

INTRODUCTION to WORK STATION CRANES

Description & Applications:

Properly Applied Gorbel® Work Station Cranes (WSC's):

- Feature enclosed track design that is more ergonomic than many other crane types
- Are designed for the lighter loads (under 4000 lbs/1814 kg) seen in today's industry
- Are exceptionally versatile, and can perform a wide variety of material handling and spotting applications
- Are economical enough to be devoted to individual work stations
- Can increase worker satisfaction
- Can encourage safe work practices
- Provide a rapid return on investment through increased productivity (refer to the Ergo Study)
- Often simplify the installation procedure
- Can decrease installation costs
- Offer a wide variety of options, capacities, and materials

Gorbel Manufactures the Following Basic Categories of Work Station Cranes:

- Free Standing and Ceiling Mounted steel bridge cranes (GLC series)
- Free Standing and Ceiling Mounted aluminum bridge cranes (AL series)
- Free Standing and Ceiling Mounted stainless steel cranes (SS series)
- Monorails of steel (GLM series), aluminum (ALM series), and stainless steel (SS series)

Bridge cranes cover rectangular work areas. Monorail systems can be used to cover various work area shapes, or to link work areas together. A crane system can be readily adapted for more sophisticated applications by the addition of extra monorail tracks, curves, and transfers that can be easily conformed into a total system.

Gorbel also manufactures complimentary products and accessories, such as:

- Offset Load Platforms
- Telescoping Bridges
- Nested Trolley Saddles
- Tractor Drives
- G-Force® Intelligent Lifting Devices

Please contact Gorbel for details on these and other special products.

Warning: Equipment described herein is not designed for, and should not be used for lifting, supporting or transporting humans. Failure to comply with any one of the limitations noted herein can result in serious bodily injury, death, and/or property damage.

Advantages of WSC's **vs. I-Beam or Patented Hard Track Cranes:**

Compared to Many I-Beam Crane Designs, Gorbel® WSC's:

- Are more ergonomic
- Can encourage safer work practices
- Can increase productivity up to 28% (see the Ergo Study)
- Are 3-4 times easier to move
- Utilize a cold rolled steel or structural aluminum with a low weight-per-foot ratio
- Reduce dead weight; let the operator concentrate on moving the load instead of the bridge
- Are available for several distinct capacities
- Don't have mill scale
- Feature enclosed track design --- helps keep out dust and contaminants for a cleaner rolling surface
- Have lower rolling resistance
- Extend the life of trolley and end truck wheels
- Are often easier to install, thus lowering installation costs
- Usually exert less force on supporting structures, thus providing a solution to a larger number of applications
- Are available in longer spans
- Require fewer support centers
- Offer better headroom
- Permit a much larger percentage of the population to safely operate them

The chart below (based on 1000 lb. capacity, 20' span, 14' height under bridge) shows how much easier Gorbel® cranes are to move and how much less dead weight they carry than certain other common crane types:

	Degree of Movement Difficulty	Approximate Force to Move	Bridge & End Truck Dead Weight
Gorbel® WSC (aluminum)	easiest	8 lbs.	226 lbs.
Gorbel® WSC (steel)	easy	10 lbs.	326 lbs.
Traditional I-beam crane	3 - 4 times harder	31 lbs.	925 lbs.
Patented (hard) track crane	2 - 3 times harder	21 lbs.	658 lbs.

The Ergonomic Study completed by the Rochester Institute of Technology further demonstrates the benefits of Gorbel® enclosed track WSC's compared to I-beam designs. A video cassette regarding the study is also available through Gorbel's Customer Service Department.

Advantages of Rigid Runway Systems vs. Articulating Runways:

Gorbel® Work Station Cranes feature rigid, traditionally-hung runway systems, which have several advantages over the articulating runway style. Rigid systems differ from articulating systems in that the rigid systems do not have hangers that allow the runways to freely swing or pivot.

Compared to Most Articulating Systems, Gorbel's Rigid Systems:

- Are easier to install and decrease installation costs
- Offer more headroom
- Have less risk of loosening hardware
- Have fewer moving parts / less to maintain
- Offer easier positioning
- Have true free standing capability (Articulating systems require a separate support structure to be built, which can increase costs.)
- Require less steel, so they are less expensive and weigh less
- Do not require safety cables
- Do not "crab-walk" down the runway, even when the load is at the far end of a bridge. ("Crab-walking" is when one end of a bridge moves ahead of the other on the runway system, thus the bridge is no longer perpendicular to the runways. Gorbel's rigid design prevents this from happening.)
- Feature anti-binding end trucks --- no matter where a load is on a runway, it is easy to move
- Utilize trussed runways that can act as stringers between support columns, thus eliminating the need for extra structural steel

Considerations for Selecting a WSC:

Selection of the Correct Work Station Crane Should Be Based Upon:

- Cycle times
- The size and shape of the work area to be serviced
- The type and extent of the structural support available
- The relative cost of each WSC type
- The capacity of the load
- The crane's environment
- The overall cost of installation
- How the crane will affect the efficiency of the work area
- How the crane will be used in daily operation

Note that Gorbel designs work station bridge cranes that can span up to 30 feet! This can really save on costs, since most buildings are designed for support centers of at least 20 feet. The longer a crane can span, the fewer the number of hangers and support structures that are required. Also note that Gorbel offers the versatility of having (very ergonomic) aluminum bridges with long-spanning steel runways.

