

# CRANE BEAM DESIGN

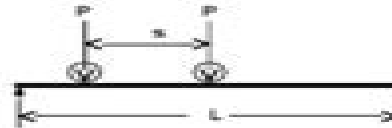
An Educational Tool to aid in Crane Runway Beam Design in accordance with AISC 9th Edition ASD and AISC 3rd Edition LRFD.  
(Ref. AISC Steel Design Guide Series - Design Guide 7 "Industrial Buildings")

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.  $\Delta_{x req'd} = 3371.3$  in.  
Horizontal Deflection L / 400 0.90 in.  $\Delta_{y req'd} = 149.2$  in.

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

### Crane Runway Design

ASCE Design Procedure LRFD ( ASD or LRFD )

### Forces

Max. Vertical Load	P v	69.05	kips / wheel (includes impact)
Max. Horizontal Load	P h **	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  $I_x = 4000.0$  in.<sup>4</sup> o.k.  
Horizontal - Top Flange Moment of Inertia Y-Y  $I_{y top} = 171.7$  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	n.g.
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

**Mustafa Mahamid, Edwin H.  
Gaylord, Charles N. Gaylord**



## **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.

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Building Systems Alexander Newman,2013 This practical guide serves as the industry standard for foundation design of metal building systems      **Tubular Structures XI** JeffreyA. 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 **Modern Steel Construction**, 2009 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

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*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 contributions from renowned engineering experts this is an invaluable working tool for structural steel designers Based on the latest design standards codes and specifications ANSI AISC 360 10 unified LRFD and ASD specification ANSI AISI S100 unified specification for cold formed members SEI ASCE 7 10 wind seismic and live loads consolidated into the International Code Council ICC International Building Code IBC AASHTO highway bridge design standards ASTM material standards AREMA railroad bridge design specifications Coverage Includes Properties of structural steels and effects of steel making 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 Railroad bridge design criteria Beam and girder bridges Truss bridges Arch bridges Cable suspended bridges

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[Metal Building Systems 3E \(PB\)](#) Alexander Newman,2014-09-22 The most complete up to date metal building systems guide Fully revised for the latest building codes and industry trends Metal Building Systems Third Edition explains how to select specify and design preengineered buildings with confidence In this book a practicing structural engineer goes beyond manufacturer supplied specifications to provide impartial and objective information that can save you money and time A new chapter on anchor bolts and embedments many new illustrations plus new and updated design examples are included in this practical reference End of chapter review questions reinforce the material presented This is an essential resource for architects engineers construction specifiers design professionals facility managers building officials and contractors working with metal building systems COMPREHENSIVE COVERAGE INCLUDES Structural loads and design methods Structural system selection criteria Primary framing Secondary framing girts and purlins Metal roofing Wall materials Insulation The process of buying a metal building Common problems and failures Lateral drift and vertical deflections Foundation design Anchor bolts and embedments Current design trends Reroofing and renovations Specifying crane buildings Avoiding construction problems

**Load & Resistance Factor Design: Connections** American Institute of Steel Construction,1994

**Engineering Journal** ,2007

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## **Table of Contents Aisc Design Guide 7**

1. Understanding the eBook Aisc Design Guide 7
  - The Rise of Digital Reading Aisc Design Guide 7
  - Advantages of eBooks Over Traditional Books
2. Identifying Aisc Design Guide 7
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Aisc Design Guide 7
  - User-Friendly Interface
4. Exploring eBook Recommendations from Aisc Design Guide 7
  - Personalized Recommendations
  - Aisc Design Guide 7 User Reviews and Ratings
  - Aisc Design Guide 7 and Bestseller Lists
5. Accessing Aisc Design Guide 7 Free and Paid eBooks



- Aisc Design Guide 7 Public Domain eBooks
- Aisc Design Guide 7 eBook Subscription Services
- Aisc Design Guide 7 Budget-Friendly Options
- 6. Navigating Aisc Design Guide 7 eBook Formats
  - ePub, PDF, MOBI, and More
  - Aisc Design Guide 7 Compatibility with Devices
  - Aisc Design Guide 7 Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Aisc Design Guide 7
  - Highlighting and Note-Taking Aisc Design Guide 7
  - Interactive Elements Aisc Design Guide 7
- 8. Staying Engaged with Aisc Design Guide 7
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Aisc Design Guide 7
- 9. Balancing eBooks and Physical Books Aisc Design Guide 7
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Aisc Design Guide 7
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Aisc Design Guide 7
  - Setting Reading Goals Aisc Design Guide 7
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Aisc Design Guide 7
  - Fact-Checking eBook Content of Aisc Design Guide 7
  - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

#### 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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