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## Site Assessment for Jack-ups in Gulf of Mexico

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### Abstract

Over several years the jack-up industry has worked on SNAME Technical and Research Bulletin 5-5 "Recommended Practice for Site Assessment of Jack-ups" to improve the practice. Bulletin 5-5 is the base document for ISO 19905 "Site Assessment of Jack-ups". These documents incorporate a partial factor LRFD approach for the assessment of the jack-up platform.

The practice is supplemented by regional annexes to incorporate unique characteristics of regions in the site assessment. This paper summarizes an approach for the Gulf of Mexico assessment that satisfies the base document's objectives while recognizing the operational approach of manned/de-manning operations used in the Gulf of Mexico.

The paper presents recommendations for certain aspects of the assessment addressed by Bulletin 5-5. These aspects include metocean criteria, airgap, foundation and geotechnical considerations, dynamic analysis, and the assessment methodology as it applies to the Gulf of Mexico.

**Key Words:** MODU, Jack-up, Site Assessment, ISO 19905

### Introduction

Site assessments for Gulf of Mexico applications use different levels of engineering evaluation in determining if a jack-up is suitable for a specific location. This paper provides a historical perspective on the site assessment and addresses specific recommendations for a Gulf of Mexico site assessment.

This paper presents an approach that addresses some of the more important parameters for Gulf of Mexico site assessment using the Society of Naval and Marine Engineers (SNAME) Technical and Research Bulletin 5-5A, "Guidelines for Site Specific Assessment of Mobile Jack-up Units" (Bulletin 5-5) for site assessment. The application of the recommendations

in this paper are aimed at providing a consistent approach for Gulf of Mexico site assessment when these units are manned.

The intent of this paper is not to go into technical details of the recommendations since these are more than adequately covered by the referenced technical papers and reports. Additional references are found in Bulletin 5-5 and conference proceedings.

### Historical Assessment Practice

Jack-ups are used throughout the world under various combinations of gravity and metocean loads. This requires the designer of these units to establish a base line capability for each design which is summarized in a Marine Operations Manual (MOM). Metocean criteria used in the design are chosen by the designer based on a regional bias while recognizing the worldwide application. As such, designers have traditionally used conservative design assumptions. Boundary conditions at the footings (spud cans), with a few exceptions, are assumed pinned and the analysis of the jack-up uses detailed finite element analysis (FEA) models.

Modern jack-up designs cover a range of water depths and are reviewed for class designation by one of the IACS member classification societies. Approved operating conditions, typically defined as benchmark storms, are incorporated into the jack-up owner's Marine Operations Manual (MOM) which defines the total elevated weight, water depth, airgap, metocean criteria, and penetration. Guidance is typically provided for other penetration cases within the text of the MOM. However, the MOM benchmark storms are only intended for guidance on the jack-up capabilities. The designer expects that each site will be evaluated based on the site specific criteria compared to the jack-up's capabilities.

Site assessments are performed by operators, drilling contractors, jack-up designers, consultants, marine surveyors, or other stakeholders in the process. Most Gulf of Mexico site assessments are generally performed by marine surveyors who represent the interest of the underwriter using their internal assessment practices.

Engineering studies with varying levels of complexity have been used for site assessments. Simplified procedures include the development of maps (Figure 1) that represent the capabilities of a jack-up design based on a jack-up's MOM benchmark storms compared to regional metocean data. These maps show areas where the unit may work and those that require review. The maps are based on analysis assumptions which must be confirmed during the site assessment process. If one or more assumptions are exceeded, a detailed assessment is required.