

DESIGN OF STEEL STRUCTURES

Principles, Analysis and Practical Applications

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Preface

Steel structures occupy a central place in modern civil and structural engineering because of their high strength-to-weight ratio, speed of construction, adaptability, durability, and suitability for a wide range of buildings and infrastructure. From industrial sheds and multistorey buildings to bridges, towers, chimneys, transmission structures, and long-span systems, structural steel continues to be one of the most important construction materials used by engineers. Sound steel design, however, demands more than familiarity with equations. It requires a clear understanding of material behaviour, load transfer, structural stability, connection performance, code-based design philosophy, detailing, fabrication, erection, and overall structural safety.

The book **Design of Steel Structures** has been developed to provide a systematic and application-oriented treatment of the analysis and design of steel structures. The presentation progresses from fundamental concepts to the design of individual structural members and finally to complete structural systems and special structures. Particular emphasis has been placed on developing a logical connection between structural mechanics, design provisions, practical detailing, and engineering judgement.

The opening chapters introduce the basic characteristics and applications of steel structures, followed by a discussion of structural steel properties, grades, and commonly used standard sections. The concepts of loads, load combinations, design philosophy, and the limit-state method are then developed to establish the basis for structural design. Since connections play a decisive role in the behaviour and integrity of steel structures, separate chapters are devoted to bolted and welded connections, including their design principles and practical considerations.

The subsequent chapters deal with the design of the principal structural elements encountered in engineering practice. Tension members, compression members, beams, flexural members, and beam-columns are treated systematically with attention to strength, stability, serviceability, and failure modes. The design of plate girders is included to address situations where conventional rolled sections are inadequate for carrying large loads or spanning greater distances.

The book then moves from individual members to structural assemblies and engineering systems. Dedicated chapters cover roof trusses, gantry girders, steel buildings, industrial frames, towers, chimneys, and other special structures. These topics are particularly important in industrial and

infrastructure applications, where structural configurations and loading conditions can differ substantially from those encountered in conventional building design.

The book is intended primarily for undergraduate and postgraduate students of Civil Engineering, Structural Engineering, and related disciplines. It may also serve as a useful reference for practicing engineers, designers, academicians, and candidates preparing for professional and competitive examinations involving structural steel design. The sequence of chapters has been arranged to support both classroom teaching and independent study.

Every effort has been made to present the subject in a clear, coherent, and technically meaningful manner while maintaining a balance between theoretical principles and practical design considerations. Structural engineering standards, materials, fabrication practices, and computational tools continue to evolve; therefore, readers are encouraged to consult the latest applicable design codes and specifications while applying the concepts discussed in this book to professional projects.

We hope that **Design of steel Structures** will help readers develop a strong foundation in structural steel design and, more importantly, cultivate the engineering judgement required to transform structural analysis into safe, economical, durable, and constructible designs.

Authors

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DESIGN OF STEEL STRUCTURES

Design of Steel Structures provides a systematic and application-oriented introduction to the analysis and design of structural steel systems. The book connects fundamental structural mechanics with code-based design principles, practical detailing, stability considerations, and engineering judgement.

Beginning with structural steel properties, standard sections, loads, load combinations, and limit-state design, the book progresses through bolted and welded connections and the design of tension members, compression members, beams, beam-columns, and plate girders. It further extends these concepts to complete structural systems, including roof trusses, gantry girders, steel buildings, industrial frames, towers, chimneys, and other special structures.

Designed for undergraduate and postgraduate students of Civil and Structural Engineering, the book also serves as a useful reference for practicing engineers, academicians, and candidates preparing for professional and competitive examinations. Its balanced treatment of theory and practical design aims to develop the knowledge and engineering judgement required for safe, economical, durable, and constructible steel structures.

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