

# STEEL BEAM AND COLUMN ANALYSIS / CODE CHECK

Stress Code Check Per AISC 9th Edition Manual (ASD)

For W, S, M, and HP Shapes

Job Name:

Subject:

Job Number:

Originator:

Checker:

## Input Data:

### Member Size:

Select: **W12x30**

### Member Loadings:

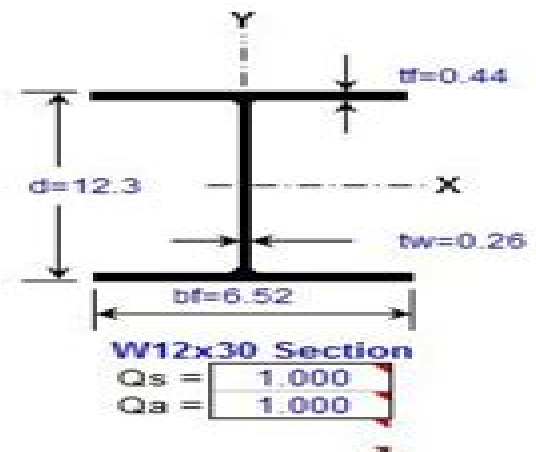
P = **10.00** kips  
M<sub>x</sub> = **25.00** ft-kips  
M<sub>y</sub> = **5.00** ft-kips

### Design Parameters:

F<sub>y</sub> = **36.00** ksi  
K<sub>x</sub> = **1.00**  
K<sub>y</sub> = **1.00**  
L<sub>x</sub> = **14.000** ft  
L<sub>y</sub> = **14.000** ft  
L<sub>b</sub> = **14.000** ft  
C<sub>b</sub> = **1.00**  
C<sub>mx</sub> = **0.85**  
C<sub>my</sub> = **0.85**  
ASIF = **1.000**

### Member Properties:

A = **8.79** in.<sup>2</sup>  
d = **12.300** in.  
t<sub>w</sub> = **0.260** in.  
b<sub>f</sub> = **6.520** in.  
t<sub>f</sub> = **0.440** in.  
r<sub>t</sub> = **1.730** in.  
d/A<sub>f</sub> = **4.30**  
I<sub>x</sub> = **238.00** in.<sup>4</sup>  
S<sub>x</sub> = **38.60** in.<sup>3</sup>  
r<sub>x</sub> = **5.210** in.  
I<sub>y</sub> = **20.30** in.<sup>4</sup>  
S<sub>y</sub> = **6.24** in.<sup>3</sup>  
r<sub>y</sub> = **1.520** in.  
J = **0.46** in.<sup>4</sup>  
C<sub>w</sub> = **719.0** in.<sup>6</sup>



## Results:

### For Axial Compression:

K<sub>x</sub>\*L<sub>x</sub>/r<sub>x</sub> = **32.25**  
K<sub>y</sub>\*L<sub>y</sub>/r<sub>y</sub> = **110.53**  
C<sub>c</sub> = **126.10**  
f<sub>a</sub> = **1.14** ksi  
F<sub>a</sub> = **11.60** ksi  
P<sub>a</sub> = **101.97** kips

### For X-axis Bending:

L<sub>c</sub> = **6.88** ft  
L<sub>u</sub> = **10.77** ft  
L<sub>b</sub>/r<sub>t</sub> = **97.11**  
f<sub>bx</sub> = **7.77** ksi  
F<sub>bx</sub> = **16.61** ksi  
M<sub>rx</sub> = **53.43** ft-kips

### For Y-axis Bending:

f<sub>by</sub> = **9.62** ksi  
F<sub>by</sub> = **27.00** ksi  
M<sub>ry</sub> = **14.04** ft-kips

### X-axis Euler Stress:

F<sub>ex</sub> = **143.62** ksi

### Y-axis Euler Stress:

F<sub>ey</sub> = **12.22** ksi

### Stress Ratio:

S.R. = **0.922** Eqn. H1-3

## Comments:

# Aisc Steel Manual Cheat Sheet

**James R. Underwood, Michele Chiuini**

A red circular graphic with a gradient, appearing as a stylized arrow or a partial circle, located to the right of the authors' names.

