Report on Two-Day Course on "Practical Design to BS8110 from Consulting Engineer's Perspective"

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The two-day course on "Practical Design to BS8110 from Consulting Engineer's Perspective" was organised by the Civil and Structural Engineering Technical Division of IEM and it was held from 29 to 30 March 2007 at the Armada Hotel, Petaling Jaya. The course was delivered by Engr. M. C. Hee, the Principal of M. C. Hee & Associates Consulting Engineers and a Committee Member of the Civil and Structural Engineering Technical Division.

Engr. M. C. Hee obtained his Bachelor of Engineering (BE) and Master of Engineering Science (M.Eng. Sc) from The University of New South Wales, Sydney, Australia. His expertise is in the design and construction of high-rise buildings particularly in value engineering and alternative design. Engr. Hee has more than 40 years of experience in the field of structural engineering and his many successfully concluded projects include several high rise structures both in Australia and Malaysia. In addition, he is well versed in computer modelling of high-rise buildings and his current interest is in strut and tie applications in the field of structural engineering particularly transfer girders and deep beams. Besides his private practice, Engr. Hee is actively involved in IEM activities. He is an Excomm member for the current session, Chairman of IEM Position Statement Committee for "Concrete Code of Practice in the Local Construction Industry after year 2010" when BS8110 is to be withdrawn and also the Chairman of Malaysian Structural Concrete Code (EC2). He has conducted several courses for IEM, particularly on practical concrete design.

The two-day course was well attended by 84 participants which included practising consultants, engineers from contracting firms, government agencies and academics from local institutions of higher learning. The ratio of participants represented a good mix of young engineers as well as experienced practitioners. Engr. Prof. Dr Mohd. Zamin Jumaat and Engr. Sudharshan N. Raman acted as the Chairpersons for the course on the first and second day, respectively.

Engr. Hee commenced his lecture by revisiting the topic on Analysis of Framed Structures. Some of the sub-topics that were discussed during this session include:

- the code coefficients for beam and one-way slab as provided in the design code,
- division of braced and unbraced framed structures,
- fundamentals of moment distribution, and
- the application of the two-cycle moment distribution method.

Several worked examples were presented by him, especially on the application of the two-cycle moment distribution method. Besides manual calculations, the concept of analysis of sub-frames using a computer program was demonstrated by Mr. Y. H. Teng, an understudy of the speaker.

The topic of Analysis and Design of RC Beams using Unified Approach was covered next. Besides the design of RC beams, the topic also included the design of prestressed, partially prestressed and composite beams. Participants were introduced to the concept of an unified approach in beam design by using the factor of combined reinforcing index, *q*, where *q* is the unifying parameter between reinforced, prestressed and partially prestressed sections. The lecture on the sub-topic of moment redistribution was covered after the lunch break. Engr. Hee concluded this session by carrying out a comparison between the BS8110 and EC2 code in the design of beams by using the *q* factor. Several examples were also discussed during the lecture which reinforced the understanding of the concept of unified approach by the participants.

Following that, Engr. Hee covered the topic of Serviceability Limit State of Deflection by using the "deemed to satisfy" condition to BS8110 effective span/depth ratio. The application of modification factors to the span/depth ratio and the implication of its use were also discussed. The last topic for the first day of the course was on the Analysis and Design for Shear and Torsion in Beams. Participants were introduced to the theory of shear transfer mechanism and the BS8110's approach in the analysis, design and detailing for shear. The concept of equilibrium and compatibility torsion was discussed next and this was followed by the BS8110's approach in torsional design and detailing. The speaker concluded the first day's lecture by comparing the shear requirements in BS8110 and EC2 codes. The question and answer session was held after that, where the participants were involved in lively discussions with the speaker.

The second day of the course commenced with the fifth topic of lecture, Analysis and Design of RC Columns. During this session, the speaker introduced the participants to a definitive concept to distinguish whether the column is considered to be braced or unbraced, i.e. by using the ACI Commentary statement and the stability index of the frame. Many participants acknowledged that this was the first time that they have been informed of a method which allows them to "calculate the brace-ability of columns". Several sample calculations were also presented to reinforce the understanding of the participants on these concepts. Following that, Mr. Y. H. Teng assisted Engr. Hee in demonstrating the use of a structural analysis software in this sub-topic. Other sub-topics that were covered in this session include:

- the computation of effective length and slenderness ratio of columns,
- the ISE Interaction Charts,
- design of short columns,
- design of braced slender columns subjected to uniaxial and biaxial bending, and
- the concepts of designing L-shaped columns.

Finally, Engr. Hee invited fellow engineer Mr. W. B. Lim to demonstrate the design of L-shaped column using a computer software.

After the lunch break, Engr. Hee continued to the topic of Analysis and Design of RC Walls. The sub-topics that were covered in this section include:

- structural classification of walls,
- design of braced and unbraced walls,
- transverse eccentricity of plain walls,
- capacity of stocky and slender RC walls, and
- interaction diagrams for core walls. ■