

CRANE BEAM DESIGN

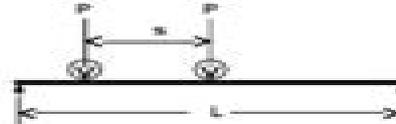
An Educational Tool to aid in Crane Runway Beam Design in accordance with AISC 9th Edition ASD and AISC 3rd Edition LRFD.
(Ref. AISC Steel Design Guide Series - Design Guide 7 "Industrial Buildings")

Project Name: AISC Design Guide 7
 Project Description: Example 18.1.2 LRFD
 Company: AISC
 Designed By: CSD Date: 3/26/2006

SINGLE CRANE WITH TWO WHEELS PER END TRUCK

Crane Data

Crane Capacity		<u>20.0</u>	Tons
Bridge Weight	Wt. b	<u>57.2</u>	kips
Trolley + Hoist Weight	Wt. t+h	<u>10.6</u>	kips
Max. Wheel Load	P	<u>38.1</u>	kips
Wheel Spacing	s	<u>12.00</u>	ft.
Vertical Impact		<u>25</u>	% (Input 25% for cab-operated cranes, 10% for pendant operated cranes)



Crane Runway

Runway Span Length L 30.00 ft. Crane Rail Weight = 60.0 lbs/ft

Runway Deflection Criteria

Vertical Deflection* L/f 600 0.60 in. $I_{x req'd} = 3371.3$ in.⁴
 Horizontal Deflection L/f 400 0.90 in. $I_{y req'd} = 149.2$ in.⁴

* Does NOT include Vertical Impact or Girder and Rail Weight.

Crane Runway Design

AISC Design Procedure LRFD (ASD or LRFD)

Forces

Max. Vertical Load	P _v	<u>69.05</u>	kips / wheel (includes impact)
Max. Horizontal Load	P _h **	<u>4.05</u>	kips / wheel / side
** Total Horizontal Force is 20% of the sum of weights of the lifted load and crane trolley, exclusive of other parts of crane.			
Bending Moment	M _x	<u>680.27</u>	kip-ft. (includes impact and girder and rail weight)
Bending Moment	M _y	<u>38.86</u>	kip-ft.
Shear	V _x	<u>113.20</u>	kips

Crane Runway Beam (Note: VALID for ASTM A6 rolled shapes ONLY!)

Crane Beam Type*** W
 *** W indicates W Shape and WC indicates W Shape + Cap Channel

Crane Beam Designation	<u>W24x131</u>
Beam Weight	Wt. <u>131.0</u> lbs/ft
Yield Stress	F _y <u>36.0</u> ksi

Deflection Checks

Vertical - Moment of Inertia X-X	$I_x =$	<u>4000.0</u>	in. ⁴	<u>O.K.</u>
Horizontal - Top Flange Moment of Inertia Y-Y	$I_{y top} =$	<u>171.7</u>	in. ⁴	<u>O.K.</u>

Summary Stress Checks

Check Bending about the X-X Axis	CSR =	<u>0.875</u>	<u>O.K.</u>
Check Bending about the Y-Y Axis in the top flange	CSR =	<u>0.360</u>	<u>O.K.</u>
Check Biaxial Bending in the top flange	CSR =	<u>1.236</u>	<u>N.G.</u>
Check Shear about the X-X Axis	CSR =	<u>0.399</u>	<u>O.K.</u>
Check Web Sidesway Buckling	CSR =	<u>0.222</u>	<u>O.K.</u>

GENERAL NOTES

This program is applicable to only rolled W shapes and W shapes with Channel Caps.
 In addition to the general crane beam design above, the following design checks **MUST** be made:
 Design for cyclic loading (Fatigue).
 Design of welds attaching cap channel to W shape beam.
 Design of crane beam end connections and bearing stiffeners.
 Design of crane rail attachment to crane beam.

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