

**J.D.Buch**

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Structural Engineering Forum

Re: A weekly essay series about author luminaries at SEFI

Dear SEFI,

Thank you for giving me an opportunity to participate in the weekly essay series, though I am not a luminary as the subject suggests.

List of my publications of books and technical papers is given in the attachment.

These publications are results of my structural and project management experience of over 35 years. Projects on which I was Lead Engineer of the design team include industrial plants, tall towers, high-rise office and bank buildings, hotels, educational institutions, townships, aircraft hangars, etc.

The object of my writing books and articles in engineering magazines is to share my experience and fulfil the need for practical design books. Most of the design examples in my book are of the existing structures on which I was associated on designs and implementation. Staad input listing for different load cases and detailing are also given.

Briefly reasons to choose a particular subject for writing the book are as under:

### **1. Design of Cement Plant Structures:**

From 1965 to 1985, we were consultants for eight cement plants (600- tpd to 2200 tpd single kiln). For any industrial plant, it is necessary for structural designer to know the basic process flow and functioning of all major equipment. Cement plant operates all the year round and has special requirements on consideration of jamming of materials, ovalling of kiln due to high heat, abrasive nature of clinker, loads due to continuously operating grab cranes (in earlier plants). In spite of advancement in knowledge of material pressure, failures of cement silos are still not uncommon. As such design cannot be based only on codes, given loads by equipment suppliers and soil parameters supplied by the soil-investigation consultants.

During the first plant, we took disproportionate time, in establishing design parameters of various materials (Density, angle of internal friction, heat, abrasion, etc) and understanding functioning of equipment in the process.

As we progressed with more experience, I presented papers at the Cement Research Institute (later called National Council for Cement and Building Research), near Delhi. Ultimately, this resulted in my writing this book. This book would serve as a single reference to the design structural engineer.

When we did our first Caustic Soda Plant (1962), we referred to a similar book by Vakil of Dhrangadhra Chemicals. I do not know if this book is still available.

## **2. Advanced Structural Design – CAD Examples:**

In mid-sixties, consulting engineers extensively referred Benson's book for design of industrial structures. Since then, due to industrial development there has been a rapid change, requiring different types of large structure. This book fulfils that need with the design examples of structure listed in the attachment.

\*Cyril S. Benson: 'Advanced Structural Design', B. T. Batsford Ltd, London; First published in 1959.

## **3. High-rise Buildings – Design Example of a 110-storey Building**

Very tall buildings always intrigued me. I wondered what magnitude of loads would be there in such buildings. Then in 1973, my ex-colleague late Dr. Sujit Majumder and I had privilege to listen to two hour spell-binding lecture by Dr. Fazlur Khan at a conference in Delhi. He presented his paper on development of new structural systems for *ultra-high-rise* buildings with illustrations on slides. Sears Tower was designed by him at that time. Later I came across a publication by National Council of Tall Buildings and Urban Habitat, where many of the tall buildings are documented.

This resulted in my writing the book on High-rise Buildings.

We again met Dr. Fazlur Khan at a conference in Bangkok, where we presented a paper (1974).

## **4. Advanced Structural Design II:**

Over last few decades, shell structures covering large column-free areas are constructed. Due to such large spans and thinner shells, the problem of non-linear buckling of shells has grown in importance.

This book is continuation of my earlier book 'Advanced Structural Design' and covers topics listed in the annexure.

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### **Publications of Structural Engineering Books by J. D. Buch**

#### **1. ‘Design of Cement Plant Structures’ (Published in 1998)**

This book serves as a single reference on process flow, case studies and design examples of unusual structures. It contains design examples of kiln foundation and a Ring silo.

