

COASTAL STRUCTURES 2003

PROCEEDINGS OF THE CONFERENCE

August 26–30, 2003
Portland, Oregon

SPONSORED BY
The Coasts, Oceans, Ports, and Rivers Institute (COPRI)
of the American Society of Civil Engineers

EDITED BY
Jeffrey A. Melby, Ph.D.

ASCE



Published by the American Society of Civil Engineers

Library of Congress Cataloging-in-Publication Data

Coastal Structures 2003 (2003 : Portland, Or.)

Coastal Structures 2003 : proceedings of the conference, August 26-30, 2003, Portland, Oregon / sponsored by the Coasts, Oceans, Ports, and Rivers Institute (COPRI) of the American Society of Civil Engineers ; edited by Jeffrey A. Melby.

p. cm.

Includes bibliographical references and index.

ISBN 0-7844-0733-9

1. Coastal engineering--Congresses. 2. Hydraulic structures--Congresses. I. Melby, Jeffrey A. II. Coasts, Oceans, Ports, and Rivers Institute (American Society of Civil Engineers) III. Title.

TC203.5.C634 2003

627'.58--dc22

2004046448

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4400

www.pubs.asce.org

Any statements expressed in these materials are those of the individual authors and do not necessarily represent the views of ASCE, which takes no responsibility for any statement made herein. No reference made in this publication to any specific method, product, process, or service constitutes or implies an endorsement, recommendation, or warranty thereof by ASCE. The materials are for general information only and do not represent a standard of ASCE, nor are they intended as a reference in purchase specifications, contracts, regulations, statutes, or any other legal document. ASCE makes no representation or warranty of any kind, whether express or implied, concerning the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed in this publication, and assumes no liability therefore. This information should not be used without first securing competent advice with respect to its suitability for any general or specific application. Anyone utilizing this information assumes all liability arising from such use, including but not limited to infringement of any patent or patents.

ASCE and American Society of Civil Engineers—Registered in U.S. Patent and Trademark Office.

Photocopies: Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by ASCE to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$18.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification for ASCE Books is 0-7844-0733-9/04/ \$18.00. Requests for special permission or bulk copying should be addressed to Permissions & Copyright Dept., ASCE.

Copyright © 2004 by the American Society of Civil Engineers.
All Rights Reserved. ISBN 0-7844-0733-9
Manufactured in the United States of America.

Foreword

The last comprehensive conference on coastal structures in the United States was held in 1983. Relatively small symposia and workshops on specific topics in the broad field of coastal structures were organized after Coastal Structures'83. The Coastal Structures'99 Conference was held in Santander, Spain in recognition of the need to hold an international and comprehensive conference on coastal structures. The Coastal Structures 2003 Conference continued the conference series into the 21st century. The primary goals of Coastal Structures 2003, as supported by the Organizing Committee and the ASCE-COPRI, were to assess the state of knowledge and practice of coastal structure design, construction, and maintenance, and to disseminate practical knowledge and research results on a wide range of topics to the coastal structure engineering community.

Nearly 140 presentations were attended by 246 participants from government, industry, and education. A wide range of topics on design, construction, and maintenance of coastal structures were included in these presentations. It was clear from the presentations that coastal structures are undergoing renewal and innovation to better serve the societal needs and to better address environmental co-existence, habitat enhancement, and risk management. Thanks to the presenters, the conference was successful in advancing and disseminating engineering knowledge and practice to the diverse participants engaged in the design and construction of coastal structures.

I would like to thank the American Society of Civil Engineers for their tremendous support in organizing this conference. In particular, Ms Christina Childs and Ms. Kelly Barnes, American Society of Civil Engineers (ASCE) and the Coasts, Oceans, Ports, and Rivers Institute of the ASCE, are gratefully acknowledged for their continuous effort in making this conference not only successful, but a great experience. I would also like to express my gratitude to the sponsors who were a critical part of the conference success. I also thank the Organizing Committee and the International Conference Advisory Committee for assisting with the conference. Finally, I thank the authors for their high quality presentations and papers. These papers offer a vast resource for practical and innovative coastal structure engineering.

