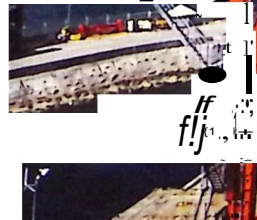




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# **MARINE CARGO OPERATIONS**

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# MARINE CARGO OPERATIONS

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[www.3ge-learning.com](http://www.3ge-learning.com)  
email: [info@3ge-learning.com](mailto:info@3ge-learning.com)

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# PREFACE

The marine cargo handling industry plays a vital role in the transfer of goods between the seller and buyer. However, more than 90% of the international trade being directed by sea. Cargo ships are types of ships or vessels that carry cargo, material, and goods from one place to the other. Various types of ships such as bulk container ships, rely primarily on shore-side cargo handling equipment to discharge or load their cargo. Marine cargo handling ships or containers are used to import or export various goods in inland waterways or oceans through national or international borders, wherein handling is carried out by the government or private port companies. The text provides information concerning container stowage and safe handling in port, care at sea, Stacking weights, cargo securing prior departure port, Lashing Strength, Dangerous Cargo Stowage & Segregation, handling Reefer units, Special Container Stowage, Irregular Stowage of Containers, and other matters regarding cargo stowage as necessary and many more detail topics related with containership operation and business.

## **Content Coverage**

*Chapter One* provides a clear and comprehensive introduction to the principal elements involved in the management of marine cargo and the carriage of goods by sea. *Chapters Two* presents the coverage of maintaining the operations of loading, discharging & stowing. The aim of ship's officers and crewmembers on board should be to prevent damage or deterioration whilst the cargo is under their care and to deliver it, as far as possible, in as good condition and order as it was when received aboard. *Chapter Three* and *Chapter Four* is about marine cargo insurance and safety, separately. *Chapter Five* explores the role of a shipping agent organizing a pilot, tugs and linemen who will help bring the ship in to the port. *Chapter Six* covers about shipping processes and documentation. *Chapter Seven* focuses on maritime issues and legislation.

## REFERENCES

1. "2014 CLIA Annual State of the Industry Press Conference & Media Marketplace." Cruise Lines International Association, 2014.
2. "Cruise Industry Overview 2013: State of the Cruise Industry." Florida Caribbean Cruise Association, 2013.
3. "North America Cruise Detail Data." U.S. Department of Transportation Maritime Administration, 15-Jun-2012.
4. A. Ahola, "Creating a consumer-driven business model for the cruise line industry: Case Royal Caribbean Cruise Lines Ltd.," Aalto University School of Business, Helsinki, 2011.
5. A. Sbarsky, "Major makeovers for older cruise ships," *Miami Herald*, 24-Aug-2013.
6. A. Weaver, "The Mcdonaldization thesis and cruise tourism," *Ann. Tour. Res.*, vol. 32, no. 2, Apr. 2005.
7. D. Crighton, "Time for a makeover," *International Cruise & Ferry Review*, 2011.
8. D. Ward, *Complete Guide to Cruising & Cruise Ships 2013*, 21st ed. London: Apa Publications, 2012.
9. M. Parsons, "Parametric Design," in *Ship Design and Construction*, vol. 1, Jersey City, NJ: The Society of Naval Architects and Marine Engineers, 2003.
10. M. Witthaus and D. Crighton, "Makeover merchants," *International Cruise & Ferry Review*, 2012.
11. P. Dawson, "Genesis: The early cruise yachts," in *Cruise Ships: An evolution in design*, London: Conway Maritime Press, 2000.
12. P. Dawson, "Rebuilding and Conversion: Cruise ships shaped out of refits and other surgery," in *Cruise Ships: An evolution in design*, London: Conway Maritime Press, 2000.
13. R. A. Swain and J. E. Barth, "An Analysis of Cruise Ship Rating Guides," *Int. J. Hosp. Tour. Adm.*, vol. 3, no. 4, 2002.
14. R. V. Jones, "Motivations to Cruise: An Itinerary and Cruise Experience Study," *J. Hosp. Tour. Manag.*, vol. 18, no. 1, 2011.
15. R. Wood, "Cruise Ships: Deterritorialized Destinations," in *Tourism and Transport: Issues and Agenda for the New Millenium*, 1st ed., Oxford: El Sevier Ltd, 2004.
16. S. Lee and C. Ramdeen, "Cruise ship itineraries and occupancy rates," *Tour. Manag.*, vol. 34, Feb. 2013.
17. X. Sun, Y. Jiao, and P. Tian, "Marketing research and revenue optimization for the cruise industry: A concise review," *Int. J. Hosp. Manag.*, vol. 30, no. 3, Sep. 2011.

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