

~~ISO/TC 67/SC 7~~

~~Date: 2023-03-31~~

ISO/FDIS 19901-8:2023(E)

~~ISO/TC 67/SC 7/WG 10~~

~~ISO/TC 67/SC 7~~

~~Date: 2023-xx~~

Secretariat: NEN

~~Oil and natural gas industries including lower carbon energy offshore — Specific requirements for offshore structures — Part 8: Marine soil investigations~~

~~Industries du pétrole et du gaz naturel — Exigences spécifiques relatives aux structures en mer — Partie 8: Investigations des sols en mer~~

Style Definition: Heading 1: Indent: Left: 0 cm, First line: 0 cm, Tab stops: Not at 0.76 cm

Style Definition: Heading 2: Font: Bold, Tab stops: Not at 0.63 cm

Style Definition: Heading 3: Font: Bold

Style Definition: Heading 4: Font: Bold

Style Definition: Heading 5: Font: Bold

Style Definition: Heading 6: Font: Bold

Style Definition: ANNEX

Style Definition: AMEND Terms Heading: Font: Bold

Style Definition: AMEND Heading 1 Unnumbered: Font: Bold

Formatted: Font: Not Bold, Italic

Formatted: Font: Not Bold, Italic

Formatted: Font: Not Bold, Italic

Formatted: Font: Not Bold, Italic

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 19901-8

<https://standards.iteh.ai/catalog/standards/sist/cc99daa6-861b-463b-b929-070bf8211adb/iso-19901-8>

COPYRIGHT PROTECTED DOCUMENT

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office

Ch. de Blandonnet 8 • CP 401

CH-1214 Vernier, Geneva, Switzerland

Tel. + 41 22 749 01 11

Fax + 41 22 749 09 47

copyright@iso.org

www.iso.org

www.iso.org

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 19901-8

<https://standards.iteh.ai/catalog/standards/sist/cc99daa6-861b-463b-b929-070bf8211adb/iso-19901-8>