Jeffrey A. Melby
Coastal and Hydraulics Laboratory
U.S. Army Engineer Research and Development Center
Vicksburg, MS

Acknowledgments

Organizing Committee

Conference Chairmen

Orville T. Magoon, COPRI CZM Committee, Coastal Zone Foundation
Nobuhisa Kobayashi, Center for Applied Coastal Research, University of Delaware

Conference Secretary

Jeffrey A. Melby, U.S. Army Engineer Research and Development Center

Members

Patricia Brown, ASCE COPRI
Christina Childs, ASCE
Kelly Barnes, ASCE COPRI
Billy Edge, Texas A&M University
Andrew Jansky, KPFF Consulting Engineers, Portland
Thomas Kendall, U.S. Army Engineer District, San Francisco
Rod Moritz U.S. Army Engineer District, Portland
Heidi Moritz U.S. Army Engineer District, Portland
Jerald D. Ramsden, PBS&J, Portland

International Conference Advisory Committee

N. W. H. Allsop
William F. Baird
Hans F. Burcharth
Julien de Rouck
Leopoldo Franco
Yoshimi Goda
William Kamphuis
Alberto Lamberti
John-Paul Latham
Miguel Losada
Inigo Losada

William G. McDougal
Hocine Oumeraci
David Phelps
Krystian Pilarczyk
Dov S. Rosen
Alf Torum
Ch. Ryu
Sigurdur Sigurdarson
Shigeo Takahashi
Jenste van der Meer
Marcel van Gent

Cooperating Organizations

Coastal Ocean Port and Rivers Institute of the American Society of Civil Engineers
International Navigation Association (PIANC)
Association of Coastal Engineers (ACE)
California Coastal Commission
National Institute of Building Sciences (NIBS)
O.H. Hinsdale Wave Research Laboratory

Financial Sponsors

Ocean and Coastal Consultants, Inc.
Great Lakes Dredging, Inc.
MTS Systems Corporation
PBS&J
US Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory
RD Instruments, Inc.

Contents

Rubble Mound Coastal Structures

Virtual Performance of Rubble Mound Structures	1
Nobuhisa Kobayashi, Haoyu Zhao, Beatriz Pozueta, and Jeffrey A. Melby	
Performance Design of Maritime Structures and Its Application to Armour Stones and Blocks of Breakwaters.....	14
Shigeo Takahashi, Minoru Hanzawa, Sunao Sugira, Ken-ichiro Shimosako, and Jentsje van der Meer	
Simulation System for the Probabilistic Optimization of Rubble Mound and Vertical Structures.....	27
Santiago Alfageme, John R. Headland, Peter W. Kotulak, and Eric D. Smith	
New Wave Parameter for Coastal Structure Design.....	40
Steven A. Hughes	
Armor Stability Based on Wave Momentum Flux.....	53
Jeffrey A. Melby and Steven A. Hughes	
Stability of Roundheads Armoured with Cubes.....	66
Hans F. Burcharth, Per R. Haagenzen, and Enrique Macineira	
Developments in Coastal Structures and Future Needs: General Remarks.....	78
Krystian Pilarczyk	
Dependence of the Stability of Mound Breakwaters on the Reflection Process.....	91
M. I. Benedicto, M. A. Losada, and I. R. Sánchez-Arévalo	
Stability of Rock Slopes with Shallow Foreshores	100
Marcel R. A. Van Gent, Alfons J. Smale, and Coen Kuiper	
Wave Grouping and Spectral Shape Effects on the Stability of Rubble Mound Breakwaters.....	113
Berguzar Oztunali Ozbahceci, Tomotsuka Takayama, Hajime Mase, and Aysen Ergin	
Effects of Layer Thickness and Core Material on Stability of Wave Dissipating Concrete Blocks	126
Shin-ichi Kubota, Shigetaka Kobayashi, Akira Matsumoto, Minoru Hanzawa, and Michio Matsuoka	
Stability of Low-Crested Breakwaters in Shallow Water Short Crested Waves	137
Morten Kramer and Hans Burcharth	
Proposal of a Full-Scale Destructive Test Method to Assess Integrity of Natural Armourstone	150
Sébastien Dupray, John-Paul Latham, and Jean-Louis Durville	

