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Quality, Reliability, Human and Organization Factors In Design of Marine Structures

Robert G. Bea

Department of Civil Engineering and
Department of Naval Architecture & Offshore Engineering
University of California
Berkeley, California

ABSTRACT

Experience has amply demonstrated that Human and Organization Factors (HOF) play important roles in determining the quality and reliability of marine structures such as ships, pipelines, and offshore platforms. This paper addresses HOF in the context of quantitative reliability analyses that are intended to help improve the quality of marine structures. Quality is defined as the combination of acceptable and desirable serviceability, reliability, durability, and compatibility in a marine structure.

A classification of HOF is proposed that addresses individual, organization, equipment / hardware, procedures / software, and environmental considerations. Alternatives for improved management of HOF are addressed including Quality Assurance and Quality Control (QA / QC), and design of error tolerant structures. A generic design process for marine structures is defined. Based on these developments, a generic Quantitative Risk Analysis (QRA) is developed that addresses HOF in addition to the structure system aspects that have been traditionally addressed by QRA. Error promoting characteristics of complex design guidelines and computer software are discussed.

A companion paper illustrates application of these developments to a ship structure problem involving design of the critical details for fatigue (Bea, 1995).

QUALITY

Quality is defined as freedom from unanticipated defects. Quality is fitness for purpose. Quality is meeting the requirements of those that own, operate, design, construct, and regulate marine structures. These requirements include those of *serviceability, safety, compatibility, and durability* (Matousek, 1990) (Figure 1).

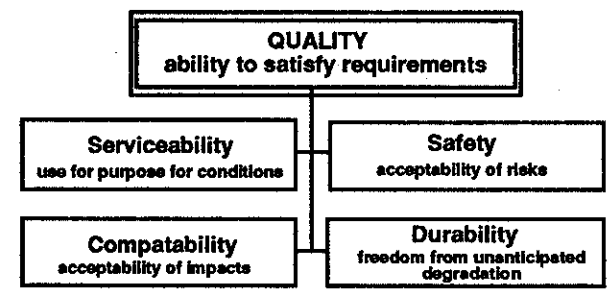


FIGURE 1 - ATTRIBUTES THAT CONSTITUTE QUALITY OF MARINE STRUCTURES

Serviceability is suitability for the proposed purposes, i.e. functionality. Serviceability is intended to guarantee the use of the system for the agreed purpose and under the agreed conditions of use. Safety is the freedom from excessive danger to human life, the environment, and property damage. Safety is the state of being free of undesirable and hazardous situations. The capacity of a structure to withstand its loadings and other hazards is directly related to and most often associated with safety. Compatibility assures that the system does not have