Contents

Foreword..... viii

Introduction..... ix

1 Scope..... 1

2 Normative references..... 1

3 Terms and definitions..... 2

4 Symbols, units and abbreviated terms..... 7

4.1 Symbols..... 7

4.2 Units..... 11

4.3 Abbreviated terms..... 12

5 Objectives, planning and requirements..... 14

5.1 Objectives..... 14

5.2 Planning..... 14

5.2.1 Sequence of activities..... 14

5.2.2 Integrated geoscience studies..... 16

5.3 Scope of work and development of project specifications..... 17

5.4 Health, safety and environmental requirements for marine operations..... 18

5.4.1 General..... 18

5.4.2 Investigation vessel..... 18

5.4.3 Hazardous substances and acoustic noise..... 19

5.4.4 Shallow gas..... 19

5.5 Other requirements..... 20

5.5.1 Operational requirements..... 20

5.5.2 Quality requirements..... 20

5.5.3 Specific considerations for unconventional soils..... 20

6 Deployment of investigation equipment..... 21

6.1 Non-drilling mode deployment..... 21

6.2 Drilling mode deployment..... 21

6.2.1 General..... 21

6.2.2 Vessel drilling..... 22

6.2.3 Seafloor drilling..... 22

6.3 Uncertainty of vertical depth measurements..... 22

6.3.1 General..... 22

6.3.2 Factors affecting the uncertainty of vertical depth measurements..... 22

6.3.3 Depth uncertainty classes..... 23

6.4 Horizontal positioning..... 24

6.5 Interaction of investigation equipment with the upper seabed..... 24

7 Drilling and logging..... 24

7.1 General..... 24

7.2 Project-specific drilling requirements..... 25

7.3 Drilling objectives and selection of drilling equipment and procedures..... 25

7.4 Drilling operations plan..... 26

7.5 Recording of drilling parameters..... 26

7.6 Borehole geophysical logging..... 27

7.6.1 General..... 27

7.6.2 Reporting of results..... 27

8 In situ testing..... 28

8.1	General	28
8.2	General requirements for the reporting of in situ tests	28
8.3	Cone penetration test	29
8.3.1	General	29
8.3.2	Equipment	29
8.3.3	Test procedures	30
8.3.4	Procedures for testing offshore	34
8.3.5	Presentation of test results	36
8.4	Pore pressure dissipation test	37
8.4.1	General	37
8.4.2	Equipment	38
8.4.3	Test procedure	38
8.4.4	Presentation of results	38
8.5	Ball and T-bar penetration tests	39
8.5.1	General	39
8.5.2	Equipment	41
8.5.3	Calibration and verification of ball and T-bar penetrometers	41
8.5.4	Procedures for testing offshore	41
8.5.5	Presentation of results	42
8.6	Seismic cone penetration test	43
8.6.1	General	43
8.6.2	Equipment	44
8.6.3	Procedures for testing offshore	44
8.6.4	Presentation of results	45
8.7	Other in situ tests	45
8.7.1	General	45
9	Sampling	46
9.1	Purpose and objectives of sampling	46
9.2	Sampling systems	46
9.3	Selection of samplers	46
9.3.1	General	46
9.3.2	Drilling mode samplers	47
9.3.3	Non-drilling mode samplers	48
9.4	Sample recovery considerations	49
9.5	Handling, transport and storage of samples	50
9.5.1	General	50
9.5.2	Offshore sample handling	51
9.5.3	Offshore storage	52
9.5.4	Onshore transport, handling and storage	52
10	Laboratory testing	52
10.1	General	52
10.2	Project specifications	53
10.3	Presentation of laboratory test results	53
10.4	Instrumentation, calibration and data acquisition	54
10.5	Preparation of soil specimens for testing	54
10.5.1	Minimum sample size and specimen dimensions	54
10.5.2	Preparation of disturbed samples and soil batching	54
10.5.3	Preparation of intact specimens (fine soils)	55
10.5.4	Laboratory-prepared compacted and reconstituted specimens	55
10.5.5	Preparation of remoulded samples	57
10.6	Evaluation of intact sample quality	57

ISO/FDIS 19901-8:2023(E)

11	Reporting	58
11.1	Reporting requirements	58
11.2	Presentation of field operations and factual data	58
11.3	Data interpretation and soil parameters	59
Annex A (informative) Additional information and guidance		61
A.1	Scope	61
A.2	Normative references	61
A.3	Terms and definitions	61
A.4	Symbols, units and abbreviated terms	61
A.5	Objectives, planning and requirements	61
A.5.1	Objectives	61
A.5.2	Planning	61
A.5.3	Scope of work and development of project specifications	64
A.5.4	Health, safety, and environmental requirements for marine operations	66
A.5.5	Other requirements	71
A.6	Deployment of investigation equipment	73
A.6.1	Non-drilling mode deployment	73
A.6.2	Drilling mode deployment	73
A.6.3	Uncertainty of vertical depth measurements	73
A.6.4	Horizontal positioning	73
A.6.5	Interaction of investigation equipment with the upper seabed	79
A.7	Drilling and logging	80
A.7.1	General	80
A.7.2	Project-specific drilling requirements	80
A.7.3	Drilling objectives and selection of drilling equipment and procedures	80
A.7.4	Drilling operations plan	84
A.7.5	Recording of drilling parameters	84
A.7.6	Borehole geophysical logging	84
A.8	In situ testing	87
A.8.1	General	87
A.8.2	General requirements for reporting of in situ tests	87
A.8.3	Cone penetration test	87
A.8.4	Pore pressure dissipation test	92
A.8.5	Ball and T-bar penetration test	92
A.8.6	Seismic cone penetration test	92
A.8.7	Other in situ tests	94
A.9	Sampling	95
A.9.1	Purpose and objectives of sampling	95
A.9.2	Sampling systems	95
A.9.3	Selection of samplers	95
A.9.4	Sample recovery considerations	101
A.9.5	Handling, transport and storage of samples	101
A.10	Laboratory testing	104
A.10.1	General	104
A.10.2	Project specifications	104
A.10.3	Presentation of laboratory test results	104
A.10.4	Instrumentation, calibration and data acquisition	104
A.10.5	Preparation of soil specimens for testing	104
A.10.6	Evaluation of intact sample quality	104
A.11	Reporting	104
A.11.1	Definition of reporting requirements	104
A.11.2	Presentation of field operations and factual data	105

