

Proceedings of the  
4<sup>th</sup> Annual Paper Meet and 1<sup>st</sup> Civil Engineering Congress  
December 22-24, 2011, Dhaka, Bangladesh



Proceedings of the  
4<sup>th</sup> Annual Paper Meet and 1<sup>st</sup> Civil Engineering Congress  
December 22-24, 2011, Dhaka, Bangladesh

*Edited by*

**Munaz Ahmed Noor, PhD**

*Professor, Department of Civil Engineering  
Bangladesh University of Engineering and Technology, Dhaka, Bangladesh*

**A.F.M. Saiful Amin, PhD**

*Professor, Department of Civil Engineering  
Bangladesh University of Engineering and Technology, Dhaka, Bangladesh*

**Sharmin Reza Chowdhury, PhD**

*Associate Professor, Department of Civil Engineering  
Ahsanullah University of Science & Technology, Dhaka, Bangladesh*

**Md. Abdur Rahman Bhuiyan, PhD**

*Assistant Professor, Department of Civil Engineering  
Chittagong University of Engineering and Technology, Chittagong, Bangladesh*

**Sarah T.N. Kakoli, PhD**

*Assistant Professor, Department of Civil Engineering  
University of Asia Pacific, Dhaka, Bangladesh*

*Organized by*



Civil Engineering Division  
Institution of Engineers, Bangladesh

*In association with*

Roads and Highways Department  
Public Works Department  
Department of Public Health Engineering  
Local Government Engineering Department  
Bangladesh Water Development Board

*Supported by*



Published by

Civil Engineering Division  
Institution of Engineers, Bangladesh

December, 2011

Copyright © Civil Engineering Division, Institution of Engineers, Bangladesh. This publication or any part of it can be reproduced in any form with due acknowledgement.

ISBN: 978-984-33-4363-5

#### Disclaimer

The texts and figures of the papers in this volume were set individually by the concerned authors. The ideas or views expressed in the papers included in this volume are of individual author. In no way these are of the Civil Engineering Division, Institution of Engineers, Bangladesh or the Editors or the institution of the authors to which they belong to.

In order to make this volume available as economically as possible, the authors' softcopy of the manuscripts retrieved via online engine have been reproduced after reformatting them. The authors' wordings have not been significantly changed in an effort to retain the originality of the authors' style of writing. Unfortunately, this method has its inherent typographical and grammatical limitations, but it is hoped that these will not distract the readers too much.

## Table of contents

Preface	
Steering Committee, Organizing Committee & Technical Committee	
MECHANICS AND MATERIALS	1-49
Prediction of Compressive Strength of Concrete from Early Age Test Result <i>M. Monjurul Hasan &amp; Ahsanul Kabir</i>	1
Use of Selected Silica Deposits of Bangladesh as Standard Sand in Testing Compressive Strength of Hydraulic Cement Mortars: A Proposal for Strength Correlation <i>M.M. Haque, M.Z.R. Siddiqi, M.A. Rahman, M.S. Islam, M.K. Alam &amp; A.F.M.S. Amin</i>	8
A State of Art Review on Internal Curing of Concrete and its Prospect for Bangladesh <i>Bushra Islam, Md. Shahinoor Rahman &amp; Munaz Ahmed Noor</i>	22
Inventory of Life Cycle CO <sub>2</sub> emission of Selected Building Materials of Bangladesh <i>S. Khusru &amp; Munaz Ahmed Noor</i>	29
Expert System for Making Durable Concrete for Aggressive Carbon-Dioxide Exposure <i>Md. Nazrul Islam &amp; Md. Khasro Miah</i>	37
A Study on Sulfuric Acid Attack on Cement Mortar with Rice Husk Ash <i>B.C. Mondal, N. Uddin &amp; I. Amin</i>	44
ENVIRONMENTAL ENGINEERING	50-103
Developing Source Receptor Model (SRM) to Estimate the Grid-based Particulate Matter Concentration in Dhaka <i>S. M. Rahman, Z. Wadud, M. A. Ali &amp; S. Guttikunda</i>	50
Electro-chemical Treatment of Wastewater <i>Shakil Ahmed &amp; M. Ashraf Ali</i>	60
A Mathematical Model for Forced Aeration Composting: Effect of Air Reuse and Initial Moisture Content <i>Quazi H. Bari</i>	67
Design Evaluation of an Effluent Treatment Plant <i>Farooque Ahmed, Md. Abrar Hossain &amp; Tahmina Tamanna</i>	76
Domestic Water Consumption Patterns in a Village In Bangladesh <i>M. Al- Amin, K. Mahmud, S. Hosen &amp; M. Akhsanul Islam</i>	83

