



Exploration & Production

GENERAL SPECIFICATION

CIVIL WORKS

GS EP CIV 102

Dredging and filling up

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1. Scope

This specification covers studies relative to dredging and filling-in works, and is more specially meant for use by Engineering CONTRACTORS.

General specifications stipulate the COMPANY minimum requirements. However, some works may present particular problems. In this case the COMPANY reserves the right to modify or complete general specifications by particular specifications.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

When local national standards, regulations and codes exist, all design, engineering, materials and construction shall conform to their latest requirements, which complete or modify the present specifications.

In case of lack of obligatory local national standards, international norms and standards will be applied.

In case of lack of international norms and standards, national norms and standards listed hereafter will be applied.

In all cases the system adopted shall be coherent, i.e. the various texts shall present no incompatibility. Any dispute shall be resolved by basing works on the most stringent text for the CONTRACTOR and at his expense.

The list of specifications and norms quoted is not exhaustive: the CONTRACTOR shall respect the secondary standards and regulations, which cover the works described in the present specification.

Certain specifications and norms may be indicated with an issue date. This is for information only and on the understanding that the most recent issue shall be used.

Correctly speaking, standards, which are specifically applicable to dredging works, do not exist. Standards, which are applicable to hydraulic filling-in works, are the same as those used for earth filling-in, and are given in specification **GS EP CIV 101**.

Standards

Reference	Title
ISO 8385 – 1999	International standards and codes Ships and Marine Technology – Dredgers – Classification
Eurocode 7	European standards and codes Calcul géotechnique, Partie 1 : Règles générales (Geotechnical design, Part 1 : general rules)
Fascicule n° 2 du CCTG	French standards and codes Terrassements Généraux (General Earthworks) – 14 mars 1979 (Ministère de l'Environnement et du Cadre de vie, Ministère des transports)

Reference	Title
NFP 11-300	Classification des matériaux utilisables dans la construction des remblais et des couches de forme d'infrastructures routières (Classification of usable materials in construction of filling-in and base course of roads)
	American standards
ASTM D 420 – 98	Guide to Site Characterisation for Engineering, Design, and Construction Purposes
ASTM D 421 – 85 (1998)	Practice for Dry Preparation of Soil Samples for Particle-size Analysis and Determination of Soil Constants
ASTM D 422 – 63 (1998)	Test Method for Particle-Size Analysis of Soils
ASTM D 854 – 00	Test Methods for Specific Gravity of Soil Solids by Water Pycnometer
ASTM D 1556 – 00	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557 – 00	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kNm/m ³))
ASTM D 1883 – 99	Test Method for CBR (California Bearing Ratio) of Laboratory – Compacted Soils
ASTM D 2167 – 94	Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2216 – 98	Laboratory Determination for Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487 – 00	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2845 – 00	Test Method for Laboratory Determination of Pulse Velocities and Ultrasonic Elastic Constants of Rock
ASTM D 2922 – 96e1	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937 – 00	Test Method for Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017 – 96e1	Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3155 – 98	Test Method for Lime Content of Uncured Soil-Lime Mixtures
ASTM D 3213 – 91 (1997)	Practices for Handling, Storing, and Preparing Soft Undisturbed Marine Soil
ASTM D 3282 – 93 (1997)e1	Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
ASTM 4253 – 00	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

Reference	Title
ASTM D 4254 – 00	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D 4318 – 00	Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soil
ASTM D 4428 – 00	Test Methods for Crosshole Seismic Testing
British standards and codes	
BS 6031 – 1981	Code of Practice for Earthworks
BS 812	Testing Aggregates
BS 1377 – 1990	Methods of Test for Soils for Civil Engineering Purposes
BS 5930 – 1999	Code of Practice for Site Investigations
BS 6349 – 5 – 1991	Maritime Structures. Code of Practice for Dredging and Land Reclamation
BS 7370 – 5 – 1998	Grounds Maintenance. Recommendations for the Maintenance of Water Areas
BS 7473 – 1991	Glossary of Terms for Dredgers

Professional Documents

Reference	Title
PIANC Bulletin 47, 1984	Classification of soils and rocks to be dredged

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP CIV 101	General earthworks
GS EP ENV 121	Environmental impact assessment onshore activities
GS EP GEO 102	Onshore geotechnical soil survey

3. Materials to be dredged

3.1 General

In the absence of any scientific classification of dredging degrees, the COMPANY requests the use of the report published by the International Navigation Association (PIANC). This report was published in 1984 in the PIANC bulletin.

