

ADVANCED STEEL CONSTRUCTION

An International Journal

Volume 8 Number 2

June 2012

CONTENTS

Technical Papers

Approximate Analytical Method of Multi-Storey or High-Rise Steel Three-Dimensional Parking Structures
Yongjun He and Xuhong Zhou

Fire Dynamic Simulation on Thermal Actions in Localized Fires in Large Enclosure
Chao Zhang and Guoqiang Li

Research on Static Property of Suspen-Dome Structure under Heap Load
Jiamin Guo, Shilin Dong and Xingfei Yuan

Uniform Corrosion Wastage Effects on the Load-Carrying Capacity of Damaged Steel Beams
Yasser Sharifi

Higher-Order Non-Linear Analysis of Steel Structures, Part I : Elastic Second-Order Formulation
C.K. Iu and M.A. Bradford

Higher-Order Non-Linear Analysis of Steel Structures, Part II: Refined Plastic Hinge Formulation
C.K. Iu and M.A. Bradford

Test Study on Basic Static Characteristics of Cable Supported Barrel Vault Structure
Wentao Qiao, Zhihua Chen and Mingshan Zhao

Copyright © 2012 by :

The Hong Kong Institute of Steel Construction

Website: <http://www.hkisc.org>

ISSN 1816-112X

Science Citation Index Expanded, Materials Science Citation Index and ISI Alerting

Cover:

THE COAL STORAGE DOMES AT THE ENEL TORREVALDALIGA NORTH THERMOELECTRIC POWER PLANT, ITALY

Credits:

Photo ©: Alfredo D'Amato - Agenzia 7 Minutes

Structural system: MERO Italiana, Verona

Dome Design: Ing. Gilbert Pirozzi, Mero, Verona

Construction Management and Technical Support: ENEL Energy and Innovation Office,

Ing. Giovanni Belloni, Ing. Marco Ulisse, Ing. Ubaldo Savina, Ing. Sergio Castronuovo.

Scientific Consultant: Prof. Federico M. Mazzolani, University of Naples

ADVANCED STEEL CONSTRUCTION

ADVANCED STEEL CONSTRUCTION

an International Journal

ISSN 1816-112X

Volume 8 Number 2

June 2012



Editors-in-Chief

S.L. Chan, *The Hong Kong Polytechnic University, Hong Kong*

W.F. Chen, *University of Hawaii at Manoa, USA*

R. Zandonini, *Trento University, Italy*

VOL. 8, NO. 2 (2012)

ISSN 1816-112X

Science Citation Index Expanded,
Materials Science Citation Index
and ISI Alerting