## **Aisc Steel Manual Cheat Sheet:**

**PPI PE Structural Reference Manual, 10th Edition - Complete Review for the NCEES PE Structural Engineering (SE) Exam** Alan Williams, 2021-09-21 The NCEES SE Exam is Open Book You Will Want to Bring This Book Into the Exam Alan Williams PE Structural Reference Manual Tenth Edition STRM10 offers a complete review for the NCEES 16 hour Structural Engineering SE exam This book is part of a comprehensive learning management system designed to help you pass the PE Structural exam the first time PE Structural Reference Manual Tenth Edition STRM10 features include Covers all exam topics and provides a comprehensive review of structural analysis and design methods New content covering design of slender and shear walls Covers all up to date codes for the October 2021 Exams Exam adopted codes and standards are frequently referenced and solving methods including strength design for timber and masonry are thoroughly explained 270 example problems Strengthen your problem solving skills by working the 52 end of book practice problems Each problem s complete solution lets you check your own solving approach Both ASD and LRFD SD solutions and explanations are provided for masonry problems allowing you to familiarize yourself with different problem solving methods Topics Covered Bridges Foundations and Retaining Structures Lateral Forces Wind and Seismic Prestressed Concrete Reinforced Concrete Reinforced Masonry Structural Steel Timber Referenced Codes and Standards Updated to October 2021 Exam Specifications AASHTO LRFD Bridge Design Specifications AASHTO Building Code Requirements and Specification for Masonry Structures TMS 402 602 Building Code Requirements for Structural Concrete ACI 318 International Building Code IBC Minimum Design Loads for Buildings and Other Structures ASCE 7 National Design Specification for Wood Construction ASD LRFD and National Design Specification Supplement Design Values for Wood Construction NDS North American Specification for the Design of Cold Formed Steel Structural Members AISI PCI Design Handbook Precast and Prestressed Concrete PCI Seismic Design Manual AISC 327 Special Design Provisions for Wind and Seismic with Commentary SDPWS Steel Construction Manual AISC 325 *PPI PE Structural Bridges Practice Problems with Solutions - Practice Problems with Full Solutions for the NCEES PE Structural Engineering (SE) Exam* David Micnhimer, 2021-08-18 David Micnhimer s PE Structural Bridges Practice Problems with Solutions STBR is a new book designed to help practice for Bridge questions on the PE Structural SE Exam This book is a comprehensive review of different types of bridge questions you can encounter on the breadth portion of the exam Features of this book 77 multiple choice questions to test your knowledge of bridge design Up to date with codes and references for the October 2021 PE Structural SE Exam Complete solutions show you step by step how to solve problems [PPI Structural Depth Reference Manual for the PE Civil Exam, Fifth Edition eText - 1 Year](#) Alan Williams, 2017-11-27 Comprehensive Coverage of the PE Civil Exam Structural Depth Section The Structural Depth Reference Manual for the PE Civil Exam prepares you for the structural depth section of the PE Civil exam It provides a concise yet comprehensive review of the structural depth section exam topics and highlights the most useful equations in the

