

ACES Two-Day Workshop on Eurocode 3 Design of Steel Structures and Connections [3rd Run]

Date: **4 & 11 July 2015 (Saturday)**

Duration: **2 full-days, 9.00am - 5.30pm**

Venue: **Concourse 3, Level 2**

Singapore Manufacturing Federation (SMF)
2985 Jalan Bukit Merah, Singapore 159457

CPDs: **14 PDUs by PE Board; 12 STUs by JAC**

ACES, JAC RE RTO:	S\$ 400 / pax
Non-Member:	S\$ 700 / pax

**Seats are limited; registration is on a
'first come first served' basis.**

COURSE OVERALL VIEW

This workshop introduces the concepts and principles of steel building design, before explaining in detail the methods employed by Eurocode 3 for designing members in bending, compression and tension. Load combinations, bracing and ties, frame stability, trusses, portal frames, multi-storey buildings, long span plate girders and bolted and welded connections are also covered. The design methods are illustrated through worked examples. Recognising the current transition from BS 5950 to the Eurocodes, the course will highlight the similarities and major differences between the two codes, but it will not assume any prior knowledge of either code.

OBJECTIVES

- discuss Eurocode 3 limit states design and explain the calculation of load combinations for ultimate, serviceability and accident limit states based on EN1990;
- explain the principles of frame stability and robustness;
- describe local buckling phenomenon and procedure for section classification;
- provide guidance for the design of restrained and unrestrained beams, compression and tension members, beam column members, plate girders and steel connections;
- provide guidance for stability design of multi-storey frames, trusses, ties and bracing, and portal frames.

Having attended this course you will:

- understand how to design steel buildings using Eurocodes;
- be able to confidently specify steel for building purposes;
- be familiar with the key requirements in EC3 for member and frame design.



Trainer: Er. Prof. RICHARD LIEW

PhD, FSEng, CEng, PE, ACPE, StEr

Richard Liew is a Professor of the National University of Singapore, Department of Civil and Environmental Engineering. He is a Chartered Engineer in UK, a Professional Engineer in Singapore, and a Chartered Professional Engineer of the Association of Southeast Asian Nations. He is a Fellow of the Academy of Engineering Singapore, an Honorary Fellow and the Past President of Singapore Structural Steel Society and Honorary Fellow of Hong Kong Institute of Steel Construction. He has been involved in research and practice in steel-concrete composite structures covering a wide spectrum of interests, including light-weight and high strength materials and advanced analysis of structures subject to extreme loads, for applications in offshore, marine, defense and civil infrastructural works. He serves on the editorial boards of

10 international and regional journals. He interacts with the industry in the Asia Pacific region serving as an expert and technical advisor and has been involved in numerous iconic steel projects.

He chairs numerous international and national committees related to standards and specifications of steel and composite structures. He is a key person responsible for the development of Singapore's codes for the design and steel and composite structures. He is currently a member of SPRING, Singapore's Technical Committee on Building Structure and wherein he also serves as a Convener on the adoption of Eurocode 3 and Eurocode 4 in Singapore and chairing several workgroups.

Workshop Outline: Two-Day Workshop on Eurocode 3 Design of Steel Structures and Connections

DAY 1	4 July 2015
8.30am	<i>Registration</i>
9.00am	<u><i>Session 1</i></u> Introduction: Overall view of Eurocode EC3; key differences between EC3 and BS5950; terminology and conventions; design load combinations from Eurocode EC0; mechanical properties of steel; partial factors for limit states design; design strength of various steel grades; examples
10.15am	<i>Tea Break</i>
10.30am	<u><i>Session 2</i></u> Local buckling and section classification: plate stability; plate slenderness limits for internal and outstand parts; classes for angles and tubular sections; effective cross sections for class 4 sections; examples
11.30am	<u><i>Session 3</i></u> Tension member: Section capacity with holes; angles and channel section in tension; unequal leg angles welded or bolted on one leg; plate with staggered bolt arrangement; examples.
12:00noon	<u><i>Session 4</i></u> Compression member: Cross section resistance of class 4 and non class4 sections; factors affecting column buckling; elastic critical load and buckling length; selection of buckling curves and imperfections; design procedure; example.
12.45pm	<i>Lunch</i>
1.45pm	<u><i>Session 5</i></u> Restrained beam: shear resistance; shear area, moment resistance, effect of high shear, serviceability deflections; example
2.30pm	<u><i>Session 6</i></u> Unrestrained beam: Lateral torsional buckling (LTB); how to avoid LTB; design of lateral restraints; buckling resistance of rolled and welded beams; simplified method of design; unbraced length; moment gradient effect; beam with intermediate lateral restraints; cantilever beam; examples.
3.30pm	<i>Tea Break</i>
3.45pm	<u><i>Session 7</i></u> Bracing and Ties: Evaluation of effective buckling length in frames and trusses; effective lateral restraints; stability consideration during construction; construction sequence; design of ties and bracing; lessons learned from common mistakes.
5.30pm	<i>End of Day 1</i>