A.11.3	Data interpretation and soil parameters	107
Annex B (informative) Laboratory testing		
B.1	General	110
B.2	Classification and index tests	110
B.2.1	Soil identification and description	110
B.2.2	Soil classification	110
B.2.3	Sample photograph	110
B.2.4	Non-destructive sampling logging	110
B.2.5	Water content	111
B.2.6	Liquid and plastic limits	111
B.2.7	Bulk density of soil or soil unit weight	111
B.2.8	Particle density of soil	112
B.2.9	Maximum and minimum index densities	112
B.2.10	Particle size distribution	112
B.2.11	Angularity	113
B.2.12	Organic content	113
B.2.13	Carbonate content	113
B.2.14	Soluble salt content	113
B.2.15	Undrained shear strength index tests	114
B.2.16	Soil sensitivity	118
B.2.17	Needle penetration resistance	119
B.3	One-dimensional consolidation	118
B.3.1	General	119
B.3.2	Incremental loading oedometer tests	119
B.3.3	Continuous loading oedometer tests	120
B.3.4	Dismounting the specimen	120
B.3.5	Determination of horizontal stress	120
B.3.6	Presentation of results	121
B.4	Consolidated triaxial tests	121
B.4.1	General	121
B.4.2	Test apparatus	122
B.4.3	Preparation of triaxial test specimens	124
B.4.4	Saturation	125
B.4.5	Consolidation	125
B.4.6	Static shearing	126
B.4.7	Cyclic testing	128
B.4.8	Dismounting the specimen	128
B.4.9	Presentation of test results	128
B.5	Direct shear tests	130
B.5.1	General	130
B.5.2	Direct simple shear	130
B.5.3	Ring shear	135
B.5.4	Direct shear box	138
B.6	Resonant column	139
B.6.1	General	139
B.6.2	Test procedure	139
B.6.3	Presentation of test results	140
B.7	Test for shear wave velocity and initial shear modulus using bender elements	141
B.8	Thixotropy	141
B.9	Permeability	142
B.10	Thermal conductivity and volumetric heat capacity tests	142
B.11	Geological and geochemical tests	142

B.11.1	General	142
B.11.2	Visual description	142
B.11.3	Mineralogical analysis	143
B.11.4	Amino acid chronology	143
B.11.5	Stable oxygen isotope analysis	143
B.11.6	Gas in sediment samples	143
B.11.7	Age determination (¹⁴ C dating)	144
B.11.8	Paleontological analyses	144
B.11.9	Soil corrosiveness	144
B.12	Rock testing	144
B.13	Other laboratory tests	145
	Bibliography	146
	Foreword	vii
	Introduction	ix
1	Scope	1
2	Normative references	1
3	Terms and definitions	2
4	Symbols, units and abbreviated terms	7
4.1	Symbols	7
4.2	Units	11
4.3	Abbreviated terms	12
5	Objectives, planning and requirements	14
5.1	Objectives	14
5.2	Planning	14
5.2.1	Sequence of activities	14
5.2.2	Integrated geoscience studies	16
5.3	Scope of work and development of project specifications	17
5.4	Health, safety and environmental requirements for marine operations	18
5.4.1	General	18
5.4.2	Investigation vessel	18
5.4.3	Hazardous substances and acoustic noise	19
5.4.4	Shallow gas	19
5.5	Other requirements	20
5.5.1	Operational requirements	20
5.5.2	Quality requirements	20
5.5.3	Specific considerations for unconventional soils	20
6	Deployment of investigation equipment	21
6.1	Non-drilling mode deployment	21
6.2	Drilling mode deployment	21
6.2.1	General	21
6.2.2	Vessel drilling	22
6.2.3	Seafloor drilling	22
6.3	Uncertainty of vertical depth measurements	22
6.3.1	General	22
6.3.2	Factors affecting the uncertainty of vertical depth measurements	22
6.3.3	Depth uncertainty classes	23
6.4	Horizontal positioning	24
6.5	Interaction of investigation equipment with the upper seabed	24

