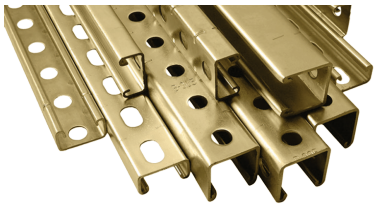
TECHNICAL DATA SHEET - INTERACTIVE PDF

Design data, metal framing channel system

Applications for use as beam or column supports

Kindorf®



Design data to help with beam or column support type applications, including channel accessories.

3-Part Specification: 26 05 29.11
Tools & Calculators

General information:

For purposes of designating type and quality for work in this section, drawings and specifications are based upon standard Kindorf® product drawings.

Materials specification:

- Steel channel sections are made from AISI 1015 commercial grade steel and are in conformance with ASTM A569-72.
- Aluminum channel sections are from 6063-T6 aluminum alloy and are in conformance with ASTM-B221-80.

Construction:

Channel and Accessories for Support Systems.

The cross sectional width dimension of the channel shall be a minimum of 1½". The depth will be as required to satisfy the load requirements. Channel with 1½" depth or greater shall be rolled from Manufacturing Std. 12 gauge steel. Channel smaller than 1½" may be Manufacturing Std. 14 gauge.

Attachment holes, when required, shall be factory punched on hole centers equal to the channel cross sectional width dimension and shall be a maximum of 9⁄16" in diameter.

Channel attachment nuts shall be designed to prelocate in the channel and provide a bearing surface on the turned down lips while making positive contact with the side walls of the channel.

Straps for the support of conduit shall be designed such that the attachment nut is captivated on the shoulder of the strap when tightened, and the attachment bolt will allow tightening by either a slot-head screwdriver or wrench.

All nuts, bolts, straps, threaded rod and edges of punched holes shall be protected with the same finish as the channel as described in the FINISH section of this specification.

Channel and Accessories for Surface Raceway Systems.

Fluorescent fixtures, as designated on the drawings and according to the fixture schedule, shall be supported and supplied through a combination raceway and support system.

The cross sectional width dimension of the channel shall be a minimum of 1½". The depth will be as required to satisfy the load and wire carrying requirements.

The supporting channel shall have 1⁄2" diameter knockouts on 6" centers to accommodate 1⁄2" conduit fittings, and be listed by Underwriters' Laboratories Inc. as complying with Std. UL-5 for use as surface raceway and support for electric discharge type lighting fixture. The channel must also provide for ground continuity.

The combination raceway and support system shall be complete with channel joiners, end caps, closure strips, hangers, wiring entrance and all necessary fittings for electrical and mechanical connections.

When splicing or joining raceway channel at 90 degree angles, the joiners shall be designed such that they are concealed and fastened to the inside surface of the channel. Joiners shall be listed by Underwriters' Laboratories Inc. and allow wires to be directly laid in place.

Finish:

- Galv-Krom
  The finish on steel components shall consist of a combination of .0005 inch electrogalvanizing on steel in accordance with ASTM B633-78 Type LS coating and a gold Trivalent barrier formed on the zinc. This coating shall be applied after factory fabrication of the material.
  When tested in accordance with ASTM B117-73 procedure, there shall be no sign of red rust after 1,000 hours of testing.

Table data:

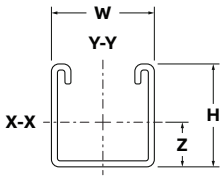
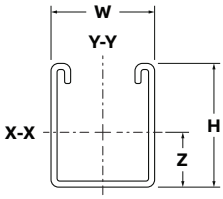
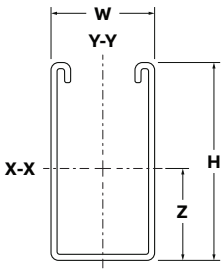
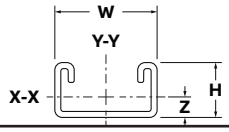
Table 1 - Single channels
Table 2 - Loads and deflections
Table 3 - 6 - Load and Deflection formulas
Table 7 - Conversion factors for beams
Table 8 - Conduit spacing, between centers of conduit
Table 9 - Pipe data, rigid conduit
Table 10 and 11 - Pipe data, Metal (IMC) and Metal (EMT)
Table 12 - Structure channel/Column loading
Table 13 - Hanger rods
Table 14 - Load deflection charts
Table 15 - Deflection constants for continuous run, 4 foot fixtures

Design data, metal framing channel system:
Properties for design

Nominal thickness (Inches):
12 gage = 0.105
14 gage = 0.075
16 gage = 0.060

Key:
I = Moment of inertia
S = Section of modulus
R = Radius of Gyration
A = Area

Table 1 - Single channels

Drawing Elements of section	Part no. Channel	Dimensions			Weight	X-X axis			Y-Y Axis		
		H in (mm)	W in (mm)	A in² (cm²)	lbs./ft. (N/M)	I in⁴ (cm⁴)	S in³ (cm³)	R in (mm)	I in⁴ (cm⁴)	S in³ (cm³)	R in (mm)
	B-900	1.500 (38.10)	1.500 (38.10)	0.521 (3.36)	1.776 (2.64)	0.155 (6.5)	0.179 (2.9)	0.545 (13.8)	0.137 (5.7)	0.168 (2.8)	0.600 (15.2)
	B-900-M	1.500 (38.10)	1.500 (38.10)	0.354 (2.28)	1.206 (1.80)	0.101 (4.2)	0.123 (2.0)	0.535 (13.6)	0.205 (8.5)	0.252 (4.1)	0.640 (16.3)
	B-901	1.875 (47.63)	1.500 (38.10)	0.595 (3.84)	2.028 (3.02)	0.263 (10.9)	0.251 (4.1)	0.665 (16.9)	0.335 (13.9)	0.413 (6.8)	0.679 (17.2)
	B-902	3.000 (76.20)	1.500 (38.10)	0.837 (5.40)	2.852 (4.25)	0.909 (37.8)	0.552 (9.0)	1.042 (26.5)	0.436 (18.1)	0.536 (8.8)	0.697 (17.7)
	B-906	0.750 (19.05)	1.500 (38.10)	0.217 (1.40)	0.740 (1.10)	0.018 (0.7)	0.041 (0.7)	0.272 (6.9)	0.237 (9.9)	0.292 (4.8)	0.652 (16.6)

—

Design data, metal framing channel system
Load and deflection, single channel: (continues on page 4)