exam adopted codes and standards Solving methods including ASD and LRFD for steel strength design for concrete and ASD for timber and masonry are thoroughly explained Throughout the book cross references connect concepts and point you to additional relevant tables figures equations and codes More than 95 example problems demonstrate the application of concepts and equations Each chapter includes practice problems so you can solve exam like problems and step by step solutions allow you to check your solution approach A thorough index directs you to the codes and concepts you will need during the exam Topics Covered Design of Reinforced Masonry Design of Wood Structures Foundations Prestressed Concrete Design Reinforced Concrete Design Structural Steel Design Referenced Codes and Standards Building Code Requirements and Specifications for Masonry Structures and Companion Commentaries ACI 530 530 1 Building Code Requirements for Structural Concrete ACI 318 International Building Code IBC Minimum Design Loads for Buildings and Other Structures ASCE SEI7 National Design Specification for Wood Construction ASD LRFD NDS PCI Design Handbook Precast and Prestressed Concrete PCI Steel Construction Manual AISC Key Features A robust index to facilitate quick referencing during the PE Civil Exam Highlights the most useful equations in the exam adopted codes and standards Binding Paperback Publisher PPI A Kaplan Company *PPI Construction Depth Reference Manual for the Civil PE Exam eText - 1 Year* Thomas Korman, 2016-11-30 Construction Depth Reference Manual prepares you for the construction depth section of the NCEES Civil PE exam All depth topics are covered and exam adopted codes and standards are frequently referenced You will learn how to apply concepts by reviewing the 40 example problems and you can check your solving approaches by reviewing each problem s step by step solution Access to supportive information is just as important as knowledge and problem solving efficiency The Construction Depth Reference Manual s thorough index easily directs you to the codes and concepts you will need during the exam Cross references to the 163 equations 38 tables 93 figures 5 appendices and relevant codes will point you to additional support material when you need it Topics Covered Construction Operations and Methods Earthwork Construction and Layout Estimating Quantity and Cost Material Quality Control and Production Scheduling Temporary Structures Worker Health and Safety *PPI Mechanical Engineering Reference Manual, 14th Edition eText - 6 Months, 1 Year* Michael R. Lindeburg, 2019-12-30 Comprehensive Reference Manual for the NCEES PE Mechanical Exams The Mechanical Engineering Reference Manual is the most comprehensive textbook for the three NCEES PE Mechanical exams HVAC and Refrigeration Machine Design and Materials Thermal and Fluid Systems This book s time tested organization and clear explanations start with the basics to help you quickly get up to speed on common mechanical engineering concepts Together the 75 chapters provide an in depth review of the PE Mechanical exam topics and the NCEES Handbook Michael R. Lindeburg s Mechanical Engineering Reference Manual has undergone an intensive transformation in this 14th edition to ensure focused study for success on the 2020 NCEES computer based tests CBT As of April 2020 exams are offered year round at approved Pearson Vue testing centers The only resource examinees can use during the test is the NCEES PE

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Standards OSHA 1910 PCI Design Handbook Precast Prestressed Concrete PCI Recommended Standards for Wastewater Facilities TSS Roadside Design Guide AASHTO Soils Foundations Reference Manual Volume I II FHWA Steel Construction Manual AISC Structural Welding Code Steel AWS      **PPI PE Civil Practice Problems, 16th Edition eText - 1 Year** Michael R. Lindeburg, 2019-03-01 PE Civil Practice Problems contains over 900 problems designed to reinforce your knowledge of the topics presented in the PE Civil Reference Manual Short six minute multiple choice problems follow the NCEES PE Civil exam problem format and focus on individual engineering concepts Longer more complex problems challenge your skills in identifying and applying related engineering concepts Problems will also familiarize you with the codes and standards you'll use on the exam Solutions are clearly written complete and easy to follow U S customary and SI units are equally supported and units are meticulously identified and carried through in all calculations All solution methodologies permitted by the NCEES PE Civil exam e.g ASD and LRFD are presented Frequent references to figures tables equations and appendices in the PE Civil Reference Manual and the exam adopted codes and standards will direct you to relevant support material Topics Covered Civil Breadth Project Planning Means and Methods Soil Mechanics Structural Mechanics Hydraulics and Hydrology Geometrics Materials Site Development Construction Earthwork Construction and Layout Estimating Quantities and Costs Construction Operations and Methods Scheduling Material Quality Control and Production Temporary Structures Health and Safety Geotechnical Site Characterization Soil Mechanics Laboratory Testing and Analysis Field Materials Testing Methods and Safety Earthquake Engineering and Dynamic Loads Earth Structures Groundwater and Seepage Problematic Soil and Rock Conditions Earth Retaining Structures Shallow Foundations Deep Foundations Structural Analysis of Structures Design and Details of Structures Codes and Construction Transportation Traffic Engineering Horizontal Design Vertical Design Intersection Geometry Roadside and Cross Section Design Signal Design Traffic Control Design Geotechnical and Pavement Drainage Alternatives Analysis Water Resources and Environmental Analysis and Design Hydraulics Closed Conduit Hydraulics Open Channel Hydrology Groundwater and Wells Wastewater Collection and Treatment Water Quality Drinking Water Distribution and Treatment Engineering Economic Analysis Key Features Over 900 practice problems to help prepare you for the NCEES PE Civil Exam Frequent references to figures tables equations and appendices in the PE Civil Reference Manual Binding Paperback Publisher PPI A Kaplan Company      **Recommended Seismic Design Criteria for New Steel Moment-frame Buildings** SAC Joint Venture. Guidelines Development Committee, 2000      **The Wiley Engineer's Desk Reference** Sanford I. Heisler, 1998-04-24 The Reference of Choice for Today's Engineer Revised expanded updated and ready to use Every engineer should have a copy of the bestselling Wiley Engineer's Desk Reference the ideal all in one resource for practical engineering applications and daily problem solving Now fully updated to address the latest developments in theory and practice this brand new Second Edition balances authoritative coverage of classical engineering topics with new material on state of the art subjects such as

