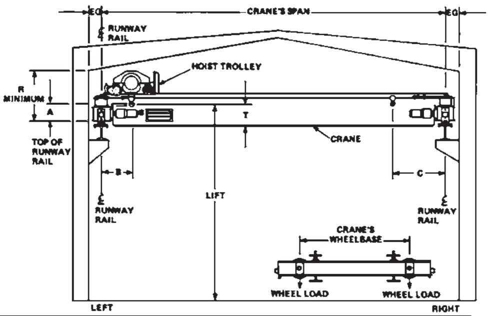
Double girder top running crane

The double girder crane has two main girders which support a hoist mounted on a top running trolley.

Selection of a double girder crane will allow heavier capacity, longer spans and maximum height of vertical load travel.



Capacity in Tons	Crane Span in feet	Top of Rail to Upper Hook Position in inches A	Min. Hook Approach in inches B	Min. Hook Approach in inches C	Min. Side Clearance of Crane in inches EG (a)	Min. Overhead Clearance in inches R (a)	Upper Hook Position to Bottom of Crane Girder in T inches	Wheel Base WB	Crane Product Number	Crane Wt. in lbs.	Wheel Loads in lbs. WL (b)
5	30	7-1/2	27	25	7-3/4	42	9-1/2	8'-4"	5430130	8,350#	8,940#
	40	7-1/2	27	25	7-3/4	42	11-1/2	8'-4"	5430150	11,350#	9,690#
	50	7-1/2	27	25	7-3/4	42	17	8'-4"	5430190	15,070#	10,700#
	60	9-1/2	26	24	8-1/2	44	23	9'-4"	5430230	19,650#	11,800#
	70	15-3/4	25	23	9-3/8	50-1/2	26	12'-4"	5431060	26,860#	13,600#
	80	21-1/2	25	23	9-3/8	56	33-1/2	13'-0"	5530170	28,520#	14,000#
	90	26-1/2	25	23	9-3/8	61	38-1/2	16'-0"	5530230	36,840#	16,100#
	100	26-1/2	25	23	9-3/8	61	44-1/2	16'-0"	5530270	41,430#	17,300#
7-1/2	30	4	26	24	8-1/2	44	4	8'-4"	5430270	8,040#	11,900#
	40	4	26	24	8-1/2	44	11-1/2	8'-4"	5430330	13,170#	13,200#
	50	4	26	24	8-1/2	44	12	8'-4"	5430370	16,820#	14,100#
	60	4	26	24	8-1/2	44	17-1/2	9'-4"	5430410	21,690#	15,300#
	70	10-1/2	25	23	9-3/8	50-1/2	23	12'-4"	5431120	29,590#	17,300#
	80	16	25	23	9-3/8	56	28	13'-0"	5530450	29,230#	17,200#
	90	21	25	23	9-3/8	61	33	16'-0"	5530510	37,760#	19,300#
	100	21	25	23	9-3/8	61	39	16'-0"	5530550	42,410#	20,500#
10	30	5-1/2	28	26	8-1/2	47	7-1/2	8'-4"	5430470	10,120#	15,400#
	40	5-1/2	28	26	8-1/2	47	13-1/2	8'-4"	5430510	13,120#	16,200#
	50	5-1/2	28	26	8-1/2	47	14	8'-4"	5430550	18,250#	17,500#
	60	5-1/2	28	26	8-1/2	47	23	9'-4"	5430590	21,930#	18,400#
	70	12	27	25	9-3/8	53-1/2	26	12'-4"	5431180	31,570#	20,800#
	80	22-1/2	27	25	9-3/8	64	34-1/2	13'-0"	5530730	29,880#	20,400#
	90	22-1/2	27	25	9-3/8	64	40-1/2	18'-0"	5530790	38,730#	22,600#
	100	22-1/2	27	25	9-3/8	64	41	18'-0"	5530830	45,410#	24,300#
15	30	8-1/4	28	27	9-3/8	56	9-1/2	9'-4"	5430630	12,050#	22,100#
	40	8-1/4	28	27	9-3/8	56	10	9'-4"	5430670	15,670#	23,000#
	50	8-1/4	28	27	9-3/8	56	18-1/2	9'-4"	5430730	21,390#	24,400#
	60	8-1/4	28	27	9-3/8	56	21	9'-4"	5430750	25,370#	25,400#
	70	18-1/2	28	27	9-3/8	66-1/2	30-1/2	13'-0"	5530970	28,240#	26,100#
	80	18-1/2	28	27	9-3/8	66-1/2	36-1/2	13'-0"	5531010	32,220#	27,100#
	90	18-1/2	28	27	9-3/8	66-1/2	37	18'-0"	5531070	42,390#	29,600#
	100	24-3/4	28	27	9-3/8	72-1/2	43	18'-0"	5531110	47,470#	30,900#
20	30	4-1/2	28	27	9-3/8	56	6	9'-4"	5430800	12,570#	28,000#
	40	4-1/2	28	27	9-3/8	56	9	9'-4"	5430890	19,360#	29,700#
	50	4-1/2	28	27	9-3/8	56	15	9'-4"	5430950	22,000#	30,400#
	60	4-1/2	28	27	9-3/8	56	17-1/2	9'-4"	5430980	27,150#	31,700#
	70	15	28	27	9-3/8	66-1/2	27	13'-0"	5531310	31,110#	32,700#
	80	15	28	27	9-3/8	66-1/2	33	13'-0"	5531370	34,610#	33,600#
	90	21-1/4	28	27	9-3/8	73	39	16'-0"	5531460	44,640#	36,100#
	100	21-1/4	28	27	9-3/8	73	39-1/2	16'-0"	5531520	51,800#	37,900#
25	50	−4	44	46	9-3/8	63	9	9'-4"	5431440	22,780#	38,000#
	60	6-1/4	44	46	9-3/8	73-1/2	18-1/2	13'-0"	5531610	23,340#	38,200#
	70	6-1/4	44	46	9-3/8	73-1/2	24-1/2	13'-0"	5531670	30,960#	40,100#
	80	6-1/2	44	46	9-3/8	73-1/2	24-1/2	13'-0"	5531710	35,710#	41,300#
	90	13	44	46	9-3/8	80	31	16'-0"	5531770	48,090#	44,400#
	100	13	44	46	9-3/8	80	36-1/2	16'-0"	5531810	56,000#	46,400#

