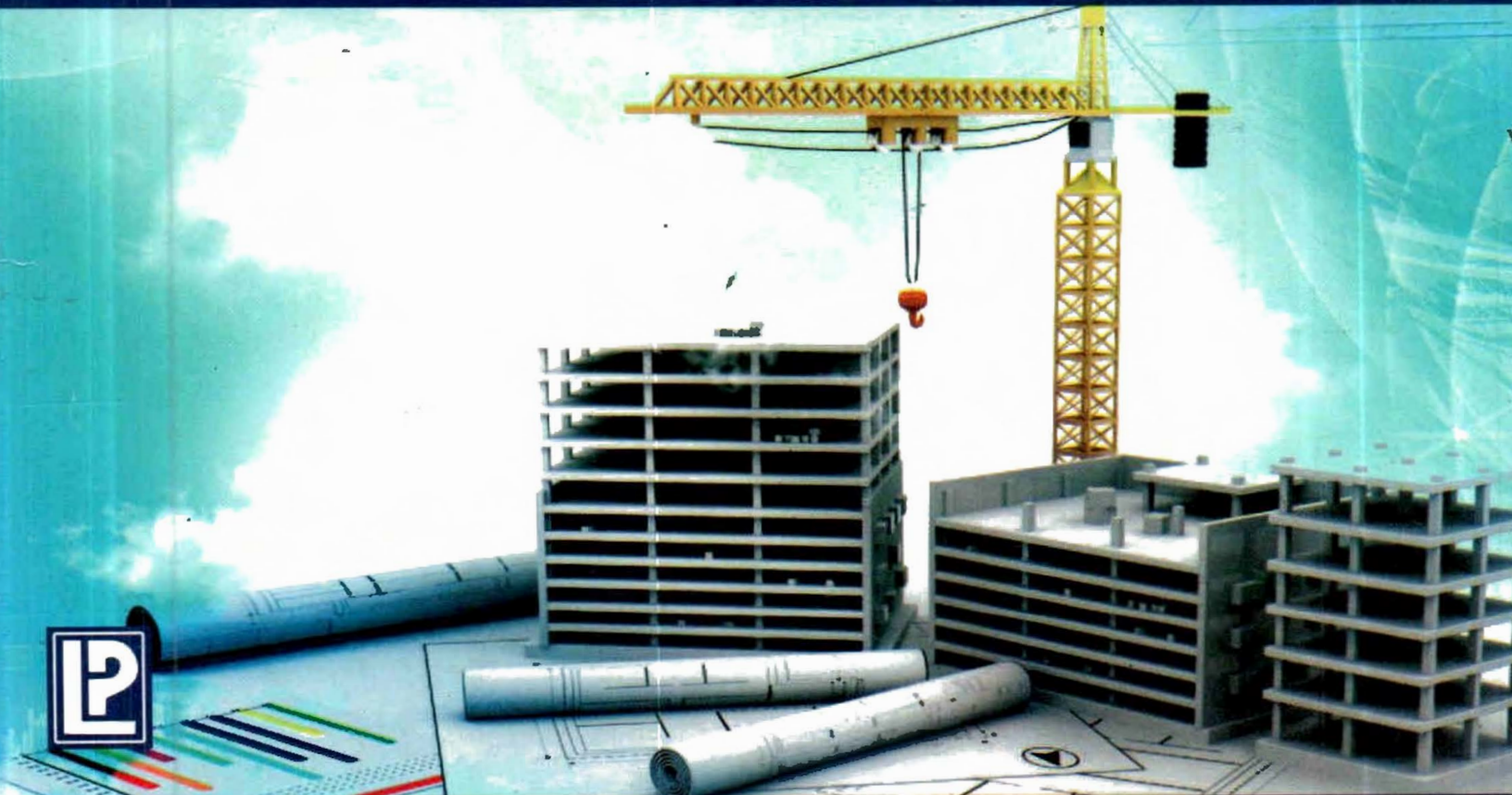


# LIMIT STATE DESIGN



OF REINFORCED CONCRETE  
(AS PER IS 456 : 2000)

Dr. B.C. PUNMIA | Er. ASHOK KUMAR JAIN | Dr. ARUN KUMAR JAIN





# **LIMIT STATE DESIGN**

## **OF REINFORCED CONCRETE**



# LIMIT STATE DESIGN OF REINFORCED CONCRETE

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# LIMIT STATE DESIGN OF REINFORCED CONCRETE

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## Preface

Reinforced concrete occupies a leading position in modern construction of buildings, bridges, water tanks, aqueducts, bunkers, silos and other similar structures. This treatise contains upto-date information on design, analysis and construction of engineered concrete structures, based on limit state design philosophy. Its intention is to provide engineers, architects and students of Civil Engineering and Architecture with authoritative theoretical and practical design information. The book is based on the Fourth Revision of IS 456 adopted by the Bureau of Indian Standards in the year 2000.

In the present book, the subject matter has been introduced gradually, beginning with the properties and characteristics of materials used in reinforced concrete. Chapter 2 deals with various design concepts including the limit state design philosophy. Chapters 3, 4, 5 and 6 deal with the limit state of collapse in flexure, incorporating the theory and design of singly reinforced rectangular sections, doubly reinforced rectangular sections, non-rectangular sections and flanged sections respectively. Chapters 7, 8 and 9 give the limit state of collapse in shear, bond and torsion respectively while Chapter 10 deals with the limit state of collapse in deflection and cracking. Chapter 11 incorporates all the above limit states for the design of various types of beams and beam-slab construction. Chapters 12, 13 and 14 present the analysis and design of two way slabs, circular slabs and flat slabs respectively while Chapter 15 deals with various types of stair cases. Chapters 16, 17, 18 and 19 deal with the analysis and design of various cases of columns, including slender columns. Chapter 20 gives the yield line theory and design of slabs, while Chapter 21 deals with the redistribution of moments in fixed and continuous beams. The design of footings and retaining walls have been given in Chapters 22 and 23 respectively, while Chapter 24 deals with analysis of building frames. Chapter 25 deals exhaustively with the analysis and design of prestressed concrete. The design of miscellaneous structures such as deep beams, corbels, brackets etc., have been incorporated in Chapter 26, while Chapter 27 deals with the detailing of earthquake resistant R.C. structures. Lastly, Appendix-A gives the Working stress design method.

Each Chapter begins with clear statements of pertinent definitions, design theory and design principles and elaborate design procedure. The basic principles are supplemented with numerous design examples and illustrations along with detailed drawings. Various designs in this book are based on latest Indian Standards. The tables and curves giving permissible stresses and/or design coefficients, as well as basic rules for design, taken from various Indian Standards are gratefully acknowledged. In spite of every care taken to check the numerical work, some errors may remain, and we shall be obliged for any intimation of these readers may discover

The Authors are thankful to Shri M.S. Gahlot for the fine laser type setting of the book. The Authors are also thankful to Shri R.K. Gupta, Managing Director, Laxmi Publications, for taking keen interest in the publication of First edition of the book and bring it out nicely and quickly.

*Jodhpur*  
*Akshaya Tritoia,*  
*20<sup>th</sup> April, 2007*

**B.C. PUNMIA**  
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