

Safe Operation and Maintenance of Dry Dock Facilities

ASCE Manuals and Reports on Engineering Practice No. 121

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Safe Operation and Maintenance of Dry Dock Facilities

Prepared by
the Dry Dock Asset Management Task Committee of
the Ports and Harbors Committee of
the Coasts, Oceans, Ports, and Rivers Institute of
the American Society of Civil Engineers

Edited by
Paul A. Harren

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PREFACE

Prior to the publication of this manual of practice, there was no documentation available to commercial facilities that provides guidance for the operators of the four types of dry dock facilities: floating dry docks, graving docks, marine railways, and vertical lifts. As a result, some facilities have been operated and maintained without a thorough understanding of the design of the dry dock and, therefore, the features that are vital to the safe operation of the facility.

Several dry dock failures in recent years have underscored the need for understanding and vigilance when operating and maintaining dry docks. The most vivid example occurred on March 27, 2002, at Dubai Dry Dock No. 2, one of the world's largest ship repair facilities. With five vessels in dock, a section of the gate failed, causing uncontrolled flooding of the dock.

This manual is intended for commercial entities that inspect, maintain, or operate the types of dry docks addressed in this manual, with a capacity of 400 long tons or greater. This manual is not applicable to facilities that are certified to MIL-STD-1625 (D)SH (2009) for the drydocking of U.S. Navy ships. Personnel safety requirements are outside the scope of this manual.

Four activities are vital to maintaining and operating a dry dock safely. These activities include:

Condition Assessment: The condition assessment evaluates the physical condition of the dry dock, reviews design documentation, and performs calculations to determine the capacity of the dry dock in its current condition.

Maintenance: Maintenance includes scheduled preventive maintenance tasks as well as maintenance to correct deficiencies that are

identified through a condition assessment, a preventive maintenance task, a control inspection, or during dock operations.

Control Inspection: The control inspection is a comprehensive but qualitative review of the dry dock facility to evaluate the effectiveness of the maintenance program in keeping the dry dock in a condition to support operating at the rated capacity as determined in the condition assessment. This is effectively an audit of the maintenance program.

Dock Operations: Dock operations encompass all tasks associated with the act of docking a vessel in a dry dock. This includes, but is not limited to, calculations to ensure the stability of the vessel and dock throughout the evolution; proper blocking to ensure proper loading of both the vessel and dock; and procedure requirements.

Sections of this manual are dedicated to each of these activities. The goal is to provide a cost-effective program that provides guidance to maintain and operate a dry dock in a safe manner.

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1
BACKGROUND

This section will provide basic information about the different types of dry docks. Knowledge of the types of dry docks and their design features is useful for understanding the structural and operational limitations of a dry dock. Additionally, an explanation of basic terms used in the following sections will be provided.

1.1 TYPES OF DRY DOCKS

1.1.1 Floating Dry Docks

Floating dry docks, often referred to as "floaters," are structures with sufficient size, strength, displacement, and stability to lift a vessel from the water using buoyancy. Figure 1-1 shows a floating dry dock. These docks can be operated with list and trim to reduce block loading and reduce or eliminate vessel stability problems when docking or undocking. Some shipyards are equipped to transfer vessels to shore from a floating dry dock, which enables concurrent work on multiple vessels. Floating dry docks are comprised of a pontoon and wing walls.

The pontoon is the main structural component (Fig. 1-2) that must be designed to distribute the concentrated blocking loads from the vessel to the dock and ultimately to the uniform buoyant force on the hull. The pontoon provides the transverse strength for the dock as well as contributing to the longitudinal strength. Additionally, the pontoon must have sufficient volume to provide the displacement to lift the vessel and dock out of the water using buoyancy.

The wing walls provide stability when the pontoon is submerged, and longitudinal strength to distribute the ship's weight to the uniform