Hoists for Double Girder Cranes

Capacity (Tons)	Hoist Product #	Bridge Speed (FPM)	Hoist Speed (FPM)	Trolley Speed (FPM)	Hoist Lift	Hoist Wt.
5	3370610	70	20	70	27′	2200#
7-1/2	3371090	80	15	70	23′	2400#
10	3471300	80	15	70	24′	2700#
15	3570890	80	20	70	32′	3500#
20	3571390	80	15	70	27′	3700#
25	3670050	80	10	60	29′	7100#

(a) This dimension includes OSHA minimum 2 inch lateral clearance and 3 inch vertical clearance.

(b) Wheel load includes allowance of 15% impact with a maximum hoist speed of 30 FPM standard industrial service. Refer to Acco Structural Beam Guide for other requirements.

Note 3 & 30 Ton are also available. Contact your local Acco Representative.

NOTE: Hoists are all single reeved units with single speed hoist and trolley except those product numbers beginning with 36 which are double reeved with variable speed hoist and single speed trolley.

FIGURE 15.11 Dimensional and loading data for double-girder, top-running cranes. (*FKI Industries, Inc.*)

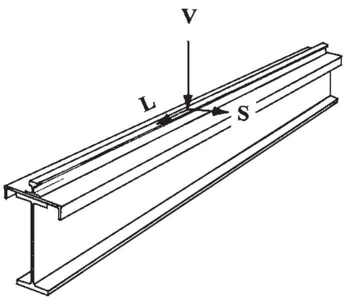


FIGURE 15.12 Forces acting on runway beam for top-running crane.

CMAA 70 and CMAA 74 prescribe taking the impact factor (hoist load factor) as 0.5 percent of the hoisting speed in feet per minute, but not less than 15 percent and not more than 50 percent. For bucket and magnet cranes, the impact factor is to be taken as 50 percent of the hoist's capacity. In addition to this lifted-load impact factor, CMAA 70 and 74 also require that impact factor be assigned to the dead load of the crane, trolley, and its associated equipment. The dead-load factor is specified as 1.1 for cranes with travel speeds of up to 200 ft/min and as 1.2 for faster cranes. CMAA 70 and 74 also include other crane loads and load combinations for which the crane supports should be designed.

Alternatively, some engineers assume an impact factor of 0.25 for preliminary design of most overhead cranes, as suggested in Ref. 14, for example.

The support systems and bracing capable of resisting large loads exerted by top-running cranes are much more complex than those for support of monorails or underhung cranes. These support systems are explained in separate sections below. For the sake of simplicity, our discussion is limited to the buildings housing a single crane. Additional considerations for buildings with multiple cranes are covered in the MBMA Manual.[3]

15.6.3 Structural Design of Crane Runway Beams

Structural design of runway beams for combined loads is well treated in many engineering handbooks as well as in the *AISC Design Guide 7,*[5] so only a general procedure will be outlined here.

The first design step is to determine whether fatigue controls the design. Fatigue cracking is blamed for perhaps nine out of ten crane girder problems.[15] Given the anticipated number of loading cycles supplied by the owner and a life span of the building—50 years may be assumed as a default value—one follows the procedure of AISC Specification Appendix K to determine the allowable stress range. Crane girders of CMAA classes D, E, and F are often controlled by fatigue, meaning that the allowable bending stress in those members is reduced from 24 to, perhaps, 16 kip/in^2.[14] New fatigue provisions for the design of crane runway girders can be found in Ref. 16.

If fatigue is not critical, the allowable combined beam stress can be found in a conventional way, as a function of the beam properties and its unbraced length. In the absence of any additional lateral bracing, the unbraced length of a simply supported runway beam equals the column spacing (bay size). For bay sizes found in most pre-engineered buildings—20 to 30 ft—the allowable combined stress often ends up being equal to $0.6F_y$.

The second step involves a computation of the required stiffness (moment of inertia) of the runway beam based on the allowable deflection criteria. Those readers who followed our discussion in Chap. 11 might remember that there is no consensus among engineers on the deflection criteria in general; deflections of crane runways are no exception. One source of information is *AISC Design Guide* 3,[17] which recommends the following design criteria:

- For CMAA classes A through C, vertical deflection of runway beams under wheel loading is limited to $L/600$ (for class D, $L/800$).
- For CMAA classes E and F, the maximum vertical deflection is limited to $L/1000$.
- Maximum *lateral* deflection of runway beams is limited to $L/400$ for all crane classifications.

Other sources suggest somewhat more restrictive criteria for vertical deflections, such as $L/1000$ for CMAA classes A, B, and C and $L/1200$ for CMAA classes D, E, and F. The lateral-deflection criterion of $L/400$ seems to be universally accepted. The impact factors used for stress analysis need not be included in deflection calculations.

The third step is a determination of the maximum bending moments from horizontal and vertical moving loads. Horizontal loads may be assumed to be resisted only by the top flange of the runway beam and the cap channel, if any is present.