Definition of Terms:

Proper application of Work Station Cranes depends upon the thorough understanding of the associated terms and parameters. The following is a list of terms that should be understood before the selection of a Gorbel® crane:

Anchor Bolt Load: The total amount of force that is applied to *each* supporting anchor bolt; usually measured in kips.

Axial Load: The total vertical force applied to the supporting structure.

Formula: Axial load = (the overall weight of the crane) + (the design factor x weight of lifted load).

Bridge Length: The overall length of a bridge. ***Note: The Working Length or Hook Coverage of the bridge is less than the overall bridge length.***

Buffer Assembly: A floating spacer that rides in the runway between two bridges (or hoist trolleys) to prevent a concentrated overload between hanger points. It physically separates the bridge or trolleys a minimum distance apart.

Column: The column of a free standing bridge crane is one of the “legs” on which the crane stands, and is made of square tube.

Design Factor: A multiplier incorporated into a formula to allow for variations in the properties of materials, manufacturing, operations, conditions, and design assumptions. The design factor for Gorbel® cranes is based upon the capacity of the crane, plus 15% for the weight of the hoist, plus an additional 25% for impact. Simply put, Gorbel’s Design Factor = (capacity x 1.4). Gorbel’s design factor for *deflection* is based upon the crane capacity plus 15% for the weight of the hoist and trolley (i.e. Deflection Design Factor = (capacity x 1.15)). It is important to distinguish the design factor from the *safety factor*, which is a much larger number (typically 5-8 times greater than the design factor). It also must be stressed that the crane should never be loaded beyond its capacity, regardless of the design factor, although it can be *load* tested to 125% of rated capacity.

Deflection: The difference in elevation of the track between an unloaded crane and a fully loaded crane; usually measured in inches. Typically Gorbel® bridge cranes are designed for L/450 deflection, where L= support center distance or span.

End Trucks: Devices, positioned on each end of a bridge, that allow a bridge to roll in a runway system.

Festooning: The cables and/or hoses needed to supply electric power, air, etc. to the hoist.

Foundation: All Gorbel® free standing bridge cranes do not require a special foundation; they can be used with a standard 6-inch reinforced concrete floor.

Hanger Assemblies: The devices which connect a ceiling mounted bridge crane or monorail to the supporting structure.

Header: The horizontal member of a free standing bridge crane's support structure, made of two back-to-back channels, from which the runways are hung.

Kips: Kilopounds. A unit of force equal to 1000 pounds (453.592 kg).

Overall Height (OAH): The distance from the floor to the top-most point on a crane (should *include hardware*).

Span (of Bridge): The distance between the center line of the runways. The span must be distinguished from the *Overall Length (OAL)* of bridge, which is larger than the span.

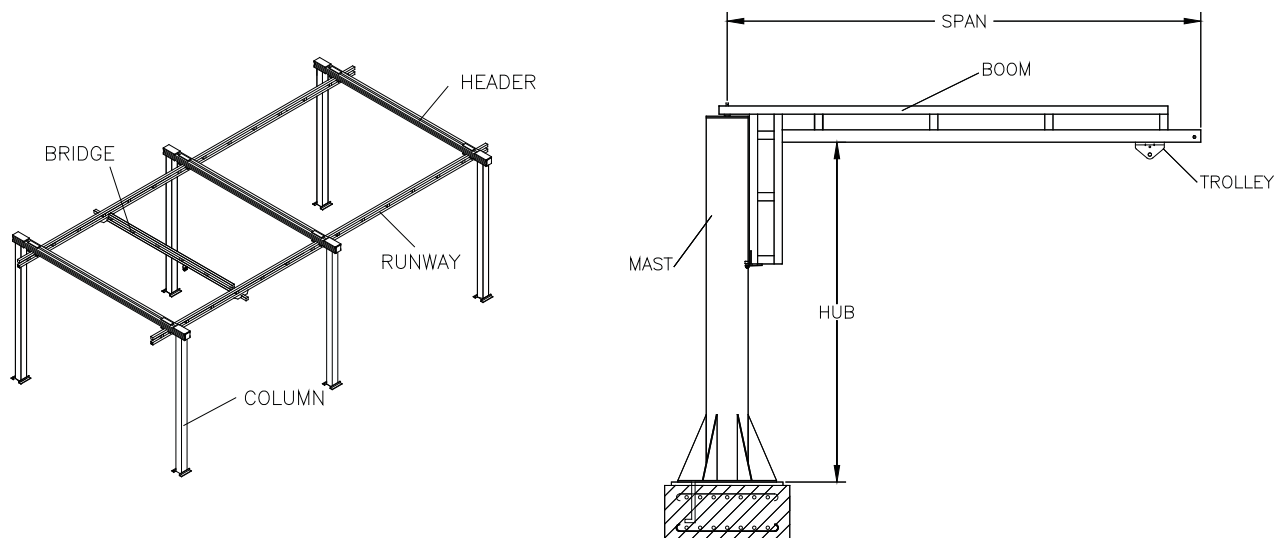
Formula (for most cranes): $\text{Span} = \{\text{OAL}_{\text{bridge}} - (2 \times \text{bridge cantilever dimension})\}$

