INSDAG GUIDE FOR

THE STRUCTURAL USE OF STEELWORK IN BUILDINGS

Prepared by:

Indian Institute of Technology Madras

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USE MORE STEEL - THE PREFERRED MATERIAL OF THE NEW MILLENIUM

FOREWARD

INSDAG has played a pivotal role over the last few years in propagating the awareness amongst students, faculties of various engineering institutes and experts and professionals from various industries, about the advantages and benefits of usage of steel in the construction sector.

It is now being accepted by most engineering professionals both academic and industrial, that the main stumbling block in the development of the steel construction industry in India is the primitiveness of the methods of design adopted by the Indian codes as against the international codes which allow higher flexibility in design approach. The relevant Indian codes of practice (IS: 800-1984 and IS: 801-1975) applicable for hot-rolled and cold-formed steel are based on the "Allowable Stress Design" approach as against the more internationally popular "Limit State Method" approach which has been proved to be technically sound and its use results in optimum economy of the structure.

With the technical contributions from leading academics and professionals, INSDAG has already brought out various publications on the design methodology of steel structures using the Limit State Method of Design (LSM), which have been beneficial to the engineering fraternity in learning the most intricate facets in LSM design.

On request from INSDAG, this publication in the form of a Guide book has been written and compiled by Dr. Rangachari Narayanan and Dr. V. Kalyanraman for the benefit of not only the student community both under-graduate and post graduate level, but also other engineering professionals across the country, since most of the engineering institutions have started including the LSM design in their curriculum and also the engineering professionals need to update themselves with the latest technological advancements. The publication is very timely as it coincides with the revision of IS: 800- 1984, which is at its advanced stage.

Special Note

The entire document has been written considering Limit State Method of design following stipulations laid down in the relevant British code, BS: 5950 Part -1, 3 & 5 and Eurocode - 3 & 4. Since IS: 800 (Code of Practice for General Construction in Steel) is presently being revised to Limit State version, this guide book may undergo certain modifications in some chapters after the publication of revised IS: 800 (LSM version) to accommodate the possible variation in stipulations that are likely to be considered in the revised code.

However, this document will be extremely useful to the students of Civil I Structural Engineering to understand the theoretical background associated with advancement in structural steel design based on Limit State Method.

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PREFACE

The low usage of structural steel in India is attributable in part to the prevailing out-of-date design practices, which result in uneconomic designs. The relevant Indian Codes of Practice (IS: 800 - 1984, IS: 801 - 1975) applicable to the structural use of hot-rolled and cold-rolled steel are largely based on "Working Stress Method". The more modern "Limit State Design Approach" developed in the 1970's in the West, is technologically sound and results in significant economies in completed structures. This is of particular advantage, as steel is reusable and environment friendly. Compared with competing materials of construction, steel framed buildings have significantly better blast and earthquake resistance and take less than half the time to build. In passing, it may be noted that the Indian Codes of Practice applicable to concrete structures have been revised to conform to Limit State Methodology. This makes the choice of steel in construction an uneconomic proposition. It is also noted that the Code of Practice for steel-concrete-composite buildings (IS: 11384 - 1985) is based on the Limit State approach but is very limited in its coverage, besides being inconsistent with IS: 800 and IS: 801 written in Working Stress format.

This situation posed a challenge, when the Government of India, Ministry of Steel initiated steps to rectify the skills shortage in Steel Construction in 1998. The newly started Institute for Steel Development and Growth (INSDAG) was entrusted with the tasks of (a) improving the teaching standards of Structural Steel Design in Indian Universities, (b) organising in-career courses for enhancing the level of competence of practising engineers (c) publishing design guidance documents for disseminating latest Steel Design Technology (d) organising design competitions for encouraging state-of-the art Structural Steel Designs. As a part of that initiative, an up-to-date Resource Material for disseminating the latest Steel Design Technology has been compiled and published in the web site of INSDAG (www.steel-insdag.org). This Design Guide has been complied, as a complementary document and has been drafted after studying the background research work carried out largely in the Western World, which led to the latest British, American, Canadian, Australian and European Codes. Many of the design specifications contained herein have been adopted from these Western Codes and will hopefully serve as a Draft document, when the Bureau of Indian Standards eventually decides to revise the Steel Codes, relevant to Construction.

The technical support provided by two young engineers, Mr. S. Sambasiva Rao and Miss P. Usha in compiling this document is gratefully acknowledged.

Dr. T.K. Bandhyopadhyay of INSDAG and Professor A. R. Santhakumar of Anna University had reviewed the document before its publication as a draft. Suggestions and comments aimed at improving this document are welcome. We are also grateful to the many engineers - too numerous to mention - who suggested improvements in the drafting stage.

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