



Ports 2016: Port Engineering



Selected Papers from the Proceedings of the
14th Triennial International Conference
New Orleans, Louisiana | June 12-15, 2016



Edited by
Don Oates, P.E., D.PE
Elizabeth Burkhart, P.E., D.PE
Jennifer Groh



COASTS, OCEANS,
PORTS AND RIVERS
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SPONSORED BY
Ports and Harbors Committee of the
Coasts, Oceans, Ports, and Rivers Institute of the
American Society of Civil Engineers

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Preface

Continuing a long tradition of excellence, **PORTS '16**: “Ports: Gateways to A World of Opportunities” will be the fourteenth in a series of international port and harbor development specialty conferences held on a tri-annual basis since 1977. This conference’s theme was selected in recognition of the broad spectrum of factors that make ports so important to their local, regional, national and international communities, including the wide range of missions they support, e.g. moving cargo, providing recreational opportunities, serving as engines of economic development, and providing for stewardship of environmental resources.

PORTS '16 is sponsored and organized by the Ports and Harbors Committee of the Coasts, Oceans, Ports, and Rivers Institute of the American Society of Civil Engineers, and co-sponsored by PIANC. The Ports and Harbors Committee focuses its activities on improvement of port, waterway, and facility engineering, development, and operating techniques, practices, and standards. Many of the Committee membership were actively involved in the development of the **PORTS '16** program and organization of the conference. The Conference efforts were led by:

Imee Osantowski, P.E., Principal Engineer, Chair, ASCE Ports & Harbors Committee
Shannon Kinsella, P.E., PMP, LEED AP, Conference Chairman
Don Oates, P.E., D. PE., Technical Committee Co-Chair
Elizabeth Burkhart, P.E., D. PE, Technical Committee Co-Chair

Approximately 275 abstracts were submitted for consideration by the Conference Technical Committee. Consisting of almost 50 individuals drawn from the Ports and Harbors Committee and the port design and development community, the Technical Committee reviewed abstracts and papers and served as Moderators for sessions. The Technical Committee chose a total of 179 papers for publication. *Ports 2016: Port Engineering* contains 80 papers covering facilities and operations; foundations and reclamation; inspection, repair, and maintenance; and extreme events. The companion title, *Ports 2016: Port Planning and Development*, contains 99 papers covering transportation and traffic; environmental issues; navigation and waterways; port planning, operations, and design; and terminal design and planning. Together these papers reflect our industry’s full diversity.

The success of this Conference, as with all **PORTS** Conferences, has relied on the contributions of the authors who submitted their work for our consideration. The preparation of **PORTS** conference abstracts, papers, and presentations is a demanding process, and our sincere thanks go out to all of those who have participated.

To all those who reviewed Abstract and Papers, to the Moderators, and those who served on the Technical Committee each of which was, in so many ways, responsible

for the success of the PORTS '16 Conference and who participated in reviewing and selecting Abstracts, reviewing and vetting submitted Papers, ensuring compliance with the Conference's publication rules, reviewing Presentations, and/or acting as Session Chairs at the Conference – our sincere appreciation and thanks. Each of their individual and collective contributions and the support of their organizations are deeply appreciated.

Sincerely and with great appreciation,

Don Oates, P.E., D. PE, M.ASCE
Technical Committee Chairman
KPPF Consulting Engineers

Elizabeth Burkhart, P.E., D. PE, M.ASCE
Technical Committee Vice Chairman
Collins Engineers, Inc.

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The Technical Committee would like to extend our many supporters whose contributions have led to the success and value of this material. Without their efforts, this publication would not be possible. Specifically, we would like to thank the following:

ASCE Port's & Harbor's General Committee,
The entire PORTS '16 Subcommittee,
All the more than 50 Moderators,
All of the 176 conference authors and presenters,
All the many authors who submitted Abstracts for consideration,
ASCE, COPRI and PIANC staff.

In addition, Liz and I would like to like to thank our families and especially our spouses (Joe and Kristi) for their patience, understanding and support without which we could not have sustained the energy necessary to complete this publication.

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