

GENERAL SPECIFICATION

SURVEYS

GS EP GEO 102

Onshore Geotechnical Investigations

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1. Scope

This specification gives the general requirements for the definition and the execution of geotechnical soil surveys necessary to the design and to the construction of foundations, civil-engineering structures and earth works.

2. Reference documents

This document is the TOTAL E&P transposition of the TOTAL S.A. Harmonized GS GR GEO 102.

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 addendums, is the latest revision published at the effective date of this document.

Reference	Title
EN 1997-2	Eurocode 7 - Geotechnical design - Part 2: Ground investigation and testing
ISO 22282 (All Parts)	Geotechnical investigation and testing - Geohydraulic testing - All Parts
ISO 22475 (Parts 1; 2; 3)	Geotechnical investigation and testing - Sampling methods and groundwater measurements - Parts 1; 2; 3
ISO 22476 (Parts 1; 3; 4)	Geotechnical investigation and testing - Field testing - Parts 1; 3; 4
ISO 80000-1	Quantities and units - Part 1: General
NF X31-614	Soil quality - Pollution detection and characterisation methods - Conducting of drilling for inspection or monitoring of groundwater quality at and around potentially polluted sites
NF X31-615	Soil quality - Methods for detecting, characterizing and monitoring groundwater at polluted or potentially polluted sites - Extraction and sampling in monitoring wells for the determination of groundwater quality

Total General Specifications

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

Reference	Title
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

3. Applicability

This specification is applicable to onshore structures.

This specification is applicable to the following engineering tasks:

- Preliminary and basic design
- Development of project particular specifications
- Detailed design
- Expertise.

4. Definitions of terms

For the purpose of this document, the following terms and definitions apply:

Company: Any entity of the TOTAL Group mentioned in the contract or the order.

Contractor: Company to which the work contract is awarded. The contractor may be responsible for carrying out the execution studies.

Engineering Company: Individual or company providing, according to this specification, the following services:

- Basic studies and possibly detailed studies
- Potential procurement of material
- Placement of work orders.

PPS: Particular Project Specification.



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The Engineering Company may be the Contractor or Company.

4.1 Glossary

For the purpose of this specification, the following definitions shall apply:

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

5. 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).

Symbology for units shall meet the following requirements:

- Symbol used for the inch unit (" or in.) be indicated
- Formatting of the number will be defined (US or European e.g. coma to separate thousands and dot for decimals in the US format).

6. Safety procedures and quality assurance

6.1 Safety and the Contractor's responsibility

All contractors shall be familiar with and apply at all times Company Golden Rules.

Daily Safety Discussion and Near-miss reporting are considered as good practice.



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As part of the Project safety plan, the following shall be provided by the Contractor:

- A complete hazard identification and risk assessment (HAZID and HIRA)
- The procedure for evacuating injured personnel (MEDEVAC/EVASAN procedure).

The Company's general safety instructions will be supplied to the Contractor who shall read them, and point out any incompatibility there may be with his own safety plan.

When the geotechnical investigation works take place at an oil or gas production site operated by the Company, the Contractor shall report to the Company site manager.

All questions concerning the safety of all investigation personnel, present during the field works at the investigation 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 investigation works at the site, a pre-job/kick-off meeting shall be organized as per the following requirements:

- Organized by the Company and Contractor
- To be attended by:
 - The Representatives of the Company
 - The Contractor
 - The Sub-Contractors
 - Any other parties involved in the investigation works, including:
 - . The Company site manager
 - . The Company safety manager
 - . Local authority (if required)
 - With the purpose of:
 - . Reviewing the scope of the geotechnical investigation works to be carried out
 - . Identifying any other activities involved at or off the site
 - Minutes of the meeting to be drawn up and signed by both the Company and Contractor Representatives.

In adverse weather conditions, Contractor may be required to cease geotechnical investigation operations at the site, when it is considered that such adverse conditions may affect:

- The safety of investigation personnel
- The safety of equipment
- The quality of the site works.



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Adverse conditions shall be defined in common agreement between the Contractor and Company Representatives.

6.2 Quality assurance

The documentation supplied by the Contractor shall allow the quality of the proposed geotechnical investigation 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 organization chart.

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

All equipment requiring calibration shall have up to date certification.

Company will focus on high quality performance of the services and deliverables. Services not up to required standard will be re performed to the required standard at Contractor's cost.

7. Definition of scope of work

7.1 General

The extent of the services is described in the order.

The services shall include:

- The detailed scope of work (see section 7.2), and
- The constraints arising from:
 - The application of the regulations
 - The proximity of existing works
 - The existing units whether operating or not.

The Contractor shall conform to:

- Local regulations, and
- The rules of the establishment for which the works are being carried out.

7.2 Detailed Scope of Work

For any project, a detailed scope of work shall be proposed by the Engineering Company and approved by Company.



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The Detailed Scope of Work shall include all the following items, as minimum:

- A description of the project
- The purpose and objectives of the geotechnical investigation
- Information on site access and work permit requirements
- Proponent contact and phone number
- Type of structures to be constructed
- Approximate loads derived from, when available, description of the main structures, columns, tanks, basin, ... if any
- Codes and standards to be applied
- A location plot plan including the locations of the existing and proposed facilities and the locations of the field tests
- The completed checklist of required geotechnical services
- The preliminary number, type, and depths of field tests to be conducted
- A description of any special tests or requirements
- The objectives of the laboratory test program (specific number and type of laboratory tests need not be specified)
- Final grade and/or anticipated cut or fill
- Depth of basements, utility trenches, pits, ponds, etc.

The scope of work shall be

- Adapted to the stage of development of the project
- Considered for the following stages, as detailed in sections 7.3 to 7.8.

7.3 Preliminary investigations

Preliminary geotechnical investigations shall be conducted according to all the following conditions:

- In case of:
 - Important or isolated project
 - When available geotechnical data are too poor.
- With the aim of:
 - Constituting a first collection of fundamental data
 - Giving a general indication of ground conditions
 - Identifying main geohazard
 - Preparing further and more precise investigations.

A desktop study shall be conducted to gather all the public information available.





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After the desktop study, the Engineering Company shall prepare a preliminary version of the Detailed Scope of Work.

The Detailed Scope of Work shall be adapted to the information which will be collected, comprising a limited a limited number of the following tests, spaced across the site:

- Boreholes
- CPT tests and
- Other exploratory holes.

If structure locations are known, the boreholes/CPTs shall be located to reflect this, otherwise a grid is normally applied.

Grid spacing is typically between 50 m and 500 m, depending on how well the project and plant locations are defined (see Appendix 1).

The purpose of this preliminary study, based on regional existing data examination and on a brief on field and laboratory tests program, is to:

- Describe the regional and local geological conditions
- Describe the hydrogeological context of the site
- Describe the climatic and seismic conditions to be considered on the site
- Describe the different geotechnical unit and roughly define the geotechnical cross-sections over the area
- Determine a level range for the ground water table
- Give a geochemical analyse of soil or water
- Estimate the global stability and the suitability of the site
- Identify main geohazard including but not limited to underground cavities (particularly in areas of predominately limestone geology), swelling soils, quick clays, flooding, etc.
- Give recommendations relating to the arrangement of the project, foundation type and possible reuse of material
- Describe the environmental neighbourhood of the site, and the possible risks or interferences with the planned works
- Identify the borrow pit, if applicable
- Give preliminary recommendations for the type of foundations or soil improvement to be envisaged
- List the detail of the complementary investigations to be conducted for the further engineering phases of the project.