



GUIDE FOR

SURVEY AND INSPECTION OF JACKING SYSTEMS

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**American Bureau of Shipping
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Foreword

This Guide has been prepared by ABS to provide Owners guidelines to establish minimum requirements for inspection of Rack and Pinion jacking gear at Special Periodical Survey of Hull for Self-Elevating Drilling Units.

This Guide provides more details regarding the examination of open and closed type jacking systems of a Self-Elevating Drilling Units. The maintenance crew will benefit from understanding the general and design specific survey requirements for a Rack and Pinion jacking gear. This will enable better planning, execution and consistent application of the scope of surveys and inspection during Special Surveys for jacking systems.

This Guide becomes effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of this Guide is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.



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SECTION 1 Purpose

The purpose of these Guide is to establish minimum requirements for inspection of Rack and Pinion jacking gear at Special Periodical Survey of Hull for Self-Elevating Drilling Units for consistent application of the below noted Rule requirement.

7-2-5/13.15 of the *ABS Rules for Building and Classing Mobile Offshore Drilling Units (MODU Rules)* is the current requirement for inspection of jacking gear, see excerpt below:

13.15 Self-Elevating Drilling Units – Leg Jacking Systems (2011)

On self-elevating type drilling units, leg jacking systems are to be examined and reported on. Pinions and gears of the climbing pinion gear train of rack and pinion systems are to be examined as far as practicable, to the Surveyor's satisfaction, by an effective crack detection method.

At Special Periodical Survey No. 2 and subsequent Special Periodical Surveys, the leg jacking system is to be examined in the presence of the Surveyor by the original equipment manufacturer or other third party inspector mutually agreeable to the owner and the Surveyor.

The above Rule gives a requirement for in-depth inspection commencing at Special Periodical Survey No.2, which is at 10 years from delivery of the Unit, by the Original Equipment Manufacturer or a third party inspector agreeable to both ABS and the Owner; however, the extent of the inspection is not clearly defined as there are multiple manufacturers and designs of Jacking Systems and the inspection requirements for each vary.

The following designs of Jacking Systems are predominantly used on Self-Elevating Drilling Units and are considered in these instructions:

- Open Type Systems
- Closed Type Systems



SECTION 2 Definitions

1 Closed Systems

Closed jacking systems are systems where a visual examination of the gears in place by removal of inspection covers cannot be carried out, as not all Closed Designs are fitted with inspection covers. These types of systems, without inspection covers, have to be removed from the unit and disassembled in a shop to carry out visual examination of the gear units. Most commonly they are planetary drive type units.

3 Open Systems

Open Jacking systems are systems that are fitted with removable inspection covers that enable in-place visual examination of the gears.

5 Jacking Gear Function Test

A jacking Gear Function test refers to operational testing of the jacking gear while jacking under normal load. In the function test, distance to be jacked is one complete revolution of the climbing pinion.



SECTION 3 General Survey Requirements

The following requirements are to be applied to all units and jacking system designs:

- i) *Record Keeping.* Number of hours and loading while jacking should be kept for review and used as a reference for the required examinations. These records should include hours jacking under preload, normal loading, pulling stuck legs and jacking in heavy weather. Verification of these records should be performed at each Annual Classification Survey.
- ii) *Lube Oil Analysis.* Lube oil from the gear boxes of systems that are designed as “closed systems” (i.e., planetary drive type) should be retrieved, and analyzed twice each year, as a minimum. When excessive metal content or other conditions that would indicate failure of the gearbox are found the gearbox is to be opened and examined prior to completion of the Special Survey.
- iii) Climbing pinions should be closely examined at each Special Survey, tooth profile checked and non-destructively tested as considered necessary.
- iv) Rack teeth profiles are to be examined, compared to the tolerances set by the Unit’s designer. Any out of tolerance must be corrected. Areas of the Rack to be examined should be determined from operational records but should include the areas of the leg most highly loaded during jacking operations while going on location.
- v) Shock pads, were fitted, are to be examined, dimensions confirmed to be in accordance with the OEM specifications and found or placed in satisfactory condition.
- vi) Leg guide wear plates are to be examined and found or placed in satisfactory condition.
 - a) Liners are to be confirmed in place
 - b) Liners are to be examined for cracking or missing retaining welds
 - c) Liner wear is to be within the OEM’s tolerances