Effects of Rock Shape on Packing Density and Stability of Rock Armour: New Guidance	163
John-Paul Latham, Terry Stewart, Simon Newberry, and Jonathan Simm	
Back Analysis of Rubble Mound Armorstone Design	176
Otavio J. Sayao	
Measurement of Armor Damage on Rubble Mound Structures: Comparison Between Different Methodologies.....	189
Cesar Vidal, Francisco L. Martin, V. Negro, X. Gironella, B. Madrigal, and J. Garcia-Palacios	
Rubble Mound Jetty Armor Damage.....	201
Jennifer Pratt, Jeffrey A. Melby, and Nobuhisa Kobayahsi	
Riprap Stability on the Inner Slopes of Medium-Height Breakwaters.....	213
Henk Jan Verhagen, Bas van Dijk, and Andries Nederpel	
A Simulation for Deformation of Rubble Structures Based on Stochastic and Dynamic Theory	223
Kazunori Itoh, Yuichi Higuchi, Takao Toue, and Hidehiro Katsui	
Armor Damage Analysis Using Neural Networks.....	236
Josep R. Medina, Joaquín Garrido, M. Ester Gómez-Martín, and César Vidal	
Rubble-Mound Breakwater Inspection in Portugal	249
João Alfredo Santos, Maria de Graça Neves, and Luís Gabriel Silva	
General Conditions for Stability Tests of Mound Breakwaters.....	262
Gregorio Iglesias, Jorge Flores, August Corrons, Miguel A. Losada, and M ^a Izaskun Benedicto	
Developments in the Use of Recycled and Secondary Materials in Coastal Structures.....	270
Jonathan Simm, Michael Wallis, Terry Hedges, Bethan Emmanuel, and Alan Brampton	
 <i>Composite, Vertical Walled, and Other Coastal Structures</i>	
Performance of Composite Breakwaters from the Viewpoint of Expected Sliding Distance of Caisson.....	283
Minoru Hanzawa, Nobufumi Yamagata, Takami Nishihara, Tomotsuka Takayama, Shigeo Takahashi, and Ryoichi Tomiyasu	
A Design Method for Double Slit-Wall Breakwaters.....	295
Shohachi Kakuno, Gozo Tsujimoto, and Yoshihiro Shiozaki	
A Proposal for Effective Consideration of Uncertain Factors for Reliability-Based Design of Caisson-Type Breakwaters.....	305
Tae-Min Kim and Tomotsuka Takayama	
Monte Carlo Simulation on Damage of Armor Stone Covering Composite Breakwater Mound.....	317
Akira Matsumoto, Minoru Hanzawa, and Shigeo Takahashi	

New Stability Formula for Rubble Mound Armor Units of Composite Breakwaters.....	330
Setsuo Matsuda, Wakiro Nishigori, Akira Matsumoto, Masafumi Saito, Michio Matsuka, and Minoru Hanzawa	
Field and Laboratory Measurement of Wave Impacts.....	343
Geoffrey Bullock, Charlotte Obhrai, Gerald Müller, Guido Wolters, Howell Peregrine, and Henrik Bredmose	
Dynamic Wave Loads on Coastal Structures: Analysis of Impulsive and Pulsating Wave Loads	356
Giovanni Cuomo, William Allsop, and Kirsty McConnell	
Influence of Parapets and Recurves on Wave Overtopping and Wave Loading of Complex Vertical Walls.....	369
A. Kortenhaus, J. Pearson, T. Bruce, N. W. H. Allsop, and J. W. van der Meer	
Physical Model Studies of Wave-Induced Loading on Exposed Jetties: Towards New Prediction Formulae.....	382
Matteo Tirindelli, Giovanni Cuomo, William Allsop, and Kirsty McConnell	
Rapid Stabilization of the Immersed Tunnel Element.....	394
Toshio Aono, Koushi Sumida, Ryuichi Fujiwara, Akiyuki Ukai, Kazuhiro Yamamura, and Yukio Nakaya	
Dynamic Pressure to Waterproof Sheet Placed in the Backfill Region of a Caisson-Type Bulkhead for Waste Disposal.....	405
Hitoshi Ino, Shigeo Takahashi, Atsushi Fujii, Susumu Ogura, and Hiroshi Saotome	
<i>Wave Runup and Overtopping</i>	
Wave Overtopping Database as the Starting Point for a Neural Network Prediction Method	418
H. Verhaeghe, J. W. van der Meer, G.-J. Steendam, P. Besley, L. Franco, and M. Van Gent	
Wave Overtopping at Seadikes.....	431
Holger Schüttrumpf and Marcel R. A. van Gent	
Large Scale Wave Run-up Tests on a Rubble Mound Breakwater	444
Björn Van de Walle, Julien De Rouck, Joachim Grüne, and Einar Helgason	
Wave Run-up and Wave Overtopping on a Rubble Mound Breakwater: Comparison of Prototype and Laboratory Investigations	456
J. Möller, A. Kortenhaus, H. Oumeraci, J. de Rouck, and J. R. Medina	
Violent Wave Overtopping: CLASH Field Measurements at Samphire Hoe	469
Tim Pullen, William Allsop, Tom Bruce, and Jimmy Geeraerts	
Hazards Resulting from Wave Overtopping—Full Scale Measurements	481
Jimmy Geeraerts, Peter Troch, Julien De Rouck, Luc Van Damme, and Tim Pullen	

