

Technical Data

MATERIALS

Carbon Steel

Channels made from high-quality carbon steel are continuously roll formed to precise dimensions. By cold working the steel mechanical properties are increased, allowing lightweight structures to carry the required load. Corrosion resistance of carbon steel varies widely with coating and alloy. See "Finishes" for more detailed information.

Stainless Steel

Stainless steel channel is available in AISI Type 304 or 316 material. Both are non-magnetic and belong to the austenitic stainless steels group, based on alloy content and crystallographic structure. Like carbon steel, stainless steel exhibits increased strength when cold worked by roll-forming.

Several conditions make the use of stainless steel ideal. These include reducing long term maintenance costs, high ambient temperatures, appearance, and stable structural properties such as yield strength, and high creep strength.

Type 304 resists most organic chemicals, dyestuffs and a wide variety of inorganic chemicals at elevated or cryogenic temperatures. Type 316 contains slightly more nickel and adds molybdenum to give it better corrosion resistance in chloride and sulfuric acid environments. For more information concerning the differences between types 304 and 316, visit www.cooperblinc.com/contactus.

Aluminum

Standard aluminum channel is extruded from aluminum alloy 6063-T6. Strut fittings are made from aluminum alloy 5052-H32.

The high strength to weight ratio of channel made of aluminum helps greatly reduce the overall cost of installation through ease of handling and field cutting.

Aluminum owes its excellent corrosion resistance to its ability to form an aluminum oxide film that immediately reforms when scratched or cut. In most outdoor applications, aluminum has excellent resistance to "weathering". The resistance to chemicals, indoor or outdoor, can best be determined by tests conducted by the user with exposure to the specific conditions for which it is intended. The corrosion resistance of aluminum to some commonly known chemicals is shown in the Corrosion Chart. For further information, contact us or the Aluminum Association.

Fiberglass

We offer two fire retardant (FR) resins for strut systems, polyester and vinyl ester. Both resins are ideal for corrosive environments or nonconductive applications with moderate strength requirements. Some common types of environments where Vinyl Ester Resins are recommended, that Poly Esters are not, are paper mills, most any metal plating operation and any condition with

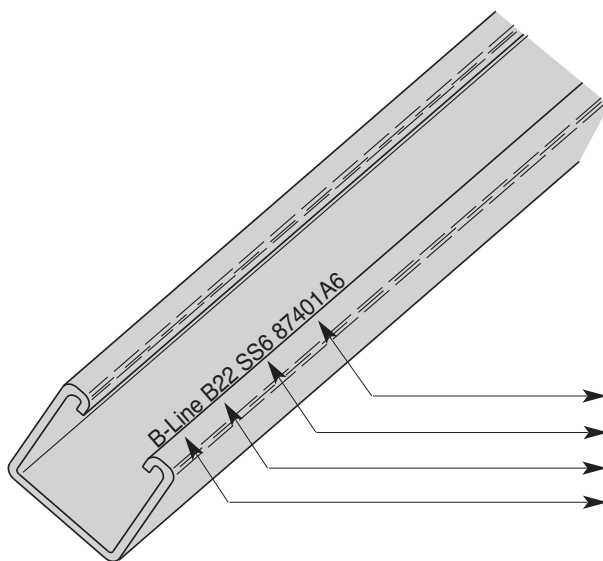
concentrated levels of Chlorine, $[Cl^-]$. Please consult our fiberglass corrosion resistance charts on pg. 183 for specific chemical recommendation data.

Unlike other base materials depicted in this catalog, fiberglass exhibits unique physical property changes when operating in elevated temperature conditions that are a fraction of increase compared to steel or aluminum. Thus, it is advised against using fiberglass in temperatures greater than 200° F.

Please refer to the "Corrosion Resistance Guide" below for specific applications.

The fiberglass strut systems are manufactured from glass fiber-reinforced plastic shapes that meet ASTM E-84, Class 1 Flame Rating and self-extinguishing requirements of ASTM D-635. A surface veil is applied during pultrusion to insure a resin-rich surface and ultraviolet resistance.

While polyester is sufficient for most uses, vinyl ester is suitable for a broader range of environments.



