1. Record Nr. UNINA9910829959303321

Autore	Kindmann Rolf
Titolo	Steel structures [[electronic resource]] : design using FEM / / Rolf Kindmann, Matthias Kraus
Pubbl/distr/stampa	Berlin, : Wilhelm Ernst & Sohn, c2011
ISBN	3-433-60126-7 1-280-66281-6 9786613639745 3-433-60125-9 3-433-60077-5
Descrizione fisica	1 online resource (554 p.)
Altri autori (Persone)	KrausMatthias
Disciplina	624.1/821 624.1821
Soggetti	Building, Iron and steel Structural design Finite element method
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. [528]-533) and index.
Nota di contenuto	Title Page; Table of Content; 1 Introduction; 1.1 Verification Methods; 1.2 Methods to Determine the Internal Forces and Moments; 1.3 Element Types and Fields of Application; 1.4 Linear and Nonlinear Calculations; 1.5 Designations and Assumptions; 1.6 Fundamental Relationships; 1.7 Limit States and Load Combinations; 1.8 Introductory Example; 1.9 Content and Outline; 1.10 Computer Programs; 2 Cross Section Properties; 2.1 Overview; 2.2 Utilisation of Symmetry Properties; 2.3 Standardisation Part I: Centre of Gravity, Principal Axes and Moments of Inertia 2.4 Calculation of Standardised Cross Section Properties Part I2.4.1 Separation of the Cross Section into Partial Areas; 2.4.2 Partial Areas of Thin-Walled Rectangles; 2.4.3 Basic Cross Sections and Elementary Compound Cross Section Shapes; 2.4.4 Tabular Calculation of Cross Section Properties; 2.4.5 Numeric Integration / Fibre and Stripe Model; 2.5 Standardisation Part II: Shear Centre, Warping Ordinate and Warping Constant; 2.6 Warping Ordinate; 2.7 Shear Centre M; 3 Principles of

FEM; 3.1 General Information; 3.2 Basic Concepts and Methodology; 3.3 Progress of the Calculations
3.4 Equilibrium3.4.1 Preliminary Remarks; 3.4.2 Virtual Work Principle; 3.4.3 Principle of Minimum of Potential Energy; 3.4.4 Differential Equations; 3.5 Basis Functions for the Deformations; 3.5.1 General; 3.5.2 Polynomial Functions for Beam Elements; 3.5.3 Trigonometric and Hyperbolic Functions for Beam Elements; 3.5.4 Basis Functions for Plate Buckling; 3.5.5 One-Dimensional Functions for Cross Sections; 3.5.6 Two-Dimensional Functions for Cross Sections; 4 FEM for Linear Calculations of Beam Structures; 4.1 Introduction; 4.2 Beam Elements for Linear Calculations
4.2.1 Linking Deformations to Internal Forces and Moments4.2.2 Axial Force; 4.2.3 Bending; 4.2.4 Torsion; 4.2.5 Arbitrary Stresses; 4.3 Nodal Equilibrium in the Global Coordinate System; 4.4 Reference Systems and Transformations; 4.4.1 Problem; 4.4.2 Beam Elements in the X-Z Plane; 4.4.3 Beam Elements in a Three-Dimensional X-Y-Z COS; 4.4.4 Loads; 4.4.5 Warping Moment and Derivative of the Angle of Twist; 4.4.6 Finite Elements for Arbitrary Reference Points; 4.5 Systems of Equations; 4.5.1 Aim; 4.5.2 Total Stiffness Matrix; 4.5.3 Total Load Vector; 4.5.4 Geometric Boundary Conditions
4.6 Calculation of the Deformations4.7 Determination of the Internal Forces and Moments; 4.8 Determination of Support Reactions; 4.9 Loadings; 4.9.1 Concentrated Loads; 4.9.2 Distributed Loads; 4.9.3 Settlements; 4.9.4 Influences of Temperature; 4.10 Springs and Shear Diaphragms; 5 FEM for Nonlinear Calculations of Beam Structures; 5.1 General; 5.2 Equilibrium at the Deformed System; 5.3 Extension of the Virtual Work; 5.4 Nodal Equilibrium with Consideration of the Deformations; 5.5 Geometric Stiffness Matrix; 5.6 Special Case: Bending with Compression or Tension Force
5.7 Initial Deformations and Equivalent Geometric Imperfections

Sommario/riassunto

This book presents the design of steel structures using finite element methods (FEM)according to the current state of the art in Germany and the rest of Europe. After a short introduction on the basics of the design, this book illustrates the FEM with a focus on internal forces, displacements, critical loads and modal shapes. Next to finite element procedures for linear calculations considering the stress states of normal force, biaxial bending and warping torsion, non-linear calculations and the stability cases of flexural buckling, lateral torsional buckling and plate buckling are concentrat