International Standard

ISO 19905-4

Site-specific assessment of mobile offshore units —

Part 4: Jack-up installation and removal at a site

Évaluation spécifique au site d'unités mobiles en mer —

Partie 4: Déploiement et repliement de plates-formes auto élévatrices sur site

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 7, *Offshore structures*.

A list of all parts in the ISO 19905 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The International Standards on offshore structures prepared by TC 67/SC 7 [i.e. ISO 19900, ISO 19901 (all parts), ISO 19902, ISO 19903, ISO 19904-1, ISO 19905 (all parts) and ISO 19906] constitute a common basis covering those aspects that address design requirements and assessments of all offshore structures used in the energy sector worldwide. Through their application, the intention is to achieve reliability levels appropriate for offshore structures, whatever the type of structure and the nature of the materials used.

Structural integrity is an overall concept comprising models for describing actions, structural analyses, design or assessment rules, safety elements, quality of work, quality control procedures and national requirements, all of which are mutually dependent. The modification of one aspect of design or assessment in isolation can disturb the balance of reliability inherent in the overall concept or structural system. The implications involved in modifications, therefore, must be considered in relation to the overall reliability of all offshore structural systems.

The International Standards on offshore structures prepared by TC 67/SC 7 are intended to provide wide latitude in the choice of structural configurations, materials and techniques without hindering innovation. Sound engineering judgment is, therefore, necessary in the use of these documents.

This document states the general principles and basic requirements for the site-specific assessment of the installation and removal of mobile jack-ups; it is intended to be used for the site-specific assessment of installation and removal and not for jack-up design.

The assessment of a jack-up at a specific site is normally comprised of two parts.

1) Assessing that the jack-up can survive in the operational elevated mode.

2) Assessing that the jack-up can be safely installed at, and removed from, the site.

Item 1 is addressed in ISO 19905-1 and item 2 is addressed in ISO 19905-4. When applicable, this document can be supplemented with ISO 19905-1 for situations when the hull is partially elevated between water surface and the full operational hull elevation.

Much of the information required for an ISO 19905-1 assessment (referred to herein as a site-specific assessment elevated – SSA-E) is also required for an ISO 19905-4 assessment (referred to herein as a site-specific installation and removal assessment – SSA-I). There is, however, additional information used in an SSA-I that is best gathered at the same time that data for the SSA-E is collected. This is further discussed in 5.1.

Site-specific installation and removal assessment is normally carried out before a jack-up is installed or removed at a specific site. The installation and removal assessment is not intended to provide a full evaluation of the jack-up; it assumes that aspects not addressed herein e.g. the derivation of leg strength, structural condition of the jack-up, have been addressed using other practices and standards or with the assessment of survival conditions when elevated on the specific site. In some instances, the original design of all or part of the structure can be in accordance with other International Standards on offshore structures prepared by TC 67/SC 7, and in some cases, different practices or standards can have been applied.

The purpose of the site-specific installation and removal assessment is to ensure that the jack-up and its foundations have been adequately assessed, taking into account the consequences of failure. It is important that the results of a site-specific installation and removal assessment be appropriately recorded and communicated to those persons required to know or act on the conclusions and recommendations. Alternative approaches to the site-specific installation and removal assessment can be used, provided that they have been shown to give a level of structural reliability equivalent, or superior, to that implicit in this document.

The annexes can include terms, definitions and concepts that differ from those included in the mandatory parts of this part of ISO 19905.

Annex A provides background to and guidance on the use of this document. The clause numbering in Annex A is the same as in the main text in order to facilitate cross-referencing.

Annex B identifies the documentation that should be gathered and exchanged and provides checklists of information and actions for the stages of installation and removal operations.

Annex C provides guidance on the competence of the rig mover.

Annex D provides guidance on the parties responsible for entering and departing safety zones.

Annex E provides an example rig move procedure (RMP).

This document is structured to consider the issues associated with a particular site and is not necessarily organized in the same way that a jack-up owner or surveyor would develop a rig move procedure (which is normally developed in terms of leaving one site and being elevated at the next), see Figure 0-1.