B-Line Steel Strut is stamped with:

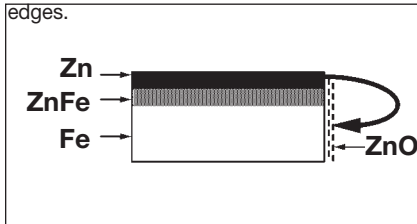
- Traceable to the steel's origin
- Material/Finish
- B-Line part number designation
- Company Name

FINISHES

Zinc Coatings

Zinc protects steel in two ways. First it protects the steel as a coating and second as a sacrificial anode to repair bare areas such as cut edges, scratches, and gouges. The corrosion protection of zinc is directly related to its thickness and the environment. This means a .2 mil coating will last twice as long as a .1 mil coating in the same environment.

Galvanizing also protects cut and drilled edges.



Electrogalvanized Zinc

Electrogalvanized Zinc (also known as zinc plated or electroplated) is the process by which a coating of zinc is deposited on the steel by electrolysis from a bath of zinc salts.

A rating of SC3, our standard, provides a minimum zinc coating thickness of .5 mils (excluding hardware, which is SC1 = .2 mils).

When exposed to air and moisture, zinc forms a tough, adherent, protective film consisting of a mixture of zinc oxides, hydroxides, and carbonates. This film is in itself a barrier coating which slows subsequent corrosive attack on the zinc. This coating is usually recommended for indoor use in relatively dry areas, as it provides ninety-six hours protection in salt spray testing per ASTM B117.

Chromium/ Zinc

Chromium/ Zinc is a corrosion resistant composition, which was developed to protect fasteners and small bulk items for automotive use. The coating applications have since been extended to larger parts and other markets.

Chromium/Zinc composition is an aqueous coating dispersion containing chromium, proprietary organics, and zinc flake.

This finish provides 500 hours protection in salt spray testing per ASTM B117.

Pre-Galvanized Zinc

(Mill galvanized, hot dip mill galvanized or continuous hot dip galvanized) Pre-galvanized steel is produced by coating coils of sheet steel with zinc by continuously rolling the material through molten zinc at the mills. This is also known as mill galvanized or hot dip mill galvanized. These coils are then slit to size and fabricated by roll forming, shearing, punching, or forming to produce our pre-galvanized strut products.

The G90 specification calls for a coating of .90 ounces of zinc per square foot of steel. This results in a coating of .45 ounces per square foot on each side of the sheet. This is important when comparing this finish to hot dip galvanized after fabrication.

During fabrication, cut edges and welded areas are not normally zinc coated; however, the zinc near the uncoated metal becomes a sacrificial anode to protect the bare areas after a short period of time.

Hot Dip Galvanized After Fabrication (Hot dip galvanized or batch hot dip galvanized)

Hot dip galvanized strut products are fabricated from steel and then completely immersed in a bath of molten zinc. A metallic bond occurs resulting in a zinc coating that completely coats all surfaces, including edges and welds.

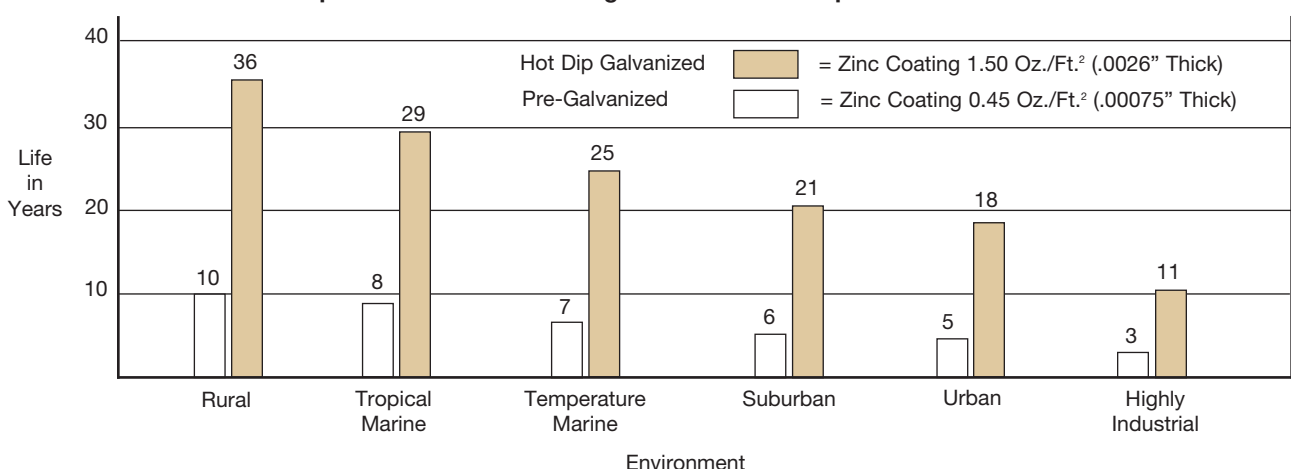
Another advantage of this method is coating thickness. Strut products that are hot dip galvanized after fabrication have a minimum thickness of 1.50 ounces per square foot on each side, or a total 3.0 ounces per square foot of steel, according to ASTM A123.

