

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

MANUAL

MARINE SAFETY OF MOBILE OFFSHORE UNITS

PTS 37.19.10.20

November 2010



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Document Approval

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PREFACE

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FOREWORD

After the breaking up and capsizing of the semisubmersible mobile offshore unit Alexander L. Kielland in the North Sea on 27 March 1980 (less than a week before it would have been under contract to a Group Operating Company) extensive discussions were initiated throughout the industry with regard to the adequacy of existing rules and regulations for hydrostatic stability, surveys performed by Classification Societies or other regulatory authorities and abandonment equipment and procedures. The E&P Forum set up a task force on the Alexander L. Kielland accident, chaired by SIPM staff. Industry response to this accident has been a general raising of safety standards over a broad front, promoted in particular by the Norwegian Authorities (NMD and NPD) and the Norwegian Classification Society (DnV).

The capsize and sinking of another large semisubmersible, the Ocean Ranger, off Newfoundland on 15 February 1982 created further concern about the marine safety of mobile offshore units. The E&P Forum again formed a task force, also led by SIPM staff, which reviewed and discussed the findings of the U.S. National Transportation Safety Board, the U.S. Coast Guard and the Canadian Royal Commission together with the recommendations made by these Committees. An internal SIPM workgroup was established in 1983 with the objective of applying the lessons learned to semisubmersibles contracted by Group Companies.

While this work was going on a third major accident occurred; the loss of the drillship Glomar Java Sea in a typhoon in the South China Sea on 25 October 1983. During this same period another major oil company, Exxon, was also seen to be devoting considerable attention to marine safety in a wide sense. Exxon performed structural inspections of several mobile offshore units of different types, which were under contract to them, and was reportedly alarmed by the many deficiencies found. These results were brought to the attention of the E&P Forum task force.

In the meantime some experience had been gained by the Group in the assessment of structural fitness-for-purpose of jack-ups which were claimed to be suitable for year-round drilling in even greater water depths and harsher environments than those for which they were designed. This experience indicated that contractor and industry assessments could not be relied upon and some proposed tender acceptances were rejected on grounds of structural inadequacy for the envisaged application.

Taken together, all this obviously created deep concern and the internal SIPM workgroup decided to extend its field of activities to cover marine safety in its widest sense for mobile offshore units of different types and functions. It set itself the task of preparing this position paper containing both firm recommendations for improvements and the impact of these recommendations, for the information and approval of EP Management and subsequent issue to all Group Operating and Associated Companies.

The workgroup consisted of staff members of EPD/11 - Offshore Structures and Metocean Services (formerly EP/23.1), EPO/63 - Safety and Environment (formerly EP/23.5), EPO/51 - Operations Engineering (formerly EP/25.1) and EPO/52 - Drilling (formerly EP/25.2), under the overall coordination of EPO/63.

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1. INTRODUCTION

In recent years, three major accidents with mobile offshore drilling units (MODUs) have occurred. The Alexander L. Kielland, Ocean Ranger and Glomar Java Sea disasters together resulted in the loss of 288 lives. These accidents could have happened while on contract to Shell as the standards and practices applied were not significantly different to those applied at the time by the Group. Indeed, the A.L. Kielland was due to commence work for Shell only a few days after its capsize. As more exploration and production is undertaken in hostile offshore environments, the likelihood of loss of life and damage to property will increase unless safety standards are maintained and in some cases raised.

This position paper appraises the current situation regarding marine safety and seeks to establish minimum standards for the design, contracting and operation of mobile offshore facilities. The paper applies only to jack-ups (self-elevating platforms), semisubmersibles, barges and ship-shaped vessels on which are installed temporary production, drilling, temporary accommodation and hook-up and commissioning facilities. Many of the recommendations are equally applicable to other forms of specialised support vessels although these are not specifically covered in the scope. Where local legislation or applicable codes are not in accordance with the requirements of this paper, the more stringent requirements shall be applied.

Studies have been made by various bodies of past incidents and the effectiveness of equipment, personnel and training, in both preventing incidents and dealing with their consequences. Many of the recommendations made, for example in the first Royal Commission Report on the Ocean Ranger incident (Ref 1.1), have already been implemented. For instance, modifications have been made to ballast control systems on some units and changes have occurred to the command structure of certain mobile offshore units (MOUs).