Splice Joint: Used when joining runway track sections together. A *track splice* is used to splice the track sections together, and an additional *truss splice plate* is required if trussed runways need to be joined.

Support Center: The distance between the center line of the two support columns or hangers along a runway. Note that support centers determine what track style is required.

Supporting Structure: For a *free standing* bridge crane, the supporting structure refers to the *support assembly*, also called the **Goal Post** or **End Frame**, consisting of the columns and header. For a *ceiling mounted* system, the supporting structure is the ceiling, including trusses, stringers, columns, etc., from which the crane is hung.

Trolley Saddle Height (TS): On a Free Standing Bridge Crane, this is the height from the top of the saddle of the hoist trolley (the clevis pin from which the hoist is actually hung) to the floor.



Work Station Bridge Cranes with multiple bridges (options):

- A) Mixed Capacity Systems - bridges are sized for individual weighted load - runways are sized for the combined weight of all loads, so they use a heavier track series
- B) Bridge Buffer Systems - bridges are sized for individual weighted load - runways are sized for the heaviest individual load, so the runways use the same track series as the largest bridge - bridges are physically separated by wheeled, movable bridge buffers
- C) System with Intermediate Stops - bridges are sized for the individual weighted load - runways are sized for the heaviest individual load, so the runways use the same track series as the largest bridge - bridges are physically separated by internal stops or bumpers

Construction for Seismic Zones:

For those customers in seismic construction zones, the design criteria of cranes can significantly change, depending on the Seismic Rating. Please consult Gorbel® Customer Service.

Painting and Special Finishes:

Gorbel offers several finishes to our cranes to suit various types of needs and environments. Some finishes may require sandblasting.

With the STANDARD finish:

- A high pressure wand is used to spray and wash the entire piece.
- One coat of self-priming paint is applied then the piece is ready for the baking process.
- Steel bridges are painted yellow. Aluminum/Stainless Steel bridges are not painted.
- Steel columns, runways and monorails are painted blue, Aluminum & Stainless Steel components aren't painted.
- Although we take great care in packaging your crane systems for shipment, scratching or chipping of the paint may occur in transit. This is not the responsibility of Gorbel.
- At least one spray can of enamel paint is included with each crane order for field touch-up. Additional touch-up paint can be purchased through Gorbel.

Several manufacturers currently match Gorbel's standard colors (in different paint formulations) so that basic touch-up paint can be purchased at a local hardware store, if desired:

Dupont "Dulux" Semi-gloss:

DUP 4N31P

Sherwin-Williams:

(both to be formulated in metal latex)

Strathmore:

(alkyd enamel)

Valspar:

(available as industrial enamel or epoxy)

Yellow: F.S. 33434

Blue: F.S. 25102

Yellow: Gorbel Yellow

Blue: Gorbel Blue

Yellow: Y13-0030

Blue: L13-0065

Yellow: B289

Blue: A58

The **304 Stainless Steel** cranes are not painted, so that the food-grade, contamination-free quality of the stainless steel system is maximized. **Aluminum** cranes are not painted for this reason also.

Galvanizing is an alternate finish available from Gorbel. This process includes a hot-dip zinc galvanizing of the cranes major components to increase corrosion resistance. **Note:** endtrucks, trolleys, and miscellaneous hardware may be cold galvanized if requested. We recommend this treatment only for systems that use 1000 series rail or higher.

Sandblasting is another option commonly performed on Gorbel® cranes, especially if an epoxy or urethane paint is to be used. Sandblasting is typically performed to SSPC-SP-10 or -6 (white or near white) specifications. Endtrucks and hoist trolleys are to be sandblasted prior to special finishes.

Customized paint colors and other finishing options are available upon request.

