

# CRANE BEAM DESIGN

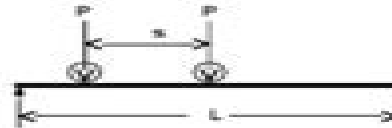
An Educational Tool to aid in Crane Runway Beam Design in accordance with AISC 9th Edition ASD and AISC 3rd Edition LRFD.  
(Ref. AISC Steel Design Guide Series - Design Guide 7 "Industrial Buildings")

Project Name: AISC Design Guide 7  
Project Description: Example 98.1.2 LRFD  
Company: AISC  
Designed By: CSD Date: 3/26/2006

## SINGLE CRANE WITH TWO WHEELS PER END TRUCK

### Crane Data

Crane Capacity		20.0	Tons
Bridge Weight	Wt. b	57.2	kips
Trolley + Hoist Weight	Wt. t+h	10.6	kips
Max. Wheel Load	P	38.1	kips
Wheel Spacing	s	12.00	ft.
Vertical Impact		25	% (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 lb/ft

### Runway Deflection Criteria

Vertical Deflection *	L /	600	0.60 in.	lx req'd. =	3371.3 in. <sup>4</sup>
Horizontal Deflection	L /	400	0.90 in.	ly req'd. =	149.2 in. <sup>4</sup>

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

### Crane Runway Design

ASCE Design Procedure LRFD ( ASD or LRFD )

### Forces

Max. Vertical Load	Pv	69.05	kips / wheel (includes impact)
Max. Horizontal Load	Ph **	4.05	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	Mx	680.27	kip-ft. (includes impact and girder and rail weight)
Bending Moment	My	38.86	kip-ft.
Shear	Vx	113.20	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	W24x131
Beam Weight	Wt. 131.0 lb/ft
Yield Stress	Fy 36.0 ksi

### Deflection Checks

Vertical - Moment of Inertia X-X	Ix =	4000.0 in. <sup>4</sup>	O.K.
Horizontal - Top Flange Moment of Inertia Y-Y	Iy top =	171.7 in. <sup>4</sup>	O.K.

### Summary Stress Checks

Check Bending about the X-X Axis	CSR =	0.875	O.K.
Check Bending about the Y-Y Axis in the top flange	CSR =	0.360	O.K.
Check Biaxial Bending in the top flange	CSR =	1.236	NG
Check Shear about the X-X Axis	CSR =	0.399	O.K.
Check Web Sidesway Buckling	CSR =	0.222	O.K.

### 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.

# Aisc Design Guide 7

**W.F. Chen, E.M. Lui**



## **Aisc Design Guide 7:**

**The Civil Engineering Handbook** W.F. Chen,J.Y. Richard Liew,2002-08-29 Providing extensive coverage of all major areas of civil engineering the second edition of this award winning handbook features contributions from leading professionals and academicians and is packed with formulae data tables and definitions vignettes on topics of recent interest and additional sources of information It includes a wealth of material in areas such as coastal engineering polymeric materials computer methods shear stresses in beams and pavement performance evaluation Its wide range of information makes it an essential resource for anyone working in civil structural or environmental engineering

**Principles of Structural Design** W.F. Chen,E.M. Lui,2005-10-31 Many important advances in designing high performance structures have occurred over the last several years Structural engineers need an authoritative source of information that thoroughly and concisely covers the foundational principles of the field Comprising chapters selected from the second edition of the best selling Handbook of Structural Engineering this book provides a tightly focused economical guide to the theoretical practical and computational aspects of structural design Expert contributors discuss a wide variety of structures including steel aluminum timber and prestressed concrete as well as reliability based design and structures based on wind engineering

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**Tubular Structures XVI** Amin Heidarpour,Xiao-Ling Zhao,2017-11-13 Tubular Structures XVI contains the latest scientific and engineering developments in the field of tubular steel structures as presented at the 16th International Symposium on Tubular Structures ISTS16 Melbourne Australia 4 6 December 2017 The International Symposium on Tubular Structures ISTS has a long standing reputation for being the principal showcase for manufactured tubing and the prime international forum for presentation and discussion of research developments and applications in this field Various key and emerging subjects in the field of hollow structural sections are covered such as special applications and case studies static and fatigue behaviour of connections joints concrete filled and composite tubular members and offshore structures earthquake and dynamic resistance specification and standard developments material properties and section forming stainless and high strength steel structures fire impact and blast response Research and development issues presented in this topical book are applicable to buildings bridges offshore structures cranes trusses and towers Tubular Structures XVI is thus a pertinent reference source for architects civil and mechanical engineers designers steel fabricators and contractors

manufacturers of hollow sections or related construction products trade associations involved with tubing owners or developers of tubular structures steel specification committees academics and research students all around the world

Structural Steel Designer's Handbook Roger Brockenbrough, Frederick Merritt, 1999-12-02 The only A Z guide to structural steel design Find a wealth of practical techniques for cost effectively designing steel structures from buildings to bridges in Structural Steel Designer's Handbook by Roger L Brockenbrough and Frederick S Merritt The Handbook's integrated approach gives you immediately useful information about steel as a material how it's fabricated and erected how to analyze a structure to determine internal forces and moments from dead live and seismic loads how to make detailed design calculations to withstand those forces This new third edition introduces you to the latest developments in seismic design including more ductile connections and high performance steels offers an expanded treatment of welding helps you understand design requirements for hollow structural sections and for cold formed steel members and explores numerous design examples You get examples for both Load and Resistance Factor Design LRFD and Allowable Stress Design ASD

