



Recent Code Developments for Employing 2nd-Order Analysis – the Direct Analysis Method

Organised by

The Hong Kong Institute of Steel Construction www.hkisc.org

Supporting Organisations

Civil and Joint Structural Divisions, The Hong Kong Institution of Engineers

Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University

Date:	12 th December 2016, Monday
Venue:	Room Y303, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong.
Time:	8:45 am (registration) for 9:00 am to 5:00 pm

Scope and Objectives

Bifurcation and gradual instability represent two general approaches for assuring the stability of structural systems. In employing a bifurcation approach, design is based on a specific buckling mode, which in turn is directly tied to a specific loading condition or related assumptions, such as all columns in a story buckle simultaneously. The effective length method of design is based on this approach, and although it has been the staple of the design profession for over fifty years, the accuracy of its use is limited to assuring the correct combination of member effective lengths is used for each possible strength limit state. In contrast, a gradual instability approach relies on using an analysis to predict the loss in stiffness of a structure as it is loaded to a strength limit state. As structural stiffness is lost, the resulting increase in deflections produce accelerated member forces and moments that when properly designed for can prevent the system from achieving a wide range of strength limit states. For steel structures, factors contributing to this loss in stiffness primarily include second-order effects, such as the $P-\Delta$ and $P-\delta$ effects, and material yielding accentuated by the presence of residual stresses. This second approach has been titled the *direct analysis method* (or *second-order analysis in Europe*) and because it more consistently and realistically represents system behavior, it has been well received by the design profession as a superior alternative to the effective length method since its introduction in the Hong Kong, U.S., and European codes over a decade ago. With redundant members not being over-designed and critical members not being under-designed, many engineers have the opinion that this method is safer and more economical. This one-day seminar presents the theoretical background and application details of the direct analysis method and a number of examples are given on its practical application. Experiences in using the method will also be shared.

Speakers

Dr. TM Chan, Assistant Professor in Structural Engineering, Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University

Dr. RD Ziemian, Chair of AISC's *TC3-Loads, Analysis, and Stability* and member of AISC's Committee on Specifications, and Professor and Associate Dean, Bucknell University, Lewisburg, PA, USA

Dr. SL Chan, Chair Professor in Computational Structural Engineering, Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University

Official Language

English will be the official language of the Seminar for both oral and written presentation.

Fees & Registration

The registration fee includes a copy of proceedings, a copy of CPD certificate, 2 tea refreshments.

Regular Registration: **HK\$ 1,200** each for HKISC/ HKIE Members; **HK\$ 1,500** each for non HKISC/ HKIE Members.

Group Registration: **HK\$ 1,200** each for group registration of at least 5 people

CPD Certificates

This seminar is recommended for **ONE** CPD day. An attendance certificate will be issued.

Please send the completed registration form with registration fee to **Mr. Sam Chan**, HKISC c/o ZS972, Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon by **7 December 2016** (Tel: 852-3400 3965, Fax No.: 852-2334 6389). You can download this form on HKISC web (<http://www.hkisc.org>) or request through emailing to: samchan@hkisc.org. For further information, please contact Mr. Sam Chan above.

Recent Code Developments for Employing 2nd-Order Analysis – the Direct Analysis Method

Organised by

The Hong Kong Institute of Steel Construction www.hkisc.org

Supporting Organisations

Civil and Joint Structural Divisions, The Hong Kong Institution of Engineers

Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University

Date: 12th December 2016, Monday
Venue: Room Y303, The Hong Kong Polytechnic University,
Hungghom, Kowloon, Hong Kong.
Time: 8:45 am (registration) for 9:00 am to 5:00 pm

REGISTRATION FORM

(To be replied on or before 7th December 2016)

Please follow the 2 steps registration procedure:

1. Fax the completed registration form to Mr. Sam Chan (Fax: 852-2334 6389) for preliminary registration.
2. Post the completed registration form together with a crossed cheque payable to **Hong Kong Institute of Steel Construction Limited** to Mr. Sam Chan, at:
HKISC c/o Room ZS972, Department of Civil and Environmental Engineering,
The Hong Kong Polytechnic University, Hungghom, Kowloon, Hong Kong

To: Mr. Sam Chan

Fax: 852- 2334 6389

A. Personal Details:

Title	Name in full (Block Letter)	Name of company	Tel. (or Fax)	E-mail address	Institution/ Membership No.
1.					
2.					
3.					
4.					
5.					

Postal Address
(for official
receipt): _____

B. Registration Details:

Item	Registration Fee	Total no. of registration	Sub-total
1. Regular registration (Member*price)	HK\$ 1200 each x	_____ person(s)	= HK\$ _____
2. Regular registration (Non-member*price)	HK\$ 1500 each x	_____ person(s)	= HK\$ _____
3. Group registration (at least <u>5</u> people)	HK\$ 1200 each x	_____ person(s)	= HK\$ _____
Total amount:			HK\$

Note: The registration fee includes a copy of proceedings, a copy of CPD certificate, 2 tea refreshments

*Member refers to HKIE or HKISC member

I enclosed a crossed cheque (cheque no. _____) with the sum of HK\$ _____ for the registration fee of the captioned Seminar.

Signature: _____ Date: _____

CPD Certificates of Attendance Please tick the appropriate box to indicate your choice:

Yes, I/we would like to have CPD certificate(s). Not request for certificate(s).

Recent Code Developments for Employing 2nd-Order Analysis – the Direct Analysis Method

Organised by

The Hong Kong Institute of Steel Construction www.hkisc.org

Supporting Organisations

Civil and Joint Structural Divisions, The Hong Kong Institution of Engineers

Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University

Date:	12 th December 2016, Monday
Venue:	Room Y303, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong.
Time:	8:45 am (registration) for 9:00 am to 5:00 pm

Time	Program
8:45 am	Registration
9:00 am	Welcoming Speech Ir Professor Paul Pang, Professor of Practice at PolyU
Lecture 1 9:15 am	A review of nonlinear analysis – from 2 nd -order to inelastic RD Ziemian
Lecture 2 10:00 am	Background for second-order direct and indirect analysis in HK Steel Code 2011 SL Chan
10:45 am	Tea Break
Lecture 3 11:15 am	Semi-rigid design of steel framed structures with illustrative benchmark and practical examples SL Chan
12:00 noon	Lunch
Lecture 4 2:00 pm	An overview of AISC's direct analysis method (2005-2016) – Elastic Design RD Ziemian
Lecture 5 2:45 pm	An overview of AISC's direct analysis method (2005-2016) – Inelastic Design RD Ziemian
3:30 pm	Tea Break
Lecture 6 4:00 pm	Background for structural analysis in Eurocode 3 Design of Steel Structures 2005 TM Chan
5:00 pm	End of Seminar