The zinc thickness is controlled by the amount of time each part is immersed in the molten zinc bath as well as the speed at which it is removed. The term "double dipping" refers to parts too large to fit into the galvanizing kettle and, therefore, must be dipped one end at a time. It does not refer to extra coating thickness.

The layer of zinc which bonds to steel provides a dual protection against corrosion. It protects first as an overall barrier coating. If this coating happens to be scratched or gouged, zinc's secondary defense is called upon to protect the steel by galvanic action.

Hot-Dip Galvanized After Fabrication is recommended for prolonged outdoor exposure and will usually protect steel for 20 years or more in most atmospheric environments and in many industrial environments. For best results, a zinc rich paint (available from B-Line) should be applied to field cuts. The zinc rich paint will provide immediate protection for these areas and eliminate the short time period for galvanic action to "heal" the damaged coating.

Anticipated Life of Zinc Coatings In Various Atmospheric Environments



Technical Data

DURA-GREEN™ and DURA-COPPER™ Epoxy Coatings

DURA-GREEN and DURA-COPPER epoxy coatings are water borne epoxy coatings applied to B-Line products by a precisely controlled cathodic electro-deposition process. This process is accomplished using a conveyor to transport channel and fittings through several cleaning, phosphatizing and application stages prior to being baked (See diagram below).

This custom-designed paint system is used for painting all channels, channel combinations, slotted angle, and fittings.

Samples are selected on a routine basis for Salt Spray (fog) testing to verify the quality of the finish. These tests are performed in accordance with ASTM B117 and evaluated and related according to ASTM D1654 (Tables 1 & 2).

The DURA-GREEN and DURA-COPPER Epoxy coatings have been tested and listed by Underwriters Laboratories in accordance with "Standard for Surface Metal Raceway and Fittings, UL5" and

"Standard for Pipe Hanger Equipment for Fire Protection Service, UL203".

Due to DURA-GREEN's organically based composition, it seats itself into porous surfaces more completely and efficiently than zinc coatings. As these porous caverns are filled along the material profile, the outer finished surface demonstrates an increased smooth uniform plane which produces considerably less off-gasing when tested.

DURA-GREEN channel meets or exceeds 100 level clean room standards. This was confirmed by testing the channel in accordance with Boeing (PCL) Standards, which are more stringent and complete than ASTM E595-93. DURA-GREEN was found to be a superior finish, due in part to its proven application process.

PVC Coating

Another of the corrosion resistant coatings offered by B-Line is PVC (polyvinyl chloride), applied over steel or aluminum channel and fittings. The PVC coating process begins by cleaning the product

thoroughly. A bonding coat is applied to the part and then preheated to a temperature above the melting point of the coating powder. The product is then passed through a fluidized bed of vinyl plastic powder where the powder particles melt, adhere and flow out to form a smooth continuous coating. The thickness is controlled by the base metal temperature and the immersion time in the bed. It is then post-heated to complete the fusion of the outer surfaces.