Characterizing Rainfall trend in Bangladesh by Temporal Statistics Analysis <i>Sharmeen Farhana &amp; Md. Mafizur Rahman</i>	86
Grey Water Generation and Quality Measurement at a Specific Site in Dhaka City <i>Marzia Tamanna, Md. Abdul Jalil, Sohikul Islam &amp; Salwa Anam</i>	95
GEOTECHNICAL ENGINEERING	104-123
Effect of Lime and Curing Period on Unconfined Compressive Strength of Gazipur Soil, Bangladesh <i>S.M. Farooq, M.A. Rouf, S.M.A. Hoque &amp; S.M.A. Ashad</i>	104
Causes of foundation failure and sudden volume reduction of collapsible soil during inundation <i>S.T.N. Kakoli &amp; A.M. Hanna</i>	109
Parametric study of anchored earth wall by finite difference method <i>M.S. Alam, M. Al – Amin &amp; N. Sakib</i>	117
TRANSPORTATION ENGINEERING	124-226
Evaluation of Bus Rapid Transit (BRT) in Context of Bangladesh <i>Salwa Anam, A.M. Hoque &amp; M. Tamanna</i>	124
Development of Interrupted Flow Traffic Noise Prediction Model for Dhaka City <i>S. Tanvir &amp; M.M. Rahman</i>	131
Effects of Traffic Demand Management in Reduction of Congestion in Dhaka City <i>A. Siddique &amp; S. Iffat</i>	139
Cost-Benefit Analysis for Freight Transportation of Bangladesh <i>Sayed Nasirullah, Md. Rubayet Mortuza &amp; Moazzem Hossain</i>	145
A Study on Mobility Problem of Disabled People in Dhaka City <i>A. K. M. Abir &amp; M. S. Hoque</i>	152
Road Safety Research in Bangladesh: Constraints and Requirements <i>S.M. Sohel Mahmud &amp; Md. Shamsul Hoque</i>	162
Road Accident Trends in Bangladesh: A Comprehensive Study <i>Mohammad Shah Alam, S.M. Sohel Mahmud &amp; Md. Shamsul Hoque</i>	172
Identifications and Investigations of Hazardous Road Locations on Dhaka-Aricha Highway <i>S.M. Sohel Mahmud, Anindya Sarker &amp; Md. Mazharul Hoque</i>	182
A Study on Car Involvement in Road Traffic Accidents in Bangladesh <i>H.M. Ahsan, M. A. Raihan &amp; M. Rahman</i>	191
Reporting and Recording of Road Traffic Accidents in Bangladesh <i>H.M. Ahsan, M. A. Raihan, M. S. Rahman &amp; N.H. Arefin</i>	200
Application of GIS in Hazardous Road Location (HRL) Identification <i>H.M. Ahsan, Md. S. Newaz, A.K.M.S. Alam &amp; M. Alam</i>	207
Evaluation and development of bus based public transport in Dhaka city <i>M.S. Hasnine</i>	217
STRUCTURAL ENGINEERING	227-278
Investigation on Bolt Tension of Flanged Pipe Joint Subjected to Bending <i>Zasiah Tafheem &amp; Khan Mahmud Amanat</i>	227

An easy way to analyse octagonal slab <i>Sharmin Reza Chowdhury</i>	235
Member Ductility Experiment with High Strength Steel and Concrete <i>S. Iffat, K. Maina &amp; Munaz Ahmed Noor</i>	244
Behaviour of Partially Encased Slender Composite Columns in Eccentric Loading <i>Saima Ali &amp; Mahbuba Begum</i>	251
Simulations of Partially Encased Composite Column under Concentric Loading using Equivalent Steel Section <i>D. Ghosh &amp; M. Begum</i>	261
Effect of Soft Storey on Multistoried Reinforced Concrete Building Frame <i>M.R. Amin, P. Hasan &amp; B.K.M.A. Islam</i>	267
Sustainable Development in Drift Control of Tall Buildings: Study of the Structural Parameters <i>M.M. Islam, A. Siddique &amp; A. Murshed</i>	273
<b>EARTHQUAKE ENGINEERING</b>	<b>279-319</b>
Seismic Performance Evaluation of Residential Buildings in Dhaka City by Using Pushover Analysis <i>R. Shahrin &amp; T.R. Hossain</i>	279
Seismic fragility assessment of SMA-bar restrained multi-span continuous highway bridge isolated by high damping rubber bearings in medium to strong seismic risk zones <i>A.R. Bhuiyan, A.H.M.M. Billah &amp; M.S. Alam</i>	287
Introduction of Rhombus Frame to Improve Building Performance in Earthquake <i>S.M.A. Hoq, M.A. Sabbir &amp; K. Mahmud</i>	298
Microtremor measurements of two historical mosques in Bangladesh <i>Munaz Ahmed Noor &amp; M. Kamruzzaman</i>	303
Seismic vulnerability of some historical masonry mosques in Bangladesh <i>Munaz Ahmed Noor &amp; M. Kamruzzaman</i>	309
<b>MANAGEMENT AND PLANNING</b>	<b>320-351</b>
Potential of Water Footprint Assessment as a Decision Support Tool for Sustainable Water Allocation Option in Dhaka City <i>Rifat Quamrul Alam, Bushra Monowar &amp; M. Monowar Hossain</i>	320
Activities Planning and Work Scheduling of a Water Supply Master Plan Project in Bangladesh <i>M.R. Amin &amp; A. Satter</i>	326
Modeling for water distribution system management in the 21 <sup>st</sup> Century <i>R. Chowdhury, A. Hassan &amp; D.M. Khan</i>	334
Investigating the Prospect of Introducing Traffic Management Measures in Dhaka city <i>T. Khan, M.S. Hoque &amp; A.S. Huq</i>	343
<b>MAINTENANCE, REPAIR AND RETROFITTING</b>	<b>352-389</b>
Fiber Reinforced Polymers for Seismic retrofitting of Structures <i>S. Nasrin, S. Khusru &amp; Z. Tafheem</i>	352
Confinement Effect of Fiber Reinforced Polymer Wraps in Circular and Square Concrete Columns <i>M.M. Islam, M.S.I. Choudhury, M. Abdulla &amp; A.F.M.S. Amin</i>	359

Parameters affecting the flexural capacities of reinforced concrete members strengthened with FRP strip: A critical comparison <i>A. Hasnat, M.M. Islam &amp; A.F.M.S. Amin</i>	363
Online Damage Identification Strategy Using Distributed Macro-strain Response <i>N.H.M. Kamrujjaman Serker &amp; Z.S. Wu</i>	371
Software-Based Method for Load Capacity Estimation of Fire Damaged RCC Columns <i>Nazmus Sakib &amp; Bashir Ahmed</i>	381
<b>WATER RESOURCES ENGINEERING</b>	<b>390-442</b>
Mathematical Modeling for Safe Drinking Water Source Identification: A Case Study <i>M.R. Amin &amp; M.T. Hasan</i>	390
River Bank Stabilization with the Application of Bamboo Bandalling Structure: A Case Study <i>Md. Lutfor Rahman, B.C. Basak &amp; Md. Showkat Osman</i>	399
Possible Impacts of Land Use Change on Eco-Hydrology of Arial Beel <i>A.R. Siddique</i>	407
Effects of Change in Temperature on Reference Crop Evapotranspiration (ET <sub>o</sub> ) in the Northwest Region of Bangladesh <i>Riyana Ayub &amp; M. Mirjahan Miah</i>	417
Greywater reuse: A Sustainable Solution for Water Crisis in Dhaka, Bangladesh <i>A. Khatun &amp; M.R. Amin</i>	427
Aspect and Necessity of Hydraulic Transient Analysis in Water Distribution System in Dhaka <i>A. Hassan, R. Chowdhury &amp; D.M. Khan</i>	435



## Preface

The Civil Engineering Division, The Institution of Engineers, Bangladesh (IEB) is organizing the Fourth Annual Paper Meet (APM) and First Civil Engineering Congress. We aim to build an effective forum where practicing engineers, technologists, scientists and academics will have the opportunity to present and share their views, ideas and experiences on recent developments, and emerging needs of Civil Engineering.

The Conference and the APM of the Civil Engineering Division is now going to be held during December 22-24, 2011 at Dhaka. At the paper meet lectures will be delivered and contributed papers will be presented on the broader areas of Civil Engineering.

This Conference is aimed at understanding the direction in which the Civil Engineering Profession is likely to evolve in the coming years. The Conference is expected to acquaint the participants with new and emerging concepts in tackling difficult engineering problems, so that the Civil Engineering professionals may play their appropriate role to face the challenges of the new century.

The conference would be very much inline with the theme of the APM, “Innovation Fetches Prosperity”. The Congress and the APM organized under the Auspices of Civil Engineering Division of IEB will take place with the view to bringing the professionals from home and abroad of different background and capacities closer in the event of sharing knowledge towards enrichment of professionalism.

A total of fifty five papers have been accepted for presentation in this Paper Meet. The papers fall within the broad areas of Mechanics and Materials (6 papers), Environmental Engineering (7 papers), Geotechnical Engineering (3 papers), Transportation Engineering (12 papers), Structural Engineering (7 papers), Earthquake Engineering (5 papers), Management and Planning (4 papers), Maintenance, Repair and Retrofitting (5 papers) and Water Resources Engineering (6 papers).

The assistance received from so many individuals in the publication of this volume of proceedings is gratefully acknowledged. Thanks are due to the contributors for their manuscripts, the organizing committee for their support and the sponsors for their assistance.

Dhaka, Bangladesh  
22 December 2011

Munaz Ahmed Noor  
A.F.M. Saiful Amin  
Sharmin Reza Chowdhury  
Md. Abdur Rahman Bhuiyan  
Sarah T.N. Kakoli

## Steering Committee

Dr. Engr. Jamilur Reza Choudhury

*Chairman*

Dr. Engr. Md. Habibur Rahman

*Co-Chairman*

Engr. Kazi Khairul Bashar

*Member-Secretary*

### *Members*

Engr. Md. Nurul Huda

Engr. Md. Mizanul Karim

Dr. Engr. Joynul Abedin

Engr. Md. Wahidur Rahman

Engr. Md. Nuruzzaman

Engr. Md. Habibur Rahman

Engr. Md. Kabir Ahmed Bhuiyan

Engr. Shahabuddin,

Engr. Md. Abdul Azim Joarder, PEng.

Engr. Md. Monir Uddin Ahmed

Engr. Dewan Md. Yamin

Engr. Md. Abdus Sabur

Dr. Engr. Munaz Ahmed Noor

Dr. Engr. Abdur Rahim

Dr. Engr. Kazi Shazzad Hossain

Dr. Engr. Gonash Chandra Shaha

Engr. Harunur Rashid Bhuiyan

Engr. Taqsem A Khan

President, REHAB

General Secretary, REHAB

Md. Monowar Islam

Director General, Dept. of Environment

Commandant, Military Institute of Science & Technology

Chief Engineer, Dhaka City Corporation

Chief Engineer, National Housing Authority

Engr. Iqbal Matin

Engr. Md. Habibur Rahman

## Organizing Committee

Engr. Md. Abdul Azim Joarder, PEng.

*Chairman*

Dr. Engr. Munaz Ahmed Noor

*Co-Chairman*

Engr. Kazi Khairul Bashar

*Member-Secretary*

*Members*

Engr. Mafiz Uddin Ahmed

Dr. Engr. Gholam Mostofa

Engr. Mohammad Ali Masud Haider

Engr. Md. Waliullah Sikder

Engr. Habibul Aziz, Peng.

Engr. Nazrul Islam

Engr. Saumitra Kumar Mutsuddi,

Engr. A.K.M. Monir Hossain Pathan, PEng.

Engr. Md. Rashidul Hasan

Engr. Jasim Uddin

Dr. Engr. Mostafa Kamal Farooque

Engr. Shishir Kumar Shil

Engr. Md. Monjur Quader

Engr. Z.M. Anwar

Engr. S.M. Rezaul Mostofa Kamal

Dr. Engr. Md. Abul Quasem Siddique

Engr. Md. Mamunur Rashid

Engr. Mosleh Uddin Ahmed

Engr. Md. Shahjahan Mollah

Engr. Md. Nazrul Islam Mian

Engr. Matiur Rahman

Engr. Md. Muslim Uddin

Engr. Md. Zikrul Hassan

Engr. Md. Abdullah Al Mamun, PEng.

Engr. Fazlul Karim Mintu

Engr. Chandan Kumar Das

Engr. Reshma Aktar

Engr. Shishir Kanti Routh, PEng.

Engr. Asheque Ahmed Shiblee

Engr. Khokon Chandra Paul

Engr. A.Z.M. Shafiul Hannan

Engr. H.M. Zahidul Islam

Engr. Asutosh Mistri

Engr. Masuda Begum

Engr. Md. Abdul Ahad Kabir

Engr. Subrata Sen

Engr. Md. Samim Hossain

Engr. Hafizur Rahman, RHD

Engr. Shahana Ferdous Bithi, RHD

## Technical Committee

Dr. Engr. Md. Habibur Rahman  
*Chairman*

Dr. Engr. Mostafa Kamal Farooque  
*Co-Chairman*

Dr. Engr. A.F.M. Saiful Amin  
*Member-Secretary*

### *Members*

Dr. Engr. Md. Abul Quasem Siddique

Engr. Md. Mizanur Rahman

Engr. Shishir Kanti Routh

Engr. Dilip Kumar Guho

Engr. Syed Azizul Haq

Engr. Ahsan Habib

Engr. Saif Hasnat

Engr. Mohammad Azharul Islam

Engr. Pallab Das

Engr. Md. Asadur Rahman Talukder

Engr. Molay Kumer Paul

Engr. Shyamol Kumar Dutta

Engr. Md. Abdullah Al Mamun

Engr. Khondoker Mahbub Alam

Engr. Asheque Ahmed Shiblee

Engr. Mominur Rahman

Engr. Md. Sharifuddin Mahmud

Engr. Alauddin Ahmed