7	Drilling and logging	24
7.1	General	24
7.2	Project-specific drilling requirements	25
7.3	Drilling objectives and selection of drilling equipment and procedures	25
7.4	Drilling operations plan	26
7.5	Recording of drilling parameters	26
7.6	Borehole geophysical logging	27
7.6.1	General	27
7.6.2	Reporting of results	27
8	In situ testing	28
8.1	General	28
8.2	General requirements for the reporting of in situ tests	28
8.3	Cone penetration test	29
8.3.1	General	29
8.3.2	Equipment	29
8.3.3	Test procedures	30
8.3.4	Procedures for testing offshore	34
8.3.5	Presentation of test results	36
8.4	Pore pressure dissipation test	37
8.4.1	General	37
8.4.2	Equipment	38
8.4.3	Test procedure	38
8.4.4	Presentation of results	38
8.5	Ball and T-bar penetration tests	39
8.5.1	General	39
8.5.2	Equipment	41
8.5.3	Calibration and verification of ball and T-bar penetrometers	41
8.5.4	Procedures for testing offshore	41
8.5.5	Presentation of results	42
8.6	Seismic cone penetration test	43
8.6.1	General	43
8.6.2	Equipment	44
8.6.3	Procedures for testing offshore	44
8.6.4	Presentation of results	45
8.7	Other in situ tests	45
8.7.1	General	45
9	Sampling	46
9.1	Purpose and objectives of sampling	46
9.2	Sampling systems	46
9.3	Selection of samplers	46
9.3.1	General	46
9.3.2	Drilling mode samplers	47
9.3.3	Non-drilling mode samplers	48
9.4	Sample recovery considerations	49
9.5	Handling, transport and storage of samples	50
9.5.1	General	50
9.5.2	Offshore sample handling	51
9.5.3	Offshore storage	52
9.5.4	Onshore transport, handling and storage	52
10	Laboratory testing	52
10.1	General	52

ISO/FDIS 19901-8:2023(E)

10.2	Project specifications	53
10.3	Presentation of laboratory test results	53
10.4	Instrumentation, calibration and data acquisition	54
10.5	Preparation of soil specimens for testing	54
10.5.1	Minimum sample size and specimen dimensions.....	54
10.5.2	Preparation of disturbed samples and soil batching.....	54
10.5.3	Preparation of intact specimens (fine soils).....	55
10.5.4	Laboratory-prepared compacted and reconstituted specimens.....	55
10.5.5	Preparation of remoulded samples	57
10.6	Evaluation of intact sample quality.....	57
11	Reporting.....	58
11.1	Reporting requirements	58
11.2	Presentation of field operations and factual data	58
11.3	Data interpretation and soil parameters.....	59
Annex A (informative)	Additional information and guidance.....	61
Annex B (informative)	Laboratory testing	110
Bibliography	146

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 19901-8

<https://standards.iteh.ai/catalog/standards/sist/cc99daa6-861b-463b-b929-070bf8211adb/iso-19901-8>

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

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).

~~Attention is drawn to the possibility that some of the elements of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).~~

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

Formatted: English (United States)

This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 7, *Offshore structures*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 19901-8:2014), which has been technically revised.

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

The main changes compared to the previous edition are as follows:

- application classes for in situ testing tools are removed and replaced by an assessment of documented calibration results and uncertainty analyses;
- new procedures for calibration and verification of cone penetrometers are introduced with reference to the latest edition of ISO 22476-1.
- references to project specifications for technical details have been reduced where possible and roles and responsibilities have been further clarified.

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

ISO/FDIS 19901-8:2023(E)

— title and scope change adopted as per Technical Management Board Resolution 53/2022.

A list of all parts in the [ISO 19901 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.

Commented [eXtyle1]: Invalid reference: "ISO 19901 series"

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 19901-8](#)

<https://standards.iteh.ai/catalog/standards/sist/cc99daa6-861b-463b-b929-070bf8211adb/iso-19901-8>

Introduction

The series of International Standards applicable to offshore structures, i.e. prepared by TC 67/SC 7 (ISO 19900, the ISO 19901 series, ISO 19902, ISO 19903, ISO 19904, ISO 19905 series and ISO 19906,) constitutes a common basis covering those aspects that address design requirements and assessments of all offshore structures used by the petroleum and natural gas industries worldwide. Through their application, the intention is to achieve reliability levels appropriate for manned and unmanned offshore structures, whatever the nature or combination of the materials used. Application specific requirements for different energy industries are referencing relevant overarching standards. For example, for the offshore wind industry the IEC standards IEC 61400-1 and IEC 61400-3-1 outline the normative design requirements (e.g. return periods) for offshore turbine support structures.

Structural integrity is a concept comprising models for describing actions, structural analyses, design rules, safety elements, workmanship, quality control procedures and national requirements, all of which are mutually dependent. The modification of one aspect of design in isolation can disturb the balance of reliability inherent in the overall concept of structural integrity (see ISO 19900). The implications involved in modifications, therefore, should be considered in relation to the overall reliability of all offshore structural systems.