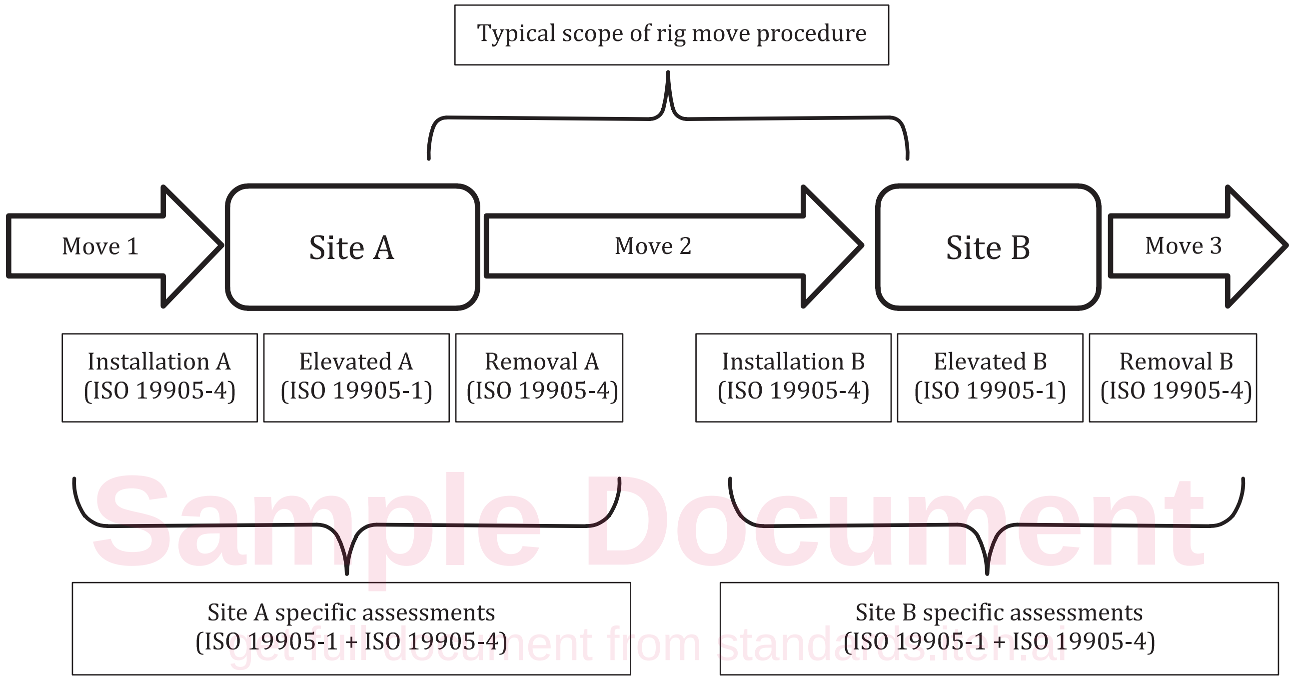

Figure 0-1 — Alignment of specific assessments with multiple sites and rig moves

The provisions of this document form an integrated approach for SSA-I, which is intended to be used in its entirety for the site-specific installation and removal assessment of an independent leg jack-up.

This document has been developed assuming that a site-specific assessment for elevated (survival) operations (SSA-E) is available for the specific site. It can be possible to develop an incomplete RMP prior to the SSA-E being finalized.

Site-specific assessment of mobile offshore units —

Part 4:
Jack-up installation and removal at a site

1 Scope

This document specifies requirements and guidance for the installation on and removal from site of independent leg jack-ups for use in the oil and gas industries including lower carbon energy. It addresses the assessment of:

a) the installation operation from when the jack-up enters the defined safety zone of the host platform or the intended site to when it is elevated to the operating hull elevation above LAT and is ready for operations;

b) the removal operation from when the jack-up is ready to jack-down to when it departs the defined safety zone.

NOTE 1 Whilst this document is for independent leg jack-ups, many of the provisions can be applied to mat-supported jack-ups.

When the jack-up has propulsion assist or is self-propelled, the provisions of this document related to positioning can be replaced or supplemented as appropriate.

This document excludes the move of the jack-up between sites and elevated operations, which are covered respectively by IMO/Class and ISO 19905-1.

NOTE 2 Whilst this document addresses the installation and removal of a jack-up at a site, RMPs normally include the move of the jack-up between sites (see example RMP in Annex E).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 19901-8, *Oil and gas industries including lower carbon energy — Offshore structures — Part 8: Marine soil investigations*

ISO 19901-10, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 10: Marine geophysical investigations*

ISO 19905-1:2023, *Oil and gas industries including lower carbon energy — Site-specific assessment of mobile offshore units — Part 1: Jack-ups: elevated at a site*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
action
external load applied to the *jack-up* (3.25) (direct action) or an imposed deformation or acceleration (indirect action)

EXAMPLE An imposed deformation can be caused by fabrication tolerances, differential settlement, temperature change or moisture variation. An imposed acceleration can be caused by an earthquake.

