

**Proceedings of the  
Ninth International Conference on  
Civil and Structural Engineering Computing**

## **Civil-Comp Press Books on Computational Engineering**

**Proceedings of the Seventh International Conference on the Application of Artificial Intelligence to Civil and Structural Engineering**

*Edited by: B.H.V. Topping*

**Proceedings of the Eighth International Conference on Civil and Structural Engineering Computing**

*Edited by: B.H.V. Topping*

**Proceedings of the Third International Conference on Engineering Computational Technology**

*Edited by: B.H.V. Topping and Z. Bittnar*

**Proceedings of the Sixth International Conference on Computational Structures Technology**

*Edited by: B.H.V. Topping and Z. Bittnar*

## **Saxe-Coburg Publications on Computational Engineering**

**Object Oriented Methods and Finite Element Analysis**

*R.I. Mackie*

**Computational Modelling of Masonry, Brickwork and Blockwork Structures**

*Edited by: J.W. Bull*

**Innovative Computational Methods for Structural Mechanics**

*Edited by: M. Papadrakakis and B.H.V. Topping*

**High Performance Computing for Computational Mechanics**

*Edited by: B.H.V. Topping and L. Lämmer*

**Computational Mechanics using High Performance Computing**

*Edited by: B.H.V. Topping*

**Computational Mechanics for the Twenty-First Century**

*Edited by: B.H.V. Topping*

**Civil and Structural Engineering Computing: 2001**

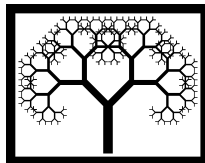
*Edited by: B.H.V. Topping*

**Parallel Finite Element Computations**

*B.H.V. Topping and A.I. Khan*

**Proceedings of the  
Ninth International Conference on  
Civil and Structural Engineering  
Computing**

*Edited by*  
**B.H.V. Topping**



**CIVIL-COMP PRESS**

© Civil-Comp Ltd, Stirling, Scotland

published 2003 by

**Civil-Comp Press**

Dun Eaglais, Kippen

Stirling, FK8 3DY, UK

*Civil-Comp Press is an imprint of Civil-Comp Ltd*

ISBN 0-948749-87-3 (Book)

ISBN 0-948749-88-1 (CD-Rom)

ISBN 0-948749-89-X (Combined Set)

**British Library Cataloguing in Publication Data**

A catalogue record for this book is available from the British Library

Cover Image: The J.C.J. Van Speyk lighthouse at Egmond-aan-Zee was built in 1833-34. It was redesigned in 1838-41 and dedicated to maritime hero Lieutenant Van Speyk, who blew up his ship including himself in 1831 to escape from the hands of Belgian rebels in Antwerp harbour. It is still a working lighthouse guarding the North Sea. (International Navigation Aid number B0842. Position: 52 37.3N 4 37.6E. Character: Iso.W.R. 10s. Specifics: W. 010-175, R. -188, obsc. -010. Range: W. 18nm (45000cd), R. 14 nm (11000cd). Light elevation: 37m. Structure height 28m.)

Printed in Great Britain by Bell & Bain Ltd, Glasgow

# Contents

<b>Preface</b>		<b>xv</b>
<b>I</b>	<b>Internet Applications</b>	<b>1</b>
1	The Influence of Internet-Based Construction Portals P.J. Gardner	3
2	Web Based Computation for Urban Earthquake Disaster Mitigation P. Zhu, M. Abe and J. Kiyono	5
<b>II</b>	<b>Software Developments and Applications</b>	<b>7</b>
3	Data Extraction in Engineering Software using XML M.E. Williams, G.R. Consolazio and M.I. Hoit	9
4	Extending Finite Element Software by Component-Oriented Technology M. Dolenc	11
<b>III</b>	<b>Construction Engineering: Design, Control and Management</b>	<b>13</b>
5	Virtual Experiments for Innovative Construction Operations H. Li and S. Kong	15
6	Spatio-Temporal Consistency Evaluation on Dynamic 3D Space System Model Y. Song, D.K.H. Chua, C.L. Chang and S.H. Bok	17
7	Visual Product Chronology: A Solution for Linking Product Modelling Technology with Practical Construction Needs K. Kähkönen and J. Leinonen	19
8	Analytic Modelling, Diagnostic and Change-Engineering Tools for Use by Management to Foster Learning in Construction Design Organisations M. Phiri	21