Additional costs and lead times for special finishes vary. Please contact a Gorbel® Customer Service Representative for information.

How to Select the Proper Gorbel® Crane:

Gorbel recommends purchasing a crane “kit” (i.e. a total bridge or monorail system) if possible, rather than buying individual components separately to make a complete system. If a kit crane is desired, the following worksheet can help in selecting the correct steel crane for each application. Model numbers will change slightly if Aluminum or Stainless Steel is required.

(1) Determine Capacity:

- A. Live load weight..... _____
B. Grab weight (hook/hoist accessories) _____
C. Total load (add A+B) _____

Gorbel® WSC designs allow 15% of crane capacity for hoist weight and 25% of crane capacity for impact. Therefore the live load can equal the capacity. The total load must not exceed 1.15 times the capacity. Please consult Gorbel when hoist weight or impact values exceed the above, or when using a magnet. For your reference: 2000 lbs. = 1 ton = 907.18kg

(2) Determine Runway or Monorail Length

- A. Hook coverage required..... _____
B. L8 from dimensional pages in brochure..... _____
C. Length of runway/monorail = {A + (2B)} from above..... _____
D. Add festoon stack-up length (L7) to C above, to obtain overall system
length (OAL) _____

Be sure to be consistent between inches and feet. For your reference: 12 inches = 1 foot = 0.305 meters

(3) Determine Support Center Dimensions (L1)

Use the GLC or GLM (untrussed) model if and only if:

$$L1 \leq 6'$$

Use the GLCS or GLMS (trussed steel) or AL or ALM (aluminum) model if and only if:

$$L1 \leq 20'$$

Use the GLCSL or GLMSL (trussed steel) model if and only if:

$$L1 \leq 25'$$

Use the GLCSLX or GLMSLX (trussed steel) model if and only if:

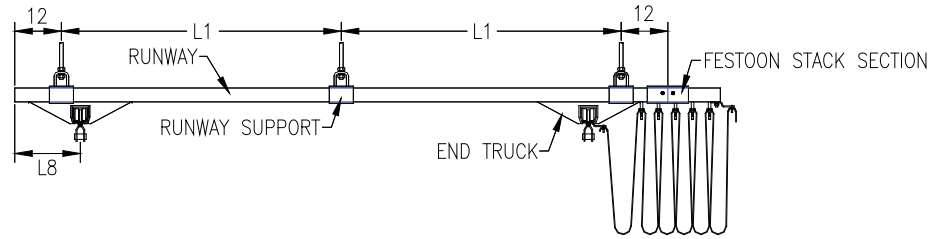
$$L1 \leq 30'$$

Note: GLCSLX is not available for 250#.

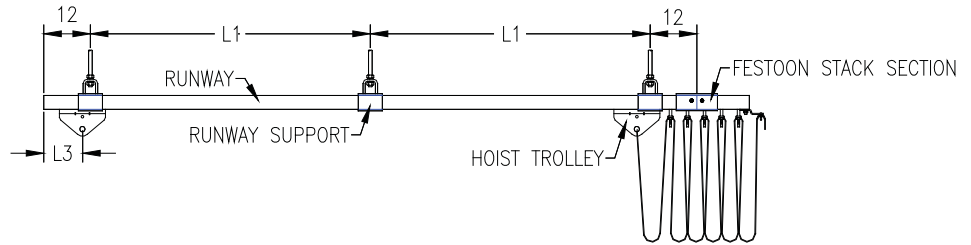
How to Select the Proper Gorbel® Crane Continued...

Drawing of:

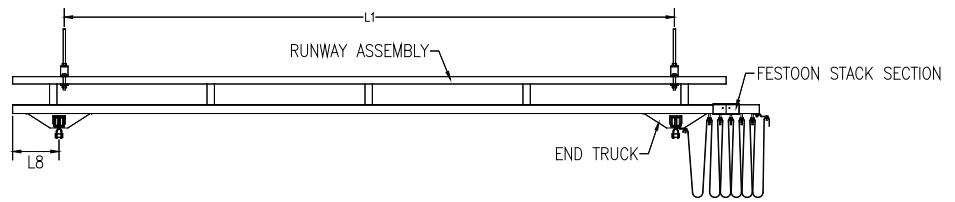
GLC



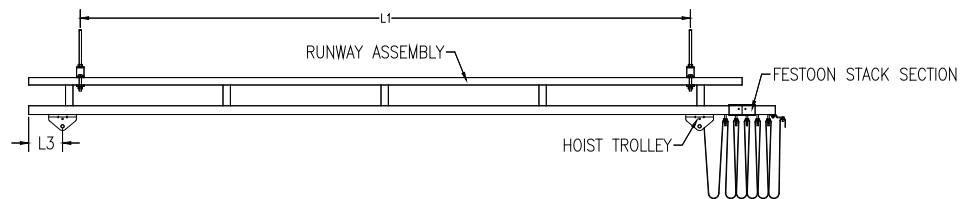
GLM (monorail)