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**PPI PE Structural 16-Hour Practice Exam for Buildings, 6th Edition - 1 Year** Joseph S Schuster,2022-06-21 PE Structural 16 Hour Practice Exam for Buildings Sixth Edition offers comprehensive practice for the NCEES PE Structural SE exam This book is part of a comprehensive learning management system designed to help you pass the PE Structural exam the first time PE Structural 16 Hour Practice Exam for Buildings Sixth Edition features include The Most Realistic Practice for the PE Structural Exam Two 40 problem multiple choice breadth exams Two four essay depth exams consistent with the NCEES PE Structural exam s format and specifications Multiple choice problems require an average of six minutes to solve Essay problems can be solved in one hour Comprehensive step by step solutions for all problems demonstrate accurate and efficient problem solving approaches Solutions to the depth exams essay problems use blue text to identify the information you will be expected to include in your exam booklet to receive full credit Supplemental content uses black text to enhance your understanding of the solution process Referenced Codes and Standards AASHTO LRFD Bridge Design Specifications AASHTO 8th Ed Building Code Requirements and Specification for Masonry Structures TMS 402 602 2016 Ed Building Code Requirements for Structural Concrete ACI 318 2014 Ed International Building Code IBC 2018 Ed Minimum Design Loads for Buildings and Other Structures ASCE SEI7 2016 Ed National Design Specification for Wood Construction ASD LRFD and National Design Specification Supplement Design Values for Wood Construction NDS 2018 Ed Seismic Design Manual AISC 327 3rd Ed Special Design Provisions for Wind and Seismic with Commentary SDPWS 2015 Ed Steel Construction Manual AISC 325 15th Ed eTextbook Access Benefits Include One year of access Ability to download the entire eTextbook to multiple devices so you can study even without internet access An auto sync feature across all your devices for a seamless experience on or offline Unique study tools such as highlighting in six different colors to tailor your study experience Features like read aloud for complete hands free review

**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

*PPI Six-Minute Solutions for Civil PE Exam: Construction Depth Problems eText - 1 Year* Elaine

Huang,2016-12-28 Targeted Training for Solving Civil PE Exam Construction Depth Multiple Choice Problems Six Minute Solutions for Civil PE Exam Construction Depth Problems contains over 100 multiple choice problems that are grouped into seven chapters that correspond to a topic on the PE Civil exam construction depth section Problems are representative of the exam s format scope of topics and level of difficulty Like the PE exam an average of six minutes is required to solve each problem in this book Each problem also includes a hint for optional problem solving guidance Comprehensive step by step solutions for all problems demonstrate accurate and efficient solving approaches Get your Construction Depth Reference Manual index at [ppi2pass.com/downloads](http://ppi2pass.com/downloads) Topics Covered Construction Operations and Methods Earthwork Construction and Layout Estimating Quantities and Costs Health and Safety Material Quality Control and Production Scheduling Temporary Structures Key Features Increase familiarity with the exam problems format content and solution methods Connect relevant theory to exam like problems Quickly identify accurate problem solving approaches Organize the references you will use on exam day Binding Paperback Publisher PPI A Kaplan Company      **Steel Structures Design: ASD/LRFD** Alan