**Tubular Structures XI** Jeffrey A. Packer, 2017-10-02 This topical book contains the latest scientific and engineering developments in the field of tubular steel structures as presented at the 11th International Symposium and IIW International Conference on Tubular Structures The International Symposium on Tubular Structures ISTS has a long standing reputation for being the principal showcase for manufactured tubing and the prime international forum for discussion of research developments and applications in this field Various key and emerging subjects in the field of hollow structural sections are covered such as novel applications and case studies static and fatigue behaviour of connections joints concrete filled and composite tubular members earthquake resistance specification and code developments material properties and structural reliability impact resistance and brittle fracture fire resistance casting and fabrication innovations Research and development issues presented in this book are applicable to buildings bridges offshore structures entertainment rides cranes towers and various mechanical and agricultural equipment This book is thus a pertinent reference source for architects civil and mechanical engineers designers steel fabricators and contractors manufacturers of hollow sections or related construction products trade associations involved with tubing owners or developers of tubular structures steel specification committees academics and research students The conference presentations herein include two keynote lectures the International Institute of Welding Houdremont Lecture and the ISTS Kurobane Lecture plus finalists in the CIDECT Student Papers Competition The 11th International Symposium and IIW International Conference on Tubular Structures ISTS11 took place in Quebec City Canada from August 31 to September 2 2006 *Foundation and Anchor Design Guide for Metal Building Systems* Alexander Newman, 2013 This practical guide serves as the industry standard for foundation design of metal building systems Structural Engineering Handbook, Fifth Edition Mustafa Mahamid, Edwin H. Gaylord, Charles N. Gaylord, 2020-04-17 Publisher's Note Products purchased from Third Party sellers are not guaranteed by the publisher for

quality authenticity or access to any online entitlements included with the product The industry standard guide to structural engineering fully updated for the latest advances and regulations For 50 years this internationally renowned handbook has been the go to reference for structural engineering specifications codes technologies and procedures Featuring contributions from a variety of experts the book has been revised to align with the codes that govern structural design and materials including IBC ASCE 7 ASCE 37 ACI AISC AASHTO NDS and TMS Concise practical and user friendly this one of a kind resource contains real world examples and detailed descriptions of today s design methods Structural Engineering Handbook Fifth Edition covers Computer applications in structural engineering Earthquake engineering Fatigue brittle fracture and lamellar tearing Soil mechanics and foundations Design of steel structural and composite members Plastic design of steel frames Design of cold formed steel structural members Design of aluminum structural members Design of reinforced and prestressed concrete structural members Masonry construction and timber structures Arches and rigid frames Bridges and girder boxes Building design and considerations Industrial and tall buildings Thin shell concrete structures Special structures and nonbuilding structures      **Structural Steel Designer's Handbook, Sixth Edition** Roger L.

Brockenbrough, 2019-10-25 Publisher s Note Products purchased from Third Party sellers are not guaranteed by the publisher for quality authenticity or access to any online entitlements included with the product A fully updated source for structural steel design information Thoroughly revised for the latest advances this comprehensive resource contains information essential to the design of steel structures The book lays out the fundamentals of structural steel fabrication and erection followed by detailed design methods for steel beams columns tension components roof systems and connections Design examples throughout the book clearly demonstrate how to apply complex code provisions in the field You will get clear explanations of AISC 360 16 the AASHTO Standard Specification for Structural Steel Bridges the AISI Cold Formed Steel Standards ASCE 7 16 and the 2018 IBC Structural Steel Designer s Handbook Sixth Edition covers Properties of structural steels Effects of steelmaking and fabrication Fabrication and erection Connections Building codes loads and fire protection Criteria for building design Design of building members Floor and roof systems Lateral force design Cold formed steel design Highway bridge design criteria Beam girder and truss bridges Arch and cable suspended bridges      *Modern Steel Construction* , 2009      **Structural Steel Designer's Handbook** Roger L. Brockenbrough, Frederick S.

Merritt, 2011-02-07 A Complete and Current Guide to Structural Steel Design Fully updated with the most recent design codes standards and specifications Structural Steel Designer s Handbook Fifth Edition provides a convenient single source of the latest information essential to the practical design of steel structures This comprehensive volume begins by covering the properties of structural steel and the fundamentals of fabrication and erection Modern structural design methods applicable to buildings and other structures such as roof systems and various types of bridges are presented Details on the design of members beams columns and tension components and of bolted and welded connections are also covered Featuring

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**Load & Resistance Factor Design: Connections** American Institute of Steel Construction,1994    Engineering Journal ,2007    **Structural Engineering SE All-in-One Exam Guide: Breadth and Depth, Second Edition** Dave K. Adams,2022-08-26 This up to date self study system delivers comprehensive coverage of all topics on the current version of the Structural Engineering SE exam This up to date self study guide provides comprehensive coverage of all topics expected on the current version of the SE exam Structural Engineering SE All in One Exam Guide Breadth and Depth Second Edition offers background material real world examples updated regulations and requirements sample problems and realistic practice exams both multiple choice and essay Written by a practicing engineer and a former exam developer and grader Structural Engineering SE All in One Exam Guide Breadth and Depth Second Edition will focus and enhance your preparation for the 16 hour Structural Engineering exam produced by NCEES and adopted by your jurisdiction This book prepares you for every topic expected to be on the exam including building systems structural analysis seismic and wind analysis structural materials bridges and simple and complex code provisions You will learn strategies for taking the exam and gain insight into how the test is written and graded Coverage includes An introduction to exam preparation and professional licensure Design codes and general loading Computer modeling and verification Construction administration and quality control Structural analysis Reinforced and prestressed concrete design Masonry design Foundation and retaining wall design Structural and cold formed steel design Timber design Seismic loading Wind loading Bridge design    **Detailing for Steel Construction** ,2002    Comprehensive Structural Design Guide Max Kurtz,1969    **The Publishers' Trade List Annual** ,1977

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