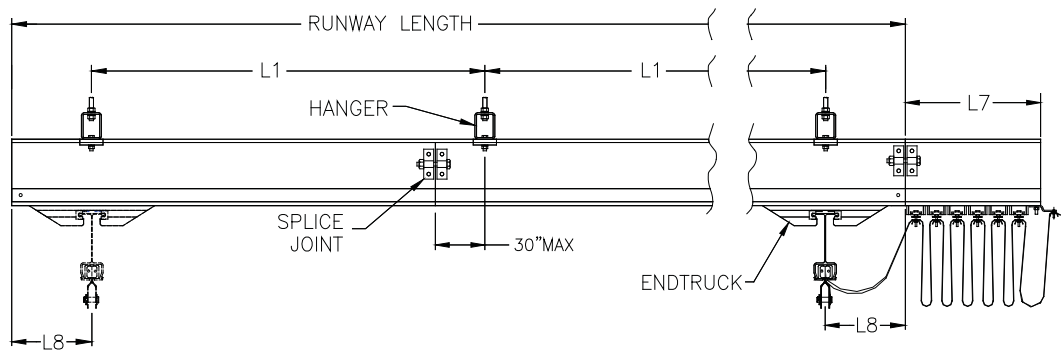
GLCS, GLCSL and GLCSLX
(the difference being in the truss)



GLMS, GLMSL and GLMSLX (monorail)
(the difference being in the truss)



AL



How to Select the Proper Gorbel® Crane Continued...

Note:

- Check to make sure the distance between runways can be maintained. Please consult Gorbel if this is not possible.
- Certain “void” spaces exist on trussed runways where hangers cannot be placed due to interference from the truss. Please consult Gorbel if a support point must be placed where a truss exists.
- The standard supplied cantilever at the end of the runway is 12” for models with Support Centers (L1) less than or equal to 6’. The standard runway cantilever is 24” for models with 30’ Support Centers. The standard runway cantilever is 18” for most other cranes. Please consult Gorbel if a runway cantilever other than these standard values is required.
- Sway Bracing (by others) is required with a ceiling mounted crane system. Sway bracing is not included in the Work Station Crane kit pricing.

(4) Determine Overall Length of Bridge (L):
(skip to (5) below for monorails)

- A. Hook coverage required _____
- B. L3 (from dimensional pages in brochures)..... _____
- C. L6 (from dimensional pages in brochures)..... _____
- D. Add (A+B+C) to obtain **overall length of bridge**..... _____

Note:

- Be sure to check that the hook coverage needs are met, especially with larger systems. (End stops, festoon carriers, hoist trolleys and load bars take up space!)
- If $L \leq 23'$, the standard supplied cantilever at end of bridge is 12” for 250#, 500#, 1000# & 2000# capacities, and 15” for 4000#.
- If $23' < L \leq 28'$, the standard supplied cantilever at end of bridge is 18”.
- If $28' < L \leq 34'$, the standard supplied cantilever at the end of bridge is 24”.
- The maximum bridge length for systems with 250# capacity is 28’. Please consult Gorbel’s Customer Service department if this is not possible.

(5) Determine the Model Number of the Crane:

Please refer to the appropriate page, row, & column in the Work Station Crane pricing sections of the Sales Manual, depending upon the dimensions and capacity of the crane. The crane price will also be listed.

The correct model number is _____

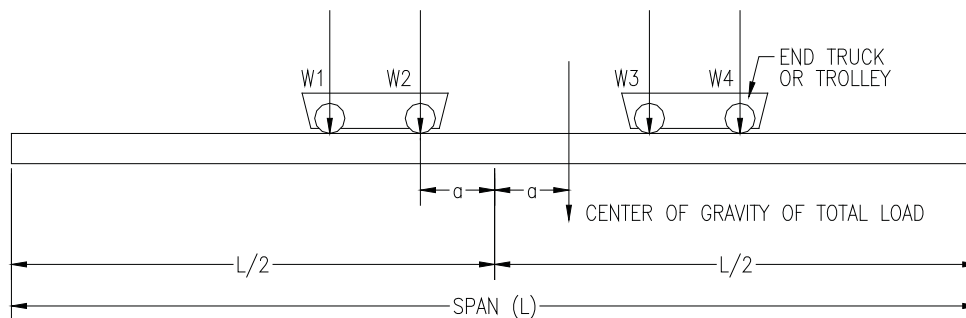
Equivalent Center Load Information

Equivalent Center Load (ECL) information is provided to help understand and calculate the forces of more sophisticated bridge crane systems, particularly those systems with more than one bridge.