Williams,2011-02-07 A COMPLETE GUIDE TO THE DESIGN OF STEEL STRUCTURES Steel Structures Design ASD LRFD introduces the theoretical background and fundamental basis of steel design and covers the detailed design of members and their connections This in depth resource provides clear interpretations of the American Institute of Steel Construction AISC Specification for Structural Steel Buildings 2010 edition the American Society of Civil Engineers ASCE Minimum Design Loads for Buildings and Other Structures 2010 edition and the International Code Council ICC International Building Code 2012 edition The code requirements are illustrated with 170 design examples including concise step by step solutions Coverage includes Steel buildings and design criteria Design loads Behavior of steel structures under design loads Design of steel structures under design loads Design of steel beams in flexure Design of steel beams for shear and torsion Design of compression members Stability of frames Design by inelastic analysis Design of tension members Design of bolted and welded connections Plate girders Composite construction      *Steel Structures: Beyond the Beams* Pasquale De Marco, Discover the fascinating world of steel structures in this comprehensive guide that goes beyond the beams to uncover the principles design considerations and construction techniques that make them possible From soaring skyscrapers to elegant bridges steel has shaped the modern world providing strength versatility and durability that have made it a preferred choice for engineers and architects alike In this book you will embark on a journey through the history of steel structures tracing their evolution from the early use of iron to the advent of steel as a construction material Explore the material properties of steel including its mechanical properties chemical composition and corrosion resistance and learn about heat treatment and strengthening methods to enhance its performance Delve into the world of load analysis and design criteria understanding the different types of loads on steel structures and the factors that influence the design process Gain insights into structural analysis and design methods for steel frames trusses columns and beams and discover the importance of design codes and

standards in ensuring the safety and reliability of steel structures Learn about the fabrication and construction of steel structures from steel production and material handling to welding techniques and quality control Explore maintenance and rehabilitation techniques including inspection assessment repair and strengthening strategies and discover case studies of remarkable steel structure designs showcasing their unique challenges and innovative solutions Uncover the latest advances in steel structure technology including emerging trends the use of advanced materials computer aided design and modeling and the integration of building information modeling BIM And finally explore the world of project management for steel structure projects from planning and scheduling to cost estimation risk management and effective collaboration Whether you are a student a practicing engineer or simply curious about the world of steel structures this book will equip you with the knowledge and insights needed to navigate this fascinating field So join us on this incredible journey where innovation meets strength and imagination shapes the future of steel structures     *The Structural Engineer's Professional Training Manual*

Dave Adams,2007-10-24 The Business and Problem Solving Skills Needed for Success in Your Engineering Career The Structural Engineer s Professional Training Manual offers a solid foundation in the real world business and problem solving skills needed in the engineering workplace Filled with illustrations and practical punch list summaries this career building guide provides an introduction to the practice and business of structural and civil engineering including lots of detailed advice on developing competence and communicating ideas Comprehensive and easy to understand The Structural Engineer s Professional Training Manual features Recommendations for successfully training engineers who are new to the field Methods for bringing together ideas from a variety of sources to find workable solutions to difficult problems Information on the real world behaviors of building materials Guidance on licensing liability regulations and employment Techniques for responsibly estimating design time and cost Tips on communicating design ideas effectively Strategies for working successfully as part of a team Inside This Skills Building Engineering Resource The Dynamics of Training The World of Professional Engineering The Business of Structural Engineering Building Projects Bridge Projects Building Your Own Competence Communicating Your Designs Engineering Mechanics Soil Mechanics Understanding the Behavior of Concrete Understanding the Behavior of Masonry Construction Understanding the Behavior of Structural Steel Understanding the Behavior of Wood Framing     *Designing Steel Structures for Fire Safety* Jean Marc Franssen,Venkatesh Kodur,Raul Zaharia,2009-05-06 Structural design in fire conditions is conceptually similar to structural design in normal temperature conditions but often more difficult because of internal forces induced by thermal expansion strength reduction due to elevated temperatures much larger deflections and numerous other factors Before making any design decisions it is esse