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DAY 2	11 July 2015
8.30am	<i>Registration</i>
9.00am	<u>Session 8</u> Beam-column: Cross section capacity checks; buckling capacity checks; interaction factors; biaxial and uniaxial bending; use of design tables; examples
10.15am	<i>Tea Break</i>
10.30am	<u>Session 9</u> Simple frames: columns in simple construction; nominal moments due to eccentricity of loads; column moments; simplified buckling check; design procedure; example.
11.15am	<u>Session 10</u> Multi-storey frames: Frame modelling; frame classification; sway and non-sway frames; methods of global analysis; global and local imperfections; equivalent horizontal forces; design for sway effect; amplified sway method; effective length method; direct analysis method. Examples and case studies.
12.30pm	<i>Lunch</i>
1.30pm	<u>Session 11</u> Plate girders: Initial sizing; moment capacity; web capacity; shear buckling; design of intermediate, transverse and load bearing stiffener; end post design; examples.
2.30pm	<u>Session 12</u> Bolted connections: General information and detailing for bolted connection; Design of Non-preloaded bolts; Design of Preloaded bolts; Examples
3.45pm	<i>Tea Break</i>
4.00pm	<u>Session 13</u> Welded connections: Material Weldability and common weld defects; Detailing requirements for welds; Design of fillet welds; Partial strength and full strength butt welds; Types of full strength welds. Examples and case studies.
5.00pm	Q & A session
5.30pm	<i>End of Day 2</i>

REGISTRATION FORM

For enquiry, please call Lilian Lean/Jennifer Quek at Tel: 6324 2682, please email your registration form to registration@aces.org.sg

Code	Topic	Trainer	Fee per pax	Schedule
W12	ACES Two-Day Workshop on Eurocode 3: Design of Steel Structures and Connections [3rd Run]	Er. Professor LIEW Jat Yuen, Richard	Member: \$400 Non-member: \$700	4 Jul 2015 & 11 Jul 2015 (Sat) 9am to 5.30pm

S/N	*Name	PE No.	RE No.	RTO No.	ACES M'ship No.
1.					
2.					
3.					

Company:

Address:

Postal code:

***Contact Person:**

***Mobile No.:**

***Email:**

Dietary Requirements (if any) : Vegetarian _____ no. of pax

PAYMENT

Enclosed is a Cheque No: _____ (Cheque should be made payable to **Association of Consulting Engineers Singapore** and mailed to ACES Secretariat, Association of Consulting Engineers Singapore, Thomson Road Post Office, PO Box 034, Singapore 915702)

Terms and Conditions	To be completed by Company and Individual Applicant
<p>By submitting and signing this application form, the company and individual applicant agree to the following:</p> <ol style="list-style-type: none"> a) The company and individual applicant has read and understood the terms of the flyer (if available) and the application form. b) Payment for the course must be made before the course commencement date. c) ACES reserves the right to amend any details relating to the course, revise the course fees without prior notice, cancel or postponed the course. d) Request for withdrawal or replacement must be made in writing. Requests are subject to approval by ACES. <ul style="list-style-type: none"> • Written request for replacement must reach ACES before the course commencement date. There will be no additional charges for suitable replacement • Written request for withdrawal that reaches ACES <ul style="list-style-type: none"> ◆ At least At least 7 working days before course commencement: Full Refund ◆ 4 to 6 working days before course commencement: 50% of the course fee Refund ◆ 3 working days before and upon course commencement: No Refund 	<p>COMPANY APPLICANT</p> <p>Name: _____</p> <p>Signature: _____</p> <p>Date: _____</p> <div style="border: 1px dashed black; width: 100%; height: 60px; margin-top: 10px;"></div> <p style="text-align: center; font-size: small;"><i>Company stamp (for company application)</i></p> <p>INDIVIDUAL APPLICANT</p> <p>Name: _____</p> <p>Signature: _____</p> <p>Date: _____</p>