Track Size	Span (ft.)													
	6	8	10	12	14	16	18	20	22	24	25	26	28	30
150AL	1000	1000	800	550	390	290	215	165	125	90	80	0	0	0
250	250													
250S	500	500	500	500	500	350	270	250						
250SL	1000	1000	1000	1000	1000	850	850	650	550	350	250			
250AL	1500	1500	1280	965	690	500	380	275	215	160	135	115	75	0
500	500	125	30											
500S	1400	1400	140	1400	950	700	525	500						
500SL	2000	2000	2000	2000	2000	1700	1300	1000	800	625	500			
500SLX	2400	2400	2400	2400	2400	1800	1350	1050	850	675	600	550	500	500
500AL	2220	2220	1880	1555	1320	1020	780	610	480	375	335	295	230	0
1000	1000	390	110											
1000S	2400	2400	2400	2400	2400	1800	1350	1000						
1000SL	2400	2400	2400	2400	2400	2400	2000	1500	1250	1050	1000			
1000SLX	2400	2400	2400	2400	2400	2400	2400	2300	1900	1500	1350	1250	1050	1000
1000AL	4000	4000	3900	3230	2750	2320	1790	1405	1120	895	805	720	575	0
2000	2000	825	380	130										
2000S	6000	6000	6000	6000	4800	3700	2800	2000						
2000SL	6000	6000	6000	6000	6000	5800	4600	3600	2900	2400	2000			
2000SLX	6000	6000	6000	6000	6000	6000	4900	3900	3100	2550	2300	2125	2050	2000
2000AL	4010	4010	4010	4010	3415	2965	2610	2215	1775	1440	1300	1175	955	0
4000	4000													
4000S	6000	6000	6000	6000	6000	6000	4900	4000						
4000SL	6000	6000	6000	6000	6000	6000	6000	5400	4400	4050	4000			
4000SLX	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	5400	4400	4050	4000

Note: ECL values are expressed in pounds.

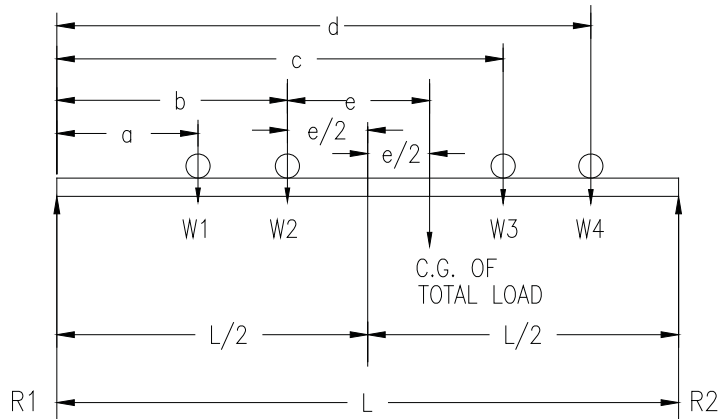
Determine the wheel loadings of end trucks:



The maximum bending moment (M) produced by moving concentrated loads occurs under one of the loads when the center line of the beam is midway between the load and the center gravity of total loads (C.G. of T.L.) (in the sketch above, when $a = a$).

Solve for M_{\max} . Then, $ECL = (4M)/L$. Use the chart above for ECL.

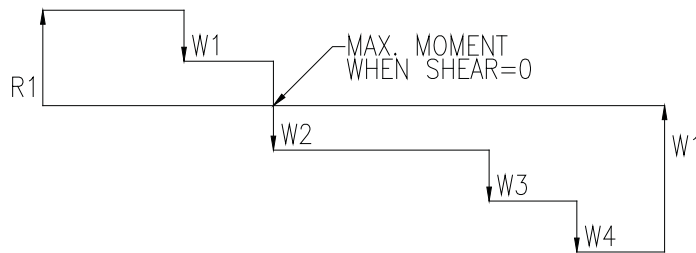
Equivalent Center Load Information Continued...



$$R_1 = W_1 + W_2 + W_3 + W_4 - R_2$$

$$R_2 = [(W_1)a + (W_2)b + (W_3)c + (W_4)d] / L$$

Thus the shear diagram is drawn:



For the example shown:

$$M_{\max} = (R_1)b - [(W_1)(b - a)]$$

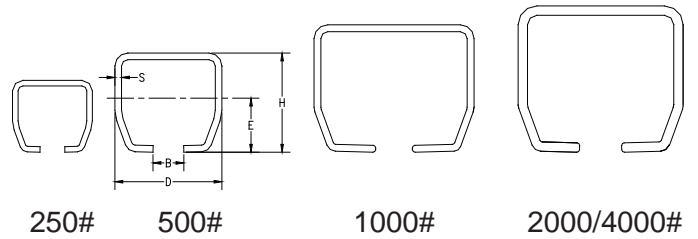
and

$$ECL = (4M / L) = (4 / L)[(R_1)b - \{W_1(b-a)\}]$$

Note: Lower flange loading must not exceed the actual trolley or end truck capacity rating. These formulas are to be used in conjunction with the ECL chart on the previous page.