A marine soil investigation is only one of many possible marine site investigations as illustrated in Figure 1. The scope of a marine soil investigation, such as field programme, equipment to be used, laboratory testing programme, soil parameters to be established and reporting, is usually defined in project specifications based on important factors, such as type of structures involved, type of soil conditions expected, regional or site-specific investigation, preliminary or final soil investigations. The reporting can comprise anything from field data only to reporting of soil parameter values.

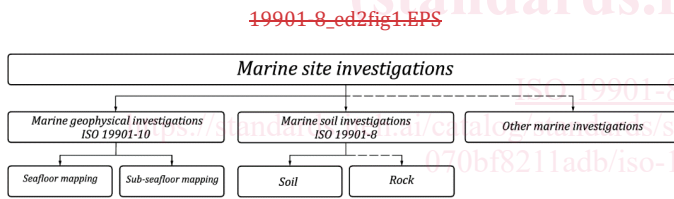


Figure 1 — Marine soil investigations shown as one of many types of marine site investigations.

Use of this document is based on the following assumptions:

- communication takes place between geophysical and geotechnical specialists for defining the scope of the marine soil investigation based on the results of a geophysical investigation (see ISO 19901-10);
- communication takes place between geotechnical personnel involved in marine soil investigations and the personnel responsible for foundation design, for construction and for installation of the offshore structures;
- soil data are collected, documented and interpreted by trained personnel;
- the project-specific scope of work for marine soil investigations is defined by one or more project specifications.

The detailed requirements for equipment and methods given in this document are only applicable if relevant for the scope of work defined in the project specifications.

Commented [eXtyle2]: Invalid reference: "ISO 19901 series"

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Commented [eXtyle3]: Invalid reference: "ISO 19905 series"

Commented [eXtyle4]: Not found: "IEC 61400-1"

Commented [eXtyle5]: Not found: "IEC 61400-3-1"

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

ISO/FDIS 19901-8:2023(E)

This document is intended to provide flexibility in the choice of marine soil investigation techniques without hindering innovation.

In this document, the following verbal forms are used:

- “shall” indicates a requirement;
- “should” indicates a recommendation;
- “can” indicates a possibility or a capability;
- “may” indicates a permission.

Information marked as “NOTE” is intended to assist the understanding or use of the document. “Notes to entry” used in Clause 3 provide additional information that supplements the terminological data and can contain requirements relating to the use of a term.

Annex A gives additional information intended to assist the understanding or use of this document. The clause numbers in Annex A correspond to the normative main text to facilitate easy cross-referencing. Annex B covers conduct of laboratory tests as part of marine soil investigations.

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Formatted: Pattern: Clear

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 19901-8

<https://standards.iteh.ai/catalog/standards/sist/cc99daa6-861b-463b-b929-070bf8211adb/iso-19901-8>

Oil and gas industries including lower carbon energy — Offshore structures — Part 8: Marine soil investigations

1 Scope

This document specifies requirements and provides recommendations and guidelines for marine soil investigations regarding:

- a) objectives, planning and execution of marine soil investigations;
- b) deployment of investigation equipment;
- c) drilling and logging;
- d) in situ testing;
- e) sampling;
- f) laboratory testing;
- g) reporting.

Although this document focuses on investigations of soil, it also provides guidance, with less detail, for investigations of chalk, calcareous soils, cemented soils and weak rock.

Foundation design is not covered by this document.

NOTE 1 [ISO 19901-4](#) and the respective design standards covering foundation design for the specific types of offshore structures to meet the requirements of application specific standards are given on the ISO website.

The results from marine geophysical investigations are, when available and where appropriate, used for planning, optimization and interpretation of marine soil investigations.

This document neither covers the planning, execution and interpretation of marine geophysical investigations nor the planning and scope of geohazard assessment studies, only the corresponding marine soil investigations aspects thereof.

NOTE 2 [ISO 19901-10](#) covers the planning, execution and interpretation of marine geophysical investigations.

This document specifies requirements and provides guidance for obtaining measured values and derived values. This document excludes requirements for determination of design values and representative values. Limited guidance is provided in [Section 11.3](#) related to data interpretation.

This document is intended for clients, soil investigation contractors, designers, installation contractors, geotechnical laboratories and public and regulatory authorities concerned with marine soil investigations for any type of offshore structures, or geohazard assessment studies.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Commented [eXtyle6]: ISO 19901-4: current stage is 40.99
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear

Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear