

# **Developments in Structural Engineering and Construction Technology**

Editors:

**Djwantoro Hardjito**

**Antoni**

**Ima Muljati**

**Proceedings of the Benjamin Lumantarna Symposium on Structural  
Engineering and Construction Technology, Surabaya, Indonesia  
14 September, 2012**

# **Developments in Structural Engineering and Construction Technology**

Edited by

**Djwantoro Hardjito, Antoni & Ima Muljati**

*Department of Civil Engineering*

*Petra Christian University*

*Surabaya, Indonesia*

Cover design and lay-out by

**Deddi Duto Hartanto**

Published by

Institute for Research and Community Service

Petra Christian University

Surabaya, Indonesia

Copyright @2012 by Institute for Research and Community Service  
Petra Christian University, Surabaya, Indonesia

*All rights reserved. No part of this publication or the information contained herein may be reproduced, stored in a retrieval system, or transmitted in any form or by no means, electronic, mechanical, by photocopying, recording or otherwise, without written permission from the publisher.*

*Although all care is taken to ensure the integrity and quality of this publication and the information herein, no responsibility is assumed by the publishers nor the author for any damage to property or persons as a result of operation or use of this publication and/or the information contained herein.*

Published by:  
Institute for Research and Community Service  
Petra Christian University  
Jl. Siwalankerto 121-131, Surabaya 60236  
Indonesia  
<http://lppm.petra.ac.id>

ISBN: 978-979-99765-1-2

## **PREFACE**

In recognition of Prof. Dr. Benjamin Lumantarna's outstanding contribution to Structural Engineering, Construction Technology, and to his four decades service in Civil Engineering Education at Petra Christian University, a number of longtime friends, colleagues and former students from around the world were invited to present papers on the Benjamin Lumantarna Symposium on Structural Engineering and Construction Technology, a theme that has been a major part of his research, deep involvement and profound contributions.

The symposium was held at Petra Christian University, Surabaya, Indonesia, on Friday, 14 September 2012; hosted by the Civil Engineering Department of the university in conjunction with the Golden Jubilee Celebration of the Department.

We would like to thank the authors, the session chairmen and the sponsors for their contribution, which enable this symposium to be held. Our thanks also go to Civil Golden Jubilee Organizing Committee, Petra Christian University, for their hard work.

As this publication represents a wealth of knowledge of eminent researchers and engineers involved in Structural Engineering, Construction Technology and Civil Engineering Education, it is hoped that this symposium volume will become a useful resource for the construction industry and Civil Engineering Education.

Djwantoro Hardjito, Antoni & Ima Muljati  
*Petra Christian University, Surabaya, Indonesia*  
*September 2012*

## FOREWORD

The Benjamin Lumantarna Symposium is gladly presented as part of the Golden Jubilee of Civil Engineering Department, Petra Christian University. It would be a thanksgiving moment for The Lord's guidance as well as a memorable moment to honor Professor Benjamin Lumantarna for his profound dedication along the years passed.

Along those years, the development of Civil Engineering Department is closely related to the contributions shared by Professor Lumantarna who has dedicated himself for four decades in Petra Christian University. As the first professor of this university, he devotes himself not only for the improvement of the department, but also toward the development of Petra as higher education institution. All his thoughtful knowledge shared will be precious legacy for the next generation in many ways.

Throughout this event, I would like to thank the organizing committee for their hard work in holding this event. I would also send my sincere gratitude to all contributors, editors and sponsors for their supports. It is hoped that this proceeding would be a valuable resource for the development of research, especially in civil engineering science and major.

Soli Deo Gloria!

*Rolly Intan*

*Rector*

*Petra Christian University, Surabaya, Indonesia*

*September 2012*

## THE BL I KNOW

Benjamin Lumantarna (BL) was born as Loo Djien Gie in Jombang, 26<sup>th</sup> November 1946. He is the youngest of five born from a great respected mother. As the youngest child, later he chose Benjamin as his new name. In 1972 he married Inge, a very understanding and supporting lady. Neal was born to them in 1974 and is the only son. Recently Nolan descended to the family.

BL's childhood, until his fifth grade, was spent in Sidoarjo. He later moved to Surabaya and finished the elementary and junior high school in St Joseph. He made a big change in his character building when he entered Petra high school instead of proceeding to the St Louis high school as St Joseph's alumni usually did. At that time St Louis was still restricted for boys, whereas Petra accepted both genders. The once shy, timid, and basically introvert boy transformed into a more friendly, active, and dynamic lad.

After finishing high school, in 1964 he signed up at Petra Christian University (PCU), and was enrolled in the Department of Civil Engineering. At that time PCU was still a young and unknown university, just three years established. He also applied to the Architectural Department of Surabaya Institute of Technology (ITS) and had joined the department for about two semesters before he abandoned it.

BL was vivid in student organizations, external and internal. I remember that day, after the 1965 turmoil, when he led a demo to the consulate of People's Republic of China as a protest to China's involvement in the rebellion.

He once acted as a chairman to the student council of PCU, and in various committees. Despite his activity in organizations, he never forgot his formal courses. He always ranked first, almost in every civil engineering course. That was due to his diligent and self-disciplined in study, but mostly that was caused by strong logic.

He graduated in 1973 and was directly assigned as a faculty member in the department. In PCU he taught structural analysis which is the basis of civil engineering. Actually his debut as engineer had begun long before he graduated. In 1968 he had already applied as apprentice in a well-known engineering firm and had been positioned as the so called structural analyst. That was his training camp to sharpen his ability in understanding design philosophy and also engineering construction problems.

In 1974 he entered the Asian Institute of Technology in Bangkok to pursue a master's degree, and achieved it in due time. Returning to PCU, he transferred his knowledge to his students. He was the first to introduce computer programming, Basic and Fortran. At that time computers were rarely owned by private universities.

To his students, he has contributed significantly to a better understanding of the behavior of structural materials.

Basically he was interested in exact studies; thus, he did not like expertises like soil engineering which has many uncertainties. It was surprising that he later favors seismic design, which is very uncertain to most of us.

In 1981 he went off to Canada where he entered University of Toronto to pursue a Ph.D., which he was able to achieve in 1984.

Going back to PCU, he occupied the position as the head of General Administration Office. There he managed the administration system and did a lot of betterment, which is still perceived up to now.

He is a keen and accurate reader, and should there be gaps or flaws in any regulations, he will be aware of it. In meetings, he is good at giving arguments and might prolong the session. However, some persons might consider him audacious.

He and Gideon established an engineering consulting firm, i.e. Benjamin Gideon and Associates (BGA). This firm celebrated its silver jubilee in 2010. Under his lead, BGA has managed many building projects especially in the structural design. However, his ability is not confined in the structural design area; due to his strong logic and sharp technical intuition, he could manage disputes regarding other disciplines. He could not only find a discrepancy in an engineering data but also show how it should be done.

With his BGA, he has attracted many young engineers, mostly alumni of PCU, to the field of structure engineering and inspired them with confidence to undertake various tasks. Now some of them have their own engineering company.

He has written many publications and been active in many seminars, symposia, and other technical meetings. He gained the title of professor in 1991, and became the first professor in PCU.

He was assigned as a reviewer or reader by the Directorate of Higher Education. Also, PCU assigned him as the chief editor for its journal, *Dimensi Teknik Sipil*. He later, in 2003, decided to change the journal to Civil Engineering Dimension (CED) to take a chance to become an international journal. His decision brings promising results. Until now, he is still holding the position of the chief editor of CED.

He should now be in his retiring days, but PCU still needs his service, and he is still in his capacity to serve. His firm, BGA is still blooming, and promises auspicious years to come.

Medio February 2012  
Johannes I. Soewono  
A relative, friend, colleague, and ex-student



## CONTENTS

	<b>Page</b>
<b>Preface</b>	iv
<b>Foreword</b>	v
<b>The BL I know</b> <i>J.I. Soewono</i>	vi
<b>A Robust Design Strategy for High-Tech Buildings</b> <i>S. L. Lee, C. G. Koh and D. K. H. Chua</i>	1
<b>A New Landscape of Civil Engineering Profession</b> <i>W. Kanok Nukulchai</i>	12
<b>Towards Rational Design Method for Strengthening by Overlay</b> <i>T. Ueda, D. Zhang and H. Furuuchi</i>	14
<b>Safe and Sustainable Tall Buildings-State of the Art</b> <i>P. Mendis</i>	24
<b>Generalized Fragility Relationships with Local Site Conditions for Probabilistic Performance-Based Seismic Risk Assessment of Bridge Inventories</b> <i>D.T. Lau, K. Vishnukanthan, C.L. Waller and S. Sivathayalan</i>	34
<b>Application of Preloading to Improve the Load Capacity of Foundation</b> <i>S. Prawono</i>	52
<b>Performance Based Seismic Procedure using Direct Displacement Design for Sheathed Cold-Formed Steel (SCFS) Structures</b> <i>G. H. Kusuma</i>	60
<b>Application of Queuing Theory in Construction Management</b> <i>K. Teknomo</i>	76
<b>Global Multidisciplinary Learning in Construction Education</b> <i>R. Soetanto and M. Childs</i>	89
<b>Structural Strengthening using Carbon Fiber Reinforced Polymer</b> <i>Hartono</i>	104
<b>Limitations in Simplified Approach in Assessing Performance of Façade under Blast Pressures</b> <i>R. Lumantarna, T. Ngo and P. Mendis</i>	111

<b>Seismic Assessment of Structures in Regions of Low to Moderate Seismicity</b> <i>E. Lumantarna, N. Lam and J. Wilson</i>	127
<b>Effect of Live Load on Seismic Response of a Horizontally Curved Bridge</b> <i>H. Wibowo, D. M. Sanford, I. G. Buckle and D. H. Sanders</i>	147
<b>Integrating Emotional Intelligence, Political Skill, and Transformational Leadership in Construction</b> <i>R.Y. Sunindijo</i>	162
<b>Learning from Local Wisdom: Friction Damper in Traditional Building</b> <i>B. Lumantarna and P. Pudjisuryadi</i>	176