EDITORS-IN-CHIEF

Asian Pacific, African and organizing Editor

S.L. Chan
*The Hong Kong Polyt. Univ.,
Hong Kong*

American Editor

W.F. Chen
Univ. of Hawaii at Manoa, USA

European Editor

R. Zandonini
Trento Univ., Italy

INTERNATIONAL EDITORIAL BOARD

F.G. Albermani
The Univ. of Queensland, Australia

I. Burgess
Univ. of Sheffield, UK

F.S.K. Bijlaard
Delft Univ. of Technology, The Netherlands

R. Bjorhovde
The Bjorhovde Group, USA

M.A. Bradford
The Univ. of New South Wales, Australia

D. Camotim
Technical Univ. of Lisbon, Portugal

C.M. Chan
Hong Kong Univ. of Science & Technology, Hong
Kong

T.H.T. Chan
Queensland Univ. of Technology, Australia

S.P. Chiew
Nanyang Technological Univ., Singapore

W.K. Chow
The Hong Kong Polyt. Univ., Hong Kong

K.F. Chung
The Hong Kong Polyt. Univ., Hong Kong

G.G. Deierlein
Stanford Univ., California, USA

L. Dezi
Univ. of Ancona, Italy

D. Dubina
The Politehnica Univ. of Timisoara, Romania

R. Greiner
Technical Univ. of Graz, Austria

L. Gardner
Imperial College of Science, Technology and
Medicine, UK

L.H. Han
Tsinghua Univ. China

S. Herion
University of Karlsruhe, Germany

G.W.M. Ho
Ove Arup & Partners Hong Kong Ltd., Hong
Kong

B.A. Izzuddin
Imperial College of Science, Technology and
Medicine, UK

J.P. Jaspart
Univ. of Liege, Belgium

S. A. Jayachandran
IIT Madras, Chennai, India

S. Kitipornchai
City Univ. of Hong Kong, Hong Kong

D. Lam
Univ. of Bradford, UK

G.Q. Li
Tongji Univ., China

J.Y.R. Liew
National Univ. of Singapore, Singapore

E.M. Lui
Syracuse Univ., USA

Y.L. Mo
Univ. of Houston, USA

J.P. Muzeau
CUST, Clermont Ferrand, France

D.A. Nethercot
Imperial College of Science, Technology and
Medicine, UK

Y.Q. Ni
The Hong Kong Polyt. Univ., Hong Kong

D.J. Oehlers
The Univ. of Adelaide, Australia

K. Rasmussen
The Univ. of Sydney, Australia

J.M. Rotter
The Univ. of Edinburgh, UK

C. Scawthorn
Scawthorn Porter Associates, USA

P. Schaumann
Univ. of Hannover, Germany

G.P. Shu
Southeast Univ. China

L. Simões da Silva
Department of Civil Engineering, University of
Coimbra, Portugal

J.G. Teng
The Hong Kong Polyt. Univ., Hong Kong

G.S. Tong
Zhejiang Univ., China

K.C. Tsai
National Taiwan Univ., Taiwan

C.M. Uang
Univ. of California, USA

B. Uy
University of Western Sydney, Australia

M. Veljkovic
Univ. of Lulea, Sweden

F. Wald
Czech Technical Univ. in Prague, Czech

Y.C. Wang
The Univ. of Manchester, UK

Y.L. Xu
The Hong Kong Polyt. Univ., Hong Kong

D. White
Georgia Institute of Technology, USA

E. Yamaguchi
Kyushu Institute of Technology, Japan

Y.B. Yang
National Taiwan Univ., Taiwan

Y.Y. Yang
China Academy of Building Research, Beijing,
China

B. Young
The Univ. of Hong Kong, Hong Kong

X.L. Zhao
Monash Univ., Australia

Z.H. Zhou
Alpha Consultant Ltd., Hong Kong

General Information

Advanced Steel Construction, an international journal

Aims and scope

The International Journal of Advanced Steel Construction provides a platform for the publication and rapid dissemination of original and up-to-date research and technological developments in steel construction, design and analysis. Scope of research papers published in this journal includes but is not limited to theoretical and experimental research on elements, assemblages, systems, material, design philosophy and codification, standards, fabrication, projects of innovative nature and computer techniques. The journal is specifically tailored to channel the exchange of technological know-how between researchers and practitioners. Contributions from all aspects related to the recent developments of advanced steel construction are welcome.

Instructions to authors

Submission of the manuscript. Authors may submit double-spaced manuscripts preferably in MS Word by emailing to one of the chief editors as follows for arrangement of review. Alternatively papers can be submitted on a diskette to one of the chief editors.

Asian Pacific, African and organizing editor : Professor S.L. Chan, Email: ceslchan@polyu.edu.hk
American editor : Professor W.F. Chen, Email: waifah@hawaii.edu
European editor : Professor R. Zandonini, Email: riccardo_zandonini@ing.unitn.it

All manuscripts submitted to the journal are recommended to accompany with a list of four potential reviewers suggested by the author(s). This list should include the complete name, address, telephone and fax numbers, email address, and at least five keywords that identify the expertise of each reviewer. This scheme will improve the process of review.

Style of manuscript

General. Author(s) should provide full postal and email addresses and fax number for correspondence. The manuscript including abstract, keywords, references, figures and tables should be in English with pages numbered and typed with double line spacing on single side of A4 or letter-sized paper. The front page of the article should contain:

- a) a short title (reflecting the content of the paper);
- b) all the name(s) and postal and email addresses of author(s) specifying the author to whom correspondence and proofs should be sent;
- c) an abstract of 100-200 words; and
- d) 5 to 8 keywords.

The paper must contain an introduction and a conclusion. The length of paper should not exceed 25 journal pages (approximately 15,000 words equivalents).

Tables and figures. Tables and figures including photographs should be typed, numbered consecutively in Arabic numerals and with short titles. They should be referred in the text as Figure 1, Table 2, etc. Originally drawn figures and photographs should be provided in a form suitable for photographic reproduction and reduction in the journal.

Mathematical expressions and units. The Systeme Internationale (SI) should be followed whenever possible. The numbers identifying the displayed mathematical expression should be referred to in the text as Eq. (1), Eq. (2).

References. References to published literature should be referred in the text, in the order of citation with Arabic numerals, by the last name(s) of the author(s) (e.g. Zandonini and Zanon [3]) or if more than three authors (e.g. Zandonini et al. [4]). References should be in English with occasional allowance of 1-2 exceptional references in local languages and reflect the current state-of-technology. Journal titles should be abbreviated in the style of the Word List of Scientific Periodicals. References should be cited in the following style [1, 2, 3].