9	The Application of an On-Site Inspection Support System to a Hydropower Plant T. Sakata and N. Yabuki	23
10	Efficient Algorithms for Octree-Based Geometric Modelling R.-P. Mundani, H.-J. Bungartz, E. Rank, R. Romberg and A. Niggel	25
<b>IV</b>	<b>Structural Analysis and Structural Re-Analysis</b>	<b>27</b>
11	An Efficient Method for Decomposition of Regular Structures using Algebraic Graph Theory A. Kaveh and H. Rahami	29
12	Derivation and Implementation of a Flexibility-Based Large Increment Method for Solving Non-Linear Structural Problems W. Barham, A.J. Aref and G.F. Dargush	31
13	The Theorems of Structural Variation for Rectangular Finite Elements for Plate Flexure M.P. Saka	33
14	A Triangular Finite Element for the Geometrically Nonlinear Analysis of Composite Shells E. Gal and R. Levy	35
<b>V</b>	<b>Chaos</b>	<b>37</b>
15	Spatial Chaos of Buckled Elastica using the Kirchhoff Analogy of a Gyrostat A.Y.T. Leung, J.L. Kuang, C.W. Lim and B. Zhu	39
<b>VI</b>	<b>Boundary and Finite Element Methods: Theory and Methods</b>	<b>41</b>
16	Boundary Element Analysis of Contact Film Stiffness R.S. Hack and A.A. Becker	43
17	Dynamics of a Tunnel: Coupling of Finite Element (FEM) and Integral Transform Techniques (ITM) H. Grundmann and K. Müller	45
18	A Mixed Enthalpy–Temperature Finite Element Method for Generalized Phase-Change Problems K. Krabbenhoft and L. Damkilde	47
19	On Multi-Field Approximation Methods G. Romano, F. Marotti de Sciarra and M. Diaco	49

20	Automatic Differentiation in Computational Mechanics P.R.B. Devloo and E.S.R. Santos	51
<b>VII</b>	<b>Modelling and Finite Element Mesh Generation</b>	<b>53</b>
21	Improvement of Mesh Quality by Combining Smoothing Techniques and Local Refinement J.M. Escobar, R. Montenegro, G. Montero, E. Rodríguez and J.M. González-Yuste	55
22	<i>hp</i> Auto Adaptive Finite Element Method on 3D Heterogeneous Meshes P.R.B Devloo, C.M.A.A. Bravo and E.C. Rylo	57
<b>VIII</b>	<b>Solution Methods for Large Scale Problems</b>	<b>59</b>
23	Modified Versions of QMR-Type Methods M.D. García, E. Flórez, A. Suárez, L. González and G. Montero	61
24	Numerical Solution of Coupled Problems J. Kruis, T. Krejčí and Z. Bittnar	63
<b>IX</b>	<b>Finite Element Studies</b>	<b>65</b>
25	The Fatigue Life Remaining in an Airfield Runway Following an Underground Explosion J.W. Bull and C.H. Woodford	67
26	A Design Chart for the Design of Flexible Pavements Based on Finite Elements B.C. Bodhinayake and M.N.S. Hadi	69
27	Modelling of Ferrule Strap Connections to uPVC Pipes F. Pozzessere, N.A. Alexander and R. Potter	71
28	Finite Element Modelling of Interactions between Openings in OSB Webbed Timber I-Beams E.C. Zhu, Z.W. Guan, P.D. Rodd, D.J. Pope	73
29	Finite Element Modelling of Glulam Beams Prestressed with Pultruded GRP Z.W. Guan, P.D. Rodd and D.J. Pope	75
30	Numerical Study on Semi-Rigid Racking Frames M. Abdel-Jaber, R.G. Beale and M.H.R. Godley	77