[SOURCE: ISO 19900:2019, 3.3, modified — "structure" changed to "jack-up".]

3.2
air gap
clearance between the highest water surface that occurs during the current phase of the installation or removal operation and the base of the hull

Note 1 to entry: In ISO 19900, "air gap" is defined as the distance between the highest water elevation and the lowest exposed part of the primary deck structure not designed to withstand associated environmental action effects for a defined return period. This differs from the air gap definition historically used by the jack-up industry. In ISO 19905-1, hull elevation above *LAT* (3.29) is used for the elevated operational case.

3.3
assessment
site-specific assessment
evaluation of the stability and structural integrity of a *jack-up* (3.25) and, where applicable, its seabed restraint or support against the *actions* (3.1) determined in accordance with specific requirements

Note 1 to entry: The specific requirements are given in this document.

Note 2 to entry: An assessment can be limited to an evaluation of the components or members of the structure which, when removed or damaged, could cause failure of the whole structure, or a significant part of it.

[SOURCE: ISO 19905-1:2023, 3.6]

3.4
assessment criteria
quantitative formulations describing the conditions to be fulfilled for each *assessment situation* (3.6)

[SOURCE: ISO 19900:2019, 3.15, modified — References to "design" deleted.]

3.5
assessment resistance
resistance limit calculated using factored *representative values* (3.46) of *basic variables* (3.10) or from factored expressions based on unfactored *representative values* (3.46) of *basic variables* (3.10)

EXAMPLE Examples of basic variables relevant to resistance are material properties.

[SOURCE: ISO 19900:2019, 3.12, modified — "design" changed to "assessment".]

3.6
assessment situation
set of physical conditions for which the *jack-up* (3.25) or its components are verified

Note 1 to entry: The assessment situations are checked against the *acceptance criteria* (3.4) of this document to demonstrate that the relevant *limit states* (3.28) are not exceeded.

[SOURCE: ISO 19900:2019, 3.16, modified — Reference to "design" deleted and "structure" changed to " jack-up". Note 1 to entry added]

3.7
assessor
entity performing the *site-specific assessment* (3.3)

[SOURCE: ISO 19905-1:2023, 3.10]

3.8
backfill
submerged weight of all of the soil that can be present on top of the *spudcan* (3.59)

Note 1 to entry: Backfilling can occur during or after *preloading* (3.38). $W_{BF,o}$ refers to the submerged weight of the backfilling that occurs up to achieving the *preload reaction* (3.40). $W_{BF,A}$ refers to the submerged weight of the backfilling that occurs after the maximum preload has been applied and held. Both $W_{BF,o}$ and $W_{BF,A}$ can comprise either *backflow* (3.9) or *infill* (3.24), or both.

[SOURCE: ISO 19905-1:2023, 3.11, modified — In note 1 to entry, the last sentence has been removed.]

3.9
backflow
soil that flows from beneath the *spudcan* (3.59) around the sides and onto the top

Note 1 to entry: Backflow is part of *backfill* (3.8).

[SOURCE: ISO 19905-1:2023, 3.12]

3.10
basic variable
variable representing physical quantities which characterize *actions* (3.1) and environmental influences, geometric quantities, or material properties including soil properties

Note 1 to entry: Basic variables are typically uncertain random variables or random processes used in the calculation or assessment of *representative values* (3.46) of actions or resistance.

[SOURCE: ISO 19900:2019, 3.7]

3.11
certificate of approval
CoA
certificate issued by the *marine warranty survey company* (3.32) upon review of the *rig move procedure* (3.48); documentation for the intended operations; weather conditions and weather forecast and checking equipment

Note 1 to entry: Separate CoAs can be issued for the removal operation, the rig move, the installation on site and the elevated operation (in relation to the ability to withstand elevated storm conditions).

3.12
chart datum
CD
local datum used to fix water depths on a chart or tidal heights over an area

Note 1 to entry: Chart datum is usually an approximation to the level of the *lowest astronomical tide* (3.29).

Note 2 to entry: Chart datum can differ from one chart to another and care is required if cross referencing sites that are not on the same chart.

[SOURCE: ISO 19901-1:2026, 3.2, modified — Note 2 to entry has been added.]

