

GENERAL SPECIFICATION

SURVEYS

GS EP GEO 102

Onshore Geotechnical Soil Survey

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1. Scope

The document defines the general requirements for the equipment and procedures applicable to onshore geotechnical soil survey works necessary for designing and constructing foundations for civil-engineering structures and/or earth works.

The document, defining references for obtaining satisfactory and consistent quality in onshore geotechnical soil surveys, applies to:

- The safety of the site operations, and the responsibility of the Contractor
- The definition of the scope and purpose of the different types of geotechnical survey works
- The equipment and procedures for the performance of the field works, including soil boring or rock coring, trial pits, soil sampling, in-situ testing or measurements, laboratory testing on soil samples or rock cores, etc.
- The procedures for the assessment of all results of the soil investigation tests and measurements, to define the soil characteristics and geotechnical parameters required to design the foundations and/or earth works for the projected structures, as well as the presentation of the results, and the reporting to be provided by the Contractor.

Contractor is responsible for the suitability of the proposed equipment and procedures to achieve the objectives of the soil investigation. In particular, sampling by drilling and excavation methods and groundwater measurements shall comply with the requirements from the Technical Specification [EN ISO 22475-1](#).

Company reserves the right to apply further Particular Technical Specifications, should Company consider that any aspects of the geotechnical survey works require more detailed definition.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
API RP 2A	Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms - Working Stress Design & Load and Resistance Factor Design
API RP 2N	Recommended Practice for Planning, Designing and Constructing Pipelines for Arctic Conditions
ASTM Volume 04.08	Soil and Rock (I): D 420 - D 5611
ASTM D 1586	Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

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Reference	Title
ASTM D 1587	Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
ASTM D 2213	Standard Test Method for Compressibility of Leather
ASTM D 4633	Standard Test Method for Energy Measurement for Dynamic Penetrometers
ASTM D 5778	Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils
ASTM D 6938	Standard test method for in-place density and water content of soil and soil - aggregate by nuclear method (shallow depth)
ASTM G 57	Standard test for field measurement of soil resistivity using the Wenner four-electrode method
BS 1377	Methods of test for soils for civil engineering purposes
BS 5930	Code of practice for site investigations
BS 6349	Code of practice for maritime structures
BS 8004	Code of practice for foundations
DTU 11.1	Drilling Foundation Soils
DTU 12	Earth Works for Buildings
DTU 13.11	Surface Foundations
DTU 13.12	Requirements for the Design of Surface Foundations
EN 12063	Execution of special geotechnical work. Sheet-pile walls
EN 12699	Execution of special geotechnical work - Displacement piles
EN 14199	Execution of special geotechnical work - Micropiles
EN 1536	Execution of special geotechnical work. Bored piles
EN 1537	Execution of special geotechnical work - Ground anchors
EN 1997 (Parts 1; 2)	Eurocode 7: geotechnical design - Parts 1; 2
EN 1998-5	Eurocode 8: design of structures for earthquake resistance - Part 5: foundations, retaining structures and geotechnical aspects
EN ISO 22475-1	Geotechnical investigation and testing -Sampling methods and groundwater measurements - Part 1: technical principles for execution
EN ISO 22476 (Parts 2; 3)	Geotechnical investigation and testing - Field testing - Parts 2; 3
ISO 80000-1	Quantities and units - Part 1: General
ISO 13793	Thermal performance of buildings - Thermal design of foundations to avoid frost heave
EN ISO 13793	

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Reference	Title
ISO 14688-1 EN ISO 14688-1	Geotechnical Investigation and Testing - Identification and classification of soil - Part 1: identification and description
ISO 14689-1 EN ISO 14689-1	Geotechnical Investigation and Testing - Identification and classification of rock - Part 1: identification and description
ISO 22476-12	Geotechnical investigation and testing - Field testing - Part 12: mechanical cone penetration test
ISO/TS 22475 (Parts 2; 3)	Geotechnical investigation and testing - Drilling and sampling methods and groundwater measurements - Parts 2; 3
ISO/TS 22476 (Parts 10; 11)	Geotechnical investigation and testing - Field testing - Parts 10; 11
ISRM	International Society for Rock Mechanics - Rock Characterisation Testing and Monitoring - ISRM Suggested Methods (1981)
ISSMFE (1989)	International Society of Soil Mechanics and Foundation Engineers International Reference Test Procedure for Cone Penetration Test (CPT)
NEN 3650	Requirements for Steel Pipeline Transportation Systems
NF P11-212	DTU 13.2. Building works. Private contracts. Deep foundations for building works
NF P11-213/A1	DTU 13.3 - Paving - Design, Calculation and Production - Part 1
NF P11-221	DTU 14.1 - Building works - Tanking works
NF P94-110-1	Soil: investigation and testing - Menard pressure meter test - Part 1: Test without unload-reload cycle
NF P94-119	Soil: investigation and testing. Piezocone test
NS 8000	Geotechnical Testing, Laboratory Methods
USCS	Unified Soil Classification System - Waterways Exp. Station Corps of Engineers, US Army. Technical Memorandum No. 3-357, Vols. 1 to 3 (1953)

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Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP CIV 101	General earthworks
GS EP CIV 500	Special foundations for onshore Structures
GS EP ENV 111	Environmental baseline and monitoring studies: Onshore Sites
GS EP GEO 210	Onshore Geophysical Site Survey - Cross hole geophysical survey
GS EP GEO 211	Onshore Geophysical Site Survey - Seismic refraction geophysical survey
GS EP GEO 401	GIS requirements for engineering site surveys and studies
GS EP POS 004	The use of Differential Global Navigation Satellite System
GS EP STR 431	Installation of piles for offshore steel structures. Driven piles