Table 2 - Loads and deflections

Part no. Channel	Maximum Uniform Load and Deflection				Uniform Load and Deflection at 1/180 Span				Uniform Load and Deflection at 1/240 Span				Uniform Load and Deflection at 1/360 Span				Column Load @ K=100	
	lbs	kN	in	mm	lbs	kN	in	mm	lbs	kN	in	mm	lbs	kN	in	mm	lbs	kN
12-in (305mm) Beam or Column span																		
B-900	3,580	(15.92)	.017	(0.43)	—	—	.067	(1.70)	—	—	.050	(1.27)	—	—	.033	(0.84)	7,628	(33.93)
B-900-M	2,460	(10.94)	.018	(0.46)	—	—	.067	(1.70)	—	—	.050	(1.27)	—	—	.033	(0.84)	7,625	(33.92)
B-901	5,020	(22.33)	.014	(0.36)	—	—	.067	(1.70)	—	—	.050	(1.27)	—	—	.033	(0.84)	7,660	(34.07)
B-902	11,040	(49.11)	.009	(0.23)	—	—	.067	(1.70)	—	—	.050	(1.27)	—	—	.033	(0.84)	7,699	(35.25)
B-906	820	(3.65)	.034	(0.86)	—	—	.067	(1.70)	—	—	.050	(1.27)	800	(3.56)	.033	(0.84)	7.337	(32.64)
18-in (457mm) Beam or Column span																		
B-900	547	(2.43)	.077	(1.96)	—	—	.100	(2.54)	—	—	.075	(1.91)	—	—	.050	(1.27)	7,507	(33.39)
B-900-M	2,387	10.62)	.039	(0.99)	—	—	.100	(2.54)	—	—	.075	(1.91)	—	—	.050	(1.27)	7,499	(33.36)
B-901	1,640	(7.30)	.041	(1.04)	—	—	.100	(2.54)	—	—	.075	(1.91)	—	—	.050	(1.27)	7,579	(33.71)
B-902	3,347	(14.89)	.032	(0.81)	—	—	.100	(2.54)	—	—	.750	(1.91)	—	—	.050	(1.27)	7,665	(34.10)
B-906	7,360	(32.74)	.020	(0.51)	—	—	.100	(2.54)	533	(2.37)	.750	(1.91)	356	(1.58)	.050	(1.27)	6,852	(30.48)
24-in (610mm) Beam or Column span																		
B-900	1,790	(7.96)	.069	(1.75)	—	—	.133	(3.38)	—	—	.100	(2.54)	1,731	(7.70)	.067	(1.70)	7,338	(32.64)
B-900-M	1,230	(5.47)	.073	(1.85)	—	—	.133	(3.38)	—	—	.100	(2.54)	1,128	(5.02)	.067	(1.70)	7,324	(32.58)
B-901	2,510	(11.16)	.057	(1.45)	—	—	.133	(3.38)	—	—	.100	(2.54)	—	—	.067	(1.70)	7,465	(33.21)
B-902	5,520	(24.55)	.036	(0.91)	—	—	.133	(3.38)	—	—	.100	(2.54)	—	—	.067	(1.70)	7,619	(33.89)
B-906	410	(1.82)	.137	(3.48)	399	(1.77)	.133	(3.38)	300	(1.33)	.100	(2.54)	201	(0.89)	.067	(1.70)	6,172	(27.45)
30-in (762mm) Beam or Column span																		
B-900	1,432	(6.37)	.108	(2.74)	—	—	.167	(4.24)	—	—	.125	(3.18)	1,098	(4.88)	.083	(2.11)	7,121	(31.68)
B-900-M	984	(4.38)	.114	(2.90)	—	—	.167	(4.24)	—	—	.125	(3.18)	715	(3.18)	.083	(2.11)	7,098	(31.57)
B-901	2,008	(8.93)	.089	(2.26)	—	—	.167	(4.24)	—	—	.125	(3.18)	1,863	(8.29)	.083	(2.11)	7,319	(32.56)
B-902	4,416	(19.64)	.057	(1.45)	—	—	.167	(4.24)	—	—	.125	(3.18)	—	—	.083	(2.11)	7,560	(33.63)
B-906	328	(1.46)	.214	(5.44)	257	—	.167	(4.24)	192	—	.125	(3.18)	127	—	.083	(2.11)	5,299	(23.57)
36-in (914mm) Beam or Column span																		
B-900	1,193	(5.31)	.156	(3.96)	—	—	.200	(5.08)	1,148	(5.11)	.150	(3.81)	765	(3.40)	.100	(2.54)	6,855	(30.49)
B-900-M	820	(3.65)	.164	(4.17)	—	—	.200	(5.08)	748	(3.33)	.150	(3.81)	499	(2.22)	.100	(2.54)	6,822	(30.35)
B-901	1,673	(7.44)	.129	(3.28)	—	—	.200	(5.08)	—	—	.150	(3.81)	1,299	(5.78)	.100	(2.54)	7,140	(31.76)
B-902	3,680	(16.37)	.082	(2.08)	—	—	.200	(5.08)	—	—	.150	(3.81)	—	—	.100	(2.54)	7,487	(33.30)
B-906	273	(1.21)	.308	(7.82)	178	(0.79)	.200	(5.08)	133	(0.59)	.150	(3.81)	89	(0.40)	.100	(2.54)	4,231	(18.82)
42-in (1067mm) Beam or Column span																		
B-900	1,023	(4.55)	.212	(5.38)	—	—	.233	(5.92)	844	(3.75)	.175	(4.44)	564	(2.51)	.117	(2.97)	6,541	(29.10)
B-900-M	703	(3.13)	.224	(5.69)	—	—	.233	(5.92)	550	(2.45)	.175	(4.44)	367	(1.63)	.117	(2.97)	6,496	(28.90)
B-901	1,434	(6.38)	.175	(4.45)	—	—	.233	(5.92)	1,431	(6.37)	.175	(4.44)	957	(4.26)	.117	(2.97)	6,929	(30.82)
B-902	3,154	(14.03)	.112	(2.84)	—	—	.233	(5.92)	—	—	.175	(4.44)	—	—	.117	(2.97)	7,401	(32.92)
B-906	234	(1.04)	.419	10.64)	130	(0.58)	.233	(5.92)	98	(0.44)	.175	(4.44)	65	(0.29)	.117	(2.97)	3,125	(13.90)
48-in (1219mm) Beam or Column span																		
B-900	895	(3.98)	.277	(7.04)	862	(3.83)	.267	(6.78)	646	(2.87)	.200	(5.08)	429	(1.91)	.133	(3.38)	6,178	(27.48)
B-900-M	615	(2.74)	.292	(7.42)	562	(2.50)	.267	(6.78)	421	(1.87)	.200	(5.08)	280	(1.25)	.133	(3.38)	6,120	(27.22)
B-901	1,255	(5.58)	.229	(5.82)	—	—	.267	(6.78)	1,096	(4.88)	.200	(5.08)	729	(3.24)	.133	(3.38)	6,686	(29.74)
B-902	2,760	(12.28)	.146	(3.71)	—	—	.267	(6.78)	—	—	.200	(5.08)	2,519	(11.21)	.133	(3.38)	7,302	(32.48)
B-906	205	(0.91)	.547	(13.89)	100	(0.44)	.267	(6.78)	75	(0.33)	.200	(5.08)	50	(0.22)	.133	(3.38)	2,392	(10.64)