**Structural Design** James R. Underwood,Michele Chiuini,2011-11-07 Written for the practicing architect Structural Design addresses the process on both a conceptual and a mathematical level Most importantly it helps architects work with structural consultants and understand all the necessary considerations when designing structural systems Using a minimum

of simple math this book shows you how to make correct design calculations for structures made from steel wood concrete and masonry What's more this edition has been completely updated to reflect the latest design methods and codes including LRFD for steel design The book was also redesigned for easy navigation Essential principles as well as structural solutions are visually reinforced with hundreds of drawings photographs and other illustrations making this book truly architect friendly

Bridge Engineering, Third Edition Jim J. Zhao, Demetrios E. Tonias, 2012-04-09 The state of the art in highway bridge engineering Fully updated with the latest codes and standards including load and resistance factor design LRFD Bridge Engineering Third Edition covers highway bridge planning design construction maintenance and rehabilitation This thoroughly revised reference contains cutting edge analytical design and construction practices the most current information on new materials and methods and proven cost effective maintenance and repair techniques Real world case studies and hundreds of helpful photos and illustrations are also included in this practical resource BRIDGE ENGINEERING THIRD EDITION FEATURES COMPLETE COVERAGE OF Highway bridge structures Project inception Project funding Design standards Bridge inspection and site survey Physical testing As built plans and other record data Superstructure types Deck types Wearing surface types Deck joint types Design loads Design methods Internal forces Load distribution Concrete deck slabs Composite steel members Plate girder design Continuous beams Protecting steel superstructures Load rating Prestressed concrete Substructure design Abutments Piers Bearings Managing the design process Contract documents Bridge management systems

*Bridge Engineering, Third Edition* Jim Zhao, Demetrios Tonias, 2012-03-05 The state of the art in highway bridge engineering Fully updated with the latest codes and standards including load and resistance factor design LRFD Bridge Engineering Third Edition covers highway bridge planning design construction maintenance and rehabilitation This thoroughly revised reference contains cutting edge analytical design and construction practices the most current information on new materials and methods and proven cost effective maintenance and repair techniques Real world case studies and hundreds of helpful photos and illustrations are also included in this practical resource BRIDGE ENGINEERING THIRD EDITION FEATURES COMPLETE COVERAGE OF Highway bridge structures Project inception Project funding Design standards Bridge inspection and site survey Physical testing As built plans and other record data Superstructure types Deck types Wearing surface types Deck joint types Design loads Design methods Internal forces Load distribution Concrete deck slabs Composite steel members Plate girder design Continuous beams Protecting steel superstructures Load rating Prestressed concrete Substructure design Abutments Piers Bearings Managing the design process Contract documents Bridge management systems

Simplified Engineering for Architects and Builders Sharon S. Baum Kuska, Patrick Tripeny, James Ambrose, 2025-01-29 The gold standard structural design reference completely revised and updated with an all new look Completely revised to reflect the latest standards and practices Simplified Engineering for Architects and Builders 13th Edition is the go to reference on structural design giving architects and contractors a concise

introduction to the structures commonly used for typical buildings. It presents primary concepts and calculations for the preliminary dimensioning of principal elements within a building design focused on key principles of quantitative analysis and design of structural members. Structural design is an essential component of the architect's repertoire and engineering principles are at the foundation of every sound structure. Architects need to understand the physics without excess math. This book covers fundamental concepts like forces, loading, and reactions to teach how to estimate critical design loads and analyze for final proportions. It provides exactly what you need to quickly grasp the concepts and determine the best solutions to difficult design challenges. The thirteenth edition of *Simplified Engineering for Architects and Builders* includes increased page size for improved visibility and usability. Newly revised wood, steel, and concrete construction sections allow easy comparison of the latest techniques and materials. Accompanying instructor manual with background discussion, solutions to exercises, additional study materials, and self-tests. A leading reference for over 80 years, *Simplified Engineering for Architects and Builders* is the definitive guide to practical structural design, ideal for students in architecture, construction, building technology, and architectural engineering.

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