3.2 Description of materials to be dredged or excavated

All call for bid for dredging or excavation works shall include a description as faithful as possible of the materials to be dredged (refer to [GS EP GEO 102](#))

3.2.1 Description of soils to be dredged

For the description of soils to be dredged, the Engineering CONTRACTOR shall refer to Table 1 in appendix, drawn up by the PIANC Maritime Navigation Commission. He shall be as precise as possible in his description (nature, consistency, colour, etc.).

The identification shall moreover include an indication of the soil physical characteristics:

- Structure (resistance to penetration, compactness)
- Granular soil: sieve analysis and description of grains
- Cohesive soil: consistency (shear breaking resistance)
- Smell and colour.

3.2.2 Description of rocks to be dredged or excavated

Drilling diagrams shall be completed by the following elements:

- The descriptive section shall start with a geological classification of rock types. This classification shall be simple but precise
- Drilling parameter characteristics:
 - Coring characteristics (diameter, method, equipment used)
 - Percentage of intact sample cores
 - Percentage of cores with a length of more than 10 cm
 - Progress speeds.
- Sedimentary rocks: indication of inclination and thickness of layers

- Qualitative information:
 - Colour
 - Particle sizes (fine or glassy particles) and texture
 - Strength
 - Bed, joint, crack or geological fault, discontinuity including orientation, etc.
 - Degree of weathering.

In appendix, table 2, drawn up by the PIANC Maritime Navigation commission, groups together the elements required for the identification and classification of rocks to be dredged or excavated.

3.3 In situ and laboratory tests

The Engineering CONTRACTOR shall find in appendix, tables 3 to 7 drawn up by the PIANC, the list of tests to be carried out:

- Table 3, relative to methods to be used on site, as well as in laboratories to identify the soils to be dredged
- Table 4, relative to testing procedures for soil
- Table 5, relative to methods to be used for testing rocks
- Table 6, relative to surface survey used in situ, to obtain sound information on soils and rocks.

Laboratory testing must be undertaken on fresh samples and great care must be taken so that samples are fully representative.

Representative soil samples shall be kept in sealed containers so that more detailed analysis may be carried out at a later date.

3.4 General considerations

Consideration of tables 1 to 7 aim at giving the elements required to define, for the Construction CONTRACTOR, the problems involved in dredging.

4. Equipment and techniques

4.1 General

The Engineering CONTRACTOR shall submit the equipment characteristics and the techniques that he intends to suggest, for COMPANY approval.

4.1.1 Choice of machine types

The Engineering CONTRACTOR shall take the following factors into consideration (this list is not exhaustive):

- Nature of materials to be dredged
- Quantity of materials to be dredged
- Dredging depth

- Distance between dredging site and deposit or fill-in area
- Site access
- Physical environment of site
- Pollution from dredged materials.

Table 7 shown in appendix may be used for a preliminary determination of machine types that can be used.

4.1.2 Work phases

The Engineering CONTRACTOR shall make clear the various work phases involved in dredging operations:

- Excavation
- Transport
- Deposit.

The study shall show the different functions, either under combined form regrouping the overall functions, or on the contrary, under dredging train form, including:

- Extraction machine: the dredging machine
- Transport equipment: barges, trucks, piping
- Unloading and setting down device: bucket elevator or other device.

4.2 Types of dredging machines

In compliance with paragraph 4.1.1, the Engineering CONTRACTOR shall study the type of the dredging machines and in his instructions he shall perfectly define the type of machine to be used, with characteristics and limits. These instructions shall be submitted to the COMPANY for approval.

4.3 Machines and methods used in excavation

Depending on the nature of rocks found, the Engineering CONTRACTOR might have to define excavation methods for rocks. The recommended methods shall be submitted to the COMPANY for approval.

4.4 Deposit or filled-in

Deposit or filled-in shall be defined in particular specifications.

The Engineering CONTRACTOR shall study the problem of deposits for excavated materials and submit his findings for COMPANY approval:

- Deposit area (hydraulic disposal at sea, onshore earth deposit)
- Deposit techniques
- Transportation of materials.

This study shall take into account the type of dredged material, as well as site access constraints.