The standard coating thickness of B-Line's PVC coated products is 15 mils (.380 mm), plus or minus 5 mils (.125 mm). Since the chemistry, not the thickness of vinyl plastic PVC determines longevity, a coating of 10 to 20 mils (.250 to .500 mm) is more than adequate. If the corrosive conditions are such that the plasticizers are leached out, a thicker coating will do little to extend the life of a coated product.

For certain environments, a plastisol dipped PVC coating is available on request.

PVC coating depends totally on the concept of encapsulation attached to the base metal by a bonding agent. If any hole or discontinuity occurs, the corrosive action can undercut the base metal to a point where all that remains is the PVC.

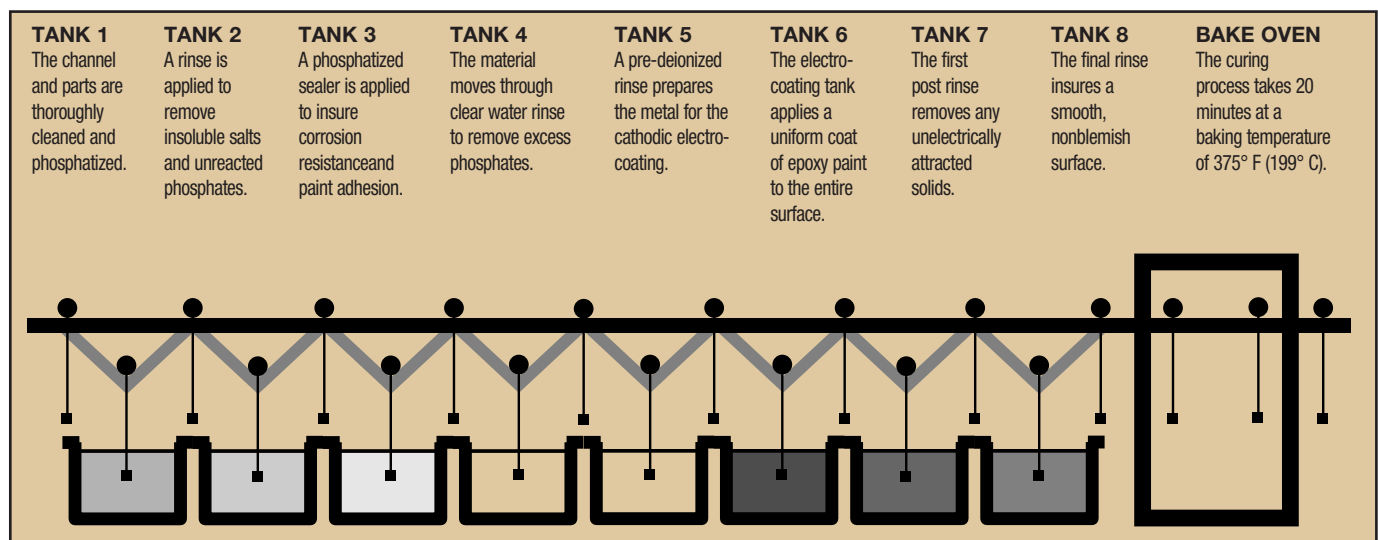
In the event of field cuts or any other damage to the coating, a liquid PVC patch, available from B-Line, must be applied to maintain the integrity of the coating. After the installation is complete, a thorough inspection should be performed to assure the absence of voids, pinholes, or cuts.

SALT SPRAY TEST RESULTS

Type of Finish	Unscribed 5% Failure (1)	Scribed 1/8" (3.2) Creepage from Scribe (1)
B-Line DURA-GREEN Epoxy	1000 Hours	312 Hours
Mill Galv. (Pre-Galv.) G90	192 Hours	288 Hours
Perma-Green	438 Hours	231 Hours
Zinc Chromate	36 Hours	96 Hours
Industry Green (Range)	10 to 36 Hours	4 to 30 Hours

(1) All salt spray (fog) tests conducted in accordance with ASTM B117 and evaluated and rated according to ASTM D1654 Tables 1 & 2. Tests are performed and certified by an independent testing laboratory.

DURA-GREEN™/DURA-COPPER™ EPOXY COATING PROCESS



Metal Framing Channels

Channel

Metal framing channel is cold formed on our modern rolling mills from 12 Ga. (2.6mm), 14 Ga. (1.9mm), and 16 Ga. (1.5mm) low carbon steel strips. A continuous slot with turned lips provides the ability to make attachments at any point.