3.13
characteristic value
value assigned to a *basic variable* (3.10) with a prescribed probability

Note 1 to entry: In some design/assessment situations, a variable can have two characteristic values, an upper value and a lower value.

[SOURCE: ISO 19900:2019, 3.9]

3.14
contingency plan
plan to implement alternate operations in case safety or productivity is jeopardized

3.15
defined safety zone
safety zone around the host platform or operating location under the control of the platform or location OIM (offshore installation manager)

Note 1 to entry: The zone typically extends 500 m from the host platform or operating location, and the zone can be known as the 500 m zone.

3.16
field
general area where the *jack-up* (3.25) is intended to operate

Note 1 to entry: The field is a general area as opposed to the *site* (3.54) which is specific.

[SOURCE: ISO 19905-1:2023, 3.23]

3.17
fixed load
lightship
permanent parts of the *jack-up* (3.25), including hull, legs and *spudcans* (3.59), outfit, stationary and moveable-fixed equipment

Note 1 to entry: Moveable-fixed equipment normally includes the drilling package structure and associated permanently attached equipment.

[SOURCE: ISO 19905-1:2023, 3.24, modified — The admitted term "lightship" has been added.]

3.18
footprint
sea floor depression which remains when a *jack-up* (3.25) is removed from a site

[SOURCE: ISO 19905-1:2023, 3.25]

3.19
foundation
soil and *spudcan* (3.59) supporting a *jack-up* (3.25) leg

[SOURCE: ISO 19905-1:2023, 3.26]

3.20
hold point
point in time at which operations are paused for decision making

3.21
hull level jetting
jetting while applying excess buoyancy, thereby creating over pull with all legs stuck, alternating jetting between legs as needed, or jetting all legs together, while keeping the hull as level as practical within designer limitations, and freeing the legs as close together as reasonably practical

3.22
human error
human action or inaction that can produce an unintended result

3.23
independent leg jack-up
jack-up (3.25) unit with legs that can be raised and lowered independently

[SOURCE: ISO 19905-1:2023, 3.32]

3.24
infill
soil above the plan area of the *spudcan* (3.59) arising from sediment transport or hole sidewall collapse

Note 1 to entry: Infill is part of *backfill* (3.8).

[SOURCE: ISO 19905-1:2023, 3.34]

3.25
jack-up
mobile offshore unit with a buoyant hull and one or more legs that can be moved up and down relative to the hull

Note 1 to entry: A jack-up reaches its operational mode by lowering the leg(s) to the seabed and then raising the hull to the required elevation. The majority of jack-ups have three or more legs, each of which can be moved independently and which are supported in the seabed by *spudcans* (3.59).

[SOURCE: ISO 19905-1:2023, 3.36]

3.26
jack-up owner
owner
representative of the company or companies owning or chartering the *jack-up* (3.25)

Note 1 to entry: The energy company, the *operator* (3.37), contracts the jack-up and is generally not the owner or charterer.

[SOURCE: ISO 19905-1:2023, 3.37]

3.27
leg run
prolonged vertical leg movement that can be controlled by the jacking system, such that the hull can be maintained within tolerable limits

3.28
limit state
state beyond which the *jack-up* (3.25) no longer satisfies the *assessment criteria* (3.4)

[SOURCE: ISO 19905-1:2023, 3.40, modified — The words "or a structural member" have been deleted]

3.29
lowest astronomical tide
LAT
level of low tide when all harmonic components causing the tides are in phase

Note 1 to entry: The harmonic components are in phase approximately once every 19 years, but these conditions are approached several times each year.

[SOURCE: ISO 19901-1:2026, 3.18]

3.30
marine assurance
secondary review of marine installation and removal procedures

3.31
marine operating manual
marine operation manual
operating manual
latest approved document that defines the operational characteristics and capabilities of the *jack-up* (3.25)

Note 1 to entry: The *assessor* (3.7) should ensure that any updated weight data are provided.

3.32
marine warranty survey company
MWS
organization approved by insurance underwriters to satisfy the requirements of the warranty clause in a marine insurance policy

Note 1 to entry: The fundamental objective of the MWS is to make reasonable endeavours to ensure that the risks associated with the warranted operation (in this case, the rig move) are reduced to an acceptable level according to the best industry practice. The MWS can specify recommendations to be met in order to minimize the risk to the insured jack-up during all phases of the move and to comply with the terms of the warranty.

Note 2 to entry: MWS attendance is not always a requirement of the insurance warranty clause.