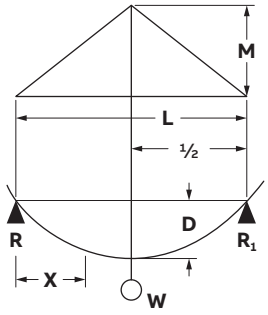
Table 2 - Loads and deflections

Part no. Channel	Maximum Uniform Load and Deflection				Uniform Load and Deflection at 1/180 Span				Uniform Load and Deflection at 1/240 Span				Uniform Load and Deflection at 1/360 Span				Column Load @ K=100	
	lbs	kN	in	mm	lbs	kN	in	mm	lbs	kN	in	mm	lbs	kN	in	mm	lbs	kN
54-in (1371mm) Beam or Column span																		
B-900	796	(3.54)	.351	(8.92)	680	(3.02)	.300	(7.62)	510	(2.27)	.225	(5.72)	340	(1.51)	.150	(3.81)	5,767	(25.65)
B-900-M	547	(2.43)	.370	(9.40)	443	(1.97)	.300	(7.62)	333	(1.48)	.225	(5.72)	222	(0.99)	.150	(3.81)	5,693	(25.32
B-901	1,116	(4.96)	.290	(7.37)	—	—	.300	(7.62)	866	(3.85)	.225	(5.72)	577	(2.57)	.150	(3.81)	6,410	(28.51)
B-902	2,453	(10.91)	.184	(4.67)	—	—	.300	(7.62)	—	—	.225	(5.72)	1,995	(8.87)	.150	(3.81)	7,189	(31.98
B-906	182	(0.81)	.692	(17.58)	79	(.35)	.300	(7.62)	59	(0.26)	.225	(5.72)	40	(0.18)	.150	(3.81)	1,890	(8.41)
60-in (1524mm) Beam or Column span																		
B-900	716	(3.18)	.433	(11.00)	551	(2.45)	.333	(8.46)	413	(1.84)	.250	(6.35)	276	(1.23)	.167	(4.24)	5,308	(23.61)
B-900-M	492	(2.19)	.457	(11.61)	359	(1.60)	.333	(8.46)	269	(1.20)	.250	(6.35)	180	(0.80)	.167	(4.24)	5,216	(23.20)
B-901	1,004	(4.47)	.358	(9.09)	934	(4.15)	.333	(8.46)	701	(3.12)	.250	(6.35)	468	(2.08)	.167	(4.24)	6,101	(27.14)
B-902	2,208	(9.82)	.228	(5.79)	—	—	.333	(8.46)	—	—	.250	(6.35)	1,619	(7.20)	.167	(4.24)	7,064	(31.42)
B-906	164	(0.73)	.854	(21.69)	64	(0.28)	.333	(8.46)	48	(0.21)	.250	(6.35)	32	(0.14)	.167	(4.24)	1,531	(6.81)
72-in (1829mm) Beam or Column span																		
B-900	597	(2.66)	.624	(15.85)	383	(1.70)	.400	(10.16)	287	(1.28)	.300	(7.62)	191	(0.85)	.200	(5.08)	4,244	(18.88)
B-900-M	410	(1.82)	.658	(16.71)	249	(1.11)	.400	(10.16)	187	(0.83)	.300	(7.62)	125	(0.56)	.200	(5.08)	4,113	(18.30)
B-901	837	(3.72)	.515	(13.08)	649	(2.89)	.400	(10.16)	487	(2.17)	.300	(7.62)	325	(1.45)	.200	(5.08)	5,387	(23.96)
B-902	1,840	(8.18)	.328	(8.83)	—	—	.400	(10.16)	1,683	(7.49)	.300	(7.62)	1,122	(4.99)	.200	(5.08)	6,773	(30.13)
B-906	137	(0.61)	1.230	(31.24)	44	(0.22)	.400	(10.16)	33	(0.15)	.300	(7.62)	22	(0.10)	.200	(5.08)	1,063	(4.73)
84-in (2134mm) Beam or Column span																		
B-900	511	(2.27)	.849	(21.56)	281	(1.25)	.467	(11.86)	211	(0.94)	.350	(8.89)	140	(0.62)	.233	(5.92)	3,136	(13.95)
B-900-M	351	(1.56)	.895	(22.73)	183	(0.81)	.467	(11.86)	137	(0.61)	.350	(8.89)	91	(0.40)	.233	(5.92)	3,022	(13.44)
B-901	717	(3.19)	.701	(17.81)	477	(2.12)	.467	(11.86)	358	(1.59)	.350	(8.89)	238	(1.06)	.233	(5.92)	4,543	(20.21)
B-902	1,577	(7.01)	.446	(11.33)	—	—	.467	(11.86)	1,237	(5.50)	.350	(8.89)	823	(3.66)	.233	(5.92)	6,429	(28.60)
B-906	117	(0.52)	1.674	(42.52)	33	(0.15)	.467	(11.86)	24	(0.11)	.350	(8.89)	16	(0.07)	.233	(5.92)	781	(3.47)
96-in (2438mm) Beam or Column span																		
B-900	448	(1.99)	1.109	(28.17)	215	(0.96)	.533	(13.54)	161	(0.72)	.400	(10.16)	108	(0.48)	.267	(6.78)	2,401	(10.68)
B-900-M	308	(1.37)	1.169	(29.69)	140	(0.62)	.533	(13.54)	105	(0.47)	.400	(10.16)	70	(0.31)	.267	(6.78)	2,314	(10.29)
B-901	628	(2.79)	.916	(23.27)	365	(1.62)	.533	(13.54)	274	(1.22)	.400	(10.16)	183	(0.81)	.267	(6.78)	3,575	(15.90)
B-902	1,380	(6.14)	.583	(14.81)	1,262	(5.61)	.533	(13.54)	947	(4.21)	.400	(10.16)	632	(2.81)	.267	(6.78)	6,032	(26.83)
B-906	103	(0.46)	2.187	(55.55)	25	(0.11)	.533	(13.54)	19	(0.08)	.400	(10.16)	13	(0.06)	.267	(6.78)	598	(2.66)
108-in (2743mm) Beam or Column span																		
B-900	398	(1.77)	1.403	(35.64)	170	(0.76)	.600	(15.24)	128	(0.57)	.450	(11.43)	85	(0.38)	.300	(7.62)	1,897	(8.44)
B-900-M	273	(1.21)	1.480	(37.59)	111	(0.49)	.600	(15.24)	83	(0.37)	.450	(11.43)	55	(0.24)	.300	(7.62)	1,828	(8.13)
B-901	558	(2.48)	1.160	(29.46)	289	(1.29)	.600	(15.24)	216	(0.96)	.450	(11.43)	144	(0.64)	.300	(7.62)	2,825	(12.57)
B-902	1,227	(5.46)	.738	(18.75)	998	(4.44)	.600	(15.24)	748	(3.33)	.450	(11.43)	499	(2.22)	.300	(7.62)	5,582	(24.83)
B-906	91	(0.40)	2.768	(70.31)	20	(0.09)	.600	(15.24)	15	(0.07)	.450	(11.43)	10	(0.04)	.300	(7.62)	473	(2.10)
120-in (3048mm) Beam or Column span																		
B-900	358	(1.59)	1.732	(43.99)	138	(0.61)	.667	(16.94)	103	(0.46)	.500	(12.50)	69	(0.31)	.333	(8.46)	1,537	(6.84)
B-900-M	246	(1.09)	1.827	(46.41)	90	(0.40)	.667	(16.94)	67	(0.30)	.500	(12.50)	45	(0.20)	.333	(8.46)	1,481	(6.59)
B-901	502	(2.23)	1.432	(36.37)	234	(1.04)	.667	(16.94)	175	(0.78)	.500	(12.50)	117	(0.52)	.333	(8.46)	2,288	(10.18)
B-902	1,104	(4.91)	.911	(23.14)	808	(3.59)	.667	(16.94)	606	(2.70)	.500	(12.50)	404	(1.80)	.333	(8.46)	5,080	(22.60)
B-906	82	(0.36)	3.417	(86.79)	16	(0.07)	.667	(16.94)	12	(0.05)	.500	(12.50)	8	(0.04)	.333	(8.46)	383	(1.70)