Lengths & Tolerances

All channels excluding 'SH' style
± 1/8" (3.2mm) on 10' (3.05m) and
± 3/16" (4.76mm) on 20' (6.09m)

All 'SH' channels only
± 1/4" (6.35mm) on 10' (3.05m) and
± 1/2" (12.70mm) on 20' (6.09m)

Custom lengths are available upon request.

Slots

Slotted series of channels offer full flexibility. A variety of pre-punched slot patterns eliminate the need for precise field measuring for hole locations. Slots offer wide adjustments in the alignment and bolt sizing.

Holes

A variety of pre-punched 9/16" (14.3 mm) diameter hole patterns are available in our channels. These hole patterns provide an economical alternative to costly field drilling required for many applications.

Knockouts

When used with series B217-20 Closure Strips, knockout channels can be used to provide an economical U.L. listed surface raceway. Channels are furnished with 7/8" (22.2 mm) knockouts on 6" (152 mm) centers, allowing for perfect fixture alignment on spans up to 20' (6.09 m).

Materials & Finishes (Unless otherwise noted)

Steel: Plain & Pre-galvanized

12 Ga. (2.6), 14 Ga. (1.9) and 16 Ga. (1.5)



Finish Code	Finish	Specification
PLN	Plain	ASTM A1011, 33,000 PSI min. yield
GRN	DURA-GREEN™	
GLV	Pre-Galvanized	ASTM A653 33,000 PSI min. yield
HDG	Hot-Dipped Galvanized	ASTM A123
YZN	Yellow Zinc Chromate	ASTM B633 SC3 Type II
SS4	Stainless Steel Type 304	ASTM A240
SS6	Stainless Steel Type 316	ASTM A240
AL	Aluminum	Aluminum 6063-T6

Note: A minimum order may apply on special material and finishes.

Design Load (Steel & Stainless Steel)

The design loads given for strut beam loads are based on a simple beam condition using an allowable stress of 25,000 psi. This allowable stress results in a safety factor of 1.68. This is based upon virgin steel minimum yield strength of 33,000 psi cold worked during rolling to an average yield stress of 42,000 psi. For aluminum channel loading multiply steel loading by a factor of 0.38.

Welding

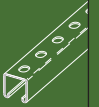
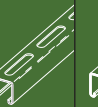
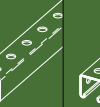
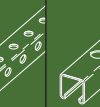
Weld spacing is maintained between 2 1/2 inches (63.5 mm) and 4 inches (101.6 mm) on center. Through high quality control testing of welded channels and continuous monitoring of welding equipment, B-Line provides the most consistent combination channels available today.

Metric

Metric dimensions are shown in parentheses. Unless noted, all metric dimensions are in millimeters.