Journal: [1] Chen, W.F. and Kishi, N., "Semi-rigid Steel Beam-to-column Connections, Data Base and Modelling", Journal of Structural Engineering, ASCE, 1989, Vol. 115, No. 1, pp. 105-119.

Book: [2] Chan, S.L. and Chui, P.P.T., "Non-linear Static and Cyclic Analysis of Semi-rigid Steel Frames", Elsevier Science, 2000.

Proceedings: [3] Zandonini, R. and Zanon, P., "Experimental Analysis of Steel Beams with Semi-rigid Joints", Proceedings of International Conference on Advances in Steel Structures, Hong Kong, 1996, Vol. 1, pp. 356-364.

Proofs. Proof will be sent to the corresponding author to correct any typesetting errors. Alternations to the original manuscript at this stage will not be accepted. Proofs should be returned within 48 hours of receipt by Express Mail, Fax or Email.

Copyright. Submission of an article to "Advanced Steel Construction" implies that it presents the original and unpublished work, and not under consideration for publication nor published elsewhere. On acceptance of a manuscript submitted, the copyright thereof is transferred to the publisher by the Transfer of Copyright Agreement and upon the acceptance of publication for the papers, the corresponding author must sign the form for Transfer of Copyright.

Permission. Quoting from this journal is granted provided that the customary acknowledgement is given to the source.

Page charge and Reprints. There will be no page charges if the length of paper is within the limit of 25 journal pages. A total of 30 free offprints will be supplied free of charge to the corresponding author. Purchasing orders for additional offprints can be made on order forms which will be sent to the authors. These instructions can be obtained at the Hong Kong Institute of Steel Construction, Journal website: <http://www.hkisc.org>

The International Journal of Advanced Steel Construction is published quarterly by non-profit making learnt society, The Hong Kong Institute of Steel Construction, c/o Department of Civil & Structural Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong.

Disclaimer. No responsibility is assumed for any injury and / or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein.

Subscription inquiries and change of address. Address all subscription inquiries and correspondence to Member Records, IJASC. Notify an address change as soon as possible. All communications should include both old and new addresses with zip codes and be accompanied by a mailing label from a recent issue. Allow six weeks for all changes to become effective.

The Hong Kong Institute of Steel Construction

HKISC

c/o Department of Civil and Structural Engineering,

The Hong Kong Polytechnic University,

Hunghom, Kowloon, Hong Kong, China.

Tel: 852- 2766 6047 Fax: 852- 2334 6389

Email: ceslchan@polyu.edu.hk Website: <http://www.hkisc.org/>

ISSN 1816-112X

Science Citation Index Expanded, Materials Science Citation Index and ISI Alerting

Copyright © 2012 by:

The Hong Kong Institute of Steel Construction.



ISSN 1816-112X

Science Citation Index Expanded,
Materials Science Citation Index and
ISI Alerting

EDITORS-IN-CHIEF

Asian Pacific, African and organizing Editor

S.L. Chan
*The Hong Kong Polyt. Univ.,
Hong Kong*
Email: ceslchan@polyu.edu.hk

American Editor

W.F. Chen
Univ. of Hawaii at Manoa, USA
Email: waifah@hawaii.edu

European Editor

R. Zandonini
Trento Univ., Italy
Email: riccardo.zandonini@ing.unitn.it

Advanced Steel Construction

an international journal

VOLUME 8 NUMBER 2

JUNE 2012

Technical Papers

- | | |
|--|-----|
| Approximate Analytical Method of Multi-Storey or High-Rise Steel Three-Dimensional Parking Structures
<i>Yongjun He and Xuhong Zhou</i> | 112 |
| Fire Dynamic Simulation on Thermal Actions in Localized fires in Large Enclosure
<i>Chao Zhang and Guoqiang Li</i> | 124 |
| Research on Static Property of Suspen-Dome Structure under Heap Load
<i>Jiamin Guo, Shilin Dong and Xingfei Yuan</i> | 137 |
| Uniform Corrosion Wastage Effects on the Load-Carrying Capacity of Damaged Steel Beams
<i>Yasser Sharifi</i> | 153 |
| Higher-Order Non-Linear Analysis of Steel Structures, Part I: Elastic Second-Order Formulation
<i>C.K. Iu and M.A. Bradford</i> | 168 |
| Higher-Order Non-Linear Analysis of Steel Structures, Part II: Refined Plastic Hinge Formulation
<i>C.K. Iu and M.A. Bradford</i> | 183 |
| Test Study on Basic Static Characteristics of Cable Supported Barrel Vault Structure
<i>Wentao Qiao, Zhihua Chen and Mingshan Zhao</i> | 199 |