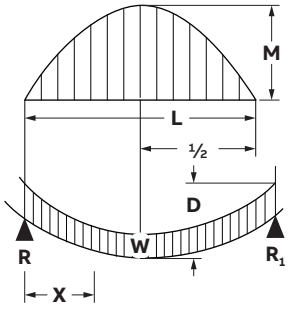
- When no numbers are shown, use the maximum uniform load
- For concentrated load values, multiply uniform load by 0.5 and deflection by 0.80
- Beam loads are based on channel being loaded across the x-x axis
- For channel with holes in bottom, multiply load by .95
- For channel with holes in bottom and sides, multiply load by .90
- For extruded aluminum channel, multiply load by .33
- Column loads calculated in accordance with ANSI Light Gauge Cold-Formed Steel Design Manual, Section 3.6

Beam formula:
For calculating deflection and maximum safe load (Beams of uniform cross section)
I = Moment of inertia, in position of load, in inches 4
S = Section modulus - in position of load *I*/n, in inches 3
f = Bending stress in extreme fiber, in pounds per square inch
E = Modulus of elasticity, in pounds per square inch
L = Length of section, in inches
W = Superimposed loads supported by beam, in pounds
W Max. = Maximum safe load at point given, in pounds
D, D1 = Deflection at points given, in inches
D Max. = Maximum deflection at point given, in inches

Steel and Aluminum:
Modulus of Elasticity (**E**):
Steel — 29,500,000 pounds per square inch
Aluminum — 10,000,000 pounds per square inch

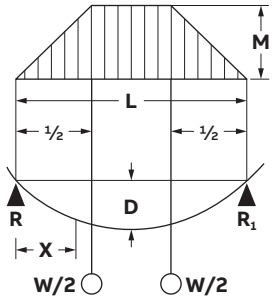


Beam supported at ends
Concentrated load at center
W max. = 4fS/L
D max. = WL3/48EI

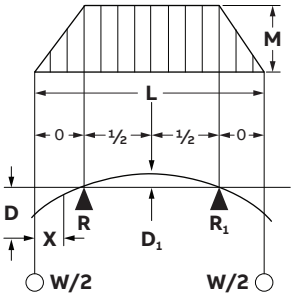


Beam supported at ends
Uniformly distributed load
W max. = 8fS/L
D max. = 5WL3/384EI

Maximum Fiber Stress (**f**):
Steel — 30,000 pounds per square inch
Aluminum — 10,000 pounds per square inch

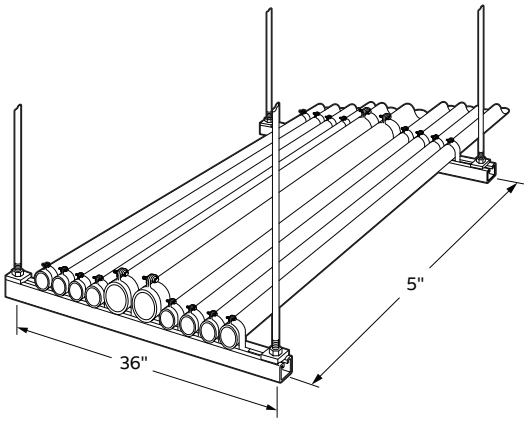


Beam supported at ends
Two symmetrical concentrated loads
W max. = 2fS/a
D max. = Wa/12EI (¾L² - a²)

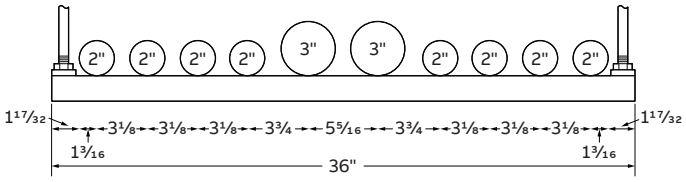


Beam continous over two supports
Two exterior symmetrical loads
W max. = 2fS/a
D, distance a = Wa(3aL-4a²)/12EI
D1, distance L/2 = Wa(2-2a)²/16EI

Installation example:



Challenge: Design trapeze to support 8 – 2" rigid steel conduits and 2 – 3" rigid steel conduits on a No. B-905 channel span with hangers spaced five (5) feet apart.



Weight per Hanger Equals:
2" rigid steel conduit with heaviest conductor combination = 6.625 lbs. per foot.
3" rigid steel conduit with heaviest conductor combination = 13.415 lbs. per foot.

8 X 6.625 X 5 = 265 lbs. = weight of 2" conduits per hanger
2 X 13.415 X 5 = 134 lbs. = weight of 3" conduits per hanger
Total = 399 lbs. = weight of conduits per hanger

NEC and National Electrical Code are registered trademarks of the National Fire Protection Association, Inc.

Installation solution:
Referring to the load span tables on table 2 for B-905 channel, a 36-inch span has a uniformly distributed load rating of 1,133 lbs., which is greater than the 399 lb. load calculated above, and is therefore satisfactory. On longer spans or spans with greater loads, use B-901, B-900-2A or B-905-2A channel or provide an intermediate support.

Note on Conduit Support:
The National Electrical Code® states the rigid metal conduit, intermediate metal conduit, and electrical metallic tubing shall be supported at least every 10 feet. See Article 344, Section 344.30 for exceptions for rigid metal conduit.

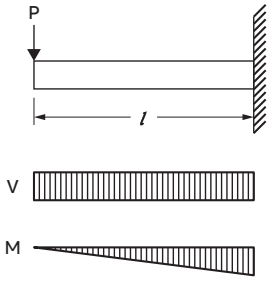
Design applications:
Load and Deflection formulas