Note: Lower liners are to be examined while the Unit is elevated.
- vii) The jacking systems including all auxiliary equipment are to be inspected for damage, wear, or corrosion. This is to include items such as the gearbox and motors, foundations, mounting arrangements, bolting, and connection couplings. Other ancillary equipment such as operating and control, piping and wiring installations along with their supporting structure should also be included.
- viii) During any inspection lock-out, tag-out or similar isolation of the jacking system is to be carried out. This included pressure systems, electrical systems, and structural components.
- ix) *Provision of Safe Access.* Due to increased likelihood of survey work being carried out at height or over water, reference is made to the entire text of 1-1-5/7 of the *ABS Rules for Conditions of Classification – Offshore Units and Structures (Part 1)* and *ABS Surveyor’s Safety*. In short, ABS Surveyors will conduct surveys, provided the client’s established safety procedures are not less effective than those contained in the *ABS Safety Manual* and associated procedures.
- x) Any replacement parts are to be manufactured in accordance with the ABS Rule requirements.



SECTION 4 Scope of Surveys

- i)* At Special Survey No. 1 Pinions and gears of the climbing pinion gear train of rack and pinion systems are to be examined as far as practicable, to the Surveyor's satisfaction, and if considered necessary by an effective crack detection method.
- ii)* Commencing at Special Periodical Survey No. 2 and beyond, the Jacking Gear is to be examined in accordance with the ABS Rules by the Original Equipment Manufacturer (OEM) or a third party mutually agreeable to the Owner and ABS. The Drilling Contractor shall submit a plan to ABS addressing any findings from the Jacking Gear examination and a timeline for any required component renewals.
- iii)* Consideration may be given to examining the Jacking Gear under continuous survey (i.e., a percentage of the Jacking Gear to be examined annually, minimum of 20% of the gear per year). The plan for continuous survey is to be submitted to the Corporate Offshore Survey Department for review and acceptance. This plan will then be placed in the Unit's records, where it will be available to the attending Surveyor.
- iv)* Self-elevating units may be placed on Preventative Maintenance Program (PMP), as specified in Appendix 7-2-A4 of the *MODU Rules*. However, the following typical items of a jacking system cannot be enrolled in PMP and will be examined to the Surveyor's satisfaction.

 - a)* For Planned Maintenance (PM)

 - Visual examination and/or testing of jacking system machinery
 - Operational testing of jacking systems
 - b)* For Condition Monitoring (CM)

 - Operational testing of jacking systems



SECTION 5 Design Specific Survey Requirements

The following requirements are noted as design specific and take into consideration the unique aspects of each design; these are to be done in addition to the General Inspection requirements noted above.

1 Open Type Systems

All gears are to be visually examined as needed based on the jacking hours, either through removal of gears, inspection ports, or by removal of covers. Boroscope examination may be acceptable provided that there are sufficient ports to give a thorough examination. Brakes are to be examined for excessive wear and the proper clearances, bearing clearances should be evaluated and brakes are to be examined for excessive wear and the proper clearances. Inspection of the high speed gear box, where fitted, may be limited to lube oil analysis and satisfactory function testing. Upon completion of inspection a function test is to be carried out.

Note: Gear profiles and gear mesh patterns give an indication of bearing wear.

3 Closed Type Systems

As these gears can only be opened and examined in a workshop, unless fitted with inspection covers, for the second Special Survey (10 years) and subsequent Special Surveys, that one gear box be examined. This may be modified by the number of hours of use, provided that corrosion while in static position is accounted for. When choosing which gearbox to examine, the actual age load and usage history of the gearbox should be considered. Boroscope examination may be acceptable provided that there are sufficient ports to give a thorough examination of all gears. The gearbox with the most hours of service or highest loads is to be examined at this time. A record of which gearbox was examined is to be kept for future reference. If the condition of this gearbox is acceptable, then only lube oil analysis and operational testing would be recommended for the remaining gear boxes. Based on the number of jacking hours, this requirement may be increased. Brakes are to be examined for excessive wear and the proper clearances, bearing clearances as accessible should also be taken and compared to the tolerances. Upon completion of inspection, a function test is to be carried out including an examination while in operation.