SELECTION CHART

for Channels, Materials and Hole Patterns

Channel Type	Channel Dimensions				Material & Thickness *				Channel Hole Pattern **				
	Height		Width		Stainless Steel				SH	S	H17/8	TH	KO6
		(mm)		(mm)	Steel	Alum.	Type 304	Type 316					
B11	3 1/4"	(82.5)	1 5/8"	(41.3)	12 Ga.	.105	—	—	<u>1</u>	<u>1</u>	<u>1</u>	—	<u>1</u>
B12	2 7/16"	(61.9)	1 5/8"	(41.3)	12 Ga.	.105	—	—	<u>1 2</u>	<u>1</u>	<u>1 2</u>	—	<u>1 2</u>
B22	1 5/8"	(41.3)	1 5/8"	(41.3)	12 Ga.	.105	12 Ga.	12 Ga.	<u>1 2 3 4</u>	<u>1 3</u>	<u>1 2 3</u>	<u>1</u>	<u>1 2</u>
B24	1 5/8"	(41.3)	1 5/8"	(41.3)	14 Ga.	.080	14 Ga.	14 Ga.	<u>1 2 3 4</u>	<u>1</u>	<u>1 2 3</u>	—	<u>1 2</u>
B26	1 5/8"	(41.3)	1 5/8"	(41.3)	16 Ga.	—	—	—	<u>1</u>	<u>1</u>	<u>1</u>	—	<u>1</u>
B32	1 3/8"	(34.9)	1 5/8"	(41.3)	12 Ga.	—	12 Ga.	—	<u>1 3</u>	<u>1</u>	<u>1 3</u>	—	<u>1</u>
B42	1"	(25.4)	1 5/8"	(41.3)	12 Ga.	—	12 Ga.	—	<u>1 3</u>	<u>1</u>	<u>1 3</u>	—	<u>1</u>
B52	1 3/16"	(20.6)	1 5/8"	(41.3)	12 Ga.	—	12 Ga.	12 Ga.	<u>1 3 4</u>	<u>1</u>	<u>1</u>	—	<u>1</u>
B54	1 3/16"	(20.6)	1 5/8"	(41.3)	14 Ga.	.080	14 Ga.	14 Ga.	<u>1 2 3 4</u>	<u>1</u>	<u>1 2 3 4</u>	—	<u>1 2</u>
B56	1 3/16"	(20.6)	1 5/8"	(41.3)	16 Ga.	—	—	—	<u>1</u>	<u>1</u>	<u>1</u>	—	<u>1</u>
B62	1 3/16"	(20.6)	1 3/16"	(20.6)	18 Ga.	—	—	—	—	—	—	—	—
B72	1 3/32"	(10.3)	1 3/16"	(20.6)	18 Ga.	—	—	—	—	—	—	—	—

The selection has been prepared to provide a reference for available channel, materials and hole patterns. Material types available for various hole patterns are defined by numbers 1 thru 4.

Some stainless steel channels with hole patterns are available on special order only.

*Metric equivalent for thicknesses shown in chart.

12 Ga. = 2.6 mm

14 Ga. = 1.9 mm

16 Ga. = 1.5 mm

18 Ga. = 1.2 mm

.105 = 2.6 mm

.080 = 2.0 mm

**1 - Steel

2 - Aluminum

3 - Type 304 Stainless Steel

4 - Type 316 Stainless Steel

Properties may vary due to commercial tolerances of the material.

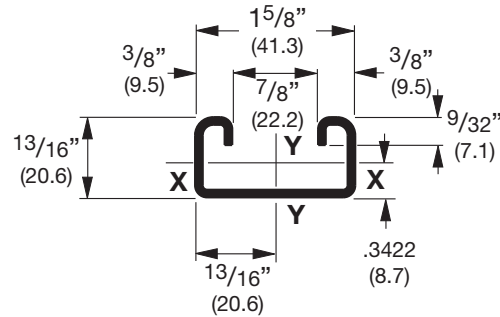
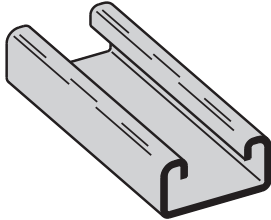
Channel Part Numbering			
Example:			
B22 SH - 120 SS4			
Channel Type	Hole Patterns	Length	Material/Finish
B11	SH (pg. 40)	120	GRN
B12	S (pg. 40)	240	GLV
B22 †	H178 (pg. 40)		HDG
B24 †	TH (pg. 41)		YZN
B26	KO6 (pg. 41)		SS4
B32	SHA (pg. 41)		SS6
B42	S58 (pg. 42)		AL
B52 †	M (pg. 42)		
B54 †	H25 (pg. 43)		
B56	H112 † (pg. 42)		
B62	* Leave blank for no hole pattern		
B72			

Reference page 14 for general fitting and standard finish specifications.