3.33
mat-supported jack-up
jack-up (3.25) unit with the leg(s) rigidly connected by a foundation structure, such that the leg(s) are raised and lowered in unison

[SOURCE: ISO 19905-1:2023, 3.44]

3.34
neutral zone

hull draught zone through which there is vertical load reversal between the legs and the hull

Note 1 to entry: Hull and legs are independent of each other with neither tension nor compression being applied to the jacking system.

Note 2 to entry: The extent of the zone can be larger in the presence of waves.

Note 3 to entry: At this draught, any backlash in the pinion to rack-teeth interface can have detrimental effects (unwinding and rewinding of the planetary gear boxes) even with the brakes set in moderate swell conditions.

Note 4 to entry: The neutral buoyancy effects are most prevalent on floating jacking systems (i.e. causing bouncing of jacking units between shock pads).

3.35
nominal value
value assigned to a variable specified or determined on a non-statistical basis, typically from acquired experience or physical conditions, or as published in a recognized code or standard

Note 1 to entry: In some design/assessment situations, a variable can have two nominal values, an upper value and a lower value

[SOURCE: ISO 19900:2019, 3.33]

3.36
operability limits
pre-defined conditions (e.g. metocean, motions, loads) outside which installation or removal operations are to be suspended

3.37
operator
representative of the company or companies leasing the site

Note 1 to entry: The operator is normally the oil company acting on behalf of co-licensees.

[SOURCE: ISO 19900:2019, 3.35, modified — Note 2 to entry deleted.]

3.38
preloading
installation and embedment of the *spudcans* (3.59) by vertical loading of the soil beneath a jack-up leg *spudcan* (3.59) with the objective of ensuring sufficient foundation capacity under *assessment situations* (3.6) through to the time when the maximum load is applied and held

Note 1 to entry: Whilst three-legged jack-ups preload by taking water ballast on board, jack-ups with four or more legs typically achieve foundation preload by carrying the hull weight on pairs of legs in turn. This procedure is known as pre-driving and generally does not require the addition of water ballast. For the purposes of this document, no distinction is made between preload and pre-drive.

[SOURCE: ISO 19905-1:2023, 3.55]

3.39
preloading air gap
distance between the baseline of the hull and the still water level at a point in time during *preloading* (3.38)

Note 1 to entry: In ISO 19900, "air gap" is defined as the distance between the highest water elevation and the lowest exposed part of the primary deck structure not designed to withstand associated environmental action effects for a defined return period. This differs from the definition historically used by the jack-up industry. In ISO 19905-1 and this document, hull elevation above *LAT* (3.29) is used for the elevated operational case.

3.40
preload reaction
maximum vertical reaction under a *spudcan* (3.59), V_{Lo}, supporting the in-water weight of the *jack-up* (3.25) during the entire *preloading* (3.38) operation

Note 1 to entry: The in-water weight is the full weight of the hull, *variable load* (3.64) and preload ballast, plus the legs and *spudcans* (3.59). and any contained water, reduced by the buoyancy in water of any submerged part of the hull and the legs and spudcans (calculated from their external dimensions). Soil buoyancy and the weight of any soil *backfill* (3.8) above the spudcan are neglected. It is necessary to take care when accounting for water contained in the spudcan (in some cases this can be included in the quoted leg weight).

Note 2 to entry: This is the maximum reaction on a *spudcan* (3.59), V_{Lo}, that would be obtained during *preloading* (3.38) if the jack-up were installed on an infinitely rigid foundation.

Note 3 to entry: V_{Lo} is a key parameter in the geotechnical analysis of independent leg foundations. *Assessors* (3.7) consider values that can be reasonably achieved during preload operations. The assessment is invalidated if the value considered in the site assessment is not achieved during preload operations

Note 4 to entry: The term leg reaction is also used in *MOMs* (3.31) and by jack-up personnel with no consistent meaning, and is thus a potential source of confusion.

3.41
preload jacking reaction
preload pinion reaction
maximum load transferred to a leg by the jacking system during *preloading* (3.38)

Note 1 to entry: The pinion reaction or jacking reaction is often referenced by *MOMs* (3.31) and jack-up personnel, it is less than V_{Lo} by the leg weight and leg water buoyancy.

3.42
punch-through
rapid leg penetration
uncontrolled vertical leg movement due to soil failure with the potential for significant consequences

Note 1 to entry: Significant consequences include: damage to the jack-up, damage to other assets, significant loss of time, and injury to personnel.