Table 3 - Cantilever beams

V max. = P

M max. = Pl

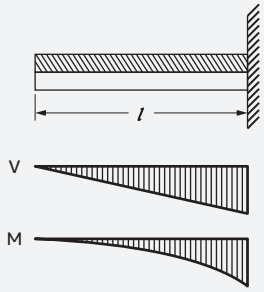
▲ max. = $\frac{Pl^3}{3EI}$



V max. = W

M max. = $\frac{Wl}{2}$

▲ max. = $\frac{Wl^3}{8EI}$



V max. = W

M max. = Pb

▲ max. = $\frac{pb^2(3l-b)}{6EI}$

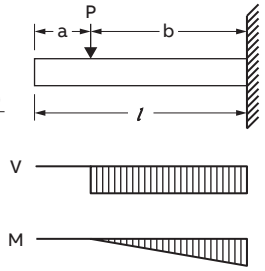


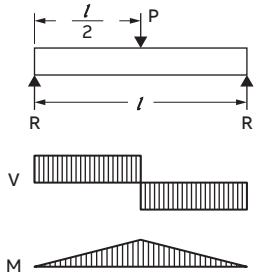
Table 4 - Simple beams

R = $\frac{P}{2}$

V max. = $\frac{P}{2}$

M max. = $\frac{Pl}{4}$

▲ max. = $\frac{Pl^3}{48EI}$

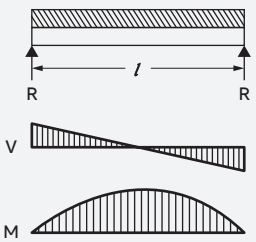


R = $\frac{W}{2}$

V max. = $\frac{Wl}{2}$

M max. = $\frac{Wl}{8}$

▲ max. = $\frac{5Wl^3}{384EI}$



$R_1 = \frac{Pb}{l}$

R_2 max. = $\frac{Pb}{l}$

V max. = $\frac{Pa}{l}$

M max. = $\frac{Pab}{l}$

▲ max. at x = $\sqrt{\frac{a(a+2b)}{3}}$

▲ max. = $\frac{Pab(a+2b)\sqrt{3a(a+2b)}}{27EIl}$

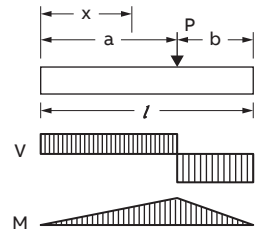


Table 5 - Beams fixed on one end, supported at other end

$R_1 = \frac{5b}{16}$

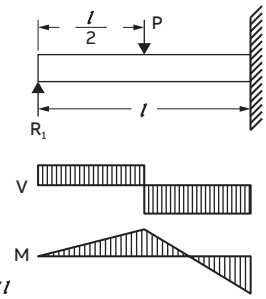
V max. = $\frac{11P}{16}$

M max. = $\frac{3Pl}{16}$

M max. = $\frac{Pab}{l}$

▲ max. at x = 0.447l

▲ max. = 0.009317 $\frac{Pl^3}{EI}$



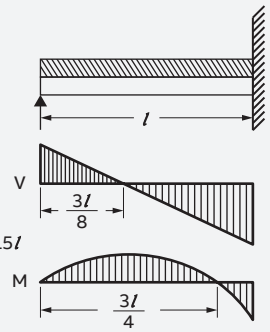
$R_1 = \frac{3W}{8}$

V max. = $\frac{5W}{8}$

M max. = $\frac{Wl}{8}$

▲ max. at x = 0.4215l

▲ max. = $\frac{Wl^3}{185EI}$



$R_1 = \frac{Pb^3}{2l^3}(a+2l)$

$R_2 = \frac{Pa}{2l^3}(3l^2+a^2)$

M at point of load = $R_1^2 a$

M at fix end = $\frac{Pab}{2l^3}(a+l)$

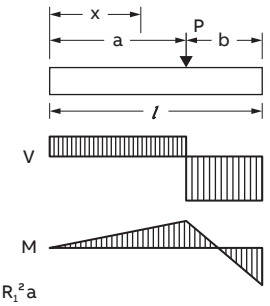
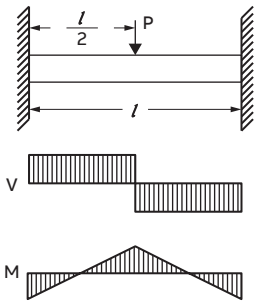


Table 6 - Beams fixed at both ends

V max. = $\frac{P}{2}$

M max. = $\frac{Pl}{8}$

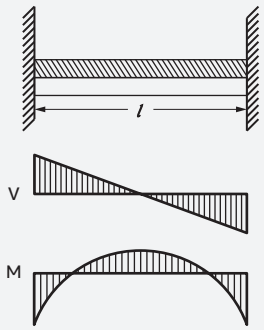
▲ max. = $\frac{Pl^3}{192EI}$



V max. = $\frac{W}{2}$

M max. = $\frac{Wl}{12}$

▲ max. = $\frac{Wl^3}{384EI}$

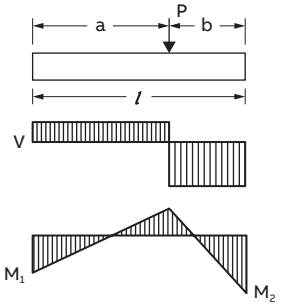


$R_1 = \frac{Pb^2}{l^3}(3a+b)$

$R_2 = \frac{Pa^2}{l^3}(3a+b)$

$M_1 = \frac{Pab^2}{l^3}$

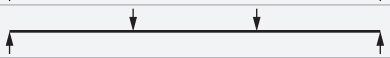
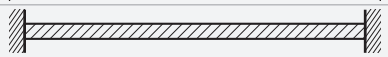
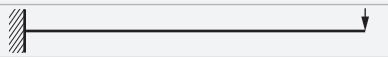
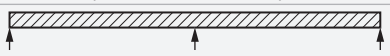
$M_2 = \frac{Pa^2b}{l^2}$



—

Single span beams:
Design loads given in Table 2 are for single span beams supported at the ends. Table 7 (below) shows other common load supporting conditions used in the industry.

Table 7 - Conversion factors for beams

Load and support conditions	Diagram	Load factor	Deflection factor
Simple beam — Uniform load		1.00	1.00
Simple beam — Concentrated load at center		0.50	0.80
Simple beam — Two equal concentrated loads at ¼ points		1.00	1.10
Beam fixed at both ends — Uniform load		1.50	0.30
Beam fixed at both ends — Concentrated load at center		1.00	0.40
Cantilever beam — Uniform load		0.25	2.40
Cantilever beam — Concentrated load at end		0.12	3.20
Continuous beam — Two equal spans — Uniform load on one span		1.30	0.92
Continuous beam — Two equal spans		1.00	0.42
Continuous beam — Two equal spans — Concentrated at Center of one span		0.62	0.71
Continuous beam — Two equal spans — Concentrated at Center of both spans		0.67	0.48

—

Conduit spacing:
Spacing in inches (mm) between centers of conduit

Table 8 - Minimum spacing between centers of conduit (in/mm)