B54 Channel & Combinations

B54

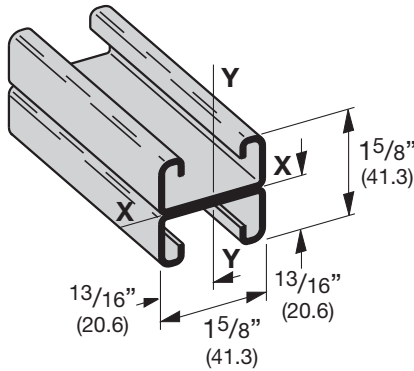
- Thickness: 14 Gauge (1.9 mm)
- Standard lengths: 10' (3.05 m) & 20' (6.09 m)
- Standard finishes: Plain, DURA-GREEN™, Pre-Galvanized, Hot-Dipped Galvanized, Stainless Steel Type 304 or 316, Aluminum
- Weight: .97 Lbs./Ft. (1.44 kg/m)



SECTION PROPERTIES

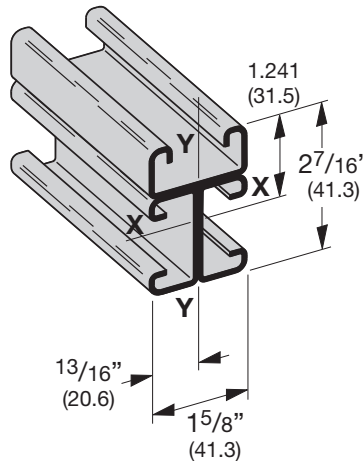
Channel	Weight		Areas of Section		Moment of Inertia (I)		Section Modulus (S)		Radius of Gyration (r)		Moment of Inertia (I)		Section Modulus (S)		Radius of Gyration (r)	
	lbs./ft.	kg/m	sq. in.	cm ²	in. ⁴	cm ⁴	in. ³	cm ³	in.	cm	in. ⁴	cm ⁴	in. ³	cm ³	in.	cm
B54	1.016	(1.51)	.299	(1.93)	.0263	(1.09)	.0560	(.92)	.297	(.75)	.1106	(4.60)	.1361	(2.23)	.608	(1.55)
B54A	2.032	(3.02)	.598	(3.86)	.1226	(5.10)	.1510	(2.47)	.453	(1.15)	.2212	(9.12)	.2722	(4.46)	.608	(1.55)

Calculations of section properties are based on metal thicknesses as determined by the AISI Cold-Formed Steel Design Manual.



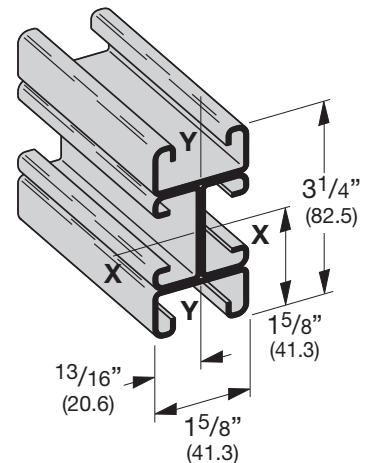
B54A

Wt. 1.94 Lbs./Ft. (2.89 kg/m)



B54B3

Wt. 2.91 Lbs./Ft. (4.33 kg/m)



B54B4

Wt. 3.88 Lbs./Ft. (5.77 kg/m)

B54 Beam & Column Loading Data

BEAM LOADING

Beam Span In. mm		Channel Style	Uniform Load and Deflection				Uniform Load @ Deflection =			
			Lbs.	kN	In.	mm	Lbs.	kN	Lbs.	kN
12	(305)	B54 B54A	870 870*	(3.87) (3.87)	.027 .005	(.68) (.13)	870 870*	(3.87) (3.87)	870 870*	(3.87) (3.87)
24	(609)	B54 B54A	465 870*	(2.07) (3.87)	.108 .043	(2.74) (1.09)	430 870*	(1.91) (3.87)	287 870*	(1.27) (3.87)
36	(914)	B54 B54A	310 832	(1.38) (3.70)	.243 .141	(6.17) (3.58)	191 832	(0.85) (3.70)	127 591	(0.56) (2.63)
48	(1219)	B54 B54A	233 624	(1.03) (2.77)	.432 .250	(10.97) (6.35)	108 499	(0.48) (2.22)	72 332	(0.32) (1.48)
60	(1524)	B54 B54A	186 499	(0.83) (2.22)	.676 .391	(17.17) (9.93)	69 319	(0.31) (1.42)	46 213	(0.20) (0.95)
72	(1829)	B54 B54A	155 416	(0.69) (1.85)	.973 .563	(24.71) (14.30)	48 222	(0.21) (0.99)	32 148	(0.14) (0.66)
84	(2133)	B54 B54A	133 357	(0.59) (1.59)	1.324 .766	(33.63) (19.45)	35 163	(0.15) (0.72)	23 109	(0.10) (0.48)
96	(2438)	B54 B54A	116 312	(0.51) (1.39)	1.730 1.001	(43.94) (25.42)	27 125	(0.12) (0.55)	18 83	(0.80) (0.37)
108	(2743)	B54 B54A	103 277	(0.46) (1.23)	2.189 1.267	(55.60) (32.18)	21 98	(0.93) (0.43)	14 66	(0.62) (0.29)
120	(3048)	B54 B54A	93 250	(0.41) (1.11)	2.703 1.564	(68.65) (39.72)	17 80	(0.75) (0.35)	11 53	(0.49) (0.23)

