16	0.085	2.06	3.49	1	6
345-2060	1 3/16	0.125	9.00	4.50	1	6
345-2061	1 3/16	0.090	2.45	2.88	1	6
345-2062	1 3/8	0.148	12.73	4.74	1	6
345-2063	1 5/8	0.148	8.60	4.00	1	6
345-2064	1 7/8	0.148	4.44	4.74	1	6

*Hole Size refers to the diameter of the hole that the spring will fit into.

Square and Ground Ends - Music Wire

Part Number	Free Length (in)	Hole Diameter (in)	Wire Size (in)	Spring Rate (lb/in)	Approx. Solid Height (in)	Unit Pack
345-3001	1			20.0	1.44	12
345-3002	1 1/2			14.0	1.65	12
345-3003	2	3/8	0.042	12.0	1.84	12
345-3004	2 1/2			8.0	1.03	12
345-3005	3			6.0	1.21	12
345-3006	1			58.0	0.49	12
345-3007	1 1/2			42.0	0.69	12
345-3008	2	1/2	0.062	32.0	0.92	12
345-3009	2 1/2			25.0	1.05	12
345-3010	3			24.0	1.24	12
345-3011	3 1/2			18.0	1.50	12
345-3012	1			57.0	0.42	12
345-3013	1 1/2			34.0	0.59	12
345-3014	2			32.0	0.81	12
345-3015	2 1/2	5/8	0.072	26.0	0.92	12
345-3016	3			20.0	1.07	12
345-3017	3 1/2			18.0	1.28	12
345-3018	4			16.0	1.60	12

Heavy Duty Extension Springs

Part Number	Free Length (in)	Outside Diameter (in)	Wire Size (in)	Spring Rate (lb/in)	Approx. Load @ Ref. Extension (in)	Unit Pack
345-5001	3 7/8	11/16	0.105	32.8	40 lb @ 5.0"	6
345-5002	6	7/8	0.120	18.5	26.5 lb @ 7.0"	6
345-5003	8	1 1/16	0.135	13.5	38 lb @ 10.0"	6
345-5004	10	1 1/8	0.148	14.0	48 lb @ 13.0"	6
345-5005	12	1 1/4	0.162	12.6	66 lb @ 15.0"	6
345-5006	14	1 3/8	0.177	13.9	74 lb @ 18.0"	6
345-5007	16	1 9/16	0.207	16.5	100 lb @ 21.0"	6

Problems & Answers
Most problems that arise in the use of die springs usually result from improper application... failure to take advantage of and protect the features engineered into the spring.

Spring Failure
Raymond die springs are produced under such careful controls that manufacturing problems have virtually been eliminated. Die spring failure is usually due to either poor spring design and manufacture or incorrect application of the spring. The most common problem source is the use of die springs too close to, or beyond, the springs' physical limitations. The solution, of course, lies with the designer's and user's more careful selection of springs for each application.

Other solutions to common spring problems are as follows:

Spring Guidance
Raymond die springs are manufactured with ends ground and squared so that they stand on their own base and compress evenly under load. There is a positive relationship between the spring's outside diameter and total length which determines whether or not a spring will buckle under load.

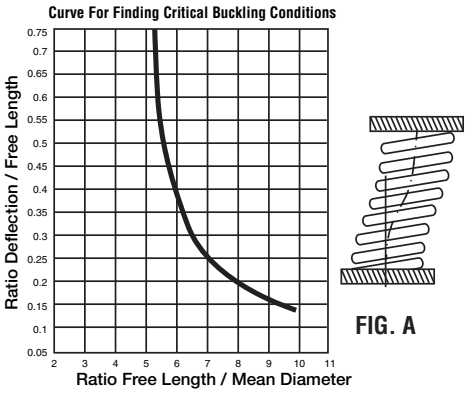


FIG. A

Generally, if the free length is more than four times the mean diameter of the spring, it could have a buckling problem under compression. This is solved by providing guidance by a pocket, a rod, or both to reduce buckling. It is always recommended to provide guidance for any die spring.

Figure A provides information as to whether a specific spring with squared, ground ends is subject to buckling. The curve indicates that buckling may occur to a squared-and-ground spring, both ends of which are compressed against parallel plates, if the values fall above and to the right of the curve.

Holes and Rods
Holes or pockets provided in the die for springs must be the specified size listed on pages 4 to 14. Springs increase in diameter as they are compressed. If the hole is undersized, a wearing or binding action will produce early spring failure.

Holes also must have flat bottoms with square corners. This will allow the spring to work on a flat surface and provide uniform stress on the coils when the spring is compressed.

Working a spring over a rod also provides good protection against buckling. Care should be taken to be sure the rod is smooth. If the rod is shorter than the spring, it should have a tapered nose so that there is no danger of the spring coils coming in contact with a sharp edge.

Alignment
Care should be taken to make certain that whatever device is used to contain or guide the spring is properly aligned on both sides of the die. Holes or rods that do not match can cause problems that create spring failure and damage to the tool.

Temperature
Heat is a frequently ignored factor in spring failure or load loss. The maximum rated service temperature for chromium alloy steel is 425°F.

Figure B shows the percentage of low-loss due to heat and stress combinations. Thought should be given to the heat generated by the working die which can be significant in many applications. Heat absorbed by the tool can be transferred to the springs resulting in a loss of load and premature spring failure.

Deflection
Deflection beyond the manufacturer's recommendation can cause early spring failure. Check the press or die travel to be sure of the actual deflection to which the spring will be subjected. If it is beyond a safe limit, changes should be made without delay.

Spring Alteration
Each Raymond die spring is carefully engineered to perform within specific areas of work. Altering the spring such as reducing its length or number of coils, grinding the inside or outside diameter, or placing restrictions on the movement of the coils can cause early spring failure. Trying to alter a spring by grinding down its ends can change the temper of the material and negatively affect spring performance.

Altering springs from their manufactured state almost invariably leads to problems and failure. Don't gamble an expensive die for the small amount saved on a cheap alteration.

Corrosion
Frequently, spring failure can be traced to corrosive elements. Reduction of material or pitting of the spring will reduce its useful life. Be alert to conditions that may effect the spring's surface such as rust, lubricants, soaps, chemicals, etc. Clean, protected springs give the best job performance.

Load Loss vs. Temperature

INITIAL STRESS P.S.I.	CARBON STEEL Approximate Percent Loss of Load			CHROMIUM ALLOY Approximate Percent Loss of Load		
	Degrees			Degrees		
	250	350	400	250	350	450
40,000	2.0	3.5	4.5	1.0	2.0	5.0
50,000	2.0	4.0	5.0	1.0	2.0	5.0
60,000	2.5	4.5	5.5	1.0	2.0	5.5
70,000	3.0	5.5	6.5	1.0	2.5	6.0
80,000	3.0	6.0	8.0	1.5	2.5	6.0
90,000	4.0	8.0	9.0	1.5	3.0	7.0
100,000	4.5	9.5	10.5	2.0	4.0	8.0
110,000	7.0	11.5	14.0	2.0	5.0	10.0
120,000	9.5	13.0	17.5	3.5	8.0	13.0

FIG. B

Associated Spring Raymond BARNES GROUP INC

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