

DEP SPECIFICATION

MARINE SOIL INVESTIGATION

DEP 37.11.00.10-Gen.

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DESIGN AND ENGINEERING PRACTICE



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These views are based on the experience acquired during involvement with the design, construction, operation and maintenance of processing units and facilities. Where deemed appropriate DEPs are based on, or reference international, regional, national and industry standards.

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All administrative queries should be directed to the DEP Administrator in Shell GSI.

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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements and gives recommendations for marine soil investigations, which are defined by ISO 19901-8 as a *"type of marine site investigation whose primary objective is to obtain reliable and representative soil data for characterization of the seabed soil conditions to facilitate the design of offshore structures and/or for geohazard evaluation"*. The preceding definition is expanded for the purposes of this DEP to specifically include any soil investigation carried out by "vessel drilling" or "seafloor drilling", which are defined in ISO 19901-8, Sections 6.1.3.2 and 6.1.3.3.

The scope of this DEP excludes requirements for onshore and nearshore site investigations, which are specified in DEP 34.11.00.10-Gen.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, gasification and distribution. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Approve, Approved, or Approval	Principal's approval of documents based on project contract document requirements and must be completed before ordering of material and/or beginning of work.

Term	Definition
Core recovery	The ratio of the length of continuous undisturbed core to the intended penetration of corer
Geotechnical coring	Seabed coring utilizing a box corer, drop corer, piston corer or jumbo piston corer
Geotechnical Investigation Vessel	A spudded, anchored or dynamically positioned floating vessel, which was built or suitably converted to undertake the marine soil investigation.
Scope of Work	Contract document, which defines the scope of the marine soil investigation
SUT-OSIG	Offshore Site Investigation and Geotechnics (OSIG) Group is a special interest group of the Society for Underwater Technology (SUT)
TS Dips	Temperature Salinity Dip, a device used to determine the velocity of sound in sea water

1.3.3 Abbreviations

Term	Definition
CPT	Cone Penetration Test
GNSS	Global Navigation Satellite Systems
DGNSS	Differential Global Navigation Satellite Systems
DP	Dynamic Positioning
DP1, DP2	Germanischer Lloyd Equipment Classes, for dynamic positioned ships
HSE	Health, Safety & Environment
IMCA	International Marine Contractors Association
IMO	International Maritime Organisation
ISM	International Safety Management
RPM	Rotations per Minute of drill string
SOPEP	Shipboard Oil Pollution Emergency Plan
STCW	Standards of Training, Certification and Watchkeeping
VHF R/T	Very High Frequency Receiver/Transmitter
USBL	Ultra-Short Baseline
WOB	Weight On Bit of drill sting
Z	Depth

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (9).

1.5 SUMMARY OF MAIN CHANGES

This is a new DEP.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://swwww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

2. GENERAL REQUIREMENTS

2.1 EXTERNAL STANDARD

1. Marine soil investigations shall comply with the requirements of ISO 19901-8.

This DEP supplements the external standard, where specific instructions, clarifications, or deviations are necessary.

3. OBJECTIVES AND PLANNING

3.1 OBJECTIVES

The objectives of marine soil investigations are defined in ISO 19901-8, Section 5.1.

3.2 PLANNING

1. Planning of marine soil investigations should be per ISO 19901-8, Section 5.2.
2. A risk assessment for execution of the marine soil investigation shall include assessment of the risk of encountering shallow gas per ISO 19901-8, Annex C, Section C.4.
 - a. The risk assessment shall be subject to approval by the Principal
Performance of a risk assessment is required by the Shell HSSE Control Framework.
3. Planning should include the following steps:
 - a. Understand the project drivers.
 - b. Identify the preferred timing of data acquisition.
 - c. Desktop study.
 - i. Understand the regional setting and area of interest.
 - ii. Compile existing data, including any relevant geotechnical, geophysical, geological and geohazard information.
 - iii. Evaluate whether additional geophysical data is required prior to marine soil investigation.
 - iv. Perform engineering studies to assess the value of geotechnical data.
 - d. Determine vessel and equipment requirements.
 - e. Determine resources (personnel and logistics) needed to manage and support the work.
 - f. Market survey of Contractors (technical qualification).