Steel Track Dimensions GLC & GLM (Plain Track with 6' Support Centers)

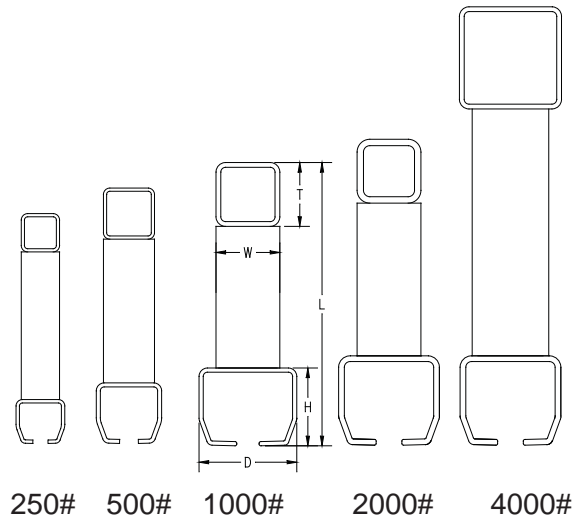
CAPACITY	H	D	B	S	E
250#	1.75"	1.9375"	0.5625"	0.138"	0.976"
500#	2.375"	2.56"	0.730"	0.157"	1.338"
1000#	3.048"	3.829"	0.875"	0.164"	1.694"
2000/4000#	3.5"	3.948"	1.0"	0.224"	1.9377"



Note: Dimensions are for reference only and are subject to change without notice.

Steel Track Dimensions GLCS & GLMS (Trussed Track with 20' Support Centers)

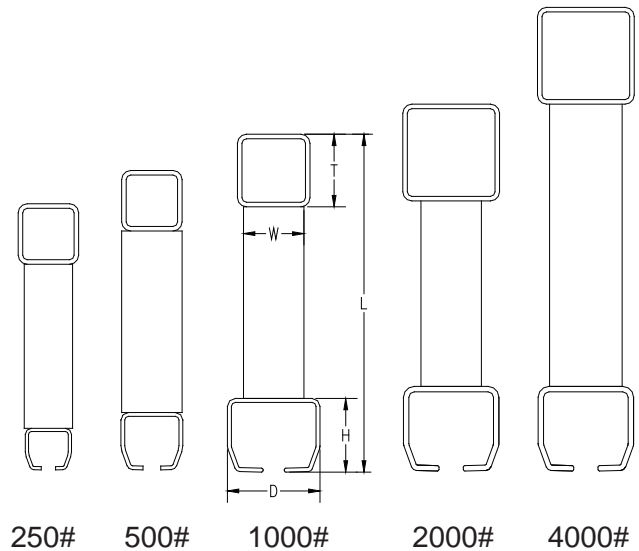
CAPACITY	L	W	T	H	D
250#	9"	1.5"	1.5"	1.75"	1.938"
500#	10"	2.0"	2.0"	2.38"	2.56"
1000#	11.048"	2.5"	2.5"	3.048"	3.829"
2000#	12"	2.5"	2.5"	3.5"	3.948"
4000#	18"	3.0"	4.0"	3.58"	3.948"



Note: Dimensions are for reference only and are subject to change without notice.

Steel Track Dimensions GLCSL & GLMSL (Trussed Track with 25' Support Centers)

CAPACITY	L	W	T	H	D
250#	11.0"	2.0"	2.5"	1.75"	1.938"
500#	12.375"	2.5"	2.5"	2.38"	2.56"
1000#	13.923"	2.5"	3.0"	3.048"	3.829"
2000#	15.375"	2.5"	4.0"	3.5"	3.948"
4000#	20.0"	3.0"	4.0"	3.5"	3.948"



Note: Dimensions are for reference only and are subject to change without notice.