It is intended to further improve the safety of operation of MOUs operating for the Group in order to reduce the risks associated with offshore operations. To quote the second Royal Commission Report (Ref 1.2) on the Ocean Ranger incident: "High standards of safety in the workplace are achieved when well-designed equipment is operated properly by well-managed and well-trained persons. Occupational safety is maintained by keeping these factors in a state of positive balance, in what is normally a highly dynamic situation. It requires constant vigilance to ensure that equipment is kept operating within permissible limits, that the persons responsible for each aspect of the operation continue to be well selected for the tasks they do, and that they are knowledgeable about what they are doing. The more demanding the work and the work environment, the more essential it is to ensure that a continuing effort is made to maintain their health, their motivation, their safety consciousness and thus their commitment to safety."

2. AIMS

It is recommended that all Group Companies engaged in the operation of mobile offshore units ensure that:

- their standards are compatible with the Group policy Guidelines on Health, Safety and Environmental Conservation,
- each unit is suitable for use at its intended location for the whole range of environmental conditions that may be encountered during the period of assignment,
- suitable equipment is installed to cope with marine emergencies,
- all personnel (both contractor and Company staff) have appropriate qualifications, training and experience,
- the lines of command on all MOUs are clearly defined,
- comprehensive and effective emergency procedures and contingency plans are in place, well-rehearsed and strictly enforced,
- all personnel working on mobile offshore units are motivated to achieve the highest standards of safety performance,
- all possible steps are taken to establish common and adequate standards for marine safety within the industry by approaching Classification Societies and inter-governmental organisations.

These aims are already manifest in the practices of Group operators and their contractors. However, some of these aims are, in the opinion of the workgroup, not adequately addressed. It is these aspects which it is sought to highlight in the following sections.

3. STRUCTURAL FITNESS-FOR-PURPOSE

3.1 General

Structural fitness-for-purpose means the adequacy of the main structure to accommodate the functional and environmental loadings for an intended application. "Main structure" includes the anchoring or positioning system in case of a floating unit, and the legs and foundation in the case of a jack-up. Assurance of structural fitness-for-purpose comprises two stages, namely confirmation that:

- 1) The design of the unit is suitable for use at the intended location for the whole range of environmental conditions that may be encountered during the period of assignment.
- 2) The actual condition of the unit conforms to the design specifications.

Stage 1 is specific for each application. Stage 2 is based on appraisal of the quality assurance during construction, a review of the in-service history and, in certain cases, follow up with actual structural integrity inspection.

3.2 Current Situation

MOUs are usually designed and built in accordance with rules and practices defined by a Classification Society chosen by the owner, and augmented by appropriate legislative requirements or owner specifications. However, depending on the owner, the country of registration and the Classification Society concerned, methods of design and the criteria employed may vary considerably (Refs. 3.1 to 3.3).

These differences originate mainly from variations in industrial and regulatory practices (for instance Norway versus USA) and prevailing environmental conditions in areas where experience has been obtained. There are significant differences in the manner of determining and the criteria for satisfying overturning stability, foundation capacity and strength of jack-up units. Fewer variations exist in the areas of strength, anchoring and stability of semisubmersibles, with the exception of regulations for damaged stability.

Since specific operational applications of a MOU are generally not known at the design stage, the design is based on a hypothetical set of environmental criteria and soil conditions. In order to obtain insurance cover for each move and deployment of the MOU, the suitability of the unit is usually verified by an insurance warranty surveyor. These surveys refer only to the marine operations and in-situ behaviour of the MOU and comprise a check that the loads and conditions to be expected are within the design capabilities of the unit. Any marine operations equipment, such as towing gear and seafastings may also be physically examined, but the structural integrity of the hull is not inspected. Methods and criteria differ between surveyors and the depth to which the survey is performed (if at all) may vary from case to case.

During construction and operation, a MOU is usually kept under survey by a Classification Society which takes a leading role in monitoring the condition of the unit. This entails checking of materials and equipment, and inspection during construction. Subsequently periodic surveys and inspections are performed, all in accordance with the Society's rules, regulations and practices. The effort of the owner is generally limited to ensuring compliance with technical specifications and contractual obligations during the construction stage, and to normal maintenance during operation.

When a MOU was considered for a particular application, the client until recently satisfied himself by verifying that all certificates and approvals of appropriate authorities, Classification Societies and warranty surveyors were obtained, and by visually examining the unit's layout and the type and status of its equipment (the so-called "rig inspection"). Only in some cases, for instance when conditions were exceptional or when the track record of the unit was in doubt, was a special investigation of the structural suitability of the MOU undertaken.

During the last few years one major Group Operating Company and SIPM have increasingly conducted independent assessments of the structural suitability of MOUs, particularly jack-ups, with regard to overturning stability, foundation capacity and leg strength for which some preliminary criteria have been specified.