4. SCOPE OF WORK

1. The project shall develop a project-specific scope of work, which meets the objectives and planning considerations in (3).
2. The scope of work shall comply with the following:
 - a. ISO 19901-8, Section 5.3;
 - b. ISO 19901-8, Section 5.5;
 - c. Applicable regulatory requirements for the location;
 - d. Classification society requirements, if applicable.
3. Refer to Table 4.1 for applicable standards when developing the scope of work.

Table 4.1 Industry and Principal guidelines for scope of work

Offshore Structure	Foundation Element	Reference
Fixed Platform	Driven piles	API RP 2A-WSD, Section 4.4
Tension Leg Platform	Driven piles	API RP 2T, Section 10.2.2
Floating Production System and / or Mobile Offshore Drilling Unit	Suction pile anchors Driven pile anchors Plate anchors	API RP 2SK, Appendix E, Section E.2
Fixed Offshore Structures	Gravity base	DNV Classification Notes No. 30.4, Section 1
Jack-up Rig	Spudcan	ISO 19905-1, Section 6.5
Subsea Structures	Gravity base Mud mat Suction caissons Pin piles	SUT-OSIG (2000)
Pipelines	Pipelines	SUT-OSIG (2004) DEP 37.81.10.15-Gen.
Renewable Energy Projects including Wind, Wave and Tidal	Monopile Driven pile Gravity base Suction pile	SUT-OSIG (2014)

5. FIELD INVESTIGATION

5.1 GEOETCHNICAL INVESTIGATION VESSEL

5.1.1 General

1. The vessel shall operate under the ISM Code (2010).
2. The vessel shall be fully type classed and equipped to meet the safety requirements for that class and number of personnel on board.
3. The vessel shall be free from class limitations and annotations to certification.
4. The vessel shall have all statutory documentation valid for duration of the work-scope.
5. The vessel shall be subject to audit or inspection by the Principal prior to acceptance.
 - a. In the case of the vessel being self-auditing under ISM, then examples of previous audits shall be submitted to the Principal.
6. The vessel shall comply with the IMO International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, with respect to hours of work and crew manning.
7. Safety equipment shall be fully certified with current certificates on board.
8. The vessel shall have a certified SOPEP and comply with the appropriate MARPOL 73/78 requirements.
9. The vessel shall have a demonstrable Environmental Policy and waste management system.

10. The vessel shall have a shipboard security plan in line with IMO (2003).
11. The vessel shall be capable of remaining safely at sea for a minimum period of 28 days.
12. The vessel should be capable of operating 24 hours a day for the duration of the marine soil investigation.
13. The vessel should be equipped with a fast rescue craft.
14. The vessel should have a minimum service speed of 10 knots at 90 % output of main engines.

5.1.2 Dynamically positioned vessels

1. Refer to DEP 37.90.10.32-Gen. for the requirements for dynamically positioned vessels.

5.1.3 Vessel deck requirements

1. The deck should be sufficiently high above the water line to allow safe deployment of geotechnical equipment during marginal weather conditions.
2. Adequate deck space shall be available for the safe deployment and retrieval of equipment.
3. The deck shall have protection for personnel working on the open deck so that the vessel can safely work in 2m (6.6ft) seas or swell.
4. All external areas shall have non-slip surfaces.
5. The deck lighting shall be sufficient to allow 24 hour operations.

5.1.4 Vessel equipment

5.1.4.1 Communications

1. The vessel shall be equipped with multi-channel VHF R/T capable of working all frequencies and with a dual watch facility.
2. The vessel shall be equipped with ship-to-shore R/T capable of operating with local shore stations, minimum range of 322 km (200 miles).
3. The vessel shall be equipped with satellite telephone and internet access.
4. The vessel shall be equipped with cellular telephone for use in inshore waters.
5. The vessel shall have an internal communications system that allows for two-way communication between critical areas.
6. The vessel shall be equipped with hand-held radios for operating in areas of the vessel not covered by the internal communications system.

5.1.4.2 Navigation aids

1. The vessel shall be fitted with the following navigation aids in addition to the positioning equipment required for the site investigation:
 - a. Gyrocompasses and a magnetic compass with gyro repeater to the survey operations room;
 - b. Two marine radars (preferably 1 cm x 3 cm and 1 cm x 10 cm) (0.4 in x 1.2 in and 0.4 in x 4 in);
 - c. Satellite positioning receiver;
 - d. Echo sounder with hull mounted transducer;
 - e. Autopilot;
 - f. Doppler or Pitot-type Speed log.