Based on simple beam condition using an allowable design stress of 25,000 psi (172 MPa) in accordance with MFMA, with adequate lateral bracing (see page 11 for further explanation). Actual yield point of cold rolled steel is 42,000 psi. To determine concentrated load capacity at mid span, multiply uniform load by 0.5 and corresponding deflection by 0.8. *Failure determined by weld shear.

COLUMN LOADING

Unbraced Height In. mm		Channel Style	Max. Column Loading K = .80				Max. Column Loading (Loaded @ C.G.)					
			Loaded@ C.G.		Loaded@ Slot Face		K = .65		K = 1.0		K = 1.2	
In.	mm		Lbs.	N	Lbs.	N	Lbs.	N	Lbs.	N	Lbs.	N
12	(305)	B54 B54A	6186 12763	(27.51) (56.77)	2586 4060	(11.50) (18.06)	6284 12835	(27.95) (57.09)	6032 12645	(26.83) (56.25)	5857 12501	(26.05) (55.61)
24	(609)	B54 B54A	5464 12135	(24.30) (53.98)	2254 3857	(10.02) (17.16)	5763 12420	(25.63) (55.25)	4968 11663	(22.10) (51.88)	4300 11087	(19.13) (49.32)
36	(914)	B54 B54A	4300 11087	(19.13) (49.32)	1816 3549	(8.08) (15.79)	5043 11728	(22.43) (52.17)	3076 10026	(13.68) (44.60)	2136 8729	(9.50) (38.83)
48	(1219)	B54 B54A	2703 9620	(12.02) (42.79)	1341 3169	(5.96) (14.09)	3920 10759	(17.44) (47.86)	1730 7734	(7.69) (34.40)	1201 5571	(5.34) (24.78)
60	(1524)	B54 B54A	1730 7734	(7.69) (34.40)	995 2745	(4.42) (12.21)	2621 9514	(11.66) (42.32)	1107** 5134	(4.92) (22.84)	769** 3566	(3.42) (15.86)
72	(1829)	B54 B54A	1201 5571	(5.34) (24.78)	763 2291	(3.39) (10.19)	1820 7992	(8.09) (35.50)	769** 3566	(3.42) (15.86)	534** 2476	(2.37) (11.01)
84	(2133)	B54 B54A	883** 4093	(3.93) (18.20)	603 1913	(2.68) (8.51)	1337 6200	(5.95) (27.58)	565** 2620	(2.51) (11.65)	— 1819**	— (8.09)
96	(2438)	B54 B54A	676** 3134	(3.01) (13.94)	487 1616	(2.16) (7.19)	1024** 4747	(4.55) (21.11)	— 2006**	— (8.92)	— 1393**	— (6.19)
108	(2743)	B54 B54A	534** 2476	(2.37) (11.01)	401 1380	(1.78) (6.14)	809** 3751	(3.60) (16.68)	— 1585**	— (7.05)	— 1100**	— (4.89)
120	(3048)	B54 B54A	— 2006**	— (8.92)	336 1190	(1.49) (5.29)	655** 3038	(2.91) (13.51)	— 1284**	— (5.71)	— —	— —

**Where the slenderness ratio $\frac{KL}{r}$ exceeds 200, and K = end fixity factor, L = actual length and r = radius of gyration.

Reference page 14 for general fitting and standard finish specifications.