The book was reviewed in The Indian Concrete Journal, June 1998, pp 296

#### **2. ‘Advanced Structural Design – CAD Examples’ (Published in 2001)**

This book presents practical structural design examples of some of the uncommon structures. The structures included are:

- 4-Segment Cement Silo, 10,000- tonne total capacity
- 31.7-m diameter suspended floor supported on structural steel frame work for an Assembly Hall
- 200-MW Turbo Generator Foundation
- Space truss roof on an office atrium entrance lobby
- 223-m tall TV Tower

Since May 2011, this book is out of print. The same is now available in CD form.

The book was reviewed in The Indian Concrete Journal, August 2002, pp 510).

#### **3. High-rise Buildings – Design Example of a 110-storey Building (Published in 2005)**

In order to meet the need of urban planning, the present trend in Indian urban cities is to construct *ultra-high rise* buildings. The time is not very far when much taller buildings will be built in India. This book is an attempt to fulfil the present need of students and consultants in the field of design of such high-rise buildings. The topics in the book cover design considerations and principles, loads, structural systems and fire hazards for such tall buildings. Design example of a 110-storey building is given as an illustration with Staadpro input listing for various load cases.

The publication is available in form of a CD with facility to independently open any topic of interest to the user. The CD contains 201 pages of A4 size.

Topics covered in the publication are briefly given below:

Chapter 1: High-rise introduction.

Chapter 2: ‘Design principles’ and ‘Design considerations’ of high-rise planning.

Chapter 3: Loads and load – effects on high-rise buildings due to static, wind, seismic and thermal loads.

Chapter 4: High-rise structural systems – Frame, shear wall, tube, both in concrete and steel

Structural systems adopted in some high-rise buildings are illustrated.

Chapter 5: Design example of a 110-storey building. Sears Tower at Chicago is taken as an illustration. The bundled tube structure (in structural steel) is analysed on Staadpro programme. **The input listings for various load cases are given.** The structure is analysed on the basis of relevant Indian and American codes. Results from the computer output are given along with observations on important aspects of design.

Chapter 6: Fire-distress / failure of steel framed structures. A case study of the collapse of the WTC 7 (in the World Trade Centre complex at New York, which was destroyed on September 11, 2001) building due to fire is given.

The book was reviewed in The Indian Concrete Journal, December 2005, pp 47

#### **4. 'Advanced Structural Design II'** (Published in 2009)

The topics included are:

- Stability of shells
- Reinforced concrete spherical dome
- Reinforced concrete Diaphragm Wall
- Pile foundation for a Ring Silo
- Analysis of axi-symmetrical shell by direct stiffness method
- Pyramidal Hopper
- Forensic Engineering

Illustrative design examples with Staadpro listing for each are given, along with detailing drawings.

The publication is available in form of a CD with facility to independently open any topic of interest to the user. The CD contains 198 pages of A4 size. The CD also contains a folder for design of axi-symmetrical shells and hoppers using FORTRAN programme. Source codes are given in the folder. User would not need a compiler since execution files are also given in this folder.

The book was reviewed in The Indian Concrete Journal, July 2009, pp 17-18

#### **Publications of Technical Papers:**

- Design aspect of tall steel frame structure in highly seismic zone (Proceedings of the Regional Conference on tall buildings, Bangkok, Jan.23-25, 1974; pp 649-663; Co-author with Dr. S. Majumder)
- Construction of first Cement Ring Silo in India (ICJ February 1990, pp 73-77)
- Foundation for roller press in a cement plant: A case study (ICJ October 1992; pp 559-561)
- Point Of View: What ails structural engineers (ICJ December 2010, pp 19-25)
- Pre-Engineered Building Systems for hangars (Journal of Indian Building Congress; Volume XIX, No. 1; May 25-26, 2012, Kolkata; pp 30-36)
- MRO Hangars (Airport International; Vol 5, No.2, August-September 2012, Indian edition, Bangalore; pp 20-22; Co-author with Nick Purohit)
- Aircraft Hangar Flooring: Floor design of MRO hangar (ICJ February 2013; pp 21-35)

- Need for site response spectra for zones in India for performance-based seismic design of structures (ICJ May 2019; pp 49-59)

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