Nom. Pipe Size in (mm)	½ (12.7)	¾ (19.1)	1 (25.4)	1¼ (31.8)	1½ (31.8)	2 (50.8)	2½ (63.5)	3 (76.2)	3½ (88.9)	4 (101.6)	41/2 (101.6)	5 (127)	6 (154.2)
½" (12.7)	1 3/16 (30.2)	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
¾" (19.1)	1 5/16 (33.3)	1 7/16 (36.5)	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
1" (25.4)	1 ½ (38.1)	1 5/8 (41.3)	1 ¾ (44.5)	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
1¼" (31.8)	1 ¾ (44.5)	1 7/8 (47.6)	2 (50.8)	2 ¼ (57.2)	— —	— —	— —	— —	— —	— —	— —	— —	— —
1½" (38.1)	1 15/16 (49.2)	2 1/16 (52.4)	2 3/16 (55.6)	2 7/16 (61.9)	2 9/16 (65.1)	— —	— —	— —	— —	— —	— —	— —	— —
2" (50.8)	2 3/16 (55.6)	2 5/16 (58.7)	2 ½ (63.5)	2 ¾ (70.0)	2 7/8 (73.0)	3 1/8 (79.4)	— —	— —	— —	— —	— —	— —	— —
2½" (63.5)	2 7/16 (61.9)	2 9/16 (65.1)	2 ¾ (70.0)	3 (76.2)	3 1/8 (79.4)	3 1/8 (79.4)	3 5/8 (92.1)	— —	— —	— —	— —	— —	— —
3" (76.2)	2 13/16 (71.4)	2 15/16 (74.6)	3 1/16 (77.8)	3 5/16 (84.1)	3 7/16 (87.3)	3 ¾ (95.3)	4 (101.6)	4 5/16 (109.5)	— —	— —	— —	— —	— —
3½" (88.9)	3 1/8 (71.4)	3 1/8 (79.4)	3 ¼ (82.6)	3 5/8 (92.1)	3 ¾ (95.3)	4 1/16 (103.2)	4 5/16 (109.5)	4 5/8 (117.5)	4 15/16 (125.4)	— —	— —	— —	— —
4" (101.6)	3 7/16 (87.3)	3 9/16 (90.5)	3 15/16 (100.0)	4 1/16 (103.2)	4 1/8 (104.8)	4 5/8 (117.5)	4 15/16 (125.4)	5 ¼ (133.4)	5 9/16 (141.3)	— —	— —	— —	— —
4½" (114.3)	3 ¾ (95.3)	3 7/8 (98.4)	4 (101.6)	4 ¼ (108)	4 3/8 (111.1)	4 5/8 (117.5)	4 7/8 (123.8)	5 ¼ (133.4)	5 9/16 (141.3)	5 7/8 (149.2)	6 1/8 (155.6)	— —	— —
5" (127.0)	4 1/8 (104.8)	4 ¼ (108.0)	4 3/8 (111.1)	4 5/8 (117.5)	4 ¾ (120.6)	5 (127.0)	5 ¼ (133.4)	5 9/16 (141.3)	5 7/8 (149.2)	6 3/16 (157.2)	6 ½ (165.1)	6 13/16 (173.0)	— —
6" 154.2)	4 ¾ (120.6)	4 7/8 123.8	5 (127.0)	5 ¼ (133.4)	5 3/8 (136.5)	5 5/8 (142.9)	5 7/8 149.2	6 3/16 157.2	6 ½ (165.1)	6 13/16 (173.0)	7 1/8 (181.0)	7 7/16 (188.9)	8 1/8 (206.4)

Pipe data:
Steel and Aluminum

Table 9 - Rigid conduit

Trade size inch	*Pipe O.D. nominal inch (mm)		*Coupling O.D. inch (mm)		Weight lbs./ft (kg/M)		Weight (maximum) of conduit and conductor Not lead covered lbs./ft (kg/M)	
	Steel	Aluminum	Steel	Aluminum	Steel	Aluminum	Steel	Aluminum
½	0.840 (21.34)	0.840 (21.34)	1.010 (25.65)	1.078 (27.38)	0.790 (1.18)	0.274 (0.41)	1.040 (1.55)	0.524 (0.78)
¾	1.050 (36.67)	1.050 (36.67)	1.250 (31.75)	1.328 (33.73)	1.050 (1.56)	0.364(0.54)	1.760 (2.62)	1.074 (1.60)
1	1.315 (33.40)	1.315 (33.40)	1.525 (37.84)	1.563 (39.70)	1.530 (2.28)	0.530 (0.79)	2.695 (4.01)	1.695 (2.52)
1¼	1.660 (42.16)	1.660 (42.16)	1.869 (47.47)	1.953 (49.61)	2.010 (2.99)	0.696 (1.04)	3.975 (5.92)	2.661 (4.96)
1½	1.900 (48.26)	1.900 (48.26)	2.155 (54.74)	2.219 (56.36)	2.490 (3.71)	0.822 (1.22)	5.000 (7.44)	3.332 (6.64)
2	2.375 (60.33)	2.375 (60.33)	2.250 (67.31)	2.750 (69.85)	3.320 (4.94)	1.157 (1.72)	6.625 (9.86)	4.462 (8.95)
2½	2.875 (73.03)	2.875 (73.03)	3.250 (82.55)	3.281 (83.34)	5.270 (7.84)	1.825 (2.72)	9.460 (14.08)	6.015 (13.35)
3	3.500 (88.90)	3.500 (88.90)	3.870 (98.30)	3.812 (96.82)	6.830 (10.16)	2.389 (3.56)	13.415 (19.96)	8.974 (16.75)
3½	4.000 (101.60)	4.000 (101.60)	4.500 (114.30)	4.438 (112.73)	8.310 (12.37)	2.877 (4.28)	16.690 (24.84)	11.257 (26.75)
4	4.500 (114.30)	4.500 (114.30)	4.875 (123.83)	5.000 (127.00)	9.720 (14.46)	3.400 (5.06)	20.410 (30.37)	14.090 (20.97)
5	5.563 (141.30)	5.563 (141.30)	6.000 (152.40)	6.219 (157.96)	13.140 (19.55)	4.654 (6.93)	29.350 (43.68)	20.864 (31.05)
6	6.625 (168.28)	6.625 (168.28)	7.200 (182.88)	7.313 (185.75)	17.450 (10.88)	6.120 (9.11)	41.910 (62.37)	30.582 (45.51)

*Inches per UL-6

Pipe data:
Metal (IMC)

Table 10 - Intermediate metal conduit (IMC)

Trade size inch	*Pipe O.D. nominal inch (mm)	*Coupling O.D. inch (mm)	Weight lbs./ft (kg/M)	Weight (maximum) of conduit and conductor lbs./ft (kg/M)
½	0.815 (20.70)	1.010 (25.65)	0.6 (0.89)	0.850 (0.89)
¾	1.029 (26.14)	1.250 (31.75)	0.8 (1.19)	1.530 (1.19)
1	1.290 (32.77)	1.525 (38.74)	1.1 (1.64)	2.325 (1.64)
1¼	1.638 (41.61)	1.869 (47.47)	1.5 (2.23)	3.465 (2.23)
1½	1.883 (47.83)	2.155 (54.74)	1.8 (2.68)	4.330 (2.68)
2	2.360 (59.94)	2.650 (67.31)	2.4 (3.57)	5.725 (3.57)
2½	2.857 (72.57)	3.250 (82.55)	4.2 (6.25)	8.470 (6.25)
3	3.476 (88.29)	3.870 (98.30)	5.2 (7.74)	11.845 (7.74)
3½	3.971 (100.86)	4.500 (114.30)	6.1 (9.08)	14.500 (9.08)
4	4.466 (113.44)	4.875 (123.83)	6.8 (10.12)	17.510 (10.12)

*Inches per UL

Pipe data:
Metal (EMT)

Table 11 - Thinwall conduit (EMT)

Trade size inch	*Pipe O.D. nominal inch (mm)	Weight lbs./ft (kg/M)	Weight (maximum) of conduit and conductor lbs./ft (kg/M)
½	0.706 (17.93)	0.285 (0.42)	0.538 (0.80)
¾	0.922 (23.42)	0.435 (0.65)	1.160 (1.73)
1	1.163 (29.54)	0.640 (0.95)	1.825 (2.72)
1¼	1.510 (38.35)	0.950 (1.41)	2.950 (4.39)
1½	1.740 (44.20)	1.100 (1.64)	3.674 (5.47)
2	2.197 (55.80)	1.400 (2.08)	4.436 (6.60)
2½	2.875 (73.03)	2.050 (3.05)	6.400 (9.52)
3	3.500 (88.90)	2.500 (3.72)	9.262 (13.78)
3½	4.000 (101.60)	3.400 (5.06)	12.100 (18.01)
4	4.500 (114.30)	3.700 (5.51)	15.355 (22.85)

