Technical Seminar On Jump on Eurocode Wave

CIVIL AND STRUCTURAL ENGINEERING TECHNICAL DIVISION

reported by

Ir. Raymond Tien Loy Bong

The Civil & Structural Technical Division (CSETD) and Midas Information Technology and Co. Ltd jointly organised a one-day technical seminar on Jump On The Eurocode Wave on 18 October, 2016. The aim was to increase awareness of the adoption of Eurocode through a sharing session with Eurocode experts and the simplification of design through Midas Software.

Over 225 participants attended the event which started with a warm welcome by Mr. Aaron Lee, the Master of Ceremony from Midas. The company has been involved in many high profile projects around the world, notably Burj Khalifa, Beijing National Stadium and Young Jong Bridge. It provides a wide range of software solutions, ranging from civil, structure, geotechnical and mechanical and, according to Mr. Lee, Midas has attained 40% market share in Singapore's analysis software.
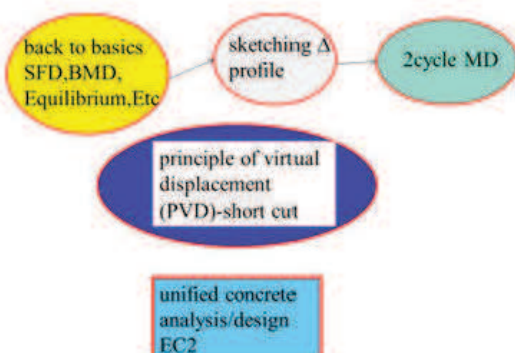
CSETD Chairman Ir. Dr Ng Soon Ching then gave the opening speech in which he noted that Malaysia was moving closer towards adopting Eurocode and that there was a need for modelling and design base software to assist the industry. He welcomed two experts, Ir. Adjunct Professor M.C. Hee from Malaysia and Prof. Richard Liew from Singapore, who would be sharing their insights and perspectives on Eurocode design.

The next speaker was Mr. Kapil Dev Bansal, Technical Manager at Midas Singapore. The civil and structural engineer, who has experience in RC and steel structures, undertakes projects involving Eurocodes and ACI. He talked about Midas nGen, a computer-aided engineering (CAE) software that utilised a diverse range of specialty finite element analysis functions as well as modern theories of structural analysis to give accurate and practical results. As the input for Midas nGen is an object-based approach application, it can be used for any type of structure with mixed structural elements and complexity.

Mr. Kapil modelled a simple high rise building from scratch. He explained how Midas nGen provided and generated results for RC and steel. He went through the assignment of the structural elements, automated Eurocode load combination assignment and showed the analysis result. He noted the perils of expected changes in architectural layout and assured design engineers that Midas nGen provided simple and hassle-free changes in the model. With Midas nGen's intuitive modelling and auto design, he said, engineers would be able to migrate towards Eurocode at a more comfortable pace.

Next was Ir. Adjunct Professor M.C. Hee, a veteran in undertaking projects in complex and high rise buildings.
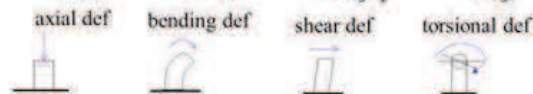

A Unified-Simplified Approach To Structural Analysis & Design...8

back to basics SFD,BMD, Equilibrium,Etc → sketching Δ profile → 2cycle MD

principle of virtual displacement (PVD)-short cut

unified concrete analysis/design EC2

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PVD...37

Principle of virtual displacement (PVD)

$$\Delta,\theta = \int_0^l \frac{Nn}{EA}\,ds + \int_0^l \frac{Mm}{EI}\,ds + \int_0^l \frac{Vv}{G_s A_v}\,ds + \int_0^l \frac{Tt}{G_s J}\,ds$$

axial def   bending def   shear def   torsional def

N=axial load; n=unit axial load.   M=bending moment; m=unit moment
V=shear force; v=unit shear.   T=torsion; t=unit torsion
A=sectional area; A_v=shear area=(5/6)A
J=torsional M of I
E=modulus of elasticity(E_{cd}=27.3x10⁶ kpa) for f_{ck}=C30/37 mpa
G_s=shear modulus=E/[2(1+u)]=0.42E=11.5x10⁶ kpa and u=poision ratio=0.2

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Unified-simplified approach and virtual displacement approach

He was also involved in the drafting of Malaysia's Eurocode 8. His topic on Eurocode 2, from the consulting engineer's perspective, emphasised on the need for engineers to understand the fundamentals of structural analysis and design.

The unified-simplified approach to structural analysis, emphasised deformations, principle of virtual displacement (PVD), matrixes and others, allows engineers to carry out a quick check on structural analysis. Professor Hee talked briefly about simple checks in elemental design calculations. He went on to prove that the results of his hand calculations and the Midas elemental results were similar.

He acknowledged that there was a need for fast and prompt analysis results, so CAE software such as Midas, aids engineers by delivering results efficiently. However, engineers were reminded that they should always check if the software results were reasonable through simple close form hand calculation.

After lunch, the first speaker was Professor Richard Liew from the Department of Civil & Environmental Engineering, National University of Singapore, who was involved in drafting Eurocode 3 for Singapore. His topic on Steel Design as per Eurocode 3, gave an overview on what to expect when adopting EC3. He made a brief comparison of BS5950 and Eurocode to show the benefits and flexibilities of EC3. However, most checks in EC3 were presented in expressions, so Eurocode is geared towards computer-based designs.

Professor Liew presented a few case studies on structural steel and mixed systems that he had undertaken. High profile projects in Singapore, such as the Marina Bay integrated resort, Art Science Museum, Gardens By The Bay and Jewel at Changi Airport, illustrated the complexity of structural steel design. Due to the architectural complexity, most of the designs required computer-aided software to analyse the structural behaviour. Professor Liew also illustrated the composite structure system which was becoming more common as architecture demands became more complex. Composite steel structures allowed a lighter structure, efficient layout and achieved longer lifespan. He summed up the importance of close form hand calculation and the need to spend more time on global stability checks.

Mr. Hans Kang, Civil and Structural Engineer of technical support for Midas, presented a special feature on Midas nGen and Design+. He showed the audience how to input lateral loads, method of consideration of 1st order and 2nd order effect in Midas nGen, and the automatic load combination input to Eurocode. The special feature in Midas nGen gives further flexibility for engineers to adjust design parameters. Some automated functions in Midas nGen can assist in reducing human error.

Midas nGen loading input can be seamlessly exported into the Midas Design+ element design. With this feature, much of the detailing can be extracted easily and it can be used in many element designs, such as RC beams, columns, staircase, footings, steel connections etc. Mr. Kang ended by sharing how Midas software can help engineers simplify their learning curve towards Eurocode.

The seminar ended with the presentation of appreciation mementos to the speakers. Midas also gave mementos to all the speakers and Ir. Dr Ng gave Midas a token of appreciation for spearheading the seminar. ■

Presenting the speakers with appreciation mementos at the closing ceremony