Full Scale Wave Overtopping Measurements	494
Julien De Rouck, Björn Van de Walle, Jimmy Geeraerts, Peter Troch, Luc Van Damme, Andreas Kortenhaus, and Josep Medina	
Full-Scale Measurement of Wave Overtopping at Ostia-Rome Yacht Harbour Breakwater	507
Leopoldo Franco, Riccardo Briganti, Giorgio Bellotti, Julien De Rouck, and Jimmy Geeraerts	
Extreme Statistics Analysis of Wave Overtopping Rate by a Stochastic Typhoon Model	520
Fuminori Kato, Ken'ichi Torii, and Hidenori Shibaki	
Violent Overtopping of Vertical Seawalls Under Oblique Wave Conditions	528
Nicolas Napp, Jonathan Pearson, Tom Bruce, and William Allsop	
Wave Overtopping on Chicago Shoreline Revetment	542
Michael R. Krecic and Otavio J. Sayao	
Analysis of Wave Transmission Behind Low-Crested Structures Using Neural Networks	555
Andrea Panizzo, Riccardo Briganti, Jentsje van der Meer, and Leopoldo Franco	
Oblique Wave Transmission over Low-Crested Structures	567
Jentsje W. van der Meer, Baoxing Wang, Ard Wolters, Barbara Zanuttigh, and Morten Kramer	
Wave Transmission Behind Low-Crested Structures	580
Riccardo Briganti, Jentsje van der Meer, Mariano Buccino, and Mario Calabrese	
Computation of Wave Transmission Coefficients at Detached Breakwaters for Shoreline Response Modeling	593
Ty V. Wamsley and John P. Ahrens	
Numerical Simulations of Hydraulic Overflow Pressure Acting on Structures Behind the Seawall.....	606
Taro Arikawa and Ken-ichiro Shimosako	
Violent Wave Overtopping—Extension of Prediction Method to Broken Waves.....	619
Tom Bruce, Jonathan Pearson, and William Allsop	
Numerical and Experimental Predictions of Overtopping Volumes for Violent Overtopping Events.....	631
David M. Ingram, Derek M. Causon, Tom Bruce, Jonathon Pearson, Feng Gao, and Clive G. Mingham	
Numerical Study for Small Negative Freeboard Wave Overtopping and Overflow of Sloping Sea Wall	643
Akram Soliman and Dominic Reeve	
Liquefaction of Loosely Deposited Sandbed Behind a Breakwater due to Wave Overtopping	656
Kojiro Suzuki and Shigeo Takahashi	