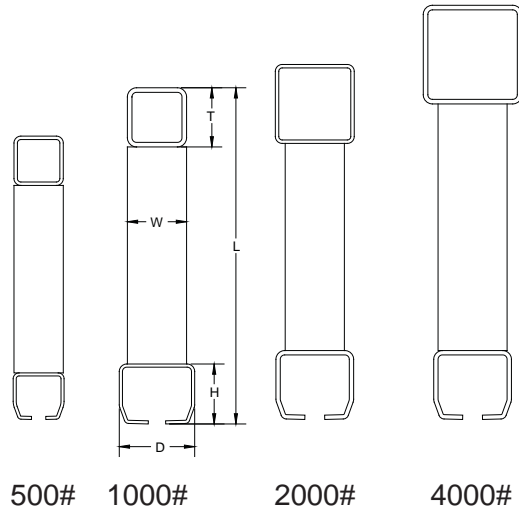
Steel Track Dimensions

GLCSLX & GLMSLX

(Trussed Track with 30' Support Centers)

CAPACITY	L	W	T	H	D
250#	---	---	---	---	---
500#	14.375"	2.5"	2.5"	2.38"	2.56"
1000#	17.048"	3.0"	3.0"	3.048"	3.829"
2000#	18.0"	3.0"	4.0"	3.5"	3.948"
4000#	21.0"	3.5"	5.0"	3.5"	3.948"

Note: Dimensions are for reference only and are subject to change without notice.



Aluminum Track Dimensions

AL & ALM (Plain Track with 20' Support Centers)

CAPACITY	L	W	H	D	Max. bridge length	Max. bridge span
150#	7.5"	2.467"	1.66"	1.943"	23'	20'
250#	8.0"	4.0"	2.404"	3.303"	23'	20'
500#	10.0"	4.0"	2.563"	3.375"	23'	20'

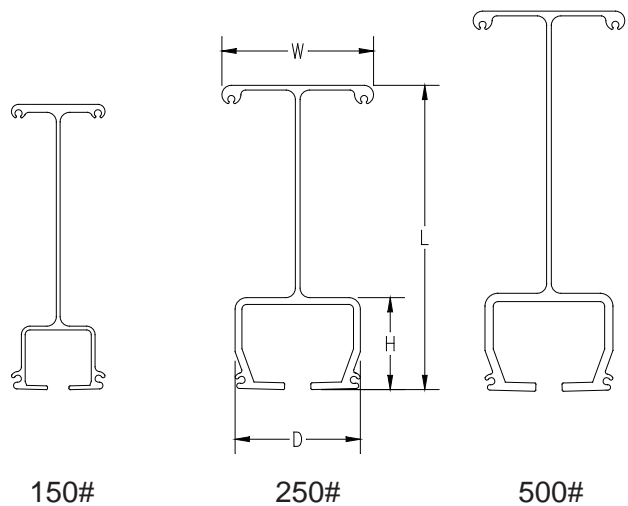
AL & ALM (Plain Track with 25' Support Centers)

150#	8.0"	4.0"	2.404"	3.303"	28'	25'
250#	10.0"	4.0"	2.563"	3.375"	28'	25'
500#	10.514"	5.0"	3.639"	4.016"	28'	25'

AL & ALM (Plain Track with 30' Support Centers)

500#	12.639"	5.0"	3.639"	4.016"	34'	30'
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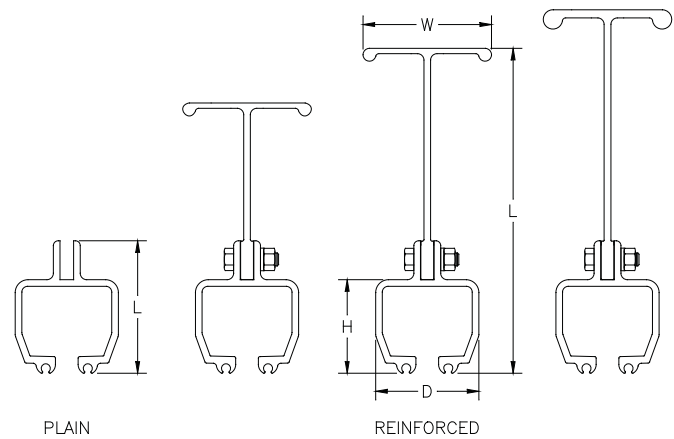
Note: Dimensions are for reference only and are subject to change without notice.



Aluminum Track Dimensions AL & ALM (1000# Capacity)

	Max. bridge length	Max. bridge span	L	W	H	D
Plain	8'	6'	5.154"	---	3.639"	4.016"
Reinforced	23'	20'	10.514"	5"	3.639"	4.016"
Reinforced	28'	25'	12.639"	5"	3.639"	4.016"
Reinforced	34'	30'	14.139"	5"	3.639"	4.016"

Note: Dimensions are for reference only and are subject to change without notice.



Aluminum Track Dimensions AL & ALM (2000# Capacity)

	Max. bridge length	Max. bridge span	L	W	H	D
Plain	8'	6'	5.653"	---	4.139"	4.166"
Reinforced	15'	13'	11.014"	5"	4.139"	4.166"
Reinforced	23'	20'	13.139"	5"	4.139"	4.166"
Reinforced	28'	25'	14.639"	5"	4.139"	4.166"
Reinforced	34'	30'	15.514"	6.5"	4.139"	4.166"

Note: Dimensions are for reference only and are subject to change without notice.