3. Glossary

HAZID	Hazard Identification
HIRA	Hazard Identification and Risk Assessment
MEDEVAC/EVASAN	Medical Evacuation / Evacuation Sanitaire
PVC	PolyVinyl Chloride
DGPS	Differential Global Positioning System
CBR	Californian Bearing Ratio
SPT	Standard Penetration Test
CPTU	Cone Penetration Test With pore pressure measurement
CPT	Cone Penetration Test
TCR	Total Core Recovery
RQD	Rock Quality Designation
SCR	Solid Core Recovery

4. Units

Only the ISO international system of units ([ISO 80000-1](#)) shall be used. However, the standard diameter and wall thickness of steel tubular pipes can also be expressed in inches (1 inch = 25.4 mm). When this is the case, the symbol used for the inch unit (" or in.) shall be clearly indicated.

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5. Safety procedures and quality assurance

5.1 Safety and the Contractor's responsibility

As part of the Project safety plan, a complete hazard identification and risk assessment (HAZID and HIRA) shall be provided by the Contractor. The procedure for evacuating injured personnel (MEDEVAC/EVASAN procedure) shall be included in this safety plan.

The Company's general safety instructions will be supplied to the Contractor who shall read them critically, and point out any incompatibility there may be with his own safety plan. When the geotechnical survey works take place at an oil or gas production site operated by the Company, the Contractor shall report to the Company site manager.

Before commencement of the field works, Company will provide to the Contractor any specific regulations and/or work permit procedure regarding to the geotechnical survey site.

All questions concerning the safety of all survey personnel present during the field works at the survey site shall be under the Contractor's responsibility. The Contractor's responsibility includes informing any Sub-Contractors on the safety procedures for the different equipment and tasks.

Before commencement of the survey works at the site, a pre-job/kick-off meeting shall be organised by the Company and Contractor. This meeting shall be attended by the Representatives of the Company, the Contractor and the Sub-Contractors, and any other parties involved in the survey works, including the Company site manager and safety manager, and local authority (if required). The purpose of this meeting shall be to review the scope of the geotechnical survey works to be carried out, and to identify any other activities involved at or off the site. Minutes of the meeting shall be drawn up and signed by both the Company and Contractor Representatives.

In adverse weather conditions, Contractor may be required to cease geotechnical survey operations at the site, when it is considered that such adverse conditions may affect the safety of survey personnel and equipment, or the quality of the site works. Such adverse conditions shall be defined in common agreement between the Contractor and Company Representatives.

5.2 Quality assurance

The documentation supplied by the Contractor shall allow the quality of the proposed geotechnical survey works and services to be assessed by the Company. The curriculum vitae of all key personnel involved in the soil investigation shall be supplied by the Contractor, together with a functional organisation chart.

For each phase of the geotechnical survey works, the Contractor shall establish a quality assurance and quality control procedure.

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6. Drilling and soil boring equipment and procedures

6.1 General procedures and documentation

6.1.1 Drilling plant and equipment

Open-hole rotary drilling shall be used to advance the soil borings and shall allow soil sampling and in-situ testing. The drilling equipment shall be compatible with any types of soil conditions likely to be encountered at the site, i.e. soft or stiff to hard clays, silt and more or less dense sands, limestone and rock formations. When necessary, drill casings shall be used to support the soil borings. Rotary diamond core drilling shall be used in cemented rock formations, and the type of drill bit shall be adapted to the rock formations likely to be encountered at the site.

The drilling machine shall meet the following minimum requirements:

- Minimum torque: 250 to 300 m.kg
- Minimum thrust: 2 to 3 tons
- Rotation speed: 0 to 800 rpm
- Mud pump: 30 to 50 bars at a flow rate of 100 l/min.

When drilling at shallow depths and in very soft soils, reduced parameters or characteristics can be used to avoid soil washing or limit soil disturbance.

The rotary drilling machine, including the mud tanks and pumps, shall be set either on an adequate truck or a self-powered caterpillar. In environmental sensitive areas, or for special access reasons, man portability of the drilling equipment can also be considered.

Contractor shall provide all accessories for drilling, such as casings, drill rods and bits, pumps and compressors, drilling fluid additives, water, and any other materials, supplies and manpower. Drill rods shall be straight and of a large enough diameter to prevent excessive whip, to ensure stability of the drill string, to maintain the up-hole velocity of the drilling fluid, and to allow in-situ testing or soil sampling with the required minimum sample diameter, as mentioned in the Particular Technical Specification. As a basis, the drilling diameter shall not be less than 100 mm (4 inches).

The drilling plant shall be smooth running and mounted in such a way that minimum vibrations or movements are transmitted by the drill string to the drill bit and core barrel for minimising the risk of disturbing the soil to be sampled or tested in-situ. The drilling equipment shall be well maintained, and the maintenance records shall be available to the Company Representative, upon request.

Continuous and automatic recording of the drilling parameters shall be performed during drilling operations, including the following parameters recorded as a function of penetration depth: drilling rate (i.e. drilling time in minutes per meter, or meters drilled per hour), weight on drill bit, torque on the drill string, mud pressure, and percentage recovery of the drilling fluid. No later than 24 hours after completion of each soil boring, the record of drilling parameters shall be provided to the Company Representative.

The composition of the drilling fluid shall be selected and varied so as to limit soil disturbance, in particular for soft and non-cohesive soils or weakly cemented formations, whilst minimising expense. Spillage of the drilling fluid shall be minimised, and water shall not be allowed to pond