31	Numerical Evaluation of Required Ductility and Load Bearing Capacity for Aluminium Alloy Continuous Beams M. Manganiello, G. De Matteis, R. Landolfo and F.M. Mazzolani	79
<b>X</b>	<b>Analysis of Plates</b>	<b>81</b>
32	Non-Linear Finite Element Analysis of Functionally Graded Material Sector Plates M. Salehi and M. Tayefeh	83
33	Micro as Required for Macromechanics of Circular, Annular and Sector Plates M. Salehi and M. Tayefeh	85
34	An Explicit Geometric Stiffness Matrix of a Triangular Flat Plate Element for the Geometric Nonlinear Analysis of Shell Structures J.-T. Chang and I.-D. Huang	87
35	Annular Sector Plates: Comparison of Full-Section and Layer Yield Predictions G.J. Turvey and M. Salehi	89
36	Analysis of Stiffened Plates: An Effective Semi-Analytical Method J.S. Kuang and H.X. Zhang	91
37	Reissner-Mindlin Plate Bending Elements with Shear Freedoms B.A. Izzuddin and D. Lloyd Smith	93
38	Experimental Response and Numerical Simulation of Plates Submitted to Small Mass Impact H. Lopes, R.M. Guedes, M.A. Vaz and J.D. Rodrigues	95
39	Analysis of Cracked Plates using Hierarchical Trigonometric Functions Y.V. Satish Kumar and Y.S. Suh	97
40	On the Computation of Stress Resultants for Plates with Free Edges using the Ritz Method C.M. Wang and Y. Xiang	99
41	Implementation of a Hybrid-Mixed Stress Model based on the Use of Wavelets L.M. Santos Castro and A.R. Barbosa	101
<b>XI</b>	<b>Computer Aided Design and Analysis of Steel Structures</b> Session organised by M. Iványi	<b>103</b>
42	Buckling Modes of Flattened Edges Rectangular Hollow Members A. Fülöp and M. Iványi	105



43	Object-Oriented Implementation of a Modified Heterosis Plate Finite Element J. Balogh, M. Iványi and R.M. Gutkowski	107
44	Numerical Study on Eccentrically Loaded Hot Rolled Steel Single Angle Struts S. Sambasiva Rao, S.R. Satish Kumar and V. Kalyanaraman	109
45	Integrated Explosion and Fire Analysis of Space Steel Frame Structures H. Chen and J.Y.R. Liew	111
46	Finite Element Simulations of Lateral Torsional Buckling of Tapered Cantilever Beams P. Buffel, G. Lagae, R. Van Impe, W. Vanlaere and M. De Beule	113
<b>XII</b>	<b>Reinforced Concrete Modelling and Analysis</b>	<b>115</b>
47	Hybrid-Mixed Stress Model for the Non-Linear Analysis of Concrete Structures C.M. Silva and L.M. Santos Castro	117
48	Damage-Based Computational Model for Concrete A.H. Al-Gadhib	119
49	An Advanced Concrete Model for RC and Composite Floor Slabs subject to Extreme Loading B.A. Izzuddin and A.Y. Elghazouli	121
50	A Unified Failure Criterion for Finite Element Analysis of Concrete Structures P.E.C. Seow, S. Swaddiwudhipong and K.K. Tho	123
51	Evaluation of the Fiber Orientation Effects on the Ductility of the Confined Concrete Elements L. Anania, A. Badalà and G. Failla	125
52	Analytical Integration over Cross-Sections in the Analysis of Spatial Reinforced-Concrete Beams D. Zupan and M. Saje	127
<b>XIII</b>	<b>Reinforced Concrete Structures: Analysis and Design</b>	<b>129</b>
53	Combined Finite Strip and Beam Elements for Double Tee Slabs M.A. Ghadeer, J.Q. Ye and A.H. Mansouri	131
54	Effect of Support Conditions on Strut-and-Tie Model of Deep Beams with Web Openings H. Guan, J. Parsons and S. Fragomeni	133

55	Cyclic Response of RC Shear Walls H.G. Kwak and D.Y. Kim	135
56	Modelling of Interior Column Loads Transmission through Flat-Plate Floors S.A. Ali Shah and Y. Ribakov	137
57	Size Effect of Compressed Concrete in the Ultimate Limit States of RC Elements A.P. Fantilli, I. Iori and P. Vallini	139
58	Limit Analysis of Reinforced Concrete Shells of Revolution and its Application M.A. Danieli (Danielashvili)	141
<b>XIV</b>	<b>Materials Modelling</b>	<b>143</b>
59	Adaptive Simulation of Materials with Quasi-Brittle Failure D. Rypl, B. Patzák and Z. Bittnar	145
60	Modelling of High Strength Concrete Structures J. Němeček and Z. Bittnar	147
61	Flowable Concrete: Three-Dimensional Quantitative Simulation and Applications M.A. Noor and T. Uomoto	149
62	Analytical Modeling of Rheology of High Flowing Mortar and Concrete M.A. Noor and T. Uomoto	151
63	Material Sensitivity Studies for Homogenised Superconducting Composites M. Kamiński	153
64	Discontinuous Models for Modelling Fracture of Quasi-Brittle Materials K. De Proft, W.P. De Wilde, G.N. Wells and L.J. Sluys	155
<b>XV</b>	<b>Static and Dynamic Analysis of Steel and Composite Structures</b> Session organised by P.C.G. da S. Vellasco and J.G.S. da Silva	<b>157</b>
65	Effect of Cooling on the Behaviour of a Steel Beam under Fire Loading including the End Joint Response A. Santiago, L. Simões da Silva, P. Vila Real and J.M. Franssen	159
66	Influence of Joint Slippage on the Cyclic Response of Steel Frames P. Nogueiro, L. Simões da Silva and R. Bento	161

67	Behaviour of Pin Connected Tension Joints R. Simões and L. Simões da Silva	163
68	Characterisation of the Behaviour of the Column Web Loaded in Out-of-Plane Bending in the Framework of the Component Method L.C. Neves, L. Simões da Silva and P.C.G. da S. Vellasco	165
69	Evaluation of the Post-Limit Stiffness of Beam-to-Column Semi-Rigid Joints using Genetic Algorithms L.A.C. Borges, L.R.O. de Lima, L.A.P.S. da Silva and P.C.G. da S. Vellasco	167
70	The Influence of Structural Steel Design Models on the Behaviour of Slender Transmission and Telecommunication Towers J.G.S. da Silva, P.C.G. da S. Vellasco, S.A.L. de Andrade and M.I.R. de Oliveira	169
71	Partial-Strength Beam-to-Column Joints for High Ductile Steel- Concrete Composite Frames O.S. Bursi, D. Lucchesi and W. Salvatore	171
<b>XVI</b>	<b>Vibration Engineering</b>	<b>173</b>
72	A Dynamical Parametric Analysis of Semi-Rigid Portal Frames J.G.S. da Silva, P.C.G. da S. Vellasco, S.A.L. de Andrade, L.R.O. de Lima and R. de K.D. Lopes	175
73	A Survey of Vibration Serviceability Criteria for Structures A. Ebrahimpour and R.L. Sack	177
74	Free Vibration of Metallic and Composite Beams Exhibiting Bending-Torsion Coupling H. Su, C.W. Cheung and J.R. Banerjee	179
75	Hybrid Finite Element Analysis of Vibrations of Anisotropic Cylindrical Shells Conveying Fluid M.H. Toorani, A.A. Lakis and M. Gou	181
<b>XVII</b>	<b>Behaviour of Structures for Dynamic and Moving Loads</b> Session organised by D. Le Houédec and L. Frýba	<b>183</b>
76	Stress Ranges in Bridges under High Speed Trains L. Frýba, C. Fischer and J.-D. Yau	185
77	FEM and FEM-BEM Application for Vibration Prediction and Mitigation of Track and Ground Dynamic Interaction under High-Speed Trains H. Takemiya and M. Kojima	187

78	Dynamic Behaviour of Ballasted Railway Tracks: a Discrete/ Continuous Approach L. Ricci, V.H. Nguyen, K. Sab, D. Duhamel and L. Schmitt	189
79	Modelling of Multilayer Viscoelastic Road Structures under Moving Loads D. Duhamel, V.H. Nguyen, A. Chabot and P. Tamagny	191
80	Numerical and Experimental Comparison of 3D-Model for the Study of Railway Vibrations B. Picoux and D. Le Houédec	193
81	Train-Bridge Interaction G. De Roeck, E. Claes and H. Xia	195
82	Influence of the Second Flexural Mode on the Response of High-Speed Bridges P. Museros and E. Alarcón	197
83	Modal Contributions to the Dynamic Response of Simply Supported Bridges for High Speed Vehicles M.D. Martínez-Rodrigo, P. Museros and M.L. Romero	199
84	Dynamic Diagnosis of Bridges J. Benčat	201
85	Influence of the High Speeds of Moving Trains on the Dynamic Behaviour of Multi-Span Bridges: Comparative Study with Various Types of French Bridges K. Henchi, M. Fafard and C. Quézel	203
<b>XVIII</b>	<b>Bridge, Railway and Road Engineering: Dynamics and Modelling</b>	<b>205</b>
86	Stochastic Analysis of Suspension Bridges for Different Correlation Functions S. Adanur, A.A. Dumanoglu and K. Soyuk	207
87	Train-Induced Ground Vibrations: Experiments and Theory A. Ditzel and G.C. Herman	209
88	Wheel-Rail Contact Elements Incorporating Rail Irregularities C.J. Bowe and T.P. Mullarkey	211
89	Analysis of Bridge-Vehicle Interaction by Component-Mode Synthesis Method B. Biondi, G. Muscolino and A. Sofi	213
90	Analysis of Cable-Stayed Bridges Under Propagating Excitation by Random Vibration and Deterministic Methods K. Soyuk and A.A. Dumanoglu	215

91	Harmonic Excitation of Bridges by Traffic Loads M.M. Husain and M.K. Swailem	217
92	Dynamic Effect of Vehicles on Multispan Pre-Stressed Concrete Bridges over Rivers A.Z. Awad and M.K. Swailem	219
93	Development and Application of an IFC-Based Bridge Product Model N. Yabuki and T. Shitani	221
94	High Performance Computing for High Speed Railways L. Argandoña, E. Arias, J. Benet, F. Cuartero and T. Rojo	223
95	On the Analysis of Structure and Ground Borne Noise from Moving Sources L. Andersen, S.R.K. Nielsen and S. Krenk	225
<b>XIX</b>	<b>Computational Techniques for Composite Materials</b> Session organised by A. Riccio	<b>227</b>
96	Influence of Loading Conditions on Impact Induced Delamination in Stiffened Composite Panels A. Riccio and N. Tessitore	229
97	Optimisation of Fibre Arrangement of Filament Wound Liquid Oxygen Composite Tanks R. Barboni, G. Tomassetti and M. de Benedetti	231
98	Simulating Damage and Permanent Strain in Composites under In-Plane Fatigue Loading W. Van Paepegem and J. Degrieck	233
<b>XX</b>	<b>Analysis of Masonry Structures</b>	<b>235</b>
99	Investigation of FRP Consolidated Masonry Panels A. Baratta and I. Corbi	237
100	Finite Element Model of a Brick Masonry Four-Sided Cloister Vault Reinforced with FRPs F. Portioli and R. Landolfo	239
101	Modelling Masonry Arch Bridges using Commercial Finite Element Software T.E. Ford, C.E. Augarde and S.S. Tuxford	241
102	Collapse Analysis of Masonry Arch Bridges T. Aoki and D. Sabia	243

103	Limit Analysis of No Tension Bodies and Non Linear Programming A. Baratta and O. Corbi	245
104	The Computational Efficiency of Two Rigid Block Analysis Formulations for Application to Masonry Structures H.M. Ahmed and M. Gilbert	247
<b>XXI</b>	<b>Seismic Analysis and Design</b>	<b>249</b>
105	Site Effect Induced in the El-Asnam (Algeria) Earthquake of 10 October 1980 K. Tounsi and M. Hammoutène	251
106	Influence of Damping Systems on Building Structures Subject to Seismic Effects J. Marko, D. Thambiratnam and N. Perera	253
107	A New Approach to Seismic Correction using Recursive Least Squares and Wavelet De-Noising A.A. Chanerley and N.A. Alexander	255
108	Nonlinear Dynamic Analysis of RC Frames under Earthquake Loading H.G. Kwak and S.P. Kim	257
109	Probabilistic Model for Seismogenetic Areas in Seismic Risk Analyses A. Baratta and I. Corbi	259
110	Behaviour of Solid Waste Landfill Liners under Earthquake Loading S.P. Gopal Madabhushi and S. Singh	261
111	Energy Dissipation and Behaviour of Building Façade Systems under Seismic Loads R. Hareer, D. Thambiratnam and N. Perera	263
112	Dam-Reservoir Interaction for Incompressible-Unbounded Fluid Domains using a New Truncation Boundary Condition S. Küçükarslan	265
<b>XXII</b>	<b>Active and Passive Control of Structures</b>	<b>267</b>
113	Geometrically Nonlinear Spring and Dash-pot Elements in Base Isolation Systems C.P. Katsaras, V.K. Koumoussis and P. Tsopelas	269
114	Design of Smart Beams for Suppression of Wind-Induced Vibrations G.E. Stavroulakis, G. Foutsitzi, V. Hadjigeorgiou, D. Marinova and C.C. Baniotopoulos	271

115	Continuous Bounded Controller for Active Control of Structures Y. Arfiadi and M.N.S. Hadi	273
<b>XXIII Structural Identification and Damage Detection</b>		<b>275</b>
116	Parameter Identification Method using Wavelet Transform T. Ohkami, J. Nagao and S. Koyama	277
117	Damage Location Plot: A Non-Destructive Structural Damage Detection Technique D. Huynh, J. He and D. Tran	279
<b>XXIV Structural Reliability: Analysis and Design</b>		<b>281</b>
118	Simulation-Based Reliability Assessment of Tension Structures S. Kmet, M. Tomko and J. Brda	283
119	Fuzzy Cluster Design: A New Way for Structural Design B. Möller, M. Beer and M. Liebscher	285
120	Numerical Estimation of Sensitivities for Complex Probabilistically- Described Systems R.E. Melchers and M. Ahammed	287
<b>XXV Water Engineering</b>		<b>289</b>
121	A Peaking Factor Based Statistical Approach to the Incorporation of Variations in Demands in the Reliability Analysis of Water Distribution Systems S. Surendran, T.T. Tanyimboh and M. Tabesh	291
122	Water System Entropy: A Study of Redundancy as a Possible Lurking Variable Y. Setiadi, T.T. Tanyimboh, A.B. Templeman and B. Tahar	293
<b>XXVI Geotechnical Engineering</b>		<b>295</b>
123	Analysis of Pipe-Soil Interaction for Pipejacking K.J. Shou and F.W. Chang	297
124	Static and Pseudo-Static Retaining Wall Earth Pressure Analysis using the Discrete Element Method A.A. Mirghasemi and M. Maleki-Javan	299
125	Numerical and Physical Modelling of the Behaviour of Vertical Anchor Walls in Cohesionless Soil E.A. Dickin	301

126	Ground Displacements around a Tunnel using Three Dimensional Modelling M.K. Swailem and A.Z. Awad	303
127	Effects of Inertial Interaction in Seismic Soil-Pile-Structure Interaction D.M. Chu and K.Z. Truman	305
128	Wave-Induced Pore Pressure and Effective Stresses in the Vicinity of a Breakwater D.-S. Jeng and M. Lin	307
<b>XXVII Structural Optimisation</b>		<b>309</b>
129	Multi-Objective Optimization Approach to Design and Detailing of RC Frames M. Lepš, R. Vondráček, J. Zeman and Z. Bittnar	311
130	Design of Frames using Genetic Algorithms, Force Method and Graph Theory A. Kaveh and M. Abdie	313
131	Topology Optimization using Homogenization Y. Wang, M. Xie and D. Tran	315
132	Evolutionary Topological Design of Three Dimensional Solid Structures S. Savas, M. Ulker and M.P. Saka	317
133	Reliability Based Optimization of Complex Structures using Competitive GAs C.K. Dimou and V.K. Koumouisis	319
134	Optimal Design of Curved Pre-Stressed Box Girder Bridges N. Maniatis and V. Koumouisis	321
135	A Simple Self-Design Methodology to Minimise Mass for Composite Structures M. Walker, R. Smith and D. Jonson	323
<b>XXVIII Parallel and Distributed Computations</b>		<b>325</b>
136	Distributed Finite Element Analysis and the .NET Framework R.I. Mackie	327
137	A Low-Cost Parallel Architecture, the Hybrid System, for Solving a Large Linear Matrix System C.S. Leo, G. Leedham, C.J. Leo and H. Schroder	329



138	Static Partitioning for Heterogeneous Computational Environments P. Iványi and B.H.V. Topping	331
<b>XXIX</b>	<b>Education</b>	<b>333</b>
139	EuroCADcrete, a Concrete Exercise with the Help of Computer Aided Learning R. Weener and B. Kumar	335
	<b>Author Index</b>	<b>337</b>
	<b>Keyword Index</b>	<b>341</b>



# Preface

This volume comprises the extended abstracts of contributed papers presented at The Ninth International Conference on Civil and Structural Engineering Computing (Civil-Comp 2003). The full papers from the conference are available on the accompanying CD-ROM.

The conference was held concurrently with The Seventh International Conference on the Application of Artificial Intelligence to Civil and Structural Engineering (AICivil-Comp 2003). Both conferences were held at Egmond-aan-Zee, The Netherlands, from 2 to 4 September 2003. These conferences are part of the Civil-Comp series that commenced in 1983. This conference, held on the 20th anniversary of the first Civil-Comp Conference, demonstrates that even after twenty years many of the original domains of the 1983 conference are still active research themes, although the technology is now at a state of development that we could only dream about in 1983. The topics included in these Proceedings are:

- Internet Applications
- Software Developments and Applications
- Construction Engineering: Design, Control and Management
- Structural Analysis and Structural Re-Analysis
- Chaos
- Boundary and Finite Element Methods: Theory and Methods
- Modelling and Finite Element Mesh Generation
- Solution Methods for Large Scale Problems
- Finite Element Studies
- Analysis of Plates
- Computer Aided Design and Analysis of Steel Structures (special session organised by M. Iványi)
- Reinforced Concrete Modelling and Analysis
- Reinforced Concrete Structures: Analysis and Design
- Materials Modelling
- Static and Dynamic Analysis of Steel and Composite Structures (special session

organised by P.C.G. da S. Vellasco and J.G.S. da Silva)

- Vibration Engineering
- Behaviour of Structures for Dynamic and Moving Loads (special session organised by D. Le Houédec and L. Frýba)
- Bridge, Railway and Road Engineering: Dynamics and Modelling
- Computational Techniques for Composite Materials (special session organised by A. Riccio)
- Analysis of Masonry Structures
- Seismic Analysis and Design
- Active and Passive Control of Structures
- Structural Identification and Damage Detection
- Structural Reliability: Analysis and Design
- Water Engineering
- Geotechnical Engineering
- Structural Optimisation
- Parallel and Distributed Computations
- Education

I should like to thank all the authors and co-authors of the papers included in this volume of proceedings. I am especially grateful to those who took the time and made the effort to participate at Egmond-aan-Zee.

Finally, I should like to thank the members of the Conference Editorial Board for their help before and during the conference: Professor H. Adeli, USA; Dr A.M. Al-sugair, Saudi Arabia; Dr A.J. Aref, USA; Dr C.E. Augarde, England; Professor A.N. Baldwin, England; Professor C.C. Baniotopoulos, Greece; Professor M.R. Barnes, England; Dr J. Baugh, USA; Professor A.A. Becker, England; Dr D.W. Begg, England; Professor A. Benjeddou, France; Dr F.A. Branco, Portugal; Dr J. Bull, England; Professor O. Bursi, Italy; Dr F. Cai, Japan; Dr R. Carneiro-Barros, Portugal; Dr J.M.A. Cesar de Sa, Portugal; Dr S. Chandra, India; Professor Y.K. Chow, Singapore; Professor G. Cooper, England; Professor G. De Roeck, Belgium; Professor G. Degrande, Belgium; Professor M.C. Deo, India; Professor J. Ermopoulos, Greece; Dr W. Ferguson, Scotland; Dr M.A. Fischer, USA; Professor L. Frýba, Czech Republic; Dr M. Fuchs, Israel; Dr H. Furuta, Japan; Dr P. Gardner, England; Professor D. Grierson, Canada; Dr R.M. Guedes, Portugal; Dr M.N.S. Hadi, Australia; Professor P. Hajela, USA; Dr M. Hirokane, Japan; Professor G. Hofstetter, Austria; Dr S.H. Hsieh, Taiwan; Dr D.C.K. Huat, Singapore; Professor M. Iványi, Hungary; Dr P. Iványi, Scotland; Dr B.A. Izzuddin, England; Dr P. Jayachandran, USA; Dr D.S. Jeng, Australia; Dr E. Kameshki, Bahrain; Dr M. Kaminski, Poland; Professor A. Kaveh, Iran; Dr T. Kerh, Taiwan; Dr E. Kita, Japan; Professor S. Kmet, Slovakia; Dr H.G. Kwak, Korea; Dr A.K.H. Kwan, Hong Kong; Dr A.S.K. Kwan, Wales; Professor D. Le Houédec,

France; Professor P. Leger, Canada; Dr C.J. Leo, Australia; Professor A.Y.T. Leung, Hong Kong; Professor R. Levy, Israel; Professor H.L. Li, Hong Kong; Professor J.Y.R. Liew, Singapore; Professor Y. Liong, Singapore; Dr P. Love, Australia; Dr W.Z. Lu, Hong Kong; Mr J.L. Mackerle, Sweden; Dr R.I. Mackie, Scotland; Dr J.L. Marcelin, France; Professor K. Marti, Germany; Professor R.E. Melchers, Australia; Professor J.C. Miles, Wales; Dr S.A. Mirza, Canada; Professor B. Möller, Germany; Dr M. Muniz de Farias, Brazil; Dr G. Muscolino, Italy; Dr S.T. Ng, Hong Kong; Dr T. Nouri-Baranger, France; Dr K. Orsborn, Sweden; Professor M. Papadrakakis, Greece; Professor H. Pasternak, Germany; Dr M. Pavlovic, England; Dr M. Phiri, England; Professor A. Ramanezianpour, Iran; Professor M. Raof, England; Dr Y. Ribakov, Israel; Dr A. Riccio, Italy; Dr C.M. Romanel, Brazil; Professor M.L. Romero, Spain; Professor R.L. Sack, USA; Professor M.P. Saka, Bahrain; Professor A. Samartin, Spain; Dr L.M. Santos Castro, Portugal; Dr T. Sayed, Canada; Professor N.E. Shanmugam, Singapore; Dr L. Simoni, Italy; Professor S. Singh, USA; Professor V.P. Singh, USA; Dr T.T. Soong, USA; Dr R. Spallino, Germany; Dr B. Stok, Slovenia; Dr N.K. Subedi, Scotland; Dr C. Symakezis, Greece; Dr I. Takahashi, Japan; Professor D. Thambiratnam, Australia; Professor H.R. Thomas, Wales; Professor B.H.V. Topping, Scotland; Dr D. Tran, Australia; Dr G. Turvey, England; Dr P. Vallini, Italy; Professor C.M. Wang, Singapore; Dr Y.B. Yang, Taiwan; Dr J.Q. Ye, England; and Professor A. Zingoni, South Africa.

I am particularly grateful for the efforts of: Professor M. Iványi, Professor D. Le Houédec, Professor L. Frýba, Dr A. Riccio, Professor P.C.G. da S. Vellasco and Dr J.G.S. da Silva who organised the special sessions.

Other papers presented at the conferences in 2003 are published as follows:

- *The Contributed Papers from AICivil-Comp 2003 are published in: Proceedings of The Seventh International Conference on the Application of Artificial Intelligence to Civil and Structural Engineering*, B.H.V. Topping, (Editor), (Book of Abstracts and CD-ROM), Civil-Comp Press, Stirling, Scotland, 2003.
- *The Invited Lectures from Civil-Comp 2003 and AICivil-Comp 2003 are published in: Progress in Civil and Structural Engineering Computing*, B.H.V. Topping, (Editor), Saxe-Coburg Publications, Stirling, Scotland, 2003.

These Conferences could not have been organised without the contribution of many who helped in their planning, organisation and execution. I am particularly grateful to Jelle Muylle, Judy Tait and Peter Iványi.

Barry H.V. Topping