*Inches per UL

—

Structure channel/Column loading:
Maximum load in pounds - column loading (continues on page 10)

Table 12 - Structure channel - Channel/Column Loading

Column height inch (mm)	Channel type	Max. column loading	Number of tiers or braces per column									
			1	2	3	4	5	6	7	8	9	10
12 (304.8)	B-900	8,625 (38.37)	2,590 (11.52)	— —	— —	— —	— —	— —	— —	— —	— —	— —
	B-900-2A	17,400 (77.40)	4,450 (19.79)	— —	— —	— —	— —	— —	— —	— —	— —	— —
	B-906	4,170 (18.55)	1,280 (5.69)	— —	— —	— —	— —	— —	— —	— —	— —	— —
	B-906-2A	8,570 (38.12)	2,160 (9.61)	— —	— —	— —	— —	— —	— —	— —	— —	— —
24 (609.6)	B-900	7.900 (35.14)	2,520 (11.21)	2,000 (8.90)	— —	— —	— —	— —	— —	— —	— —	— —
	B-900-2A	16.500 (73.40	4,400 (19.57)	3,650 (16.24)	— —	— —	— —	— —	— —	— —	— —	— —
	B-906	3,450 (15.35)	1,200 (5.34)	980 (4.36)	— —	— —	— —	— —	— —	— —	— —	— —
	B-906-2A	7,840 (34.87)	2,100 (9.34)	1,700 (7.56)	— —	— —	— —	— —	— —	— —	— —	— —
36 (914.4)	B-900	6,960 (30.96)	2,420 (10.76)	1,960 (8.72)	1,780 (7.92)	— —	— —	— —	— —	— —	— —	— —
	B-900-2A	15,000 (66.72)	4,300 (19.13)	3,520 (15.66)	2,960 (13.17)	— —	— —	— —	— —	— —	— —	— —
	B-906	2,250 (10.01)	1,015 (4.51)	950 (4.23)	795 (3.54)	— —	— —	— —	— —	— —	— —	— —
	B-906-2A	6,680 (29.71)	2,020 (8.99)	1,700 (7.56)	1,720 (7.65)	— —	— —	— —	— —	— —	— —	— —
48 (1219.2)	B-900	5,970 (26.56)	2,280 (10.14)	1,910 (8.50)	1,640 (7.30)	1,360 (6.05)	— —	— —	— —	— —	— —	— —
	B-900-2A	13,095 (58.25)	4,100 (18.24)	3,480 (15.48)	2,930 (13.03)	2,520 (11.21)	— —	— —	— —	— —	— —	— —
	B-906	1,270 (5.65)	755 (3.36)	895 (3.98)	775 (3.45)	670 (2.98)	— —	— —	— —	— —	— —	— —
	B-906-2A	4,980 (22.15)	1,830 (8.14)	1,660 (7.38)	1,420 (6.32)	1,230 (5.47)	— —	— —	— —	— —	— —	— —
60 (1524.0)	B-900	5,055 (22.49)	2,140 (9.52)	1,850 (8.23)	1,560 (6.94)	1,340 (5.96)	1,180 (5.25)	— —	— —	— —	— —	— —
	B-900-2A	11,490 (51.11)	3,950 (17.57)	3,420 (15.21)	2,900 (12.90)	2,500 (11.12)	2,210 (9.83)	— —	— —	— —	— —	— —
	B-906	— —	— —	830 (3.69)	745 (3.31)	650 (2.89)	575 (2.56)	— —	— —	— —	— —	— —
	B-906-2A	3,340 (14.86)	1,550 (6.89)	1,610 (7.16)	1,400 (6.23)	1,215 (5.40)	1,075 (4.78)	— —	— —	— —	— —	— —
72 (1828.8)	B-900	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
	B-900-2A	9,900 (44.44)	3,750 (16.68)	3,340 (14.86)	2,870 (12.77)	2,480 (11.03)	2,190 (9.74)	1,960 (8.72)	— —	— —	— —	— —
	B-906	— —	— —	700 (3.11)	710 (3.16)	635 (2.82)	565 (2.51)	505 (2.25)	— —	— —	— —	— —
	B-906-2A	2,170 (9.65)	1,240 (5.52)	1,550 (6.89)	1,370 (6.09)	1,205 (5.36)	1,065 (4.74)	955 (4.25)	— —	— —	— —	— —
84 (2133.6)	B-900	3,645 (16.21)	1,840 (8.18)	1,720 (7.65)	1,490 (6.63)	1,310 (5.83)	1,140 (5.07)	1,025 (4.56)	925 (4.11)	— —	— —	— —
	B-900-2A	8,715 (38.77)	3,550 (15.79)	3,240 (14.41)	2,820 (12.54)	2,470 (10.99)	2,170 (9.65)	1,945 (8.65)	1,760 (7.83)	— —	— —	— —
	B-906	— —	— —	520 (2.31)	635 (2.82)	610 (2.71)	550 (2.45)	495 (2.20)	450 (2.00)	— —	— —	— —
	B-906-2A	— —	— —	1,450 (6.45)	1,330 (5.92)	1,180 (5.25)	1,050 (4.67)	945 (4.20)	860 (3.83)	— —	— —	— —

Table 12 - Structure channel - Channel/Column Loading

Column height inch (mm)	Channel type	Max. column loading	Number of tiers or braces per column									
			1	2	3	4	5	6	7	8	9	10
96 (2438.4)	B-900	3,045 (13.54)	1,670 (7.43)	1,650 (7.34)	1,460 (6.49)	1,290 (5.74)	1,130 (5.03)	1,015 (4.51)	920 (4.09)	835 (3.71)	— —	— —
	B-900-2A	7,395 (32.89)	3,180 (14.15)	3,140 (13.97)	2,780 (12.37)	2,450 (10.90)	2,160 (9.61)	1,930 (8.59)	1,720 (7.78)	1,600 (7.12)	— —	— —
	B-906	— —	— —	470 (2.09)	605 (2.69)	590 (2.62)	535 (2.38)	490 (2.18)	445 (1.98)	410 (1.82)	— —	— —
	B-906-2A	— —	— —	1,330 (5.92)	1,290 (5.74)	1,160 (5.16)	1,040 (4.63)	935 (4.16)	850 (3.78)	780 (3.47)	— —	— —
108 (2743.2)	B-900	2,580 (11.48)	1,520 (6.76)	1,570 (6.98)	1,430 (6.36)	1,260 (5.60)	1,120 (4.98)	1,000 (4.45)	905 (4.03)	825 (3.67)	760 (3.38)	— —
	B-900-2A	6,190 (27.53)	3,030 (13.48)	3,040 (13.52)	2,730 (12.14)	2,420 (10.76)	2,140 (9.52)	1,920 (8.54)	1,745 (7.76)	1,595 (7.09)	1,465 (6.52)	— —
	B-906	— —	— —	130 (0.58)	535 (2.38)	555 (2.47)	525 (2.34)	485 (2.16)	435 (1.93)	400 (1.78)	370 (1.65)	— —
	B-906-2A	— —	— —	1,200 (5.34)	1,250 (5.56)	1,150 (5.12)	1,020 (4.54)	930 (4.14)	840 (3.74)	775 (3.45)	715 (3.18)	— —
120 (3048.0)	B-900	2,100 (9.34)	1,340 (5.96)	1,500 (6.67)	1,380 (6.14)	1,230 (5.47)	1,110 (4.94)	990 (4.40)	900 (4.00)	820 (3.65)	755 (3.36)	700 (3.11)
	B-900-2A	5,580 (24.82)	2,900 (12.90)	2,940 (13.08)	2,665 (11.85)	2,380 (10.59)	2,135 (9.50)	1,910 (8.50)	1,730 (7.70)	1,580 (7.03)	1,460 (6.49)	1,350 (6.01)
	B-906	— —	— —	— —	470 (2.09)	520 (2.31)	500 (2.22)	465 (2.07)	430 (1.91)	395 (1.76)	365 (1.62)	340 (1.51)
	B-906-2A	— —	— —	1,160 (5.16)	1,190 (5.29)	1,120 (4.98)	1,010 (4.49)	915 (4.07)	835 (3.71)	770 (3.43)	710 (3.16)	660 (2.94)