Waves and Structures

Field Measurements of Hydrodynamics Around a Beach Defence System	663
Renata Archetti, Matteo Tirindelli, and Alberto Lamberti	
Hydraulic Analyses and Design of a Sediment Cap at a Superfund Site.....	676
Jerald D. Ramsden and Susan Gardner	
The Development of a 40-Year Wave Climate for the Entire Chilean Coastline	689
Charles Fournier, Cristóbal Pantoja, Donald Resio, and Douglas Scott	
Influence of Dredged Channels on Wave Penetration into Harbors:	
The Malamocco Inlet Case.....	702
Gian-Mario Beltrami, Paolo De Girolamo, and Giulia Pellegrini	
Velocity Profiles at the Swash Zone.....	715
Giuseppe R. Tomasicchio and Ferdinando Frega	
Pressures by Breaking Waves on a Slope Computed with a VOF Model	728
Neelke Doorn and Marcel R. A. van Gent	
Kinematics of a Focused Wave Group on a Plane Beach: Physical Modelling	
in the UK Coastal Research Facility.....	740
Alison Hunt, Paul Taylor, Alistair Borthwick, Peter Stansby, and Tong Feng	
Numerical Study of Three-Dimensional Flow Fields Around the Base of a Vertical	
Cylinder in Oscillatory plus Mean Flow.....	751
Shinya Umeda, Masatoshi Yuhi, and Hajime Ishida	
Secondary Flows and Sediment Problems near Coastal Marine Outfalls.....	764
Nabil M. Ismail and Robert L. Wiegel	
Effects of Breakwater Reflections on Local Sea Steepness and Navigation	777
R. M. Abernethy, N. W. H. Allsop, N. Poisson, and M. W. McBride	
Wave Dissipation and Reflection on Muddy Bottoms	789
D.-X. Shen, Christopher M. Carr, and M. Isobe	
Modelling Wave Reflection and Transmission Around Nearshore Structures.....	802
Shunqi Pan and Premanandan T. Fernando	
Laboratory Experiments for Mass Transport Velocities and Turbulence Flows	
due to New Type Wave Front Breaker over Artificial Reef	814
Takehisa Saitoh and Hajime Ishida	
Wave Field Computation Around Artificial Reefs with Gradational	
Breaker Model.....	824
Yoshimi Goda	
Improved Boussinesq Model and Its Application to Wave Transformations over	
Artificial Reef on Sloping Beach	837
Mitsuhiro Nakajima, Masatoshi Yuhi, Hajime Mase, and Hajime Ishida	
Wave and Current Flows Around Low-Crested Structures.....	850
Alberto Lamberti, Barbara Zanuttigh, and Morten Kramer	
2-D Experimental and Numerical Analysis of Wave Interaction with Low-Crested	
Breakwaters Including Breaking and Flow Recirculation.....	863
Inigo J. Losada, Javier L. Lara, and Nicolas Garcia	

Validation of Numerical Models Against Laboratory Measurements of Waves and Currents Around Low Crested Structures.....	876
Erik D. Christensen, Barbara Zanuttigh, and Julio A. Zyserman	
Wave Height, Pressure, and Velocity CDFs Around Rubble Mound Protections for Submarine Outfalls.....	889
Pedro Lomonaco, Cesar Vidal, Iñigo J. Losada, and Fernando J. Mendez	
A Flushing System to Clean Up Coastal Lagoons.....	902
Miguel Angel Alatorre Mendieta, Rodolfo Silva Casarin, Francisco Ruiz Renteria, and Martin Marino Ibarra	
NEES Multidirectional Wave Basin for Tsunami Research.....	911
Solomon C. Yim, Harry H. Yeh, Daniel T. Cox, and Cherri M. Pancake	
Hydraulic Failure and Soil-Structure Deformation due to Wave and Draw Down Loading.....	924
M. Davis, H.-J. Köhler, M. A. Koenders, and R. Schwab	
<i>Shore Protection</i>	
Groin Notching in Spring Lake, New Jersey.....	935
Lynn M. Bocamazo, Kerry Anne Donohue, Brian Williams, and Gamal Awad	
Beach Diamond Mining Design at the Rocky Namaqualand Coast.....	949
A. K. Theron, J. S. Schoonees, P. Huizinga, and D. T. Phelp	
Design of Timber Groynes.....	962
Udo Perdok, Matt Crossman, Henk Jan Verhagen, Simon Howard, and Jonathan Simm	
Economical Rock Groynes—Reducing Lifecycle Costs.....	975
A. P. Bradbury, M. P. Crossman, N. W. H. Allsop, S. Segura-Dominguez, and J. D. Simm	
Wave Transmission and Force on Fabric Tube Breakwaters.....	988
Hiroaki Hosoi, Nobuhisa Kobayashi, and Jeffrey A. Melby	
Advances in Geotextile Tube Technology.....	1001
Daniel J. Heilman and Gerald J. Hauske	
Samoa Stone™: An Architectural and Functional Concrete Armor Unit.....	1013
George F. Turk and Jeffrey A. Melby	
Performance of Structural Alternatives for Sediment Control at North Jetty, Grays Harbor, WA.....	1023
Neil MacDonald and Philip Osborne	
National Shoreline Erosion Control Development and Demonstration Program Status (Section 227).....	1035
William R. Curtis and Donald L. Ward	
A Dynamic Revetment and Reinforced Dune as “Natural” Forms of Shore Protection in an Oregon State Park.....	1048
Jonathan C. Allan, Paul D. Komar, and Roger Hart	

Innovative Shore Protection Structures at Cape May Point, New Jersey	1061
Michael A. Giovannozzi, Donald K. Stauble, and Randall A. Wise	
Analysis of Sliding Stability of a Submerged Double-T	1074
Asher H. Peltz, Donald L. Ward, and William R. Curtis	
Section 227 Shoreline Erosion Control Demonstration Project: Jefferson County, Texas.....	1084
Jeffrey P. Waters	
Ft. Pierce Federal Shore Protection Project: Shoreline Stabilization Design Using T-Head Groins	1096
Christopher K. Goshow and Rajesh Srinivas	
Composite T-Head Groins for Erosion Control	1109
Brett D. Moore and Kenneth K. Humiston	
Evaluation of Submerged Narrow Crested Breakwaters for Shoreline Protection	1122
Jeffrey R. Tabar and Donald K. Stauble	
Structural Rehabilitation of the Holly Beach, Louisiana, Breakwater Field.....	1135
Douglas W. Mann, Gordon G. Thomson, and Christin Perkinson	
Feasibility Analysis of Shore Protection Alternatives for Rockefeller Wildlife Refuge in the Chenier Plain of Southwestern Louisiana (USA).....	1142
Larry A. Wise, T. Neil McLellan, and Mark R. Byrnes	
Submerged Reef Structures for Beach Erosion Control	1155
Lee E. Harris	
Relation Between Aggregating Effect of Artificial Fish Reef and Flow Pattern Around Reef	1164
Masanobu Ono and Ichiro Deguchi	
Complex Principal Component Analysis of Medium-Term Nearshore Geomorphology at North Sendai Coast, Japan.....	1176
Yusuke Uchiyama and Yoshiaki Kuriyama	
<i>Case Studies</i>	
Use of the CORE-LOC™ as a Baffling System at the Chicago River Turning Basin Cutoff Wall.....	1189
Didi Duma	
Broad Toe Berm Jetty Head Design, Yaquina North Jetty.....	1199
Heidi P. Moritz, Alan C. Jeffries, and Hans R. Moritz	
Sirevåg Berm Breakwater: Design, Construction, and Experience After Design Storm	1212
Sigurdur Sigurdarson, Arnold Jacobsen, Omar Bjarki Smarason, Sverre Bjørdal, Gisli Viggosson, Christen Urrang, and Alf Tørum	
Crown Wall Parapet Failure After a Severe Wave Storm, Isle of Alboran, Mediterranean Sea.....	1225
Vicente Negro, Ovidio Varela, Javier Díez, and Gregorio Iglesias	

Historical Breakwaters on Lake Champlain, New York/Vermont:	
History, Inspection, and Preservation	1237
Valery Gelfer, Edward Landenberger, and Alex Matlin	
Case Study—Performance Investigation of a Sunken Concrete Ship Cargo	
Handling Wharf at the Port of Newport, Oregon	1250
Marvin L. Byington, Keith S. Martin, David D. Driscoll, and Philip L. Wurst	
Pier 300 Extension Using Dredged Materials from the Main Channel,	
Port of Los Angeles	1262
Philip N. Robins, Thomas W. McNeilan, James A. Schneider, and John Foxworthy	
A Case Study in Jetty Maintenance, Tillamook Bay, Oregon	1275
Heather R. Sumerell, Jessica R. Hays, Hans R. Moritz, and Heidi P. Moritz	
Columbia River Waterway Risks	1286
Yumei Wang	
Holistic Framework for Assessing the Functional Integrity of Navigation	
Structures at the Mouth of the Columbia River	1299
Hans R. Moritz, Heidi P. Moritz, Jessica Hays, and Heather Sumerell	
Dynamics of an Emergency Jetty Repair at Coos Bay, Oregon.....	1312
Jessica R. Hays, Hans R. Moritz, and Heidi P. Moritz	
Designing an Outfall Extension Through a Beach Renourishment for Deal Lake,	
New Jersey.....	1324
Jack C. Cox, Lynn M. Bocamazo, Gregory L. Williams, Hugh E. Ruthven, Andrew M. Cornett, and Stuart A. Chase	
Frequency Domain Dynamic Analysis of a Floating Bridge	1334
Eric Morris, Victor Szabo, Gang Yang, and Michael Isaacson	
Indexes	
Subject Index.....	1347
Author Index	1351