—

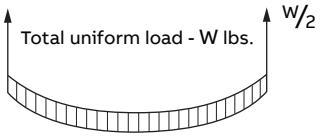
Hanger rods:

Table 13 - Selection of hanger rods

Use H-193-3/8 or "R" series hanger rods for	If total uniform load is	Use H-193-1/2 or "R" series hanger rod for	If the total uniform load is between
2 supports	975 lbs. or less	2 supports	975 lbs. and 1810 lbs
3 supports	1220 lbs. or less	3 supports	1220 lbs. and 2260 lbs.
4 supports	1665 lbs. or less	4 supports	1665 lbs. and 3080 lbs.

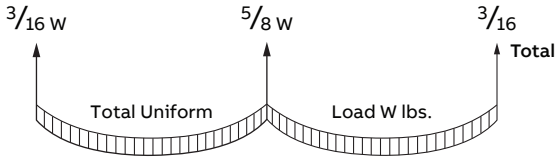
Load distribution on hanger rods:

2 Supports:



Example – If the total uniformly distributed load W is 1,000 lbs., each hanger must be capable of supporting half of the load or 500 lbs. Therefore, H-193-3/8 or c "R" series hanger rod would be sufficient to support this load.

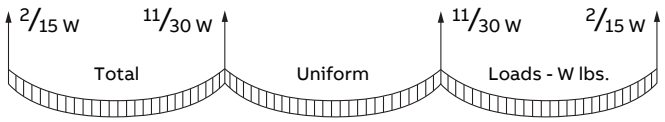
3 Supports:



Total uniform load W lbs.
Maximum safe load - H-193-3/8 or "R" series - 610 lbs.
per hanger rod H-193-1/2 or "R" series - 1130 lbs.

Example – If the total uniformly distributed load W is 1,000 lbs., the load is distributed to each support in the following manner: 187 lbs. to each end support and 625 lbs. to the center support. In this case, the maximum load to be supported is 625 lbs., which exceeds the recommended safe load of 610 lbs. for H-193-3/8 hanger rod., therefore H-193-1/2, or d 'R' series supports should be used.

4 Supports:



Example – If the total uniformly distributed load W is 1,000 lbs., the load is distributed to each support in the following manner: 133 lbs. to each end support and 367 lbs. to each inner support. Therefore, H-193-3/8, or c 'R' series hanger rod would be sufficient to support this load.

Load deflection charts:
Kindorf channel bars

Table 14 - Uniformly distributed loads for part no. 6014

Beam span inch (mm)	Load at 25,000 PSI stress lbs. (kN)	Deflection at 25,000 PSI stress inch (mm)	Load at max. deflection of 1/240 span lbs. (kN)
12 (304.8)	68 (0.30)	0.060 (1.52)	57 (0.25)
24 (609.6)	34 (0.15)	0.238 (6.05)	14 (0.06)
36 (914.4)	22 (0.10)	0.536 (13.61)	6 (0.03)
48 (1219.2)	16 (0.07)	0.953 (24.21)	3 (0.01)
60 (1524.0)	13 (0.06)	1490 (37.85)	1 (0.00)

Selecting the proper channel:
Building construction often determines hanger spacing. Deflection determines proper channel selection. Deflection must not exceed 1/240 of the span. Multiply the weight of a single fixture times the applicable deflection constant (Table 15) to estimate the deflection at the center of an intermediate span in long continuous runs (Figure 1). The estimated deflection also applies to the end span in Figure 1 and the single span in Figure 2 if the dimension "C" is between ¼ and ⅓ of the length of the span. If a cantilever does not exist as in the double span (Figure 3), the deflection of end spans (Figure 3) will be doubled.

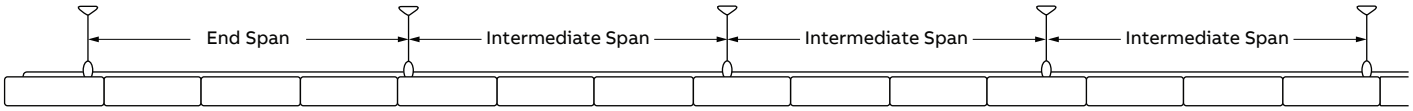


Figure 1 — Long Continuous Run

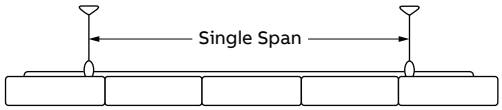


Figure 2 — Single Span

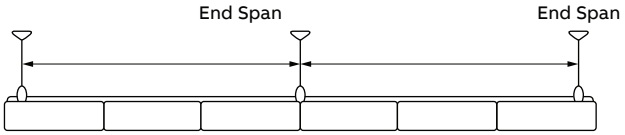


Figure 3 — Double Span

Table 15 - Deflection constants for continuous run, 4 foot fixtures*

Span feet	B-906 G-956	B-900-M G-975-M	G-953	B-900 G-975	B-901 G-950 G-965	B-900-A	B-902 G-955
6	0.004	0.000	0.000	0.000	0.000	0.000	0.000
8	0.009	0.002	0.001	0.000	0.000	0.000	0.000
10	—	0.005	0.004	0.003	0.001	0.000	0.000
12	—	0.010	0.007	0.006	0.004	0.001	0.001
14	—	—	—	0.012	0.007	0.002	0.002
16	—	—	—	0.020	0.011	0.004	0.004
18	—	—	—	—	0.018	0.007	0.006
20	—	—	—	—	—	0.010	0.009

*For 8-foot fixtures reduce the deflection constant by 50%. This table is for normal weight fixtures — the constant ".000" indicates negligible deflection.

A long, continuous run of 30 lb. 4-foot fixtures on G-975 channel is supported on 12' centers. The deflection at the center of an intermediate span will be the deflection constant (.006) times the fixture weight (30 lbs.) or .18 inches.

Warning:
Load tables, charts and design criteria provided in this catalog are intended as guides only. Selection of proper product, installation intervals, erection and placement are the responsibility of the user. Kindorf® products are intended to be used for the support and bracing of fixtures, cable, pipe and conduit. Improper use or installation may result in injury to persons or damage of property.

Material and finish specifications are subject to change without notice.

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction – in whole or in part – is forbidden without prior written consent of ABB. © 2023 ABB Installation Products Inc. and/or its related companies. All Rights Reserved.